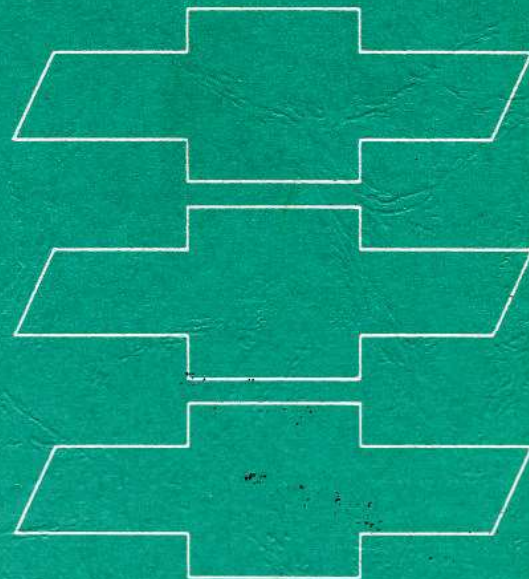
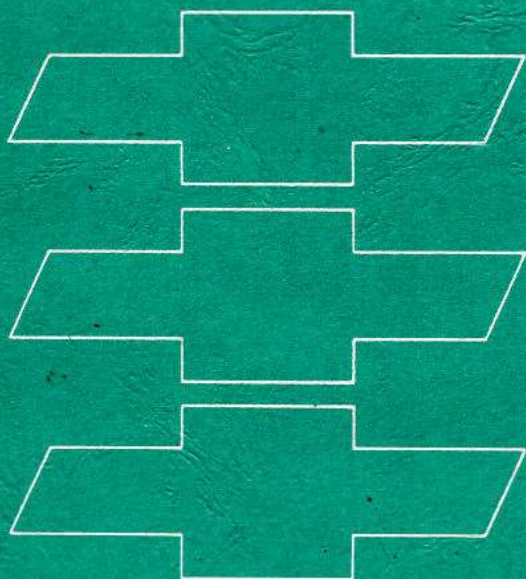


1965



CORVAIR



**CHASSIS
SHOP
MANUAL**

1965 CHEVROLET CORVAIR CHASSIS SHOP MANUAL

FOREWORD

This manual is designed to provide complete information on the maintenance and repair of various units, except the Body, of the 1965 Chevrolet Corvair Passenger Vehicles. Service information for 1965 body items for these vehicles is contained in the 1965 Body Service Manual. For service information on the 1965 Corvair Greenbrier refer to the 1961 Corvair Shop Manual and the 1964 Corvair Shop Manual Supplement.

An effort has been made to produce a manual that will serve as a ready reference book for the experienced service man and also cover step by step procedure for the guidance of the less experienced man.

The Section Index on this page enables the user to quickly locate any desired section. At the beginning of each section, a Table of Contents gives the page number on which major subjects begin. An Index is placed at the beginning of each major subject within the section.

Summaries of Special Tools, when required, are found at the end of major sections, while Specifications covering vehicle components are presented at the rear of the manual.

This manual should be kept in a handy place for ready reference. If properly used, it will enable the technician to better serve the owners of Chevrolet Corvair vehicles.

All information, illustrations and specifications contained in this literature are based on the latest product information available at the time of publication approval. The right is reserved to make changes at any time without notice.

CHEVROLET MOTOR DIVISION

General Motors Corporation
DETROIT, MICHIGAN

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SECTION 6 ENGINE

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CORVAIR 10100 AND 10500 SERIES ENGINE TUNE-UP

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GENERAL DESCRIPTION

The engine tune-up has become increasingly important to the modern automotive engine with its vastly improved power and performance. With the higher compression ratios, improved electrical systems and other advances in design, today's engines have become more sensitive to usage and operating conditions, all of which have decided effect on power and performance.

Since the modern engine is admittedly more temperamental and sensitive to adjustments, some means must be devised to put back into the engine the standard of performance and economy of which it is capable.

Since it is seldom advisable to attempt an improvement in performance by correction of one or two items only, time will normally be saved and more lasting results assured if the serviceman will follow a definite and thorough procedure of analysis and correction of all items affecting power, performance and economy.

The tune-up will be performed in three parts. The first part will consist of visual and mechanical checks and adjustments; the second part will consist of mechani-

cal synchronization of carburetors; while the third part will consist of an instrument checkout that can be performed with any one of the modern compact units of service equipment available for this purpose. Always follow the instructions provided by the manufacturer of the particular equipment to be used.

Additional checks and adjustments are included in the latter part of this section for use as required. Many of these operations would normally be used to isolate and correct trouble located during the tune-up. Where conditions are uncovered requiring major corrective action, refer to the appropriate section of this manual for detailed service information.

All operations included herein will be performed on the vehicle. Illustrations depicting bench operations have been employed for convenience only and are intended only to clarify the operations which will be performed on the vehicle. Since it is impractical to illustrate all possible installations that may be encountered, only a typical installation will be used to illustrate the point in question.

MECHANICAL CHECKS AND ADJUSTMENTS

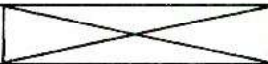
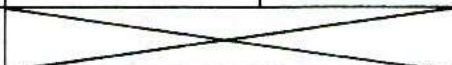
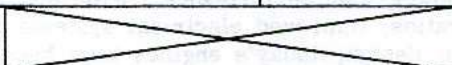
Remove Spark Plugs

1. Remove spare tire.
2. Remove air cleaner assembly.
3. Disconnect spark plug wires at spark plugs.
4. Remove any foreign matter from around spark plugs by blowing out with compressed air then loosen all plugs one turn.

5. Start engine and accelerate to 1000 rpm to blow out loosened carbon.

NOTE: Clearing out carbon in this manner is important in preventing false compression readings due to chips of carbon being lodged under the valves.

ENGINE TUNE-UP CHART

H.P.			95	110	140	180
COMPRESSION PSI (Note 1)			130			
SPARK PLUGS	Make and Number	Colder Standard	AC44FF		AC42FF Competition	
			AC46FF	AC44FF		
	Gap		.035"	.030"		
IGNITION DISTRIBUTOR	Point Dwell		31°-34°			
	Point Gap		.019 (New) .016 (Used)			
	Arm Spring Tension		19 - 23 Ounces			
	Condenser		.18 - .23 MFD			
BLOWER BELT			55 ± 5 Lbs. (Used) 75 ± 5 Lbs. (New) Using Strand Tension Gauge			
AIR CLEANER			Note 2			
TAPPET ADJUSTMENT			Hydraulic - 1 Turn Down from Zero Lash			
IGNITION TIMING B.T.D.C. (Note 3)		Synchromesh	4°-8°	12°-16°	16°-20°	24°
		Automatic	12°-16°	12°-16°		
ENGINE IDLE RPM		Synchromesh	450-500	600-650		850
		Automatic	Note 4			
FUEL PUMP	Pressure		4 - 5 Lbs. Idle - 1000 R.P.M.			
	Volume		1 Pint in 30 - 45 Seconds			
CRANKCASE VENTILATION			.089" Orifice			

NOTE 1: At cranking speed, throttle wide open -- Maximum Variation 20 pounds between cylinders.

NOTE 2: PAPER ELEMENT -- Service at 12,000 miles initially -- Check every 6,000 miles thereafter.
OIL BATH -- Change oil at regular engine oil change intervals.

NOTE 3: At idle speed with vacuum advance line disconnected and plugged.

NOTE 4: Idle speed on engines with automatic transmission should be set as low as possible to obtain a smooth idle and prevent creep in drive or harsh shifts during transmission operation.

6. Stop engine and remove spark plugs.

NOTE: A piece of 7/16 I.D. soft rubber or soft plastic tubing approximately 8" long may be used to remove the spark plugs after they have been loosened.

Test Compression

1. Block throttle and choke in wide open position.
2. Hook up starter remote control cable and insert compression gauge firmly in spark plug port (fig. 1).

CAUTION: Whenever the engine is cranked remotely at the starter, with a special jumper cable or other means, the primary distributor lead must be disconnected from the negative post on the coil and the ignition switch must be in the "ON" position. Failure to do this will result in a damaged grounding circuit in the ignition switch.

NOTE: Unless special adapters are available, it will be necessary to remove carburetors to perform the compression test.

3. Crank engine through at least four compression strokes to obtain highest possible reading.

Clean and Inspect Spark Plugs

Inspect each plug individually for badly worn electrodes, glazed, broken or blistered porcelains and replace plugs where necessary. Refer to spark plug diagnosis information Section 6Y for an analysis of plug conditions. Use new spark plug gaskets with cleaned plugs.

Install Spark Plugs and Torque to Specifications

Service Ignition System

1. Replace brittle or damaged spark plug wires. Install all wires to proper spark plug.
2. Tighten all ignition system connections.
3. Replace or repair any wires that are frayed, loose or damaged.
4. Remove distributor cap, rotor, and dust shield. Clean cap and inspect for cracks, carbon tracks and burned or corroded terminals. Replace cap where necessary.
5. Clean rotor and inspect for damage or deterioration. Replace rotor where necessary.

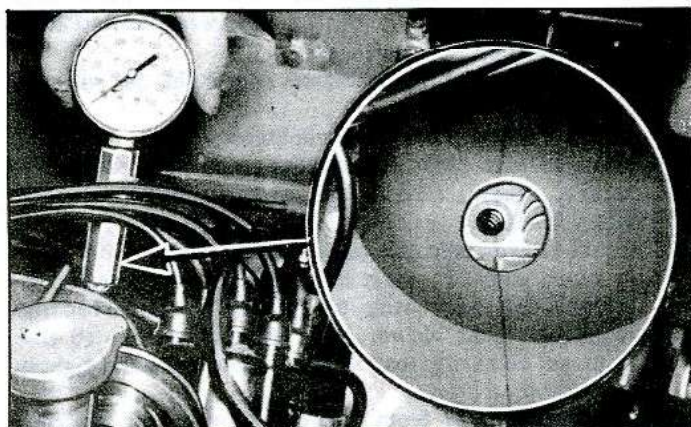


Fig. 1—Checking Compression

6. Check the distributor centrifugal advance mechanism by turning the distributor cam to see if the springs return it to its retarded position. If the cam does not return readily, the distributor must be disassembled and the cause of the trouble corrected.
7. Check to see that the vacuum spark control operates freely by turning the movable breaker plate to see if the spring returns it to the retarded position. Any stiffness in the operation of the vacuum spark control will affect the ignition timing. Correct any interference or binding condition noted.
8. Examine distributor points and clean or replace if necessary.

- Contact points with an overall gray color and only slight roughness or pitting need not be replaced.
- Dirty points should be cleaned with a clean point file.

Use only a few strokes of a clean, fine-cut contact file. The file should not be used on other metals and should not be allowed to become greasy or dirty. Never use emery cloth or sandpaper to clean contact points since particles will embed and cause arcing and rapid burning of points. Do not attempt to remove all roughness nor dress the point surfaces down smooth. Merely remove scale or dirt.

- Replace points that are burned or badly pitted.

9. Clean cam lobe with cleaning solvent, lubricate cam lobe with "Delco Remy Cam and Ball Bearing Lubricant" or its equivalent and rotate cam lubricator wick 1/2 turn.

NOTE: Where prematurely burned or badly pitted points are encountered, the ignition system and engine should be checked to determine the cause of trouble so it can be eliminated. Unless the condition causing point burning or pitting is corrected, new points will provide no better service than the old points. Refer to Section 6Y for an analysis of point burning or pitting.

10. Adjust distributor contact point gap to .019" (new points) or .016" (used points), using a feeler gauge or dial indicator (fig. 2). Breaker arm rubbing block should be on extreme top of cam lobe during adjustment.

NOTE: If contact points have been in service they should be cleaned before adjusting with a feeler gauge.

- Check alignment of distributor points with points closed (fig. 3). Align new points where necessary, but do not attempt to align used points. Instead, replace used points where serious misalignment is observed.
- If necessary, align points by bending fixed contact support. Use an alignment tool if available. Do not bend breaker arm.
- After alignment, readjust point gap.

11. Make sure all distributor wire terminals are clean and tight.
12. Install dust shield, rotor and distributor cap. Press all wires firmly into cap towers.

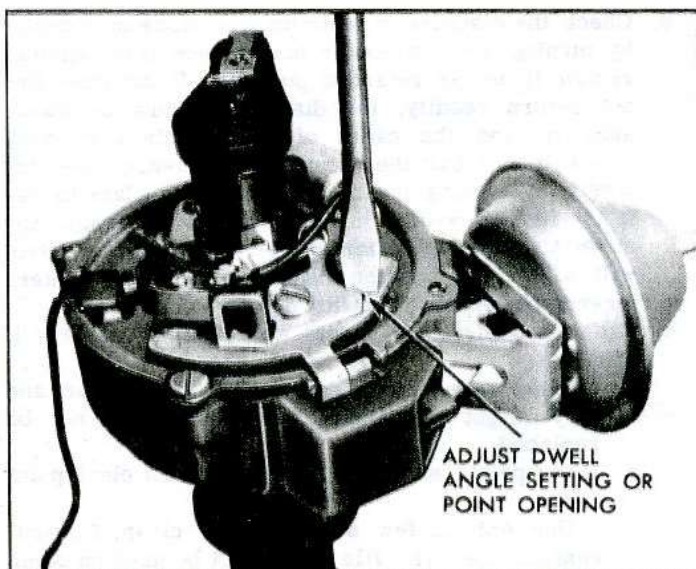


Fig. 2—Point Adjustment

NOTE: Cap must be installed with notch to vacuum advance lever opening on housing.

Service Battery and Battery Cables

Inspect battery and cables and perform necessary service on these components. See Additional Checks and Adjustments for battery tests.

Inspect for signs of corrosion on battery, cables and surrounding area, loose or broken carriers, cracked or bulged cases, dirt and acid, electrolyte leakage and low electrolyte level. Fill cells to proper level with distilled water or water passed through a "demineralizer".

The top of the battery should be clean and the battery hold-down bolts properly tightened. Particular care should be taken to see that the tops of batteries are kept clean of acid film and dirt. For best results when cleaning batteries, wash first with a dilute ammonia or soda solution to neutralize any acid present and then flush off with clean water. Care must be taken to keep vent plugs tight so that the neutralizing solution does not enter the cell. The hold-down bolts should be kept tight enough to prevent the battery from shaking around in the holder, but they should not be tightened to the point where the battery case will be placed under a severe strain.

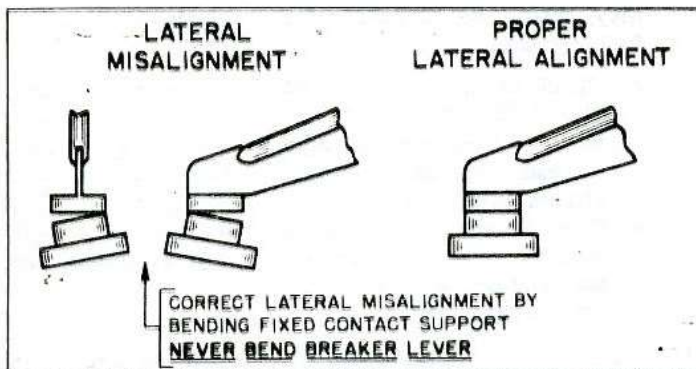


Fig. 3—Point Alignment

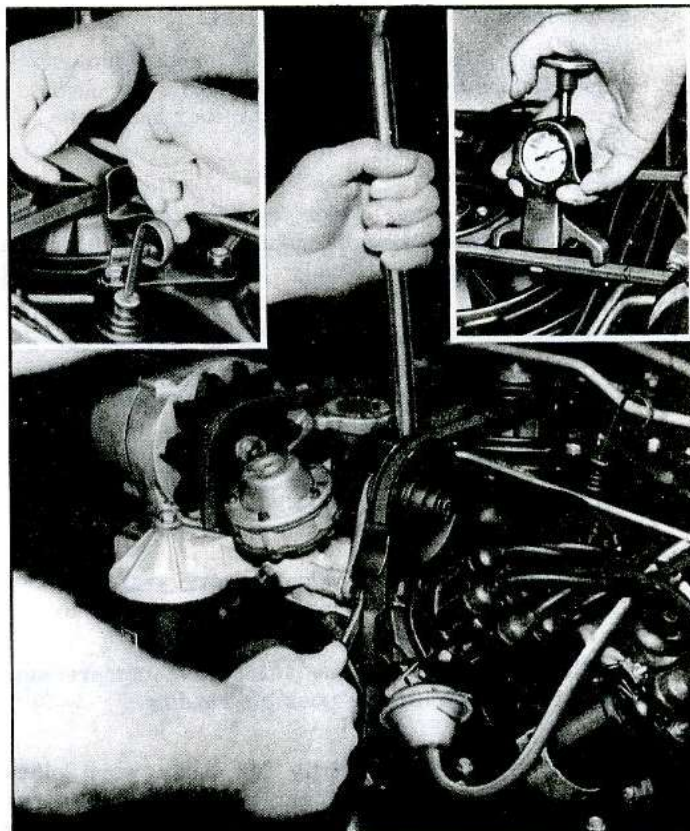


Fig. 4—Blower Belt and Guide Adjustment

To insure good contact, the battery cables should be tight on the battery posts and fully bottomed. To remove or install spring type cable clamps, a suitable pliers must be used to spread the ends of the clamps. Oil battery terminal felt washer. If the battery posts or cable terminals are corroded, the cables should be cleaned separately with a soda solution and a wire brush. It is NOT recommended that the battery posts and cable clamps be greased prior to installing cables to battery as this may contribute to slippage of the calmps from the battery posts.

If battery has remained undercharged, check for loose (worn) blower belt, defective Delcotron, high resistance in the charging circuit, oxidized regulator contact points, or a low voltage setting.

If the battery has been using too much water the voltage output (regulator setting) of the Delcotron is too high.

Service Blower Belt and Delcotron

1. Inspect blower belt condition and check deflection of belt.

If belt damage is noted, replace the belt. A slightly damaged belt must be replaced to prevent premature failure. Install blower belt over pulleys (Delcotron pulley last).

2. Adjust blower belt and guides as follows:

- Place a 1/16" shim between belt and rear guide (fig. 4), then using a bar and a strand tension gauge adjust blower belt. Fifty-five lbs. \pm 5 lbs. (used belt), 75 lbs. \pm 5 lbs. (new belt) and tighten securely.
- Remove shim from between blower belt and rear guide and using shim as a gauge adjust upper guide (fig. 4) and tighten securely.

3. If a new belt was installed run belt in at 1500 rpm for at least two minutes, then recheck deflection.

NOTE: If a strand tension gauge is not available adjust belt to give a $\frac{3}{8}$ deflection between blower and idler pulley under a 15 pound load and have belt set with a strand tension gauge as soon as possible.

4. Replace or repair frayed or broken Delcotron wires and tighten all wire connections.

Service Fuel Lines and Fuel Filter

Inspect fuel lines for kinks, bends or leaks and if engine has been flooding, replace fuel inlet filter.

NOTE: If a complaint of poor high speed performance exists on the vehicle, fuel pump tests should be performed.

Service Air Cleaner

Refer to Engine Fuel, Section 6M.

Service Crankcase Ventilation (Fig. 5)

1. Disconnect hose from vent pipe.
2. Inspect for deteriorated or plugged hoses.
3. Clean positive ventilation orifice, using a $\frac{5}{64}$ " drill (inserted through orifice in vent pipe and twisted by hand).
4. Connect hose to vent pipe, then inspect all connections.

