1949-50-51

FORD

PASSENGER CAR

SHOP MANUAL

ORD DIVISION

ORD MOTOR COMPANY

1949, 1950 and 1951 Ford Passenger Car Shop Manual
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SERVICE DEPARTMENT

Nov. 24, 1950

PREFACE

This manual combines under one cover complete service information for the 1949-50-51 Ford Passenger Cars. All aspects of the servicing of the parts, assemblies, or systems involved will be found here. Repair men will find step by step procedures plus disassembled views of all of the assemblies used in these models. The diagnostician will find that working procedures for each kind of trouble he will encounter are covered. Maintenance and lubrication data is provided for those interested in this aspect of service. Service Managers and salesmen will find hints of everyday care that they can pass on to their customers. Collision men will find construction detail well illustrated to assist them in collision work. Electrical men will find simply written principles, not only of operation, but of testing as well for each of the electrical units or systems. Upholstery men will find how-to-do-it procedures for their work.

Step-by-step procedures for the disassembly, inspection, and repair are presented throughout this manual. In addition, each assembly has been illustrated disassembled, with each of the component parts arranged in the order of assembly or disassembly. In many cases, a glance at these illustrations will tell you all you need to know about how the parts go together. These illustrations carry basic part numbers for each of the parts. These basic numbers plus the model number of the car will permit you to order parts from any Ford dealer even though you may not have a "Parts Book."

In recognition of the specialization that is currently practiced in many service establishments, this manual has been divided into five major divisions. These five parts are as follows:

Part ONE—POWER PLANT—has to do with the Ford engines and the various systems that are necessary to their operation. These include fuel system, ignition system, and the cooling system.

Part TWO—CHASSIS—starting with the clutch, covers the entire power train (clutch, [illegible]mission, drive line, rear axles, etc.) and the [illegible] gear (wheels, tires, brakes, springs, sus[illegible]d linkages, etc.). [illegible]AL AND AC[illegible]lectrical systems [illegible]hich is covered in Part ONE) and all of the accessories for Ford cars.

Part FOUR—BODIES—contains complete information on the maintenance and repair of all body components, including adjustment and alignment not only of the body proper, but also of doors, deck lids, hoods, fenders, and shields.

Part FIVE—MAINTENANCE, TROUBLE SHOOTING, AND SPECIFICATIONS—has been arranged in the back of the book separately for the convenience of quick service men. In this part, all of the information ordinarily required for quick service men and service salesmen has been combined into three separate chapters.

The Table of Contents on the next page shows not only the part break-down as described above, but also the chapters that have been established in each of the five parts. Each chapter has been divided into sections which also are listed in the Table of Contents. Regardless of the aspect of service in which you are interested or the unit of the vehicle in which you may be specializing, a glance at the Table of Contents will quickly direct you to the portion of this manual in which you are interested. If you are interested in maintenance procedures, trouble shooting, or specifications, the information you desire will be found in Part FIVE. Otherwise, it will fall in one of the four other parts. A quick glance at the chapter and section listings under the part involved will direct you to the page desired.

Throughout this manual the top of each left-hand, even-numbered page gives the name of the chapter; and the top of each right-hand, odd-numbered page gives the name of the section involved. Thus, regardless of where you open the manual, a glance at the top of the two pages will tell you exactly what subject matter is discussed at that point.

No one expects even the most experienced mechanic to remember all details of servicing these cars and you will find that you will have to occasionally refer to this manual. Keep your manual where it will be readily available for reference at all times.

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CHAPTER I—MAINTENANCE PROCEDURES

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Part ONE

POWER PLANT

Chapter

I

H-Series—6-Cylinder

The material presented in this chapter covers the H series 6-cylinder engine illustrated in figs. 1, 2, and 3. This engine is a 95-horsepower L-head engine with a 3.3 inch cylinder bore and a 4.4 inch piston stroke. The piston displacement is 226 cubic inches.

Complete removal, repair, and installation information covering all of the component parts of the engine as listed above are included in this chapter. Always install new gaskets when any installation is made. A complete engine overhaul gasket kit illustrated in fig. 4 is available for engine overhaul.

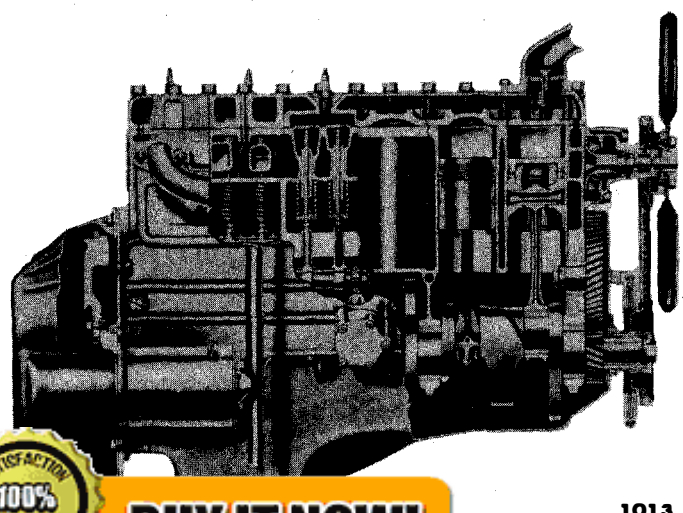
1. ENGINE REMOVAL AND INSTALLATION

A detailed procedure is outlined below for the removal and installation of the 6-cylinder car engine. It includes the steps necessary for mounting the engine on a work stand after it has been removed.

a. Removal.

Remove the hood and battery. Drain the crankcase and cooling system. Disconnect the upper radiator hose at the engine and the lower hose at the radiator. Remove the radiator. Disconnect the heater hoses at the engine. Remove the air cleaner.

Disconnect the generator wires, the temperature sender wire, the oil pressure sender wire, and the ignition switch to coil wire. Fold the cable harness out of the way.



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(Sectional View)

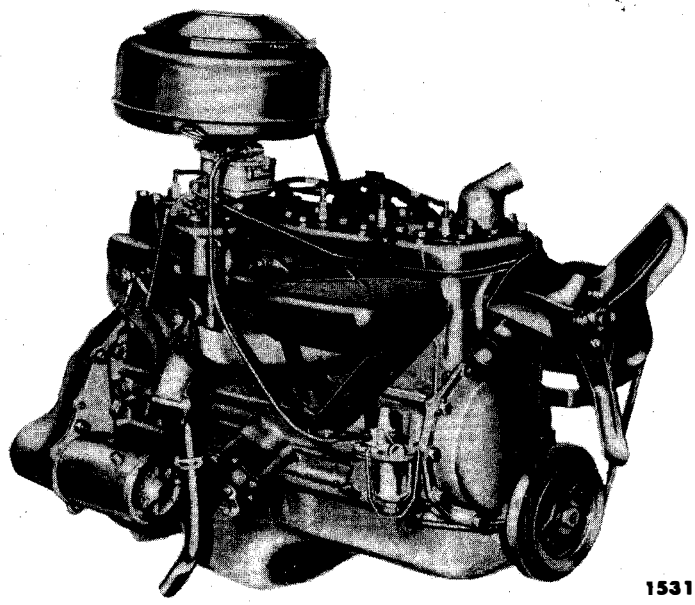

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Fig. 2—1951 H-Series 6-Cylinder Engine (¾ Front View)

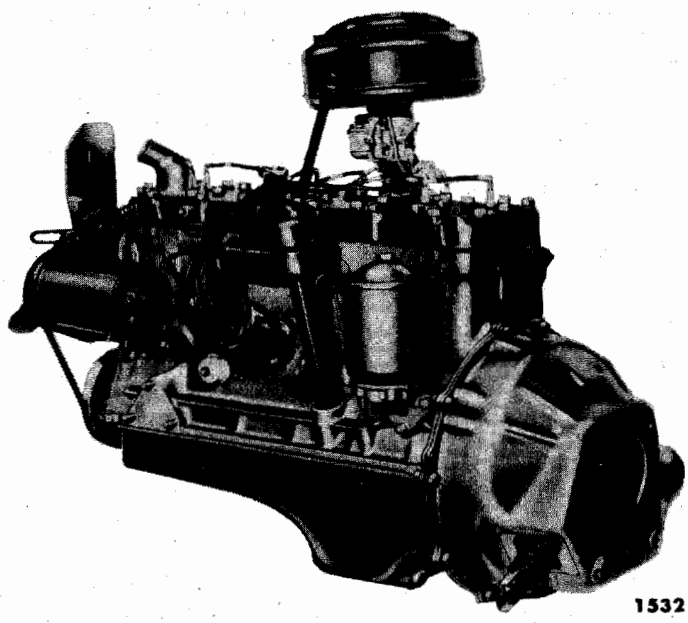
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Fig. 3—1951 H-Series 6-Cylinder Engine (¾ Rear View)

Disconnect the flexible fuel line connection. Disconnect the choke wire, the throttle linkage, and the windshield wiper hose at the carburetor.

Disconnect the starter cable at the starter motor terminal, the muffler inlet pipe, and the clutch spring and rod.

Remove the engine front support bolt. Install the engine lift bracket and take up the load with a hoist. Support the transmission with a jack. Remove the transmission to flywheel housing screws. Rock the engine and pull it away from the transmission, then raise the engine carefully (fig. 5). Be sure it clears all parts of the compartment. Do not let the engine swing against the grille.


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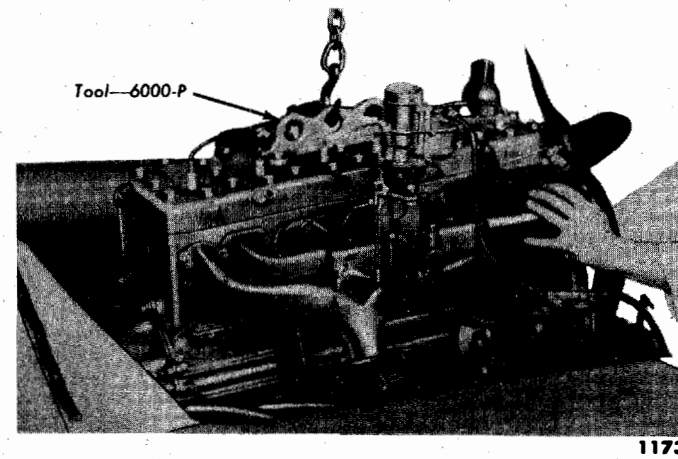

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Fig. 5—Removing Engine

With the engine clear of the car and hanging on the hoist, remove the manifold assembly. Install the engine on a work stand (fig. 6).

b. Installation.

Remove the engine from the workstand. With the engine hanging on the hoist, install the manifold assembly. Shift the transmission into gear. Raise the transmission until it just touches the floor pan. Center the clutch release bearing on the clutch and lower the engine into the compartment carefully. Start the transmission main shaft into the clutch.

NOTE: ***It may be necessary to adjust the position of the transmission with relation to the engine. If the engine "hangs up" after the pilot enters, turn the crankshaft slowly until the splines seat.***

Install the transmission to flywheel housing screws and torque them to 40-50 foot-pounds. Remove the jack from under the transmission. Lower the engine to the frame

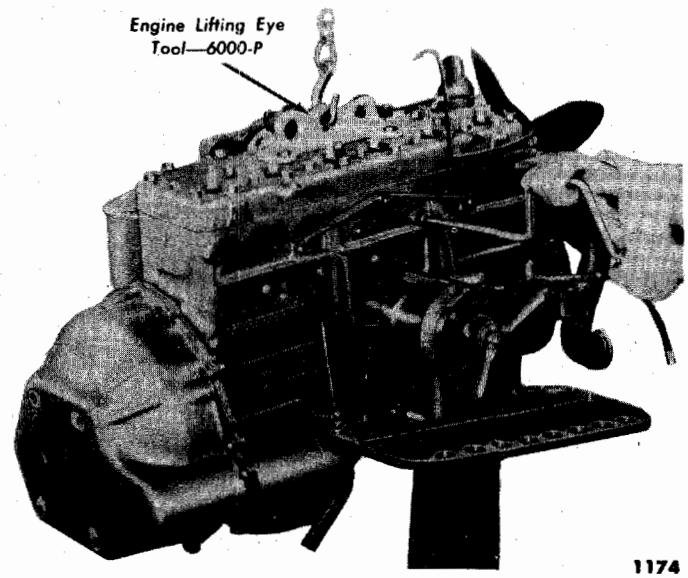

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Fig. 6—Installing Engine on Workstand

and install the engine front support bolts. Remove the lift brackets. Connect the starter cable, muffler inlet pipe, and clutch release rod and spring. Adjust the clutch pedal free play.

Connect the throttle linkage, the choke wire, and the windshield wiper hose. Connect the flexible fuel line.

Connect the generator wires, the temperature sender wire, the oil pressure sender wire, and the ignition switch to coil wire.

Install the radiator. Connect the radiator and heater hoses. Install the battery, hood, and air cleaner. Fill the crankcase with the proper grade and amount of engine oil. Fill the cooling system according to the prevailing temperature. Run the engine and check for leaks in the system.

2. MANIFOLDS

A chamber is built into the intake manifold center section where the carburetor and exhaust manifold are attached. An exhaust control valve, located in the exhaust manifold, directs exhaust gases into this chamber when the engine is cold to provide for quicker warm-up during starting.

NOTE: ***Do not remove manifolds when hot. They may warp and make reassembly difficult.***

a. Removal.

Remove air cleaner. Disconnect hot water heater hose at water pump. Disconnect distributor vacuum line at carburetor. Disconnect fuel line at carburetor. Disconnect accelerator linkage at both sides of the bell crank and at the carburetor. Remove carburetor. Disconnect windshield wiper hose. Remove the screw holding the intake manifold baffle assembly to cylinder head. Remove the top nut from the engine right front support bracket and remove the intake manifold baffle assembly. Disconnect muffler inlet pipe from exhaust manifold. Remove manifold hold down nuts and lift both manifolds and gaskets from the block. Remove nuts holding manifolds together and separate the manifolds (fig. 7).

b. Cleaning.

Remove all old gaskets and scrape the gasket surfaces on the manifolds and the block. Scrape the carbon and the dirt accumulation from the interior and exterior of the manifolds.

c. Inspection.

Inspect the manifolds for cracks especially around the heat chamber in the intake manifold. Make sure all gasket surfaces are free from projections that may interfere with sealing. Place a straight edge across the port openings. The manifold should touch the straight edge at all points. Replace the manifold if faulty.

d. Installation.

Use new manifold gaskets as shown in fig. 8.

Fasten the manifolds together (30-35 foot-pounds torque). Place the manifolds on the engine block. Tighten the nuts to 25-30 foot-pounds torque, starting in the center and working outward. Install the carburetor, then connect the windshield wiper hose. Connect the accelerator linkage at bell crank and carburetor. Connect the fuel line and the distributor vacuum line to the carburetor. Fasten the intake manifold baffle assembly to the cylinder head. Install the top nut on the engine front support bracket. Connect the muffler inlet pipe to the

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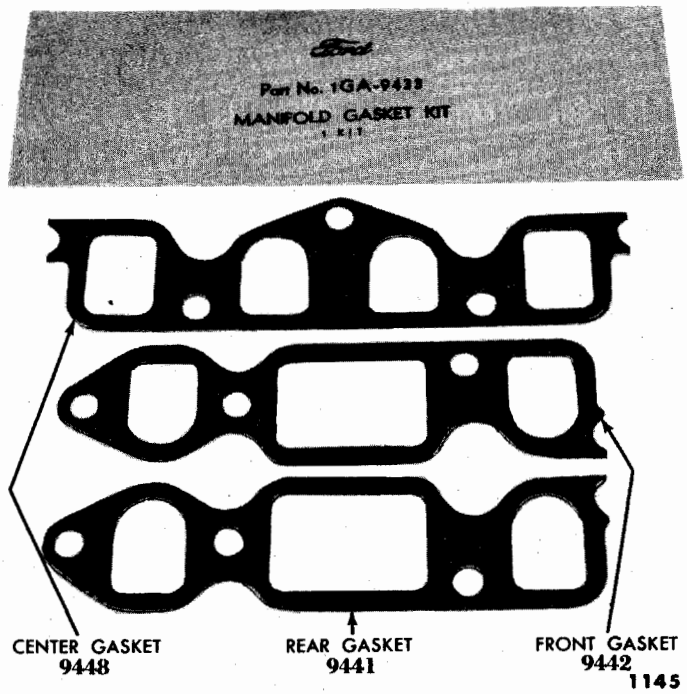

Fig. 8—Manifold Gasket Set

exhaust manifold. Connect the heater hose and install the air cleaner.

e. Checking Exhaust Control Valve.

Move the counterweight through its complete travel and check for sticking in any position. Inspect all parts for breakage. Make sure the weld is not broken between deflector plate and shaft.

Figure 7 shows both manifolds and location of exhaust control valve.

3. CYLINDER HEAD

Cylinder heads are cast from the same high grade iron as is used for the cylinder block. Expansion and contraction due to temperature variations is the same for both head and block lessening the possibility of cylinder head distortion.

NOTE: ***The 0HA-6050 cylinder head is interchangeable with the 7HA-6050 cylinder head.***

The cylinder head removal, cleaning, inspection, and installation is given below.

a. Removal.

Drain the cooling system. Disconnect the radiator hose from the cylinder head. Disconnect the lead from the cylinder head temperature sending unit. Remove the screw from distributor vacuum line clamp on forward left corner of cylinder head. Disconnect the ignition wires from the spark plugs and remove the plugs. Remove the two screws from the coil bracket and let the bracket hang from the distributor. Disconnect the heater hose. Remove the screw from the intake manifold air baffle assembly on the right side of the cylinder head. Remove the cylinder head bolts and remove the cylinder head.

b. Cleaning.

Remove carbon from the combustion chambers with a scraper and stiff wire brush. Be careful not to scratch the machined surfaces on the cylinder head. Remove the rust and dirt from the water passages.

c. Inspection.

Check the cylinder head for cracks or warped surfaces. Check to see that water passages are open and the head is clean. Make sure the head and block gasket surfaces are free from grease, dirt, and raised projections that may occur at screw holes.

d. Installation.

NOTE: ***Do not enlarge any gasket holes or overheating of the rear cylinders may result.***

Install a new cylinder head gasket (fig. 9) with the cut off corner at the left front corner of the block.

NOTE: ***If the gasket is installed improperly, water will leak externally at the left rear corner of the engine between cylinder head and block.***

Place the cylinder head in position on the block, being careful not to damage the gasket. Before installing the cylinder head bolts, coat the bolt threads with a light coat of water resistant sealer. Insert the cylinder head bolts and tighten to 65-70 foot-pounds in the sequence as shown in fig. 10. Fasten intake manifold air baffle assembly to cylinder head. Connect the heater hose. Fasten the distributor vacuum line clamp to the cylinder head. Connect the temperature sending wire. Install the spark plugs. Torque the plugs to 24-30 foot-pounds. Position the coil bracket and install the two holding screws. Connect the secondary ignition wires to the spark plugs. Connect the radiator hose. Fill the cooling system according to the prevailing temperature. Operate the engine for five minutes, stop engine, and refill the cooling system to the normal level.

4. OIL PAN, OIL PUMP, AND PRESSURE RELIEF VALVE

Procedures in this section cover removal, cleaning, inspection, installation of the oil pan, reconditioning the oil pump, installation of oil seal and pressure relief valve.

a. Oil Pan.

For servicing 1949, 1950, and 1951 cars with standard or overdrive transmissions a new oil pan 1HA-6675-C is used in place of 8HA-6675-A or B. 1951 models with automatic transmission use 1HA-6675-B.

NOTE: ***The engine must be removed from the chassis in order to remove the oil pan.***

(1) *REMOVAL.* Remove the engine from the chassis. Remove the screws that hold the oil pan to engine rear plate. Remove the screws that hold the oil pan to the

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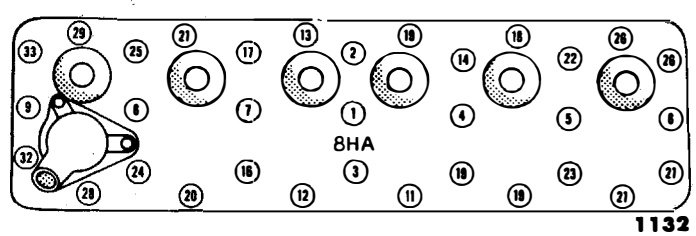


Fig. 10—Cylinder Head Bolt Tightening Sequence

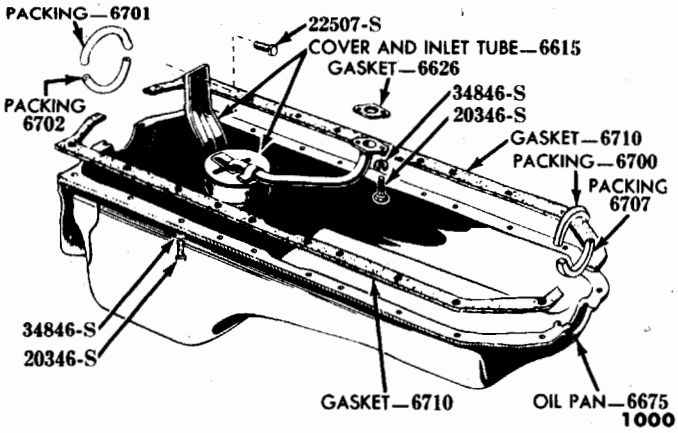


Fig. 11—Oil Pan

engine block and the front cover plate. Remove the oil pan from the engine fig. 11.

(2) *CLEANING*. Use a solvent to remove the sludge and dirt from both the inside and outside of the oil pan. Scrape the old gasket flange. Clean the oil sump strainer.

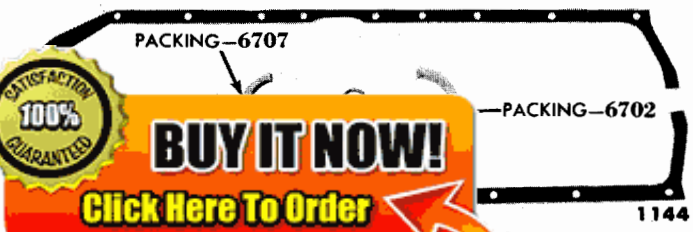
(3) *INSPECTION*. Inspect the oil pan for any external damage such as cracks or warped gasket surfaces. Inspect the drain plug threads for damage that may cause leakage. Check oil sump strainer for crimped passages. Repair any damage and cracks, or replace the pan if repairs cannot be made.

(4) *OIL SEAL INSTALLATION*. Remove the oil packing and thoroughly clean packing retainer grooves. Soak packing (fig. 12) for two hours in S A E 20 oil before installation. Install the short packing in the retainer grooves. "Roll-in" the packing with a round bar (fig. 13), make sure the packing meets the gasket evenly.

(5) *INSTALLATION*. Spread a thin film of grease on the oil pan gasket surface to hold the gasket in place during installation. Install a new gasket (fig. 12) on the pan. Lift the pan into place and install the screws that hold oil pan to block and front cover plate. Torque the screws to 15-18 foot-pounds.

NOTE: ***Alignment of oil pan can be simplified by using two studs in opposite corners of the block.***

Install the screws that hold the oil pan to the engine rear plate. Torque screws to 10-15 foot-pounds. Install



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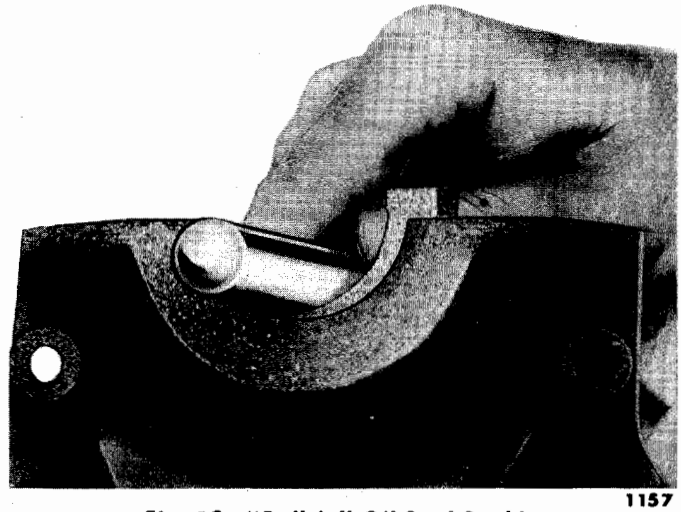

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Fig. 13—"Roll-in" Oil Seal Packing

the drain plug. Install the engine in the chassis. Fill crankcase with proper quantity and grade of oil.

b. Oil Pump.

The rotor type oil pump is used on the 6-cylinder series engine and is externally mounted. In order to remove the oil pump with the engine in the chassis, it is necessary to raise the front of the engine so that the pump will clear the frame side rail when it is pulled out.

NOTE: ***The oil pump and camshaft gear back lash should be 0.003-0.005 inch.***

Before removing the oil pump check the back lash between the oil pump driven gear and the camshaft gear. This can be done by moving the distributor rotor and checking the distributor shaft free play. The rotor free play should be less than ¼ inch.

(1) *REMOVAL*. Disconnect the right hand front engine support. Disconnect the radiator hoses. Raise the engine so the pump will clear the frame when removed.

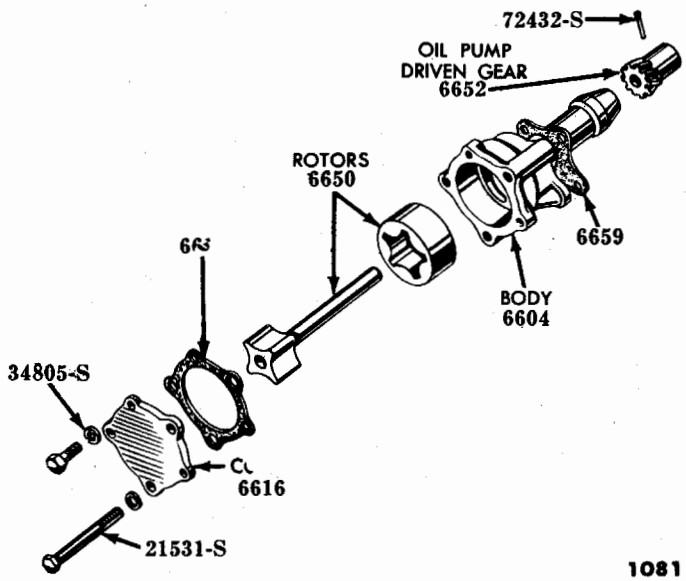


Fig. 14—Rotor Type Oil Pump Disassembled

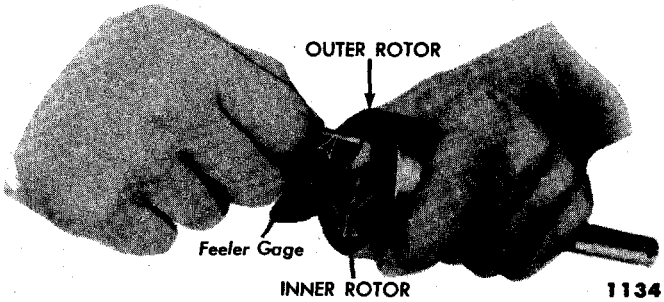


Fig. 15—Measuring Clearance Between Oil Pump Rotors

Remove the screws that hold the pump to the block and remove the pump.

(2) *DISASSEMBLY*. Figure 14 illustrates a disassembled rotor type pump. Remove the cover plate. Remove the outer rotor. Remove the pin from the oil pump driven gear. Remove the gear. Remove inner rotor and shaft.

(3) *CLEANING*. Remove any dirt and sludge formations from the pump parts. Clean all parts with a suitable solvent.

(4) *INSPECTION*. Visually check all parts for breakage. Measure clearance between rotors as shown in fig. 15. Clearance should be 0.006-0.010 inch between the rotors.

Measure outer rotor to body clearance as shown in fig. 16. Clearance should be 0.005-0.010 inch.

Make rotor measurements as illustrated in fig. 17. Thickness should not be less than 0.998 inch. Outer rotor outside diameter should not be less than 2.246 inches.

NOTE: ***If rotors are worn beyond the specified limits, replace them with Oil Pump Rotor and Shaft Kit number 7HA-6650 (fig. 18).***

Check the cover plate for wear as shown in fig. 19. If the clearance exceeds 0.001 inch replace the plate.

With rotors assembled in housing, place a straight edge over the rotors and pump body. Measure the clearance between the pump body and the straight edge. Replace the pump body if clearance is less than 0.001 to 0.003 inch.

Measure the pump shaft end play as shown in fig. 20. End play should be 0.008-0.012 inch.

(5) *ASSEMBLY*. Install the inner rotor and the shaft in the housing. Press the oil pump driven gear on the shaft until there is a shaft end play of 0.008-0.012 inch.

NOTE: ***Oil pump shaft end play can be changed by pressing the driven gear on the shaft with the pin hole at right angle to the old pin hole. Set the proper clearance, drill shaft with a number 30 (0.1285) drill, and install the pin. Peen both ends of the pin after it is installed.***

Install the outer rotor and lubricate the rotors with engine oil. Install a new cover plate gasket and install the cover plate. Tighten the screws to 7-10 foot-pounds.

(6) *INSTALLATION*. Use a new gasket between the oil pump and block. Insert the pump into the block and install the hold down screws. Tighten the screws to 10-15 foot-pounds. Time the engine.

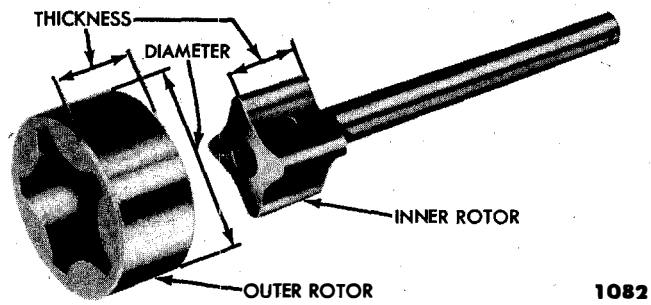


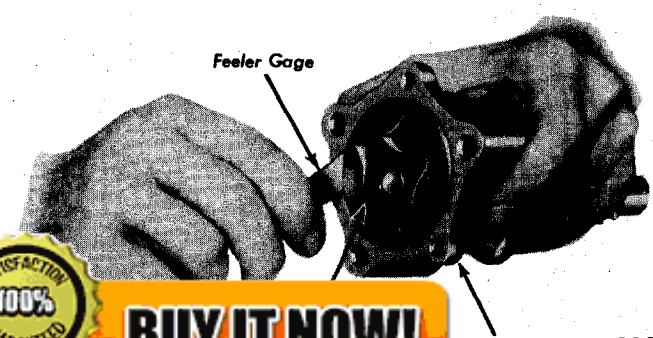
Fig. 17—Oil Pump Rotors

c. Pressure Relief Valve.

A non-adjustable spring loaded oil pressure relief valve is located in the left rear corner of the engine block.

(1) *REMOVAL*. Remove the plug that retains the spring and plunger from the block. Remove the spring and plunger illustrated in fig. 21.

(2) *INSPECTION*. Test pressure relief valve spring.



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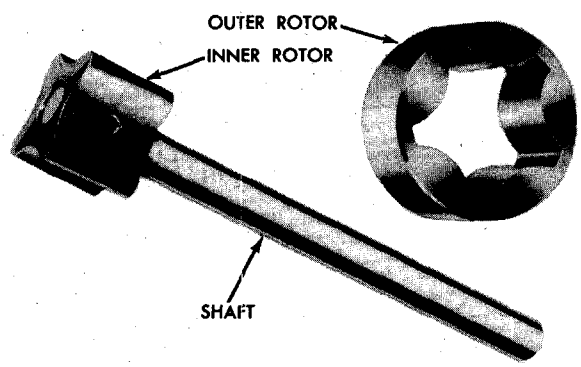

Fig. 18—Oil Pump Rotor and Shaft Kit

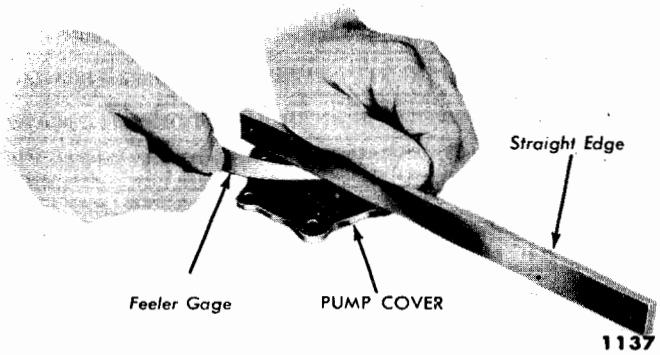

Fig. 19—Measuring Oil Pump Cover Plate Wear

When compressed to 1.14 inches, the spring force should be 12.75 pounds plus or minus 2 ounces. Replace spring if not within specifications.

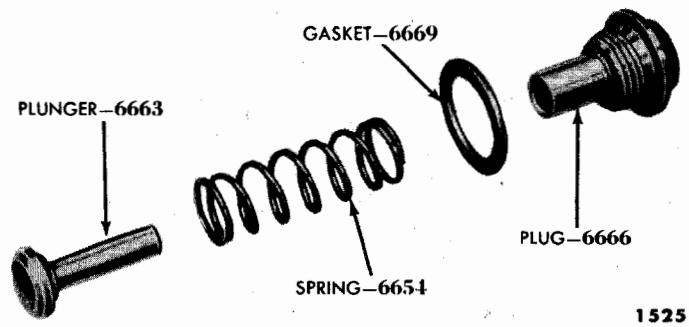

Fig. 21—Oil Pump Relief Valve

(3) *INSTALLATION*. Insert the plunger and spring. Install a new valve retainer plug gasket. Install the valve retainer plug.

5. CRANKSHAFT DAMPER

The 6-cylinder engine is equipped with either a viscous type or a rubber type damper. The damper outside diameters are different, requiring two timing pointers on the engine front cover. Both type dampers can be replaced with the engine in the car. Figure 22 shows the stamped dampers used on 1949-50 engines. Malleable interchangeable iron dampers are used on 1951 engines.

a. Removal.

Remove the radiator. Remove the damper retainer bolt and washer from end of crankshaft. Install damper removing tool on damper assembly as shown in fig. 23. The tool has two $\frac{3}{8}$ inch screws to remove the viscous damper and two $\frac{5}{16}$ inch screws to remove the rubber damper. Pull the damper assembly from the crankshaft.

b. Installation.

Align keyway in damper with Woodruff key on shaft and press damper into place.

NOTE: ***If engine is out of car, a damper replacing tool (fig. 24) can be used to install the damper.***

Install the damper retainer bolt and the washer in the end of the crankshaft. Install the radiator.

6. ENGINE FRONT COVER

The engine front cover is either a stamping or an aluminum diecasting. The cover has two timing pointers to correspond with the different size dampers. The upper half of the crankshaft front packing is retained by the cover plate. Two dowels are used to locate the cover on the block.

The cover removal, inspection, oil seal installation, and cover installation is given below.

...nd Play

a. Removal.

Remove the radiator. Remove the damper. Remove the two screws that hold the oil pan to the front cover. Remove the cover retaining screws and remove the cover.

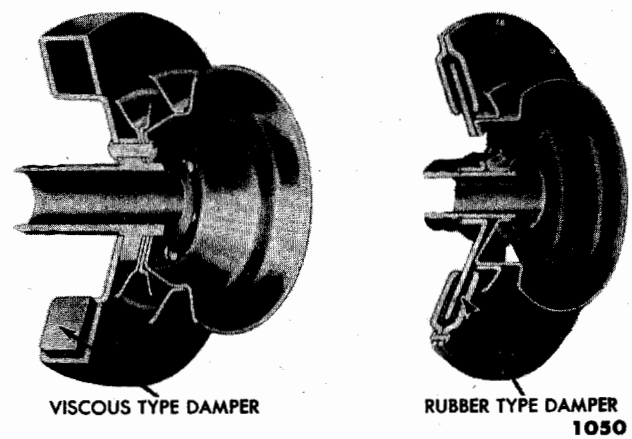

Fig. 22—1949-50 Vibration Dampers

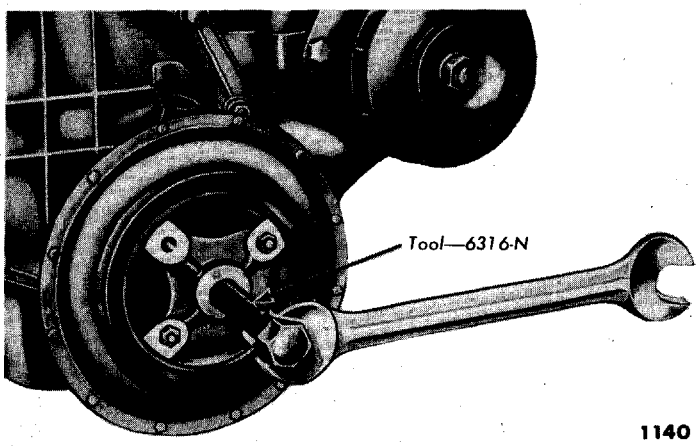

Fig. 23—Damper Remover

b. Inspection.

Inspect the cover for cracks or a damaged gasket surface. Replace if cover is cracked or damaged.

c. Oil Seal Installation.

Remove the old packing and clean the packing groove.

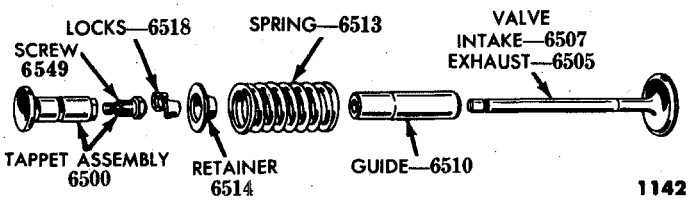

Fig. 25—Valve and Related Parts

Soak the new packing (fig. 4) in SAE 20 oil for two hours before installation. Install new oil seal packing. Make sure the packing and cover gasket meet evenly. "Roll in" the packing with a round bar to make sure it is seated properly (fig. 13).

d. Installation.

Position a new gasket on the cover. Place the cover on the block and install the screws. Be sure to install the two screws that hold the oil pan to the cover. Torque the screws to 15-18 foot-pounds. Install the damper. Install the radiator.

7. VALVES, SPRINGS, GUIDES, AND SEATS

The procedures for reconditioning valves and valve seats, replacement of guides, and tappet adjustment are covered in this section. Figure 25 shows the 1949-50 valve and its related parts as used in the 6-cylinder engine. Figure 26 shows the rotatable valve used in 1951 engines.

a. Valves and Valve Guides.

Rotatable intake and exhaust valves are used in 1951 engines. This type of valve has a two piece spring retainer differing from the single piece spring retainers.

Rotatable valves and parts can be installed in engines not so equipped by changing the spring retainer, intake valve, and exhaust valve.

Openings in the valve chamber should be covered before removing valves to prevent valve locks from falling into the oil pan.

As parts of the valve assemblies are removed, tag or otherwise identify them so they can be installed for reassembly in the valve port from which they were removed.

(1) *REMOVAL.*

NOTE: ***When removing valves with the engine in the vehicle, remove the right front wheel and the front fender apron panel in addition to the following procedure.***

Remove the cylinder head. Remove the manifolds. Remove the valve chamber covers. Crank the engine until the tappet rests on the heel of the cam. Compress the valve spring and remove the valve spring retainer locks. Remove the valve. Remove the valve spring and spring retainer as shown in fig. 27. The valve spring retaining sleeve used with rotatable valves will remain on

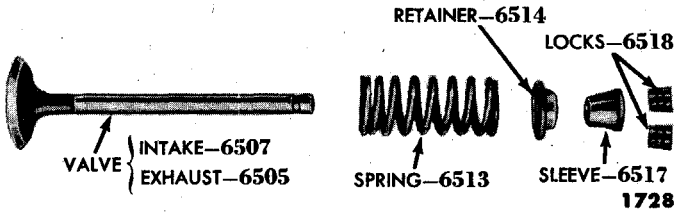

Fig. 26—Rotatable Valve and Related Parts

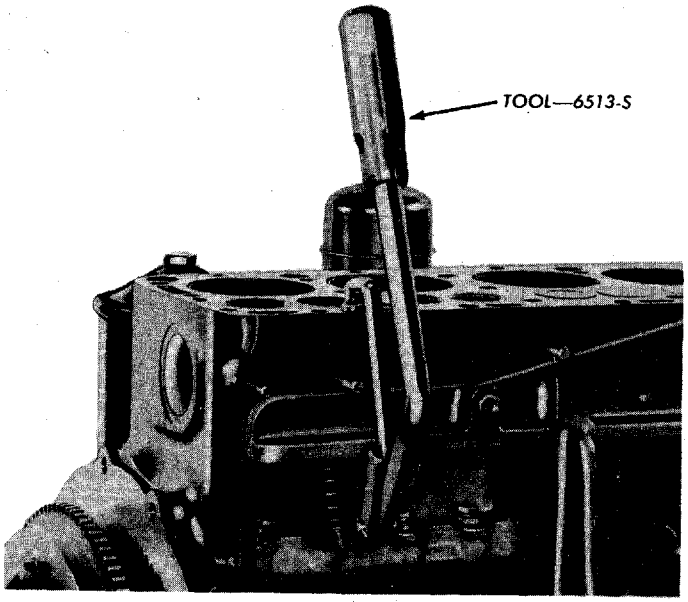

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Fig. 27—Valve Spring Remover and Replacer

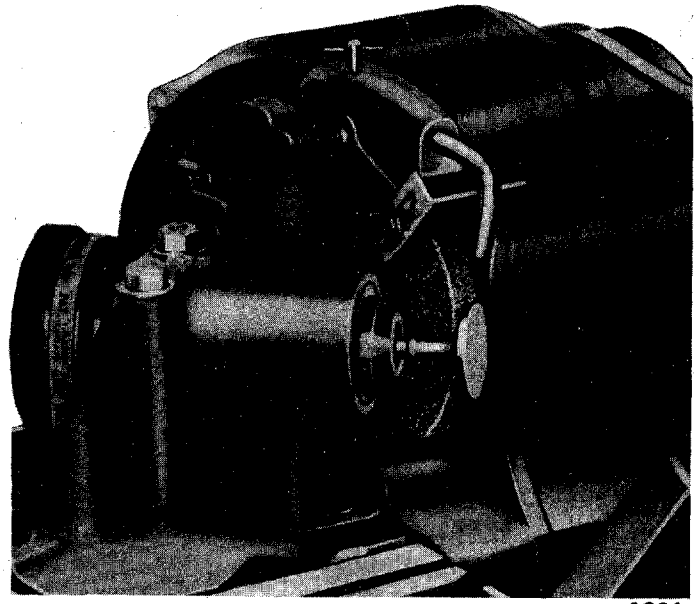

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Fig. 29—Refacing Valve

the tappet when the spring is compressed and can easily be lifted out.

(2) *CLEANING*. Scrape carbon and lead deposits from head and stem of valve. Remove varnish from stem with lacquer thinner.

(3) *INSPECTION*. Check valve for a burned or warped head. Measure stem diameter and replace if less than 0.341 inch.

(4) *SPRING TESTING*. Test valve spring (fig. 28) for compression. When compressed to 2.11 inches, the valve spring pressure should be 47-53 pounds. Replace any burned, warped, or worn valves.

(5) *REFACING VALVES*. Grind valve face 45 degrees on a valve refacing machine as shown in fig. 29. Replace valve if the edge of the valve head is less than 1/32 inch thick after grinding.

(6) *VALVE GUIDE INSPECTION*. Valve stem clearance in the guide should not exceed 0.0031 inch. Figure 30 illustrates the method of measuring valve guide wear with a telescope gauge and a micrometer. Replace the guide if it is not within the above tolerance. Replace guide if either end is bellmouthed.

(7) *VALVE GUIDE REPLACEMENT*. Pull the valve guide from the block as shown in fig. 31.

To install the valve guide, position the new guide in the bore. Drive the guide in the block as shown in fig. 31. Drive the exhaust valve guides to a depth of 1.08 inches and the intake valve guides to 1.18 inches measured from the top of the valve guide to the cylinder block surface as shown in fig. 32.

(8) *REFACING VALVE SEATS*. Clean seats thoroughly with a wire brush to prevent carbon from becoming embedded in the grinding wheel when refacing steel valve seats. Keep grinding dust from entering the engine. Remove only enough stock to clean up pits and other depressions.

NOTE: ***Worn valve guides must be replaced before refacing valve seats.***

After regrinding valve seats, the width of the seat

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g Pressure

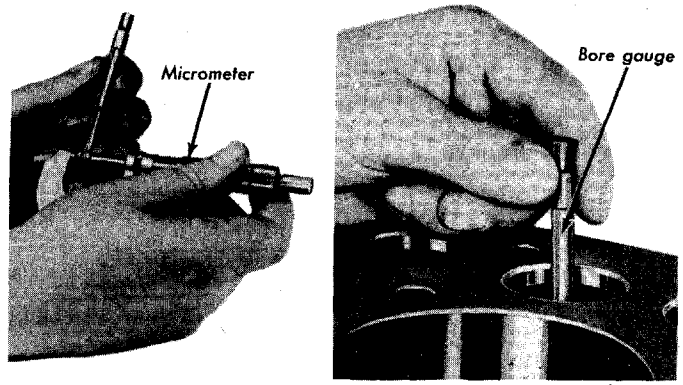

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Fig. 30—Checking Valve Guide Wear

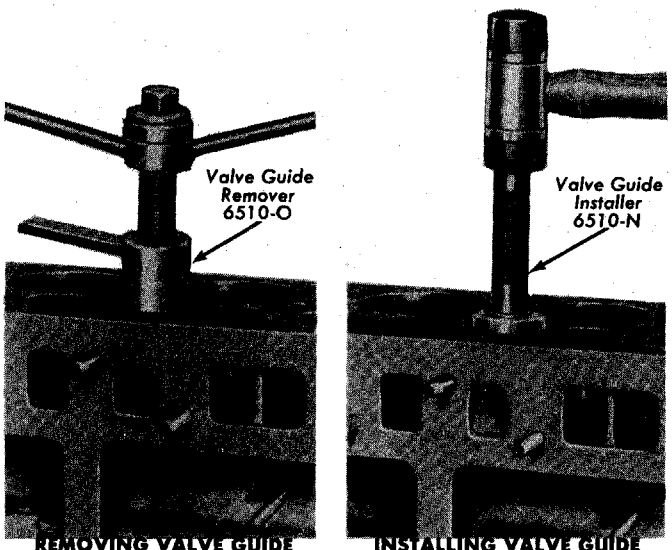
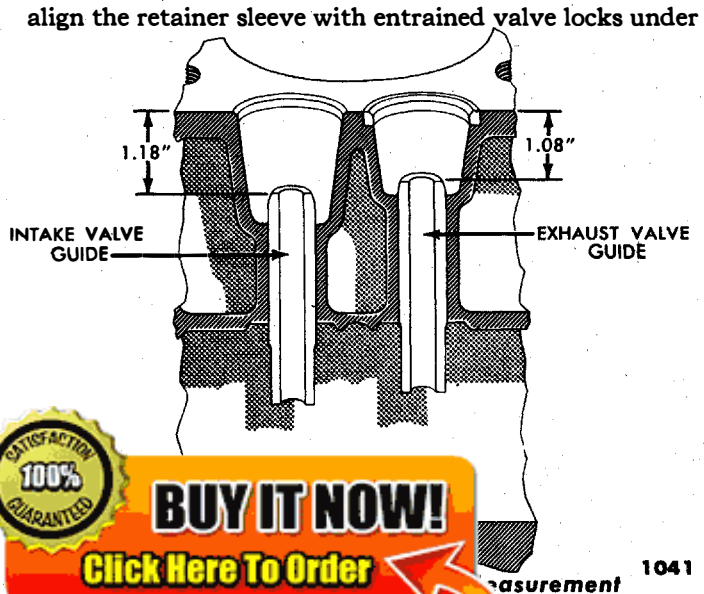


Fig. 31—Removing and Installing Valve Guide

must not exceed 1/16 inch measured across the face of the seat as shown in fig. 33.

If the valve seat is too wide, remove just enough stock from the top or bottom of the valve seat to reduce the width to approximately 1/16 inch. This can be done by using a 30 degree angle grinder to remove stock from the bottom of the valve seat, or a 60 degree angle grinder to remove stock from the top of the valve seat. The finished valve seat should not exceed 0.005 inch run-out. Check the valve seat run-out with a dial indicator in (fig. 34).

(9) *INSTALLATION*. Install the retainer and the valve spring with the tightly wound coils in the up position against the block using the tool shown in fig. 27. Insert the valve in the guide and align it with the spring retainer. For non-rotating valves, press the spring and install the valve spring retainer locks as shown in fig. 35. For rotating valves, compress the spring, lift the valve, align the retainer sleeve with entrained valve locks under



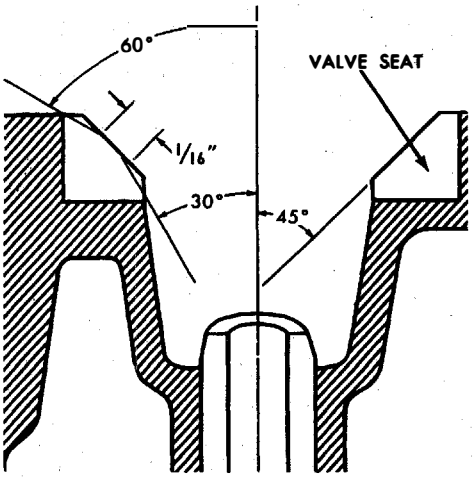


Fig. 33—Correct Valve Seat Width

valve, lower the valve and seat locks with your finger. Release the spring slowly while holding the locks in place. Install the valve chamber covers. Install the manifolds and the cylinder head.

NOTE: ***If the procedure was made with the engine in the car, install the right front fender apron and the right front wheel.***

b. Seats.

Special alloy valve seat inserts are pressed into the

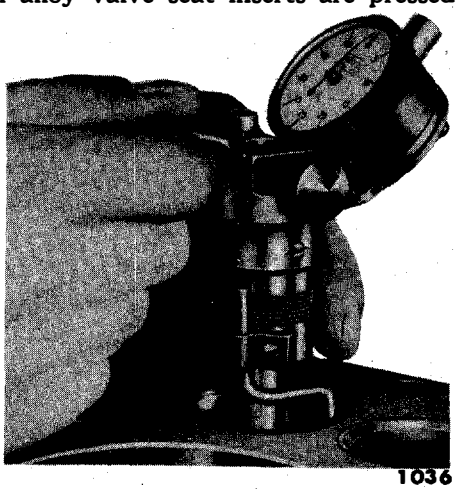


Fig. 34—Checking Valve Seat Run-Out

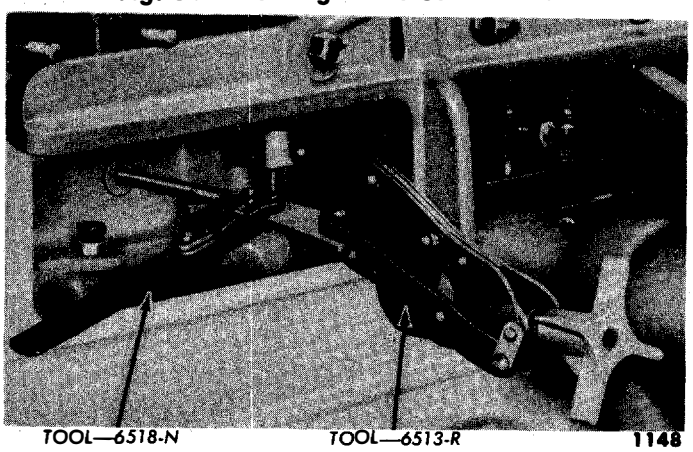


Fig. 35—Installing Valve Stem Locks

counterbore in the cylinder block exhaust valve port (fig. 36). These inserts are from 0.0015 to 0.0030 inch press fit.