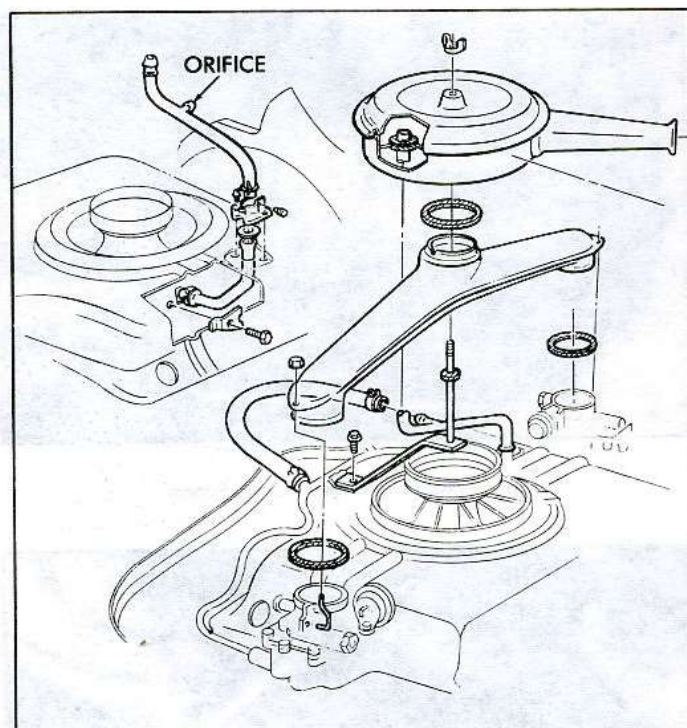


Fig. 5—Crankcase Ventilation

CARBURETOR SYNCHRONIZATION

Mechanical Adjustments

1. Disconnect accelerator control rod swivel at cross shaft lever and connect accelerator pull back spring to swivel hole in cross shaft lever "A" (fig. 6).

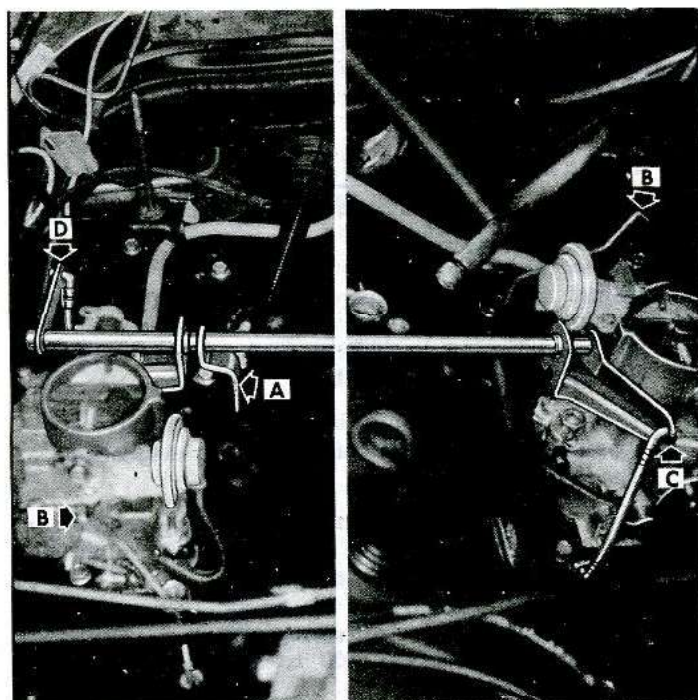


Fig. 6—Carburetor Linkage

2. Disconnect choke rods at choke shaft levers on both carburetors and open choke valves "B" (fig. 6), then tighten carburetor hold down nuts.
3. Back idle screws away from throttle shaft levers on both carburetors (2-1/2 turns should be sufficient) to leave clearance between the throttle shaft levers and idle screws.
4. Disconnect throttle rod from cross shaft lever on R/H carburetor "C" (fig. 6).

NOTE: A strip of paper approximately $\frac{3}{8}$ " wide and 8" long should be used in the following step. Feeler gauge stock will not provide a SENSITIVE feel and should not be used.

5. Set idle screw on L/H carburetor by placing strip of paper between idle screw and throttle shaft lever and turning screw in until a firm drag is felt on the paper. Turn idle screw in 1-1/2 additional turns (fig. 7).

NOTE: This will give an initial idle speed of 500-600 rpm.

6. Connect throttle rod to cross shaft lever on R/H carburetor and disconnect throttle rod from cross shaft lever on L/H carburetor "D" (fig. 6).
7. Set idle screw on R/H carburetor in the same manner as L/H carburetor.
8. Adjust throttle rod on L/H carburetor by holding up on rod (so throttle shaft lever is against idle screw) and turning rod in lower swivel until rod freely enters hole in cross shaft lever (fig. 8).
9. Connect throttle rod on L/H carburetor to cross shaft lever.

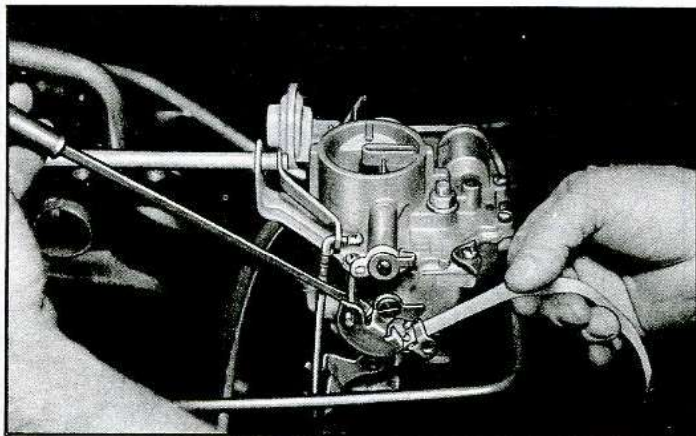


Fig. 7—Adjusting Idle Speed Screw

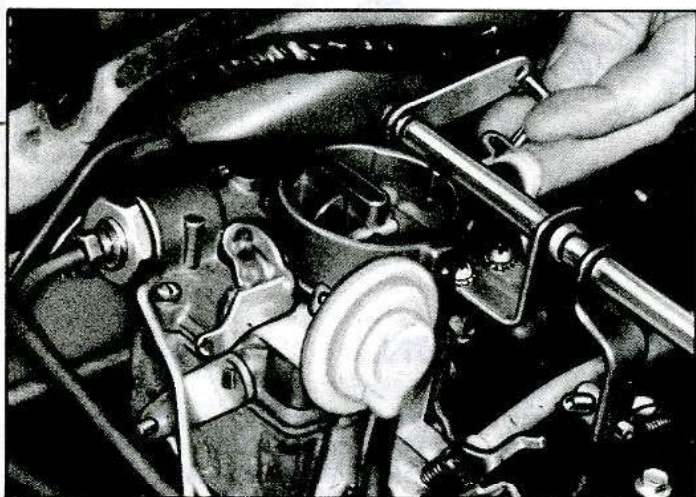


Fig. 8—Adjusting Throttle Rod



Fig. 9—Adjusting Accelerator Rod

10. Remove accelerator pull back spring from cross shaft lever, hold cross shaft lever in the full throttle position and pull accelerator control rod rearward (on vehicles equipped with Powerglide, pull through detent), and adjust swivel on accelerator control rod until it freely enters hole in cross shaft lever (fig. 9). Then connect swivel and pull back spring and be sure carburetors return to idle position (idle screws against throttle levers).
11. Turn idle mixture screws on both carburetors lightly to its seat and back out 1-1/2 turns.

INSTRUMENT CHECK-OUT

Instrument Hook-Up

1. Remove distributor vacuum advance hose from R/H carburetor spark port tube and plastic cap from L/H carburetor spark port tube.
2. Connect vacuum gauge, dwell meter, tachometer and timing light.

NOTE: The vacuum gauge must be connected to both carburetor spark port tubes. A windshield washer tee makes this possible (fig. 10).

Ignition Dwell

1. Start engine and check ignition dwell.
If dwell is not within specifications, recheck point gap, check for wrong point assembly, defective or misaligned point, worn rubbing block or worn distributor cam.
2. Check dwell variation.
Slowly accelerate engine to 1500 rpm and note dwell reading. Return engine to idle and note dwell reading. If dwell variation exceeds specifications, check for worn distributor shaft, worn distributor shaft bushing or loose breaker plate.

CAUTION: Accelerate engine at accelerator rod only. Do not open throttle by grasping other portions of linkage.

Set Ignition Timing

1. Adjust timing as required by loosening distributor clamp bolt and rotating distributor body until specified timing is indicated at tab (fig. 11), then tighten distributor clamp bolt.

NOTE: Timing should be advanced as far as possible (within specifications) unless detonation (spark-knock) occurs.

2. Check operation of centrifugal advance mechanism by accelerating engine and watching clockwise (advance) movement of timing mark.

Check Carburetor Synchronization as Follows:

1. Accelerate engine to 1100 to 1200 rpm and hold steady.

NOTE: A tool to hold engine rpm steady may be manufactured with a small turn buckle and

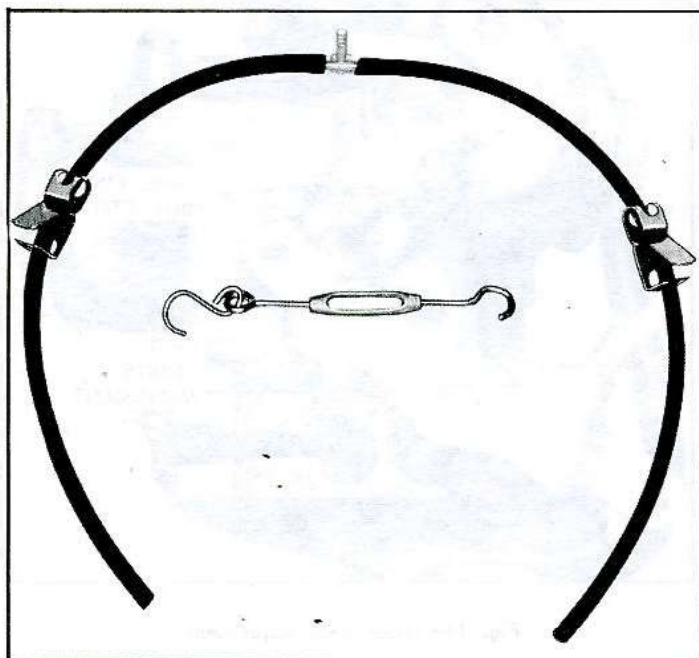


Fig. 10—Vacuum Gauge Adapter and Turnbuckle

hooks (fig. 10). When this tool is installed between the accelerator rod and fuel line the rpm can be adjusted by turning turnbuckle.

2. With rpm set to 1100 to 1200 and steady, note vacuum reading. Pinch shut vacuum gauge hose to R/H carburetor and note vacuum reading. If vacuum decreases, return engine to idle and lengthen throttle rod (one turn) on L/H carburetor, then recheck.

If vacuum increases, return engine to idle and shorten throttle rod (one turn) on L/H carburetor, then recheck.

If vacuum remains steady (± 1 ") open hose to R/H carburetor and pinch shut vacuum gauge hose to L/H carburetor. Vacuum should remain steady (± 1 ").

3. Disconnect vacuum gauge from spark port tubes and reinstall distributor vacuum advance hose on R/H carburetor and plastic cap on L/H carburetor.

Vacuum Advance

Check operation of vacuum advance by accelerating engine and watching movement of vacuum advance arm.

Idle Speed and Mixture Adjustment

1. Disconnect choke diaphragm hoses from both carburetor bases and connect vacuum gauge at these locations.
2. Adjust idle speed (duplicate adjustment on both carburetors) to obtain specified engine idle.
3. Adjust idle mixture screws on both carburetors to obtain peak, steady vacuum at specified idle speed.

Adjust Fast Idle Cam Clearance (Fig. 12)

1. Stop engine.
2. With throttle lever on next to the highest step of fast idle cam, bend tang to obtain .078" clearance between idle speed screw and throttle lever.

Adjust Vacuum Diaphragm (Fig. 13)

1. Hold choke valve closed with a rubber band.
2. Hold vacuum diaphragm arm squarely against diaphragm.

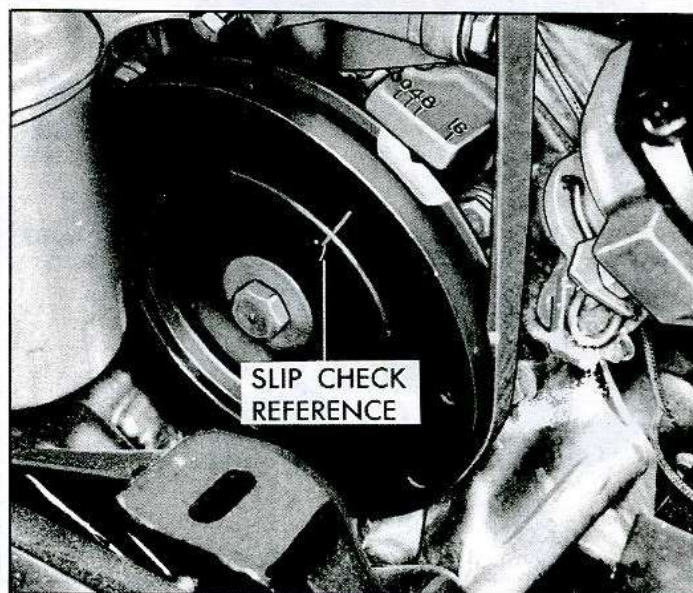


Fig. 11—Ignition Timing

3. Measure clearance between lower edge of choke valve and wall of bowl cover. Clearance should be .180" to .5".
4. If necessary to adjust, disconnect and bend diaphragm link.
5. At this setting, throttle lever fast idle tang should rest on next to the highest step of fast idle cam. If not, adjust by bending outer choke shaft lever tang.

Adjust Vapor Vent (Fig. 14)

The vent should just start opening when idle screw is on high step of fast idle cam. The valve will then be open at idle setting. If necessary, adjust by bending throttle lever tang.

NOTE: It is hard to see this valve when carburetor is installed. A mirror will aid in making this adjustment.

Adjust Choke (Fig. 15)

Hold choke valve closed and, while holding the control rod up against the stop in choke thermostat bracket, adjust upper choke control rod until it freely enters hole in choke shaft lever, then lengthen rod two turns and connect.

CAUTION: To minimize the possibility of deforming the control rod while adjusting, always turn the vertical portion. Do not "crank" the rod using offset portion.

Adjust Choke Unloader (Fig. 16)

Check unloader adjustment by holding throttle valve in wide open position and insert a .312" wire gauge between choke valve lower edge and wall of bowl cover. To adjust, if necessary, bend tang on throttle lever.

Final Adjustment

1. Install air cleaner assembly.
2. Start engine, and if necessary, readjust carburetor idle speed and mixture.
3. Shut engine off, remove instruments, then connect choke vacuum break hoses, and install spare tire.

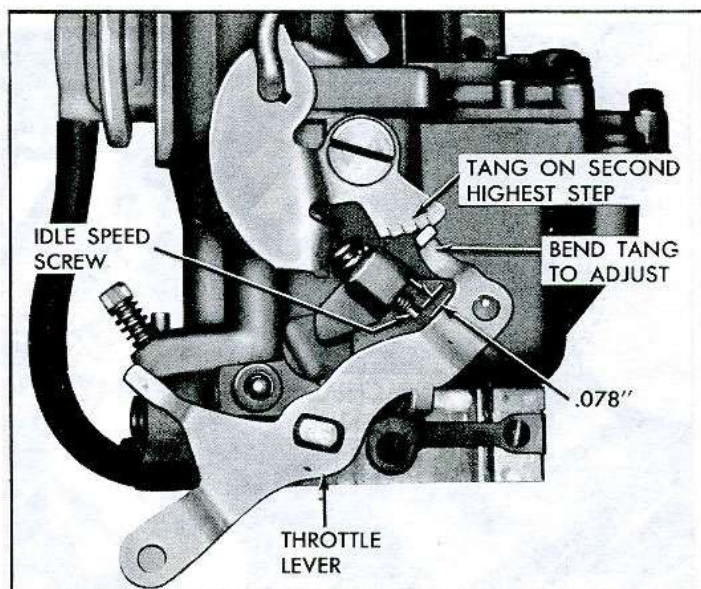


Fig. 12—Fast Idle Cam Adjustment

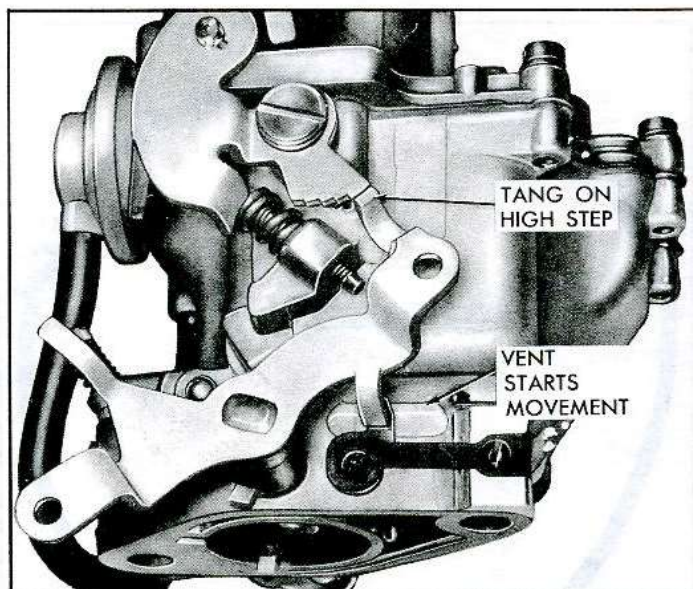


Fig. 14—Vapor Vent Adjustment

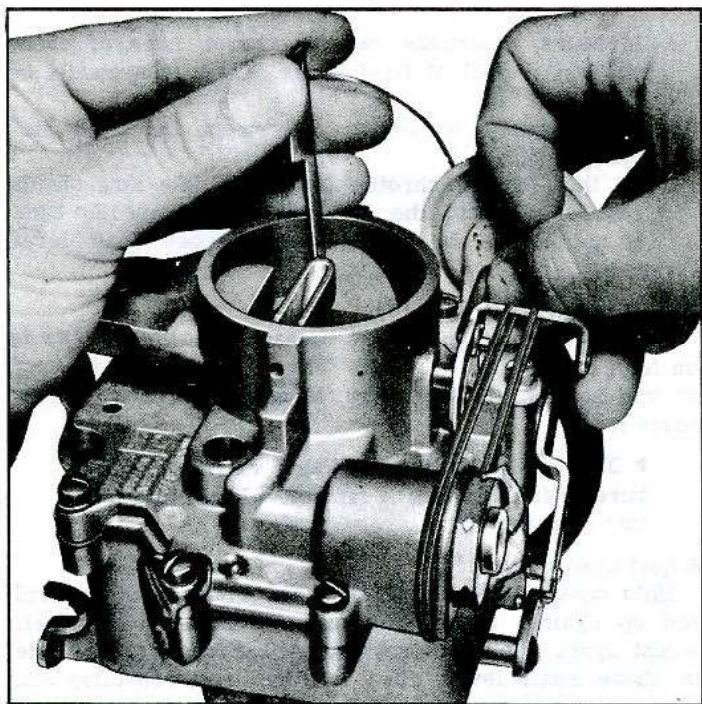


Fig. 13—Vacuum Diaphragm Adjustment

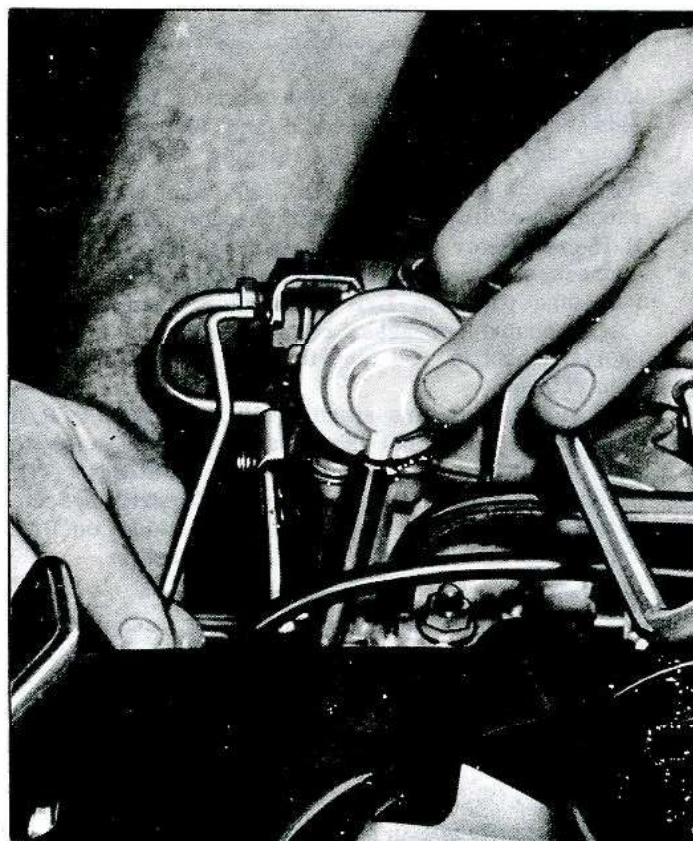


Fig. 15—Choke Control Rod Adjustment

ADDITIONAL CHECKS

Cylinder Balance Test (Fig. 17)

It is often difficult to locate a weak cylinder. A compression test, for example, will not locate a leaky intake manifold, a valve not opening properly due to a worn camshaft, or a defective spark plug.