The inserts can be removed by driving a wedge under the insert and prying the insert out of the counterbore.

Before installing a new insert, make sure the counterbore is clean and free of any burrs.

When installing a new insert, pack it in dry ice for approximately 15 minutes, then position it over the counterbore. Use a tool that fits the diameter of the insert and drive it into place.

c. Tappet Adjustment.

The adjustable type tappet (fig. 37) has a self-locking adjustment screw requiring no lock nut. The valve clearance is adjusted by the use of two open end wrenches, one holding the tappet body and the other turning the adjusting bolt. The adjustment is illustrated in fig. 38.

Valve gap settings are 0.013-0.015 inch for intake and 0.017-0.019 inch for exhaust valves when used with the new camshaft with the letter "O" stamped on the forward end. For old camshafts with no letter stamping, set intake at 0.009-0.011 inch and exhaust at 0.013-0.015 inch.

8. CAMSHAFT GEAR, CAMSHAFT, AND BEARINGS

The camshaft is supported by four bearings which are pressed into the block and is driven by a gear which meshes with a gear on the crankshaft. A special cam on the camshaft contacts the fuel pump operating arm and operates the fuel pump. A bolt-on type aluminum timing gear is used on the early 1949 cars and a pressed-on type fiber timing gear is used on the late 1949, 1950, and 1951 cars. The camshaft thrust is controlled by a plate which is bolted on the front of the engine block.

The procedure for removal, inspection, and installation of the camshaft gear, camshaft, and camshaft bearings is given below.

a. Camshaft Gear.

The bolt-on type timing gear is secured to the camshaft gear hub by four screws which are locked with retaining tabs. The mounting holes are spaced to make it impossible to install the gear incorrectly. The camshaft gear hub can be replaced as shown in figs. 39 and 40.

The pressed-on type gear is pressed on the camshaft and is located on the shaft by a key. Two types of pressed-on gears are used. One type has two tapped holes in the hub and the other does not have any holes.

All oversize camshaft gears can be identified by the pitch diameter stamped on the outer edge of the gear.

(1) *REMOVAL*. If the engine is in the vehicle, access to the camshaft gear can be obtained by removing the radiator. Then remove the vibration damper. Remove the engine front cover screws and be sure to include the two screws from the forward end of the oil pan. Remove the front cover and bend the oil slinger outward.

Follow the instructions given below for the type of camshaft gear that applies.

(a) BOLT-ON GEAR. Bend the lock ring tabs away from the cap screws (fig. 41). Remove the cap screws and lock plate. Pull the gear off the camshaft.

(b) PRESS-ON GEAR (WITH TAPPED HOLES). Use a puller which fits the two 7/16"—14 tapped holes in the gear hub and pull the gear off the camshaft.

(c) PRESSED-ON GEAR (WITHOUT TAPPED HOLES). Drill hub with the special tool as shown in fig. 42 to relieve the press fit.

Remove the gear with a puller as shown in fig. 43.

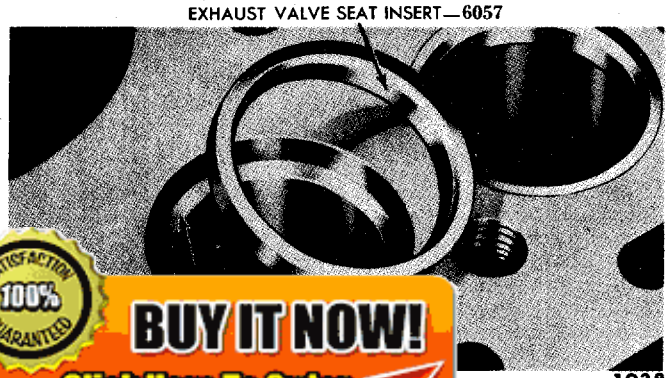
(2) *INSTALLATION*. When the timing gear is installed be sure the timing marks on the camshaft gear and the crankshaft are aligned as shown in fig. 44. After installing the gear, check the gear backlash. The backlash should be between 0.001 to 0.002 inch.

NOTE: ***Oversize camshaft gears are available for service. Install the next oversize gear when excessive backlash exists between the camshaft gear and the crankshaft gear.***

The 8HA-6256 camshaft gear can be used with camshaft OHA-6250-A. However, if this is done, the 15° chamfer must be increased to 45°. The OHA-6256-A gear can be used with the 7HA-6250-C camshaft.

(a) BOLT-ON TYPE GEAR. Install the gear on the camshaft aligning the holes. Install the lock plate and screws. Tighten the screws to 15-20 foot-pounds torque and bend the lock plate tabs. Install the front cover and the gasket. Install the vibration damper.

EXHAUST VALVE SEAT INSERT—6057



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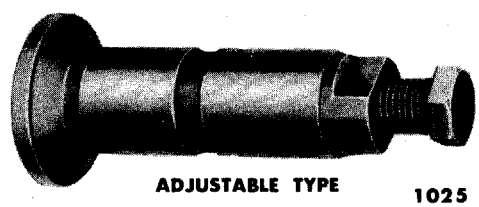


ADJUSTABLE TYPE 1025

Fig. 37—Adjustable Type Tappet

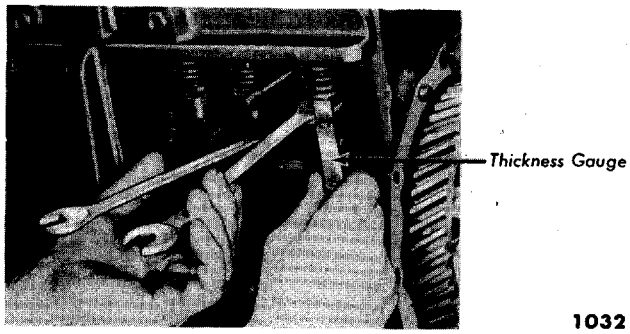


Fig. 38—Adjusting Tappets

NOTE: ***If the engine is in the vehicle install the radiator.***

(b) PRESS-ON TYPE GEARS. The following procedure applies to both types of press-on gears.

Position the camshaft gear on the camshaft with the slot in the gear hub in alignment with the key in the camshaft (fig. 45).

Press the gear on the camshaft (fig. 46).

NOTE: ***Be sure the mark on the gear is in alignment with the marks on the crankshaft gear (fig. 44).***

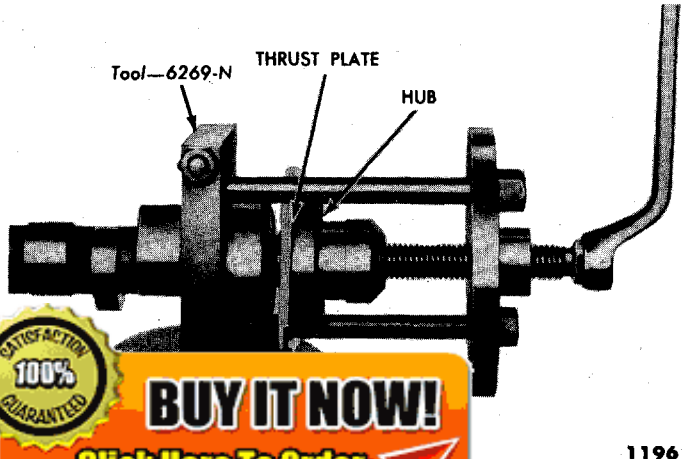
Bend the oil slinger back to its original shape. Install the front cover. Install the vibration damper.

NOTE: ***If the engine is in the vehicle install the radiator.***

b. Camshaft.

Late 1950 engines are equipped with an OHA-6250 camshaft which replaces the 7HA-6250-C camshaft used in the 1949 and early 1950 engines. This camshaft can be identified by the letter "O" stamped on the forward end of the camshaft. The 1951 engines are equipped with an OHA-6250-B which can be identified by the letter "B" stamped on the forward end of the camshaft.

The undercut at the point where the camshaft gear post joins the camshaft proper was eliminated on the OHA-6250 camshaft and a radius was incorporated. This



ear Hub

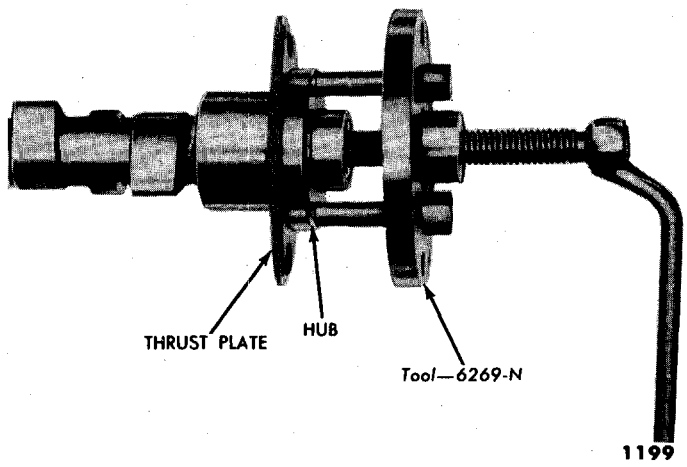


Fig. 40—Removing Camshaft Gear Hub

radius made it necessary to increase the chamfer on the inside diameter of the camshaft gear hub from 15° to 45° in order to avoid interference. The camshaft gear OHA-6256-A with a larger chamfer incorporated on the hub is available for use with the OHA-6250 camshaft.

Engines equipped with the OHA-6250 camshaft are identified by the letter "OH" stamped on the right-hand side of the cylinder block and directly above the number 3 intake port.

If 7HA-6250-C camshaft is used to replace the OHA-6250 camshaft, it will be necessary to change the valve gap spacing to 0.009-0.011 inch for the intake and 0.013-0.015 inch for the exhaust valve.

If an OHA-6250 camshaft is used to replace a 7HA-6250-C camshaft, it is necessary to change the valve gap spacing to 0.013-0.015 inch for the intake valves and 0.017-0.019 inch for the exhaust valves. Stamp the letters "OH" on the cylinder block directly above the number 3 intake port to identify new type camshaft.

It will be necessary to replace the camshaft when the cam lobes are worn to such an extent that the valve lift is less than 0.3375 inch for the intake valves and 0.3335 inch for exhaust valves. Make valve lift measurements when the engine is cold and valve gaps are within specifications. Check the valve lift with a dial indicator as shown in fig. 47.

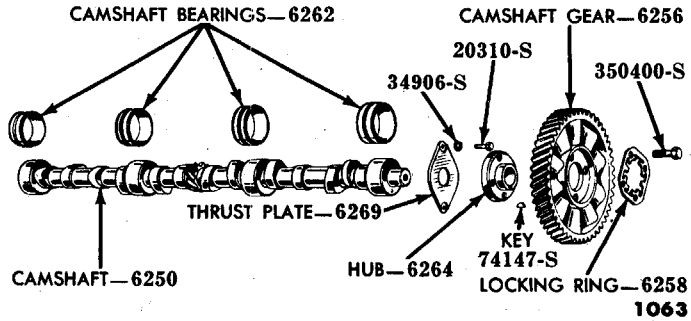


Fig. 41—Bolt-on Type Camshaft Gear and Camshaft Disassembled

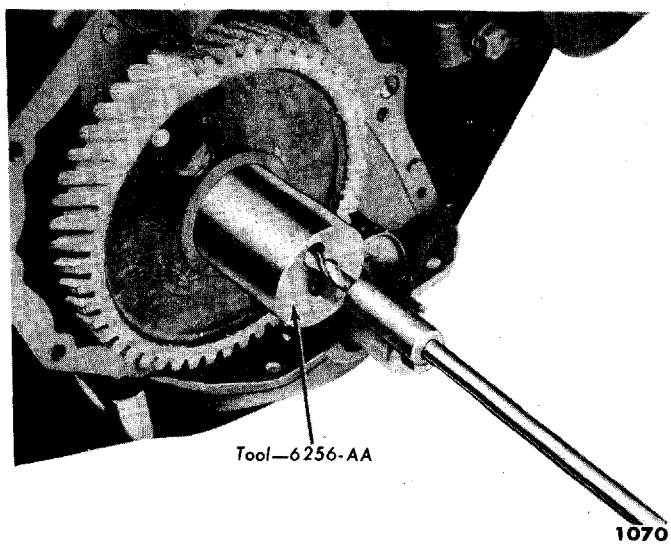


Fig. 42—Drilling Camshaft Gear

(1) *REMOVAL.* Remove the cylinder heads, manifolds, and valves. Lift the valve tappet assembly and hold in the up position with spring clothespins or rubber bands.

NOTE: ***If engine is on an engine stand and the valves have been removed, invert the block to eliminate tappet interference.***

Loosen the oil pump. Remove the front cover and the camshaft gear. Remove the thrust plate. Remove the camshaft by pulling it through the bearings.

NOTE: ***Exercise care so that the camshaft bearings are not damaged by the lobes on the camshaft.***

If engine is mounted in car, remove the grille and radiator to permit removing camshaft.

(2) *INSPECTION.* Check the camshaft journal surface for grooves or scratches.

Measure the diameter of the journals with a micrometer for wear and out of round. Replace the camshaft if the journals measure less than 1.924 inches in diameter. Measure the inside diameter of the bearings with an inside micrometer or telescope gauge. The difference in measurements (amount of clearance) should be 0.001 to 0.002 inch for a new camshaft and bearings and not over 0.005 inch for a used camshaft and bearings.

Check the fuel pump eccentric for wear (deep groove worn by the push-rod end). Inspect the oil pump drive gear for worn, chipped, or broken teeth.

Replace camshaft if any of above conditions exist.

(3) *INSTALLATION.* Position the thrust plate on the camshaft with the oil groove toward the journal. Press the gear or the hub on the camshaft far enough so the camshaft thrust plate has 0.003 to 0.006 inch clearance. Carefully slide the camshaft through the bearings. Secure the thrust plate to the block. Tighten the screws to 15-18 foot-pounds torque. Install the bolt-on type gear if that type of gear is used.

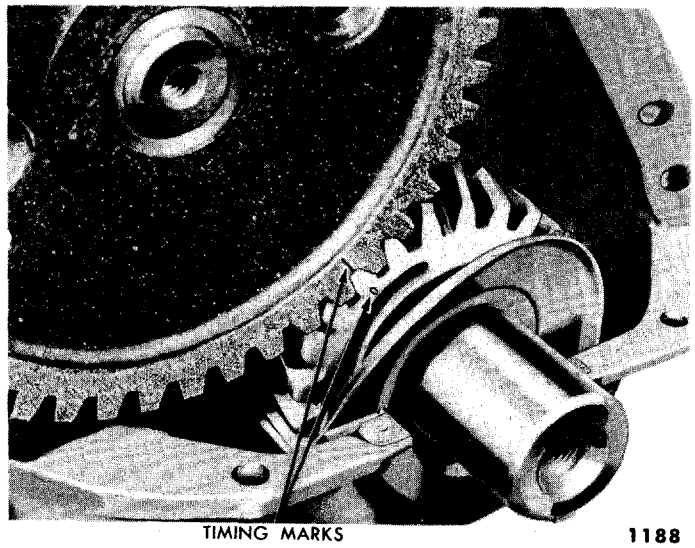


Fig. 44—Timing Marks

Gear

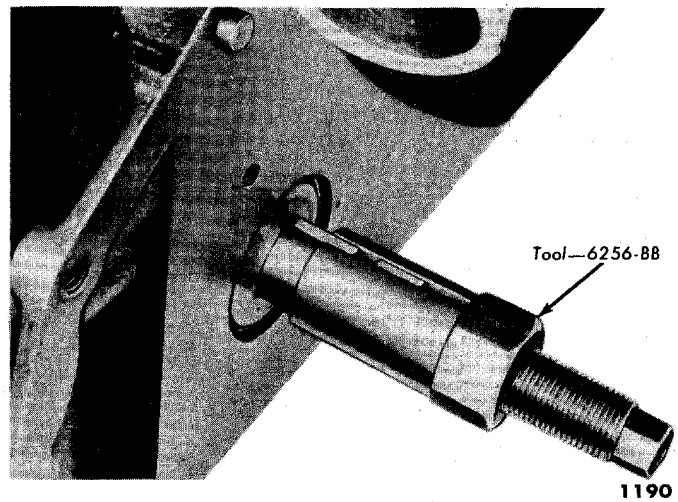
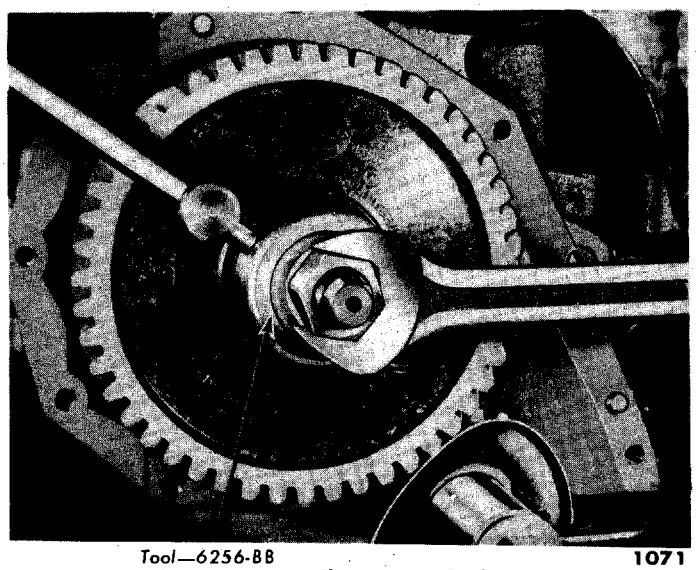


Fig. 45—Camshaft Gear Keyway Alignment Tool



Tool—6256-BB 1071

Fig. 46—Installing Camshaft Gear

Check the camshaft gear run-out. It should not exceed 0.002 inch. Install the front cover and gasket. Connect the oil pump. Remove the valve tappet holders if used. Install the valves. Install the cylinder head and the manifolds.

c. Camshaft Bearing Replacement.

Under normal usage the camshaft bearings will not require replacement. However, they should be replaced if they are damaged or worn. It will be necessary to remove the engine from the vehicle to make the bearings accessible.

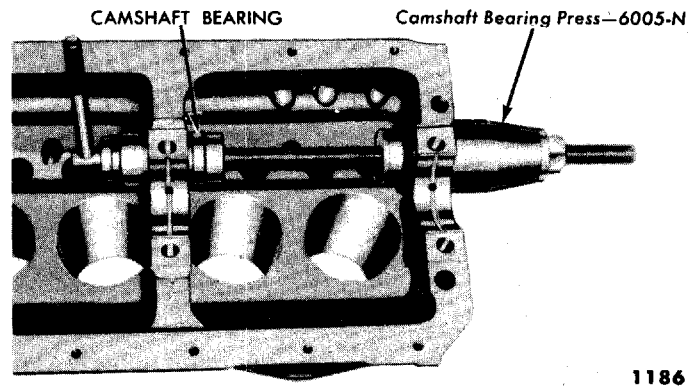


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Fig. 48—Removing Camshaft Bearings

Bearings are finished to size and should not be line bored or reamed after installation.

(1) *REMOVAL.* Remove the camshaft. Remove the plug at the end of the block. Remove the camshaft bearings using the tool shown in fig. 48.

(2) *INSTALLATION.* Select the correct size camshaft bearings after measuring the camshaft journal outside diameter and the inside diameter of the camshaft bores in the block. Position the camshaft bearing at the bearing bore and press the camshaft bearings into place. Be sure the oil hole in each bearing and bore are in alignment. The tool shown in fig. 48 is used to remove and install camshaft bearings. Apply sealer on the camshaft rear bearing plug and install the plug. Install the camshaft.

9. CRANKSHAFT, BEARINGS, AND FLYWHEEL

This section contains data on removal, inspection, and replacement of the crankshaft, bearings, and flywheel. Each of these parts are covered under the descriptive headings given below.

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Lift

a. Crankshaft.

The function of the crankshaft is to convert the reciprocating motion of the piston into the rotary motion of the driveshaft.

The crankshaft is made of cast alloy steel with integral counterweights and is dynamically and statically bal-

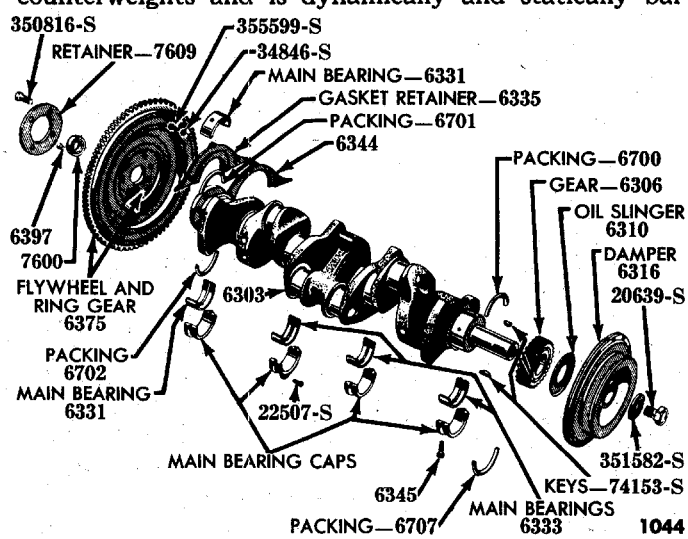

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Fig. 49—Engine Crankshaft

anced. Oil distribution holes are drilled through the shaft for main bearing and connecting rod lubrication.

(1) *REMOVAL.* Remove the engine from the chassis. Then remove the flywheel housing assembly, clutch and clutch plate, flywheel, starter and engine rear plate assembly, damper, front cover assembly, oil pan, and oil pump screen cover assembly. A disassembled view of the crankshaft is shown in fig. 49.

When removing the clutch and clutch plate, make certain that the clutch and flywheel are marked so that the clutch may be reassembled to the flywheel in the same relationship as when it was removed. It is important to do this so the assembly will be properly balanced.

Before removing any of the bearings, make sure that they are marked so that the bearings may be replaced exactly as they were originally installed. Remove all connecting rod bearing caps and inserts. If the four main bearing caps and inserts are now removed, the crankshaft may be removed.

(2) *INSPECTION.* Examine the shaft for evidence of cracks. Make certain that the dowel pins in the flange are not loose or damaged. Pins that are slightly nicked on the end may be chamfered with a mill file.

Main bearing inserts that are scratched, show fatigue pockets, or have the overlay wiped out, should be replaced.

A bearing that has only light scratches may be re-used providing the clearances are satisfactory. Scratched bearings are shown in fig. 50. Fatigue failure can be recognized by the breaking away of the bearing overlay material (fig. 51). Figure 52 shows two bearings with the overlay wiped out.

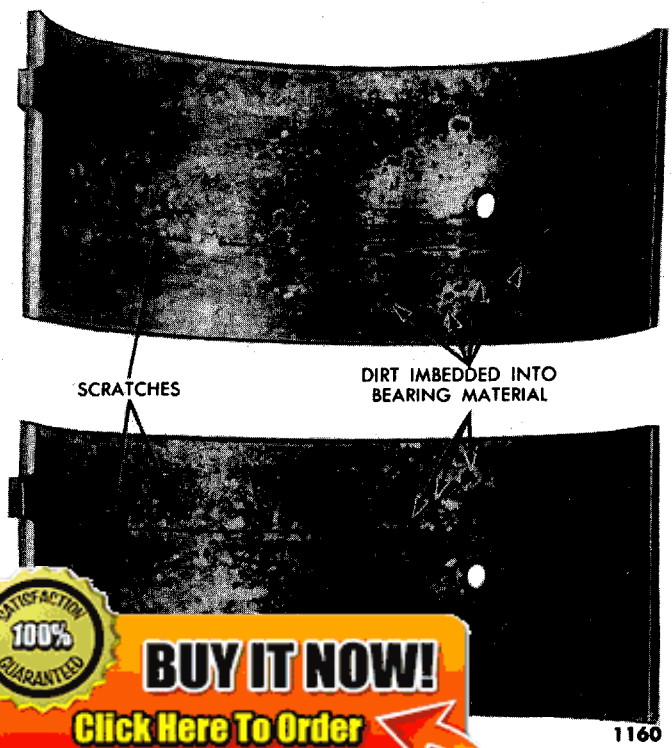
NOTE: ***Any engine that has experienced rod or piston failure must have all the oil passages thoroughly cleaned before rebuilding the engine.***

A bearing showing signs of excessive wear on one side of the bearing half (fig. 53) indicates a tapered bearing journal. The journal should be reground to the next undersize to remove the taper and undersize bearings installed. Similarly, bearings showing excessive wear at the center or end of the bearing around the circumference (fig. 54) indicate high spots on the bearing journal which should be corrected before the engine is rebuilt.

Bearings that show bright sections across the back of the bearing (fig. 55) indicate the bearings have been loose in the bore either because of an undersize outside diameter, because of the bearing bore being too large, or by the bearing not having sufficient "crush."

Grooved or scored main bearing or crank pin journals will cause bearing failure and should be machined or the crankshaft should be replaced. Light scores or scratches can be removed with a hone, then polished with No. 320 grit polishing paper.

(3) *MEASURING CRANKSHAFT JOURNALS.* Measure each crankshaft journal diameter at a minimum of four places to determine size, out of round, and taper. If any of the journals are out of round more than 0.0015 inch or if taper of more than 0.001 inch exists, they should be machined. Journals that are worn evenly and have less than 0.001 inch taper or a 0.0015 inch out of round condition will not require machining if the available bearings will provide not more than 0.0022 inch clearance for the main bearings, or not more than 0.0027 inch clearance for the crank pin bearings.



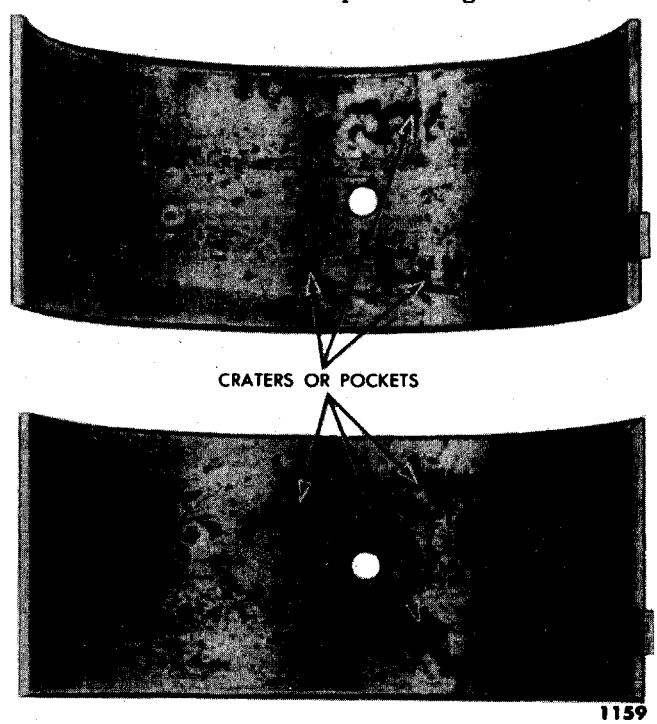


Fig. 51—Fatigue Failure of Bearing

The main journals have a maximum diameter of 2.8740 inches. The crank pin journals have a maximum diameter of 2.2988 inches.

(4) *REGRINDING CRANKSHAFT JOURNALS.* After measuring the crankshaft journal diameters, select the next undersize bearing diameter from those shown in Table 1, and grind the journals to that size.

CAUTION: ***Never grind journals in excess of 0.030 inch undersize.***

Always grind the same size radii at the ends of the bearing journals as the shaft had originally. The radii distribute stress at this point. Undersize radii will cause radii ride at the end of the bearing, resulting in early bearing fatigue.

Extreme care should be used to obtain the finest possible finish on the bearing journals.

Use a number 320 grit emery cloth and motor oil to polish the bearing journals. Crocus cloth may also be used.

Table 1—Crankshaft Journal Bearings

FRONT AND INTERMEDIATE BEARINGS		
Part Number	Size	Crankshaft Diameter (Inches)
OHA-6333-A	Standard*	2.8736/2.8740
OHA-6333-B	Standard**	2.8732/2.8736
7HA-6333-A	Standard	2.8732/2.8740
7HA-6333-B	0.002 inch U/S	
7HA-6333-C	0.010 inch U/S	2.8649
7HA-6333-D	0.020 inch U/S	2.8559
7HA-6333-E	0.030 inch U/S	2.8459
REAR MAIN BEARING		
Part Number	Size	Crankshaft Diameter (Inches)
OHA-6331-A	Standard*	2.8736/2.8740
OHA-6331-B	Standard**	2.8732/2.8736
7HA-6331-F	Standard	2.8732/2.8740
7HA-6331-G	0.002 inch U/S	
7HA-86331-H	0.010 inch U/S	2.8649
7HA-6331-J	0.020 inch U/S	2.8559
7HA-6331-K	0.030 inch U/S	2.8459
CONNECTING ROD BEARING		
Part Number	Size	Crankshaft Diameter (Inches)
7HA-6211-A	Standard	2.2980/2.2988
7HA-6211-B	0.002 inch U/S	2.2964
6211-C	0.010 inch U/S	2.2884
		2.2784
		2.2684

inch.
inch.

b. Rear Oil Seal Installation.

Always install oil seals at general overhaul or whenever seal deterioration or oil leakage is evident. Soak the oil seals at least two hours in oil before installation. Roll the seal into position in the recess by using bar stock slightly smaller than the diameter of the crankshaft bearing. Trim the ends of the seal flush with the block.

CAUTION: ***Oil seals extending below the mating surfaces of the block will result in oil leaks at the main bearing.***

c. Main Bearings.

Steel backed copper lead insert bearings are used in the four main bearings supports of the engine. These bearings are held in place with indentations on the end of the insert which locate themselves in machined notches in the cylinder block and cap when installed.

Care should be used in fitting main bearings since the crankshaft carries the entire engine load. Lubrication must be maintained or the main bearings will wear out rapidly with possible damage to the crankshaft journals. Crankshaft end thrust is controlled by the rear main bearing flange.

Bearing inserts are precision manufactured and are ordered by size to re-establish the manufacturer's tolerance when the engine is overhauled. The bearing inserts can be removed and replaced without removing the crankshaft.

(1) *REPLACEMENT WITHOUT REMOVING CRANKSHAFT.* After the bearing cap has been removed, a special tool designed for removing the upper bearing insert may be inserted in the oil hole in the crankshaft as shown in fig. 56. Figure 57 shows the tool in position ready to bear against the insert. When the crankshaft is rotated in the direction opposite to engine rotation the tool will force out the bearing insert.

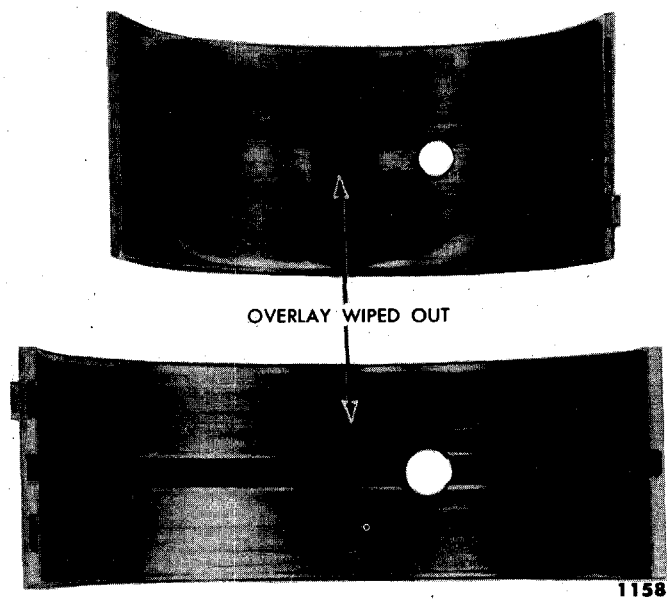


Fig. 52—Bearing Failure Due to Lack of Oil

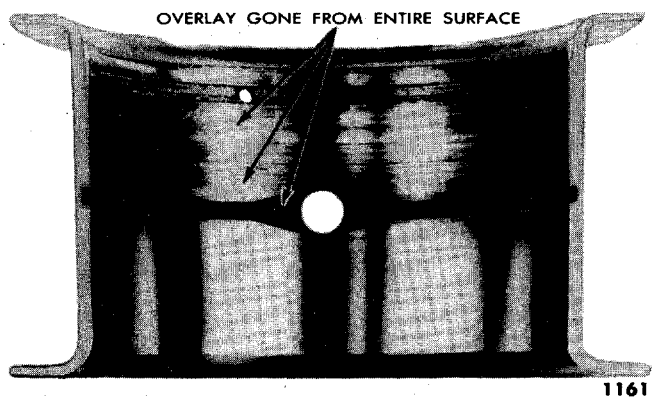


Fig. 53—Bearing Failure Due to Tapered Journal

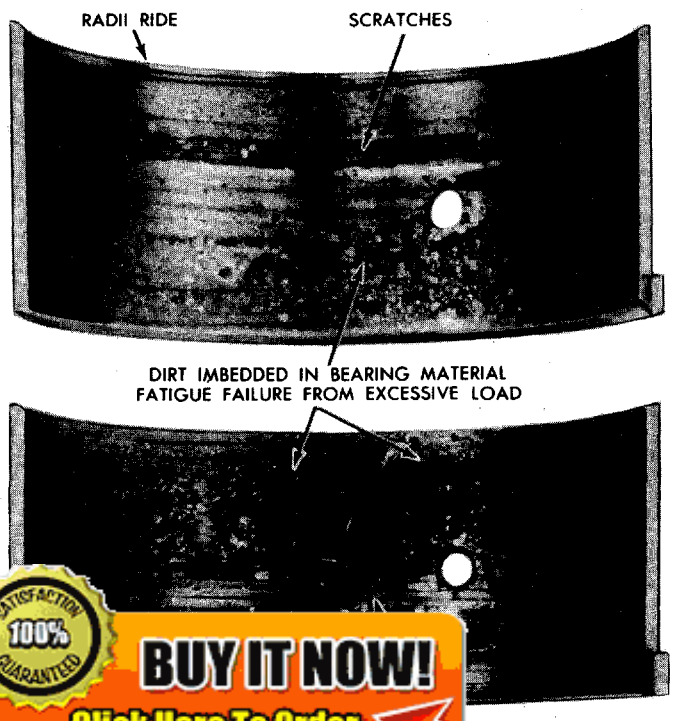
To install the upper main bearing insert, place the plain end of the bearing over the locking lip side of the shaft. Using the same tool, rotate the crankshaft in the direction of engine rotation until the bearing seats itself in the bearing support.

(2) *FITTING MAIN BEARINGS (PLASTIGAGE METHOD).* Remove the bearing cap and wipe the oil from the bearing and journal.

NOTE: ***Keep the other bearing caps tight while checking the fit of a bearing.***

Place a piece of Plastigage the full width of the bearing on the bearing insert.

Install the bearing cap and torque the retaining bolts to 95-105 foot-pounds. Leave the cap tight for at least one minute and then remove it.



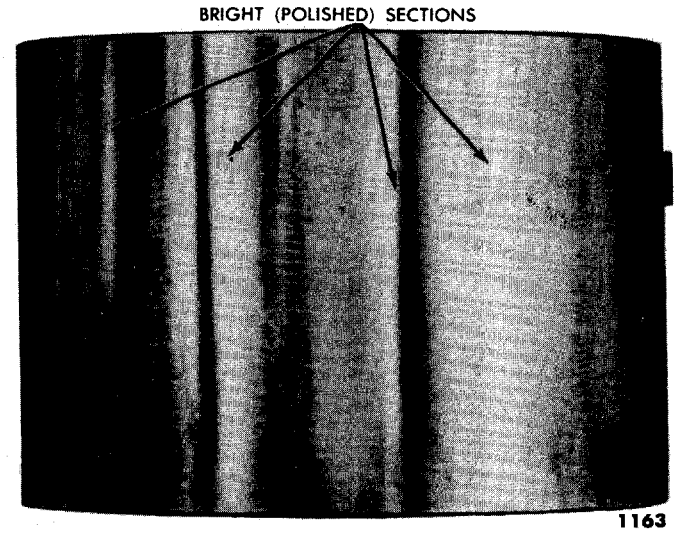


Fig. 55—Bearing Showing Bright Spots Because of Improper Seating

CAUTION: ***Do not turn the crankshaft while the Plastigage is between the bearing and the journal.***

Remove the bearing cap. Without moving the plastic, check its width (at the widest point) with the graduations on the Plastigage container as shown in fig. 1181.

If the bearing clearance is not over 0.002 inch, the bearing insert is satisfactory. If the clearance is greater than 0.002 inch, install an OHA-6333-B bearing (front and intermediate) or an OHA-6331-B bearing (rear) and recheck the clearance.

Where the OHA-6333-B or OHA-6331-B bearing is used and the clearance is excessive, grind the crankshaft main bearing journals for use with the next undersize bearing insert. These inserts are available in the following undersizes: 0.010, 0.020, and 0.030 inch.

(3) *FITTING MAIN BEARINGS (SHIM METHOD).* Place a 0.002 inch brass shim ½ inch wide by 1 inch long between the bearing insert in the cap and

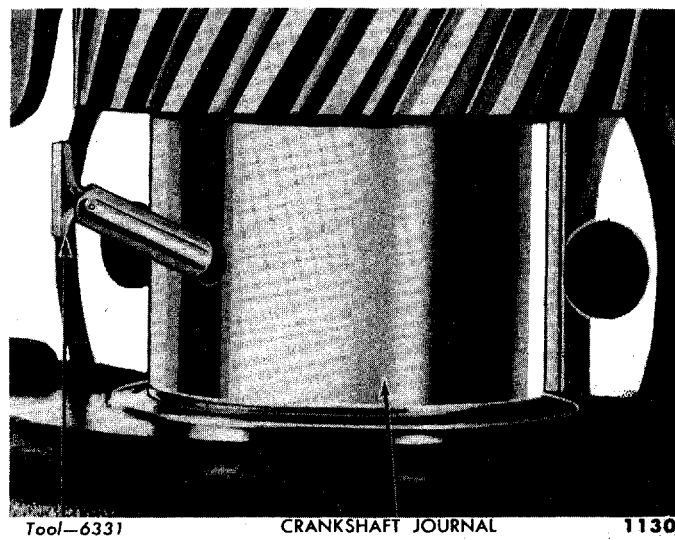


Fig. 56—Install Bearing Remover in Oil Hole

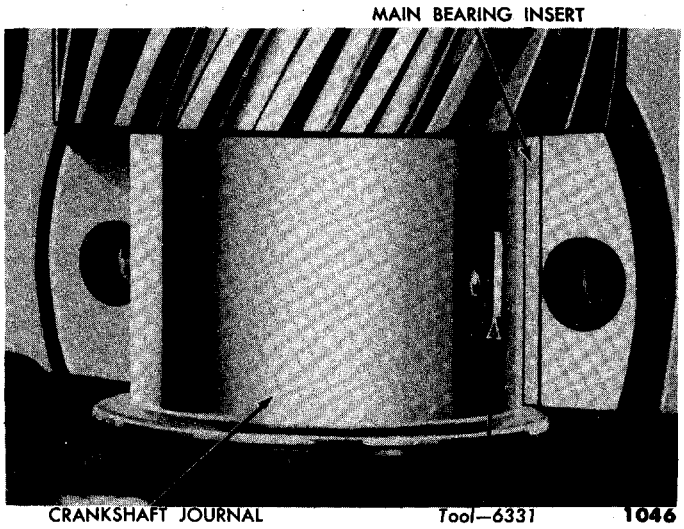


Fig. 57—Removing Main Bearing Insert

the crankshaft journal. Coat shim with light engine oil. Torque the main bearing cap bolts to 95-105 foot-pounds.

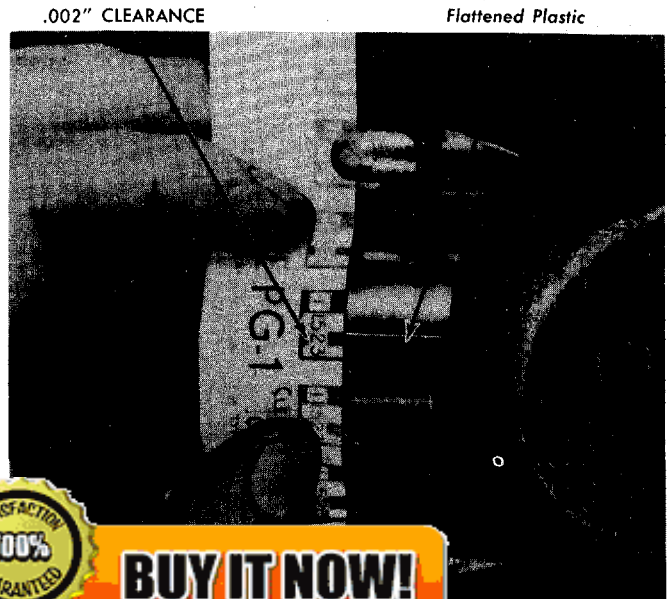
Turn the crankshaft one inch in either direction.

If the crankshaft is locked with the 0.002 inch shim, and is free without the shim, the bearing insert used is satisfactory.

If the crankshaft can be moved freely with the 0.002 inch shim, install an OHA-6333-B bearing (front and intermediate) or an OHA-6331-B bearing (rear) and repeat the above check.

If the crankshaft turns easily, excessive clearance is indicated and the crankshaft should be reground to the next undersize bearing insert size.

Bearing inserts are available as follows: 0.010, 0.020, and 0.030 inch undersize.



Plastigage

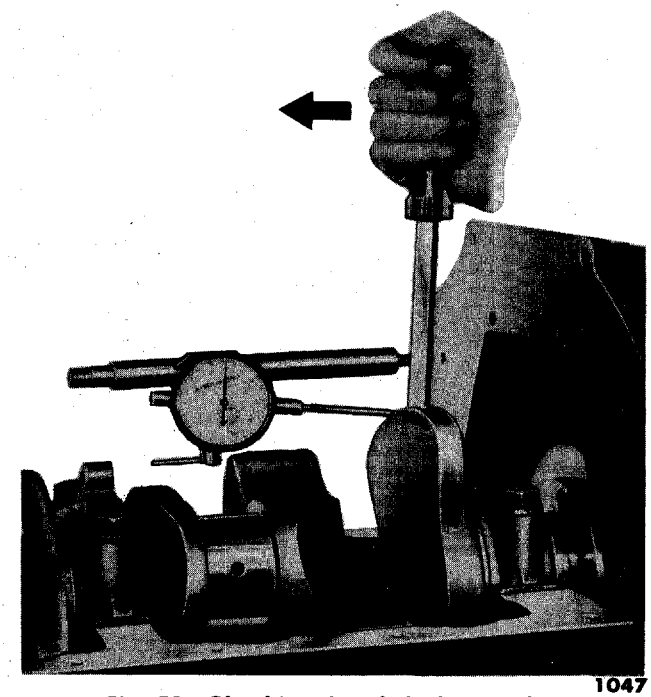


Fig. 59—Checking Crankshaft End Thrust

NOTE: ***Rotate the crankshaft to be sure that the bearing is not too tight.***

(4) *CHECKING CRANKSHAFT END THRUST.* When installing new rear main bearing inserts the crankshaft end play should be checked. To check the crankshaft end play, pry the crankshaft toward the rear of the engine. Place a dial indicator against the forward side of the rear counterweight. Set the dial to zero and then pry the shaft forward.

If the dial indicator shows more than 0.008 inch end play, the rear main bearing insert should be replaced with a new insert to take up the thrust. The manufacturing crankshaft end clearance is 0.004-0.008 inch. Checking the crankshaft end thrust is illustrated in fig. 59.

d. Crankshaft Gear.

The crankshaft gear is attached to front end of the crankshaft.

(1) *INSPECTION.* When it is necessary to replace the camshaft gear, it is advisable to inspect the crankshaft gear. Check the crankshaft gear for chipped, cracked, or worn teeth. Check the crankshaft gear runout. The maximum allowable runout is 0.0015 inch.

(2) *REMOVAL.* To remove the crankshaft gear it is

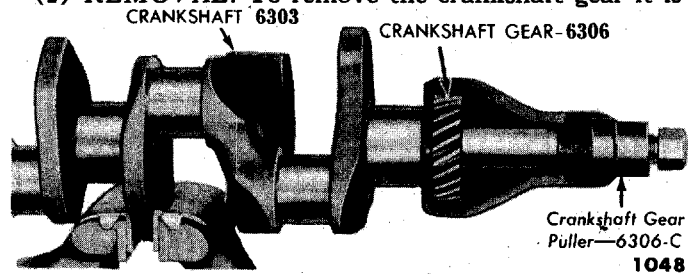


Fig. 60—Removing Crankshaft Gear

necessary to remove the damper assembly, the front engine cover, the oil slinger, the oil pan, and the front main bearing cap. Remove the gear with a crankshaft gear puller. The crankshaft and the crankshaft gear puller are shown in fig. 60.

(3) *INSTALLATION.* Check the condition of the bore, keyway, and teeth of the crankshaft gear. Install the Woodruff key. Start the gear on the shaft making sure the keyway aligns with the key and the timing marks are away from the engine block. Position the crankshaft gear installing tool on the crankshaft, making sure the puller stud is fully threaded into the crankshaft. Assemble the sleeve and wing nut and tighten the nut pulling the gear firmly into place (fig. 61).

CAUTION: ***Make sure the timing gear marks align as the teeth of the gears engage. Make sure the teeth engage freely before pulling the gear into place.***

Check the gear lash by inserting a feeler gauge between the teeth of the crankshaft and the camshaft gears. The lash should be between 0.002 and 0.003 inch. Install the oil slinger with the concave side outward. Inspect the condition of the oil seal in the timing gear cover and in the oil pan. Replace if necessary.

Install the engine front cover using a new gasket. Trim the gasket flush with the cover and block.

Install the damper assembly, making sure the oil seal has not been damaged while installing the assembly. Install the oil pan using new gaskets.

e. Flywheel

The flywheel acts to carry over and smooth out the separate thrusts of each piston. The rear face of the flywheel is used as a friction surface which is engaged by the clutch plate. The flywheel ring gear which is engaged by the starter pinion when starting, is secured to the flywheel by a shrink fit.

(1) *INSPECTION.* The flywheel should be cleaned and inspected. Flywheels that have a burned or scored

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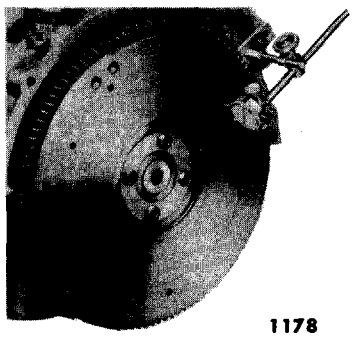
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Fig. 62—Checking Flywheel Runout

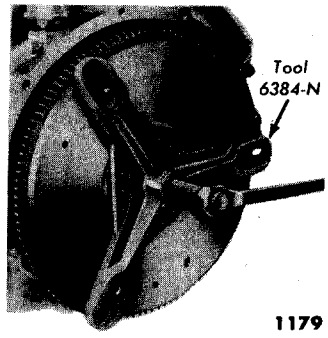

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Fig. 63—Pulling Flywheel with Puller

friction face surface should be replaced or machined. Check the flywheel runout by clamping an indicator to the backing plate (fig. 62). Position the indicator needle on the outer edge of the flywheel pressure plate area.

If the runout exceeds 0.005 inch total indicator reading and the flywheel has double timing marks, remove the flywheel and turn it 180°, then re-install and recheck runout. If runout is still in excess of 0.005 inch check the runout of the mounting side of the flywheel. If the runout is within limits, it indicates that the flywheel has been refaced without being "trued-up" before refacing. In this event true up the mounting side of the flywheel and reface it, if the flywheel has sufficient stock.

NOTE: ***Runout of the crankshaft flange should be established before discarding the flywheel for excessive runout.***

Examine the ring gear for cracks, damaged teeth, and for looseness on the flywheel. Cracks in the gear can be detected by sounding with a hammer.

(2) *REMOVAL.* Remove the transmission, clutch

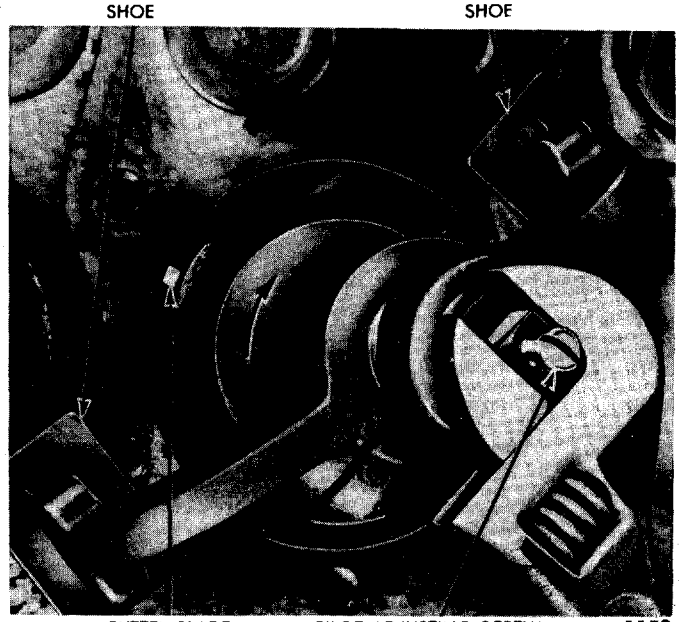

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Fig. 64—Removing Cylinder Ridge

housing, and clutch. The flywheel is mounted to the crankshaft rear flange with dowel pins and self-locking bolts. It may be necessary to use a wheel puller after removing the flywheel bolts. Figure 63 shows a wheel puller in position on the flywheel.

CAUTION: ***Mark the clutch assembly so that it may be remounted on the flywheel in the same position from which it was removed.***

(3) *REFACING*. If it is necessary to remove more than 0.045 inch from the original thickness of the flywheel to obtain a smooth surface, it should be replaced.

(4) *RING GEAR REPLACEMENT*. To replace a ring gear, drill a $^{17}/_{32}$ inch hole nearly through the ring gear on the engine side of the gear, and cut the remaining portion with a chisel. Heat the new ring evenly to 360° F, and place it in position on the flywheel and allow it to cool. Check the ring gear runout. The runout must not exceed 0.010 inch.

(5) *INSTALLATION*. Assemble the flywheel to the mounting flange and install the mounting bolts. Install the clutch and clutch plate to the flywheel making sure that the clutch is in the same position on the flywheel as it was before removal. Install the clutch housing and transmission.

10. CONNECTING RODS, PISTONS, AND PINS

This section gives the removal, inspection, and installation procedures for connecting rods, pistons, and pins. Complete data is given on the fitting of all bearings and the fitting of new rings and pistons.

a. Remove Piston and Connecting Rod Assemblies.

Remove the engine from the car. Remove the oil pan and cylinder head.

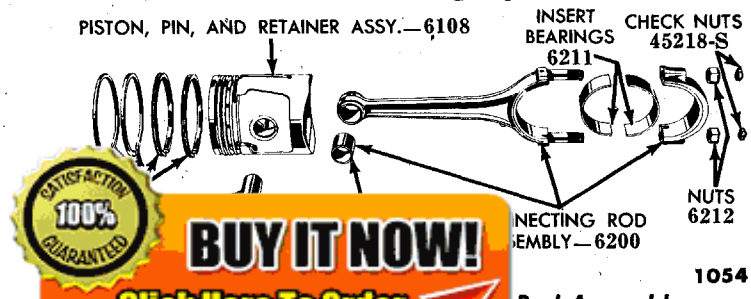
Before removing a piston from the engine, remove any ridges that may be present along the upper part of each cylinder.

Move the piston to the bottom of its travel and place a cloth on the piston head to collect the cuttings. Position the ridge remover in the cylinder and adjust the ridge remover pilot to the cylinder size. Make sure the cutter is at the top side of the roller bar and that the cutter does not extend beyond the roller. Make sure the ridge remover shoes are tight. Hold the ridge remover tightly against the block and turn the arbor clockwise with a wrench (fig. 64).

CAUTION: ***Never cut into the ring travel area in excess of 1/32 inch when removing ridges.***

Remove the ridge remover from the cylinder bore. Turn the crankshaft until the piston is at the top of its stroke and carefully remove the cloth with the cuttings from the piston head.

Turn the crankshaft until the rod of the piston being removed is down. Remove the nuts from the connecting rod studs. Lift the rod bearing cap from the rod and push the rod and piston assembly out the top of the cylinder with the handle end of a hammer. Install the bearing cap on the connecting rod. Repeat this procedure for each assembly.



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Rod Assembly—

NOTE: ***Each rod and bearing cap is numbered from 1 to 6 beginning at the timing gear end of the engine. The numbers on the rod and bearing cap must be on the same side when re-installing them into their respective cylinder bores. If a connecting rod is ever transposed from one block to another, make sure all the bearings are new and that the number on the rod is restamped or prick punched to correspond with the cylinder number.***

b. Disassembly of Piston and Connecting Rod Assemblies.

File the cylinder number on the inside bottom of the piston skirt prior to removing the rods from the pistons, for identification of the piston with the bore for reassembling purposes.

Remove the piston rings. Remove the lock rings at each end of the piston pin. Push the piston pin out of the piston or, if necessary, heat the assembly in hot water and remove the pin by tapping with a light hammer on a brass drift slightly smaller than the pin diameter. Remove the rod bearing cap and the bearing inserts. The piston and rod assembly is shown in fig. 65.

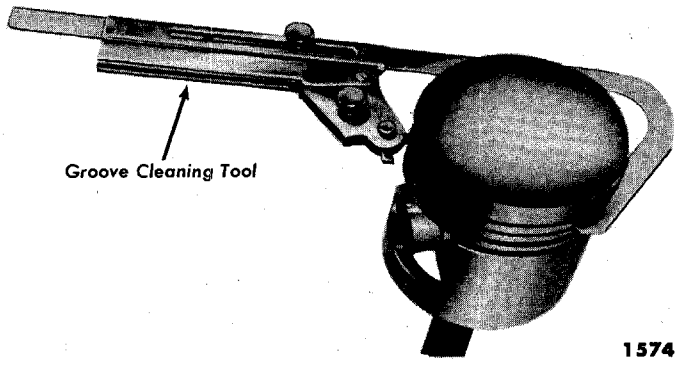

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Fig. 66—Cleaning Piston Ring Grooves

c. Cleaning Piston and Connecting Rod Assemblies.

Remove the carbon from the piston head with a scraper or carbon brush. Clean the piston ring grooves with a ring groove cleaner (fig. 66). Clean the carbon from the oil return holes in the oil ring grooves by running a drill through the holes. Make sure the drill is the same size as the hole.

Clean all the parts and passages in mineral spirits or gasoline. Never use caustic cleaning solution. Remove the bearing inserts (identify them if they are to be used again) and thoroughly clean the rod bore and the back of the inserts.

d. Inspection of Piston and Connecting Rod Assemblies.

Connecting rods with damaged threads, nicked studs, deep nicks, signs of fractures, scored bore, or bore out of round more than 0.002 inch should be replaced.

Use a new piston pin to check the piston pin bushing in the connecting rod for wear. The pin should have a 0.0001 inch to 0.0003 inch clearance in the rod bushing. If the new pin falls through the bore by its own weight, ream the bore for the next oversize pin (fig. 67), or replace the bushing.

Connecting rods with twists or bends should be replaced. Check every connecting rod for alignment on a fixture after fitting the piston pins (fig. 68).

(1) *CONNECTING ROD BEARINGS.* Replace bearing inserts that are scored, have the overlay wiped out, show fatigue failure, or are badly scratched (figs. 50 through 55).

Install the bearing inserts in the cap and rod section. The bearing should snap into place and remain there. If the bearing slides in freely and will fall out readily, the bearing has lost its spread and should be replaced. Check the inside edge of the bearing at the parting line for sharp burrs. Remove the burrs if any are apparent. The part-

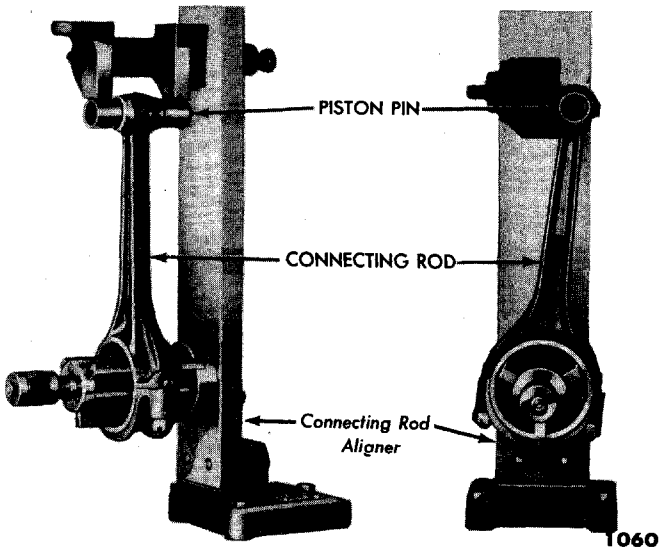


Fig. 68—Checking Connecting Rod Alignment

ing edges of the bearings should be free of dirt or other foreign particles.

CAUTION: ***Remove only enough stock to remove any burrs as a chamfer at this location can cause low oil pressure.***

With the insert held firmly in the cap, place a straight edge over the open end of the bearing. There should be 0.001 to 0.003 inch clearance between the straight edge and the parting line of the cap to provide for bearing "crush." If the parting line of the insert and the cap are flush, the bearing should be replaced. Bearing "crush" tends to hold the bearing firmly in the bearing bore to give support to the bearing and also assures better dissipation of heat from the bearing to the rod.

(2) *PISTONS.* Inspect pistons for fractures at the ring lands, skirt, and pin bosses. Replace pistons showing signs of wavy ring lands, fractures, or damage from detonation. Spongy eroded areas near the edge of the

od Bushing

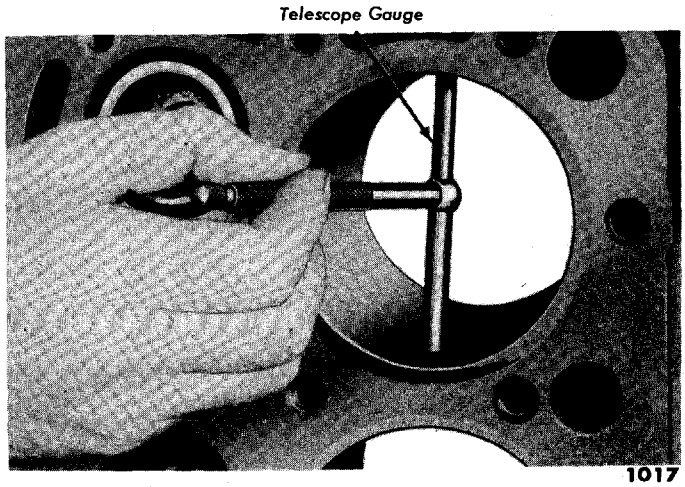


Fig. 69—Measuring Cylinder Bore

piston top, usually on the side opposite the valves, are caused by detonation. In some instances holes are also burned through the piston top. Replace any pistons that show excessive skirt clearance.

(3) *PISTON PINS.* Replace piston pins showing signs of fractures or etching. Piston pins that show wear or fit loose in the piston or rod bushing should be replaced. Replace all piston pin retainers.

(4) *CYLINDER BLOCK.* Make a thorough check for cracks. Minute cracks not visible to the naked eye may be detected by coating the suspected area with a mixture of 25% kerosene and 75% light motor oil. Wipe the part dry and immediately apply a white coating of zinc oxide dissolved in wood alcohol. If cracks are present, the white coating will become discolored at the defective area.

Inspect the cylinder bores for scoring. Check the cylinders closely for bulging at the top. Bulging indicates overheating. Inspect the expansion plugs for rust at the edge of the plug. Rust indicates leakage. If leakage is indicated, remove the plug by drilling a small hole through it and use a punch to pry it out. Replace with a new plug. Always use a sealer when installing new plugs or leakage may result.

Check the cylinder bore for taper, out of round, and wear. Use a cylinder gauge, telescope gauge, or inside micrometers. Only experienced personnel should be permitted to take these measurements.

Record measurements taken lengthwise and crosswise at the top and bottom of the block as follows:

Lengthwise of the block, measure and record as "A" the diameter of the cylinder at the top of the cylinder where the greatest ring wear occurs. Also lengthwise of the block, measure and record as "B" the cylinder diameter at the bottom of the piston skirt travel.

Crosswise of the block, measure and record as "C" the diameter at the top of the cylinder at the greatest wear point. Measure and record as "D" the diameter at the bottom of cylinder bore, also crosswise of the block.

Reading "A" compared to reading "B" and reading "C" compared to reading "D" indicates cylinder taper. If the taper is greater than 0.015 inch the cylinder must be rebored and honed for the next oversize piston.

Reading "A" compared to reading "C" and reading "B" compared to reading "D" indicates whether or not the cylinder is out of round. If the out of round exceeds 0.003 inch, the cylinders must be rebored and honed for the next oversize pistons.

Measuring cylinder bore with a telescope gauge is illustrated in fig. 69.

e. Fitting Pistons.

Proper assembly tolerances of pistons are required if satisfactory engine operation is to be obtained. Cylinder bores must be checked for taper and out of round condition before fitting a piston.

Before installing a piston and new rings in a used block, remove the high polish on the cylinder wall to aid ring seating by passing a hone through the cylinder bore a few times. Do not hone more than enough to rough up the polish. Make sure that wet rags are placed in the bore to catch the hone dust and that the cylinder is thoroughly cleaned before installing the piston.

To fit a new piston in a new bore, attach a tension scale to the end of a feeler ribbon ½ inch wide and having the correct feeler ribbon thickness as given in Table 2. Position the feeler ribbon on the thrust side of the piston (camshaft side) 90° from the piston pin hole. Invert the piston, then push the piston in the cylinder so the end is about ½ inch below the top of the block. Keep the piston pin bores parallel with the camshaft. Pull out the feeler gauge while noting the reading (fig. 70).

The pull limits for new pistons and used pistons in new or used bores is given in Table 2.

Table 2—Piston Fitting Specifications

	Piston	
	7HA	OHA
New Piston in New Bore		
Gauge Thickness (inches)	0.003	0.002
Pounds Pull	6-12	3-12
New Piston in Used Bore		
Gauge Thickness (inches)	0.003	0.002
	6-12	3-12
	0.003	0.003
	6-12	3-12

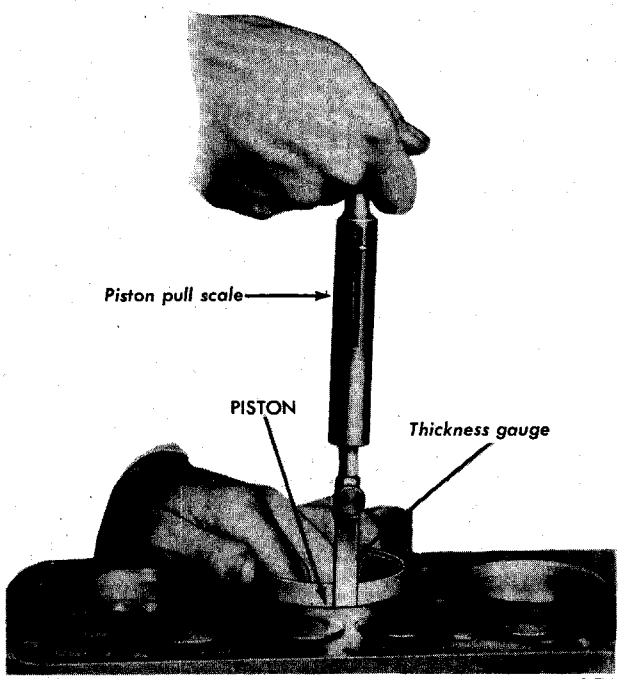


Fig. 70—Fitting Piston to Cylinder Bore

If the scale reading is greater than the maximum allowable pull, try another piston or hone the cylinder bore to obtain the proper fit. If the scale reading is less than the minimum allowable pull, try another piston. If none can be fitted, rebore cylinders to next oversize (Table 3).

f. Boring Cylinder Block.

To assure maximum engine performance and balance of the reciprocating parts of the engine, all cylinders must be bored to the same size even though only one cylinder requires reboring and the others are within tolerance. Manufacturers recommendations on how to use boring equipment should be followed and the work performed only by experienced personnel.

Bore the cylinder with the most wear first to determine the proper oversize. If the cylinders will not clean up at 0.060 inch oversize, the block must be replaced.

When reboring the cylinders allow 0.0015 inch stock for honing when fitting pistons. Hone the bores to fit the pistons so as to provide a 6-12 pound pull on a 0.003 x ½ inch feeler ribbon for 7HA piston and 0.002 x ½ inch feeler ribbon for OHA piston when pulled from between the thrust side of the piston and the cylinder wall. Use a number 220 to 280 grit hone for this operation.

CAUTION: ***Thoroughly clean the block to remove all particles of abrasive after the honing operation.***

g. Fitting Piston Pins.

Check the piston pin fit in the piston. Piston pins must be a hand-push fit in the piston pin bore at normal room temperature (70°F.).

If oversize piston pins are to be used, or if the piston pins are too tight, use an expansion type piston pin reamer. Place the reamer in a vise and revolve the piston around the reamer (fig. 71).

Set the reamer to the size of the piston bore, then expand reamer very slightly and trial ream the bore ⅛ inch deep in the piston using a pilot sleeve of the nearest size to maintain alignment of the piston pin bores.

CAUTION: ***Take a very light cut and do not allow the reamer to enter the bore more than ⅛ inch.***

Check the reamed hole size using a new piston pin as a gauge. If the bore is small, finish reaming the hole, then turn the piston around and ream the other hole.

Expand the reamer slightly and make another trial cut, then repeat the procedure outlined until a piston pin fit is obtained.

Similarly ream all the pistons in which pins need to be fitted, checking each with the pin to be used in the piston.

in Holes

Table 3—Piston Kits Available for Service

Piston Kit Part No.	Type	Piston Skirt Dia. Limit (Dimension At Skirt—Inches)
7HA-6108-A	Standard	3.2996-3.3008
7HA-6108-D	0.020 inch O.S.*	3.3180-3.3190
7HA-6108-E	0.030 inch O.S.	3.3280-3.3290
7HA-6108-F	0.040 inch O.S.	3.3380-3.3390
7HA-6108-G	0.060 inch O.S.	3.3580-3.3590
OHA-6108-A	Standard	3.3003-3.3015
OHA-6108-B	0.0025 inch O.S.	3.3016-3.3028
OHA-6108-C	0.020 inch O.S.	3.3191-3.3203
OHA-6108-D	0.030 inch O.S.	3.3291-3.3303
OHA-6108-E	0.040 inch O.S.	3.3391-3.3403
OHA-6108-F	0.060 inch O.S.	3.3591-3.3603

*O.S. means oversize.

There are four pistons of each type (standard and oversize) with skirt diameter variation in steps of 0.0003 inch for selective fitting of OHA pistons.

h. Fitting Piston Rings.

Install the piston ring in the cylinder bore. Invert the piston and use the top to push the ring about halfway into the bore to true the ring with the cylinder bore. Measure the ring gap with a feeler gauge. The gap should be 0.007-0.047 inch (all rings). If the gap is less than the minimum limit the ring will have to be removed and the ends filed until the proper clearance is obtained.

If the ring gap exceeds the maximum limit, the next oversize ring must be used. After the rings have been fitted in the cylinder bore, they should be immediately installed on the piston or identified with the piston and cylinder bore in which they are to be installed.

Check the ring to groove clearance on the proper piston for the cylinder as shown in fig. 72.

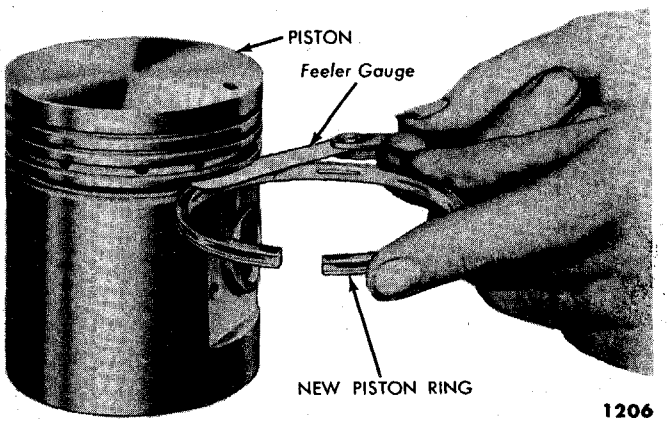


Fig. 72—Checking Piston Ring Clearance

The rings should have the following clearance:

Ring	Clearance in Piston Groove (inch)	End Gap of Ring in Cyl. Bore (inch)
1st Top Compression	0.0015-0.0030	0.007-0.047
2nd Top Compression	0.0010-0.0025	0.007-0.047
3rd Oil Ring	0.0010-0.0025	0.007-0.047
4th Oil Ring	0.0010-0.0025	0.007-0.047

Remove stock from tight rings by rotating the ring over emery cloth placed on a surface plate or plate glass until the ring fits the groove within the above limits.

Three different type rings are available in sets for service, the standard ring, the expander ring, and the steel section ring.

The standard (snap in type) is designed for use in a new engine or whenever the block is rebored and new pistons installed and a light hone is recommended.

The expander type is designed for use after a light honing job and the taper of the cylinder bore does not exceed 0.006 inch or whenever an oil consumption condition is encountered.

The steel section type ring should be used in cylinders where the taper of the cylinder bore is between 0.006 and 0.015 inch or for excessive oil consumption conditions when the cylinder bore is not to be honed.

NOTE: ***When the steel section 0HA ring sets are not available, the steel section 7HA may be used on the OHA piston by installing the oil ring expander in the 3rd groove rather than in the 4th groove as specified on the 7HA pistons.***

i. Fitting Connecting Rod Bearings (Plastigage Method).

Place a piece of Plastigage plastic the length of the cap in the bearing cap. Install the cap and tighten to 45-50 foot-pounds.

NOTE: ***Do not turn the crankshaft with Plastigage in place.***

Remove the bearing cap and using the Plastigage scale measure the width of the flattened piece of plastic at the widest point. If reading is not over 0.003 inch, standard size connecting rod bearings should be used; if over 0.003 inch, install 0.002 inch undersize bearing and recheck. Where use of the 0.002 inch undersize bearing results in excessive clearance grind the crankshaft and install undersize bearing inserts.

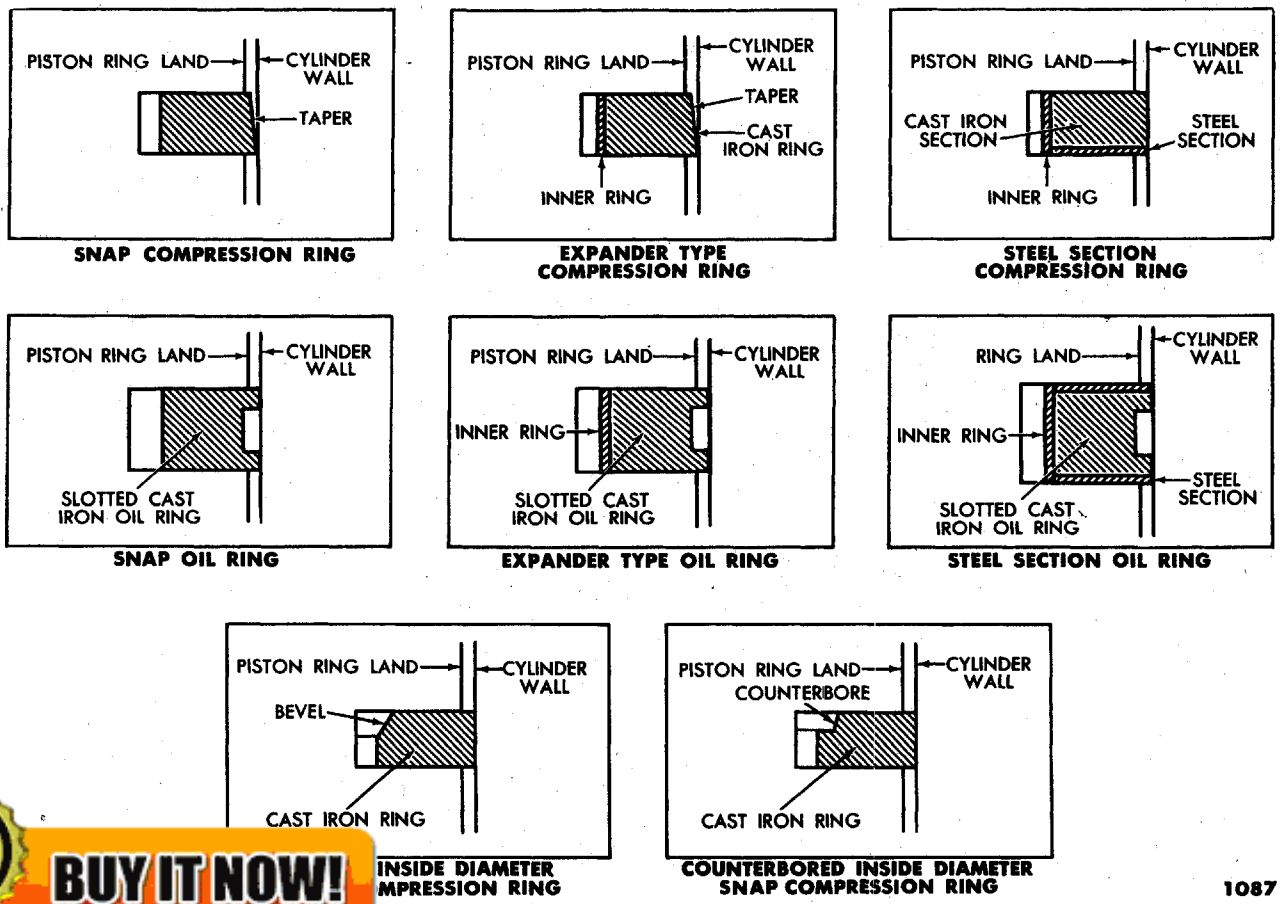


Fig. 73—Piston Ring Types

j. Fitting Connecting Rod Bearings (Shim Method).

Place 0.003 brass shim ½ inch wide by 1 inch long in the bearing cap with a new standard insert and install the cap. Tighten the nuts to 45-50 foot-pounds torque.

Attempt to move the connecting rod endwise on the crank pin by hand and then by a light tap of a hammer.

Remove the shim and repeat the above test, then move the rod endwise by hand. If connecting rod did not move by hand, but moved by tap of hammer in the previous test and moved freely with shim removed, the standard bearing as installed should be used. If rod could be moved by hand when used with the shim, install the 0.002 inch undersize bearing and repeat the above test.

After determining that the correct bearing insert has been fitted, tighten connecting rod bearing cap nuts to 45-50 foot-pounds torque. Then rotate the shaft to be sure the bearing is not too tight.

k. Assembly.

Lubricate all parts with light engine oil.

NOTE: ***The oil squirt hole should be toward the valve side of the engine when assembly is installed.***

Position the connecting rod in the piston and push the pin into place.

NOTE: ***The OHA type piston is serviced as a piston, pin, and retainer assembly, and the retainer has a tang for aiding the removal of the retainer from the groove. The piston does not have the slot which is in the 7HA type piston.***

Insert new piston pin retainers. Install the piston rings following the instructions for the type of ring you are installing (fig. 73).

Insert the bearing halves in the rod end cap.

l. Installation.

Oil the cylinder wall with light engine oil. Make sure the ring gaps are equally spaced around the circumference of the piston. Compress the rings with a compressing tool and tap the piston down with a soft faced hammer (fig. 74) until it is slightly below the top of the cylinder. NOTE: ***Install the OHA type piston with the indentation in the piston head toward the front of the engine.***

Turn the crankshaft throw down. Oil the crank pin and push the piston all the way down until the rod bearing seats on the crank pin. Install the bearing cap (line up the stamped numbers) and tighten the retaining nuts to 45-50 foot-pounds torque. Install new lock nuts and tighten to 4-5 foot-pounds torque.

Install the oil pan and cylinder heads. Install the engine in the car. Fill the crankcase with the proper grade and amount of lubricant. Fill the cooling system. Start the engine and run it slowly. Make sure there is sufficient oil pressure. Check the temperature to make sure the engine does not overheat. Overheating can be caused by too tight bearings.

11. MUFFLER, INLET PIPE, AND OUTLET PIPE

The exhaust system on the 6-cylinder passenger car consists of a muffler, an exhaust outlet pipe, and an exhaust inlet pipe.

The following procedure covers the removal and installation of the units of the exhaust system (see fig. 75).

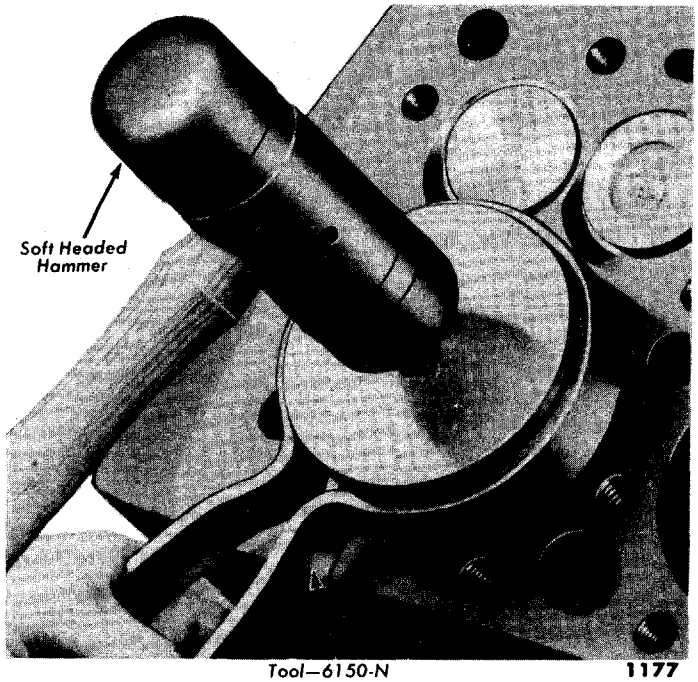
a. Muffler Replacement.

Extra heavy double-wall construction mufflers are available for service.

(1) *REMOVAL.* Loosen muffler inlet and outlet pipe clamps. Slide clamps away from the muffler, the inlet pipe, and the outlet pipe. Loosen front and rear outlet pipe clamps and disengage outlet pipe from muffler by sliding the outlet pipe to the rear. Remove the muffler from the inlet pipe.

(2) *INSTALLATION.* Place muffler in position on the inlet pipe and slide outlet pipe into the muffler. Place the inlet pipe and the outlet pipe clamps in position on the muffler and tighten clamps. Tighten the front and [illegible]tlet pipe clamps.

[illegible]frame by flexible only prevent the [illegible]ough the chassis frame but also relieve the exhaust system from twisting or bending stresses.



Tool—6150-N 1177

Fig. 74—Tapping in Piston

(1) *REMOVAL.* Loosen the muffler outlet pipe clamps, leaving the clamp on the muffler. Remove the outlet pipe front and rear support clamps and disengage the outlet pipe from the muffler.

(2) *INSTALLATION.* Position outlet pipe in the muffler. Place the outlet pipe rear support bracket clamp on the outlet pipe. Install the front support bracket clamp and tighten nut. Position the rear outlet pipe clamp on rear bracket and tighten nut.

c. Inlet Pipe Replacement.

The exhaust inlet pipe is designed to give the exhaust gases leaving the exhaust manifolds a direct through passage to the muffler, thereby increasing the over-all efficiency of the exhaust system.

(1) *REMOVAL.* Loosen the muffler inlet pipe clamp. Remove the two nuts holding the inlet pipe to the exhaust manifold, then remove the gasket. Disengage the inlet pipe from the muffler by sliding the inlet pipe forward.

(2) *INSTALLATION.* Place the inlet pipe in the muffler. Install gasket on the inlet pipe and secure the pipe to the exhaust manifold with two nuts. Tighten the muffler inlet pipe clamp.

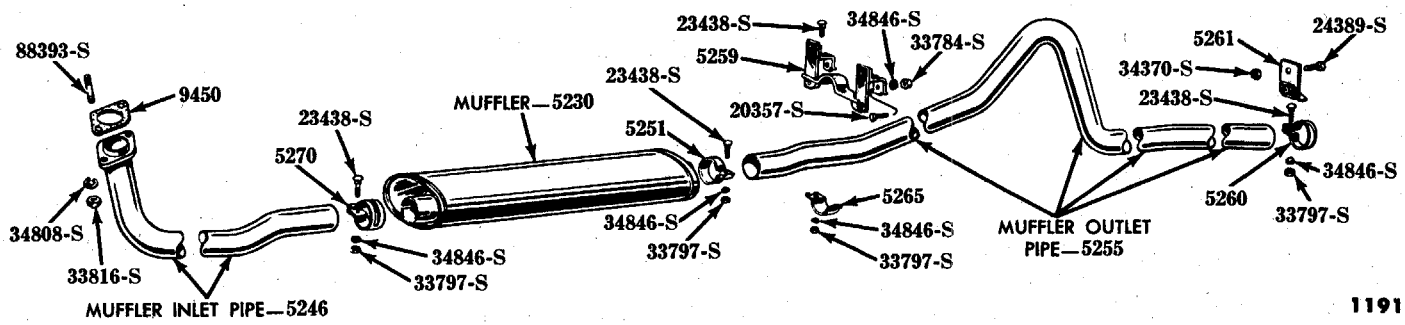


Fig. 75—Muffler and Related Parts

SERVICE LETTER REFERENCE

Letter No.	Date	Subject	Changes Information on Page No.

Part ONE

POWER PLANT

Chapter

II

B-Series — 8-Cylinder Engine

Complete procedures for the overhaul and repair of the 8-cylinder car engine are contained in this chapter. To help locate the information you desire, the chapter is divided into the sections listed above.

The 8-cylinder "B" series passenger car engine (fig. 1) has a bore of $3\frac{3}{16}$ inches, a stroke of $3\frac{3}{4}$ inches, and is rated at 100 horsepower.

Engine accessories are mounted on the intake manifold. Servicing operations can be readily conducted with this arrangement. Front and rear views of the engine are shown in figs. 2 and 3 respectively.

A complete engine overhaul gasket kit is illustrated in fig. 4.

1530

e Cutaway

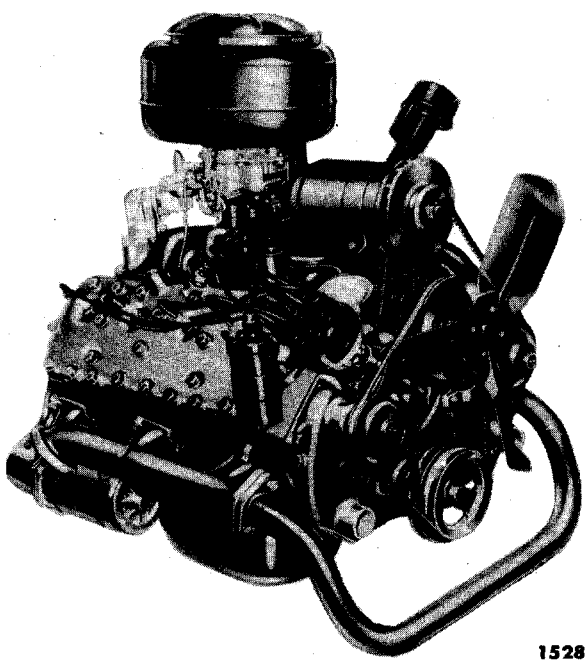


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Fig. 2—1951 8-Cylinder Engine (¾ Front View)

1. ENGINE REMOVAL AND INSTALLATION

A detailed procedure is given here for the removal and installation of the 8-cylinder passenger car engine including the mounting of the engine on a work stand.

a. Removal.

Remove the hood and the battery. Drain the crankcase and the coolant. Disconnect the upper radiator hoses at the engine and the lower hoses at the radiator. Remove the radiator. Disconnect the heater hoses at the engine. Remove the air cleaner.

Disconnect the generator wires, oil pressure sender wire, ignition switch to coil wire, and temperature sender wire. Spread the cable clips and fold the cable out of the way.

Disconnect the flexible fuel line connection. Disconnect the choke wire, throttle linkage, and the accelerator pedal rod. Push the cross shaft back against the dash panel. Disconnect the windshield wiper hose at the carburetor.

Disconnect the muffler inlet pipe, the starter cable (at starter motor terminal), and the clutch retracting spring and release rod. Remove the two top transmission to flywheel housing bolts.

Remove the engine front support nuts. Install the engine lift brackets and yoke and take up the load with a hoist. Support the transmission and remove the two lower transmission to flywheel housing bolts. Rock the engine and pull it away from the transmission until the pilot and shaft separate from the clutch, then raise the engine carefully. Be sure it clears all parts of the engine compartment. Do not let engine strike the grille.

With the engine clear of the car and hanging on the hoist, remove the crossover pipe and the right-hand manifold. Install the engine on a work stand (fig. 5).

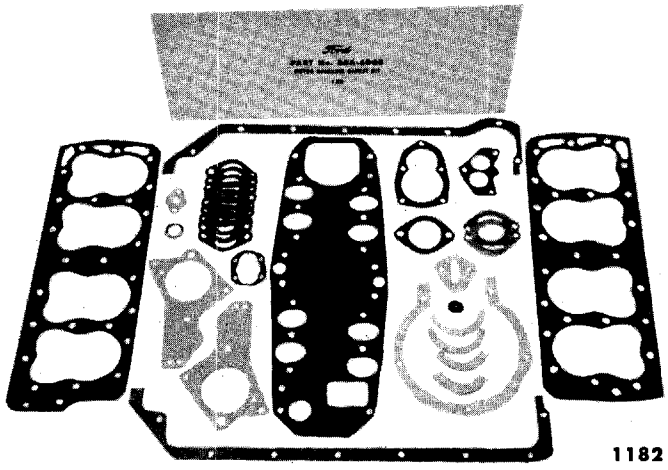

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Fig. 4—Engine Overhaul Gasket Kit

b. Installation.

Remove the engine from the work stand. With the engine hanging on a hoist, install the right hand exhaust manifold and crossover pipe. Shift the transmission into gear. Place a jack under the transmission and raise the transmission until it just touches the toe board.

Center the clutch release bearing in the clutch and lower the engine into the engine compartment carefully. Start the transmission pilot and spline into the clutch.

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¾ Rear View)

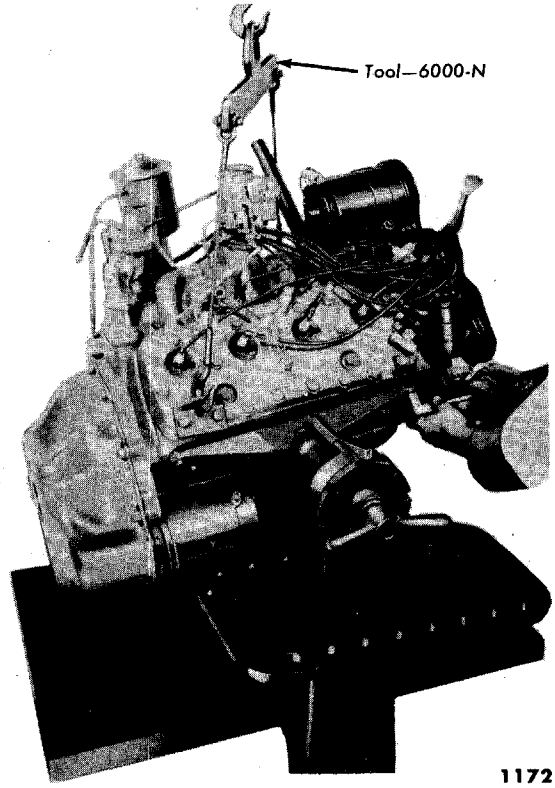

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Fig. 5—Installing Engine on Work Stand

NOTE: ***It may be necessary to adjust the height of the transmission with relation to the engine until the pilot enters the clutch. If the engine "hangs up" after pilot enters, turn crankshaft slowly until splines seat.***

Install the transmission to flywheel housing bolts and torque them to 40-50 foot-pounds torque. Remove the jack under the transmission. Lower the engine to the frame and install the engine front support nuts. Remove yoke and lift brackets.

Connect the starter cable, muffler inlet pipe, and clutch release rod and spring. Adjust the clutch pedal free play. Connect the throttle linkage and foot pedal rod. Connect choke wire, windshield wiper hose, and flexible fuel line. Connect the generator wires, the oil pressure sender wire, the temperature sender wire, and the ignition switch to coil wire. Install the cable in the retaining clips.

Install the radiator and connect the hoses. Connect the heater hoses. Install the air cleaner, battery, and hood. Fill the crankcase with the proper grade and amount of oil. Fill the cooling system. Run the engine and check for leaks in the system.

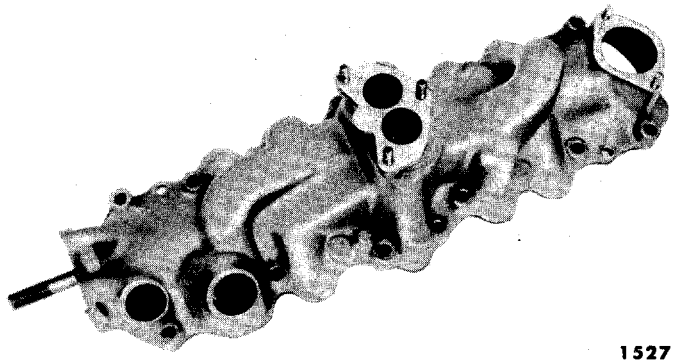

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Fig. 7—Intake Manifold

2. MANIFOLDS

Procedures for removal, cleaning, inspection, and installation of the exhaust and intake manifolds are outlined below. Intake and exhaust manifolds are covered separately. Figure 6 illustrates the manifold gasket kit.

a. Intake Manifold.

It is not necessary to remove the carburetor when the manifold is removed unless the manifold is defective and must be replaced. The intake manifold is shown in fig. 7.

(1) *REMOVAL.* Remove the carburetor air cleaner. Disconnect generator wires. Remove the fan and generator. Disconnect the temperature sending unit wire. Disconnect the fuel lines at the fuel pump and remove the pump. Pull out the pump push rod. Disconnect the carburetor throttle linkage, choke wire, and carburetor to distributor vacuum line at the carburetor. Loosen the crankcase breather pipe clamp and remove the breather pipe. Remove the manifold retaining bolts, clear the spark plug wires out of the way, and remove the manifold and gasket.

(2) *CLEANING.* Brush out rust and dirt from the inside of the manifold. Wash oil and grease from the outside with solvent and dry the manifold.

(3) *INSPECTION.* Inspect the manifold for cracks and warped sealing surfaces. Replace the manifold if it is cracked or warped.

(4) *INSTALLATION.* Align a new gasket with the proper holes in the cylinder block and lay the manifold on the gasket, aligning the bolt holes. Install and tighten the manifold retaining bolts. Torque bolts to 23-28 foot-pounds.

NOTE: ***The ignition cable mounting brackets must be placed under the two bolts located just forward of the carburetor pad.***

Insert the fuel pump push rod into its guide in the cylinder block and install the fuel pump. Be sure the push rod is seated in the pump rocker arm. Tighten the retaining nuts to 6-9 foot-pounds torque. Connect the fuel lines to the pump.

Install the crankcase breather and tighten the retaining clamp. Connect the carburetor throttle linkage, choke wire, and carburetor to distributor vacuum line. Connect the temperature sending unit wire. Install generator and fan and adjust belts. Install air cleaner.

b. Exhaust Manifold.

1949 and early 1950 models use a butterfly type

1183

Kit

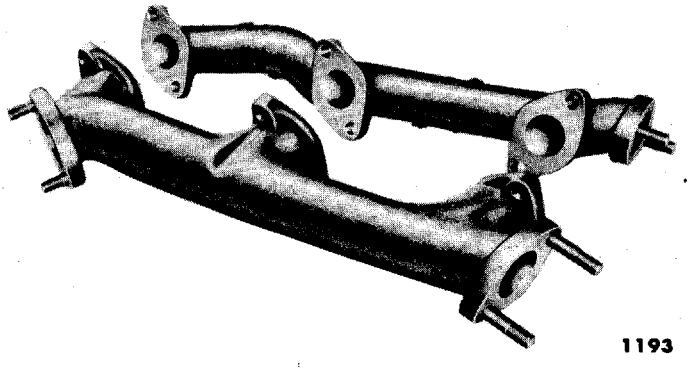

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Fig. 8—Exhaust Manifold

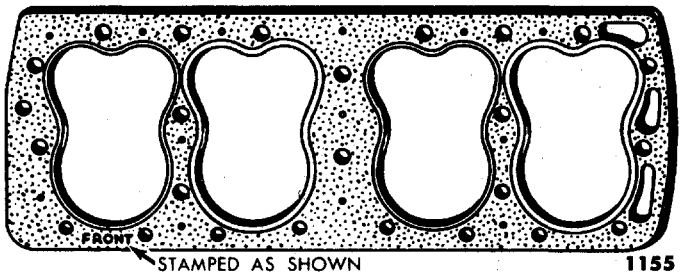

Fig. 9—Cylinder Head Gasket

exhaust thermostat located between the crossover pipe and the right-hand manifold. Late 1950 models and 1951 models use a "duck-bill" type thermostat located inside the crossover pipe. The manifolds are illustrated in fig. 8.

(1) *REMOVAL*. Remove the crossover pipe. Disconnect the muffler inlet pipe when removing the right hand manifold. Remove the manifold retaining screws and remove the manifold and gaskets.

(2) *CLEANING*. Use a wire brush to remove carbon deposits from manifold. Clean flange and gasket faces.

(3) *INSPECTION*. Check the manifold for cracks or holes. Check the gasket surfaces for warping. Replace cracked or warped manifolds.

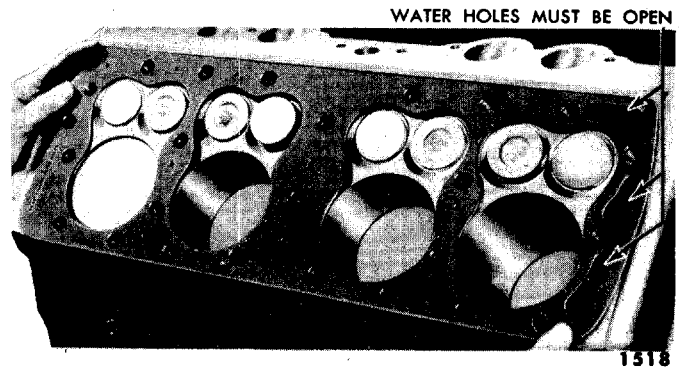

Fig. 11—Cylinder Head Gasket Installation

(4) *INSTALLATION*. Install the manifold with new gaskets between the manifold and cylinder block. Install the retaining screws and tighten them to 25-30 foot-pounds torque. Install the crossover pipe. Connect the muffler inlet pipe when installing the right-hand manifold.

3. CYLINDER HEADS

Procedures for removal, cleaning, inspection and installation of cylinder heads are given below. The procedures include preliminary instructions for removing parts that interfere with the removal of each head. Figure 9 illustrates the cylinder head gasket and the cylinder head is shown in fig. 10.

a. Preliminary.

When removing the left hand cylinder head, disconnect and remove the oil filter. Disconnect the generator wires and fold back. Disconnect the battery ground cable.

When removing the right hand cylinder head, remove the coil bracket mounting screws. Disconnect the heater hose at the cylinder head elbow.

b. Removal.

Drain coolant and disconnect the radiator hose at the cylinder head elbow. Disconnect the spark plug wires and remove the spark plugs. Remove the head bolts and remove the head and gasket.

c. Cleaning.

Remove carbon deposits by brushing with a wire brush or by scraping. Be careful not to scratch the gasket surfaces of the cylinder head. Clean out dirt or rust from the coolant holes.

d. Inspection.

Check the cylinder head for cracks or warped surfaces. Replace the head if it is cracked or warped.

e. Installation.

Position the head gaskets as shown in fig. 11. Lay the head on the gasket and install one head bolt finger tight at each end of the head to align the head and gasket with the cylinder block. Use a water resistant sealer to prevent leakage past the cylinder head bolts. Install the remaining head bolts and tighten the bolts in the order shown in fig. 12 to 65-70 foot-pounds torque. Install the spark plugs and torque to 24-30 foot-pounds. Install the spark plug wires. Connect the radiator hose and fill the radiator with coolant.

NOTE: ***On the left hand cylinder head install the oil filter, generator wires, and battery ground strap. On the right hand cylinder head, install the coil and heater hose.***

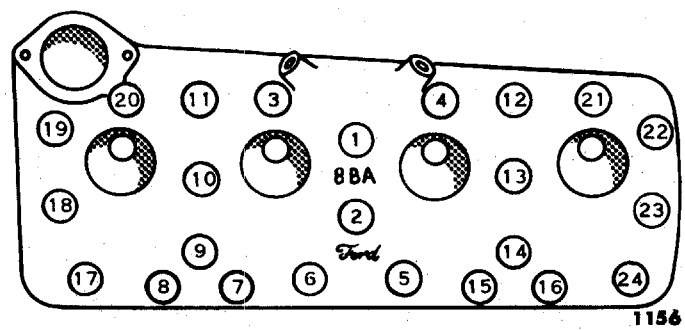

Fig. 12—Cylinder Head Bolt Tightening Sequence

4. OIL PAN, OIL PUMP, AND PRESSURE RELIEF VALVE

Detailed procedures for repair and replacement of the oil pan, oil seals, oil pump, and pressure relief valve are presented in this section. Information can be located by referring to the headings which describe the particular unit or operation. The oil pan gasket kit is illustrated in fig. 13.

NOTE: ***The 1951 (1BA-6675) oil pan cannot be used to replace the 1949 or 1950 (8BA-6675) oil pan.***

a. Oil Pan.

Procedures covering the oil pan and oil seal are presented here under headings indicating the nature of the procedure. Removal, cleaning, inspection, and installation of the oil pan and the steps necessary for oil seal installation are all described below. The oil pan is illustrated in fig. 14.

(1) *REMOVAL* Drain the crankcase. Remove the starter motor, clutch return spring, and the flywheel housing front cover. Remove the bolt retaining the road air breather duct and remove the duct. Remove the bolts retaining the steering gear idler arm bracket to the frame. Remove the steering gear arm and drop the idler arm connecting rod until it hangs from the spindle arms.

Unscrew the oil level indicator tube. Remove the oil pan retaining screws and the oil pan. The two front retaining screws can be reached through access holes provided in the frame front cross member.

NOTE: ***On some engines it will be necessary to disconnect the front engine supports and lift the front of the engine.***

(2) *CLEANING*. Wash the pan in solvent. Brush any dirt or metal particles from the inside of the pan. Scrape off old gasket material on the gasket surface of the pan. Dry any remaining solvent.

(3) *INSPECTION*. Check the pan for stripped threads, cracks, holes, or warped gasket surfaces. Repair any cracks and holes or replace the pan if repairs cannot be made.

(4) *OIL SEAL REPLACEMENT*. Pry out the old packing in the front and rear seal retaining grooves. Install new packing in the recess at each end of the oil pan. "Roll" the packing in with a round bar as shown in fig. 15 to make sure it is seated properly in the recess.

NOTE: ***Soak oil seal packing in light engine oil for at least two hours before installation.***

(5) *INSTALLATION*. Make sure the gasket surface of the cylinder block is clean. File off any burrs around the threaded bolt holes. Tie each half of the gasket to the pan through two of the bolt holes to hold the gakset in place while installing the pan.

Hold the pan in place on the cylinder block and install two screws (not tight) in each side (not in the same holes as those used for tying the gasket). Remove the string ties and install the remaining screws and tighten them to 15-18 foot-pounds torque. Install the oil level indicator tube, the road air breather duct, and the flywheel housing front cover.

NOTE: ***Align the flywheel housing front cover by installing the two shoulder bolts in the top holes.***

Install the starter motor and the clutch return spring. Install the steering idler arm support bracket and the steering gear arm. Fill the crankcase with the proper grade and amount of oil. Run the engine and check for oil leaks.

b. Oil Pump and Pressure Relief Valve.

The gear type oil pump is mounted on the cylinder block inside the oil pan at the rear of the engine. The pressure relief valve is mounted in the pump housing.