With the cylinder balance test, the power output of one cylinder may be checked against another, using a set of

grounding leads. When the power output of each cylinder is not equal, the engine will lose power and run roughly. Tool J-7412 is available to perform this test.

Perform a cylinder balance test as follows:

1. Connect the tachometer and vacuum gauge.
2. Start engine and run at 1500 rpm.

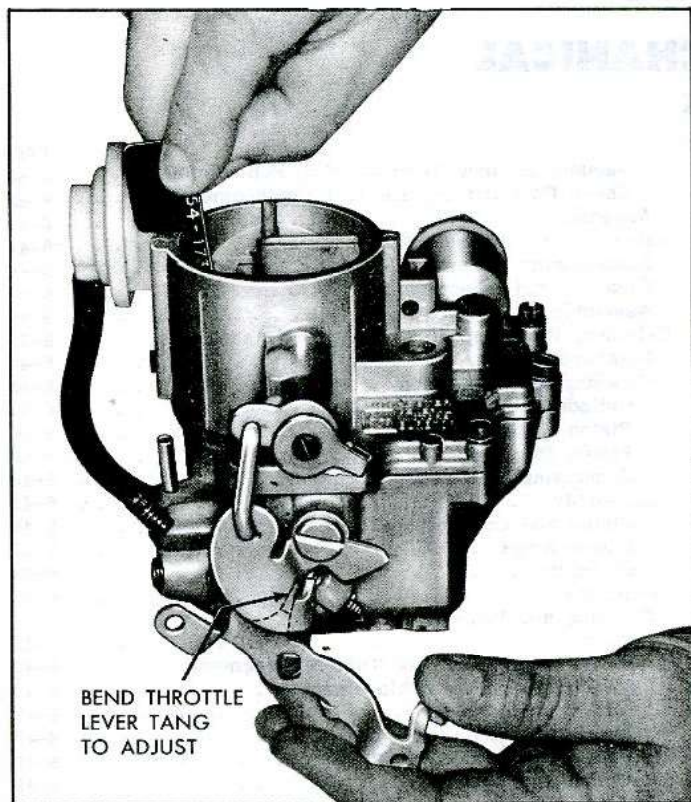


Fig. 16—Choke Unloader Adjustment

3. Ground large clip of grounding leads and connect individual leads to all spark plugs except the pair being tested. Divide the firing order in half and arrange one-half over the other. The cylinders to be tested together appear one over the other, i.e.,
 Firing Order=1-4-5-2-3-6= $\frac{1-4-5}{2-3-6}$ =1-2, 4-3, 5-6.
4. Operate engine on each pair of cylinders in turn and note engine rpm and manifold vacuum for each pair. A variation of more than 1 inch of vacuum or 40 rpm between pairs of cylinders being tested indicates that the cylinders are off balance.
5. To isolate one weak cylinder, short out one bank of cylinders at a time. The bank giving the lower readings will include the weak cylinder.

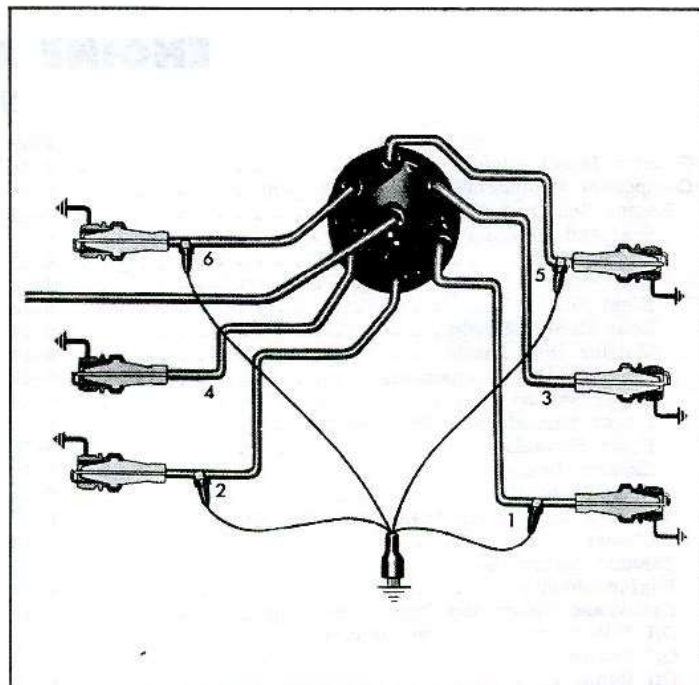


Fig. 17—Cylinder Balance Test

Starting Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks.

Charging Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks and regulator adjustments.

Ignition Circuit Checks

See Engine Electrical--Section 6Y, for a description of these checks.

Fuel Pump Tests

If the owner has complained of poor high speed performance, the fuel pump may be at fault. Too low a pump pressure or volume will cause a high speed miss because of lack of fuel delivered to the carburetors, while too high a pressure will cause carburetor flooding. See Engine Fuel--Section 6M for a description of fuel pump checks.

ENGINE MECHANICAL

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GENERAL DESCRIPTION

The six cylinder, over head valve, engines covered in this section are the 164 cu. in. engines used in the Corvair 10100 and 10500 series vehicles (fig. 18). The engine is horizontally opposed, air cooled and has two opposing, aluminum cylinder heads that incorporate integral intake manifolds.

The aluminum crankcase is vertically divided into two halves, each having three pilot openings for individual cast iron cylinders. The crankshaft and camshaft are located between the split halves of the crankcase. The crankshaft, supported by the crankcase halves, has four

main bearings. The camshaft journals, having no bearings, ride directly on the crankcase halves.

The cylinders are numbered rear to front: 1-3-5 on the right bank, and 2-4-6 on the left bank. Firing order is 1-4-5-2-3-6. Crankshaft rotation as viewed from the rear is counter-clockwise.

Full pressure lubrication, through a full flow oil filter and an air cooled oil cooler is furnished by a gear-type oil pump located in the engine rear housing. The distributor, driven by a helical gear on the crankshaft, drives the oil pump. The main oil gallery feeds oil

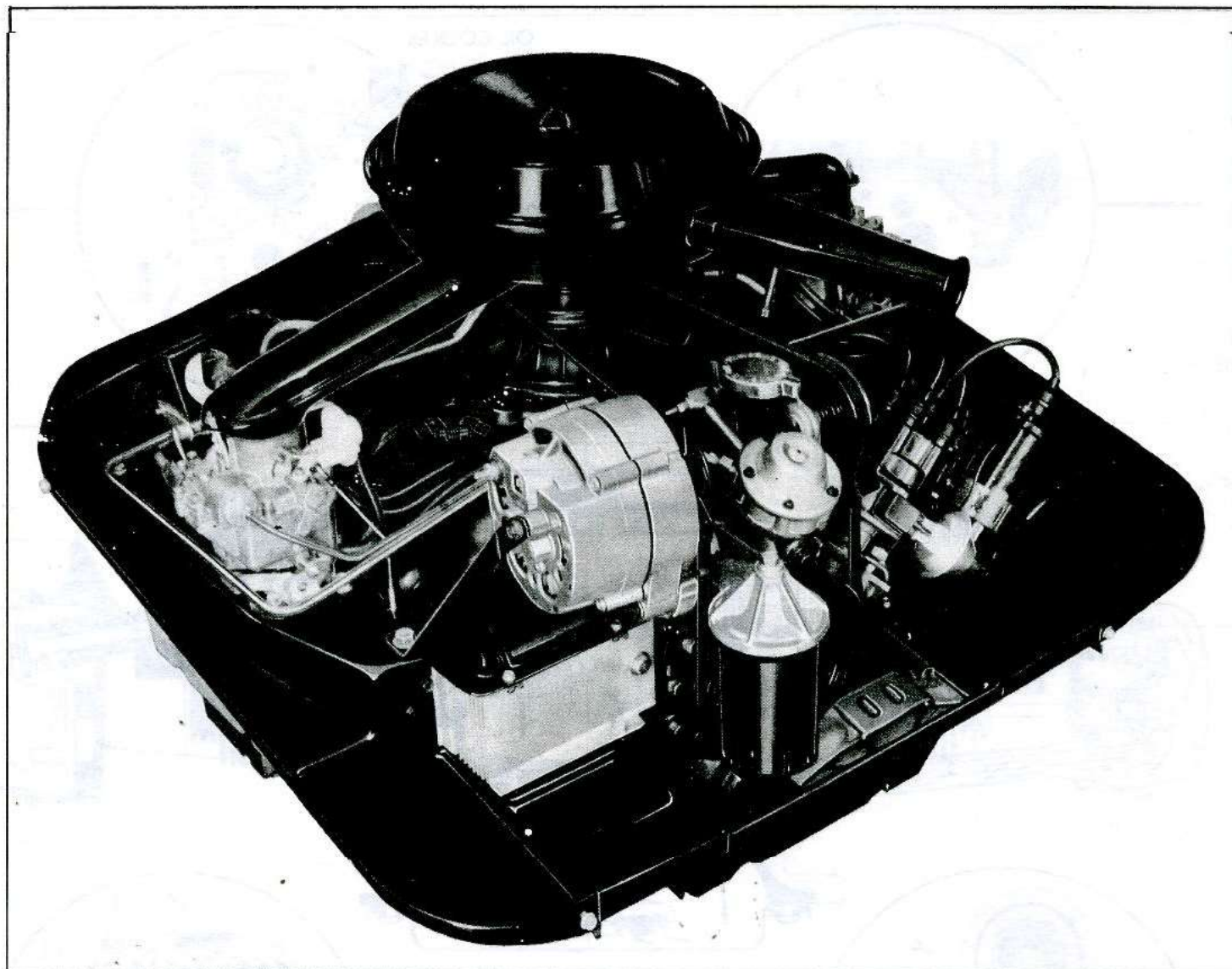


Fig. 18—Corvair Engine

through drilled passages to the camshaft and crankshaft journals. The main oil gallery also feeds the hydraulic valve lifters, which through hollow push rods feed the individually mounted rocker arms (fig. 19).

Engine cleanliness is very important, oil leaks, exhaust leaks or foreign material within the engine shrouding may result in objectionable fumes within the passenger compartment.

COMPONENT REPLACEMENT AND ADJUSTMENTS

ENGINE SEAL AND SHIELDS

Seal and Retainer (Fig. 20)

Removal

1. Remove spare tire, then remove air cleaner assembly.
2. Remove retainer to body attaching screws.
3. Disconnect seal from engine shields by pushing groove of seal off shield flange.
4. Remove seal and retainer assembly.

Installation

1. Lubricate groove of seal with liquid soap or silicone and place seal and retainer assembly in position over engine shields.

2. While guiding groove of seal on shield flange, (with one hand), press seal in place using a block of wood or a hammer handle.
3. Install all retainer attaching screws finger tight, then tighten screws securely.

Front Shield (Fig. 21)

Removal

1. Disconnect battery positive cable.
2. Remove spare tire, then remove air cleaner assembly.
3. Remove vacuum balance tube.
4. Disconnect heater hose at upper shroud.

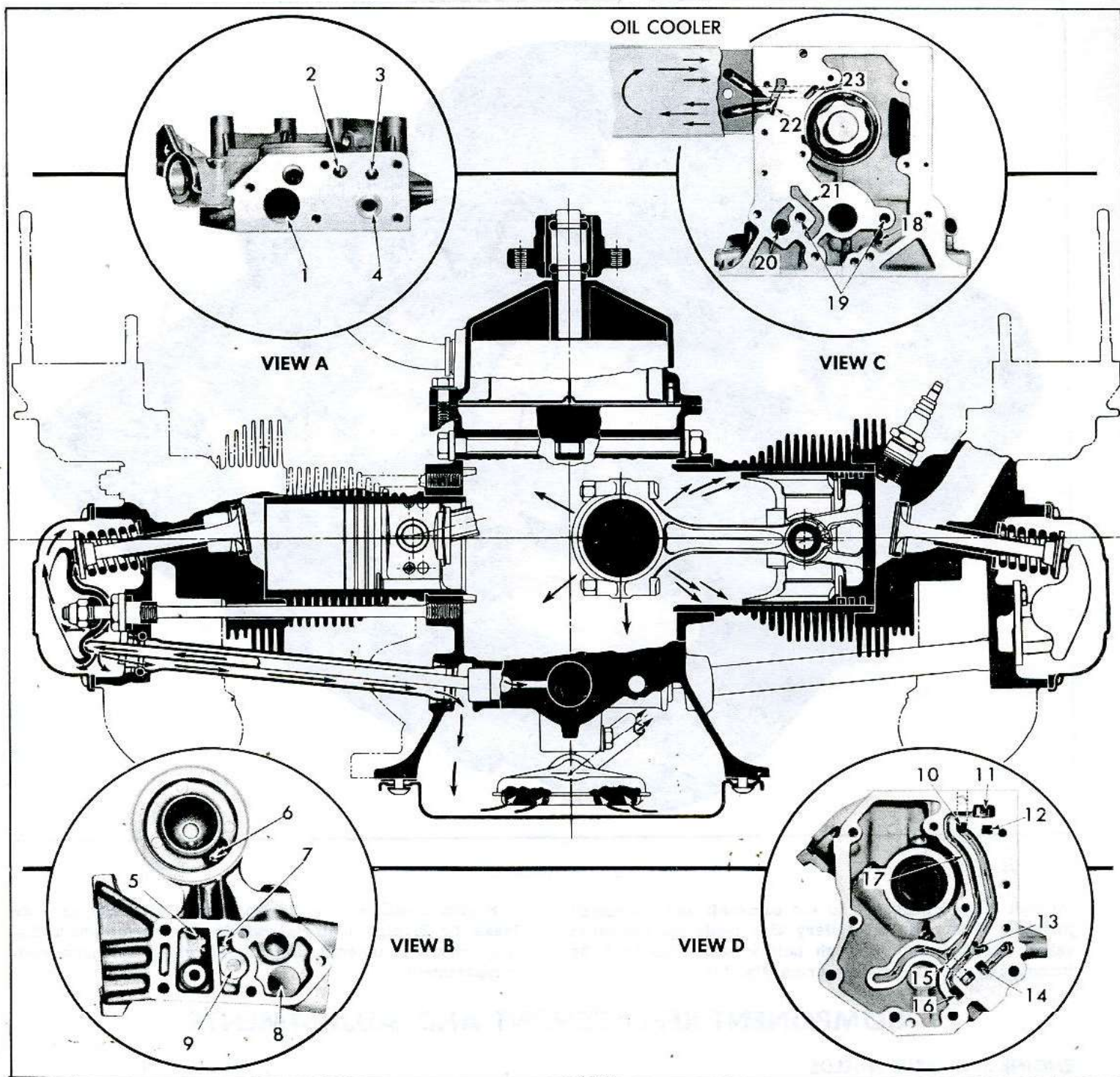


Fig. 19—Engine Lubrication

View A Top face of engine rear housing

View B Bottom face of oil filter and Delcotron adapter

View C Rear of engine crankcase

View D Front face of engine rear housing

NOTE: • Face of oil filter and Delcotron adapter shown in View "B" mounts to top face of engine rear housing shown in View "A."
 • Front face of engine rear housing shown in View "D" mounts to rear face of engine crankcase shown in View "C."

1. Oil Filler Inlet
2. To Oil Filter
3. To Oil Cooler
4. Oil Cooler By-Pass Valve
5. Oil Filter Outlet
6. Oil Filter Element Inlet
7. Oil Filter Inlet

8. Oil Filler Inlet
9. Oil Filter By-Pass Valve
10. To Oil Filter
11. Oil Cooler By-Pass Valve Exit
12. To Oil Cooler from the Oil Filter

13. Oil Pressure Regulator Entrance
14. Oil Pump Inlet
15. Oil Passage to Main Oil Gallery Left Side
16. Oil Pump Outlet
17. Oil from Oil Cooler

18. Entrance to Crankcase Sump
19. Main Oil Galleries
20. Oil Pump Suction
21. Oil Pump Outlet Cavity
22. Oil Cooler Inlet
23. Oil from Cooler to Main Galleries

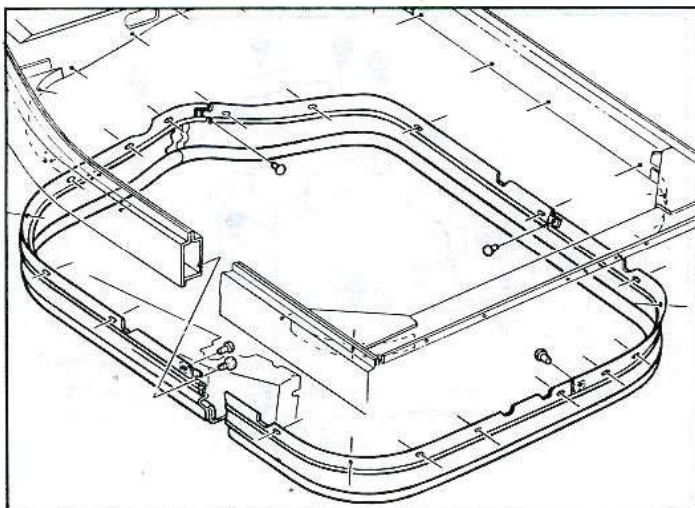


Fig. 20—Engine Seal and Retainer

5. Remove grommet for Powerglide dip stick tube (if so equipped).
6. Disconnect seal from flange of front shield.
7. Remove grommet (for starter wiring and fuel line) from front shield.
8. Disconnect starter wiring (engine side).
9. From the underside of vehicle: disconnect accelerator rod at transmission bellcrank and disconnect fuel line at flexhose (plug fuel line from fuel tank), then disconnect axle dip stick tube at differential carrier.
10. Disconnect accelerator rod at carburetor cross shaft, then remove rod and bellows from front shield.
11. Disconnect grommet from front shield and remove axle dip stick tube assembly.
12. Disconnect fuel line at fuel pump, then remove fuel line from front shield.
13. Remove bolts attaching front shield, then remove front shield.