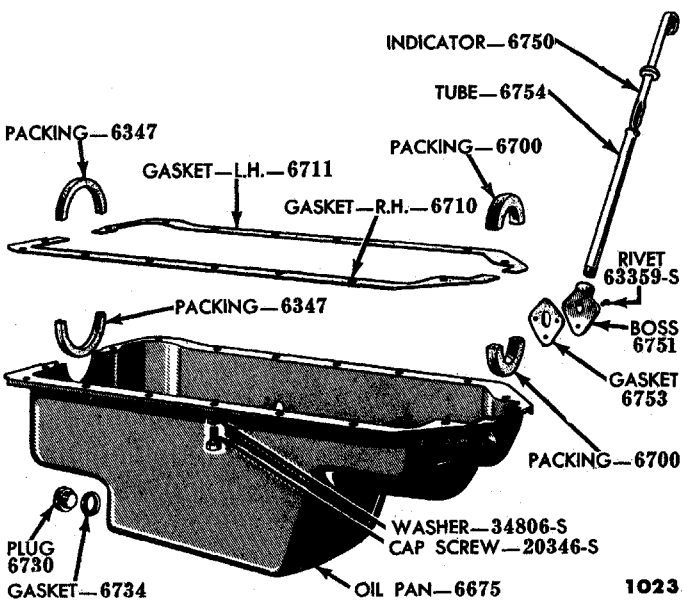

Fig. 14—Oil Pan

The oil pump used on early 1949 engines is equipped with spur gears. The increased capacity oil pump used on late 1949, 1950 and 1951 engines is equipped with helical gears. There is no visible difference between the pumps. To determine which pump you have, remove the oil pump tube and screen, and check the gears.

Oil pump removal, disassembly, cleaning, inspection, assembly, and installation procedures are presented below. The pressure relief valve is covered in the disassembly and assembly procedures for the pump since the valve is a part of the pump.

(1) *REMOVAL*. Drain the oil and remove the oil pan. Remove the oil pump retaining screw and remove the pump and strainer assembly.

(2) *DISASSEMBLY*. Remove the strainer assembly retaining screws, the strainer, and the gasket. Remove the cover plate and the pump driven gear. Remove the lock wire and the pressure relief valve (plug, gasket, spring, and valve).

Drive out the pin and remove the upper driven gear. Slide the shaft and drive gear assembly out of the housing. The oil pump is shown completely disassembled in fig. 16.

(3) *CLEANING*. Wash all the parts in solvent and dry them thoroughly. Brush the inside of the pump housing to make sure no dirt or metal particles remain.

(4) *INSPECTION*. Check the pump housing for cracks or excessive wear. The pump shaft should have a free running fit without excessive play in the bushings (0.0005 to 0.0025 inch clearance). Check the pump gear teeth for scratches and wear. Measure the clearance between the pump gears and the pump body. It should be no greater than 0.005 inch. Check the compression of the relief valve spring. It should be 12 pounds plus or minus 2 ounces when the spring is compressed to 1.14 inches. Replace any worn or defective parts.

(5) *ASSEMBLY*. Apply a light coat of engine oil to all moving parts. Slide the shaft and drive gear assembly into the housing. Install the upper driven gear, insert the retaining pin, and rivet the end of the pin to hold it in place.

NOTE: ***When a new shaft and pump drive gear assembly is installed, it will be necessary to drill the retaining pin hole in the shaft. Set the end clearance to 0.016 inch and use a number 30 (0.1285) drill for the retaining pin hole.***

Install the pump driven gear, the cover plate gasket, and the cover plate. Tighten the cover plate screws to 7-10 foot-pounds torque. Install the pressure relief valve, the spring, the gasket, and the plug. Insert a piece of lock wire through the hole provided in the plug and twist the wire around the housing extension. Install the strainer gasket and strainer and tighten the screws securely.

(6) *INSTALLATION*. Slide the pump into the cylinder block (make sure the upper driven gear meshes properly) and install the pump retaining screw with a lockwasher. Tighten the screw to 12-15 foot-pounds torque. Install the oil pan and fill the crankcase with the proper grade and amount of oil.

...al Packing

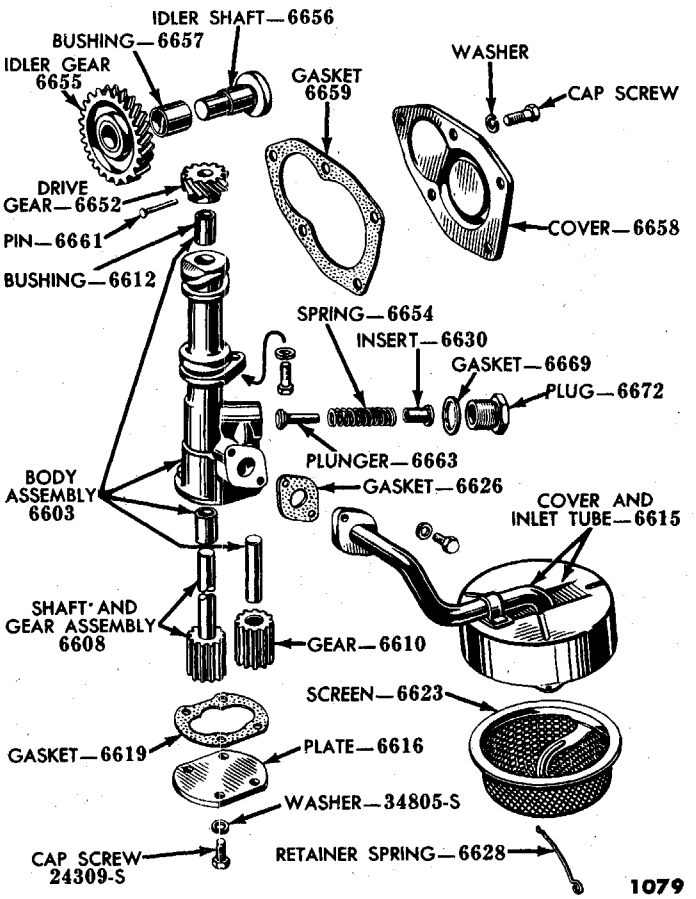

Fig. 16—Oil Pump Disassembled

5. CRANKSHAFT PULLEY REPLACEMENT

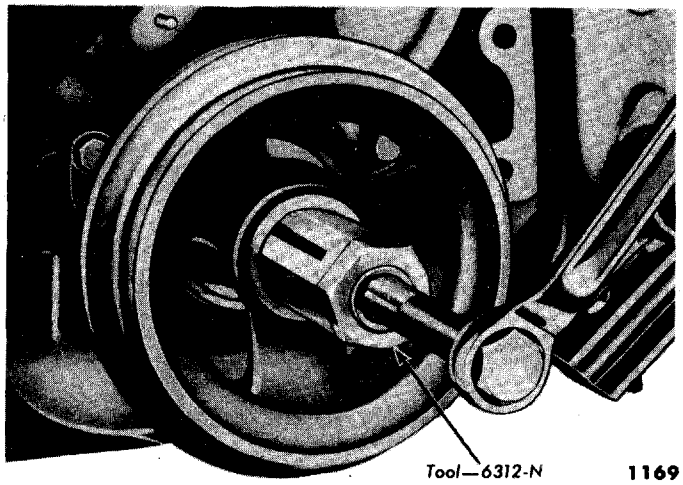

Fig. 17—Removing Crankshaft Pulley

The 8-cylinder engines are equipped with a double groove pulley keyed to the crankshaft and held in place with a bolt and washer. If the pulley is to be replaced with the engine in the car, remove the radiator.

a. Removal.

Remove the fan and generator belts. Remove the retaining bolt and lockwasher. Use a tool as shown in fig. 17 to remove the pulley.

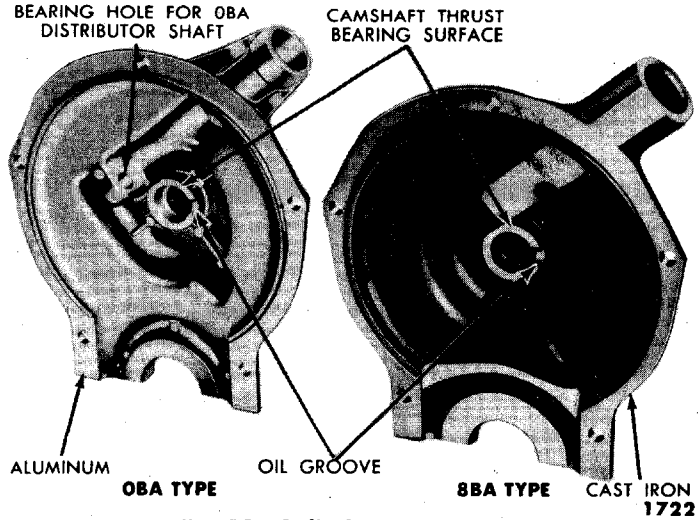

Fig. 19—Cylinder Front Covers

b. Installation.

Start the pulley on the shaft by tapping it with a soft-faced hammer. Use a tool as shown in fig 18 to install the pulley tightly against the crankshaft shoulder. Install the retaining bolt and washer. Install and adjust the fan and generator belts.

NOTE: ***With the engine in the vehicle, it will be necessary to press the pulley on far enough to permit using the pulley retaining bolt for seating the pulley.***

6. CYLINDER FRONT COVER

The 1949 and early 1950 engines are equipped with a cast iron front cover. The distributor drive gear is supported by the distributor housing. Late 1950 engines and 1951 engines have an aluminum front cover with a support for the end of the distributor shaft. The procedure for removing and installing either cover is the same with minor differences which are noted below. Oil seal replacement is covered separately. Figure 19 shows both the cast iron and aluminum cylinder front covers.

...ulley

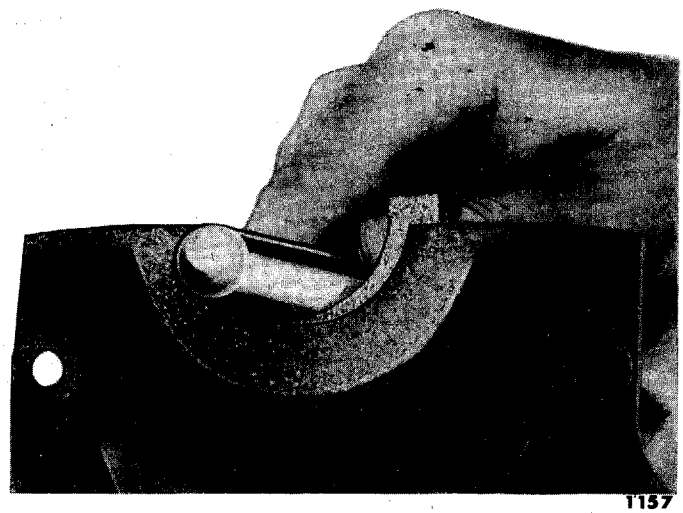

Fig. 20—"Rolling In" Oil Seal Packing

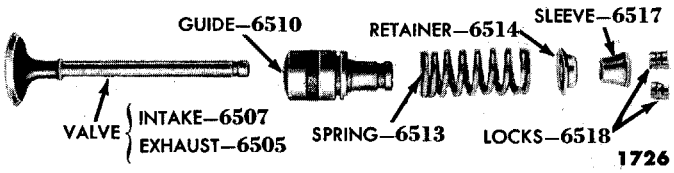

Fig. 21—Rotatable Valve and Related Parts

a. Removal.

Remove the fan. Remove the distributor. Remove the front cover retaining screws and remove the cover and gasket.

NOTE: ***On some models the road air breather clamp bracket is mounted under one of the cover screws and will be removed when the screw is taken out.***

b. Oil Seal Replacement.

Pry out the old packing from the recess in the cover. Install new packing in the recess and "roll" the packing in with a round bar to make sure it is seated properly (fig. 20).

NOTE: ***Soak the oil seal packing in light engine oil for two hours previous to installing the packing.***

c. Installation.

Install the cover (with a new cover gasket) by placing the lower end over the crankshaft and tight against the cylinder block. Install the two lower retaining screws finger tight. Tap the top edge of the cover with a soft-faced hammer until the ridge inside the cover seats in the cylinder block recess. Install the remaining screws (replace the air duct clamp support if necessary) and tighten the screws to 12-15 foot-pounds torque. Install the distributor, fan, and generator. Adjust the belts and check the ignition timing.

CAUTION: ***Do not install the upper edge of the cover first, or the oil pan gasket may be damaged by the sharp lower edge of the cover.***

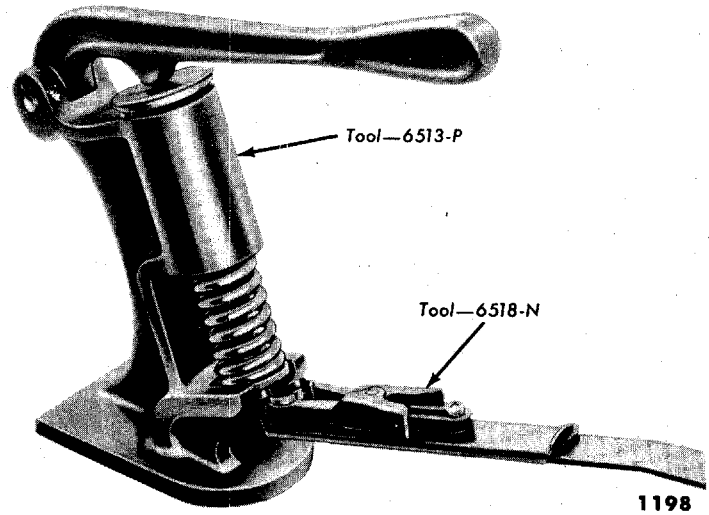

Fig. 23—Replacing Valve Spring Retainer Locks

7. VALVES, SPRINGS, GUIDES, AND SEATS

Removal and installation of valves, seats, and guides are presented below. Valve and seat refacing and tappet adjustment procedures are also given. The procedures are identified by headings that describe the material included.

a. Valves.

Exhaust and intake valves serviced for Ford 8-cylinder engines are made of nickel-chrome alloy to withstand the high operating temperatures encountered. Rotatable intake and exhaust valves are used in 1951 engines. This type of valve (fig. 21) has a two piece spring retainer that differs from previous single piece spring retainer. A shorter valve spring is used but no change has been made in the valve locks.

Rotatable valves and parts can be installed in engines not so equipped by changing the spring retainer, valve spring, intake valve, and exhaust valve. When removing valve assemblies from the engine be sure to identify each assembly so it can be replaced in the same valve port from which it was removed.

(1) *REMOVAL.* Remove the cylinder heads and intake manifold. Compress the valve spring down against the valve locks and remove the valve guide retainer as shown in fig. 22. Pry up on the tappet end of the valve spring to remove the assembly.

(2) *CLEANING.* Clean the assembly by washing it

...ide Retainer

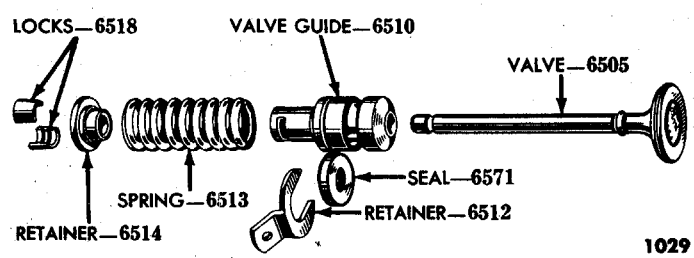

Fig. 24—Valve and Related Parts

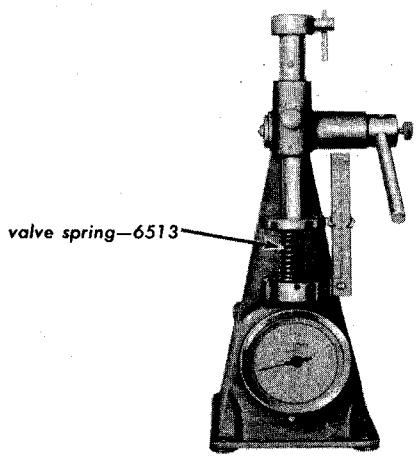

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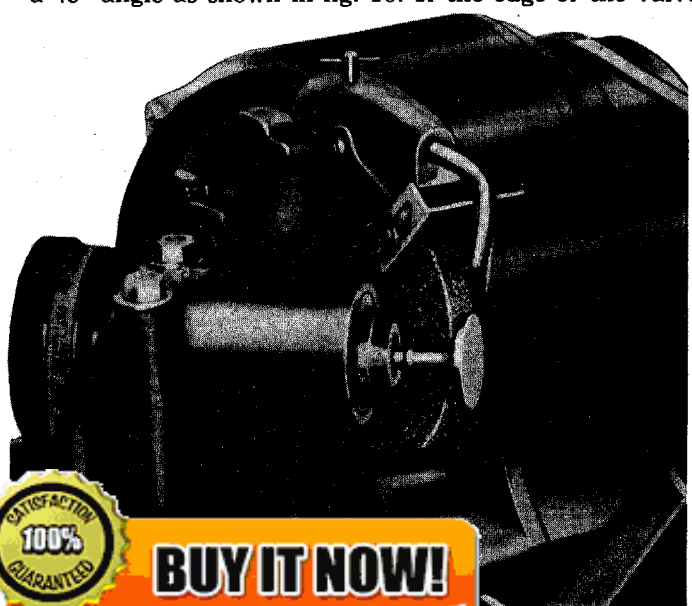
Fig. 25—Checking Valve Spring

in solvent. Scrape carbon and lead deposits from head and stem of valve.

(3) *DISASSEMBLY*. Compress the spring with a compressing tool as shown in fig. 23 and remove the valve spring retainer locks. Remove the valve spring retainer, valve spring, and the valve guide (fig. 24).

(4) *INSPECTION*. Check the valve face for pitted or burned spots. Check valve spring pressure as shown in fig. 25. The valve spring should have a pressure of 40 to 43 pounds when compressed to 2.130 inches for 1949 and 1950 non-rotating valves and 1.89 inches for 1951 rotatable valves. Check the clearance between the valve stem and the guide. The clearance should be 0.0015-0.0035 inch. Replace any warped, burned, pitted, or worn valves. Replace worn guides or weak valve springs.

(5) *REFACING VALVES*. Remove all carbon from the valve head and stem. Grind the face of the valve at a 45° angle as shown in fig. 26. If the edge of the valve



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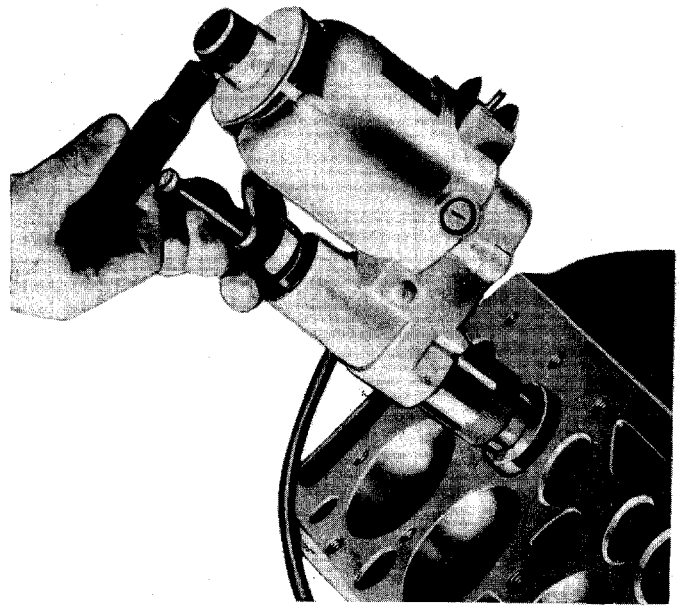

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Fig. 27—Grinding Valve Seats

head is less than 1/32 inch thick at the outer edge replace the valve.

(6) *REFACING VALVE SEATS*. Cover the cylinder bores with paper and masking tape. Clean all carbon from the valve seat with a wire brush. Grind the seat with an eccentric grinder as shown in fig. 27. Remove only enough stock to clean up pits or grooves in the seats.

Thoroughly clean out all grinding dust by blowing compressed air in the valve seat and opening. After refacing valves and seats it is recommended that the valve be lapped to match the seat by hand lapping with a fine lapping compound. If the valve seat face is wider than 1/16 inch after grinding, relieve the seat face by grinding at 30° and 60° angles as shown in fig. 28. Check valve seat runout with a dial indicator as shown in fig. 29. Runout should not exceed 0.005 inch.

(7) *ASSEMBLY*. For 1949-50 type valves, install the valve guide on the valve. Install the spring, the spring retainer, and place the assembly in the compressing tool

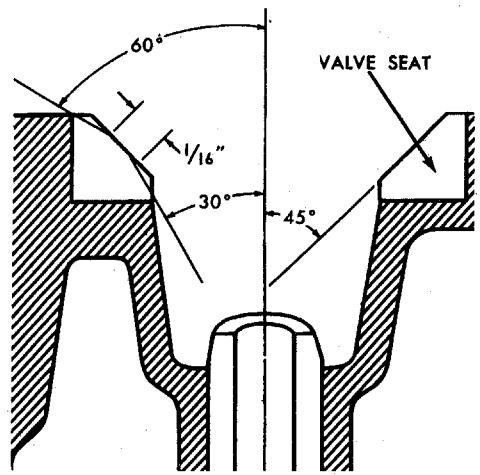

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Fig. 28—Relieving Valve Seat Face

(fig. 23). Compress the spring and install the retainer locks with the lock replacer.

For 1951 rotatable valves, place the valve, spring, guide, and spring retainer in the compressing tool. Place the valve locks in the valve spring retainer sleeve. Hold the locks in the sleeve, start the sleeve over the end of the valve, compress the valve spring, and work the sleeve and locks into place with your finger (fig. 30).

(8) *INSTALLATION.* Slide the valve and spring assembly in the valve chamber. Compress the valve spring and insert the guide retainer in the groove provided in the valve guide. Be sure the guide retainer seats properly when you release the spring. Install the cylinder heads and intake manifold.

CAUTION: ***Be sure the rubber seal around the intake valve guide starts evenly in the valve guide opening. Otherwise part of the seal may be sheared off by the sharp edge of the hole.***

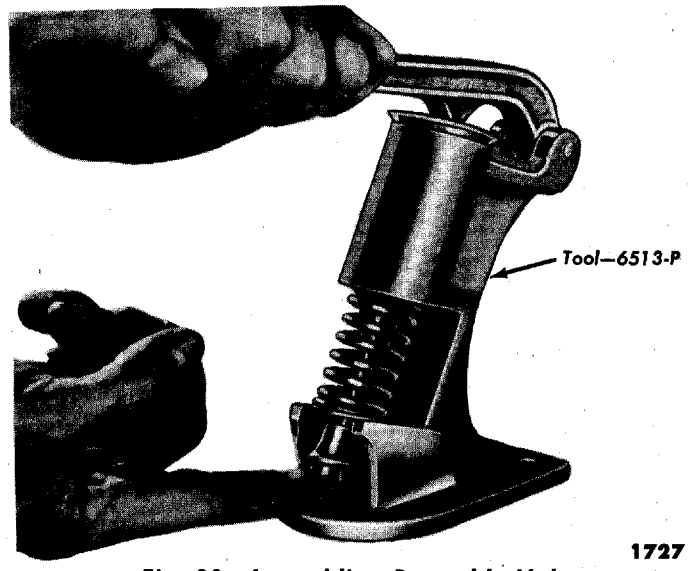

Fig. 30—Assembling Rotatable Valve

b. Valve Seats.

Some engines are completely equipped with valve seat-inserts, others use inserts in the exhaust valve ports only, and some have no inserts at all. Procedures for the removal and installation of inserts are given below.

(1) *INSERT REMOVAL.* Remove cylinder heads, intake manifold, and valve assemblies. Remove the insert by driving a wedge under the insert and prying it out.

(2) *INSERT INSTALLATION.* Chill the inserts with dry ice before inserting them in the cylinder blocks. Tap the inserts with a soft faced hammer until they seat firmly in the recess. After installing the valve seat inserts, grind them concentric to the valve guides. Install valve assemblies, intake manifold, and cylinder heads.

c. Valve Tappet Clearance.

The solid type tappets are not adjustable. However tappet clearance can be increased by grinding the end of the valve stem, or decreased by grinding the valve face.

Check the tappet clearance as shown in fig. 31.

The clearance should be as follows:

Valve	Early 1949 Engine Clearance (inch)	Late 1949, 1950, and 1951 Engine Clearance (inch)
Intake	0.010-0.012	0.013-0.015
Exhaust	0.014-0.016	0.017-0.019

If the clearance is too small, grind the required amount of material from the end of the valve stem. If the clearance is too large, grind the face of the valve until the clearance is within the limits.

8. CAMSHAFT, BEARINGS, AND CAMSHAFT GEAR

Procedures for the removal, inspection and installation of the camshaft, camshaft bearings, and camshaft gear are presented below under headings identifying the subject and type of procedure contained.

Runout

a. Camshaft Replacement.

It will be necessary to replace the camshaft when the cam lobes are worn to such an extent that the valve lift is less than 0.291 inch for the intake valves and 0.287

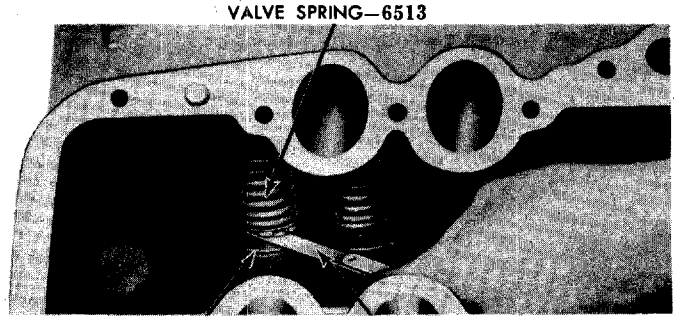

Fig. 31—Checking Valve Clearance

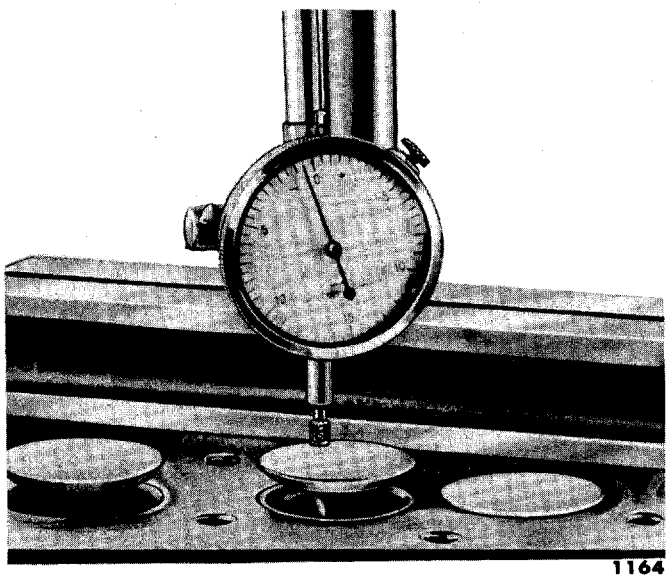
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Fig. 32—Checking Valve Lift

inch for exhaust valves. Make valve lift measurements when the engine is cold and valve gaps are within specifications. Check the valve lift with a dial indicator clamped to the cylinder block as shown in fig. 32.

Camshafts in late 1949, 1950, and 1951 engines have the letter "B" stamped on the forward end. Late 1949 engines have the valve gap specification "intake 0.014 inch, exhaust 0.018 inch" stamped on the top of the cylinder block as shown in fig. 33. Service limits on the valve gap spacings are: intake 0.013-0.015 inch, exhaust 0.017-0.019 inch. Early 1949 engines have service limits of: intake 0.010-0.012 inch, exhaust 0.014-0.016 inch.

When installing a new type camshaft in an old block, stamp the specifications on the block.

NOTE: ***If the valve gap setting for the old design camshaft is used for the new design camshaft, the valve timing will not be correct resulting in loss of power.***

Engines used in 1950 and 1951 passenger cars are not stamped with gap specifications. However, cylinder assemblies for service are stamped.

(1) *REMOVAL.* Remove the cylinder heads, the intake manifold, and all the valve assemblies. Remove the tappets by lifting them into the valve chamber. Remove the cylinder cover and the camshaft gear. Remove the

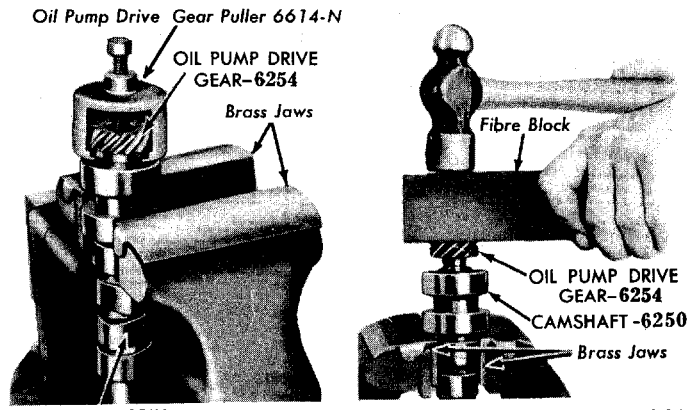

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Fig. 34—Removing and Installing Oil Pump Drive Gear

camshaft by pulling it through the camshaft bearings. Be careful not to scratch or gouge the bearings with the tips of the cam lobes while removing the camshaft.

NOTE: ***If the engine is mounted in the car, remove the grille and radiator to permit pulling the camshaft.***

(2) *INSPECTION.* Check the camshaft journal surfaces for grooves or scratches. Check camshaft runout. Replace if not within 0.005 inch. Check the fuel pump eccentric for wear (deep groove worn by the push rod end). Inspect the oil pump drive gear and the distributor drive gear for worn, chipped or broken teeth. Replace the camshaft if it is worn or damaged. Replace the oil pump and distributor drive gears if they are worn or chipped (figs. 34 and 35).

(3) *INSTALLATION.* Carefully slide the camshaft through the bearings. It may be necessary to turn the shaft to engage the oil pump gear. Install the camshaft gear and front cover.

Install the tappets and the valve assemblies.

CAUTION: ***Be sure to install the tappets and valves in the same cylinder from which they were removed.***

Install the cylinder heads and the intake manifold.

b. Camshaft Bearing Replacement.

Under normal usage the camshaft bearings will not

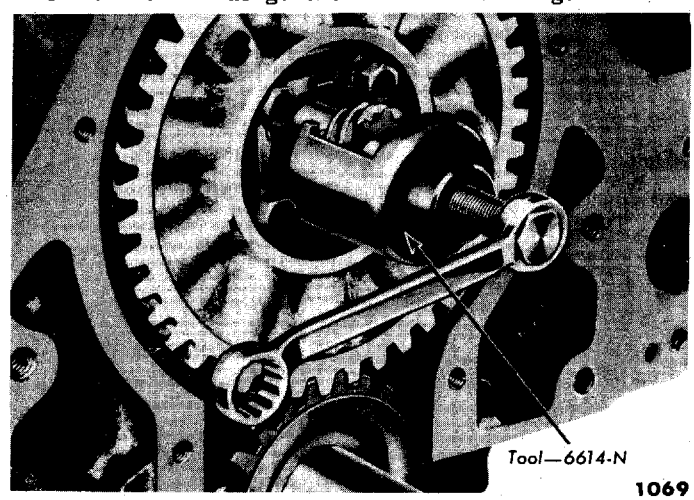

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Fig. 35—Removing Distributor Drive Gear

need replacement. However they should be replaced in case they are damaged through insufficient lubrication or worn because of severe usage. It will be necessary to remove and disassemble the engine to make the bearings accessible.

(1) *REMOVAL.* Remove the engine from the vehicle and mount it on a work stand. Remove cylinder heads, intake manifold, valve assemblies, tappets, oil pan, and front cover. Remove the camshaft. Disconnect the connecting rods, push the pistons up in the cylinders, and remove the crankshaft. Remove the clutch housing, clutch plate assembly, and flywheel. Remove oil pump drive cover and idler gear. Remove the camshaft bearings with a bearing puller as shown in fig. 36.

(2) *INSTALLATION.* Install the camshaft bearings with a bearing installation tool as shown in fig. 37.

Install the oil pump drive idler gear and cover. Install flywheel, clutch plate assembly, and clutch housing. Install the crankshaft, connecting rods, camshaft and camshaft gear. Install the front cover and the oil pan. Install tappets, valve assemblies, intake manifold, and cylinder heads. Install the engine in the car.

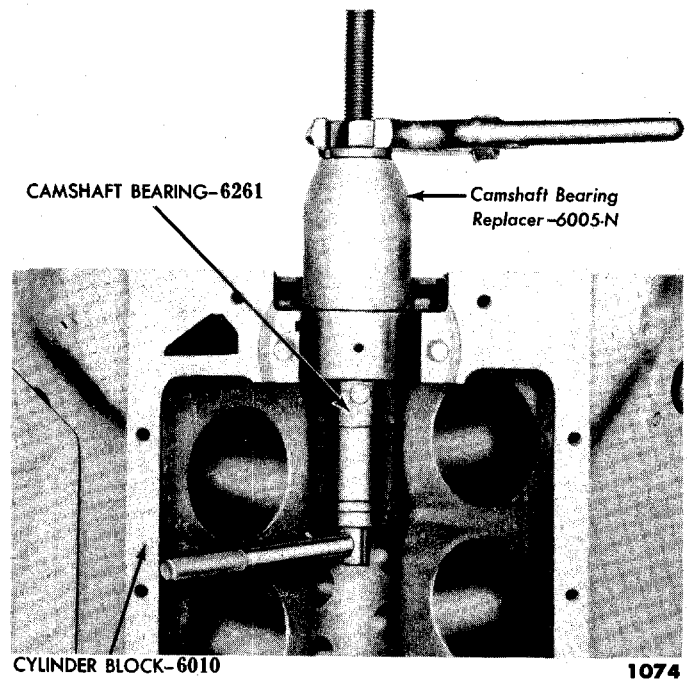

Fig. 37—Installing Camshaft Bearings

c. Camshaft Gear Replacement.

Two types of camshaft gears, aluminum and fibre, have been used on 1949 and 1950 engines. The aluminum type and the fibre type gears are secured to the camshaft by means of four screws which are locked with retaining tabs. The mounting holes are spaced to make it impossible to install the gear incorrectly. Only the fibre type gear is used on the 1951 models.

(1) *REMOVAL.* Remove the generator and fan. Remove the front cover. Rotate the crankshaft until the timing marks line up. Bend the lock tabs away from the retaining screws and remove the screws. Remove the camshaft gear.

Bearings

(2) *INSTALLATION.* When the timing gear is installed be sure the timing marks on the camshaft gear and the crankshaft gear line up as shown in fig. 38.

NOTE: ***Oversize gears are available for service.***

Install the next oversize gear when excessive backlash exists between the camshaft gear and the crankshaft gear.

Install the gear on the camshaft flange and align the bolt holes. Install the lock-plate and screws. Tighten the screws to 15-20 foot-pounds torque and bend the lock plate tabs against the screws. Install the front cover, the generator, and the fan. Adjust the belt tension.

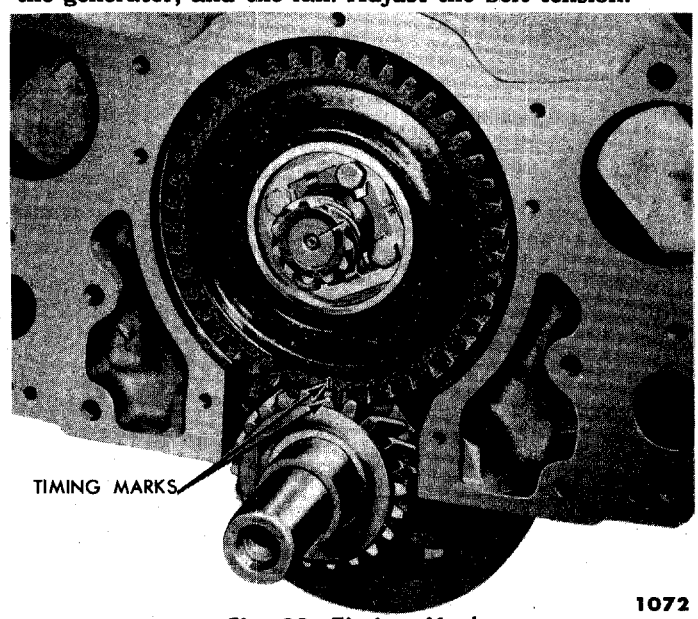

Fig. 38—Timing Marks

9. FLYWHEEL, CRANKSHAFT, AND BEARINGS

Procedures in this section cover the removal, inspection, repair, and installation of the crankshaft, rear oil seal, main bearings, crankshaft gear, and flywheel.

a. Flywheel.

The flywheel is mounted on the crankshaft rear flange with dowel pins and self-locking bolts. The rear face of the flywheel is a friction surface for clutch plate engagement. The starter ring gear is not an integral part of the flywheel. It is held on the flywheel by a shrink fit.

The flywheel can be checked for runout, removed, and installed with the engine mounted in the vehicle. Support the rear end of the engine on an engine support and remove the transmission, flywheel housing, clutch assembly, and starter motor.

(1) *INSPECTION.* Check flywheel runout with a dial indicator (fig. 39). If runout exceeds 0.005 inch, remove flywheel, turn it 180°, reinstall, and again check runout. If runout is still excessive, remove flywheel and check runout of crankshaft mounting flange. True up flange if necessary.

NOTE: ***Runout of the crankshaft flange should be established before discarding the flywheel for excessive runout.***

If the flange is not at fault, the flywheel should be replaced or machined. Machine the friction surface of the flywheel if it is burned or scored.

(2) *REMOVAL.* Remove starter motor, clutch housing, clutch pressure plate, and disc. Remove the flywheel bolts and locking ring. Bolt flywheel puller to rear face of flywheel and remove the flywheel (fig. 40).

(3) *REFACING.* If it is necessary to remove more than 0.045 inch of stock from the original thickness, the flywheel should be replaced.

(4) *RING GEAR REPLACEMENT.* Flywheel ring gear should not runout more than 0.010 inch. Replace gear if teeth are worn, chipped, cracked, or have excessive runout.

To replace a ring gear, drill a $^{17}/_{32}$ inch hole nearly through the ring gear on the engine side of the gear and cut the remaining portion with a chisel. Heat the new ring gear evenly to 360° F and place it in position on flywheel. Make sure the gear is seated properly against the shoulder.

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0—Removing
wheel

(5) *INSTALLATION.* Align flywheel on dowel pins, install and torque bolts to 75-85 foot-pounds. Install clutch pressure plate and disc. Torque screws to 17-20 foot-pounds. Install clutch housing and torque bolts to 37-42 foot-pounds. Install starter motor.

b. Crankshaft.

Crankshafts are made of cast alloy steel with integral counterweights and are both statically and dynamically balanced. Drilled oil passages (fig. 41) provide lubrication to main and connecting rod bearings.

Remove engine from chassis and mount on work stand. Figure 42 shows the crankshaft and its related parts.

(1) *REMOVAL.* Remove the spark plugs, oil pan, clutch housing, clutch, and flywheel. Remove the connecting rod caps and push the pistons up into the cylinders. Remove the main bearing caps. Lift out the crankshaft and place it where it will not be dropped or damaged.

(2) *CLEANING AND INSPECTION.* Wash the crankshaft in solvent. Blow out the oil passages with compressed air. Examine the shaft for evidence of cracks. Check the dowel pins in the flange for looseness. Remove any nicks on the ends of the pins with a file.

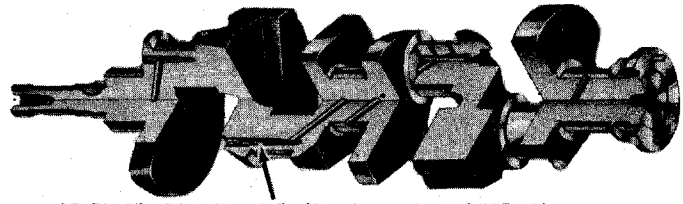
CAUTION: ***Do not file the body diameter of the dowel pins.***

(a) MEASURING CRANKPINS AND JOURNALS. Measure each crankpin and journal for diameter, out of round, and taper at several places around the circumference of the shaft. If the pins or journals are out of round in excess of 0.0015 inch or tapered more than 0.001 inch, regrind the shaft for the next undersize bearing.

Crankshaft dimensions are:

	Mfg. Dia. (inches)
Main bearing journals	2.4982-2.4990
Crankpin	2.1382-2.1390

(b) CHECK MAIN BEARING BORE ALIGNMENT. Remove bearing inserts and install an aligning bar 0.00075 under the bearing bore size. Install the bearing caps and torque the bolts to 95-105 foot-pounds. Attempt to turn the bar with a 15 inch wrench. If the bar turns, the bearing



SLUDGE TRAPS (DRILLED IN EACH JOURNAL—INDIVIDUAL OIL PASSAGES FROM SLUDGE TRAP TO EACH ROD BEARING—PRESSED-IN HOLLOW PLUGS SEAL OPENINGS.) 1523

Fig. 41—Crankshaft Oil Passages

bores are in line. If the bar will not turn, replace the cylinder block.

(3) *REGRINDING CRANKSHAFT JOURNALS.* Calculate the correct undersize from the crankshaft dimension given above. Bearings are available in 0.002, 0.010, 0.020, 0.030, and 0.040 undersize diameters.

EXAMPLE: ***If the main bearing journal will "clean up" before it is ground to 2.499—0.010 = 2.489 inches diameter, finish it to that diameter and install 0.010 undersize bearings.***

CAUTION: ***Never grind journals or crankpins in excess of 0.040 undersize.***

Always reproduce the same radii in the corners of the pin or journal that existed originally. Too small a radius may result in crankshaft failure, while too large a radius will result in bearing failure.

After grinding, polish the pin or journal with No. 320 grit emery cloth and engine oil. Crocus cloth may also be used.

(4) *REAR OIL SEAL.* Remove the oil seal retainer from the cylinder block, pry out the packing and "roll in" new packing.

NOTE: ***Soak packing in engine oil for at least two hours before installing.***

Clean the retainer slot in the cylinder block. Install the retainer making sure it seats all the way in the slot. The edges of the retainer should be flush with the cylinder block.

(5) *INSTALLATION.* Install the bearing inserts in the crankcase bearing bores and oil them with engine oil. Lay the crankshaft in the bearings. Install the bearing caps (with inserts) and tighten the retaining bolts to 95-105 foot-pounds torque. Push the pistons down and install the connecting rod bearing caps. Install the flywheel, clutch, and housing. Install the oil pan and spark plugs.

c. Main Bearings.

The main bearings can be replaced with the crankshaft removed (described previously) or without removing the crankshaft as described below.

(1) *REPLACEMENT WITHOUT REMOVING CRANKSHAFT.* Remove oil pan. Remove the main bearing caps, one at a time allowing the other two caps to support the crankshaft.

NOTE: ***If all bearings are to be replaced, replace the intermediate bearing first.***

Turn the crankshaft until the oil hole is near the un-notched edge of the bearing half. Insert the bearing removing tool in the oil hole and rotate the crankshaft ½ turn to remove the bearing (fig. 43).

Oil the new bearing half and lay it in the same position the old bearing was when it was taken off the journal. Rotate the crankshaft ½ turn in the opposite direction until the insert is flush with the cylinder block. Install the bearing insert in the cap and replace the cap. Torque the cap retaining bolts to 95-105 foot-pounds. Repeat the procedure for replacing the other bearings. Install the oil pan.

(2) *FITTING MAIN BEARINGS (PLASTIGAGE METHOD).* Remove the bearing cap and wipe the oil from the bearing and journal.

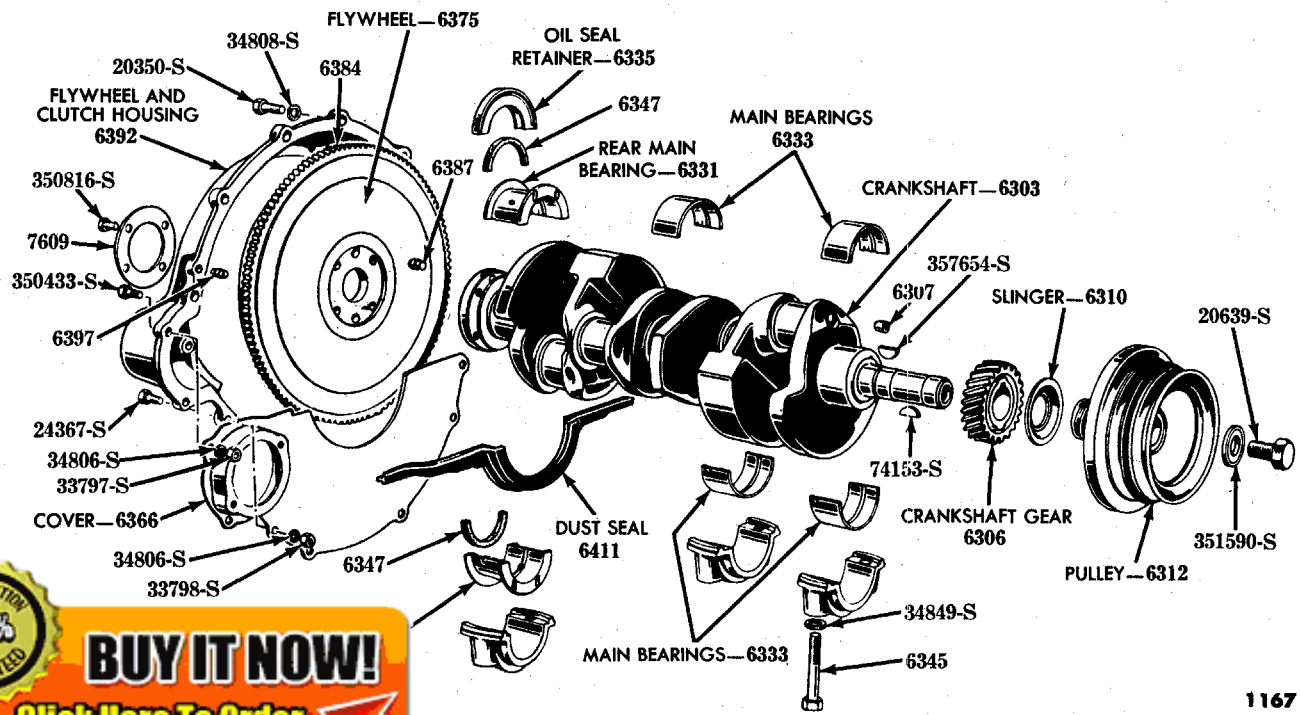


Fig. 42—Crankshaft and Related Parts

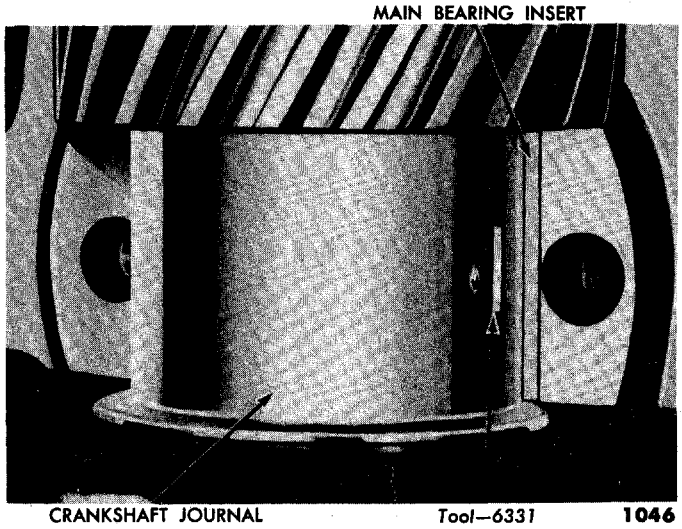


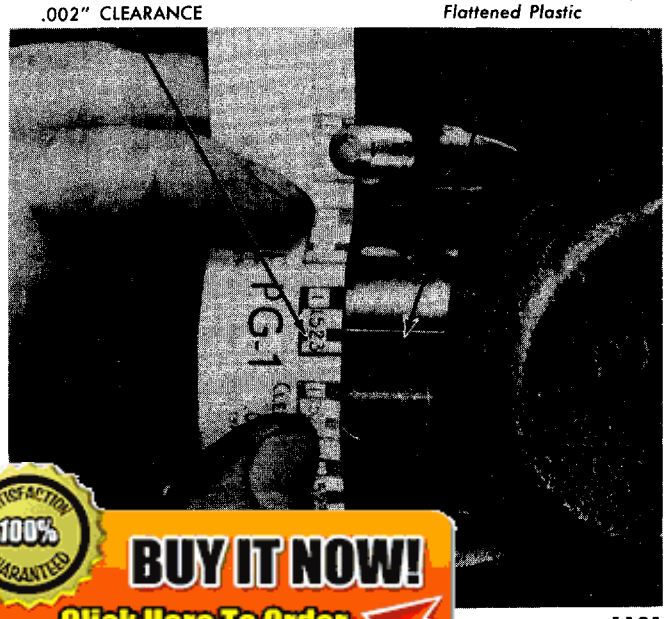
Fig. 43—Removing Main Bearing Insert

NOTE: ***Keep the other bearing caps tight while checking the fit of a bearing.***

Place a piece of Plastigage the full width of the bearing on the bearing insert. Install the bearing cap and torque the retaining bolts to 95-105 foot-pounds. Leave the cap tight for at least one minute and then remove it. CAUTION: ***Do not turn the crankshaft while the Plastigage is between the bearing and the crankshaft journal.***

Remove the bearing cap. Without moving the plastic, check its width (at the widest point) with the graduations on the Plastigage container as shown in fig. 44.

If the bearing clearance is not over 0.002 inch, the bearing insert is satisfactory. If the clearance is greater than 0.002 inch, install a 0.002 inch undersize bearing and recheck the clearance.



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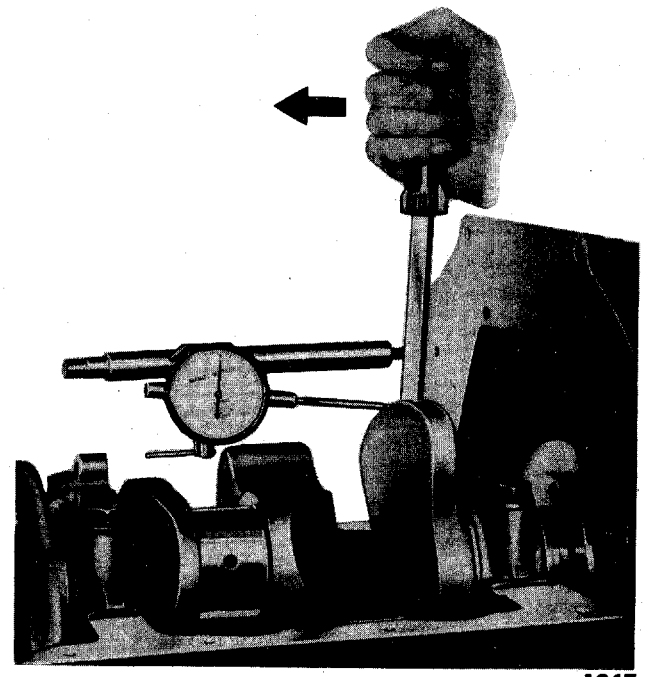

Fig. 45—Checking Crankshaft End Thrust

Where the 0.002 inch undersize bearing is used and the clearance is excessive, grind the crankshaft main bearing journals for use with the next undersize bearing insert. These inserts are available in the following undersizes: 0.002, 0.010, 0.020, 0.030, and 0.040 inch.

(3) *FITTING MAIN BEARINGS (SHIM METHOD).* Place a 0.002 inch brass shim ½ inch wide by 1 inch long between the bearing insert in the cap and the crankshaft journal. Coat shim with light engine oil. Tighten the main bearing cap bolts to 95-105 foot-pounds torque. Turn the crankshaft one inch in either direction. If the crankshaft is locked with the 0.002 inch shim, and is free without the shim, the bearing insert used is satisfactory. If the crankshaft can be moved freely with the 0.002 inch shim, install a 0.002 inch undersize bearing insert and repeat the above check. If the crankshaft turns easily, excessive clearance is indicated and the crankshaft should be reground to the next undersize bearing insert size.

Bearing inserts are available as follows: 0.002, 0.010, 0.020, 0.030, and 0.040 inch undersize.

NOTE: ***Rotate the crankshaft to be sure that the bearing is not too tight.***

(4) *CHECKING CRANKSHAFT END THRUST.*

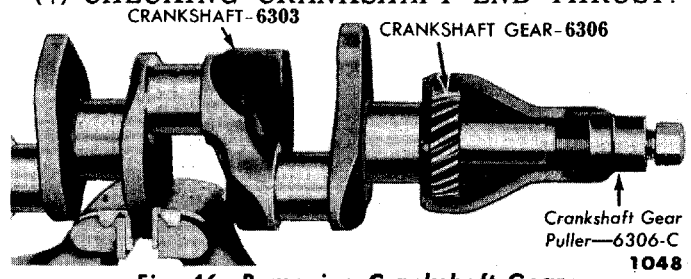

Fig. 46—Removing Crankshaft Gear

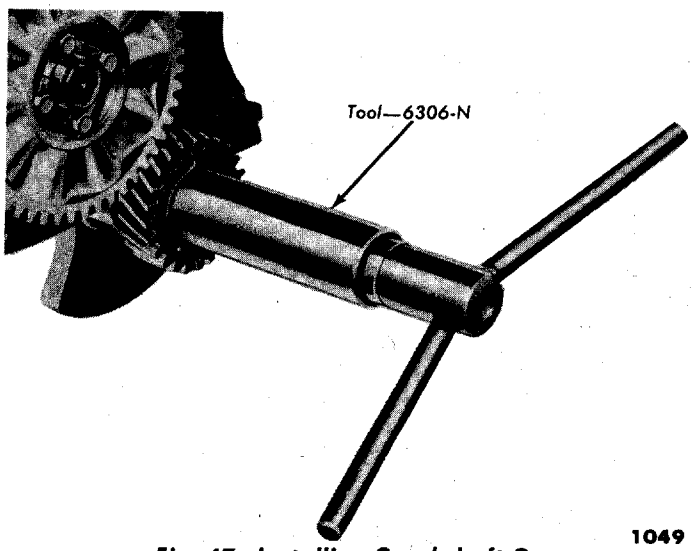

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Fig. 47—Installing Crankshaft Gear

Remove the oil pan. Pry the crankshaft toward the rear of the engine. Insert a feeler gauge between the crankshaft thrust flange and the flange face of the rear main bearing or use a dial indicator as shown in fig. 45. Allowable end thrust is 0.002-0.006 inch. Replace the thrust bearing insert if the end thrust is too great. Install the oil pan.

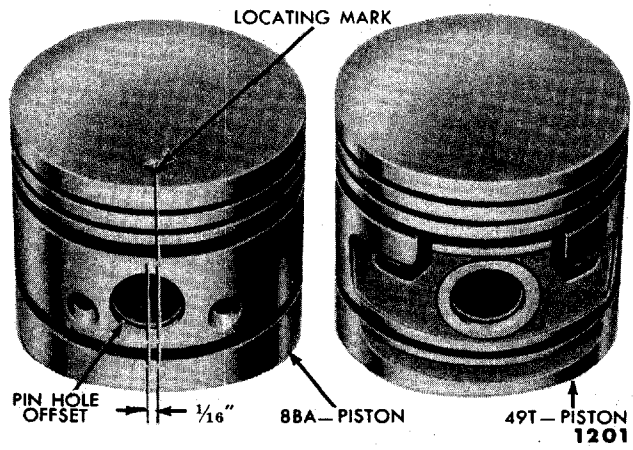

Fig. 48—8BA Piston and 49T Piston

d. Crankshaft Gear.

The crankshaft gear is pressed on and keyed to the shaft.

(1) *INSPECTION.* Remove the oil pan and front cover. Check the gear teeth for cracks, nicks, or wear. If the gear teeth are cracked, badly nicked, or show signs of excessive wear, replace the gear.

(2) *REMOVAL.* Remove the oil pan and front cover

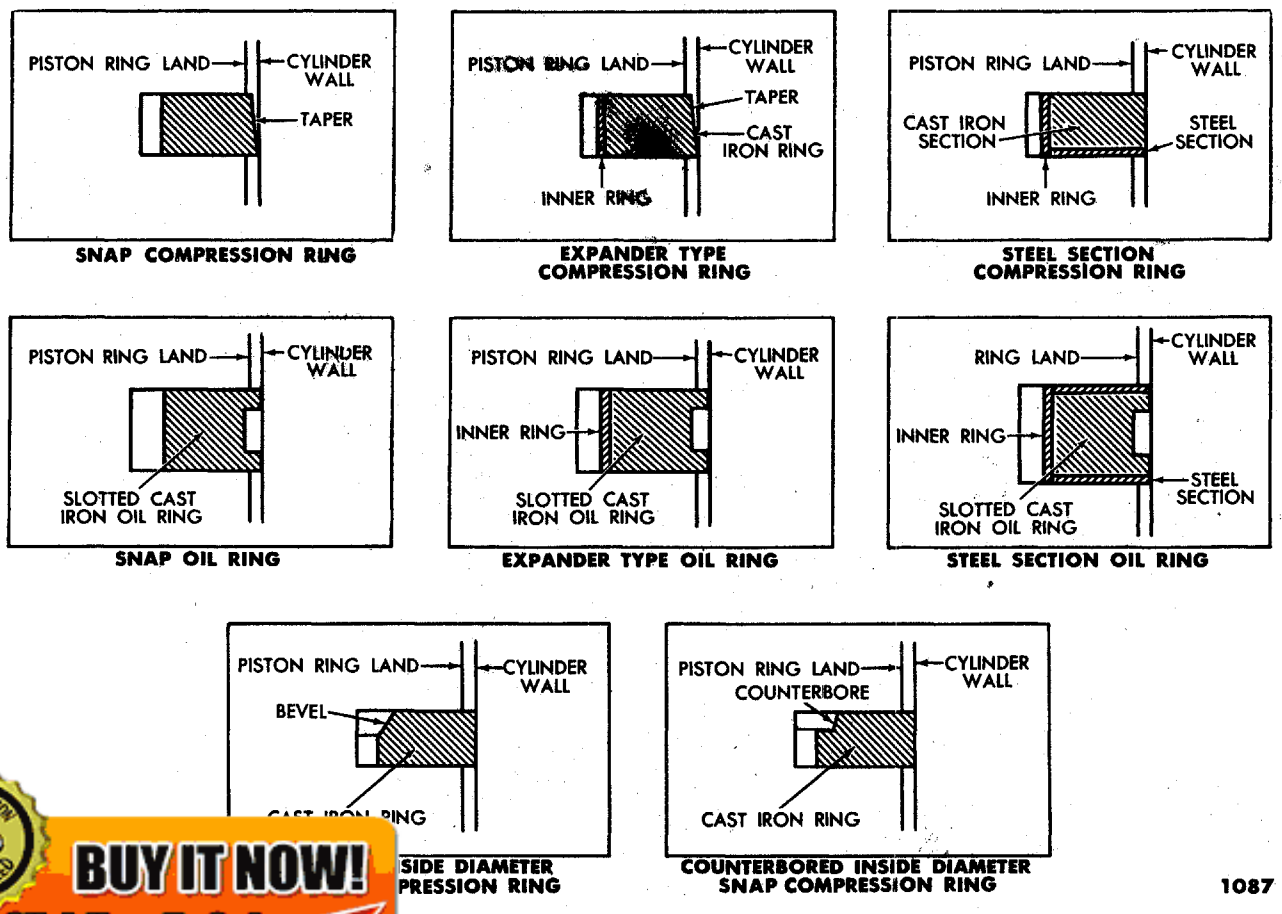

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Fig. 49—Piston Ring Types

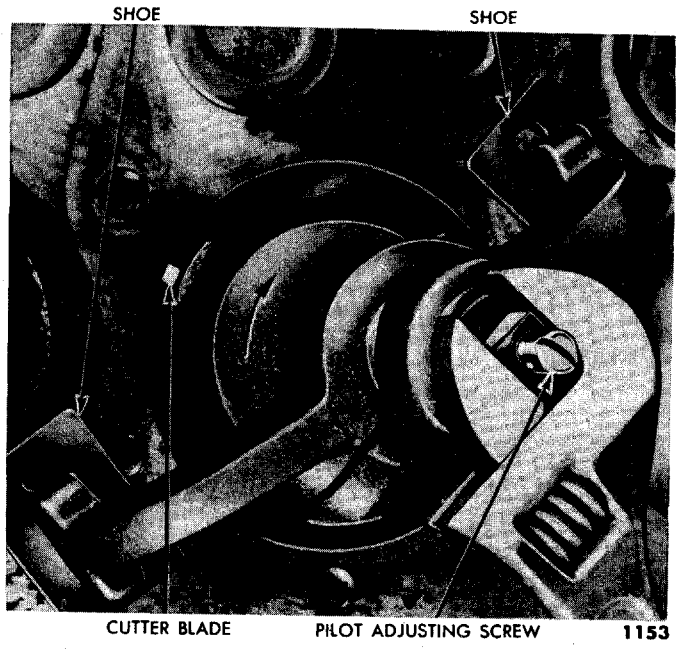


Fig. 50—Removing Ridge from Cylinder

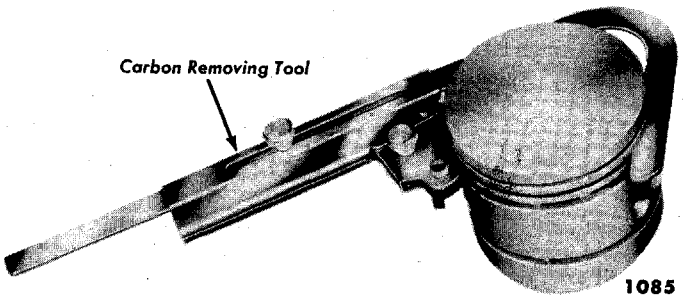


Fig. 52—Cleaning Piston Ring Grooves

Remove the crankshaft pulley and front main bearing cap. Remove the gear with the pulling tool as shown in fig. 46.

(3) *INSTALLATION*. Press the gear on the crankshaft with the tool as shown in fig. 47. Be sure the keyway and key are aligned.

Install the bearing cap, front cover, and oil pan. Install the pulley.

10. CONNECTING RODS, PISTONS, AND PINS

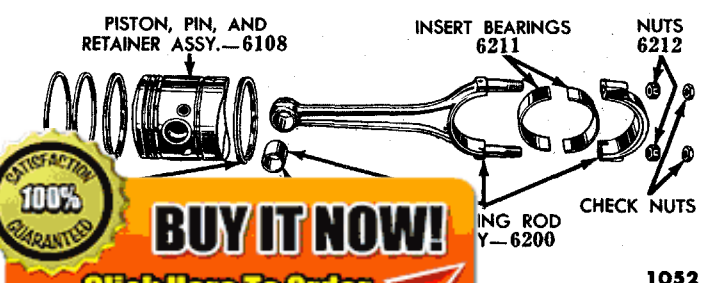
Procedures for complete overhaul of pistons and connecting rods are outlined below with headings describing the material contained under each heading. The removal, disassembly, cleaning, inspection, assembly, and installation of the connecting rod assembly are covered separately. Information is also presented on the fitting of pistons, rings, pins, and connecting rod bearings.

The 1949 and early 1950 engines are equipped with 4-ring split skirt pistons. The piston part number prefix is 09T. For service the piston is available only as an assembly which includes the piston, piston pin and retainer under a 49T part number prefix. Therefore, in this manual, 49T type piston is the nomenclature used when any reference is made to the split skirt piston.

On late 1950 engines and 1951 engines, a solid skirt 4-ring piston (8BA Piston) was installed for quieter engine operation. The 8BA piston is cam ground and maintains a close tolerance across the thrust axis of the cylinder when the engine is cold. As the engine warms up to operating temperature, expansion is controlled along the piston pin axis which causes the piston to become circular and provide close tolerance around the entire piston circumference. The 8BA piston is identified by a locating mark on top of the piston (fig. 48) which is used for proper installation.

The 8BA pistons can be used in engines formerly equipped with 49T pistons but installation of 49T pistons in engines equipped with 8BA pistons is not recommended. Replacement should be in sets of 8 but installation of one or more is permissible as required.

In addition to the oversizes of 0.0025 inch, 0.020 inch, 0.030 inch, 0.040 inch, and 0.060 inch, service pistons are available in four grades in 0.0003′ inch steps for selective fitting.



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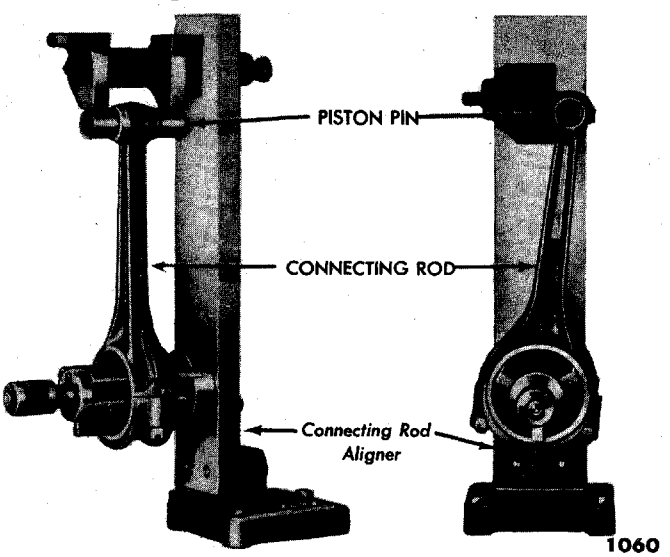


Fig. 53—Checking Connecting Rod Alignment

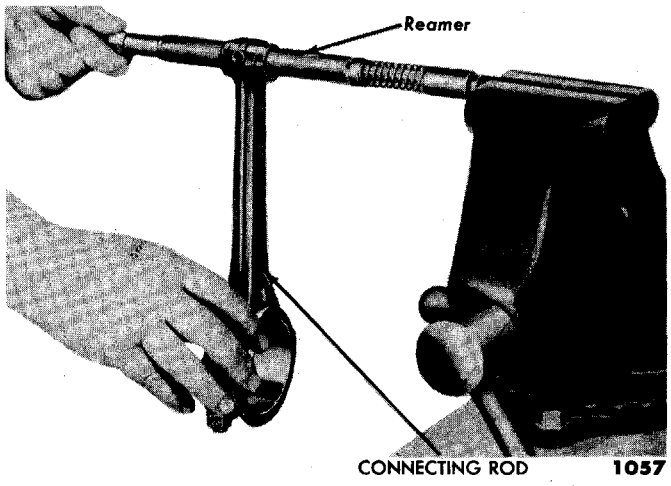


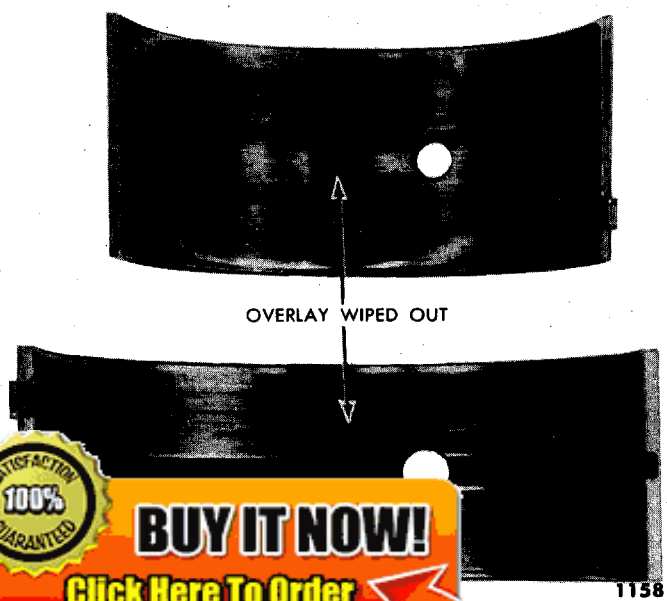
Fig. 54—Reaming Connecting Rod Bushing

Three types of piston ring sets are used in servicing Ford engines. They are: the "snap" type or standard ring set; the "expander" type ring set; and the "steel section" type ring set. Figure 49 shows the various compression and oil control rings included in the above ring sets.

The standard or snap type is designed for use in a new engine replacement or whenever a block is rebored and new pistons installed. A light hone is recommended in either case.

The expander type is designed for replacement after a light hone job and the taper of the cylinder bore does not exceed 0.006 inch or whenever an oil consumption condition is encountered.

The steel section type is designed for replacement in worn cylinders where the taper of the cylinder bore is more than 0.006 inch but not more than 0.015 inch. Also for excessive oil consumption conditions when the cylinder bore is not to be honed.



ack of Oil

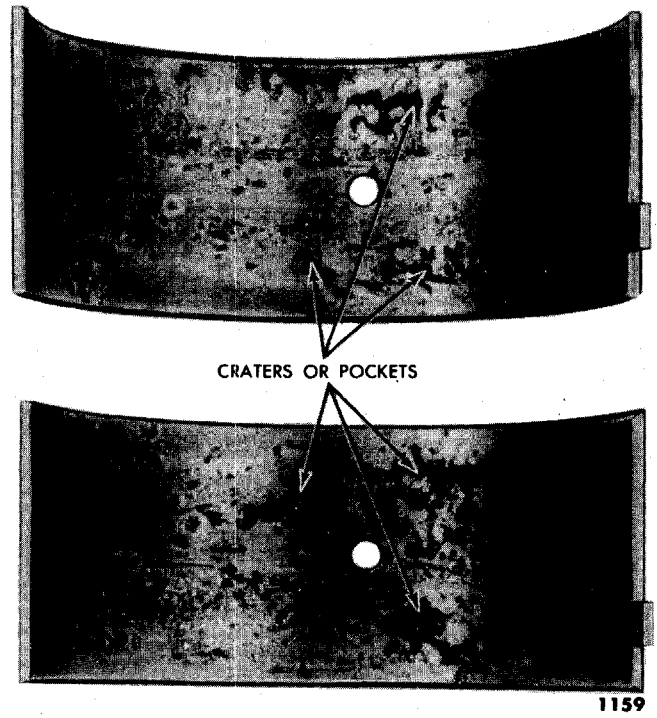


Fig. 56—Fatigue Failure of Bearing

NOTE: ***To service 8BA pistons, 8BA piston ring sets must be used. Do not attempt to install 29A piston ring sets as they are not interchangeable.***

a. Removal.

Drain the crankcase and the coolatn. Remove the cylinder heads and the oil pan. Check the upper cylinder

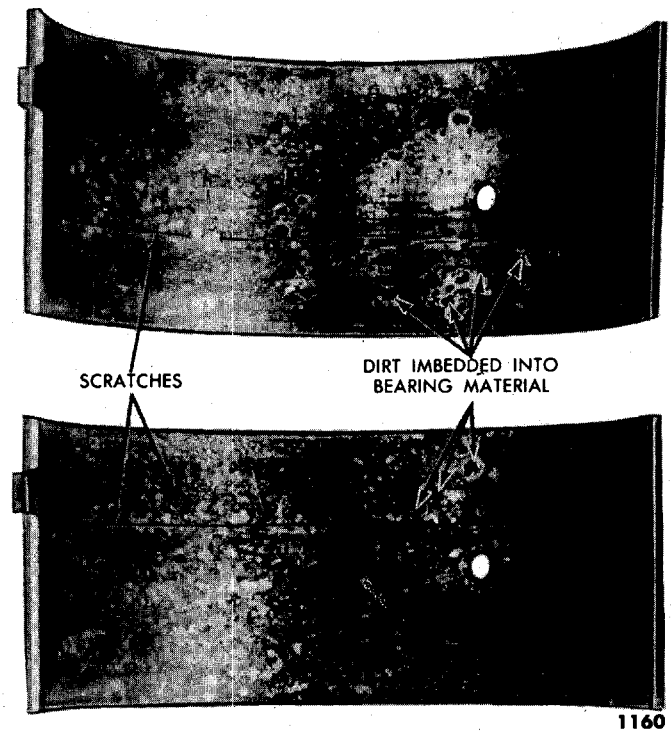


Fig. 57—Bearing Scratched by Dirt In the Oil

wall to see if a ridge has been worn by the piston. If any appreciable ridge is present, it will be necessary to remove the ridge before removing the piston.

To remove the ridge, rotate the crankshaft until the piston is at the bottom of the cylinder and place a cloth on the piston to collect any cuttings made in removing the ridge. Adjust the ridge removing tool to the cylinder size and move the cutter blade to a depth just below the ridge (no more than 1/32 below). Make sure the ridge remover is held tightly against the top of the block and turn the arbor to cut away the ridge (fig. 50).

After the ridge has been removed turn the crankshaft to bring the piston to the top of the cylinder and carefully remove the cloth and cuttings from the piston head. Repeat the procedure for the other cylinders.

Turn the crankshaft until the throw is down. Remove the lock nuts and retaining nuts from the connecting rod studs. Remove the cap and each half of the bearing. Push the rod and piston assembly up through the top of the cylinder. Each rod assembly is numbered to correspond to the cylinder in which it operates. Keep all parts of the assembly together when it is removed.

b. Disassembly.

Spread and remove the piston rings with an expanding tool. Remove the piston pin retainers with a needle-nose plier or by prying them out of the groove. Push out the piston pin. Press out the connecting rod bushing. The piston and rod are shown completely disassembled in fig. 51.

c. Cleaning.

Remove carbon from the piston head with a scraper or wire brush. Clean the piston ring grooves with a groove cleaner (fig. 52).

Clean the oil return holes by running a drill through the holes. Be sure the drill is the same size or slightly smaller than the holes.

Clean all parts in solvent. Do not use caustic base cleaner for this operation. Clean the connecting rod bearing bore and the back of the bearing inserts (if they are to be re-used).

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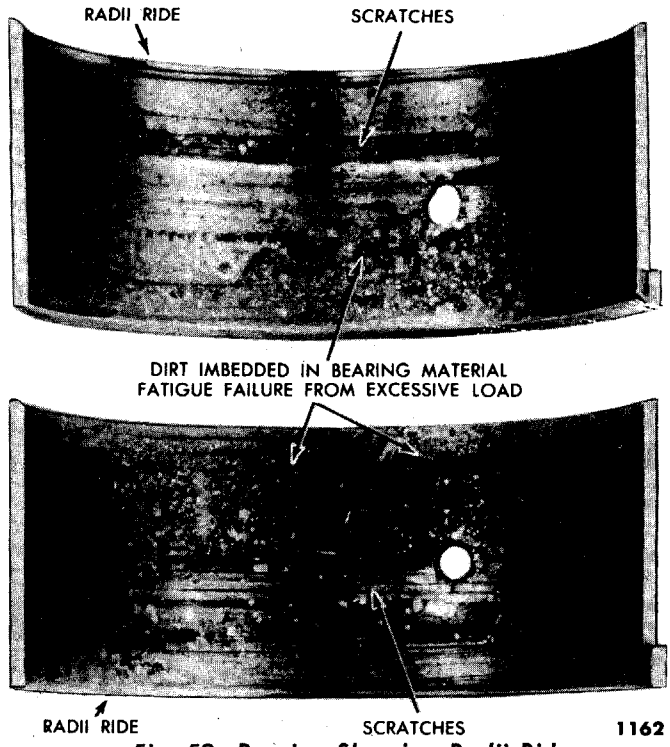


Fig. 59—Bearing Showing Radii Ride

d. Inspection.

Check the parts of the rod and piston assembly for the following signs of wear or damage.

(1) *CONNECTING ROD.* If the rod has damaged studs, deep nicks, cracks, or scored bearing bores, it should be replaced. If the rod is twisted it should be replaced. Check the alignment of the rod on a fixture as shown in fig. 53.

The clearance at the pin should not exceed 0.0005 inch.

Check the connecting rod bushing by inserting a new piston pin. The bushing should hold the pin when the

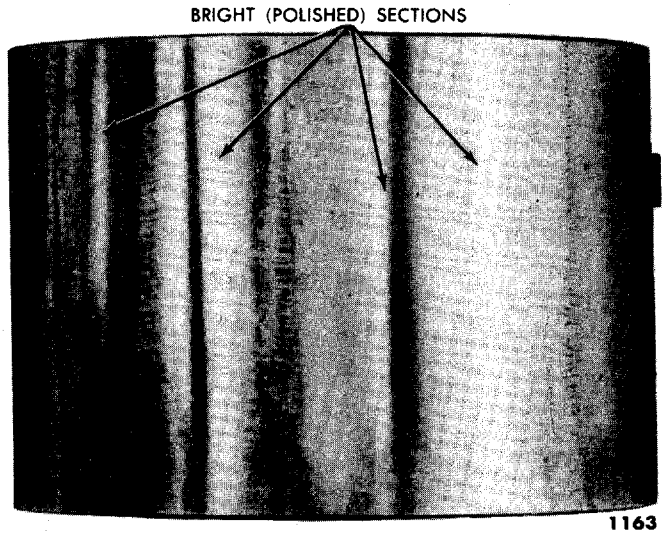


Fig. 60—Bearing Showing Bright Spots Because of Improper Seating

pin is in a vertical plane. If the pin falls through of its own weight, ream the bushing for the next oversize pin (fig. 54).

(2) *BEARINGS.* Replace any bearing inserts that are scored, badly scratched, show fatigue failure, or have the overlay wiped out (figs. 55 through 60).

Check the fit of the bearing inserts by installing them in the rod and cap. The bearing should snap in place and remain there. If the bearing is loose it has lost its spread and should be replaced.

Check the inside edge of the bearings at the parting line. Remove any burrs from this edge.

CAUTION: ***Remove only the burrs. If a chamfer is found at the parting line it can cause low oil pressure.***

Place a straight edge on the bearing and check the clearance between the straight edge and the cap or rod. There should be 0.001 to 0.003 clearance to permit "crushing" the bearing when the cap is installed. Bearing "crush" holds the bearing firmly, supports it all the way around, and assures better dissipation of heat from the bearing to the rod.

(3) *PISTONS.* Check the pistons for cracks at the bottom of the ring grooves, skirt, and bosses. Spongy corroded areas near the top edge of the piston are usually caused by deterioration. In some cases, holes may be burned through the piston head. Replace any such pistons. Replace piston if grooves are worn more than 0.0045 inch.

(4) *PISTON PINS.* Replace any pins that show cracks or excess wear ridges. If the piston pin is loose (clearance exceeds 0.0007 inch) in the piston it should be replaced. 8BA and 49T pistons use the same piston pin.

(5) *CYLINDERS.* Make a thorough check for cracks. Minute cracks can be located by coating the cylinder wall with a mixture of 25 percent kerosene and 75 percent light engine oil, wiping the wall dry, and then applying a light coating of zinc oxide powder dissolved in wood alcohol. The cracks will show as discolored lines on the zinc oxide coating.

Inspect the bore for scratches or scuffing. Check for bulging at the top of the cylinder bore. Replace any leaking expansion plugs (indicated by rust around the plug). Use a sealing compound under the new plug.

Check the cylinder bore using a telescopic gauge and outside micrometers, cylinder gauge, or inside micrometers. Measure and record as "A," "B," "C," and "D" the dimensions shown in fig. 61.

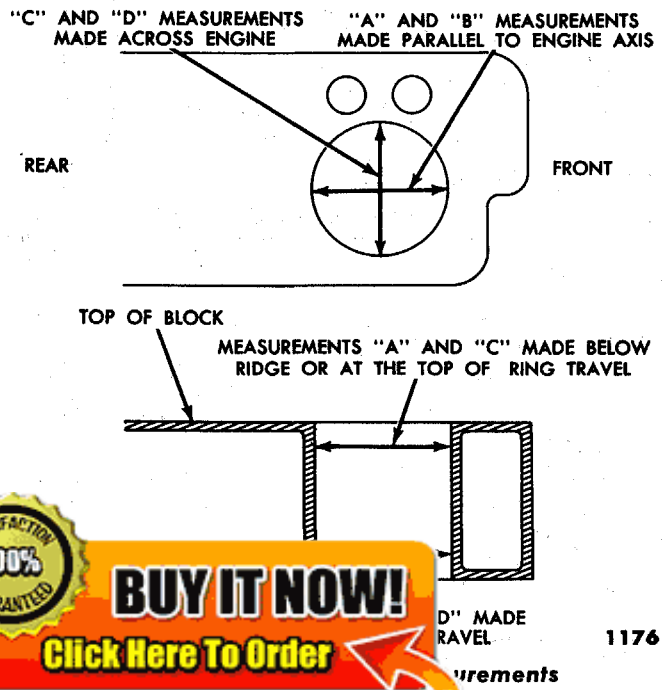
Compare "A" with "C" and "B" with "D" to determine the amount of taper in the bore. If the taper is greater than 0.015 inch, the cylinder must be rebored or straightened by honing.

Compare "A" with "B" and "C" with "D" to determine how much the cylinder is out of round. If the bore is more than 0.003 out of round it must be rebored.

e. Fitting Pistons.

Before installing or fitting pistons with new rings in an old block, remove the high polish on the cylinder walls by passing a hone through the bore a few times. Clean all honing dust out of the cylinder after this operation.

To fit a new piston in a new bore, attach a tension scale to one end of a feeler ribbon (0.003 x ½" wide for 49T piston; 0.0015 x ½" wide for 8BA piston). Position the feeler ribbon on the thrust side of the cylinder (side away from the camshaft in the right hand bank; toward the camshaft in the left hand bank), invert the piston, and push it in the cylinder so the skirt is ½ inch below



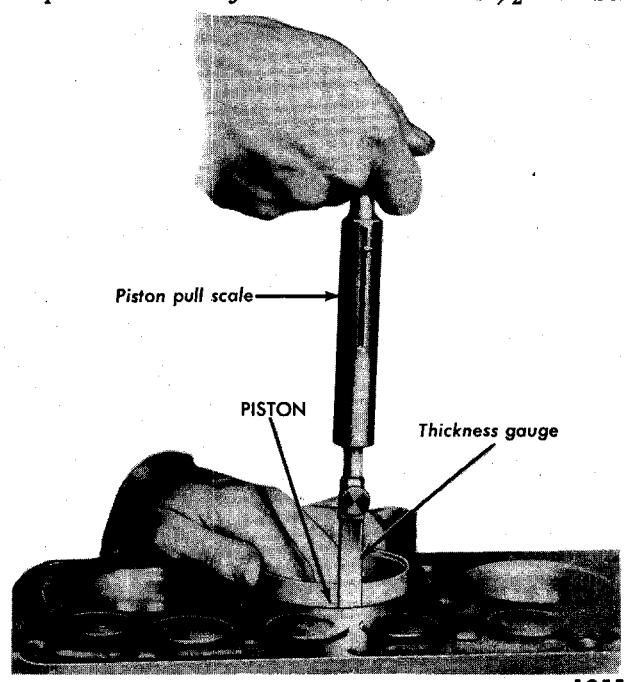


Fig. 62—Fitting Piston to Cylinder Bore

the top of the cylinder. Keep the piston pin bore parallel to the camshaft. Pull out the feeler ribbon noting the reading on the spring scale (fig. 62). The reading should be 6-12 pounds for a 49T piston and 3-12 pounds for an 8BA piston. If the reading is more than 12 pounds try another piston or hone the cylinder to obtain a fit. If the reading is less than 6 pounds for a 49T piston or 3 pounds for an 8BA piston, try another piston. The various size pistons available for service are given in Table 1.

If a fit cannot be obtained rebore the cylinder to the next oversize.

The clearance between the bottom of the piston skirt and the cylinder for the 8BA piston is 0.0005-0.0011 inch and for the 49T piston the clearance is 0.0018-0.0023 inch.

The specifications for fitting pistons are included in Table 2.

f. Boring Cylinder Block.

Bore all cylinders to the same size when they require reboring. Bore the cylinder with the most wear first to determine the proper oversize. If the cylinder bore will not clean up at 0.060 inch oversize, the block must be replaced. Allow 0.0015 inch stock for honing when fitting the pistons. Fit pistons as described previously. Use No. 280 grit hone for this operation.

NOTE: ***Be sure to remove all abrasive dust from the cylinder block after honing.***

g. Fitting Piston Pins.

Piston pins must be a hand push fit (0.0001-0.0003 loose) in the piston with both piston and pin at room temperature (70°F). If the pins are too tight or oversize pins are to be fitted, use an expansion type reamer to enlarge the piston pin holes.

Set the reamer to the present size of the bore, then expand the reamer slightly and trial ream the bore ⅛ inch deep. Use a pilot the nearest size to the existing bore to maintain alignment of the reamer.

Check the trial reamed hole by inserting the new pin as a plug gauge. If the bore is still small, finish reaming the hole, turn the piston around, and ream the other hole. Repeat the trial reaming and finish reaming until the pin is a push fit.

Table 1—Piston Kits

Piston Kit Part No.	Type	Piston Skirt Diameter Limits (Dimension at Skirt —inches)
49T-6108-A	Standard	3.1855-3.1865
49T-6108-C	0.020 inch O.S.	3.2055-3.2065
49T-6108-D	0.030 inch O.S.	3.2155-3.2165
49T-6108-E	0.040 inch O.S.	3.2255-3.2265
49T-6108-F8	0.060 inch O.S.	3.2455-3.2465
8BA-6108-A	Standard	3.1879-3.1891
8BA-6108-B	0.0025 inch O.S.	3.1891-3.1903
8BA-6108-C	0.020 inch O.S.	3.2067-3.2079
8BA-6108-D	0.030 inch O.S.	3.2167-3.2179
[illegible]BA-6108-E	0.040 inch O.S.	3.2267-3.2279
[illegible]	[illegible]	3.2467-3.2479

[illegible]ndard and oversize) .0003 inch for selec-

h. Fitting Piston Rings.

Install the ring in the cylinder bore. Invert a piston and push it about half way into the bore to square the ring with the bore. Measure the ring gap. It should be 0.007 to 0.047 inch in a worn cylinder. If the gap is smaller than 0.007 inch file the ends of the ring until clearance is obtained.

If the ring gap exceeds 0.047 inch install the next oversize ring. Be sure to identify the rings so they will be installed in the same cylinder in which they were fitted.

Check the ring to groove clearance on the proper piston for the cylinder as shown in fig. 63.

The rings should have the following clearance:

Ring Location	Ring Groove Mfg. Clearance (Inches)
1st—Top Compression	0.0015-0.0030
2nd—Compression	0.0010-0.0025
3rd—Oil Ring	0.0010-0.0030
4th—Oil Ring	0.0010-0.0030

Remove stock from tight rings by rotating the ring over emery cloth placed on a surface plate or plate glass until the ring fits the groove within the above limits.

i. Fitting Connecting Rod Bearings (Plastigage Method).

Place a piece of Plastigage plastic the length of the cap in the bearing cap. Install the cap and tighten to 45-50 foot-pounds.

Table 2—Piston Fitting Specifications

	PISTON TYPE	
	49T	8BA
New Piston in New Bore		
Gauge Thickness	0.003	0.0015
Pounds Pull	6-12	3-12
New Piston in Used Bore		
Gauge Thickness	0.003	0.0015
Pounds Pull	6-12	3-12
Used Piston in Used Bore		
Gauge Thickness	0.004	0.003
Pounds Pull	6-12	3-12

Use a ½ inch wide feeler gauge.

NOTE: ***Do not turn the crankshaft with Plastigage in place.***

Remove the bearing cap and using the Plastigage scale measure the width of the flattened piece of plastic at the widest point. If reading is not over 0.003 inch, standard size connecting rod bearings should be used; if over 0.003 inch, install 0.002 inch undersize bearing and recheck. Where use of the 0.002 inch undersize bearing results in excessive clearance grind the crankshaft and install undersize bearing inserts.

j. Fitting Connecting Rod Bearings (Shim Method).

Place 0.003 inch brass shim ½ inch wide by 1 inch long in the bearing cap with a new standard insert and install the cap. Tighten the nuts to 45-50 foot-pounds torque.

Attempt to move the connecting rod endwise on the crank pin by hand and then by a light tap of a hammer.

Remove the shim and repeat the above test, move the rod endwise, by hand. If connecting rod did not move by hand, but moved by tap of hammer in the previous test and moved freely with shim removed, the standard bearing as installed should be used. If rod could be moved by hand when used with the shim, install the 0.002 inch undersize bearing and repeat the above test.

After determining that the correct bearing insert has been fitted, tighten connecting rod bearing cap nuts to 45-50 foot-pounds torque. Rotate the shaft to be sure the bearing is not too tight.

k. Assembly.

Position the connecting rod in the piston so the connecting rod squirt hole will face toward the front of the engine upon installation and push the pin in place.

NOTE: ***Connecting rods with metered hole should only be used in conjunction with engines equipped with neoprene seals on the intake valve guides and the increased capacity oil pump. This pump and guide can be used with the old-style connecting rods without the squirt hole. It is permissible to replace the 8BA connecting rod and bearings with 0BA rod and bearings but the 0BA types should not be replaced with 8BA types.***

Insert the pin retaining clips. Install the piston rings with the side up that is counterbored, beveled, or stamped "top."

Insert the bearing halves in the rod and cap.

NOTE: ***Rings with a beveled or counterbored inside diameter must be assembled with the counterbore or bevel up in order to obtain full advantage of their sealing abilities.***

l. Installation.

Oil the cylinder wall with light engine oil. Make sure ring gaps are equally spaced around circumference of piston. Compress the lower ring with a ring compresser and start the piston in the cylinder by tapping the piston head with a soft hammer.

NOTE: ***Position 8BA pistons so the indentation in the piston head is toward the front of the engine. This is necessary as the 8BA piston pin is offset 1/16 inch.***

Shift the compressor to the three upper rings, compress them, and tap the piston in with a soft hammer (fig. 64) until it is slightly below the top of the cylinder. Turn the crankshaft so the throw is down and push the piston all the way down until the rod bearing seats on the crankpin. Install the bearing cap, lining up the stamped numbers, and tighten the retaining nuts to 45-50 foot-pounds. Install new lock nuts.

Install the oil pan and cylinder heads. Fill the crankcase with the proper grade and amount of lubricant. Fill the cooling system. Start the engine and run it slowly. Make sure there is sufficient oil pressure. Check the temperature to make sure the engine does not overheat. Overheating can be caused by too tight bearings.

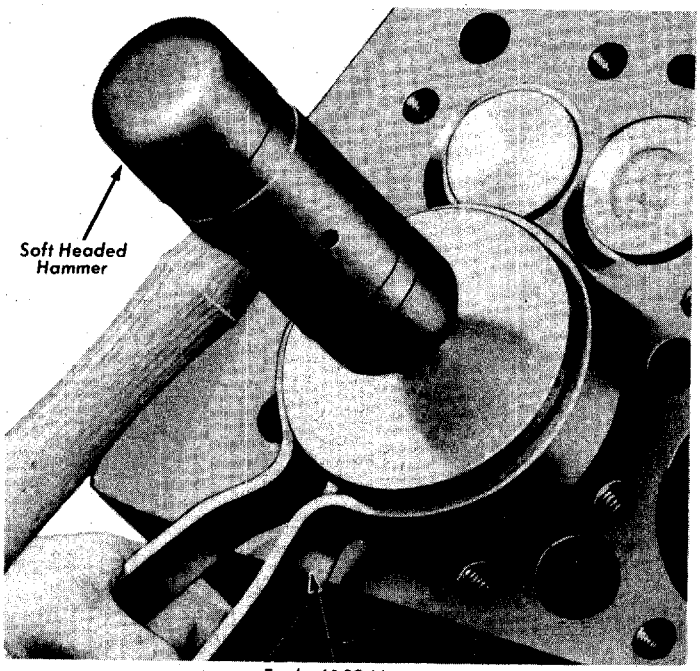


Fig. 64—Tapping in Piston

11. MUFFLER, CROSS OVER PIPE, INLET PIPE, AND OUTLET PIPE

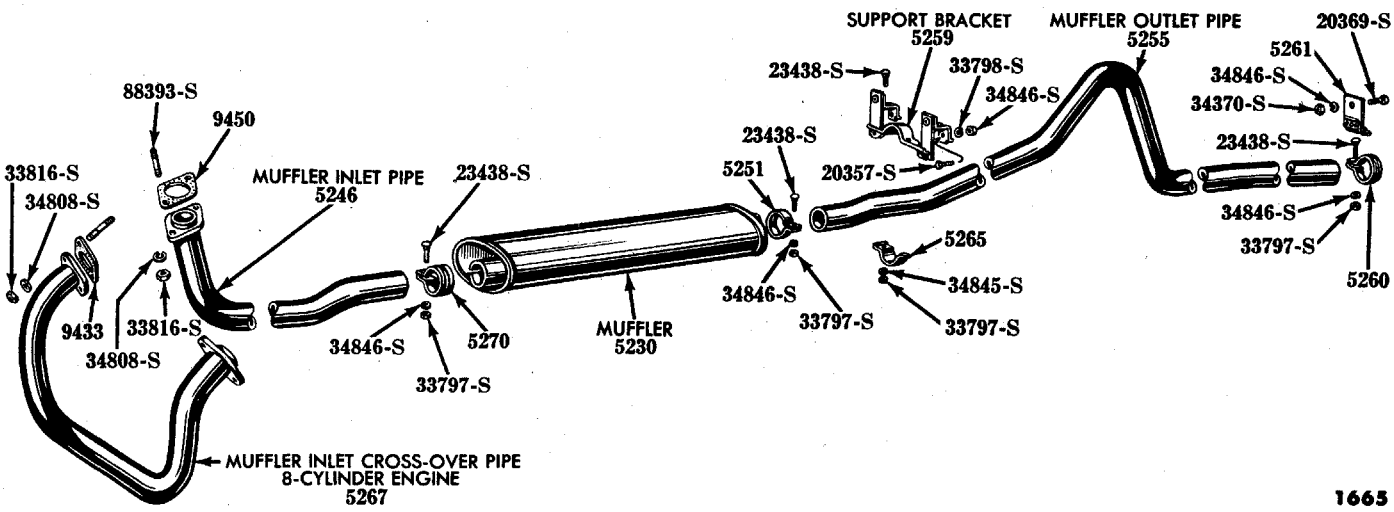


Fig. 65—Muffler and Related Parts

The exhaust system on the 8-cylinder passenger car consists of a muffler inlet cross over pipe, an exhaust inlet pipe, muffler, and an outlet pipe.

The following procedure covers removal and installation of individual units of the exhaust system (fig. 65).

a. Muffler Replacement.

Extra heavy double wall construction, corrosion resistant materials and low moisture formation inherent in reverse-flow design, assure long life of the muffler.

(1) *REMOVAL*. Loosen muffler inlet and outlet pipe clamps. Slide clamps away from muffler on the inlet pipe and the outlet pipe. Loosen front and rear outlet pipe clamps and disengage outlet pipe from muffler by sliding outlet pipe to rear. Remove muffler from inlet pipe.

(2) *INSTALLATION*. Place muffler in position on inlet pipe and slide outlet pipe into muffler. Place inlet pipe and outlet pipe clamps in position on muffler and tighten clamps. Tighten front and rear outlet pipe clamps.

b. Outlet Pipe Replacement.

The outlet pipe is attached to the frame by flexible sound deadening materials which not only prevent exhaust noises from being conducted through chassis frame but also relieve exhaust system from twisting or bending stresses.

(1) *REMOVAL*. Loosen muffler outlet clamp, leaving clamp on muffler. Remove outlet front and rear support clamps and disengage outlet pipe from muffler.

(2) *INSTALLATION*. Position outlet pipe in muffler. Place pipe rear support bracket clamp on outlet pipe. Install front support bracket clamp and tighten unit. Position rear outlet pipe clamp on rear bracket and tighten unit.

c. Inlet Pipe Replacement.

The exhaust inlet pipe is designed to give the exhaust gases leaving the exhaust manifolds a direct through

Control Valve

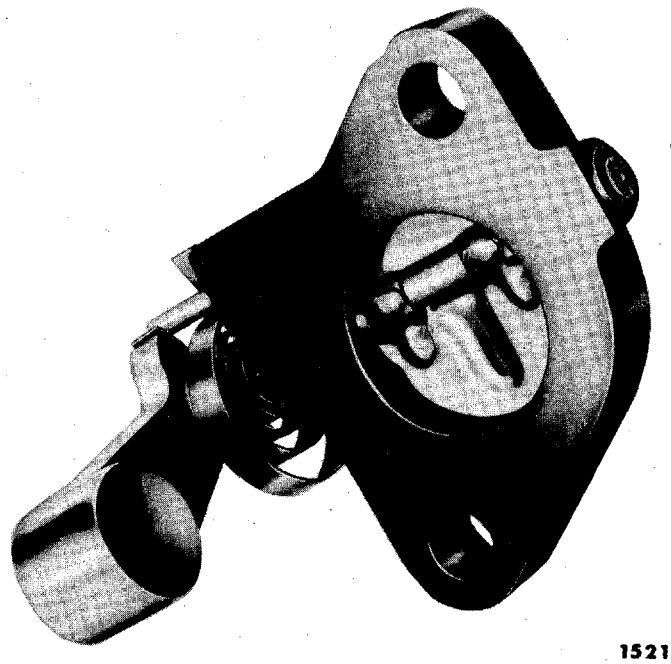


Fig. 67—Butterfly Type Exhaust Control Valve

passage to the muffler, thereby increasing the overall efficiency of the exhaust system.

(1) *REMOVAL.* Loosen muffler inlet pipe clamp. Remove inlet pipe from exhaust manifold, then remove gasket. Disengage inlet pipe from muffler by sliding inlet pipe forward.

(2) *INSTALLATION.* Place inlet pipe on muffler. Install gasket on inlet pipe and secure pipe to exhaust manifold. Tighten muffler inlet pipe clamp.

d. Muffler Inlet Cross Over Pipe.

The exhaust control valve is of the "duck bill" type (fig. 66) and is located in the muffler inlet cross over pipe just ahead of the right hand exhaust manifold in late 1950 and 1951 engines. The 1949 and early 1950 engines have the butterfly type (fig. 67) mounted between the cross over pipe and the right hand exhaust manifold.

(1) *REMOVAL.* Remove 4 nuts and lockwashers holding cross over pipe to exhaust manifolds, then remove manifold making sure gaskets are removed.

(2) *INSTALLATION.* Place gaskets on cross over pipe and fasten cross over pipe to exhaust manifold with 4 nuts and lock washers.

SERVICE LETTER REFERENCE

Letter No.	Date	Subject	Changes Information on Page No.

Part One

POWER PLANT

Chapter

III

Ignition, Fuel, and Cooling System

The ignition, fuel and cooling systems are all necessary components of the engine itself. However, due to the fact that service on these systems is performed separately from engine service they have been grouped together here in one chapter. Another advantage to this grouping, lies in the fact that most quick service operations involve one or more of these systems, and you now have the service information necessary for performing quick service operations in one place, arranging in easy to find sections as listed above.

Information contained in this chapter includes adjustments, testing, replacement and repair of the parts which are included in the ignition system, fuel system, and cooling system.

1. IGNITION SYSTEM

The ignition system consists of the distributor assembly which includes the condenser, the coil, the spark plugs, and the necessary wires and terminals for connecting these units.

Information on how to perform all repairs and adjustments on the ignition system with the exception of the distributor, are given in this section.

Spark plug replacement, testing, and adjustment are covered in "a. Spark Plugs." "b. High Tension (Secondary) Wires" gives procedures for replacement of the secondary ignition wires on both the 6 and 8-Cylinder engines. Coil replacement and testing are procedures described in "c. Coil." "d. Timing" gives the engine ignition timing procedure.

a. Spark Plugs.

Spark plugs should be cleaned and inspected, adjusted, and tested at least every 5000 miles.

REMOVAL. Pull the wire off each spark plug. around each spark k plug wrench. Be t when the plug is

(2) *CLEANING.* The main object in cleaning plugs is to remove all of the carbon and lead deposits from the insulator, shell, and electrodes. This can be done on a sand blast cleaner. Do not prolong the use of the abrasive blast as it will wear the insulator and damage the plug. A thorough cleaning of spark plugs should always include removing carbon and other deposits from the threads with a stiff wire brush. These threads are the means of carrying the heat away from the plug. Any deposits will retard the heat flow from the plug to the cylinder head, causing overheating and preignition.

The electrode construction (fig. 1) is such that the cleaning process sometimes does not remove the deposits from all surfaces of the electrodes. Therefore, it is important to clean the electrode surfaces with a small file of the type used on distributor contacts. Dress the electrodes to secure flat parallel surfaces on both the center and side electrode.

By restoring the flat surfaces and providing sharp edges on the electrodes, the voltage required to jump the gap is reduced and the spark plug performance is improved. A visual inspection will indicate when the

plug has been properly cleaned. The insulator appearance should be white and the metal case clean.

After cleaning, examine the plug carefully for cracked or broken insulators, badly pitted electrode, or other signs of failure and replace as required.

(3) *ADJUSTMENT.* Set the spark plug gap (0.029-0.032 inch). All adjustments should be made by bending the side electrode only.

(4) *TESTING.* After setting the gap, test the plugs on an approved tester. Compare the sparking efficiency of the cleaned and re-gapped plug with a new plug. Replace the plug if it fails to meet requirements.

During this test, check the plug for pressure leakage at the insulator seal. Cover with oil the shoulder of the plug where the insulator projects through the shell and the top of the plug where the center electrode and terminal project from the insulator. Place the plug under pressure and if oil bubbles appear, the plug is leaking and must be replaced. If the plug is satisfactory, wipe it clean before installing it in the engine.

(5) *INSTALLATION.* Clean the area around the spark plug port, to ensure proper seating of the plug gasket. Use a new gasket when installing a spark plug.

After the plugs are installed, connect the spark plug wires and operate the engine until it reaches its normal operating temperature. Remove the wires, tighten each plug to the proper torque (24-30 foot-pounds), and reconnect the wires.

b. High Tension (Secondary) Wires.

The high tension wires include the wires connecting the distributor cap to the spark plugs, and the wire connecting the center terminal of the distributor cap to the center terminal of the ignition coil.