Installation

1. Install front shield by guiding shield over starter wiring and Powerglide dip stick tube (if so equipped).
2. Install all bolts attaching front shield finger tight, then tighten bolts securely.
3. Install fuel line through front shield, then connect fuel line at fuel pump.
4. Install accelerator rod through front shield, then connect bellows to front shield and connect accelerator rod at carburetor cross shaft.
5. Install axle dip stick tube assembly through front shield and connect grommet in front shield.
6. Connect starter wiring.
7. Install grommet (for starter wiring and fuel line) in front shield.
8. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
9. Install grommet for Powerglide dip stick tube (if so equipped).
10. Connect heater hose at upper shroud.
11. Install vacuum balance tube.
12. From the underside of vehicle: connect fuel line at flexhose, connect accelerator rod at transmission

bellcrank and connect axle dip stick tube at differential carrier.

13. Connect battery positive cable.
14. Install air cleaner assembly, then install spare tire.

Left Shield (Fig. 21)

Removal

1. Remove bolts attaching left side of upper shroud and left shield to cylinder head.
2. Remove bolts attaching left shield to left exhaust duct.
3. Remove bolt attaching left shield and oil cooler to cylinder head.
4. Remove bolts attaching left shield to front shield and (if so equipped) remove screw from ground strap.
5. Disconnect seal from flange of left shield.
6. Remove left shield, by pulling from under upper shroud, front shield and oil cooler flange.

Installation

1. Place left shield in position under upper shroud, front shield and oil cooler flange.
2. Install all bolts attaching left shield finger tight, then tighten bolts securely.
3. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
4. Connect ground strap (if so equipped).

Right Shield (Fig. 21)

Removal

1. Remove spare tire then, remove bolts attaching right side of upper shroud and right shield to cylinder head.
2. Remove bolts attaching right shield to right exhaust duct.
3. Remove ignition coil and bracket.
4. Remove bolts attaching right shield to front shield and (if so equipped) remove screw from ground strap.
5. Disconnect seal from flange of right shield.

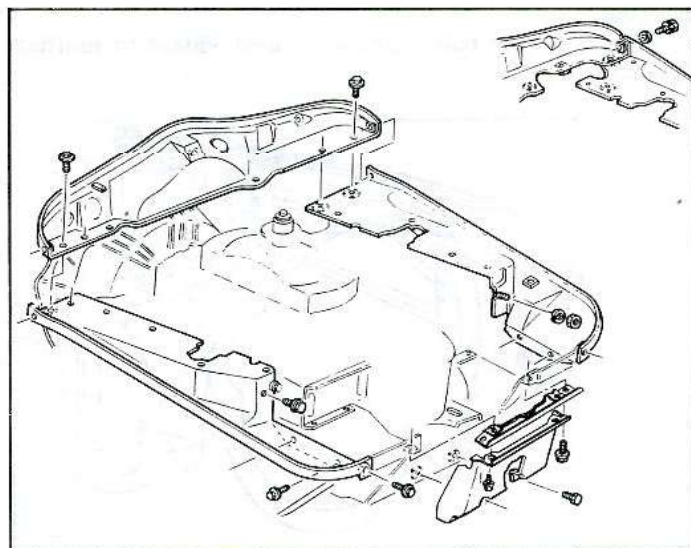


Fig. 21—Engine Shields

6. Remove bolt attaching muffler bracket to right shield.
7. Remove muffler.
8. Remove right shield by pulling from under upper shroud and front shield.

Installation

1. Place right shield in position under upper shroud and front shield.
2. Install all bolts attaching right shield finger tight, then tighten bolts securely.
3. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
4. Connect ground strap (if so equipped).
5. Install ignition coil and bracket, then install spare tire.

Rear Center Shield (Fig. 21)

NOTE: The rear center shield is two pieces. The engine seal is connected to the upper half, which need not be removed under normal conditions.

Removal and Installation (Lower Half)

1. Remove bolts attaching rear center shield to skid plate and exhaust ducts.
2. Remove rear center shield.
3. Place rear center shield in position with attaching bolts fingertight, then tighten bolts securely.

Removal and Installation (Upper Half)

1. Remove lower half as outlined.
2. Disconnect seal from flange of rear center shield.
3. Remove bolts and remove upper half.
4. Install upper half and tighten securely.
5. Install lower half as outlined.
6. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand) press seal in place with a block of wood or a hammer handle.

Muffler Heat Shield (Fig. 22)**Removal**

1. Remove two bolts attaching heat shield to muffler hanger.

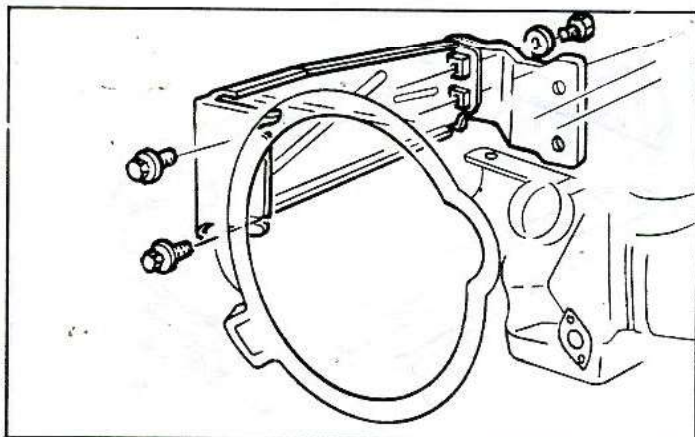


Fig. 22—Muffler Heat Shield

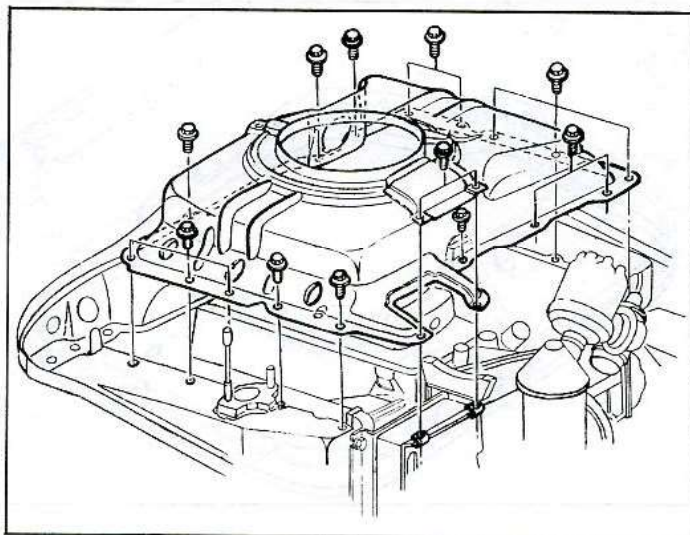


Fig. 23—Upper Shroud

2. Loosen two bolts attaching rear of heat shield and right rear shroud to cylinder head.
3. Remove heat shield.

Installation

1. Install heat shield in position under head of two bolts in rear of cylinder head.
2. Install bolts attaching heat shield to muffler hanger and tighten securely.
3. Tighten two bolts attaching rear of heat shield and right rear shroud to cylinder head.

ENGINE COOLING COMPONENTS**Upper Shroud (Fig. 23)****Removal**

1. Remove spare tire then remove air cleaner assembly.
2. Disconnect fuel lines at fuel pump and carburetors, then remove fuel lines to carburetors.
3. Disconnect vacuum advance hose at right carburetor.
4. Disconnect accelerator rod at carburetor cross shaft and disconnect choke control rods at choke levers then remove upper choke control rods.
5. Remove carburetors with cross shaft and linkage attached.
6. Remove blower belt.
7. Disconnect crankcase ventilation tube at upper shroud, then disconnect vacuum balance tube at bracket and cylinder heads.
8. Remove vacuum balance tube and crankcase ventilation tube and hoses as an assembly.
9. Remove Delcotron with bracket attached.
10. Disconnect heater hose at upper shroud.
11. Remove oil cooler access hole cover and oil dip stick.
12. Remove distributor cap, then remove spark plug wires and distributor cap as an assembly.
13. Remove bolts attaching upper shroud, then remove shroud by raising front of shroud and rotating clockwise to clear oil filter and Delcotron adapter.

Installation

1. Place upper shroud in position and install all attaching bolts finger tight then rotate blower checking clearance while tightening bolts securely.
2. Install oil cooler access hole cover and oil dip stick, then install spark plug wires and distributor cap assembly.
3. Connect heater hose at upper shroud.
4. Install Delcotron and Delcotron bracket.
5. Install vacuum balance tube and crankcase ventilation tube and hoses.
6. Install blower belt and adjust as outlined.
7. Install carburetors and cross shaft then connect vacuum advance hose at right carburetor.
8. Install, adjust and connect upper choke control rods, then adjust and connect accelerator rod as outlined in Engine Tune-Up.
9. Install and connect fuel lines.
10. Install air cleaner assembly, then install spare tire.

Lower Shrouds and Thermostats (Fig. 24)**Removal**

1. Remove bolts attaching lower shroud to crankcase, cylinder head, front shroud and exhaust duct.
2. Drop lower shroud until swivel on thermostat rod can be disconnected from exhaust duct damper.
3. Disconnect swivel and remove lower shroud and thermostat assembly.

Thermostat Replacement

NOTE: In the event of a failed thermostat bellows, the exhaust duct damper will remain in the open position allowing a maximum air flow over the engine to prevent overheating.

1. Remove lower shroud as outlined.
2. Using an open end wrench, on the flat provided, hold thermostat and remove thermostat actuating rod and swivel assembly.
3. Remove nut attaching thermostat to bracket, then remove thermostat.
4. Install new thermostat and tighten securely.
5. Install thermostat actuating rod and swivel assembly and tighten securely.

CAUTION: To prevent damage to the thermostat bellows while tightening actuating rod, hold flat on thermostat with an open end wrench.

Thermostat Adjustment

1. Install lower shroud assembly with two bolts (one to crankcase and one to cylinder head).
2. Hold exhaust duct damper in the fully open position and pull the thermostat actuating rod out the maximum travel (thermostat against bracket stop).
3. Adjust the swivel until it just enters the hole provided in the exhaust duct damper.
4. Remove lower shroud assembly and connect retaining clip, then install lower shroud as outlined.

Installation

1. Connect swivel to exhaust duct damper then install all lower shroud attaching bolts and tighten securely.
2. Check adjustment verifying that thermostat bottoms at bracket before damper hits stop.

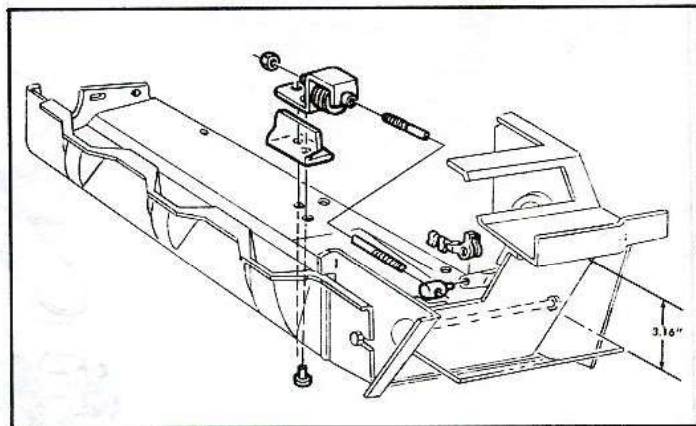


Fig. 24—Lower Shroud and Thermostat

Front Shrouds (Fig. 25)**Removal**

1. Remove lower shroud as outlined.
2. Remove exhaust manifold as outlined.
3. Disconnect heater hose at elbow on front shroud.
4. Remove bolts attaching front shroud to cylinder head and upper shroud, then remove front shroud and heater elbow as an assembly.

NOTE: On left front shroud, one attaching bolt (to cylinder head) is reached through heater elbow.

Installation

1. Install front shroud and tighten securely.
2. Connect heater hose.
3. Install exhaust manifold as outlined.
4. Install lower shroud as outlined.

Exhaust Ducts (Fig. 25)**Removal**

1. Disconnect seal from flange of exhaust duct and rear center shield.
2. Remove ignition coil and bracket (for right exhaust duct).
3. Remove grille, then, remove rear center shield as outlined.
4. Remove lower shroud as outlined.
5. Remove exhaust duct attaching bolts, then remove exhaust duct.

Installation

1. Install exhaust duct with all bolts finger tight, then tighten bolts securely.
2. Install lower shroud as outlined.
3. Install rear center shield as outlined, then, install grille.
4. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto rear center shield and exhaust duct flange (with one hand), press seal in place with a block of wood or a hammer handle.
5. Install ignition coil and bracket (if removed).

Rear Shrouds (Fig. 25)**Removal**

1. Remove oil cooler (for left rear shroud) or remove ignition coil and bracket (for right rear shroud).

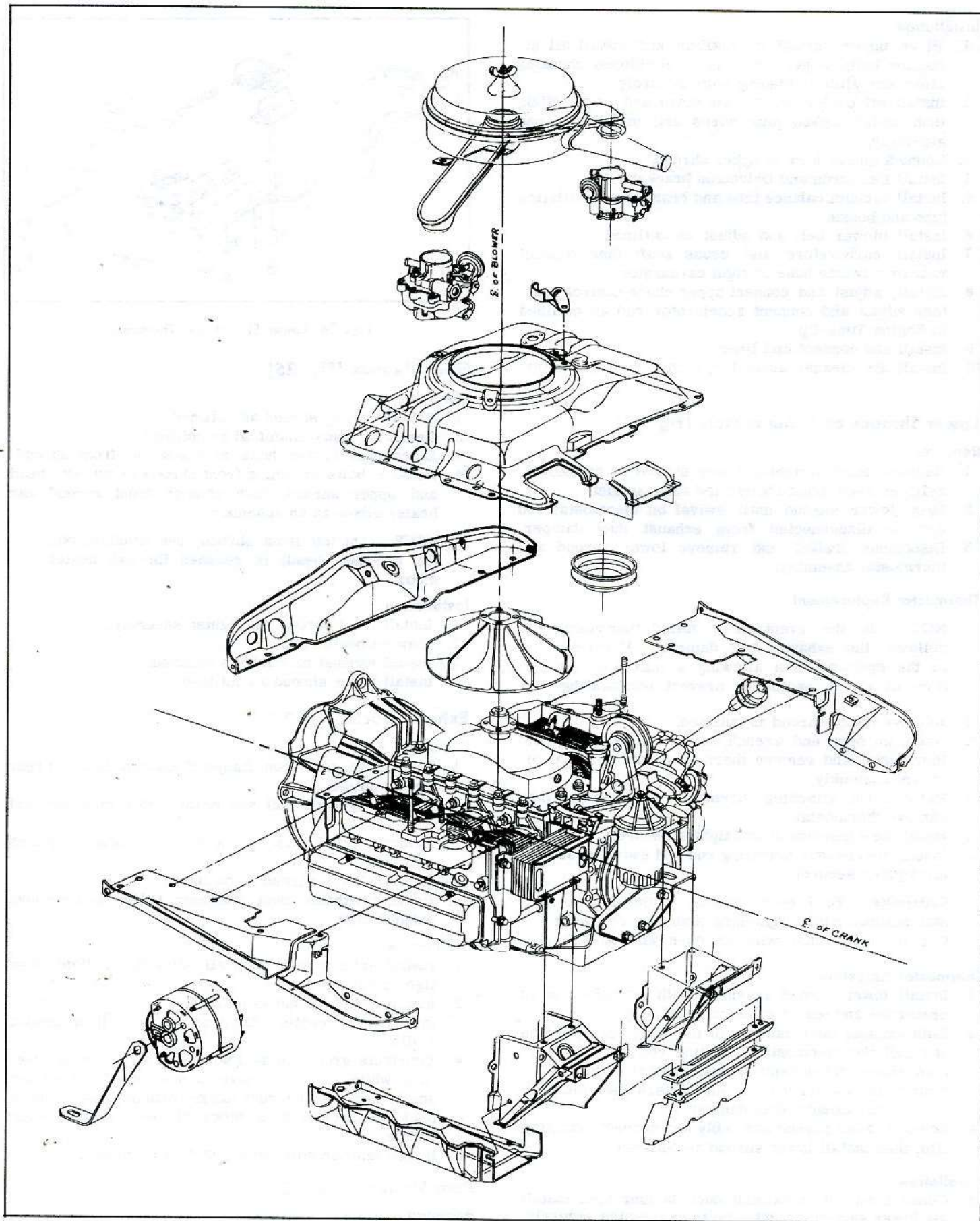


Fig. 25—Engine Sheet Metal—Exploded View

2. Remove lower shroud as outlined.
3. Remove exhaust duct as outlined.

NOTE: For right rear shroud it is necessary to disconnect the wiring at the cylinder head temperature and oil pressure sending units, then disconnect at harness quick-disconnect so harness may be removed with shroud.

4. Disconnect bolts attaching upper shroud to rear shroud, then remove rear shroud.

Installation

1. Install rear shroud, then install exhaust duct and lower shroud as outlined.
2. Install oil cooler and/or ignition coil and bracket.

Blower Belt, Idler Pulley and Belt Guides (Fig. 26)

Removal

1. Loosen nut and bolt at idler pulley and remove blower belt.
2. If necessary, remove bolt and remove idler pulley and rear belt guide as a unit.
3. If necessary, remove bolts attaching upper belt guide and remove upper guide.

Installation and Adjustment

1. If removed, install upper guide leaving bolts finger tight.
2. If removed, install rear guide and idler pulley as a unit and leave bolt and nut finger tight.
3. Install blower belt over pulleys (Delcotron pulley last).
4. Adjust blower belt as follows:

Place a 1/16" shim between belt and rear guide then using a bar and a strand tension gauge adjust blower belt to 55 lb. \pm 5 lb. (used belt), 75 lbs. \pm 5 lb. (new belt) and tighten bolt and nut securely.

Remove shim from between blower belt and rear guide then using shim as a gauge adjust upper guide and tighten securely.

Blower

Removal

1. Remove upper shroud as outlined.
2. Remove bolts from blower pulley, then remove blower pulley and blower from blower bearing hub.

NOTE: For blower bearing replacement refer to Crankcase Cover.

Installation

1. Install blower and blower pulley on blower bearing hub, then install bolts and torque to specifications.
2. Install upper shroud as outlined.

EXHAUST MANIFOLDS

Removal

1. Remove lower shroud as outlined.
2. Remove nuts at exhaust manifold flange (retaining exhaust pipe).
3. Bend french locks, then remove nuts, locks and clamps.
4. Using a soft hammer tap exhaust manifold off exhaust port sleeves then remove and discard all packings.