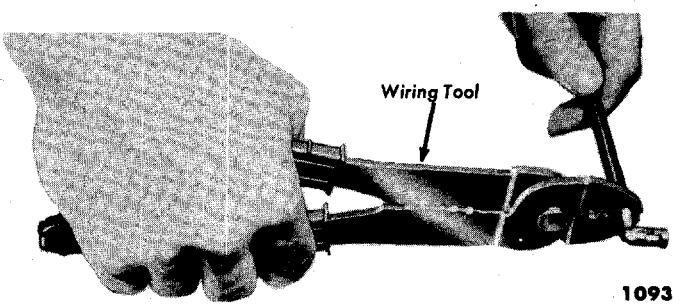


Fig. 2—Installing Wire Terminal

At regular intervals clean and inspect the wires for cracked insulation and loose terminals. If any of these conditions exist, replace the wires.

The wiring used for the ignition systems is available in sets or in 100 foot rolls. When making up an ignition set from the roll wire, use the old wires for a pattern to obtain the correct length. Clip the terminals on the end of the wire with terminal pliers as shown in fig. 2.

(1) *REPLACEMENT (6-CYLINDER).* A spark plug wire set for 6-cylinder engines, which consists of parts shown in fig. 3, is available from Ford Dealers.

(a) REMOVAL. Disconnect the wires at the spark plugs and at the distributor cap and pull the wires out of the ignition coil mounting strap bracket. Disconnect the ignition coil to distributor high tension wire assembly from the coil and distributor cap.

(b) INSTALLATION. Place the shielding cover on the No. 3 wire and position wires in the bracket as shown in fig. 4. Connect the proper wires to the proper spark plugs. Install the weather seals on the distributor end of the wires and insert the end of the wire in the correct socket in the distributor cap. Be sure the wires are forced all the way down into their sockets and that they are held firmly in position. Sockets are numbered to identify the correct socket for inserting the wire which will connect the distributor and the correct spark plug. Install the coil to distributor wire and push the weather seals into position.

(2) *REPLACEMENT (8-Cylinder).* Two types of ignition wire brackets (figs. 5 and 6) are used on the 8-cylinder engines. The procedure for replacing the

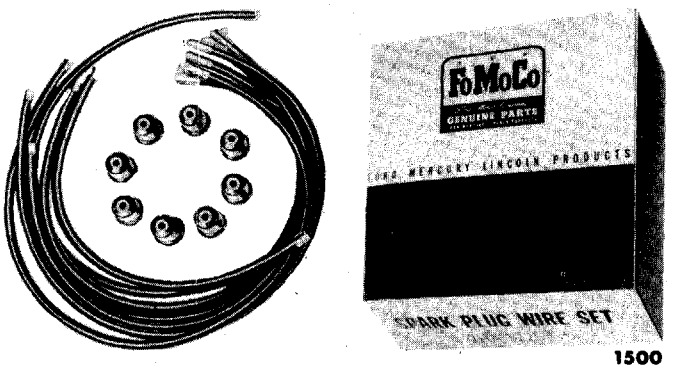


Fig. 3—6-Cylinder Wire Set

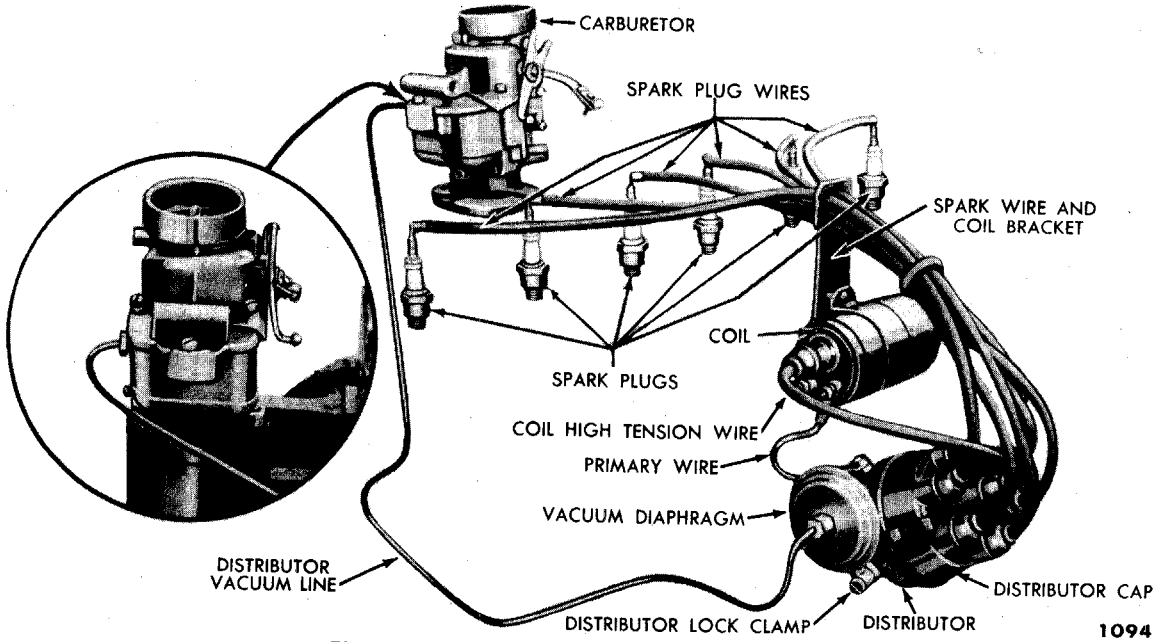


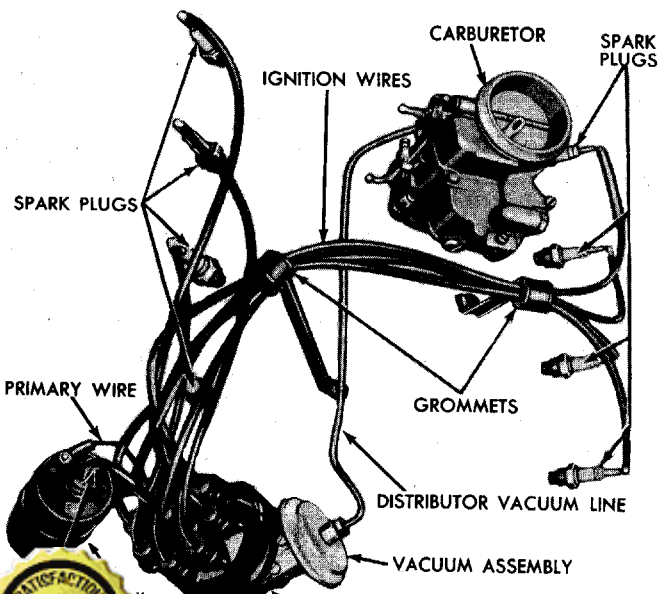
Fig. 4—6-Cylinder Ignition Wire Installation

wires is the same except that on the spread type bracket be sure to install the wires in the proper holes in the bracket.

A spark plug wire set containing the parts shown in figure 7 is available from Ford Dealers.

To remove the wires from the engine, disconnect the wires from the spark plugs and the distributor cap. Pull the wires out of the mounting brackets. Disconnect the coil high tension wire from distributor cap and coil.

To install the wires, place the shielding on the No. 8 wire and position the wires in the brackets as shown in figs. 5 and 6. Install the weather seals in the distributor end of the wires. Insert the wires in the proper distributor cap socket. Be sure the wires are forced all the way down into their sockets. These sockets are numbered to correspond with the proper spark plug. Install the coil to distributor high tension lead and push all weather seals into position.



allation with

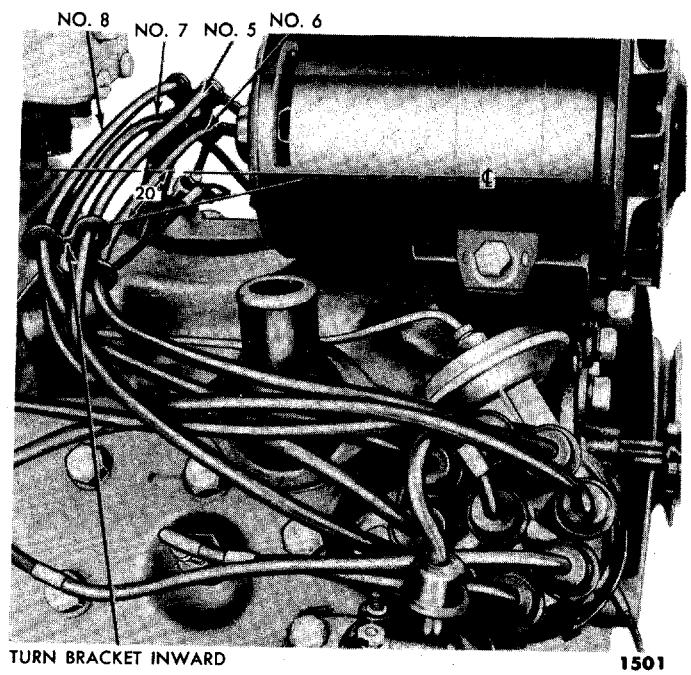


Fig. 6—8-Cylinder Ignition Wire Installation with OBA-12111 Bracket

c. Coil.

The same coil is used on all Ford passenger cars. This metal clad coil is mounted on the plug wire and coil bracket on the 6-cylinder engine. On the 8-cylinder engine a bracket attached to the front end of the right-hand cylinder head holds the coil.

(1) *REMOVAL.* Disconnect the high tension lead and the primary leads from the coil.

Loosen ignition coil mounting strap and remove coil.

(2) *INSTALLATION.* Position the coil in the mounting strap, then tighten the mounting strap. Insert the high tension lead into the coil socket and connect the primary wires to the coil. Push the weather seal tightly against the coil.

(3) *TESTING ON CAR.* Place the spark plug end of a spark plug wire approximately 3/16 inch from the cylinder head. Run the engine at idle speed. If the spark will jump the gap regularly the coil and the condenser are satisfactory.

(4) *TEST ON DISTRIBUTOR STROBOSCOPE.* Install the coil on the test set as shown in fig. 8 and check the coil output. The spark should jump a 14 kilovolt setting regularly at 2000 R.P.M.

d. Timing.

The 6-cylinder engine is equipped with either a viscous type damper having a groove timing mark or a rubber type damper having a ball timing mark. Because of the difference in diameter between the two types of dampers, two timing pointers are located on the engine front cover (fig. 9). The pointer nearest to the outer circumference of the damper should be used to time the engine. A pointer on the engine front cover and a mark on the crankshaft pulley are used to time the 8-cylinder engine.

When the pointer, as shown in fig. 9, is in line with the timing mark, No. 1 or No. 6 cylinder is in firing position, depending on which piston is on the compression stroke.

In order to determine which piston is on compression stroke, use a compression gauge or block the spark plug hole with your thumb. Pressure will be high on the compression stroke.

...g Wire Set

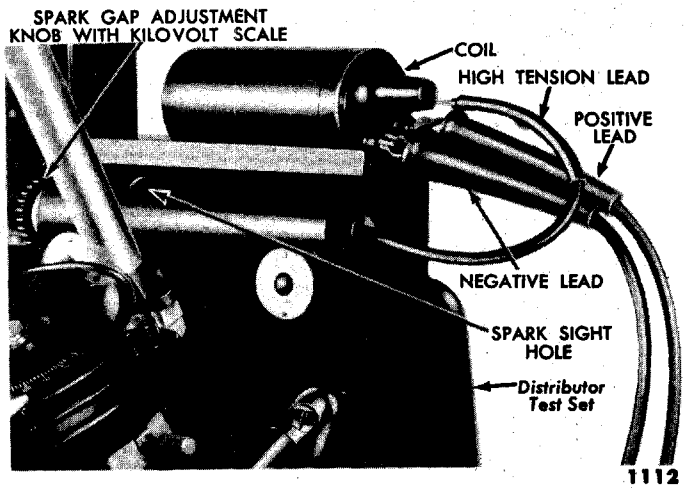


Fig. 8—Testing Coil on Distributor Stroboscope

(1) *INITIAL TIMING.* Align the rotor with the No. 1 spark plug wire terminal in the distributor cap, when the No. 1 cylinder piston is on the compression stroke and timing marks are aligned.

With the timing mark in line with the pointer, the distributor points should just start to open. It may be necessary to rotate the distributor body approximately 15 degrees clockwise, and then slowly rotate it counter-clockwise until the contacts start to open. Tighten the distributor lock plate cap screw. Start the engine and check the timing with the aid of a timing light as shown in fig. 10.

(2) *CHECKING TIMING WITH TIMING LIGHT.* Always disconnect the distributor vacuum line before checking the timing.

Connect the timing light to the engine with the high tension lead on No. 1 spark plug and the other two leads to the proper battery terminals. Clean the grease and dirt from the timing mark and, if necessary, cover

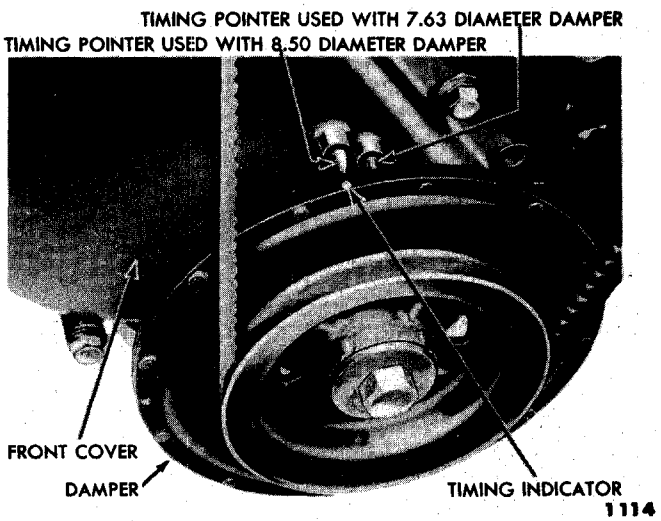


Fig. 9—6-Cylinder Engine Timing Mark

the timing mark and pointer with white chalk. Start the engine and operate it at idle speed. Direct the light on the timing mark as shown in fig. 10. It should flash just as the timing mark lines up with the pointer, indicating correct timing. The operator should stand so that his eye is in line with center of damper and timing pointer.

If the timing mark and the pointer do not line up, rotate the distributor until the timing mark is in line with the stationary pointer.

To advance the timing, rotate the distributor body counterclockwise and to retard the timing, rotate the distributor body clockwise.

2. DISTRIBUTOR MINOR REPAIR AND ADJUSTMENTS

Ford distributors are known as the Loadomatic type, with the spark advance regulated by the vacuum differential at the carburetor. This distributor advance is operated by a vacuum unit mounted on the distributor. One side of this vacuum unit is connected to the breaker plate by direct linkage and the other side is connected by a vacuum line to the carburetor.

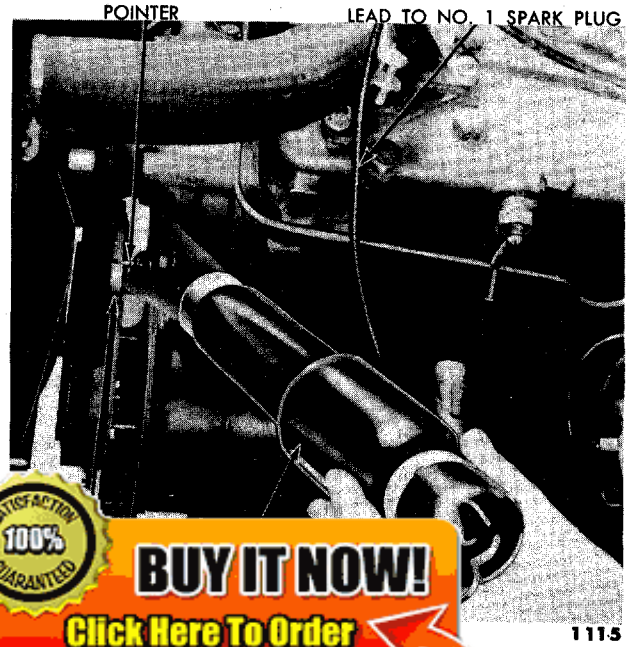
The spark advance characteristics are controlled by two breaker plate springs working against the distributor diaphragm (fig. 12). The amount of spark advance is determined by the amount of vacuum supplied to the distributor and by adjustment of breaker plate spring.

The carburetor has a vacuum passage with openings at both the venturi tube and a point just above the throttle plate (fig. 11), so that the vacuum in the distributor line is at all times a combination of the carburetor throat and venturi vacuums. The lower opening is above the throttle plate when the engine is idling, and at idle speed the spark is retarded.

Under normal road load or part throttle operation the vacuum ("B" fig. 11) is high, and the spark will become fully advanced at 18 to 35 miles per hour.

When the engine is accelerating the vacuum at the venturi increases as the engine speed increases; however, the manifold vacuum (vacuum at the throttle body throat) decreases considerably from the road load vacuum. The net result of these two changes is to lower the vacuum at the distributor diaphragm while the springs retard the spark advance from its road load setting. As the vehicle speed increases, the venturi vacuum and the manifold vacuum continue to increase.

The procedure for replacing, testing, or adjusting the distributor points, testing the condenser, and replacing the distributor is given below.



...ing Light

a. Distributor Points.

The distributor point assembly in the loadomatic distributor consists of the stationary distributor point bracket assembly, breaker arm, and primary wire terminal. This assembly is mounted on the breaker plate as a unit and can be replaced without removing the distributor from the engine (fig. 12).

Although the distributor point assembly spring tension is set by the manufacturer, the tension should be adjusted, it is not within specifications.

(1) *REMOVAL.* Disconnect the primary and condenser leads. Remove the screws which secure the point assembly to the breaker plate. Remove the point assembly.

(2) *INSTALLATION.* Place the primary and condenser leads, lock washers, and nut on the point assembly primary terminal and tighten the nut securely.

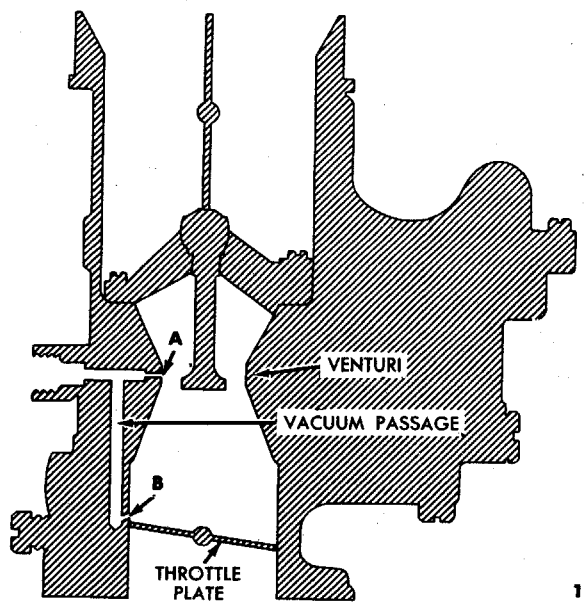


Fig. 11—Carburetor Vacuum Passage

Position the point assembly on the breaker plate. Install the holding screws. Be sure the ground wire terminal is on the screw nearest to the adjustment slot and the lock washer is used under the screw at the opposite end. Adjust the distributor point spacing.

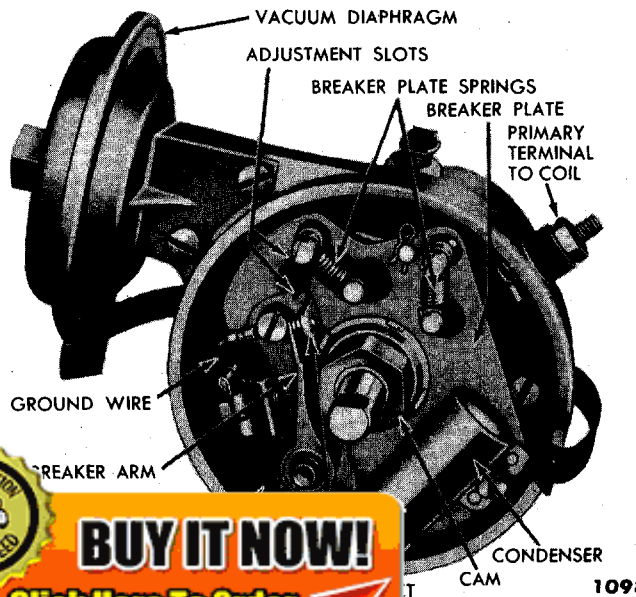
(3) *CHECKING SPRING TENSION.* Place the tension gauge as near as possible to the distributor points and push at right angle (90°) until the points just open (fig. 13). Read the spring tension and adjust if outside specifications (17-20 ozs.).

(4) *ADJUSTING SPRING TENSION.* Disconnect the wires at the distributor point terminal, and loosen the nut holding the spring in position. Move the spring toward the screw stud to increase the tension and in the opposite direction to decrease the tension. Tighten the nut securely and recheck the spring tension. After the proper tension is obtained, install the primary wires on the point assembly primary terminal and tighten the nut securely.

(5) *DISTRIBUTOR POINT SPACING ADJUSTMENT.* The distributor points can be adjusted with the distributor in the car or on a distributor stroboscope. Before adjusting the points, they should be examined and replaced if they are oily, severely pitted, badly oxidized, or have an excessive amount of foreign matter on the contact surfaces.

To increase point life and improve engine performance, it is important to adjust the point spacing accurately.

If the distributor point assembly is replaced or need adjustment, crank the engine until the rubbing block rests on the peak of a cam lobe. Loosen the lock screws, insert a screw driver blade or adjusting blade of distributor adjusting wrench (fig. 14) in the adjustment slot, and turn it to obtain the proper point spacing



denser Installation

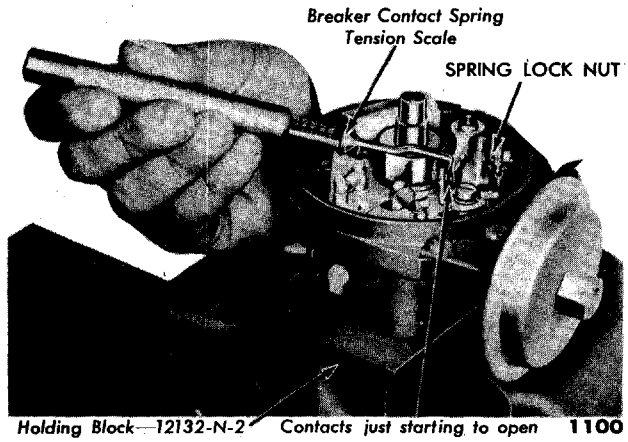


Fig. 13—Checking Breaker Arm Spring Tension

(0.024-0.026 inch on 6-cylinder engine and 0.014-0.016 inch on 8-cylinder engine).

Tighten the lock screws and recheck the clearance between the distributor points. Always retime the ignition after adjusting the distributor point gap.

b. Condenser.

The condenser can be removed from the distributor, either when the distributor is in the engine or when it is removed from the engine.

(1) *REMOVAL.* Disconnect the condenser lead from the distributor point primary terminal and remove the screw that holds the condenser on the breaker plate. Lift the condenser out of the distributor.

(2) *INSTALLATION.* Position the condenser on the breaker plate. Install the condenser holding screw. Connect the condenser lead to the primary terminal.

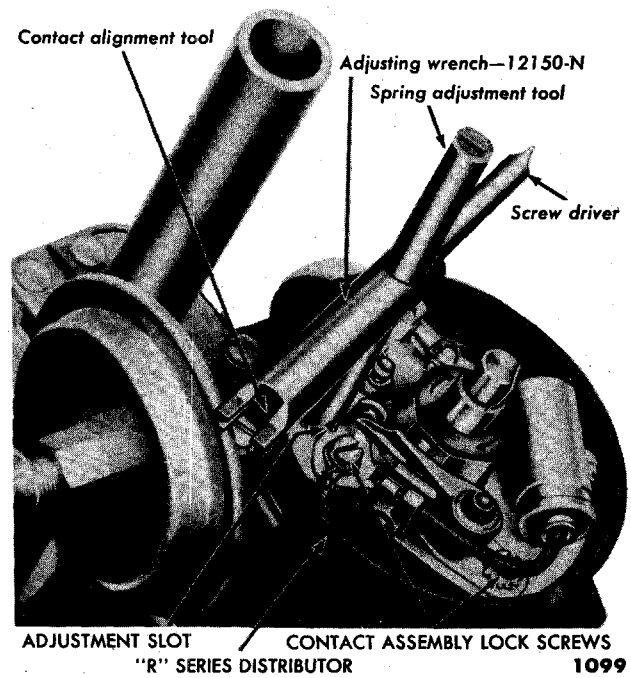


Fig. 14—Adjusting Distributor Contacts

(3) *TESTING.* Before removing the condenser to make a test, it is advisable to first make the test on the car.

(a) TEST ON CAR. This test is made at the same time as the coil test. If the spark is not satisfactory, it will be necessary to remove the condenser and test it on a distributor stroboscope test set.

(b) TEST ON DISTRIBUTOR STROBOSCOPE. Install the condenser on a distributor test set as shown in fig. 15. Test the condenser for leakage, series resistance, and capacity. Condenser capacity is 0.21 to 0.25 microfarads, leakage should be greater than 5 megohms at room temperature and series resistance should be one ohm or less.

c. Distributor.

The distributor must be removed from the engine when the vacuum advance is to be checked or adjusted.

(1) *REMOVAL.* Before removing the distributor from an engine which is timed correctly, be sure to scribe a mark on the distributor housing indicating the position of the rotor, and another mark on the engine and housing to indicate the position of the housing. The distributor can be reinstalled when the rotor is in line with the mark without rotating the engine crankshaft to obtain the proper timing.

Remove the distributor cap. Disconnect the primary wire and vacuum line. Loosen the distributor clamp lock screw or distributor hold-down bolt and remove the distributor assembly from the engine.

(2) *CHECK VACUUM ADVANCE.* Install the distributor on the stroboscope as shown in fig. 16.

Connect the dwell lead and check the percent dwell. If the dwell is not between 58 and 63 per cent and the point spacing is not within limits, it will be necessary to adjust the points. Check the breaker arm spring tension and adjust if required (17-20 ozs.). Set the distributor speed at 200 r.p.m., hold the distributor breaker

or Stroboscope

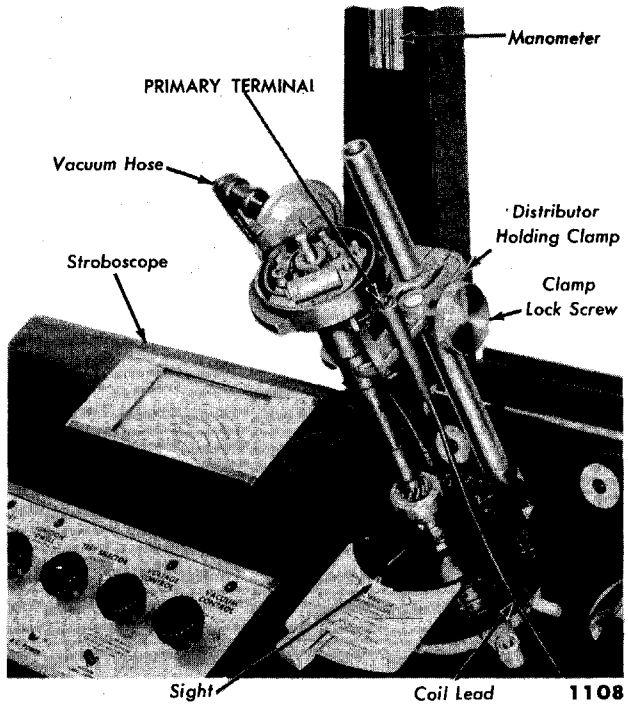


Fig. 16—Distributor Installed on Stroboscope

plate against the stops in full retard position, and rotate the distributor housing until the spark lines up with the zero degree position on the scale. Tighten the distributor holding clamp. Check the distributor according to the speed and vacuum setttings given in Table 1.

Set the distributor speed to the proper r.p.m. and apply the required vacuum. Read the spark advance on the degree scale. If the spark advance is not within these specifications, adjust the tension on the springs.

(3) *VACUUM ADVANCE ADJUSTMENT.* Install distributor on a distributor stroboscope. Adjust the distributor point spacing. Set the distributor speed at 200 r.p.m., hold the distributor breaker plate against the stops in full retard position, and rotate the distributor

Table 1—Distributor Vacuum Advance

Distributor	Distributor R.P.M.	Distributor Degrees		Vacuum (Inches of Mercury)
		Min.	Max.	
All 6-cyl. Models 7HA-12127	200	0	0	0
	500	1¾	3	0.4
	1000	5½	6¾	1.4
	1000	11½	13	5.5
	1500	8½	9¾	2.9
	2000	10½	11½	4.1
All 1949 and early 1950 8-cyl. Models 7RA-12127-C	200	0	0	0
	500	1¼	2¼	0.4
	1000	4¼	5¼	1.7
	1500	6¼	7¼	2.8
	2000	7½	8½	3.7
Late 1950 and 1951 8-cyl. Models 8BA-12127 0BA-12127	200	0	0	0
	500	0	1	0.30
	1000	5¼	6¼	1.32
	1500	8¾	10	2.85
	2000	10	11¼	3.7

housing until the timing light in the stroboscope base lines up with the zero degree position on the scale. Tighten the distributor holding clamp. Release the tension on the two retard springs by turning both adjustment posts clockwise until the tension is relieved from each spring as shown in fig. 17.

Adjust the primary (light) spring first and the secondary (heavy spring on H & R series distributor) last.

Two springs of the same kind are used as the primary and the secondary spring on the 0BA and 8BA type distributors.

The procedure for setting the required tension on each spring is given in Table 2.

Check the operation of the vacuum advance at the various speeds. The degrees advance should be within the limits given in Table 1. If the spark advance is not within the limits under low vacuum, the primary spring is at fault. If the spark advance is not within the limits under high vacuum, the secondary spring is at fault.

If it is impossible to adjust both springs to give the correct spark advance, one or both springs should be replaced, and the spark advance readjusted.

(4) *INSTALLATION.* Align the rotor with the mark previously scribed on the distributor body. Install the distributor in the engine, with the housing mark in alignment with the mark previously made on the engine.

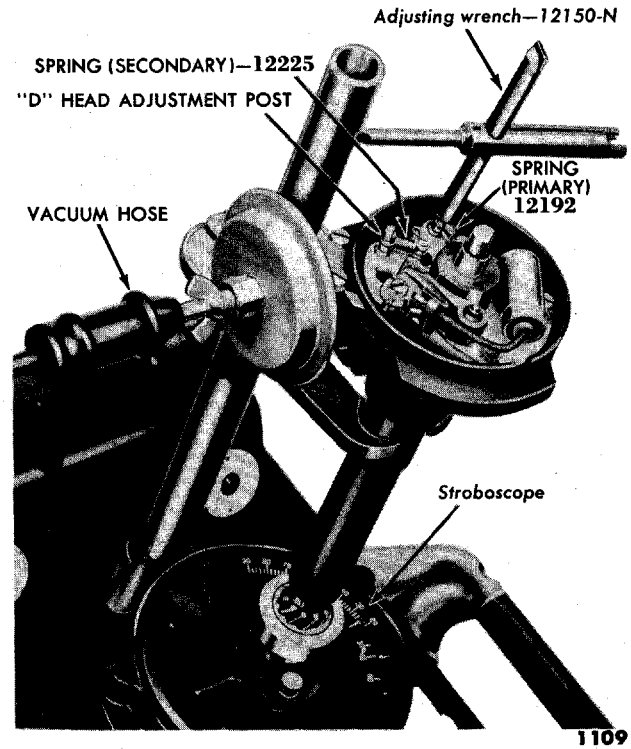


Fig. 17—Adjusting Spark Return Spring Tension

Tighten the holding clamp cap screw. Check and adjust the ignition timing, using a timing light.

3. DISTRIBUTOR OVERHAUL

Before disassembling the distributor for overhaul it is advisable to place the distributor on a distributor stroboscope and, after adjusting the distributor point spacing, test the distributor for variation of spark and correct vacuum advance. This test will give valuable information on the distributor condition and indicate the parts which need replacement.

This section covers the complete disassembly, inspection and assembly of the 6-cylinder distributor under the heading "**a.** 6-cylinder." "**b.** 8-cylinder" covers 8-cylinder distributor disassembly, inspection and assembly.

a. 6-Cylinder.

If the vacuum unit, ground wire and primary wire are in satisfactory condition it is not necessary to remove these parts from the distributor housing when replacing bushings. Figure 18 illustrates the 6-cylinder distributor parts and their relative positions.

(1) *SHAFT AND CAM REMOVAL.* File off the rivet head. Drive out the collar rivet with a punch.

Slide the collar off the drive shaft. Remove the shaft and cam assembly from the distributor housing.

(2) *BREAKER PLATE REMOVAL.* Place the

Table 2—Distributor Advance Adjusting Specifications

Distributor	Primary (Light) Spring Adjustment Procedure			Secondary (Heavy) Spring Adjustment Procedure		
	Set Distributor Speed to R.P.M.	Apply Vacuum (inches Hg) to distributor diaphragm	Turn Adjustment Post until Spark is advanced to (degrees)	Set Distributor Speed to R.P.M.	Apply Vacuum (inches Hg) to distributor diaphragm	Turn Adjusting Post until Spark is advanced to (degrees)
7HA-12127 (1949-1950-1951 6-cylinder)	400	0.26	1¾	1000	1.4	6¼
7RA-12127-C		0.28	1	1200	2.1	6
		0.30	1	1000	1.32	5¾

distributor housing in a holding block, and clamp the tool in a vise.

Remove the two screws holding the distributor point assembly on the breaker plate. Disconnect the primary wire and the condenser lead from the distributor point assembly primary terminal. Lift the point assembly from the breaker plate.

Remove the hair-pin retainer attaching the vacuum unit rod to the breaker plate, and push the rod end out of the breaker plate.

Release the tension on the two return springs by rotating the adjustment posts to a position nearest to the stationary posts. Remove the two springs.

NOTE: ***Do not stretch or bend the springs during their removal as this might make it difficult to obtain the correct spark advance adjustment.***

Remove the lock ring attaching the breaker plate to the upper bushing. Lift the breaker plate from the distributor housing.

Disconnect the primary and ground wires from the distributor housing.

(3) *INSPECTION.* Inspect the distributor shaft and bushings for wear. The distributor shaft manufacturing minimum diameter is 0.4675 inch. The upper bushing manufacturing limit inside diameter is 0.4685-0.4695 inch. Replace all parts that are not within these limits.

(4) *BUSHING REMOVAL.* Drive the upper and lower bushings from the housing by using the split drift.

(5) *BUSHING INSTALLATION.* Bushings are made of powdered metal and must not be reamed. Place a new lower bushing in position on the bushing installation tool. Place the distributor housing and the "A" spacer on the tool. Turn the T-handle until the lower bushing is flush with the distributor housing. Remove the T-handle and the "A" spacer. Position the upper bushing on the housing with the lock ring end up. Place the "A" spacer over the bushing. Turn the T-handle until the spacer bottoms firmly against the distributor housing.

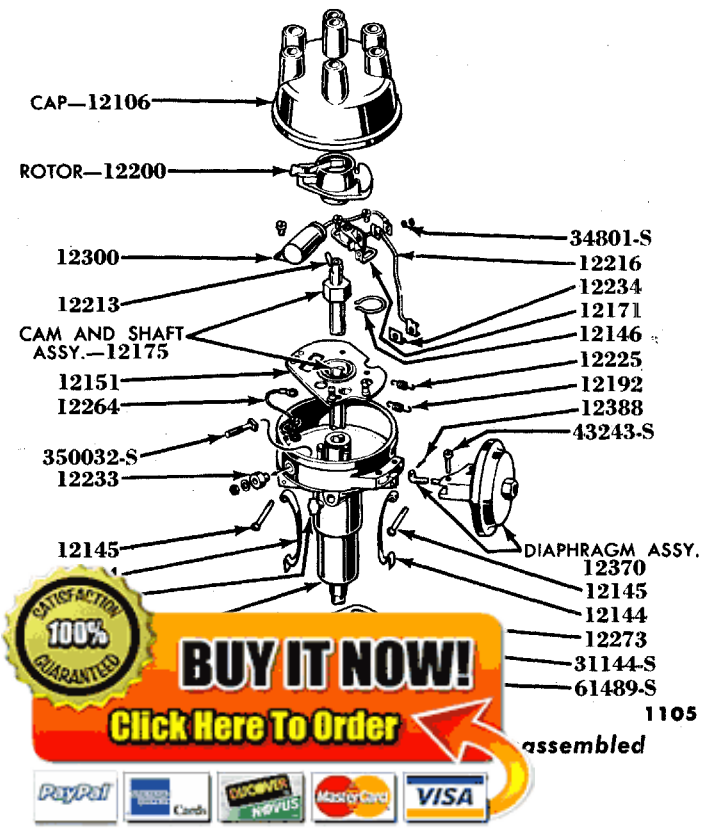
Properly size the upper and lower bushing using the burnishing tool.

(6) *BREAKER PLATE INSTALLATION.* Install the ground wire and the primary wire in the distributor housing. Position the breaker plate in the housing. Install the lock ring to secure the breaker plate. Install the condenser on the breaker plate. Place the condenser lead, primary lead, lock washer, and nut on the distributor point primary terminal, and securely tighten the nut.

Install the distributor point assembly. Be sure the pivot pin enters the hole in the breaker plate. Install the ground wire and the screw at the adjustment slot end of the breaker assembly and the screw at the opposite end of the assembly. Install the vacuum unit on the distributor housing if it was previously removed.

Install the two return springs on the adjustment and body posts. Connect the vacuum unit rod to the breaker plate, and attach it with the hair pin retainer.

(7) *SHAFT INSTALLATION.* Slide the shaft into the housing. Place the collar in position on the shaft. Install the collar rivet. Place the distributor in position



assembled

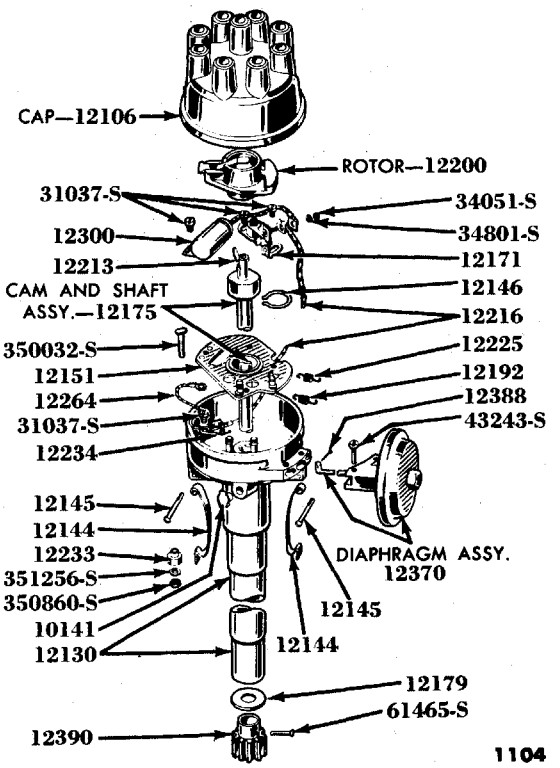


Fig. 19—8-Cylinder Distributor Disassembled 7RA and 8BA Type

on the block tool and peen the end of the rivet. Adjust distributor point spacing. Adjust vacuum advance.

b. 8-Cylinder.

Three different distributors are used in the 8-cylinder engines. The 1949 and some early 1950 model engines use the 7RA-12127 distributor which has a cast iron housing fig. 19. The housing extends along the shaft to the distributor gear and contains two bushings which support the distributor shaft at both ends. The distributor shaft is held in position by the distributor gear which is pressed on end of shaft and pinned in place.

Some Early 1950 models use an 8BA-12127 distributor which is the same distributor as the 7RA-12127 except the two spark advance return springs were replaced with two 8EQ-12192 springs. These springs are adjusted to 8BA-12127 distributor advance limits.

Late 1950 distributors, part no. 0BA-12127 have a longer shaft and a die-cast housing with a short extension (fig. 20).

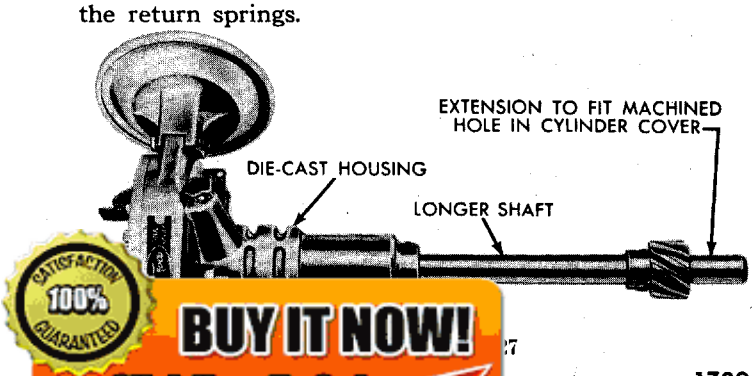
A collar on the distributor shaft holds the shaft in position and controls the shaft end play. The gear is installed on the shaft and allows the shaft to extend below the gear (fig. 20). The additional length of the shaft fits into a pilot hole in the engine front cover. All 8-cylinder distributors have the same distance between the distributor pad and the distributor gear.

The disassembly, inspection and assembly procedure given below covers the three 8-cylinder distributors.

(1) *SHAFT AND CAM REMOVAL.* Position the distributor housing on the repair block. File off the rivet head on the distributor drive gear. On the 0BA-12127 distributor also file off the collar rivet head. Drive out the rivet or rivets with a punch (fig.21).

Pull the distributor gear (fig. 22). On the OBA-12127 distributor slide the collar off the shaft.
Slide the shaft out of the distributor housing.

(2) *BREAKER PLATE REMOVAL.* Place the distributor housing in the holding block. Remove the distributor point assembly. Remove the condenser. Remove the hair pin retainer and disconnect the rod. Release the tension on the return springs. Disconnect the return springs.



—0BA Type

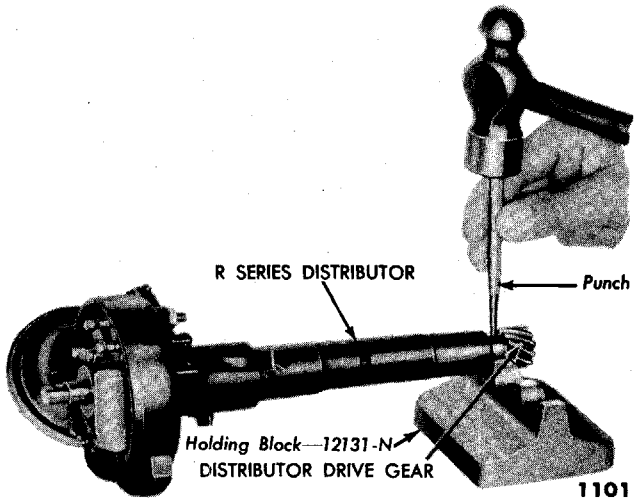


Fig. 21—Removing Pin From Distributor Gear

NOTE: ***Do not stretch the springs as this may distort the springs making it difficult to obtain adjustment.***

Remove the lock ring attaching the breaker plate to the upper bushing. Lift the breaker plate from the housing. If required, disconnect and remove the primary and ground wires.

(3) *INSPECTION.* Inspect the distributor shaft and bushings for wear and replace if outside the limits. The distributor shaft minimum diameter at the bushing is 0.4675 inch. The upper bushing manufacturing limit inside diameter is 0.4685-0.4695 inch.

(4) *BUSHING REMOVAL.* Drive out the lower bushing with the distributor bushing remover as shown

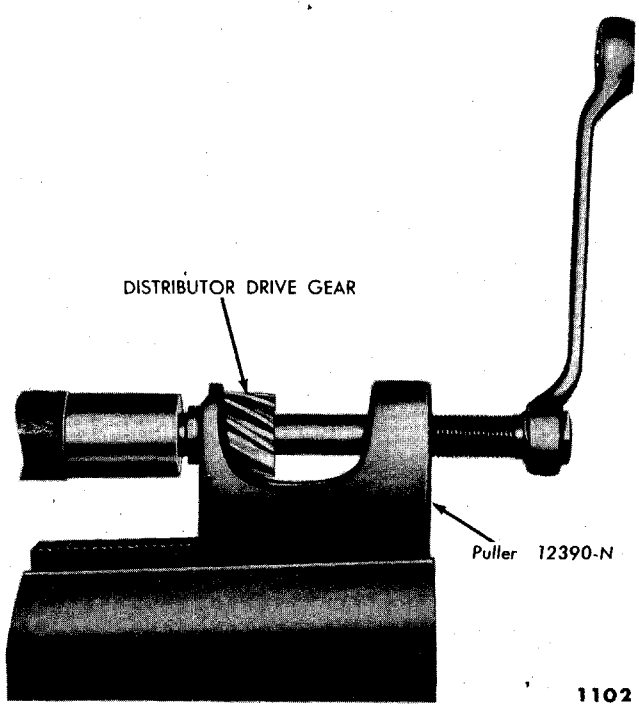


Fig. 22—Removing Distributor Gear

in fig. 23. Invert the distributor housing. Drive out the upper bushing.

(5) *BUSHING INSTALLATION.* Place a new lower bushing in position on the bushing installation tool fig. 24. Place the distributor housing and the "A" spacer on the tool. Turn the T-handle until the lower bushing is flush with the distributor housing. Remove the T-handle and the "A" spacer. Position the upper bushing on the housing with the lock ring end up. Place the "A" spacer over the bushing as shown in fig. 24. Turn the T-handle until the spacer bottoms firmly against the distributor housing. Burnish both bushings to the proper size with a burnishing tool as shown in fig. 25.

(6) *BREAKER PLATE INSTALLATION.* Install the ground wire and the primary wire on the distributor housing if they had been removed. Position the breaker plate in the housing. Install the lock ring to secure the breaker plate. Place the condenser lead, primary lead, lock washer, and nut on the primary terminal, and tighten the nut. Install the distributor point assembly. Be sure the pivot pin enters the hole in the breaker plate. Install the ground wire and the screw at the adjustment slot end of the breaker assembly and the screw and lock washer at the opposite end of the assembly. Install the vacuum unit on the distributor housing if previously removed during disassembly. Install the two return springs on the adjustment and body posts. Connect the vacuum unit rod to the breaker plate, and attach the rod with the hair pin retainer.

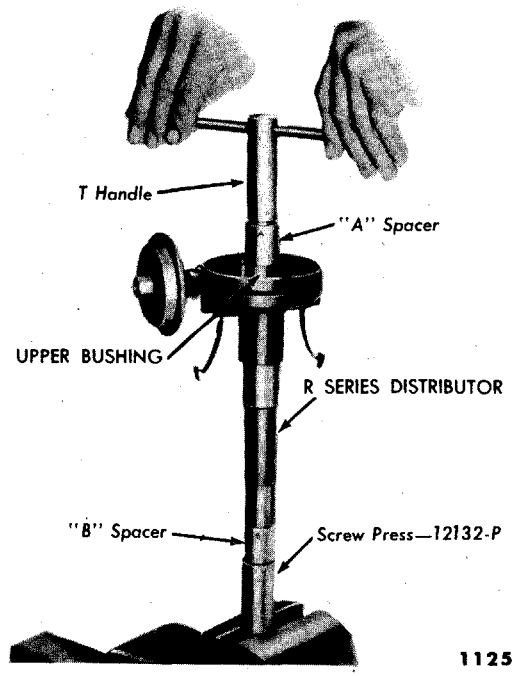
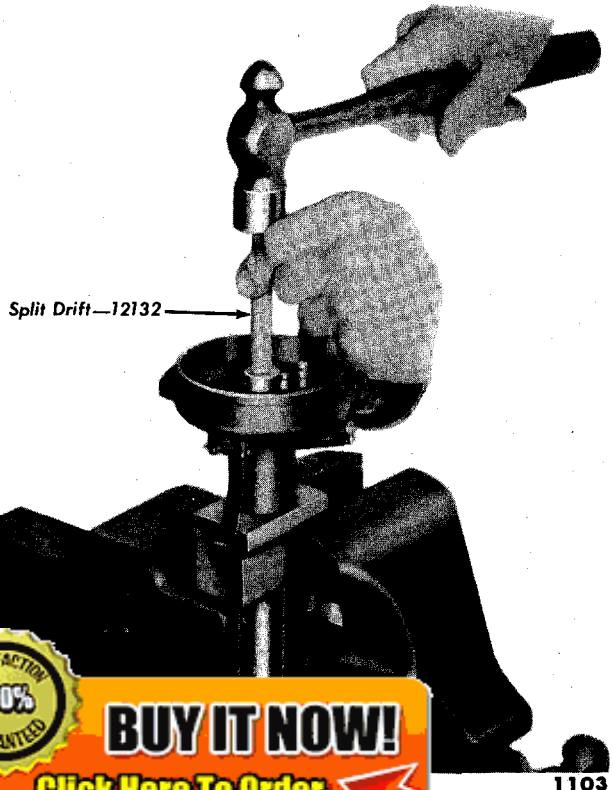


Fig. 24—Installing Bushing

(7) *SHAFT INSTALLATION.* Slide the shaft into the housing. Place the spacer on the gear end of the shaft (7RA & 8BA distributors only). On the 0BA distributor slide the collar on the shaft. Install the pin and peen the pin end. Press the gear on the shaft until the hole in the gear and shaft are in alignment. End clearance should be 0.002 to 0.005 inch. Insert the pin through the shaft and peen the pin end.

If the shaft on the 7RA or 8BA distributor has been replaced, it is necessary to position the gear on the shaft with the marks on the end of the gear and shaft in alignment. Establish the proper end play 0.002-0.005 inch then drill the shaft using a number 30 (0.1285) drill.

If a new shaft is used on the 0BA type distributor,



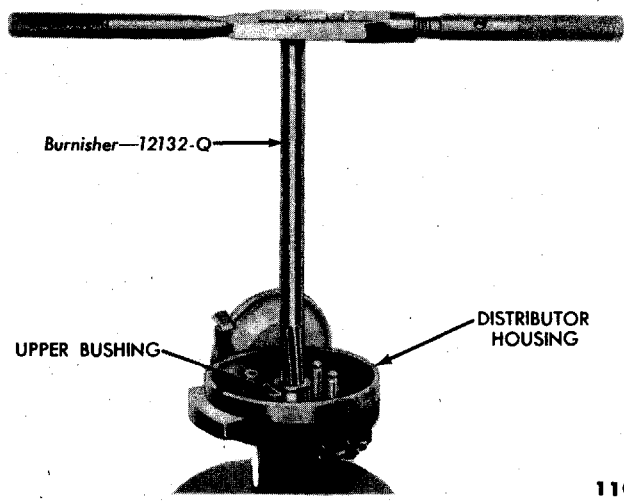


Fig. 25—Burnishing Upper Bushing

it is necessary to position the collar on the shaft, establish the proper end play (0.002-0.005 inch) and drill the shaft with a number 30 (0.1285) drill. Then install the pin in the collar and peen the pin head.

Press the gear on the shaft until the bottom edge of the gear is aligned with the junction of the two diameters (0.94 inch from the end of the shaft). Drill a hole in the shaft using a number 30 (0.1285) drill, install the pin and peen the end. Adjust the distributor point spacing. Adjust the vacuum advance.

4. CARBURETOR OPERATION, TESTS, AND ADJUSTMENTS

Carburetor operating principles, tests, and adjustments are covered in this section under headings which describe the nature of the material contained. Adjustments on the carburetor that pertain to the automatic transmission are covered in the Fordomatic Section.

a. Operation.

While some variation in design exists between the 6-cylinder and 8-cylinder carburetors, each carburetor has four fuel circuits and the principles involved are the same for each. Minor variations in design are pointed out throughout this presentation.

Each system is designed to supply the correct quantity of fuel under a particular type of operation. The operating principles of these separate circuits are presented under the following headings: "(1) Idle Fuel System," "(2) Main Fuel System," "(3) Power Fuel System," and "(4) Accelerating System."

The 8-cylinder carburetor construction is illustrated in figures 26 and 27.

(1) *IDLE FUEL SYSTEM.* The idling system for the different Ford carburetors are illustrated in figures 28 and 29.

The fuel from the carburetor bowl passes through the main metering jet and into the idle tube "F." Air is introduced into the fuel stream by the idle air bleed "A" and a small additional amount of air is bled in by a small hole "B" in the aspirating nozzle. The idle mixture goes around the aspirating nozzle, then travels down the idle passages to the idle discharge holes "D" and "E."

When the engine is running at a speed of 450 r.p.m., the mixture is discharged from the lower hole "E" only. As the throttle plate opens and the speed is increased, the upper hole "D" starts discharging in addition to the lower hole "E."

The action and timing are such that the discharge from the upper hole "D" reaches a maximum at about 900 r.p.m., and then gradually becomes less effective as the main nozzle starts to flow.

The lower discharge hole "E" is provided with an idle adjusting screw. Turning this screw "out" gives a richer mixture and turning the screw "in" gives a leaner mixture.

(2) *MAIN FUEL SYSTEM.* The main fuel system starts to operate as the idle system becomes less effective and the main nozzle starts to deliver fuel (fig. 30 and 31). This occurs at about 900 r.p.m. Between 900 r.p.m. and 1250 r.p.m. there is a definite blend of the idle system and the main metering system. In this

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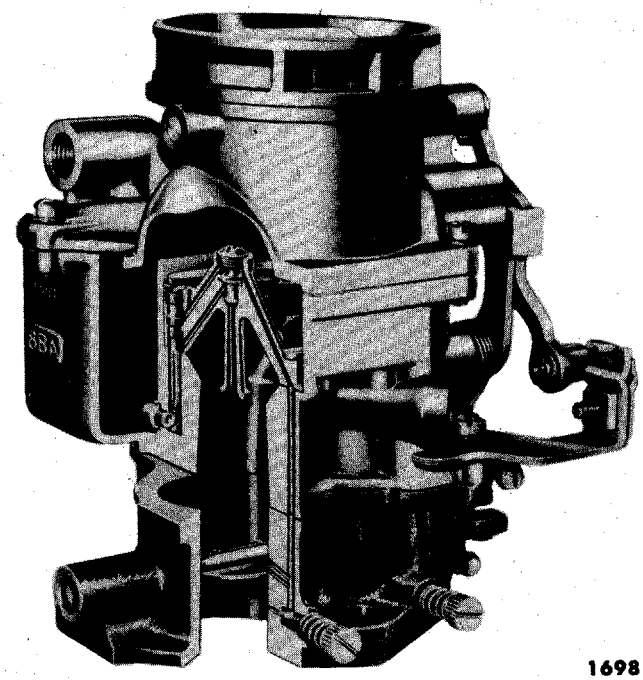

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Fig. 27—8-Cylinder Carburetor (Idle System)

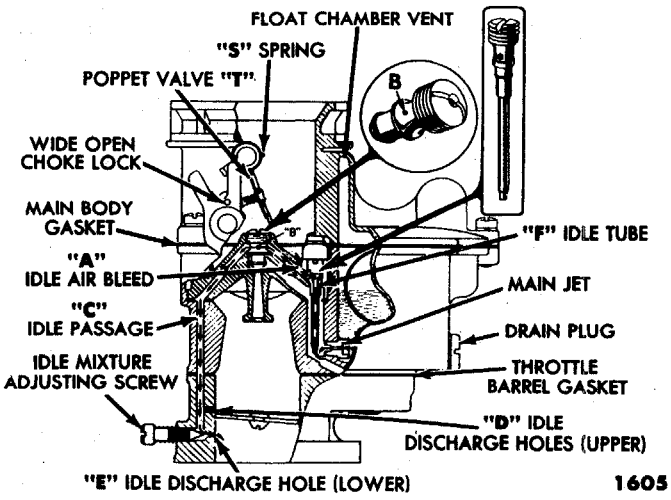


Fig. 28—8-Cylinder Carburetor Idle Fuel System

range, all the fuel passes through the main jets up through the main vertical well to the angle channel.

Here the fuel is atomized by the high speed bleed "H" and an additional supply of air is introduced to this mixture by the bleeder plug before being discharged through vertical passage "G" into venturi.

(3) *POWER FUEL SYSTEM.* The power vacuum piston and spring are actuated by the vacuum below the throttle plate. At idle speed, vacuum is high but decreases as the load increases. The diaphragm (on 8-cylinder carburetors only) actuated by the vacuum, holds the power valve "J" on its seat until the vacuum drops to about 6 to 6.5 inches of mercury, which is not high enough to resist the action of the spring "K" (fig. 33). On the 6-cylinder (fig. 32), the piston (actuated by vacuum) and the spring are held in the "up" position which allows the valve "J" to remain closed until the vacuum drops to approximately 6.5 to 7.5 inches of mercury.

Under load, as in climbing hills, etc., the vacuum

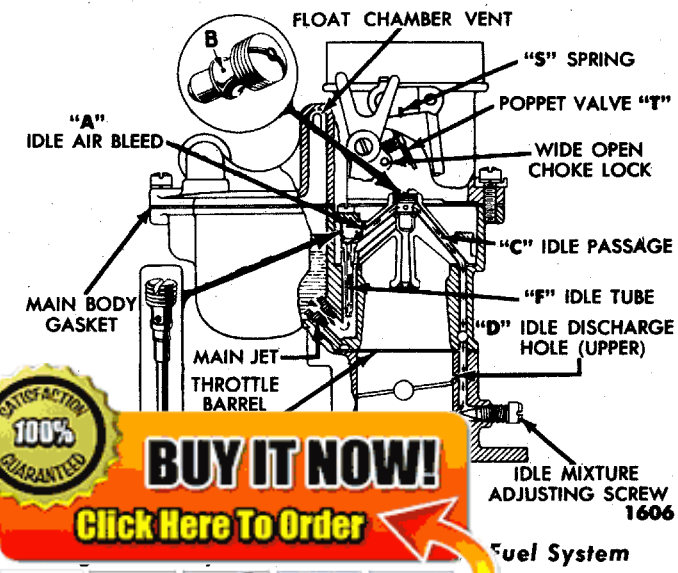


Fig. 29—8-Cylinder Carburetor Main Fuel System

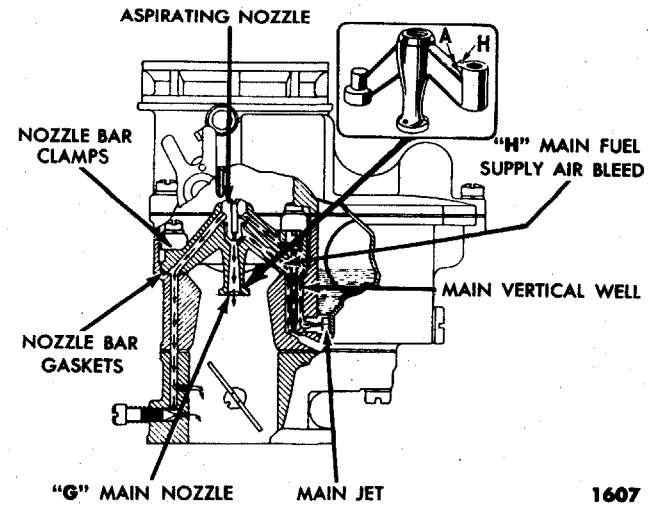


Fig. 30—8-Cylinder Carburetor Main Fuel System

drops because it becomes necessary to open the throttle wider in order to maintain speed. When the vacuum drops below 6.5 inches of mercury, on the 8-cylinder and below 7.5 inches on the 6-cylinder, the power valve "J" is opened by the spring "K" on the 8-cylinder and closed on the 6-cylinder carburetor. The fuel then flows into the power valve chamber, through the high speed restrictions, and into the main discharge nozzle. This gives the additional fuel required for high speeds, for heavy loads, and for low speeds at full throttle.

(4) *ACCELERATING SYSTEM.* The accelerating pump illustrated in figs. 34 and 35 is connected directly to the throttle linkage, and its function is to enrich the mixture temporarily for rapid acceleration. The fuel is drawn into the pump chamber, through the pump inlet passage, and the pump inlet ball check valve "N," on the upward stroke of the pump piston "O." When the throttle is opened, the piston moves downward, closing the pump check valve and overcoming the weight of the pump discharge needle valve "P." The accelerating fuel then goes around this valve, and out the pump discharge jet.

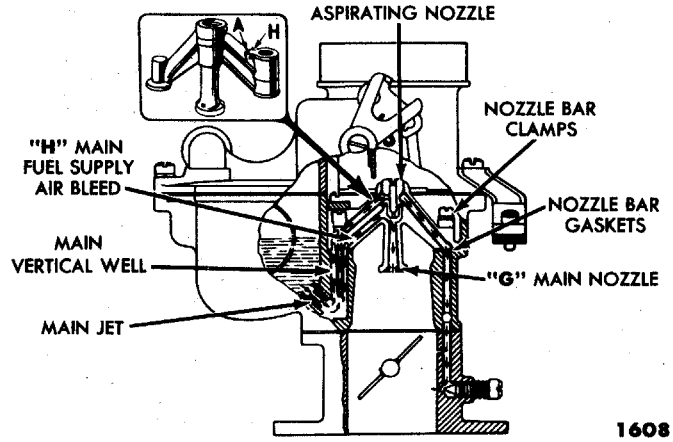


Fig. 31—6-Cylinder Carburetor Main Fuel System

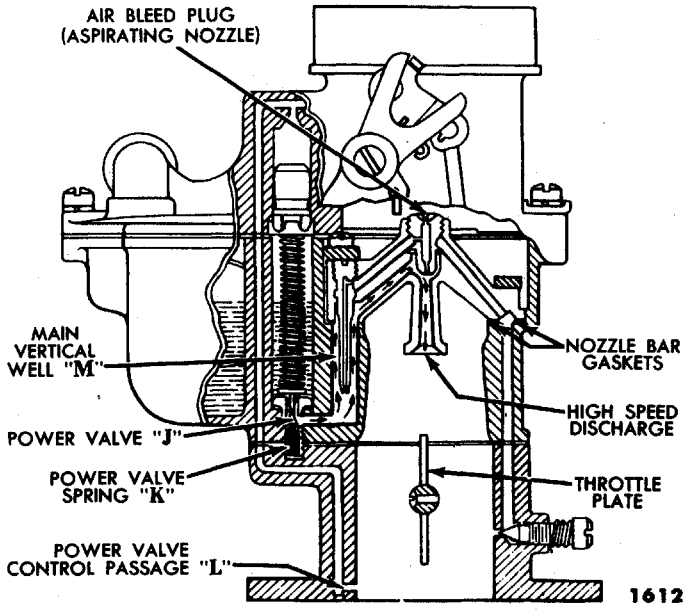
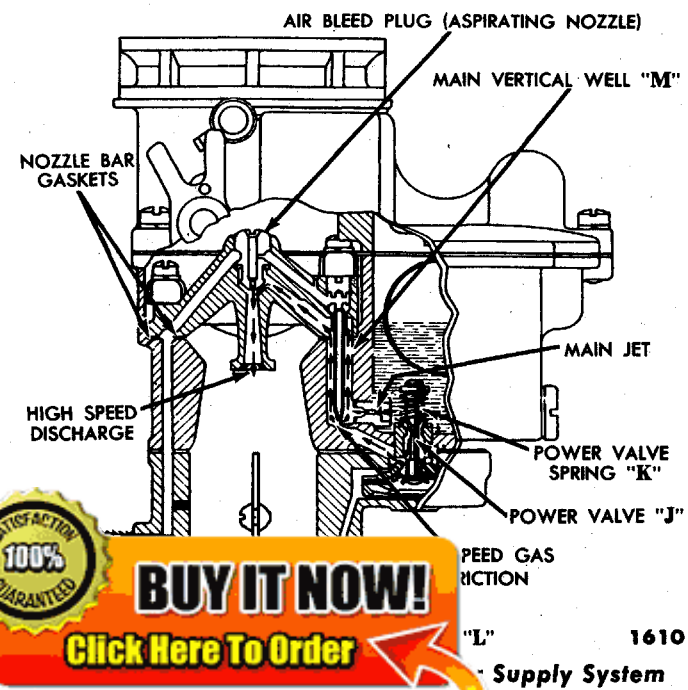


Fig. 32—6-Cylinder Carburetor Power Supply System

A slot in the pump piston stem allows the pump operating rod to overrun the pump piston when the throttle is opened suddenly. This overrun causes the pump piston to be subjected to the pressure of the spring thereby giving a prolonged discharge of the accelerating fuel.

b. Adjusting Idle Fuel Mixture.

The idle fuel mixture is controlled by the idle mixture adjusting screw. Turn the screw "in" to restrict the mixture flow, and turn the screw "out" to increase the mixture flow. Make the initial idle fuel adjustment by turning the idle adjustment screws "in" (6-cylinder



Supply System

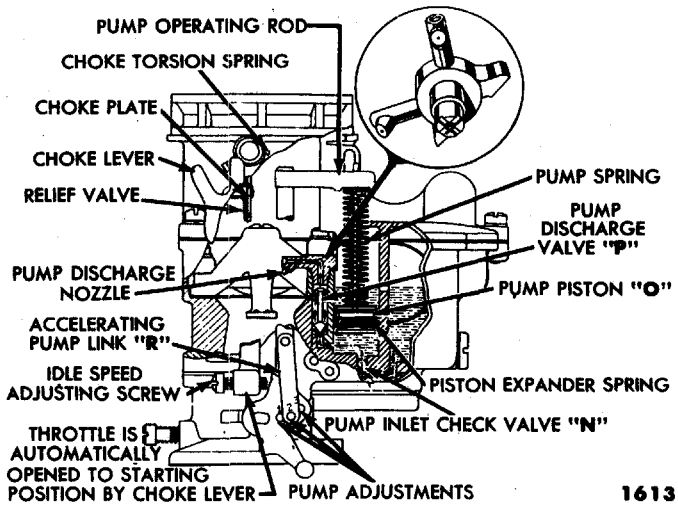


Fig. 34—Accelerating System—8-Cylinder Carburetor

carburetor has only one screw) until it lightly touches the seat. Then back off approximately one turn.

CAUTION: ***Do not turn the screw against its seat tight enough to groove the point. If screw is damaged, it must be replaced before proper idle adjustment can be obtained.***

Start the engine and allow it to run at idle speed until normal operating temperature is reached.

Adjust the idle mixture to the highest and steadiest vacuum reading. If a vacuum gauge is not available, turn the adjusting screw out until the engine begins to "roll," then turn screw "in" until engine slows down. Turn the screw out until an even smooth idle at the correct idle speed is obtained. It may be necessary to reset the idle speed stop screw after the idle mixture is obtained.

c. Adjusting Idle Speed.

A stop screw controls the engine idle speed (figs. 36 and 37). Turn the idle stop screw "in" to increase the engine speed and "out" to decrease the engine speed. Idle speed should be 475 to 500 r.p.m. (425 r.p.m. on cars equipped with automatic transmission).

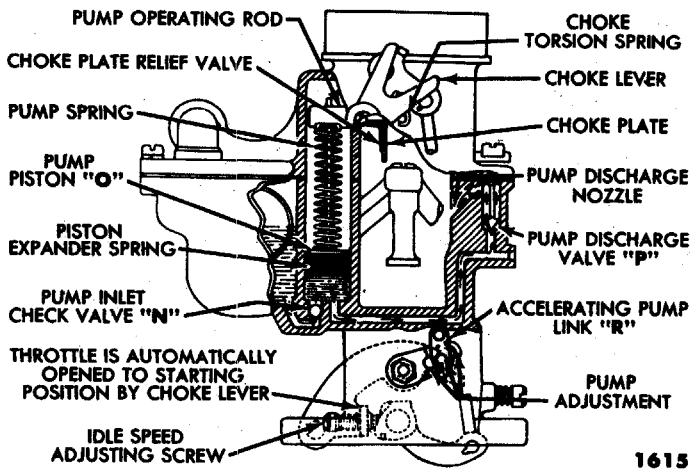


Fig. 35—6-Cylinder Accelerating System

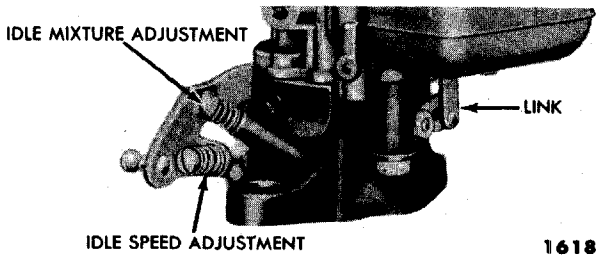


Fig. 36—6-Cylinder Carburetor

d. Adjusting Accelerating Pump Stroke.

The quantity of fuel discharged by the accelerating pump is controlled by changing the position of the pump link in the throttle lever holes. Three positions are provided, the shortest stroke (closest hole to the throttle plate) is suitable for hot weather operation. The center hole should be used for average conditions. The longest stroke (hole farthest from throttle) which provides the greatest accelerating charge is suitable for cold weather operation.

e. Checking Accelerating Pump.

Remove the air cleaner. Operate the throttle and observe the fuel flow from the discharge outlet. When the system is in good condition a quick steady stream will flow from the discharge outlet the instant the throttle is opened.

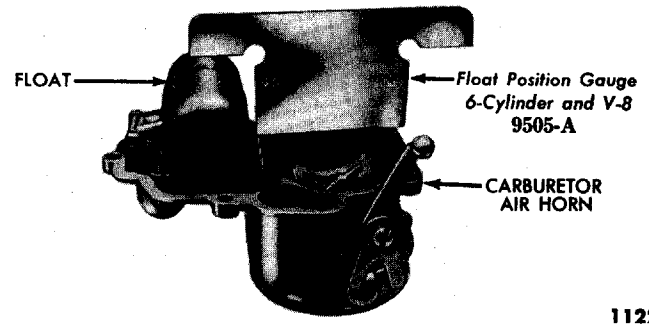


Fig. 38—8-Cylinder Carburetor Float Adjustment

f. Checking and Adjusting Float Level.

Hold the air horn upside down and with the float in the closed position as shown in fig. 38. Check the dimension from the flange surface of the air horn to the bottom side of the float (not the soldered seam). The correct distance is 1.322 to 1.353 inches.

To correct the float setting, bend the float lever arm up or down to bring the float within the limits.

5. 6-CYLINDER CARBURETOR OVERHAUL

The procedure for removing, overhauling, and installing the 6-cylinder carburetor is given under the following headings: "a. Removal," "b. Disassembly," "c. Cleaning," "d. Assembly," and "e. Installation."

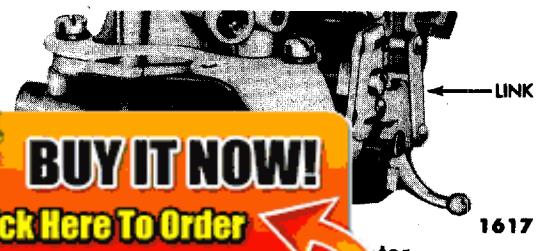
Carburetors with and without automatic transmission throttle lever are illustrated in fig. 39.

a. Removal.

Remove the air cleaner. Disconnect the accelerator rod and choke wire from the carburetor. Remove the line connecting the fuel pump to the carburetor. Disconnect the distributor vacuum line. Remove the carburetor holding nuts and lock washers. Lift the carburetor and gaskets off the manifold.

b. Disassembly.

The throttle plate and shaft, and the choke plate and shaft should not be removed from the carburetor unless absolutely necessary as difficulty may be encountered when installing these parts in their correct position.



(1) *REMOVE AIR HORN.* Remove the carburetor fast idler rod clips and fast idle rod. Remove the screws holding the air horn on the main body and lift the air horn and the gasket off the main body.

(2) *REMOVE THROTTLE BODY.* Remove the carburetor accelerator pump to throttle shaft lever retainer and lever. Remove the throttle body to main body screws and separate the throttle body and gasket from the main body.

(3) *DISASSEMBLE MAIN BODY.* Lift the accelerating pump assembly from the main body. Remove the two nozzle bar clamps and lift the nozzle bar out of

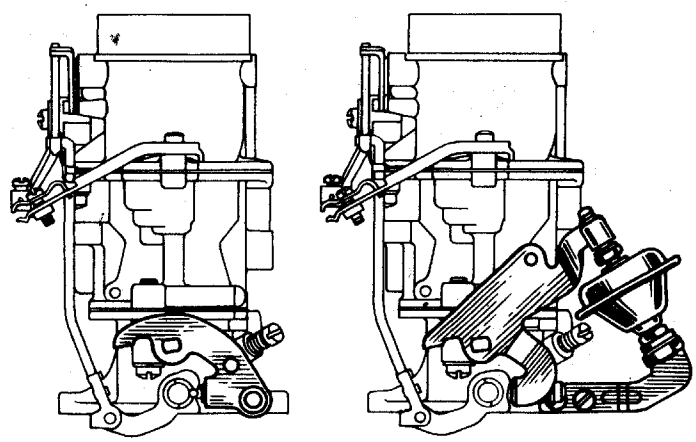


Fig. 39—1951 6-Cylinder Carburetors

the main body. Remove the power valve. Remove the main jet. Remove the pump discharge valve retainer. Remove the carburetor pump check ball retainer with a wire with a hook at one end. Place a hand over the top of the main body, and turn the body over, being careful to catch the pump check ball and the pump discharge valve. Remove the idle tube and nozzle air bleed plug from the nozzle bar.

(4) *DISASSEMBLE AIR HORN.* Remove the float hinge pin and float from the air horn. Lift the float needle valve from the valve seat. Remove the float needle valve seat. Pull the power valve piston assembly from air horn. Remove the choke lever, choke lever plunger, and spring.

If absolutely necessary, remove the two choke plate screws, hold the choke lever in the open position, and remove the choke plate shaft and spring.

(5) *DISASSEMBLE THROTTLE BODY.* Remove the carburetor idle adjustment needle and spring fig. 40. If necessary, remove the throttle plate screws and slide the throttle plate out of the throttle shaft. Remove the shaft nut, lock washer, and accelerator pump lever.

c. Cleaning and Inspection.

Many carburetor troubles are the result of deposits accumulating in the carburetor. A thorough cleaning must be performed to assure the satisfactory performance of the carburetor. Clean all parts in solvent.

(1) *THROTTLE BODY.* Remove all gum and varnish from the throttle bore. Clean the upper and lower idle discharge hole with a number 53 (0.0595) drill. Clean the distributor vacuum hole at the venturi (upper hole) with a number 56 (0.0465) drill and the lower hole with a number 55 (0.052) drill.

Inspect the fit of the throttle plate when held in the closed position and observe the amount of light that can be seen around the edges of the plate. A very snug fit is necessary for proper idling and low speed operation. The complete assembly should be discarded if wear or looseness is evident. Replace the idle adjusting needle if a ridge is visible on the valve surface.

(3) *MAIN BODY.* Clean all passages with compressed air. Replace the main body if it is cracked, has nicks large enough to permit leakage at any gasket surface, or if it has stripped threads.

Inspect the accelerating pump and replace the pump piston spring if it is broken. Replace the pump piston if the leather cup is worn or damaged, or if the piston expanding spring is broken.

Inspect the idle tube and replace if it is plugged, bent, damaged, or the screw driver slot is damaged. Replace the pump discharge needle if it is ridged. Replace the nozzle bar air bleed plug if it is clogged, threads are stripped, or if the screw driver slot is damaged. Replace the power valve if it is leaking, has a broken spring, or if the valve will not seat.

(4) *AIR HORN.* Replace the air horn if it is cracked or has nicks large enough to permit leakage at any gasket surface.

Close the choke plate and hold the horn in position to observe the fit of the plate in the air horn. If the choke plate does not fit tightly or if the shaft is loose, replace the air horn assembly.

Inspect the solder on the float to make certain the float does not leak. Inspect the float for leaks by holding the float under water that has been heated to just below the boiling point. Bubbles will appear if the float leaks. Another method to detect a leaking float is to

hrottle Body,

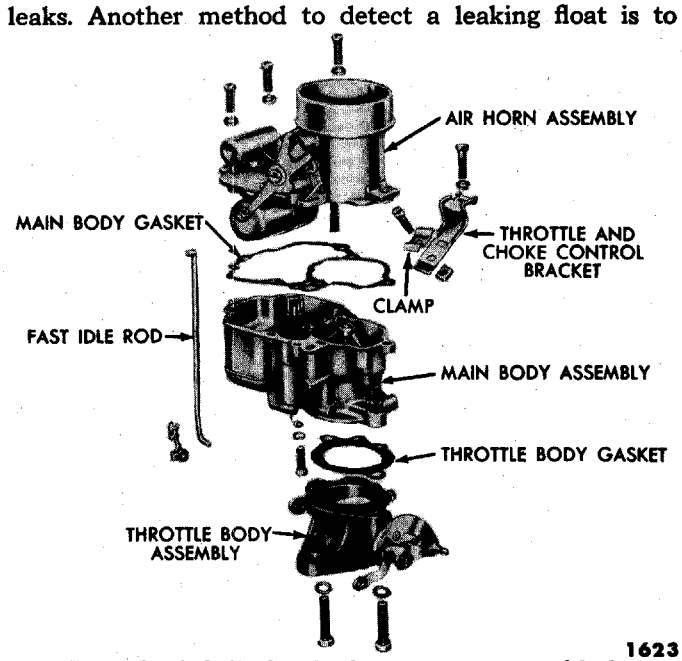


Fig. 41—6-Cylinder Carburetor, Disassembled

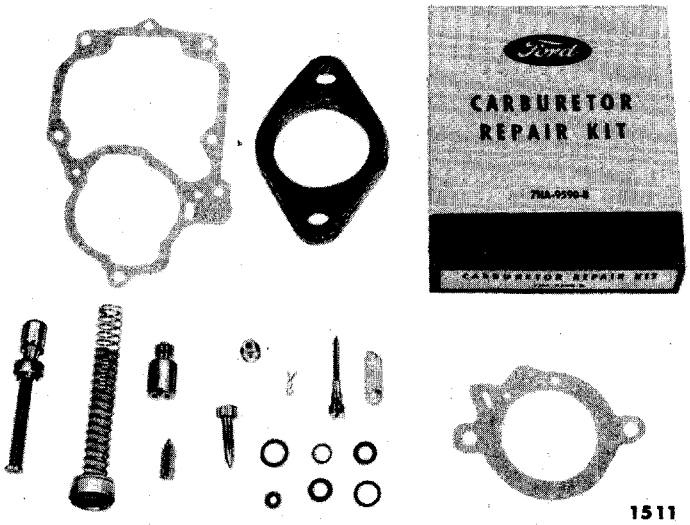


Fig. 42—6-Cylinder Carburetor Overhaul Kit

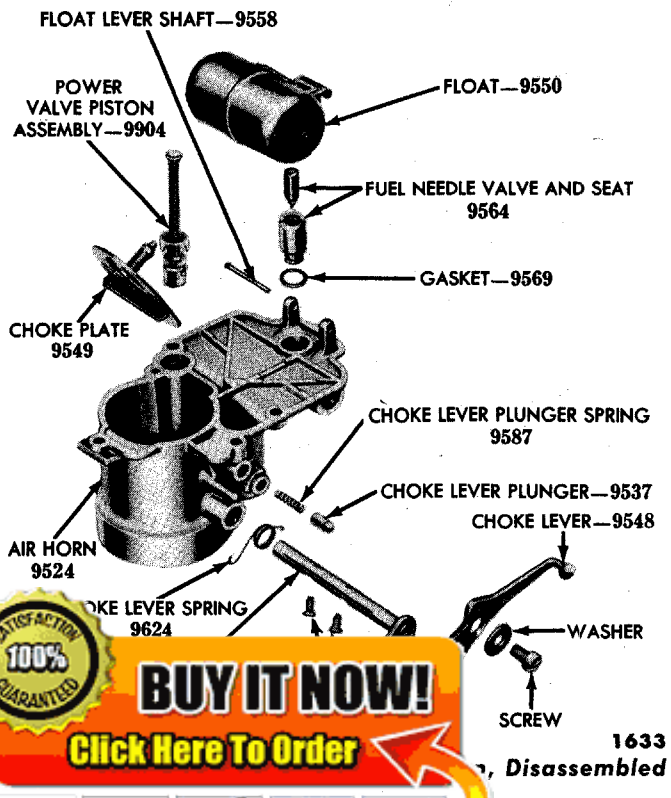
shake the float and see if gasoline can be detected inside the float. If the float leaks, replace it with a new one. Polish the fuel needle contact surface of the float arm.

Inspect the fuel inlet needle valve and seat, and replace both parts if there is any indication of wear on either part. The parts are supplied in matched sets.

Make a visual inspection of the choke lever for wear in the "v" opening. Replace the choke lever if excessive wear is evident.

d. Assembly.

Always install new gaskets when rebuilding the carburetor. A carburetor overhaul kit is also available



, Disassembled

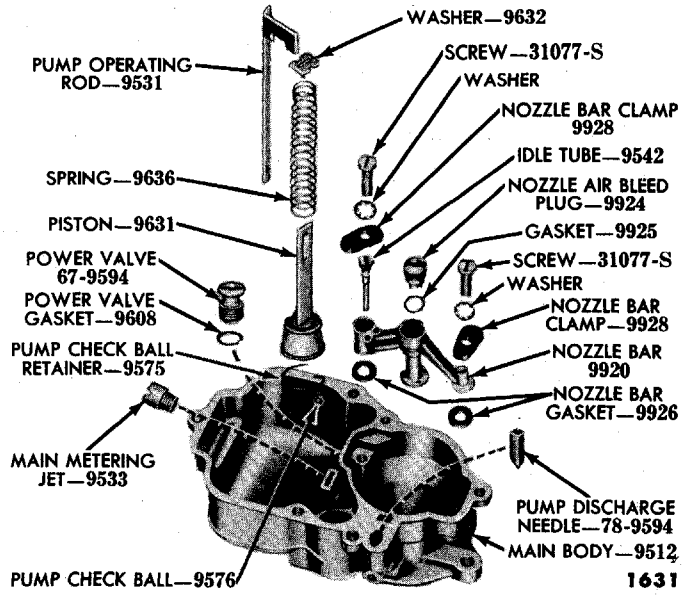


Fig. 44—6-Cylinder Carburetor Main Body, Disassembled

and contains the parts shown in fig. 42. Figure 41 illustrates the carburetor disassembled.

(1) *ASSEMBLE AIR HORN.* Install the float needle valve seat and new gasket fig. 43. Install the choke shaft and choke shaft spring if these parts had been removed. Be sure the choke shaft spring is on the peg provided on the air horn so the choke plate will remain in the closed position. Place the choke plate in the shaft, and install new choke plate screws but do not tighten the screws. Centralize the valve by tapping it lightly. Hold the valve in place while tightening the screws. Stake the screws in place on the shaft.

Install the choke lever, plunger, and spring on the air horn. Place the choke lever on the boss. Make sure the stop on the choke shaft lever is in the "v" of the choke lever. Install the piston and stem power valve piston assembly in the air horn.

Install the float needle valve and float in the air horn. Adjust the float level to 1.322-1.353 inches.

(2) *ASSEMBLE MAIN BODY.* Place a new gasket on the power valve and install the valve in the main body (fig. 44). Install the correct size main jet. Table 3 shows the available main jets. Place the pump check ball in the forward hole in the pump bore. Install the

Table 3—6-Cylinder Carburetor Main Jets

Carburetor Part No.	Use	1949 and Early 1950 Jet		Late 1950 and 1951 Jet	
		Part No.	Size	Part No.	Size
8HA-9510-A	Up to 5,000 ft. alt.	5GA-9533-A	0.065	1GA-9533-A	0.064
8HA-9510-B	5,000 to 10,000 ft. alt.	5GA-9533-B	0.063	1GA-9533-B	0.062
8HA-9510-C	10,000 to 15,000 ft. alt.	5GA-9533-C	0.061	1GA-9533-C	0.060
8HA-9510-D	15,000 ft. alt. and up	5GA-9533-D	0.059	1GA-9533-D	0.058

check ball retainer in the pump bore, making sure the bent end of the retainer is over the check ball. Install the pump discharge needle and retainer. Install the idle tube (fig. 44) in the nozzle bar. Place a new gasket on each nozzle seat in the main body. Position the nozzle bar and install the nozzle bar clamps, lock washers, and screws. Install the air bleed plug and gasket. Install the pump piston assembly.

(3) *ASSEMBLE THROTTLE BODY.* Install the adjusting needle and spring.

If throttle plate and shaft were removed, slide the shaft into the throttle body. Install the accelerating pump lever and secure with the lock washer and nut. Place the throttle plate in the shaft, and install new throttle plate screws but do not tighten the screws. Centralize the valve by tapping it lightly. Hold the valve in place while tightening screws. Stake the screws.

(4) *ASSEMBLE THROTTLE BODY TO MAIN BODY.* Position a new throttle body gasket on the main body and secure the throttle body to the main body. Insert the grooved pin (long pin) of the pump link in the pump operating rod and the other pin in the pump operating lever. Install the pump link retainer in the groove of the pin. The hole farthest from the pivot point is for extreme cold temperatures. The hole nearest to the pivot is for extreme hot temperatures. The center hole is for average driving conditions.

(5) *ASSEMBLE AIR HORN TO MAIN BODY.* Position a new gasket on the main body. Position the air horn on the main body and secure with the screws. Be sure to install the choke control bracket under the rear screw. Install the idle lever on the throttle body. Install a cotter pin to secure the lever in place. Connect the fast idle rod to the choke shaft lever. Connect the idle lever to the fast idle rod.

e. Installation.

Position a new gasket on the manifold. Place the carburetor on the manifold and secure with the lock washers and nuts. Tighten the nuts evenly. Connect the choke, and throttle linkage to the carburetor. Connect the fuel line and the distributor vacuum line. Place air cleaner on the carburetor and tighten clamp.

6. 8-CYLINDER CARBURETOR OVERHAUL

The procedure for removing, overhauling, and installing the 8-cylinder carburetor is covered in this section under "a. Removal," "b. Disassembly," "c. Cleaning and Inspection," "d. Assembly," and "e. Installation."

a. Removal.

Remove the air cleaner. Disconnect the accelerator rod and choke wire at the carburetor.

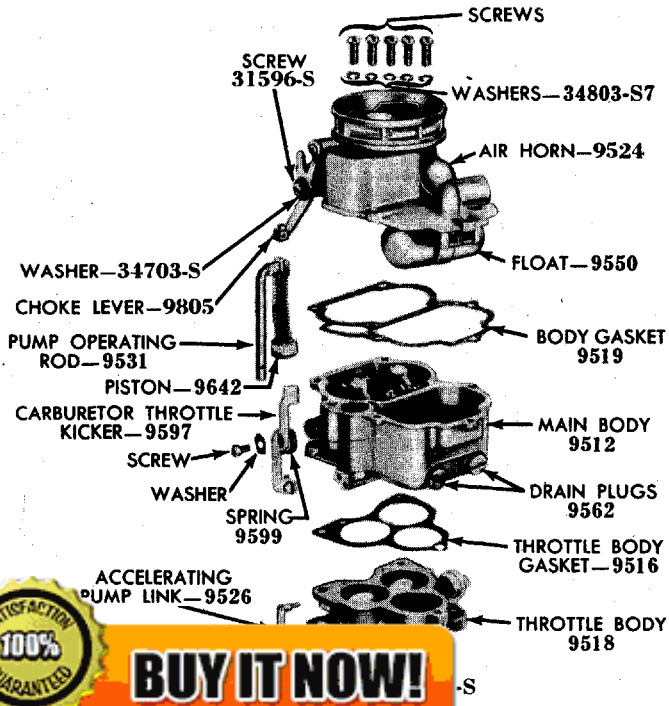


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Fig. 45—8-Cylinder Carburetor Disassembled

Remove the line connecting the fuel pump to the carburetor. Disconnect the distributor vacuum line. Remove

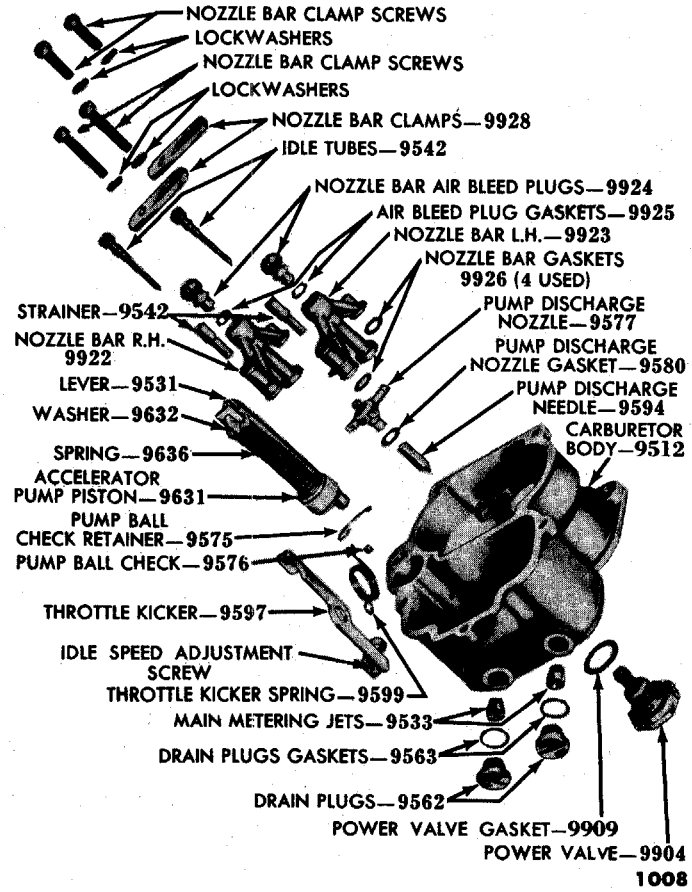

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Fig. 46—8-Cylinder Carburetor Main Body, Disassembled

the carburetor holding nuts and lock washers then lift the carburetor and gaskets off the manifold.

b. Disassembly.

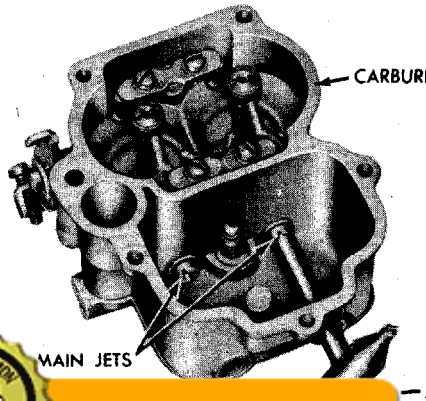
The throttle plate and shaft and the choke plate and shaft should not be removed from the carburetor, unless absolutely necessary as difficulty may be encountered in installing these parts in their correct position.

(1) *REMOVE CHOKE LEVER AND THROTTLE KICKER.* Remove the screw and flat washer that secure the choke lever to the air horn, and remove the lever, fig. 45. Lift the choke lever plunger and spring from the air horn. Remove the screw and washer holding the throttle kicker to the main body. Lift the throttle kicker and spring from the main body. Disconnect the pump link from the pump rod and throttle shaft lever.

(2) *REMOVE THROTTLE BODY AND AIR HORN FROM MAIN BODY.* Remove the screws holding the throttle body to the main body. Lift the throttle body and gasket from the main body. Remove the screws holding the air horn on the main body. Lift the air horn and gasket from the main body.

(3) *DISASSEMBLE MAIN BODY.* Lift the accelerating pump assembly from the main body (fig. 46). Remove the screw from each nozzle bar clamp and remove the clamps. Lift the pump discharge nozzle and the two nozzle bars from the main body. Remove the two drain plugs and gaskets from the main body. Remove the two main jets as shown in fig. 47. Remove the power valve and gasket. Remove the pump check ball retainer from the main body. A tool for this operation can be made by bending the end of a small wire to form a hook. Insert the hook into the bore and engage the end of the retainer. Turn the assembly upside down, besure to catch the pump check ball and pump discharge needle.

(4) *DISASSEMBLE AIR HORN.* Remove the float lever shaft, float, and float needle valve from the air horn (fig. 48). Remove the float needle valve seat with a jet wrench. Remove the screws holding the choke plate to



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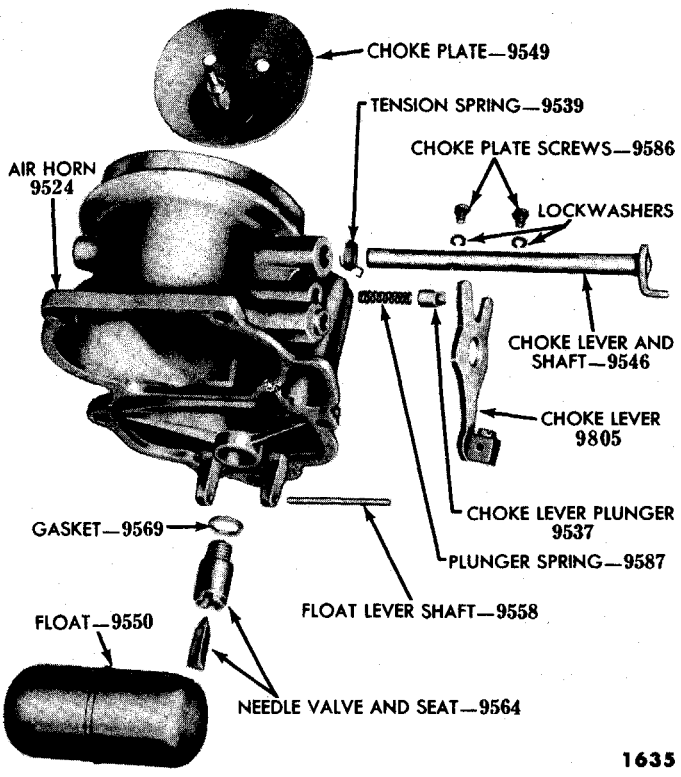

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Fig. 48—8-Cylinder Carburetor Air Horn, Disassembled

the choke shaft. Remove the choke plate from the shaft, then remove the shaft.

(5) *DISASSEMBLE THROTTLE BODY.* Remove the two idle fuel needles and springs (fig. 49). Remove the throttle plates. Remove the throttle lever stop spring and throttle lever. Slide the shaft out of the throttle body.

c. Cleaning and Inspection.

Many carburetor troubles are the result of deposits accumulating in the carburetor. A thorough cleaning must be performed to assure the satisfactory performance of the carburetor.

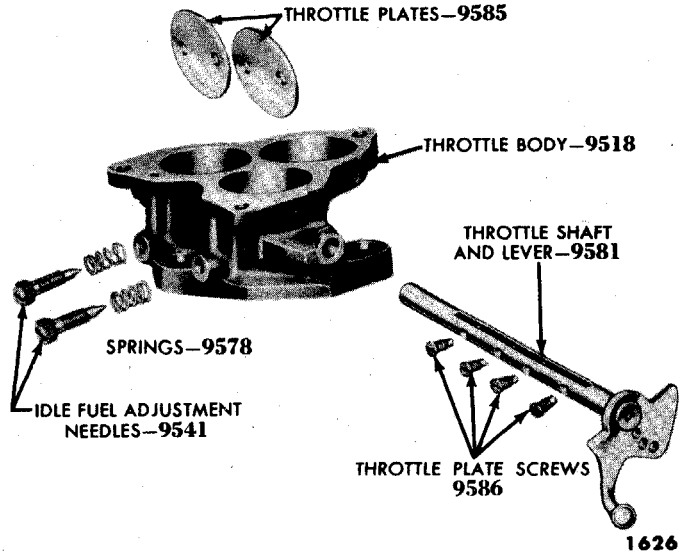

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Fig. 49—8-Cylinder Throttle Body, Disassembled

Clean all parts in a cleaning solvent except the carburetor power valve. Cleaning solvent may damage the power valve diaphragm.

(1) *THROTTLE BODY.* Make certain that any gum or varnish is removed from the throttle bores. Clean the upper idle feed holes in the throat above the throttle plates with drills number 60 (0.040) and number 65 (0.035), drill and the lower idle discharge holes with a number 56 (0.0465) drill. Clean the distributor vacuum hole in the carburetor throttle body with a number 56 (0.0465) drill. Clean the idle adjusting holes.

Inspect the fit of the throttle plates when held in the closed position and observe the amount of light that can be seen around the edges of the plate. A very snug fit is necessary for proper idling and low speed operation. The complete assembly should be discarded if wear or looseness is evident.

Replace the idle adjusting needle if a ridge is visible on the valve surface of the needle.

(2) *MAIN BODY.* Clean all passages with compressed air. Replace the main body if it is cracked, has nicks large enough to permit leakage at any gasket surface, or if it has stripped threads.

Inspect the accelerating pump and replace the pump piston spring if it is broken. Replace the pump piston if the leather cup is worn or damaged, or if the piston expander spring is broken.

Inspect the idle tube and replace if it is plugged, bent, damaged, or the screw driver slot is damaged. Replace the pump discharge needle if it is ridged. Replace the nozzle bar air bleed plug if it is clogged, threads are stripped, or if the screw driver slot is damaged.

Replace the pump discharge nozzle if it is plugged, broken, or damaged in any way.

Examine the power valve seat and replace the body if the seat is damaged so that the valve will not seat properly. This would cause fuel to leak into the lower body and affect the fuel mixture.

(3) *AIR HORN.* Replace the air horn if it is cracked or has nicks large enough to permit leakage at any gasket surface.

Close the choke plate and hold the air horn in position to observe the fit of the plates in the air horn. If the choke plate does not fit tightly or the shaft is loose, replace the air horn assembly.

Inspect the solder on the float to make certain the float does not leak. Inspect the float for leaks by holding the float under water that has been heated to just below the boiling point. Bubbles will appear if the float leaks. A leaking float can frequently be detected by shaking the float vigorously, and observe the noise made by any fuel inside the float. If the float leaks replace with a new float. Polish the fuel needle contact surface of the float arm.

Inspect the fuel inlet needle valve and seat, and replace both parts if there is any indication of wear on either parts as the fuel needle valve and seat are matched in sets. Make a visual inspection of the choke lever for wear in the "v" opening which operates the lever on the choke plate shaft. Replace the choke lever if the wear is excessive.

d. Assembly.

Always use new gaskets when rebuilding the carburetor. The gasket kit shown in fig. 50 is available from Ford Dealers. An overhaul carburetor kit is also available and contains the parts shown in fig. 51.

(1) *ASSEMBLE AIR HORN.* Install the float needle valve seat and new gasket. Install the choke shaft and choke shaft spring in the air horn. Be sure the choke shaft spring is in the slot provided in the air horn so the choke plate will remain in the closed position. Place the choke plate in the shaft and install new choke plate screws but do not tighten the screws. Centralize the valve by tapping it lightly. Hold the valve in place while tightening the screws. Stake the screws in place on the shaft. Install the float needle valve and float in the air horn. Adjust the float level to 1.322-1.353 inches.

(2) *ASSEMBLE MAIN BODY.* Install standard size number 51 main jets for sea level operation. At altitudes of 5,000 to 10,000 feet use number 49 and higher altitudes use number 47. Install the two drain plugs

Gasket Kit

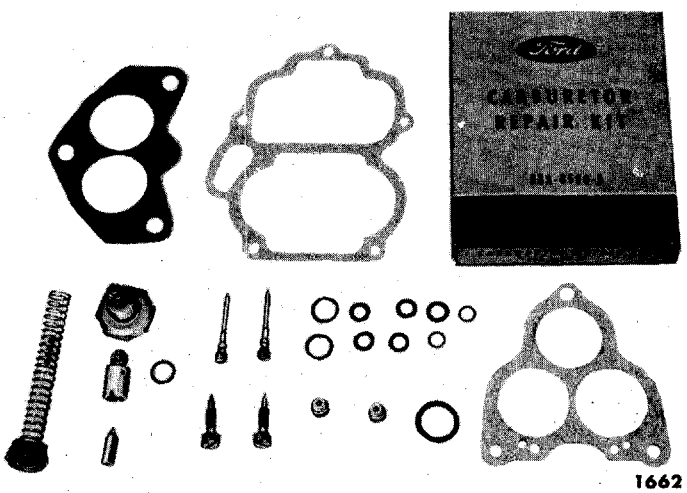

Fig. 51—8-Cylinder Carburetor Repair Kit

with new drain plug gaskets. Install the power valve, using a new gasket. Position the pump discharge needle, pump discharge nozzle, and a new gasket in the main body. Place four new nozzle bar gaskets in the main body. Place the two nozzle bars in position with the air bleeds close to the pump discharge nozzle and secure with the two nozzle bar clamps.

NOTE: ***The two long screws are used at the pump discharge side.***

Install the pump check ball and retainer. Install the accelerator pump.

(3) *ASSEMBLE THROTTLE BODY.* Insert the throttle shaft in the throttle body. Position the throttle valve in the shaft. Install new throttle valve screws but do not tighten them. Centralize valves by tapping lightly and hold in place while tightening the throttle valve screws. Stake the screws in position. Install the throttle lever, spring, and throttle lever stop.

(4) *INSTALL THROTTLE BODY AND AIR HORN ON MAIN BODY.* Place a new throttle body gasket on the main body. Secure the throttle body to the main body with three screws and lock washers. Place a new gasket on the main body and secure the air horn to the main body with the screws and lock washers. Install the accelerator pump link and be sure to use the correct adjustment hole.

(5) *INSTALL CHOKE LEVER AND THROTTLE KICKER.* Attach the throttle kicker and spring to the main body with a screw and flat washer. Install the choke lever plunger spring and plunger in the main body. Install the choke lever.

e. Installation.

Position a new gasket on the manifold. Place the carburetor on the manifold, install the lock washer and nuts. Tighten the nuts evenly. Connect the choke and throttle linkage to the carburetor. Connect the fuel line and the distributor vacuum line. Place the air cleaner on the carburetor, and tighten the clamp.