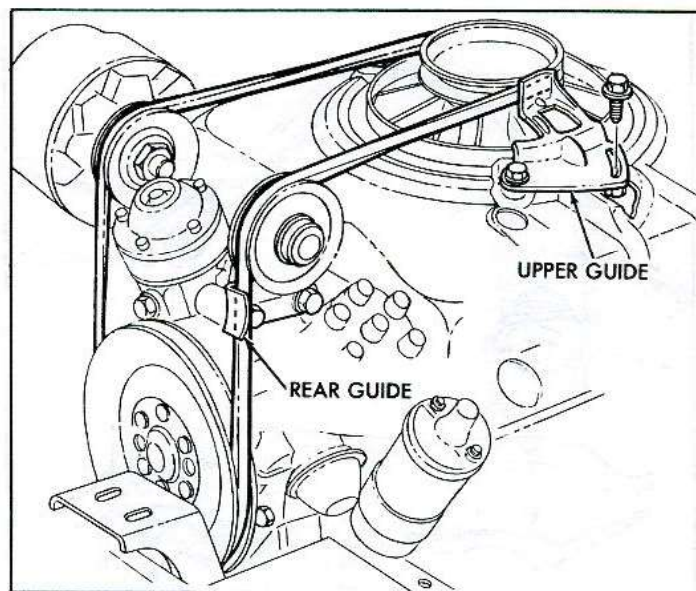


Fig. 26—Blower Belt and Guides

Installation

1. Using new packings install exhaust manifold over exhaust port sleeves, then install clamps, locks and nuts.
2. Tighten manifold clamp nuts a little at a time until specified torque is reached. Tap manifold in place over exhaust port sleeves with a soft hammer while tightening nuts.
3. Bend french locks, then install lower shrouds.
4. Using a new packing, connect exhaust pipe to exhaust manifold.

ENGINE MOUNTS

NOTE: Front and rear engine mounts are of the non-adjustable type. Because of this, service is seldom required. Broken or deteriorated mounts should be replaced immediately because of the added strain on other mounts and other drive line components.

Front Mounts (Fig. 27)

Replacement

1. On engines equipped with synchromesh transmission; remove clutch lever ball stud from front mount bracket, then disconnect shift rod coupling from transmission shift rod.
On engines equipped with Powerglide transmission, disconnect control cable.
2. Place engine lift, with Tool J-7894 attached, under engine.
3. Remove cotter key and nut from each engine front mount.
4. Lower engine enough to release weight from front mounts.
5. Disconnect emergency brake return spring from front mount bracket.
6. Remove bolts attaching front mount bracket to transmission.

NOTE: On synchromesh equipped vehicles be careful not to drop the spacer on the one 7/16" bolt.

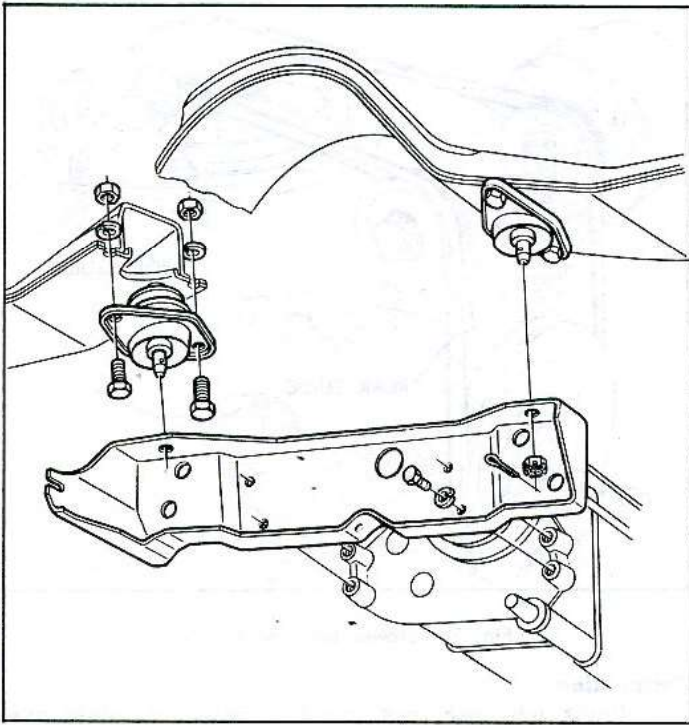


Fig. 27—Front Mounts

7. Remove front mount bracket and spacer (if used).
8. Remove front mount retaining nuts, then remove front mounts.
9. Install front mounts and torque to specifications.
10. Install front mount bracket to transmission with the spacer (if used) on the one 7/16" bolt, then torque bolts to specifications.
11. Raise engine until weight is on front mount bracket, and install nuts and torque to specifications, then install cotter key.
12. Connect emergency brake return spring.
13. On engines equipped with synchromesh transmission, connect shift rod coupling to transmission shift rod then install clutch lever ball stud in front mount bracket.

On engines equipped with Powerglide transmission, connect control cable.

14. Remove engine lift and Tool J-7894 from under engine.

Rear Mount (Fig. 28)

Replacement

1. Place engine lift, with Tool J-7894 attached, under engine.
2. Remove grille and rear center shield, then disconnect rear mount from rear mount bracket.
3. Lower engine enough to release weight from rear mount.
4. Remove four bolts attaching mount to body, then remove mount.
5. Install rear mount and torque to specifications.
6. Raise engine until weight is on rear mount then install spacer and nuts and torque to specifications.
7. Install rear center shield and grille.
8. Remove engine lift and Tool J-7894 from under engine.

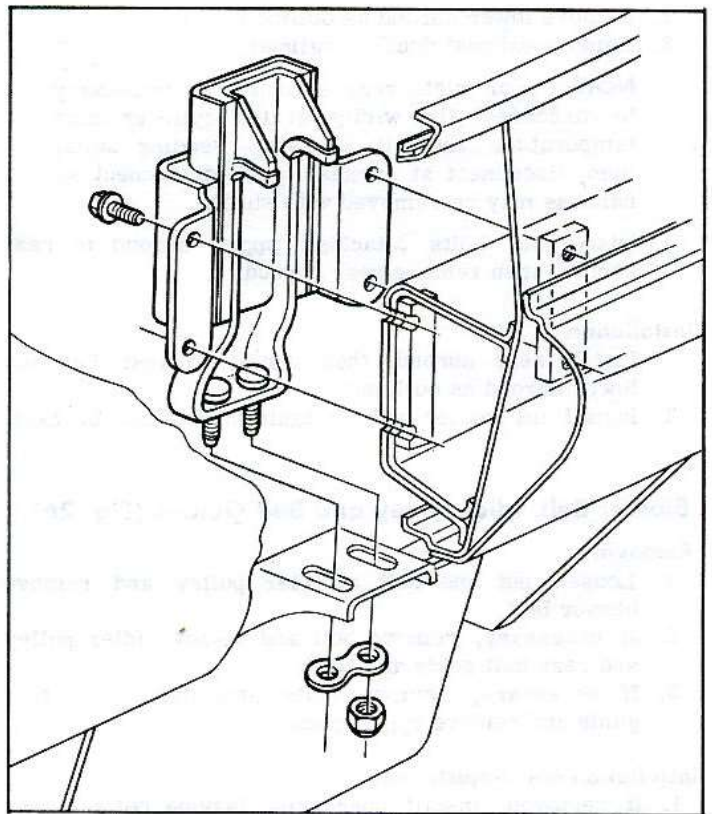


Fig. 28—Rear Mount

CRANKCASE COVER AND BLOWER BEARING

Removal

1. Remove upper shroud as outlined.
2. Remove retaining bolts from blower pulley and remove blower pulley and blower from blower bearing hub assembly.
3. Remove crankcase vent tube retainer, crankcase vent tube and crankcase vent tube "O" ring seal. Discard "O" ring seal.
4. Remove crankcase cover bolts and flat washers.
5. Remove crankcase cover and blower bearing assembly as a unit.
6. Remove crankcase vent and both crankcase cover gaskets. Discard gaskets.

Blower Bearing Replacement (Fig. 29)

1. While supporting crankcase cover, press blower bearing shaft out of cover.
2. Coat new blower bearing shaft with hypoid lubricant, then while supporting crankcase cover, press blower bearing hub assembly into crankcase cover to specified height.

CAUTION: Press on shaft of blower bearing. Do not press on bearing outer race or bearing seal.

Installation

1. Clean gasket surfaces on crankcase, crankcase vent and crankcase cover.
2. Install crankcase cover gasket and crankcase vent then second crankcase cover gasket.

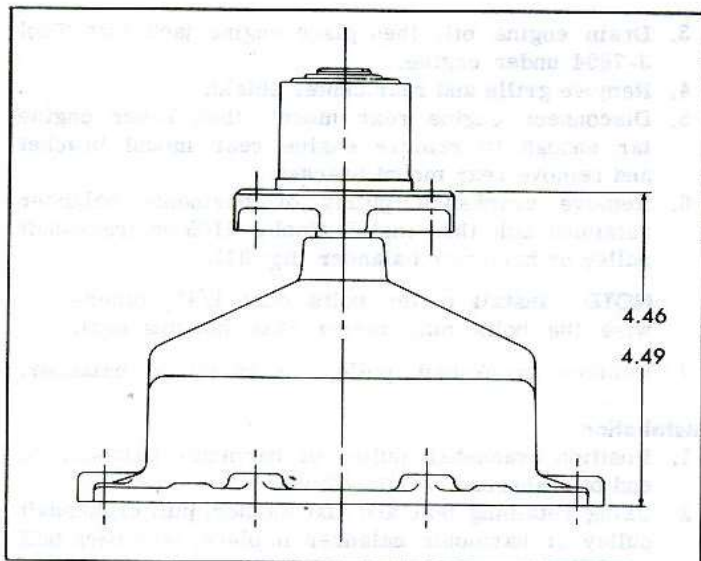


Fig. 29—Blower Bearing Replacement

3. Install crankcase cover and torque bolts to specifications.
4. Install crankcase vent tube using a new "O" ring seal.
5. Install blower and blower pulley and torque to specifications.
6. Install upper shroud as previously outlined.

OIL FILTER AND DELCOTRON ADAPTER

Removal

1. Remove blower belt.
2. Disconnect and remove Delcotron.
3. Disconnect fuel lines at fuel pump.
4. Remove bolts around oil filler tube, then remove all remaining bolts from adapter.
5. Remove adapter with fuel pump, oil filter, idler pulley and belt guide as a unit.
6. Remove adapter gasket and discard.

Installation

1. Check surface of engine rear housing and adapter for nicks or cracks.
2. Install a new adapter gasket.
3. Place bolts and flat washers (3) in adapter around oil filler tube.
4. Start fuel pump push rod and return spring into push rod guide.
5. Hold adapter cover in place and tighten bolts around oil filler tube finger tight.
6. Install remaining bolts and flat washers and torque all bolts to specifications.
7. Install and connect Delcotron.
8. Connect fuel lines at fuel pump.
9. Start engine and check for leaks.

Oil Cooler (Fig. 30)

Removal

1. Remove oil cooler access hole cover.
2. Remove all screws and bolts retaining oil cooler to shroud, shield and cylinder head.

3. Remove oil cooler mounting bolt and then remove oil cooler and seals. Discard seals.

Installation

1. Install new oil cooler seals in place on oil cooler adapter.
2. Install oil cooler and torque to specifications.
3. Install all screws and bolts to shroud, shield and cylinder head, then tighten securely.
4. Install oil cooler access hole cover.
5. Start engine and check for leaks.

OIL PUMP

Gear Removal

1. Drain engine oil.
2. Install engine jack, with Tool J-7894 attached, under engine with a piece of hardwood positioned between the oil pan rails adjacent to engine skid plate.

NOTE: Installation of hardwood block will allow removal of engine skid plate.

3. Remove grille and rear center shield and disconnect rear mount, then lower engine approximately 1" (to clear rear mount bracket).
4. Remove rear mount bracket and engine skid plate.
5. Remove oil pump cover and gasket. Discard gasket.

NOTE: Refer to Repair Procedures, Engine Rear Housing for oil pump repair.

Gear Installation

1. Install oil pump gears, then using a new gasket install oil pump gear cover and torque to specifications.
2. Install skid plate and rear mount bracket and torque nuts to specifications.
3. Raise engine, connect rear mount and torque to specifications.
4. Install rear center shield and grille.
5. Remove lifting jack, Tool J-7894 and hardwood block.
6. Fill with oil, start engine and check for leaks.

Pressure Regulator Removal

1. Drain engine oil.
2. Remove left lower shroud and left exhaust duct.

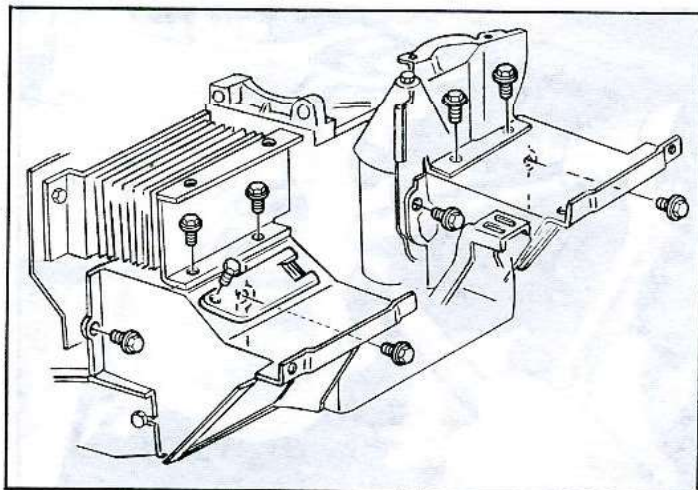


Fig. 30—Oil Cooler and Exhaust Ducts

3. Remove pressure regulator plug, gasket, spring and valve.

NOTE: Refer to Repair Procedures, Engine Rear Housing for pressure regulator valve repair.

Pressure Regulator Installation

1. Install pressure regulator valve, spring, gasket and plug, then torque to specifications.
2. Install left exhaust duct and left lower shroud.
3. Fill with oil, start engine and check for leaks.

NOTE: To check oil pressure regulator, remove oil pressure sending unit and connect oil pressure gauge. Accelerate engine until oil pressure gauge stops increasing. Oil pressure regulator should regulate at 35 psi.

OIL PAN

Removal and Installation

1. Drain engine oil, remove oil pan and gasket. Discard gasket.
2. Clean gasket surfaces on oil pan and crankcase with cleaning solvent.
3. Install oil pan with a new gasket. Torque retaining bolts to specifications.
4. Fill with oil, start engine and check for leaks.

OIL PICK-UP SCREEN AND TUBE

Replacement

1. Remove oil pan as outlined.
2. Remove clamp and bracket from tube.
3. Remove and replace oil pick-up screen and tube as outlined under Repair Procedures, Crankcase.
4. Install bracket and torque bolts to specifications.
5. Install oil pan as outlined.
6. Fill with oil, start engine and check for leaks.

CRANKSHAFT PULLEY OR HARMONIC BALANCER

Removal

1. Disconnect engine seal from rear center shield and the rear half of the left and right side shield flanges.
2. Remove blower belt and oil filter.

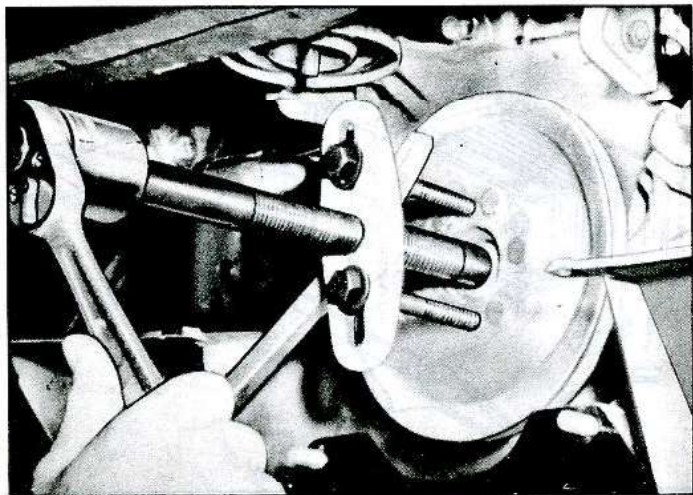


Fig. 31—Removing Crankshaft Pulley

3. Drain engine oil, then place engine jack with Tool J-7894 under engine.
4. Remove grille and rear center shield.
5. Disconnect engine rear mount, then lower engine far enough to remove engine rear mount bracket and remove rear mount bracket.
6. Remove crankshaft pulley or harmonic balancer retaining bolt then install Tool J-8105 on crankshaft pulley or harmonic balancer (fig. 31).

NOTE: Install puller bolts only 1/4", otherwise the bolts may injure rear housing seal.

7. Remove crankshaft pulley or harmonic balancer.

Installation

1. Position crankshaft pulley or harmonic balancer on end of crankshaft with key lined up.
2. Using retaining bolt and flat washer, pull crankshaft pulley or harmonic balancer in place, then back bolt out 1/2 turn and torque to specifications.

CAUTION: Do not drive crankshaft pulley or harmonic balancer onto crankshaft. To do so may damage crankshaft thrust bearing and crankcase.

3. Install engine rear mount bracket and torque nuts to specifications.
4. Raise engine and connect rear mount, then torque to specifications.
5. Remove engine jack and Tool J-7894.
6. Install rear center shield and grille.
7. Install new oil filter and torque to specifications.
8. Install blower belt and adjust as outlined.
9. Lubricate groove of seal with liquid soap or silicone, then while guiding groove of seal onto shield flange (with one hand), press seal in place with a block of wood or a hammer handle.
10. Fill with oil, start engine and check for leaks.

ENGINE REAR HOUSING SEAL

Replacement

1. Remove crankshaft pulley or harmonic balancer as outlined.
2. Remove seal by prying on outer edge of seal with two screw drivers, then discard seal.
3. Install new seal over crankshaft and tap in place with a block of hardwood.
4. Install crankshaft pulley or harmonic balancer as outlined.

ENGINE REAR HOUSING

Removal

1. Remove distributor cap and note position of rotor, then disconnect and remove distributor.
2. Remove oil filter and Delcotron adapter as outlined.
3. Drain engine oil.
4. Install engine lift with Tool J-7894 attached, under engine with a piece of hardwood positioned between the oil pan rails adjacent to engine skid plate.

NOTE: Installation of hardwood block will allow removal of engine skid plate.

5. Remove rear center shield and disconnect rear mount, then lower engine approximately 1" (to clear rear mount bracket).

6. Remove rear mount bracket and engine skid plate.
7. Remove crankshaft pulley or harmonic balancer as outlined.
8. Remove engine rear housing assembly.

NOTE: Refer to Repair Procedures, Engine Rear Housing for service to engine rear housing.

Installation

1. Install engine rear housing and torque bolts to specifications.
2. Install crankshaft pulley or harmonic balancer as outlined.
3. Install engine skid plate and rear mount bracket and torque nuts to specifications.
4. Raise engine and connect engine rear mount then torque to specifications.
5. Install rear center shield.
6. Remove engine lift, Tool J-7894 and hardwood block.
7. Install oil filter and Delcotron adapter as outlined.
8. Install distributor in the same position as when removed then install distributor cap.
9. Fill with oil, start engine, check and adjust timing and check for oil leaks.

DISTRIBUTOR DRIVE GEAR AND/OR FUEL PUMP ECCENTRIC

Replacement

1. Remove engine rear housing as outlined.
2. Remove distributor drive gear with Tool J-7112-1 and adapter Tool J-7112-2, then remove spacer and fuel pump eccentric.

CAUTION: Be sure Tool J-7112-1 is on distributor drive gear solidly, or gear may be damaged during removal.

3. Be sure woodruff keys (2) are installed in crankshaft, then position fuel pump eccentric and spacer on crankshaft.
4. Lubricate crankshaft and distributor drive gear with engine oil and using Tool J-5590 install distributor drive gear until it bottoms.
5. Install engine rear housing as outlined.