7. FUEL PUMPS AND VACUUM BOOSTER

The fuel pump used on the 6 and 8-cylinder engines are the same except differences in the method of operating these pumps. The 8-cylinder fuel pump is driven by a push rod which is activated by an eccentric on the camshaft (fig. 52).

The 6-cylinder fuel pump is driven directly off the camshaft eccentric (fig. 53).

A combination fuel pump and vacuum booster is available as standard equipment on late 1950 and 1951 cars equipped with Overdrive. This unit is actuated by the camshaft as the single fuel pump assemblies. The operation, testing, replacement, and overhaul of the 6 and 8-cylinder fuel pump as given in "**a.** Fuel Pumps." "**b.** Fuel Pump and Vacuum Booster" covers the operation, testing, replacement, and overhaul of the combination fuel pump and vacuum booster.

a. Fuel Pumps.

For servicing the fuel pump, kits are available for both the 6 and 8-cylinder engines (fig. 54 and 55).

(1) *OPERATION.* The rotation of the camshaft eccentric actuates the rocker arm "A" (through a push rod in the 8-cylinder engine fig. 56) which pulls the link "B" and diaphragm "C" downward against spring pressure "D," which creates a vacuum in the pump chamber "E."

On the suction stroke of the pump, fuel from the gas tank enters through the inlet into the sediment bowl "F" and passes through the strainer "G" and then through the inlet valve "H" into the pump chamber "E."

On the return stroke, spring pressure "D" pushes the diaphragm upward, forcing the fuel from the chamber "E" through the outlet valve "J" and through chamber "K" to the carburetor.

When the carburetor bowl is filled to the correct level, the float valve will close, thus creating a pressure in the pump chamber "E." This pressure holds the diaphragm "C" downward against spring pressure "D" where it will remain inoperative until the carburetor requires further fuel and the float opens the float valve.

(2) *TESTS.* The following fuel pump tests can be performed with the fuel pump on the engine.

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l Pump

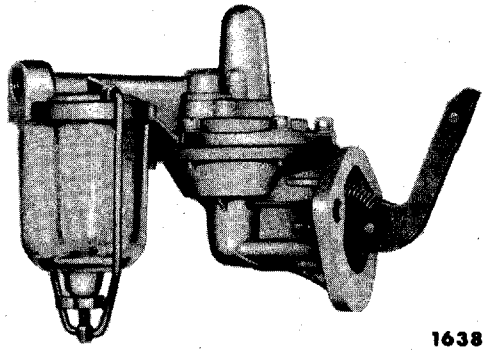

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Fig. 53—6-Cylinder Engine Fuel Pump

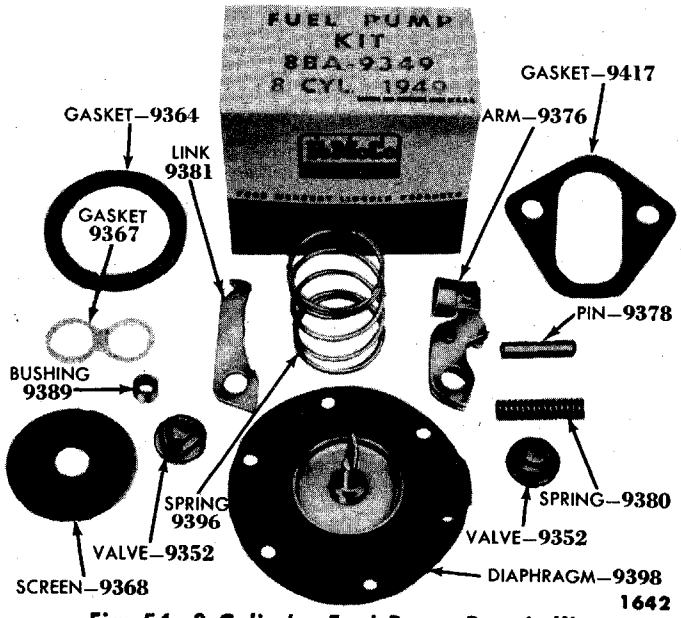


Fig. 54—8-Cylinder Fuel Pump Repair Kit

(a) PRESSURE TEST. Disconnect the carburetor line at the fuel pump and attach a fuel pump pressure test gauge to fuel pump outlet (fig. 57).

Operate the engine at idle speed on the fuel remaining in the carburetor and observe the pressure reading on the gauge. Pressure reading should be 4 to 5 pounds per square inch for 6 cylinder and 3½ to 4½ for 8-cylinder engines.

(b) VACUUM TEST. Install the vacuum gauge on the inlet side of the fuel pump. Operate the engine at idle speed and observe the reading on the gauge. The pump

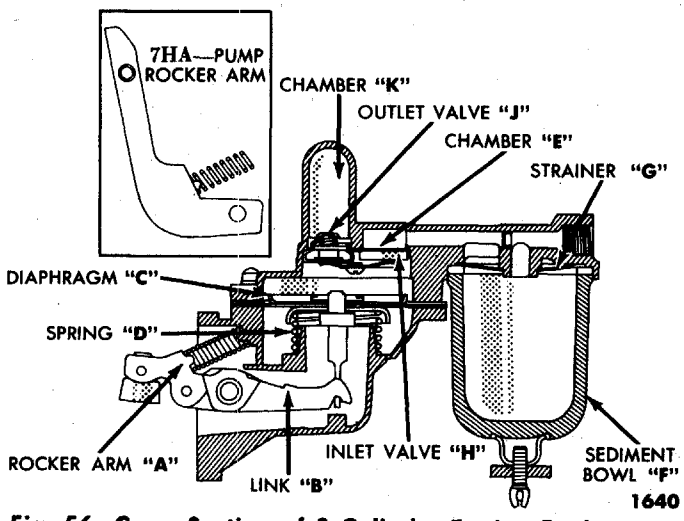


Fig. 56—Cross Section of 8-Cylinder Engine Fuel Pump

vacuum should increase until the gauge indicates a vacuum of at least 10 inches of mercury. Stop the engine and the gauge pointer should fall slowly at a rate which will not allow it to reach zero in less than one minute. If the rate is faster the intake valve is at fault.

(c) CAPACITY TEST. The capacity test is necessary only when the pressure is within specifications.

Install a fitting with rubber tubing on the fuel pump outlet. Position the end of the rubber tube in a pint measure at the same height as the carburetor. Operate the engine at idle speed. Observe the time required to fill the one pint measure (should be 45 seconds or less).

(3) *REMOVAL.* The procedure for removing the fuel pump from the 6- and 8-cylinder engines is given below:

(a) 6-CYLINDER. Disconnect the two fuel lines at the fuel pump. Remove the two cap screws and the fuel pump from the engine block.

(b) 8-CYLINDER. Disconnect the two fuel lines at the the dash connection, and unscrew the line from the pump. Disconnect the fuel pump to carburetor fuel line. Remove the two cap screws and the fuel pump.

(4) *DISASSEMBLY.* Remove the glass sediment bowl gasket and screen. Scratch a line on the pump

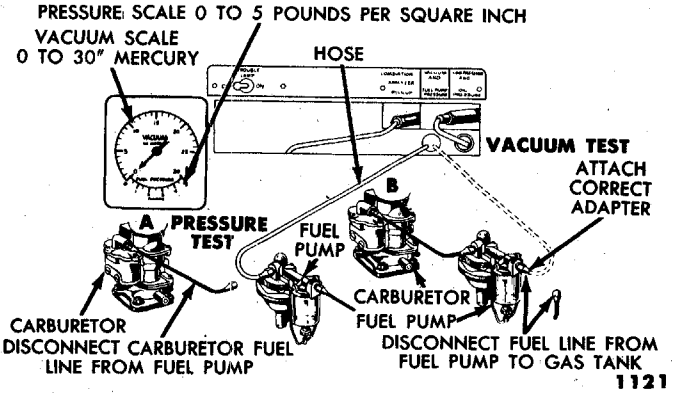


Fig. 57—Fuel Pump Vacuum and Pressure Tests

cover and body so that on reassembly inlet and outlet holes will be in the correct position.

Remove the upset end of the rocker arm pin and drive out the rocker arm pin using a long drift.

Remove the screws holding the cover to the pump body while holding down on the fuel cover until all screws are removed.

Turn diaphragm slightly to unhook the eye in the pull rod from the rocker arm and remove the diaphragm and spring. Remove the rocker arm and spring. Remove the valve plate and lift the intake and outlet valves from the cover. Figure 58 illustrates the relative position of the 8-cylinder fuel pump parts. The 6-cylinder pump is similar except the method of drive is different.

(5) *CLEANING AND INSPECTION.* Clean the bowl, and fuel pump housing. Make certain that all corrosion is removed. Inspect the housing for cracks or other damage and replace if required. It is advisable to install the parts included in the repair kit when rebuilding the fuel pump.

NOTE: ***Always use new gaskets when rebuilding a fuel pump.***

(6) *ASSEMBLY.* Position the rocker arm and bushing in the 6-cylinder fuel pump body. For the 8-cylinder pump, place the link rocker arm bushing and rocker arm in position in the body.

Install the rocker arm pin. Place the diaphragm spring and diaphragm in the body, and hook the diaphragm pull rod on the lower link. Install the rocker arm spring in the rocker arm. Install the valve gaskets, valves, and plate in the pump cover. Hold the rocker arm in the up position and position the cover on the pump body. Install the screws, release the rocker arm, and tighten the screws evenly. Install the sediment bowl gasket and bowl.

(7) *INSTALLATION.* The procedure for installing the fuel pump is given below:

(a) 6-CYLINDER. Install a new gasket and place the pump in position on the block. Make sure the rocker arm is against the eccentric on the camshaft. Secure the pump with two cap screws. Connect the two fuel lines.

(b) 8-CYLINDER. Install a new gasket and place the pump in position. Make sure the rocker arm socket is properly seated on the push rod inside. Secure the pump to the adapter with the two cap screws. Connect the two fuel lines to the pump.

b. Fuel Pump and Vacuum Booster.

An overhaul kit (fig. 59) for servicing the combination fuel pump and vacuum booster is available.

(1) *OPERATION.* The rocker arm "A" actuated by the pump push rod, as shown in fig. 60, moves the two links "L" to which the booster diaphragm "M" is hooked, downward against the diaphragm spring "N" which expels the air in the lower pump chamber "O" through the exhaust valve "P" and through the line to the intake manifold. On the return stroke, the spring moves the diaphragm upward, creating a suction in the pump chamber "O," opening the intake valve and drawing air through the inlet line "Q" from the windshield wiper.

When the windshield wiper is not being used, the manifold vacuum holds the diaphragm down against the spring pressure so that the diaphragm does not make a complete stroke for every stroke of the rocker. Figure 60 shows a cross-section of the combination fuel and vacuum booster pump.

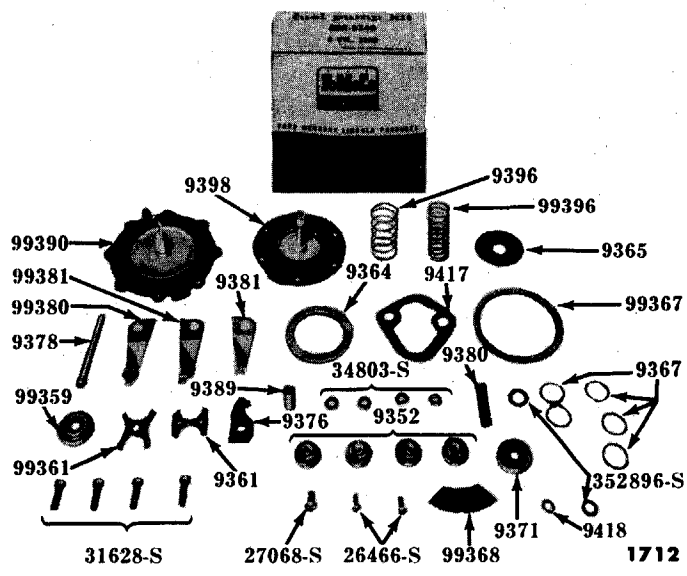


Fig. 59—Fuel Pump and Vacuum Booster Kit

(2) *TEST.* Disconnect both inlet and outlet lines at the vacuum booster. Attach a vacuum gauge to the wiper motor side of the booster.

Operate the engine at 1000 r.p.m. and observe the reading. The reading should be between 7 and 12 inches of vacuum. If reading is less than 7 inches of vacuum the vacuum pump is not operating properly.

CAUTION: ***When making this test the pump outlet should always be open as a closed outlet will damage the unit.***

(3) *REMOVAL.* Disconnect the fuel and vacuum lines at the fuel pump and booster. Remove the pump holding screws and remove the pump.

(4) *DISASSEMBLY.* Remove the sediment bowl, gasket, and screen. Scratch a mark in line on both the fuel and vacuum diaphragm flanges so these parts may be reassembled in their correct position. Remove only two cover screws from opposite sides of the vacuum section and install two 10-32x1½ inch screws. Remove remaining short screws, then back out the two long screws until the heavy spring tension is relieved. When removing the diaphragm, avoid the possibility of damaging the built-in oil seal by first removing the rocker arm pin, then wiggle the rocker arm to disconnect the links from the diaphragm pull rods. This permits the diaphragm to be drawn straight out of the body oil seal.

Place the pump in a vise with fuel pump section on top. Remove screws from the fuel cover while holding the fuel cover down until all screws are removed, then release the pressure on the cover gradually until the spring is expanded.

Remove the retainer holding the valves in the fuel cover and remove the valves and gaskets. Remove the retainer holding the valves in the vacuum cover and remove valves and gaskets.

(5) *CLEANING AND INSPECTION.* Clean the sediment bowl and fuel and vacuum booster housing. Inspect the housing for cracks or damage and replace if required. It is advisable to replace all parts in the assembly with the new parts included in the repair kit.

(6) *ASSEMBLY.* Position the spacer with the projection for the rocker arm coil spring on each side of the fuel pump link (short link) so that the holes line up and the projection on the spacer for the spring points toward the hood end of the link. Place one long link on each side of spacer so that holes line up and so that hook ends of long links come together. Be sure hooks on long links point in the same direction as hook on ink. Insert links and spacer in fork of rocker arm face of rocker arm od cup is down on the holes in rock-

mp body. Insert a long tapered drift in place of rocker arm pin. Install the new rocker arm pin, driving out the drift. Place the flat washer over the pin and peen the hollow end of the pin over the washer. Install new oil seal in fuel pump side of pump body casting with lip toward the rocker arm side.

Place new gaskets in recess of fuel cover. Install outlet valve in center recess so three legs of valve caps are down. Install inlet valve in outer recess so three legs are up. Then install retainer with forks over the valve cages and hump in retainer up. Position the spring between the fuel diaphragm and housing. Position the fuel diaphragm in the housing and hook the short center link to the diaphragm pull rod.

Assemble the fuel cover and place the cover over the diaphragm. Be sure to align the marks on the flanges and retain the cover with the screws until they just engage the lockwashers.

Push the rocker arm in all the way and do not release until all cover screws are tightened.

Hook vacuum diaphragm to both long links.

Install the inlet and outlet valves in the vacuum body. Install the heavy spring over the diaphragm. Align the housing marks and pull the cover down with the two 10-32x1½ inch screws. Install short screws. Remove the long screws and tighten all cover screws securely. Install a new bowl gasket and the sediment bowl.

(7) *INSTALLATION.* The procedure for installing the fuel pump with booster is given below:

(a) 6-CYLINDER. Position a new gasket on the block. Place the pump in position. Make sure the rocker arm

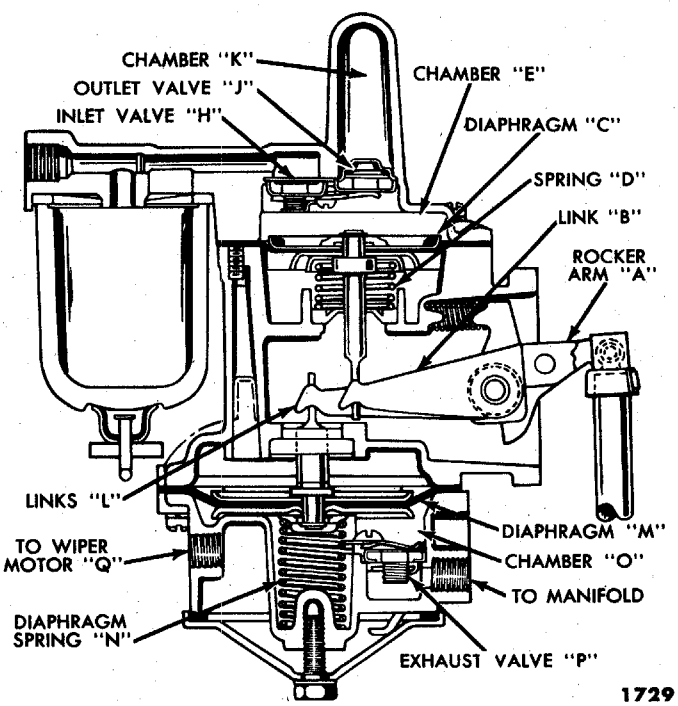


Fig. 60—Fuel Pump and Vacuum Booster

is against the eccentric on the camshaft. Tighten the nuts 15-20 foot-pounds torque. Connect the vacuum lines and the fuel lines.

(b) 8-CYLINDER. Position a new gasket on the adapter. Install the pump on the adapter, tighten screws to 6-9 foot-pounds torque. Make sure the rocker arm socket is properly seated on the push rod. Connect the vacuum and fuel lines.

8. FUEL TANKS AND LINES

The fuel tank is mounted on the bottom of the body rear compartment floor pan and is held in position by two metal straps. The fuel gauge sending unit may be removed from the tank thru the opening in the floor pan. A fuel line fastened to the frame left-hand side rail connects the tank to the fuel pump.

The procedure for replacing the fuel tank is given in "a. Fuel Tank Replacement." "b. Fuel Line Replacement" covers the replacement of the fuel line.

a. Fuel Tank Replacement.

Before removing the tank, be sure to drain all of the fuel from the tank.

(1) *REMOVAL.* Loosen the clamp on the filler pipe and pull it away from the tank (fig. 61).

Disconnect the fuel line at the tank. Remove the nuts and lock washers from the fuel tank support lower strap assemblies. Lower the tank. Disconnect the fuel gauge wire, then remove the fuel gauge sender unit.

(2) *INSTALLATION.* Install the fuel tank drain plug. Position the fuel gauge gasket on the tank. Install the fuel gauge sending unit. Tighten the screw securely. Connect the fuel gauge wire to the terminal on the fuel gauge sending unit. Place the fuel tank in position under the body rear compartment floor pan. Install the fuel tank support strap assemblies. Connect the fuel line to the fuel tank. Place the filler pipe to fuel tank hose in position and install the hose clamp. Fill the tank and check the fuel line connection for leaks.

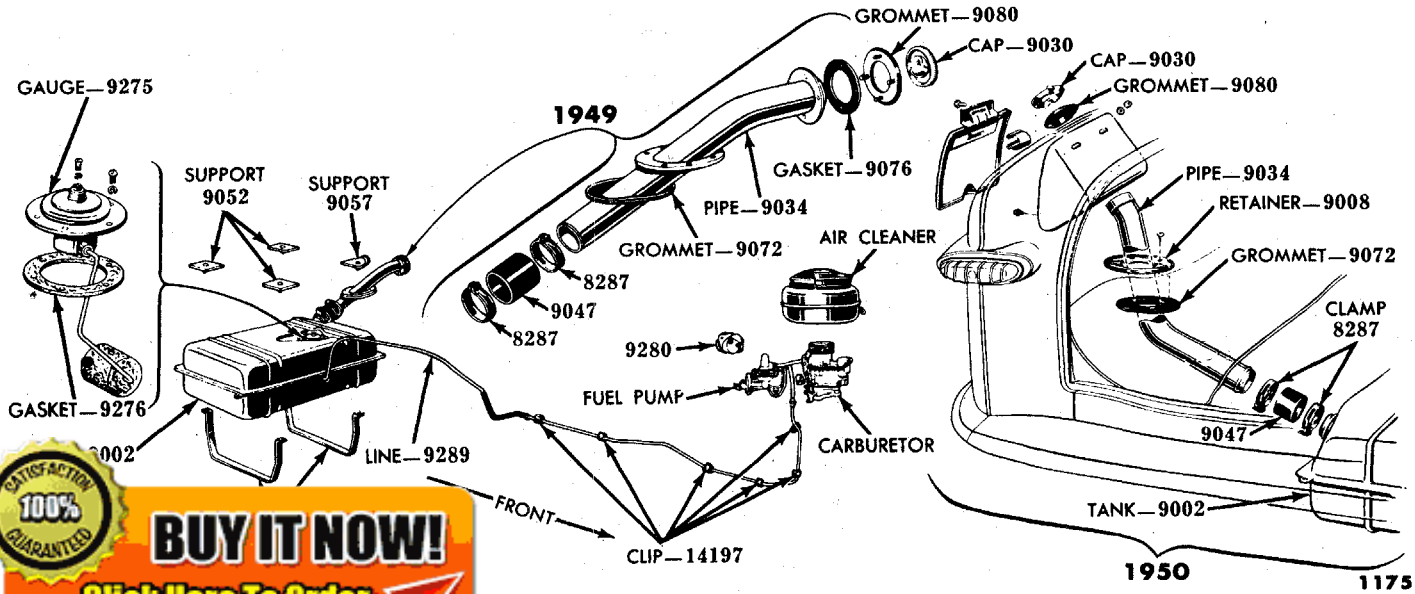
b. Fuel Line Replacement.

The fuel line connecting the fuel tank to the flexible line at the fuel pump is a 5/16 inch outside diameter line. The 5/16 inch line is available in 25 foot rolls for service. A 1/4 inch line connects the fuel pump to the carburetor. This 1/4 inch line cut to the correct length with the two connectors and ferrules installed, is available for service.

(1) *REMOVAL.* Drain the fuel from the tank. Disconnect the fuel line at the fuel tank, fuel pump flexible hose, and at the intermediate sections. Remove the lines from the holding clips and remove the lines. Slide the loom off the line.

(2) *INSTALLATION.* Cut the new line to approximately the same length as the original line allowing additional length for the flaring operation. Square off the end with a file, then ream the sharp edges with the reamer blade on the tube cutter.

Position the looms on the new lines. Place new connections on the line and flare the ends of the lines using a flaring tool (fig. 62). Bend the new line to conform to contour of the original line. Position the line in the clips on the vehicle, and tighten the connections. Check the connections for leaks.



Fuel System—1949-1950 (1951 same as 1950)

9. FANS AND BELTS

The fans used on Ford passenger cars require no lubrication. Servicing of fans is limited to replacement in case of damage. Adjusting and replacing worn or broken belts are the service procedures required to maintain proper operation of the water pumps and generator.

a. Fans.

Different types of fans are used on the 8-cylinder and 6-cylinder engines. "(1) 8-Cylinder Fan" describes the removal and installation procedure for the B-series engine. The H-series fan removal and installation can be found under the heading "(2) 6-Cylinder Fan."

(1) *8-CYLINDER FAN.* The fan blades are secured to the hub with rivets and are not removable as in the 6-cylinder engine. A four blade fan is used on 1949 models and a three blade fan on 1950 and 1951 models.

(a) REMOVAL. Remove the four cap screws and belts and fan belt. Remove fan and bracket assembly.

(b) INSTALLATION. Position the fan and bracket assembly on the generator bracket. Install the retaining screws but do not tighten them. Install the fan belt. Adjust the belt and tighten the screws.

(2) *6-CYLINDER FAN.* A four blade fan is secured to the hub with cap screws and is detachable from the hub (three blade fan used on 1951 models).

(a) REMOVAL. Remove the four cap screws and lockwashers securing the blades to the hub. Remove the blades.

(b) INSTALLATION. Place the blades in position against the hub. Install the cap screws (with lockwashers) and tighten them securely.

b. Belts.

Proper adjustment of the fan and generator belts must be maintained at all times. A loose or broken belt will cause improper operation of the water pump and generator. A belt that is too tight places a severe strain on the water pump and generator bearings.

(1) *"H" SERIES ENGINES.* A single fan belt is adjusted by positioning the generator.

(a) ADJUSTMENT. Loosen the bolt in the slot on the generator support bracket. Move the generator either toward or away from the cylinder block until a ¼ inch deflection of the belt is obtained between the generator and water pump (fig. 63). Occasionally it is necessary to loosen the generator support bolts located at the right-hand forward side of the generator before the generator can be moved. After the adjustment is made, tighten the bolts securely.

(b) REPLACEMENT. Loosen the generator support bracket bolts. Move the generator toward the cylinder block. Remove the belt from the generator, crankshaft damper, and water pump pulley.

To install, position the belt on crankshaft damper and water pump pulley. Stretch the belt over the generator pulley and adjust. Tighten generator support belts.

(2) *"B" SERIES ENGINE.* (1949). This engine is equipped with two fan belts. The longer belt is mounted on the generator, right and left-hand water pumps, and inner crankshaft pulley groove. The shorter belt is mounted on the fan and outer crankshaft pulley groove.

(a) ADJUSTMENT. To adjust the generator belt, loosen the hub and adjusting bracket assembly adjusting nut and screws (fig. 64). Raise or lower the generator until a belt deflection of ½ inch is obtained between the generator and the left-hand water pump, then tighten the adjusting nut. Raise or lower the fan until a deflection of ½ inch is obtained on the small belt between the fan and crankshaft pulley, then tighten the adjusting screws.

To adjust the fan belt loosen the adjusting screws, and raise or lower the fan until a deflection of ½ inch is obtained on the belt between the fan and crankshaft pulley, then tighten the adjusting screws.

(b) REPLACEMENT. To remove the generator fan

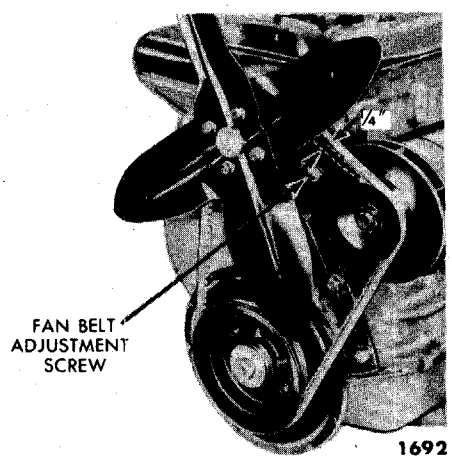


Fig. 63—Fan Belt Adjustment "H" Series Engines

belt, loosen the adjusting nut, lower the generator and fan assembly, and remove the belt.

To install, position the belt on the crankshaft, right and left-hand water pumps, and generator pulleys. Raise the generator until the belt has the proper deflection. Adjust small belt and tighten adjusting screws and nut.

To remove the small fan belt, loosen the adjusting screws, lower the fan, and remove the belt.

To install, position the belt on the crankshaft and fan pulleys. Raise the fan until the belt has the proper deflection, then tighten the adjusting screws.

(3) *"B" SERIES ENGINE* (1950-1951). This engine is equipped with two belts which are placed to form a triangle drive. One belt (generator and water pump) is mounted on the generator, left-hand water pump, and inner crankshaft pulley groove. The other belt (fan and water pump) is mounted on the fan, right-hand water pump, and outer crankshaft pulley groove.

(a) ADJUSTMENT. To adjust the generator and water pump belt, loosen the hub and bracket assembly adjusting nut. Raise or lower the generator until a belt deflection of ⅜ inch is obtained between the generator and water pump (fig. 64). Tighten the adjusting nut.

To adjust the fan and water pump belt, loosen the adjusting screw, and raise or lower the fan until belt deflection of ¼ inch is obtained between the right-hand water pump and fan. Tighten the adjusting screws.

NOTE: ***On the heavy duty belt used with the 60 ampere generator, the belt deflection between the right-hand water pump and the fan is ⅜ inch.***

(b) REPLACEMENT. To remove the fan and water pump belt, loosen the adjusting screw, lower the fan, and remove the belt.

To install, position the belt on the crankshaft, right-hand water pump, and fan pulleys. Raise the fan until the belt has the proper deflection, then tighten the adjusting screws.

To remove the generator and water pump belt, first remove the fan belt. Loosen the adjusting screws and nut, lower the generator, and remove the belt.

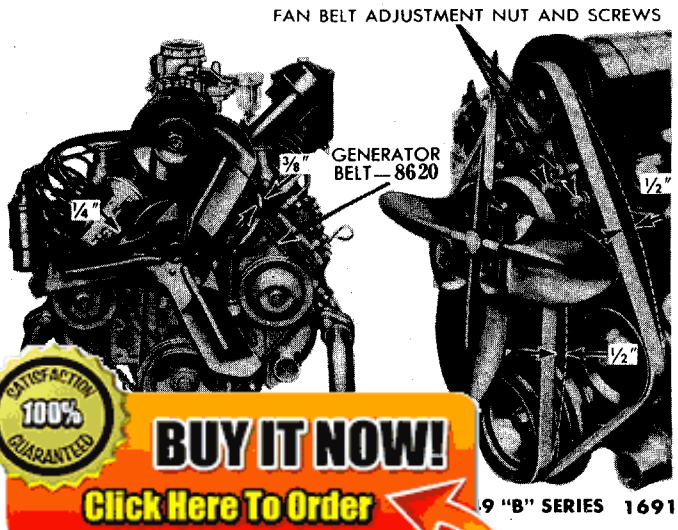
To install, position the belt on the crankshaft, left-hand water pump, and generator pulleys. Raise the generator until the belt has the proper deflection. Adjust the fan and water pump belt.

10. WATER PUMPS

Three types of water pumps are used on Ford cars. The "H" series engine is equipped with a single water pump. This water pump requires no lubrication. Two water pumps are used on the "B" series engine. Some water pumps used on early 1949 "B" series engine are equipped with a bearing that is serviced separately from the shaft. This bearing is lubricated through an oil cup located at the top of the water pump housing. Use S.A.E. 20 engine oil at installation and every 1000 miles. The bearing used on the late 1949, 1950, and 1951 "B" series engines is integral with the shaft and requires no lubrication.

When water pump difficulty is experienced, it is not necessary to replace the entire assembly as a water pump repair kit for each type water pump is available for service. Whenever a pump is disassembled, the impeller, slinger, seal, bearing, shaft, or shaft and bearing assembly should always be replaced.

Water pump repair procedures are described according to the various water pump types and appear under descriptive headings "**a.** H-Series Engine" and "**b.** B-Series Engine." The B-series water pump procedures



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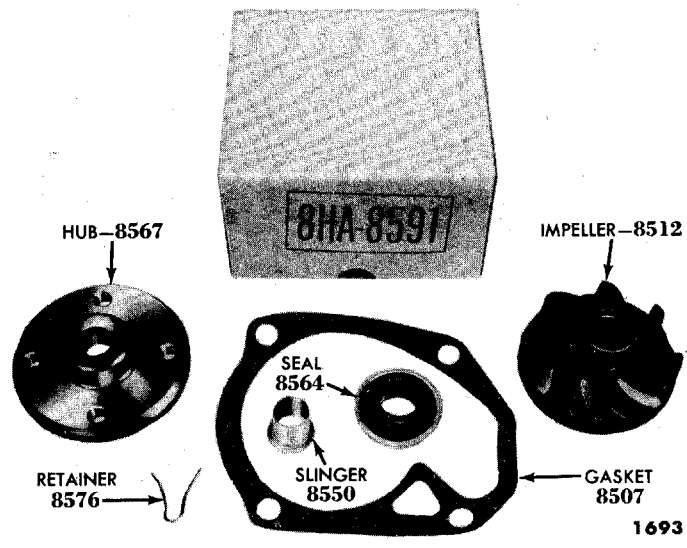


Fig. 65—6-Cylinder Water Pump Repair Kit

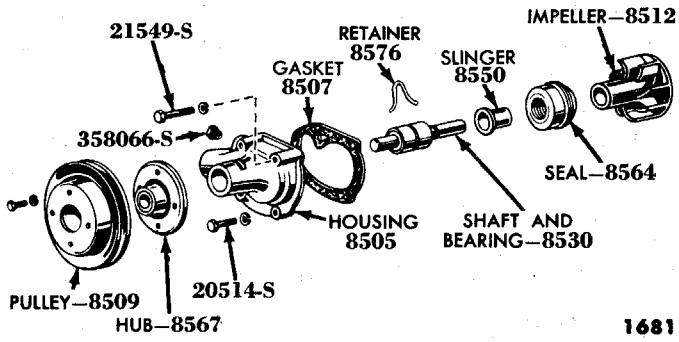


Fig. 66—Water Pump Assembly "H" Series Engine

take into account the differences in the two 8-cylinder pumps.

a. "H" Series Engine.

When repairing this type water pump, use the 8HA-8591 or 8HA-8591-B water pump repair kit (fig. 65).

(1) *REMOVAL.* Drain the radiator. Remove the fan belt, fan, and pulley. Remove the lower radiator hose and heater hose. Remove the four cap screws, water pump assembly, and gasket from the engine block.

(2) *DISASSEMBLY.* Remove the bearing retainer located in the access hole on the housing (fig. 66). Press the hub off the shaft. Press the impeller and the shaft and bearing assembly out of the housing.

(3) *ASSEMBLY.* Install a new slinger on the shaft with flange end toward bearing. Press seal assembly into the housing. Press the shaft assembly (fig. 67) into the housing, pressing on the outer shell of the bearing only. Install the bearing retainer in the access hole. Press the hub on the shaft with the flat side of the hub facing the housing.

NOTE: ***Support opposite end of shaft when installing hub.***

Position the impeller on the shaft with the flat portion out, then press the impeller on the shaft to proper position. (On 7HA-8501 pump, set impeller 0.020-0.044 inch below body face and on 0HA-8501 pump, set impeller (0.024-0.034 inch below body face.)

Bearing

Fig. 68—Early 1949 8-Cylinder Water Pump Repair Kit

(4) *INSTALLATION.* Position the new gasket and water pump assembly on the cylinder block and secure with the four cap screws. Tighten the cap screws to 27-32 foot-pounds torque. Install the lower radiator hose and heater hose. Install the pulley, fan, and fan belt. Fill the radiator with coolant.

b. "B" Series Engine.

When repairing the early type "B" series Engine water

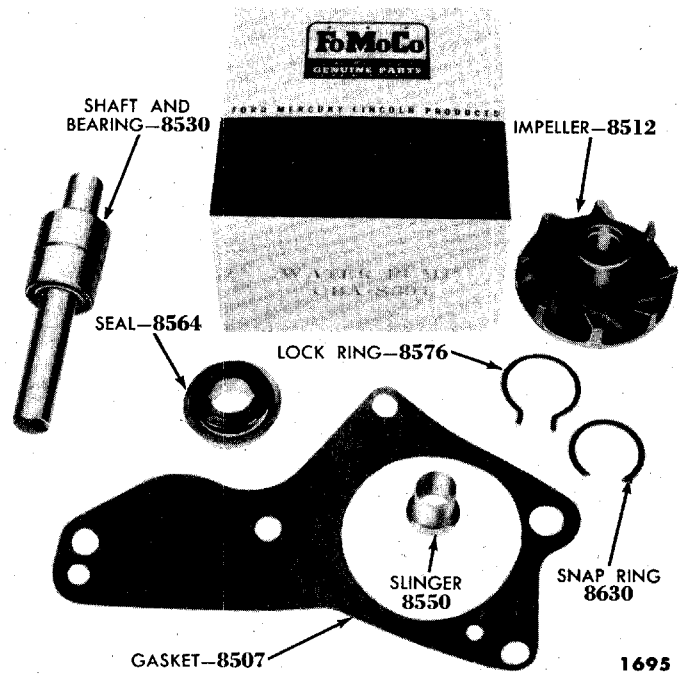


Fig. 69—Late 1949,1950, and 1951 8-Cylinder Water Pump Repair Kit

pump, use the 8BA-8591-A or 8BA-8591-B water pump repair kit (figs. 68 and 69).

(1) *REMOVAL.* Drain the radiator. Remove the fan belts. Remove the water pump to radiator hose. Place a jack or other support under the engine, then remove the two cap screws securing the water pump to the engine front support. Remove the cap screw located inside the pump hose opening. Remove the remaining three cap screws, water pump assembly, and gasket from the cylinder block.

(2) *DISASSEMBLY.* Because of the differences in design and disassembly procedures for the early "B" series and the late "B" series water pumps are described separately.

(a) EARLY "B" SERIES. Using a suitable puller, remove the pulley (fig. 70) from the shaft. Remove the bearing retainer located in the access hole in the housing. Press the impeller off the shaft by pressing the shaft and bearing out through the front end of the housing. Press the bushing, slinger, and seal out through the impeller end of the housing. Press the bearing off the shaft and, if necessary, remove the lock ring.

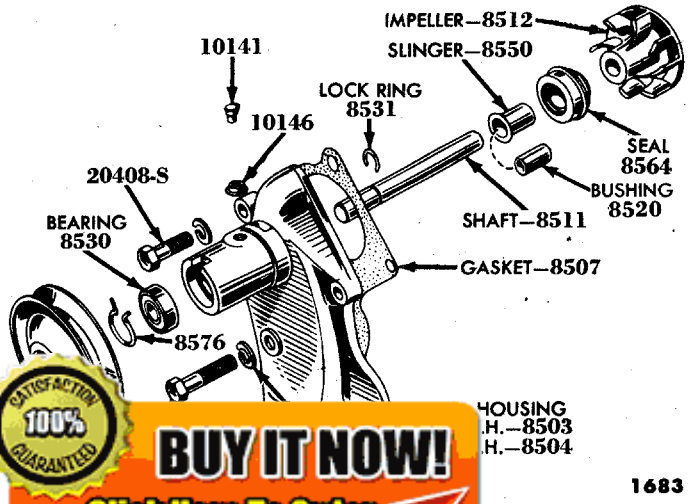
(b) LATE "B" SERIES. Remove the pulley (fig. 71) from the shaft. Remove the bearing lock ring located at the pulley end of the housing. Press the impeller off the shaft by pressing the shaft and bearing assembly out through the front of the housing. Press the seal out of the housing and, if necessary, remove the snap ring located inside the housing.

(3) *ASSEMBLY.* Before assembling the "B" series water pumps, make sure the proper repair kit has been obtained.

(a) EARLY "B" SERIES. Using a 0.5925 inch arbor, press a new bushing into the housing. *Bushing should be soaked in oil before inserting.* If the snap ring was removed from the shaft, install it on the shaft, then press the bearing on the shaft. Press on inner race only. Insert the shaft and bearing assembly into the front end of the housing, then press the bearing assembly and shaft into the housing, pressing on *outer race only.* Install the bearing retainer in the groove located in the housing. Press slinger to proper position on shaft. Insert the seal into the housing with the carbon washer of the seal toward the impeller end, then press the seal into position, using proper tool, which presses on flange only. Press the pulley on the shaft. Support *opposite end* of *shaft* when doing this. Press impeller on shaft to proper position. Make sure a 0.030 to 0.040 inch clearance is maintained between the impeller blades and the housing. Press from opposite end of shaft when pressing impeller on shaft. Thoroughly lubricate the bushing through oil cup located on the housing.

(b) LATE "B" SERIES. If the snap ring was removed from inside the housing install a new snap ring. Press a new seal into the housing with carbon washer of the seal facing the impeller. Make sure the seal replacer contacts only the outer metal portion of the seal. Position the slinger on the shaft with the flanged end of the slinger toward the bearing. Insert the shaft and bearing assembly into the housing at the front end, then press the shaft and bearing assembly into the housing. Press on outer shell of bearing only (not on shaft end). Install the bearing lock ring in the groove located in the housing, then press the pulley onto the shaft by pressing on opposite end of shaft. Press impeller on shaft to proper position. Make sure a clearance of 0.030 to 0.040 inch is maintained between the impeller blades and the housing. Press from opposite end of shaft.

(4) *INSTALLATION.* Using a new gasket, position the water pump assembly on the cylinder block and secure with the three cap screws. Install the cap screw located inside the radiator hose opening. Attach the engine front support to the water pump housing with the two cap screws. Remove the support from under the engine.



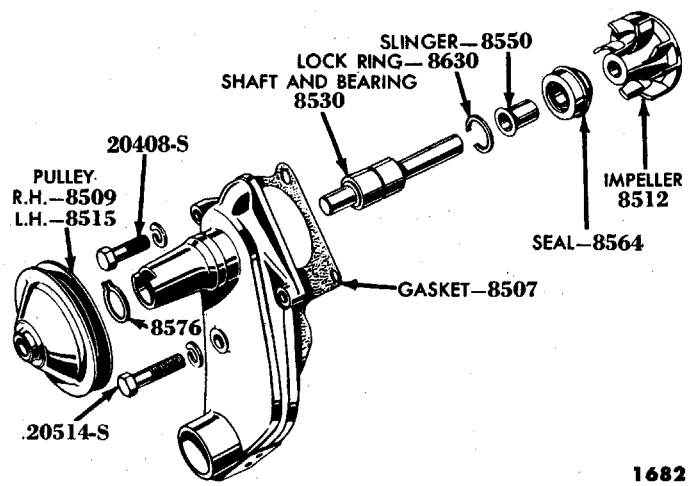


Fig. 71—Water Pump, Disassembled (Late "B" Series Engine)

NOTE: ***Tighten all water pump cap screws to 25-28 foot-pounds torque.***

Install the water pump to radiator hose. Install the fan belts and fill the radiator with coolant.

11. RADIATOR, HOSE, AND THERMOSTATS

The cooling system used on Ford cars is the pressure type, having a regulated pressure maintained in the system while in operation. 3½ to 4½ pounds pressure is used on all 6-cylinder cars and 8-cylinder cars without automatic transmission. 6½ to 7½ pounds pressure is used in the 8-cylinder cars equipped with the automatic transmission. With this pressure system, the coolant is allowed to reach a higher boiling point. This higher coolant temperature reduces the loss of energy to the coolant and also assists in decreasing internal friction by maintaining a higher lubricating oil temperature.

In addition to the water pump, the radiator, hose and thermostats are also vital parts in the cooling system. In order to maintain peak efficiency, the cooling system must be kept air and water tight, the radiator clean, and the coolant at the proper level at all times. Cooling System Maintenance is described under the heading "**a.** Care of Cooling System." "**b.** Radiator Replacement," describes the operations necessary to remove and install the radiator. Radiator hoses are covered under "**c.** Radiator Hose." Thermostat removal, testing, and installation appear under the heading "**d.** Thermostats."

a. Care of Cooling System.

Although the cooling system controls the operating temperature of the engine, late ignition timing or improper or insufficient lubricating oil in the crankcase may cause the engine to overheat. Refer to trouble shooting to determine the various causes of inefficient cooling.

(1) *CLEANING COOLING SYSTEM.* To remove rust, sludge, and other foreign matter from the cooling system, use 81A-18442, Cooling System Cleaner. Removal of such matter restores cooling efficiency and avoids overheating.

In severe cases where cleaning solvents will not properly clean the cooling system for efficient operation it may be necessary to use the pressure flushing system.

Various types of flushing equipment are available. If the pressure flushing system is used, make sure the cylinder head bolts are properly tightened to prevent possible water leaks into the cylinders.

NOTE: ***Always remove the thermostats when using a pressure flushing system.***

A pulsating or reversed direction of water flow will loosen sediment more quickly than a steady flow in the normal direction of coolant flow.

(2) *RUST INHIBITOR.* To prevent the accumulation of rust or scale in the cooling system, use 8A-19546-C rust inhibitor. It is a good practice to use rust inhibitor after the cooling system has been cleaned.

It is a safeguard against additional corrosion or rust which usually occurs where dissimilar metals are used. Rust inhibitor does not remove rust nor dissolve rust. It is a preventive only and not a cleaner.

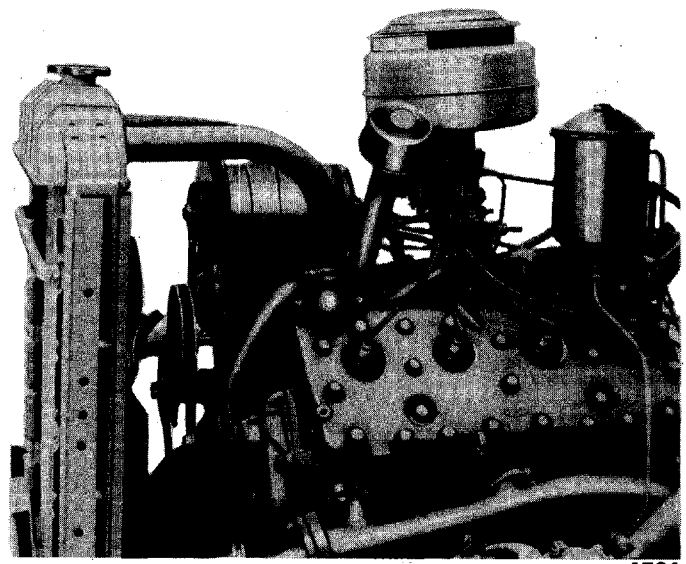


Fig. 73—1951 Radiator and Engine Installation

b. Radiator Replacement (6 or 8-Cylinder).

The radiator replacement procedure is basically the same for the 6- and 8-cylinder cars.

(1) *REMOVAL.* Raise the hood and drain the coolant. Disconnect the upper and lower radiator hoses at the radiator. Remove the center air deflector to side air deflector screws (fig. 72). Remove the cap screws that secure each side of the radiator to the radiator and front fender apron support. Using care not to bend the cooling fins, lift the radiator out of the vehicle.

(2) *INSTALLATION.* Carefully lower the radiator in position. Install the cap screws that secure each side of the radiator to the support. Position the center air deflector, and install the self-tapping screws (fig. 72). Connect the upper and lower radiator hoses. Fill the radiator and check the hose connections for leaks. Fig. 73 shows the radiator and engine installation.

c. Radiator Hose.

Radiator hoses should be replaced whenever they become cracked or soggy.

(1) *REMOVAL.* Drain the radiator, then loosen the clamp bolts at each end of the hose. Slide the hose off the radiator connection and the cylinder head water outlet connection (upper hose) or the water pump connection (lower hose).

(2) *INSTALLATION.* Position the clamps on each end of the new hose. Slide the hose on the connections and firmly tighten the clamp bolts. Fill the radiator with coolant, run the engine for several minutes and observe the hose and connections for leaks.

d. Thermostats.

Two thermostats are used in the 8-cylinder engine and one thermostat is used in the 6-cylinder engine. They are mounted inside the water outlet elbow on the cylinder head.

NOTE: ***Do not attempt to repair thermostats. They should be replaced if they are not operating properly.***

(1) *REMOVAL.* Drain the coolant. Remove the cap screws, water outlet elbow, and gasket from the cylinder head. Remove the thermostat.

(2) *TESTING.* Inspect the bellows and valve. The valve should be closed at room temperature. Immerse the thermostat in a heated pan of water. Raise the temperature of the water (check with a thermometer) to the range in which the thermostat operates (Table 4). If the thermostat does not open within the limits given, it should be replaced.

(3) *INSTALLATION.* Insert the thermostat in the cylinder head with the bellows portion down. Install a new elbow gasket, the water outlet elbow, and the cap screws. Torque the screws to 12-15 foot-pounds on the 8-cylinder engine and 13-19 foot-pounds on the 6-cylinder engine. Fill the radiator and check for leaks.

Table 4—Thermostat Operating Ranges

Engine	Thermostat	
	Opens At	Part No.
"H" Series	157°-162°	7HA-8575-A3
"H" Series	148°-153°	7HA-8575-B1
"H" Series	148°-153°	7HA-8575-B3
"H" Series	177°-182°	7HA-8575-C*
"B" Series	157°-162°	8BA-8575-B
"B" Series	167°-172°	8BA-8575-C*
"B" Series	152°-157°	8BA-8575-D
"B" Series	148°-153°	8BA-8575-A

*Use with permanent type Anti-freeze.

SERVICE LETTER REFERENCE

Letter No.	Date	Subject	Changes Information on Page No.

Part TWO

CHASSIS

Chapter

1

Clutch and Transmission

A single plate, gyro-grip, semi-centrifugal clutch is used in conjunction with a three-speed transmission.

The description of the clutch, replacement of the clutch or disc and the clutch pedal adjustment procedure is given in Section 1. General information on the conventional transmission and gear shift linkage, including complete overhaul procedures, is given in Section 2. Section 3 contains service information on the Fordomatic transmission which is available as optional equipment on the 1951 cars.

1. CLUTCH

The clutch assembly is the single plate type. Service information on the clutch assembly is presented in this section under five major headings as follows: "**a.** Construction," giving the detailed features of the clutch, "**b.** Clutch Pedal Adjustment," which includes clutch pedal free play adjustment; "**c.** Clutch and Disc Removal," includes the removal procedure, "**d.** Parts Inspection," describes checking, cleaning, and the necessary replacement of parts, and "**e.** Clutch and Disc Installation," contains lubrication and the installation procedure.

The Ford clutch, located in the flywheel housing, is a single, dry plate, cushion-disc type (fig. 2). The cushion-disc construction consists of spring steel segments between the facing, and damper springs between the clutch disc and hub. The clutch disc is splined to the transmission main drive gear, and facings are riveted on each side of the disc. The facings contact the surface of the flywheel on one side and the pressure plate on the other side when the clutch is engaged.

The clutch pressure plate and cover assembly consists of the pressure plate, clutch springs, clutch release levers and cover, and are serviced as an assembly. The three forged steel release levers, mounted on needle roller bearings, have weights at the outer ends. The faster the clutch revolves the greater the pressure on the pressure plate due to the centrifugal force of the release levers.

e clutch release bearing is of the pre-lubricated need for periodic

attached to the fork
o spring clips.

When the clutch release lever is actuated by the clutch pedal release rod, the release lever pivots on the edge of a bracket which is attached to the inside of the flywheel housing.

A bronze bushing is used as the clutch pilot shaft bearing.

The clutch pedal release rod is hooked into a hole in the clutch release equalizer bar. An arm on the clutch pedal shaft assembly fits into a slot in the clutch release equalizer bar and the clutch pedal is clamped to the outer end of the clutch pedal shaft. A clutch-pedal retracting spring is connected to the clutch retracting spring bracket and clutch lever.

The only clutch adjustment required is the clutch pedal free travel adjustment. This adjustment is required when the lining wears.

a. Clutch Pedal Adjustment.

The need for a clutch pedal adjustment is indicated when the clutch pedal free play is less than 1.0 inch. The pedal travel should also be checked and adjusted if necessary after new clutch parts have been installed.

To check the clutch pedal free travel, depress the clutch pedal by hand and measure the distance the pedal travels before the beginning of the clutch disengagement is felt. The free travel limit is 1.0-1.25 inches. If the free travel is not within these limits, adjust the travel as follows:

Loosen the clutch pedal release rod lock nut (fig. 1), then turn the adjusting nut until the free travel is within limits. Tighten the release rod nut to secure the adjustment.

SHOP MANUAL