VALVE LIFTERS (Valve Train Components)

Hydraulic valve lifters very seldom require attention. The lifters are extremely simple in design, readjustments are not necessary, and servicing of the lifters require only that care and cleanliness be exercised in the handling of parts.

Locating Noisy Lifters

Locate a noisy valve lifter by using a piece of garden hose approximately four feet in length. Place one end of the hose near the end of each intake and exhaust valve with the other end of the hose to the ear. In this manner, the sound is localized making it easy to determine which lifter is at fault.

Another method is to place a finger on the face of the valve spring retainer. If the lifter is not functioning properly, a distinct shock will be felt when the valve returns to its seat.

The general types of valve lifter noise are as follows:

1. Hard Rapping Noise—Usually caused by the plunger becoming tight in the bore of the lifter body to such

an extent that the return spring can no longer push the plunger back up to working position. Probable causes are:

- a. Excessive varnish or carbon deposit causing abnormal stickiness.
 - b. Galling or "pick-up" between plunger and bore of lifter body, usually caused by an abrasive piece of dirt or metal wedging between plunger and lifter body.
2. Moderate Rapping Noise—Probable causes are:
 - a. Excessively high leakdown rate.
 - b. Leaky check valve seat.
 - c. Improper adjustment.
 3. General Noise Throughout the Valve Train—This will, in almost all cases, be a definite indication of insufficient oil supply, or improper adjustment.
 4. Intermittent Clicking—Probable causes are:
 - a. A microscopic piece of dirt momentarily caught between ball seat and check valve ball.
 - b. In rare cases, the ball itself may be out-of-round or have a flat spot.
 - c. Improper adjustment.

In most cases where noise exists in one or more lifters all lifter units should be removed, disassembled, cleaned in a solvent, reassembled, and reinstalled in the engine. If dirt, varnish, carbon, etc. is shown to exist in one unit, it more than likely exists in all the units, thus it would only be a matter of time before all lifters caused trouble.

Removal

1. Drain engine oil, then remove lower shrouds as outlined. For the right bank, remove muffler heat shield.
2. Remove valve rocker arm covers and discard gaskets.
3. Remove rocker arm nuts, rocker arm balls, rocker arms and push rods. Place in a rack so they may be installed in their original location.
4. Remove rocker arm studs and push rod guides, then remove and discard rocker arm stud "O" ring seals (fig. 32).
5. Pull push rod tubes from crankcase bore and remove and discard inner "O" ring seal, (fig. 33), then remove push rod tube from cylinder head and remove and discard outer "O" ring seal.

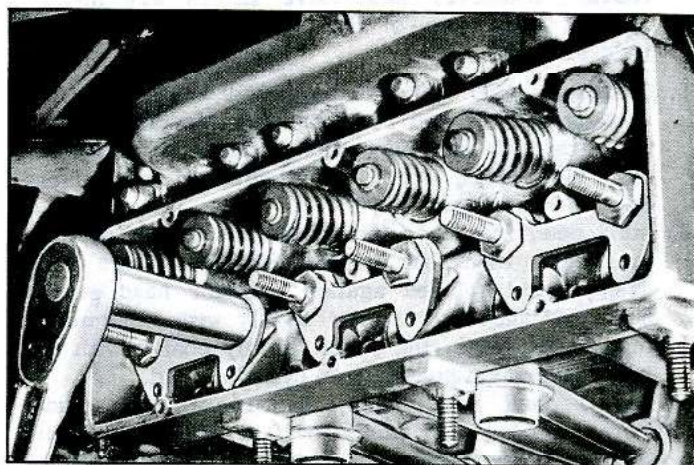


Fig. 32—Rocker Arm Studs and Push Rod Guides

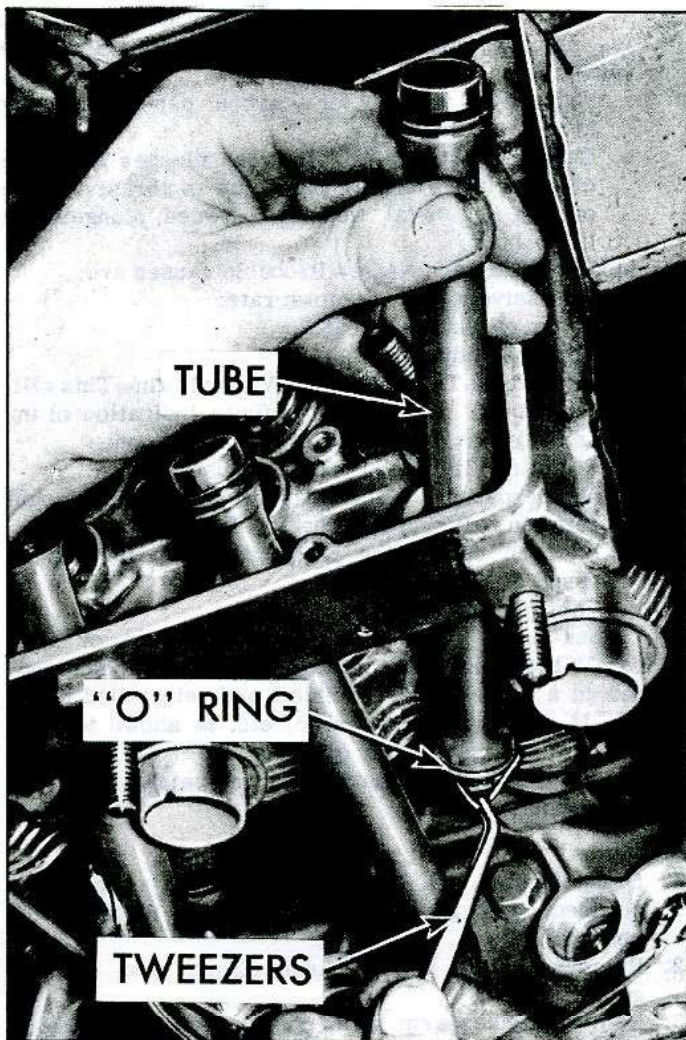


Fig. 33—Removing Push Rod Tubes

6. Remove valve lifters with a strong magnet or a wire hook. Place valve lifters in a rack so they may be reinstalled in their original location.

Installation and Adjustment

1. Lubricate valve lifters and install in crankcase bore.

NOTE: Whenever new valve lifters are installed, coat foot of lifter with Molykote or its equivalent.

2. Install new "O" ring seals, lightly coated with oil, on long end of push rod tubes, then install push rod tubes through bore in cylinder head and install new "O" ring seals, lightly coated with oil, on inner end of push rod tubes.
3. Start push rod tubes into bores in cylinder head and crankcase, then seat the push rod tubes with a 9/16" deep socket (placed against cylinder head end of push rod tube and tapped lightly with a hammer).
4. Install new "O" ring seals, lightly coated with oil, into rocker arm stud bore in cylinder head.
5. Install push rod guides, then rocker arm studs.
6. Torque rocker arm studs to 10 ft. lb. below specifications, then torque cylinder head nuts and rocker arm studs a little at a time in the sequence shown (fig. 34) until the specified torque is reached.

7. Install push rods with the side oil hole out (fig. 35).
8. Install valve rocker arms, rocker arm balls and rocker arm nuts.

NOTE: Whenever new valve rocker arms and rocker arm balls are installed, coat surfaces lightly with Molykote or its equivalent. (Install new rocker arms and balls in sets).

9. Adjust the valves as follows:

Remove distributor cap and rotate crankshaft counter-clockwise until number 1 cylinder is at T.D.C. of compression stroke rotor pointing to number 1 cylinder position and timing mark at 0 on the tab), then adjust No. 1 intake, No. 1 exhaust, No. 3 intake and No. 5 exhaust on the right bank and No. 4 exhaust and No. 6 intake on the left bank.

NOTE: Turn adjusting nut out until there is end play in the push rod, then turn adjusting nut in until there is no end play at push rod. Turn adjusting nut one additional turn in (to center plunger in hydraulic valve lifter)

Turn crankshaft one turn counter-clockwise (number 2 cylinder at T.D.C. of compression stroke and timing mark at 0 on tab), then adjust the valves on No. 3 exhaust and No. 5 intake on the right bank and No. 2 intake, No. 2 exhaust, No. 4 intake and No. 6 exhaust on the left bank.

10. Using new gaskets, install the valve rocker covers and torque to specifications (fig. 36).
11. Install lower shrouds and muffler heat shield as outlined.
12. Fill with oil, start engine and check for leaks.

CYLINDER HEAD ASSEMBLIES

Removal

1. Drain engine oil, then disconnect battery positive cable.
2. Remove spare tire, then remove air cleaner assembly.
3. Remove the following items from the cylinder head to be removed.

Carburetor, carburetor mounting studs and upper choke control rods.

Ignition coil and bracket (right cylinder head).
Side shield, lower shroud and exhaust duct.

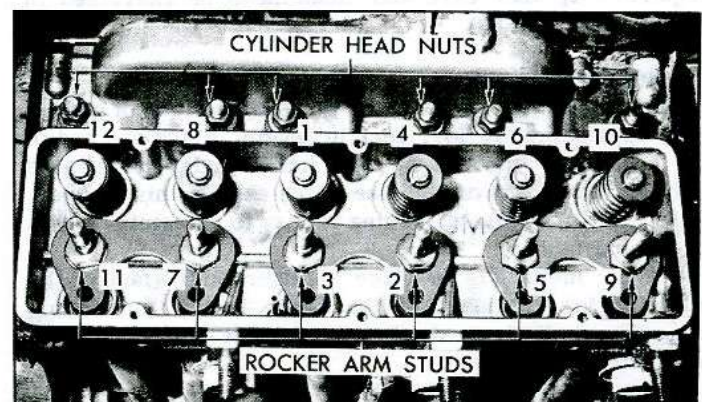


Fig. 34—Cylinder Head Torque Sequence

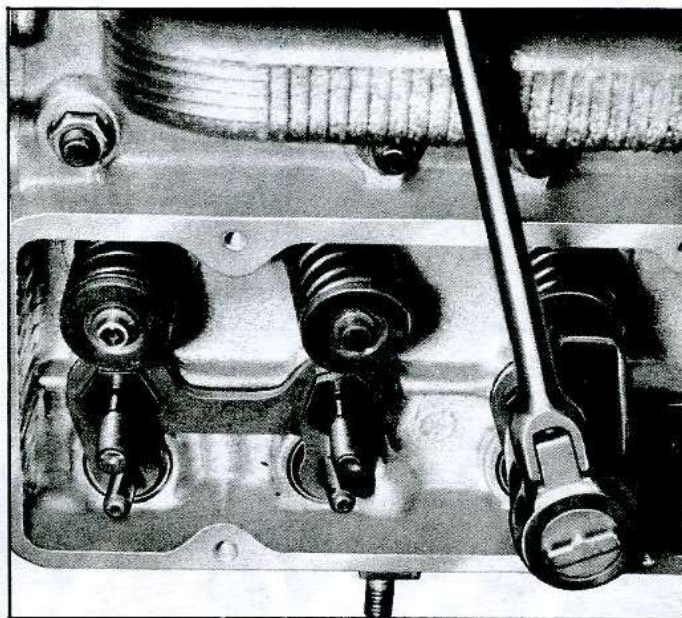


Fig. 35—Push Rods Installed

Oil cooler (left cylinder head).

Muffler, muffler shield and muffler hanger (right cylinder head).

Spark plugs and vacuum balance tube hose at cylinder head.

Bolts attaching upper shroud to front and rear shrouds and bolts attaching front and rear shrouds to cylinder head.

Exhaust manifolds.

NOTE: On left rear shroud, it will be necessary to disconnect heater hose at elbow to gain access to one bolt.

4. On the right cylinder head, disconnect wire to cylinder head temperature sending unit.

5. Remove cylinder head assembly as follows:

Remove valve rocker arm cover and discard gasket.

Remove rocker arm nuts, rocker arm balls, rocker arms and push rods. Place in a rack so they may be installed in their original location.

Remove rocker arm studs and push rod guides, then remove and discard rocker arm stud "O" ring seals.

Pull push rod tubes from crankcase bore and remove and discard inner "O" ring seal, then remove push rod tube from cylinder head and remove and discard "O" ring seal. Remove cylinder head nuts, then remove cylinder head assembly from crankcase studs and discard cylinder head gaskets.

Installation

1. Install cylinder head assembly as follows:

Place cylinder head gasket in cylinder head combustion chamber.

Install cylinder head assembly over studs and carefully guide into place.

Install 6 cylinder head nuts (finger tight).

Install new "O" ring seals, lightly coated with oil, on long end of push rod tubes, then install push rod tubes through bore in cylinder head and install

new "O" ring seals, lightly coated with oil, on inner end of push rod tubes.

Start push rod tubes into bores in cylinder head and crankcase, then seat the push rod tubes with a 9/16" deep socket (placed against cylinder head end of push rod tube and tapped lightly with a hammer).

Install new "O" ring seals, lightly coated with oil into rocker arm stud bore in cylinder head.

Install push rod guides, then rocker arm studs (finger tight).

Torque cylinder head nuts and rocker arm studs, a little at a time, in the sequence shown (fig. 34) until the specified torque is reached.

Install push rods with the side oil hole out.

Install rocker arms, rocker arm balls and rocker arm nuts.

NOTE: Whenever new rocker arms or rocker arm balls are installed, coat surfaces lightly with Molykote or its equivalent.

2. Connect wire to cylinder head temperature sending unit on right cylinder head.
3. Adjust valves as outlined under Valve Lifters.
4. Using a new gasket, install valve rocker cover and torque to specifications.
5. Install the following items as outlined.

Exhaust manifold.

Bolts attaching front and rear shroud to cylinder head and bolts attaching upper shroud to front and rear shroud.

Spark plugs and vacuum balance tube hose.

Muffler hanger, muffler heat shield, and muffler (right cylinder head).

Oil cooler (left cylinder head).

Exhaust duct, lower shroud and side shield.

Ignition coil and bracket (right cylinder head).

Carburetor mounting studs, carburetor and choke control rods.

6. Fill with oil, then connect battery positive cable.
7. Synchronize carburetors as outlined in Engine Tune-up.
8. Check for oil leaks.
9. Install air cleaner assembly and spare tire.

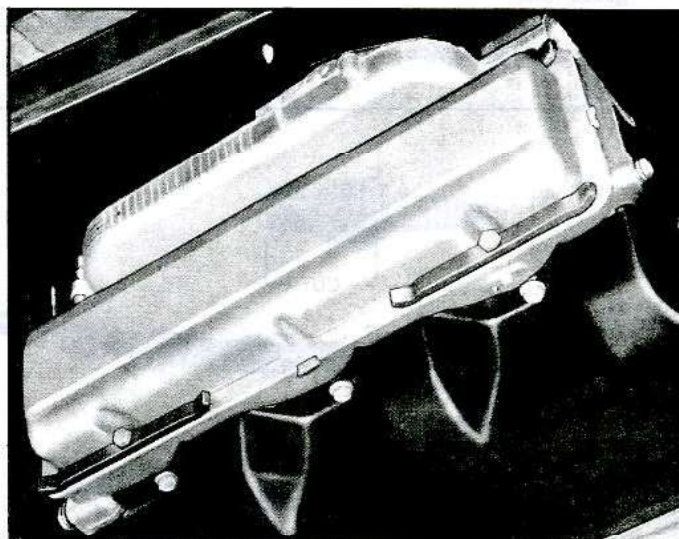


Fig. 36—Rocker Arm Cover Installed

VALVE SPRINGS AND/OR VALVE STEM OIL SEALS

NOTE: Intake valves on all Corvair engines are provided with valve stem oil seals. Valve springs and/or valve stem oil seals can be replaced with the cylinder head installed.

Replacement

1. Remove the spark plug, valve rocker cover, rocker arm nut, rocker arm ball, rocker arm and push rod on the cylinder to be serviced.
2. Apply compressed air to the spark plug hole to hold the valve in place.

NOTE: A tool to apply air to the cylinder is available through local jobbers or may be manufactured (fig. 37).

3. Using Tool J-5892 to compress the valve spring, remove the valve locks, valve cap and valve spring and damper assembly.
4. If valve stem oil seal on intake valve is to be replaced, remove seal from valve guide.
5. Check valve spring installed height as follows.
Install the spring cap and valve locks without the spring.

Hold the spring cap and pull the valve against the seat, then measure the distance between spring cap and spring seat (fig. 38).

NOTE: This locates the spring cap in the installed position.

6. Remove valve locks and spring cap and, if necessary, shim spring.

NOTE: Spring shims are available in .030" thickness. Do not shim if shim will bring installed height below minimum specification.

7. On intake valves, install new valve stem oil seal using special plastic protector sleeve to prevent seal damage as seal passes over the valve lock grooves. Push seal on guide until it bottoms on guide end.
8. Place the valve spring and damper assembly and valve cap in place.

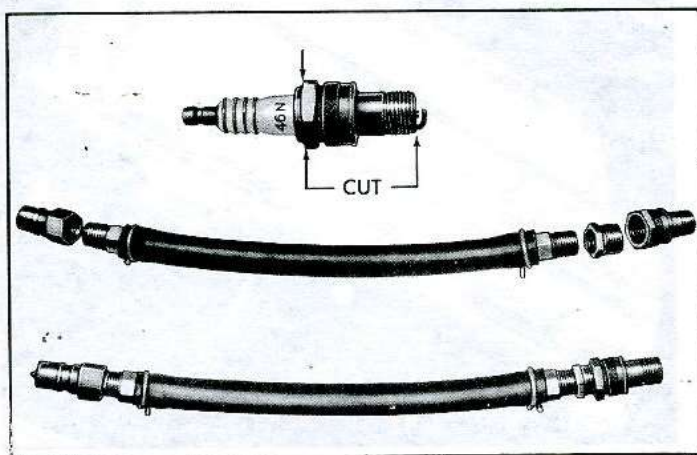


Fig. 37—Air Adapter Tool

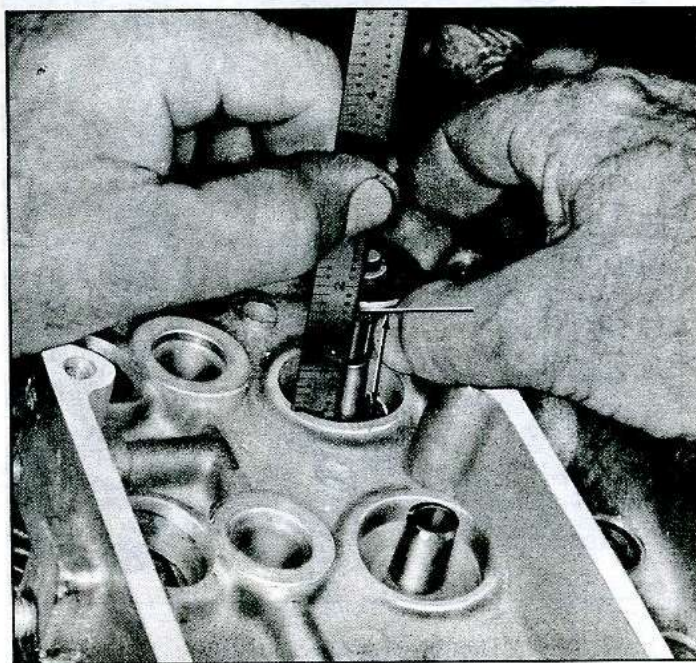


Fig. 38—Measuring Valve Spring Installed Height

9. Compress the valve spring with Tool J-5892 and install valve cap and valve locks, then release the compressor tool making sure the lock seats properly.

NOTE: Grease may be used to hold the locks in place while releasing the compressor tool.

10. Install spark plug with a new gasket, then install valve rocker arm, rocker arm ball and rocker arm nut and adjust valve as outlined under Valve Lifters.
11. Using a new gasket, install the valve rocker cover and torque to specifications.

CONNECTING ROD BEARINGS

Replacement

1. Remove upper shroud and crankcase cover as outlined.
2. Position connecting rod for removal of cap.
3. Remove connecting rod nuts, then remove connecting rod cap.
4. Install a piece of 5/16" I.D. plastic or rubber hose on connecting rod bolt, to protect crankshaft journals, (fig. 39).
5. Remove spark plug from cylinder being serviced and position connecting rod so bearing may be removed.
6. Remove bearing from connecting rod and connecting rod cap.

NOTE: Refer to Repair Procedures, Connecting Rod Bearing for clearances and bearing selection.

7. Lubricate and install bearing in connecting rod and connecting rod cap.
8. Install connecting rod cap and torque to specifications.
9. Install spark plug with a new gasket and torque to specifications.

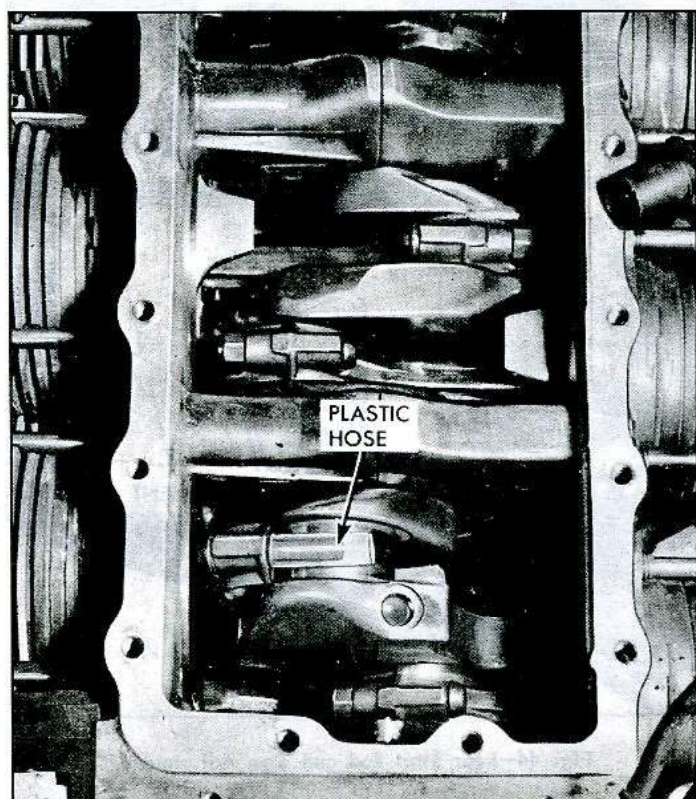


Fig. 39—Connecting Rod Bearing Replacement

10. Install crankcase cover and upper shroud as outlined.

PISTON RING AND/OR CYLINDER GASKET

Replacement

Cylinders and pistons are serviced as a unit and the operation outlined below, is only for one or more cylinders in one bank, requiring ring or gasket replacement. The operation below is not intended for complete engine (piston ring) overhaul.

1. Drain engine oil and remove cylinder head, then remove cylinder air baffle.
2. Remove cylinder from piston requiring piston ring, or cylinder gasket replacement.
3. If removed for ring replacement, replace rings on piston as outlined in Repair Procedures, Piston Rings.

CAUTION: Positioning of ring gaps is very important (To prevent oil consumption and to permit installation of the notched cylinder over the piston rings). Ring gaps must not line up with the notch in the cylinder.

4. Lubricate piston rings with engine oil and slide Tool J-8356 over piston rings. Tighten Tool J-8356 just enough to compress piston rings (fig. 40).
5. Install a new cylinder gasket over cylinder pilot and slide cylinder over piston and piston rings. Remove Tool J-8356, by unhooking clamp and pulling from piston assembly (fig. 41).
6. Install cylinder air baffle.
7. Install cylinder head as outlined.
8. Fill with oil, start engine and check for leaks.

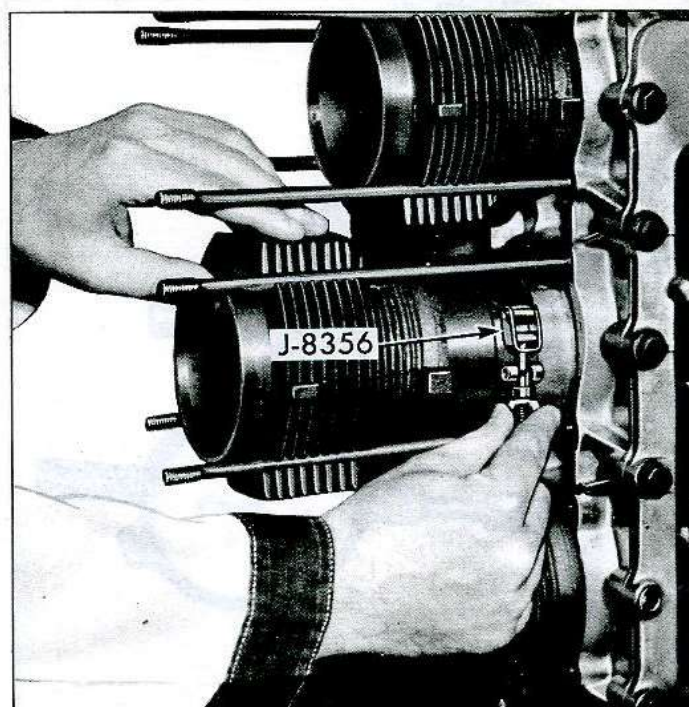


Fig. 40—Compressing Piston Rings

CAMSHAFT

Measuring Lobe Lift (At Push Rod)

This procedure is similar to that used for checking valve timing. Measure the lift of each lobe in consecutive order and record the readings.

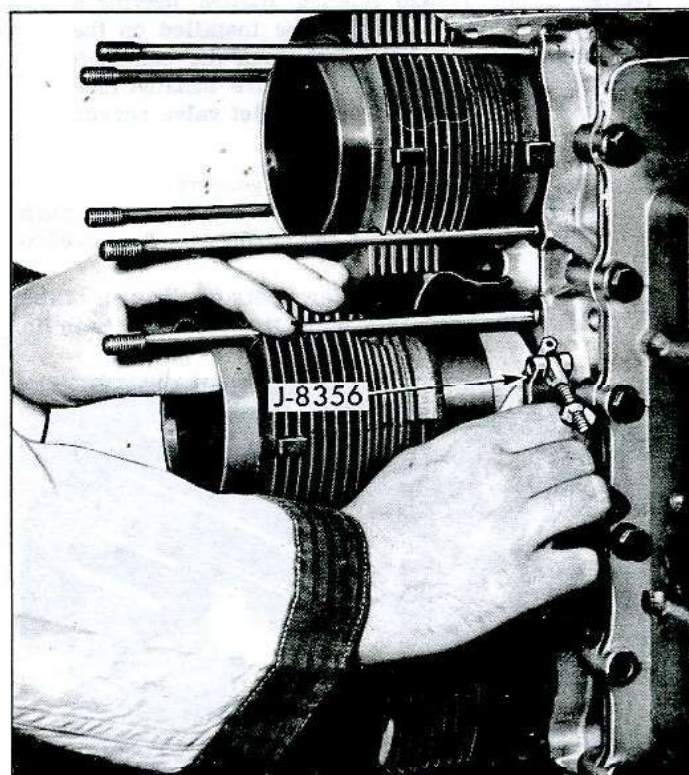


Fig. 41—Removing Tool from Piston Assembly

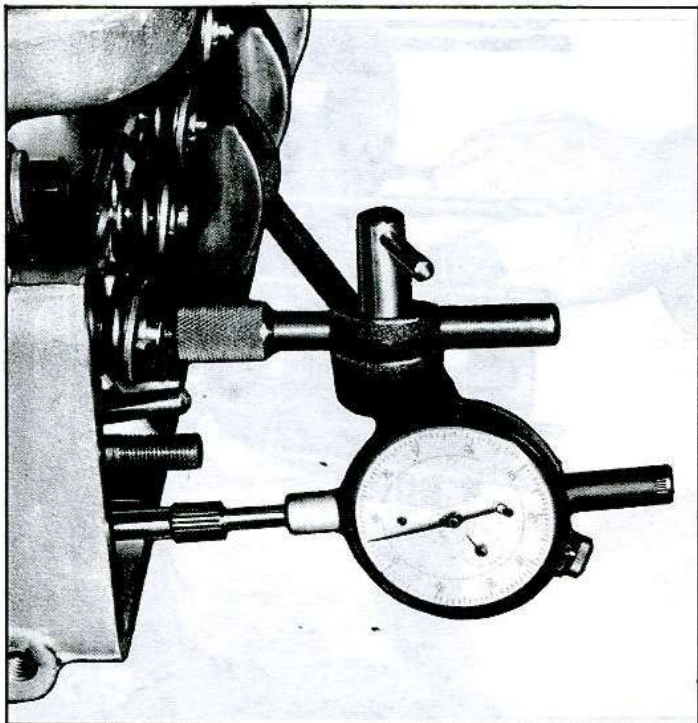


Fig. 42—Measuring Camshaft Lobe Lift

1. Drain crankcase oil and remove valve covers and discard gaskets.
2. Remove valve rocker arms, rocker arm balls and rocker arm nuts. Install adapter provided in Tool J-8520 on the valve rocker stud at desired cylinder to be measured and attach dial indicator.

NOTE: Tool J-8520 holding fixture (having a 3/8"-24 tapped hole) must be installed on the opposite valve rocker stud, than the camshaft lobe to be measured. To measure exhaust lobe lift, install Tool J-8520 on the inlet valve rocker stud.

3. Remove spark plugs and discard gaskets.
4. Install the push rod in place and make sure the push rod is in the lifter socket and adapter on Tool J-8520 (fig. 42).
5. Crank engine until the lifter rests on the heel of the camshaft lobe. At this point the push rod is in its

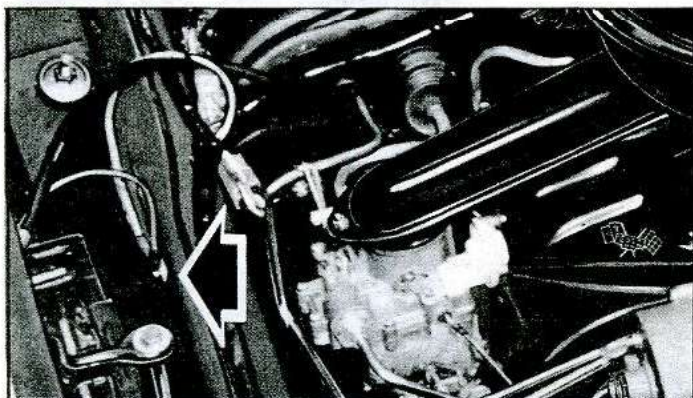


Fig. 43—Electrical Disconnect

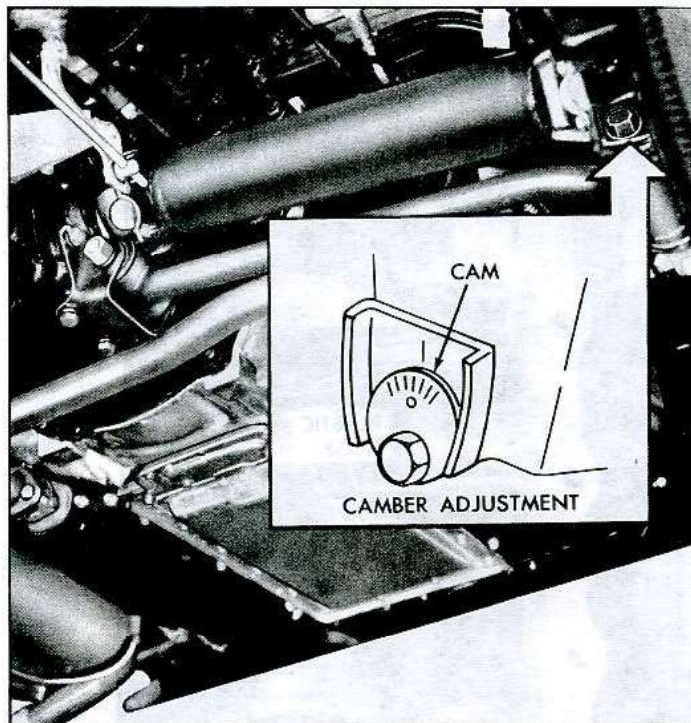


Fig. 44—Rear Strut Rod and Cam Adjustment

lowest position. Set the dial indicator on zero, then crank the engine until the push rod is in its fully raised position and note the total lift recorded on the indicator. Continue to rotate the crankshaft until the indicator reads zero. This will check the original indicator reading.

6. If the reading on any lobe is below specifications the camshaft and lifters should be replaced as outlined under Engine Disassembly.
7. If camshaft readings for all lobes are within specifications, remove dial indicator and adapter Tool J-8520.
8. Install valve rocker arms, rocker arm balls and rocker arm nuts and adjust valves as outlined under Valve Lifters.
9. Install valve covers using new gaskets.
10. Install spark plugs using new gaskets (clean plugs if necessary).
11. Fill with oil, start engine and check for leaks.

ENGINE ASSEMBLIES (POWER TRAIN)

Removal

1. Remove spare tire.
2. Disconnect heater hose at upper shroud.
3. Disconnect engine seal from engine shields.

NOTE: Disconnect seal by grasping at lower edge, then pulling up and off the shield flange.

4. Remove axle dip stick.
5. Disconnect the following electrical items:
 - Battery positive cable terminal and 10 gauge red wire at terminal on body side rail (fig. 43).
 - Battery negative cable at Delcotron bracket.
 - Starter wiring at quick disconnect.
 - Cylinder head temperature and oil pressure indicator wire at quick disconnect.

Positive wire at ignition coil.

If so equipped, radio ground straps at left and right engine shields.

6. Raise vehicle, then remove grille and rear center shield.
7. Disconnect fuel line at flexible hose then plug line from tank.
8. Disconnect heater hoses at elbows on left and right front shrouds.
9. Disconnect accelerator control rod at idler lever on transmission.
10. Index adjustment cam on outer end of rear strut rods (fig. 44), then loosen nut (do not turn bolt).

NOTE: This will aid in disconnecting and connecting rear strut rod at differential carrier.

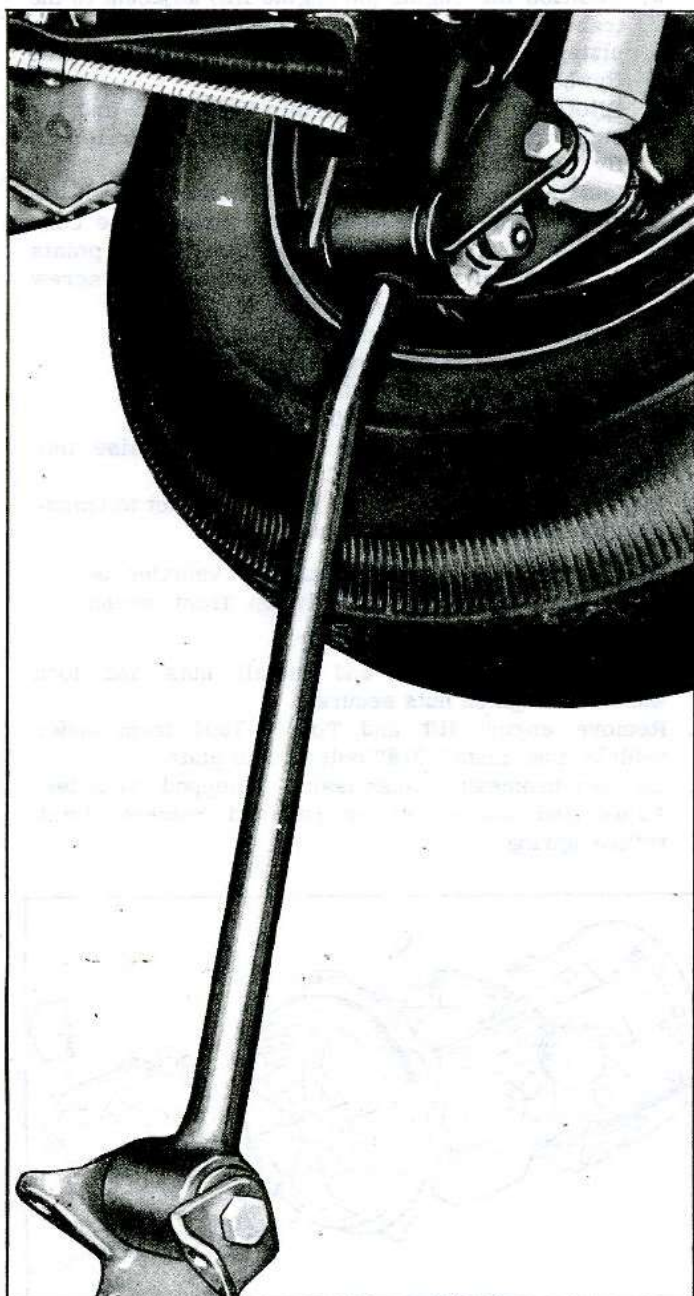


Fig. 45—Rear Strut Rod Lowered

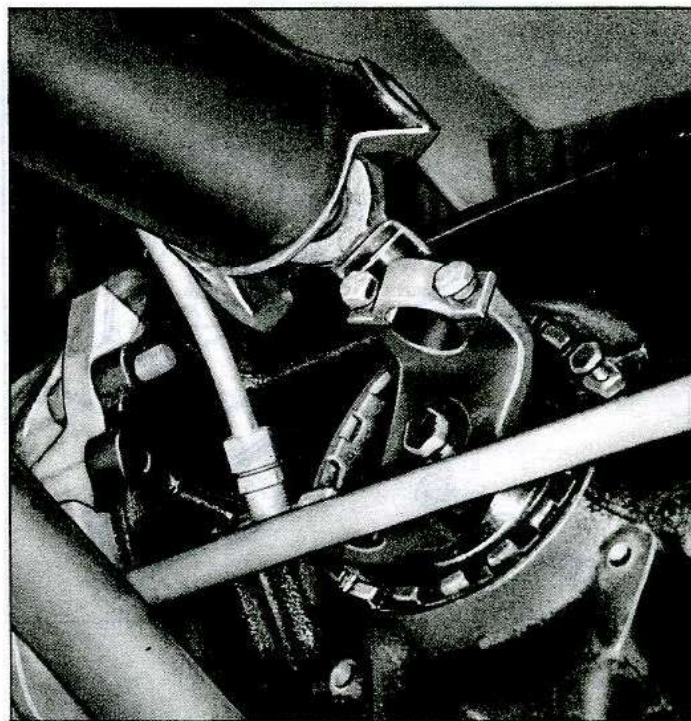


Fig. 46—Rear Axle Disconnected

11. Disconnect left and right rear strut rod brackets from differential carrier (fig. 45), then swing rods down.
12. Disconnect inner universal joints (fig. 46).
13. On automatic transmission equipped vehicles, disconnect transmission shift cable.

NOTE: Disconnect transmission shift cable by removing bolt retaining cable at transmission case, then rotate throttle lever its full limit clockwise and pull cable from transmission case.

14. On synchromesh transmission equipped vehicles: Disconnect shift tube coupling at transmission shifter shaft.

Disconnect clutch return spring, then disconnect clutch rod from clutch cross shaft.

If so equipped, disconnect back up lamp switch from 4-speed transmission.

15. Remove 3/8" bolt from bottom of skid plate then place engine lift, with Tool J-7894 attached, under engine and support weight of engine.
16. Remove nuts from engine rear mount, then remove bolts attaching front mount bracket to transmission case (fig. 47).

CAUTION: Do not loose spacer on synchromesh transmission equipped vehicles. Spacer is located on right bolt between transmission case and front mount bracket.

17. Slowly lower power train being sure all disconnects have been made and checking for interference, then remove power train from under vehicle.
18. Remove exhaust pipe and muffler as an assembly.
19. Remove transaxle (and clutch) as follows:

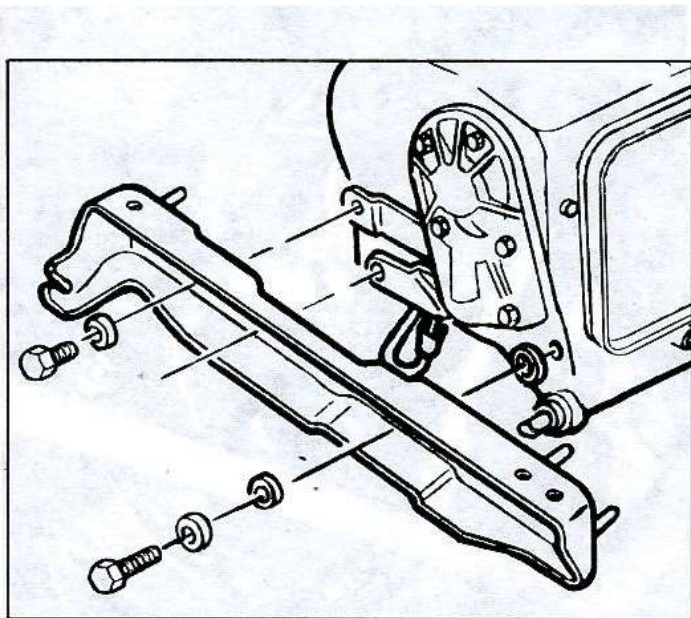


Fig. 47—Front Mount Bracket Bolts

SYNCHROMESH

- a. Using the engine lift, lower power train until transaxle rests on suitable blocks to support weight of transaxle.
- b. Disconnect starter wiring and remove starter.
- c. Remove the two bolts securing the clutch rod dust seal assembly, then remove the pin attaching the rod to the clutch fork.
- d. Separate the transaxle from the engine by removing the attaching bolts securing the differential carrier to the flywheel housing. Pull engine away horizontally.
- e. Loosen clutch mounting bolts a turn at a time (to prevent distortion of clutch cover) until the spring pressure is released. Remove all bolts, clutch disc and pressure plate assembly.

AUTOMATIC

- a. Drain transmission by disconnecting transmission filler tube.
- b. Disconnect hose from vacuum modulator.
- c. Disconnect starter wiring and remove starter.
- d. Disconnect the converter from the engine flex plate by removing the three attaching bolts through the access hole at the 12 o'clock position in the converter housing (fig. 48). The converter can be rotated by prying against the starter gear teeth on the converter housing with a screw driver.
- e. Using the engine lift, lower power train until transaxle rests on suitable blocks to support weight of transaxle.
- f. Separate the transaxle from the engine by removing the attaching bolts securing the differential carrier to the flywheel housing. Pull engine away horizontally.

Installation

1. Install transaxle (and clutch) on engine as follows:

SYNCHROMESH

- a. Install clutch on flywheel as outlined in Section 7.
- b. Position the engine (on engine lift) adjacent to the transaxle and with the clutch shaft in place in the transaxle align the clutch shaft to clutch splines and align the differential carrier and flywheel housing.
- c. Pilot the clutch shaft into the clutch and install all bolts securing transaxle to flywheel housing.
- d. Connect the clutch rod to the clutch fork with pin, then position and secure the clutch rod dust seal assembly to the clutch housing with two bolts.
- e. Install starter and connect wiring.

AUTOMATIC

- a. Position the engine (on engine lift) adjacent to the transaxle and align the converter with the flex plate and align the differential carrier to the flywheel housing.
 - b. Pilot the converter hub into crankshaft and install all bolts securing differential carrier to flywheel housing.
 - c. Install converter-to-flex plate bolts through the access hole in the converter housing. The converter can be rotated to make the attaching points accessible by turning the converter with a screw driver against its starter gear teeth.
 - d. Install starter and connect wiring.
 - e. Connect hose at vacuum modulator.
 - f. Connect transmission filler tube.
 2. Install exhaust pipe and muffler assembly.
 3. Place power train under vehicle and raise into position.
 4. Install bolts attaching front mount bracket to transmission case. Tighten bolts securely.
- NOTE:** On synchromesh equipped vehicles be sure and install spacer between front mount bracket and transmission case.
5. Connect rear mount and install nuts and lock washers. Tighten nuts securely.
 6. Remove engine lift and Tool J-7894 from under vehicle, then install 3/8" bolt in skid plate.
 7. On synchromesh transmission equipped vehicles: Adjust and connect clutch rod and connect clutch return spring.

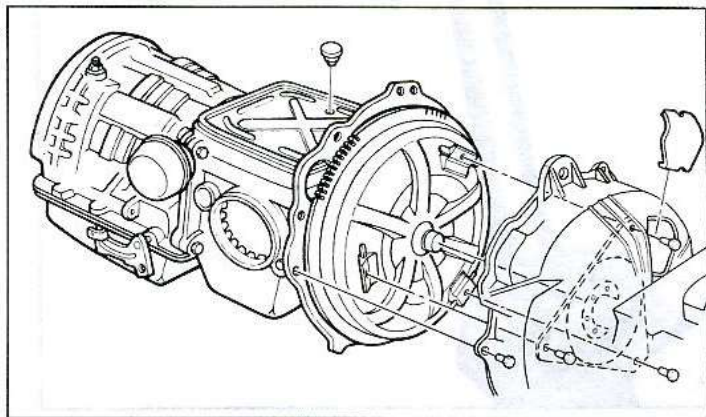


Fig. 48—Transaxle Separated from Engine

Connect shift tube coupling at transmission shifter shaft.

8. On automatic transmission equipped vehicles, connect transmission shift cable.

NOTE: Connect transmission shift cable by rotating throttle lever its full limit counter-clockwise and inserting ball end of cable into transmission case until shoulder seats against transmission case, then lock in place with bolt.

9. Connect universal joints.
10. Connect left and right rear strut rod brackets to differential carrier.
11. Connect accelerator control rods at idler lever on transmission.
12. Connect heater hoses at elbows on left and right front shrouds.
13. Connect fuel line at flexible hose.
14. Install rear center shield and grille, then lower vehicle.
15. With vehicle sitting at curb height:
Check cam adjusters on outer end of rear strut rod and be sure they are in the same position as indexed, then tighten nut without turning bolt.

16. Connect the following electrical items:

If so equipped, radio ground straps at left and right engine shields.

Positive wire at ignition coil.

Cylinder head temperature and oil pressure indicator wire at quick disconnect.

Starter wiring at quick disconnect.

Battery positive cable at battery terminal and 10 gauge red wire at terminal on body side rail.

Battery negative cable at Delcotron bracket.

17. Install axle dip stick.
18. Lubricate groove of engine seal with liquid soap or silicone then connect seal.

NOTE: While guiding groove of seal on shield flange, (with one hand) press seal in place using block of wood or a hammer handle.

19. Connect heater hose at upper shroud, then install spare tire.
20. If necessary, fill engine with oil, fill transmission and fill axle.
21. Start engine, check fog leaks and perform necessary adjustments.

REPAIR PROCEDURES

ENGINE ASSEMBLIES

Disassembly

1. With engine on lifting jack and Tool J-7894 (as removed from vehicle) and transaxle removed:

Remove air cleaner assembly.

Disconnect fuel lines at carburetors and vacuum advance hose at right carburetor.

Disconnect choke rods at choke levers and remove upper choke control rods.

Remove carburetors and cross shaft as an assembly.

Remove blower belt.

Remove grommet with starting wire from front shield.

Remove fuel pump and fuel lines as an assembly.

Remove fuel pump push rod and spring assembly.

Remove Delcotron and bracket.

Disconnect positive ventilation tube at top shroud, then remove vacuum balance tube and positive ventilation tube and hoses as an assembly.

Remove engine front shield.

Remove oil filter and Delcotron adapter with the oil filter attached. Discard gasket.

2. Bolt lifting adapter to rear of engine and attach a chain and shackle (from Tool J-4536-A) to lifting adapter and to lifting eye at flywheel housing.
3. Remove flywheel (Synchromesh) or flex plate (Automatic).

NOTE: Because of a difference of 1-5/8" between the center line of the crankshaft and the engine rear mounting bracket, a special lifting adapter is required. This adapter, made from angle iron 3" x 3" x 1/4" and mounted as shown (fig. 49), will provide a center line lifting point.

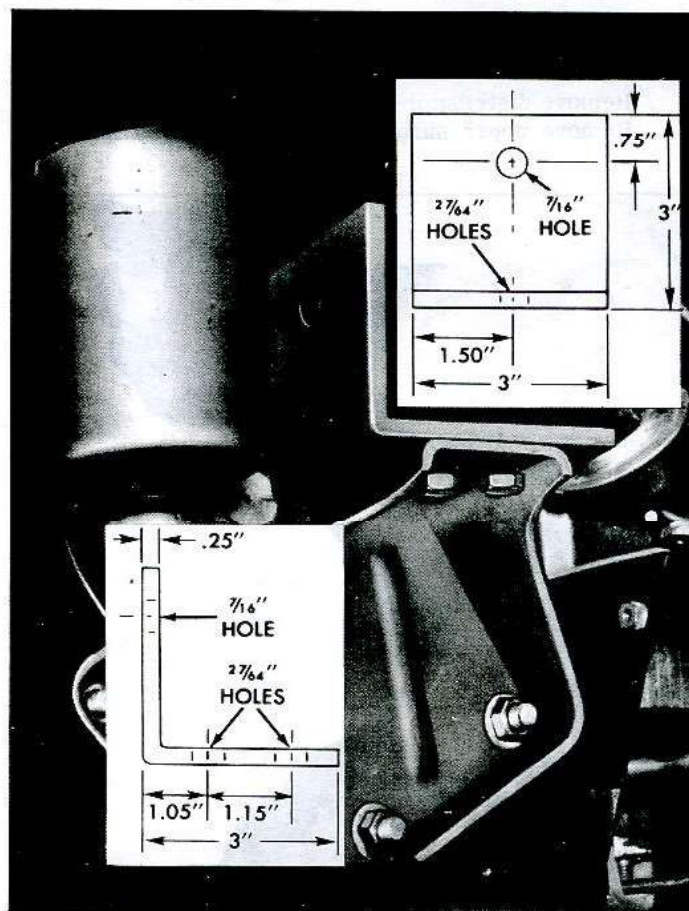


Fig. 49—Lifting Adapter

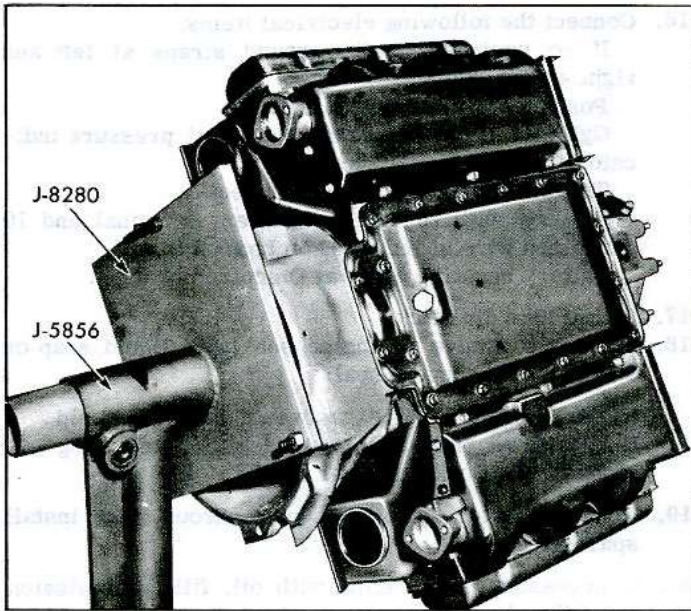


Fig. 50—Engine on Engine Stand

4. Using a chain fall or comparable lift, remove engine from lifting jack and Tool J-7894.
5. Install engine on engine stand (Tool J-5856) by mounting flywheel housing to adapter (Tool J-8280) (fig. 50).
6. Drain engine oil, then:
 - Remove distributor cap and spark plug wires as an assembly.
 - Remove oil cooler access hole cover and the oil dip stick.
 - Remove distributor and ignition coil.
 - Remove upper shroud then left and right shields.



Fig. 51—Removing Left Front Shroud

- Remove oil cooler and discard seals.
- Remove spark plugs and discard gaskets.
- Remove blower pulley and blower.
- Remove crankcase vent tube and discard "O" ring seal, then remove crankcase cover and crankcase vent. Discard gaskets.

7. Invert engine then:

Remove muffler heat shield, lower shrouds and exhaust ducts.

Remove left rear shroud then disconnect wire from cylinder head temperature unit and remove right rear shroud and harness as an assembly.

Remove oil pan and discard gasket.

Remove exhaust manifolds and discard packings.

Remove front shroud and elbow assemblies (one left shroud attaching bolt may be reached inside heater elbow) (fig. 51).

Remove rear mounting bracket and skid plate at engine rear housing.

Remove valve rocker arm covers and discard gaskets.

8. Remove rocker arm nuts, rocker arm balls, rocker arms and push rods. Place in a rack so they can be installed in their original location.

9. Remove valve rocker arm studs, then remove push rod guides and discard "O" ring seals.

10. Pull push rod tubes from crankcase bores and remove and discard inner "O" ring seals from push rod tubes, then remove push rod tubes from cylinder head and remove and discard outer "O" ring seals.

11. Remove nuts from cylinder head studs.

12. Remove cylinder head assemblies and discard gaskets.

NOTE: Cylinders will need a holding fixture (Six 4-5/8" lengths and six 3-3/4" lengths of thinwall 1/2" O.D. tubing) if crankshaft is turned with cylinder heads removed.

13. Install one long and one short holding fixture (over a long and a short stud) for each cylinder and retain with cylinder head nuts (fig. 52).

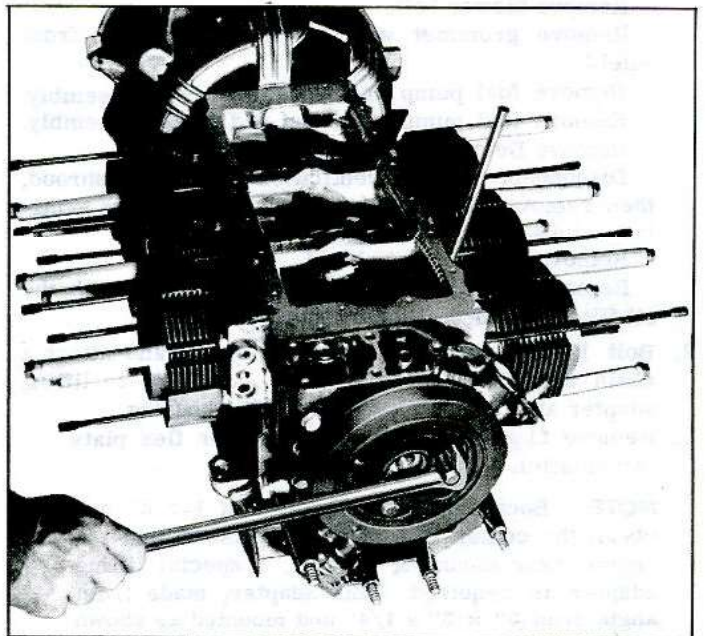


Fig. 52—Cylinder Holding Fixture

14. Remove valve lifters with a magnet or wire hook. Place lifters in a rack so they can be installed in their original location.
15. Invert engine (top up), then remove cylinder air baffles.
16. Remove cylinder, piston and connecting rod assemblies as follows:

Using a 3/4" wrench on crankshaft bolt, turn crankshaft so number 1 connecting rod cap can be removed.

Mark connecting rod and connecting rod cap for cylinder identification, if not previously marked.

NOTE: Cylinders are numbered rear to front; 1-3-5 on the right bank and 2-4-6 on the left bank.

Remove connecting rod cap and cylinder holding fixture, then remove cylinder, piston and connecting rod as an assembly.

If connecting rod bearings are to be reused, leave in place in connecting rod and connecting rod cap.

If connecting rod bearings are to be replaced, remove and discard bearings.

Install connecting rod cap to connecting rod (finger tight) and remove and discard cylinder gasket.

Remove the remaining cylinder, piston and connecting rod assemblies in the same manner.

17. Remove crankshaft bolt and washer, then remove crankshaft pulley and hub or harmonic balancer with Tool J-8215 (fig. 53).
18. Remove oil cooler adapter and discard gasket.
19. Remove engine rear housing and discard gasket.
20. Remove the oil pick-up screen, tube bracket and short crankcase bolt.
21. Disconnect flywheel housing from Tool J-8280, then remove crankcase assembly and flywheel housing from engine stand and place on two short lengths of wood (2" x 4") to protect oil pick-up screen and tube assembly.
22. Remove flywheel housing and discard gasket.
23. Loosen eight long crankcase bolts, then place crankcase on a block of wood at an angle of approximately

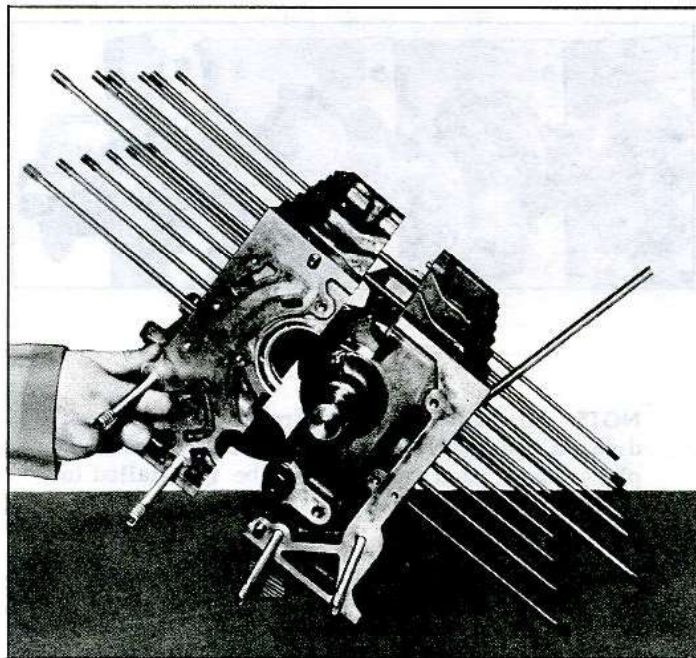


Fig. 54—Removing Left Crankcase Valve

15° (left half up) to prevent crankshaft from falling out when left crankcase half is removed (fig. 54).

24. Remove eight crankcase bolts and remove left crankcase half.
25. Remove camshaft assembly by turning while lifting.

CAUTION: Remove camshaft carefully to avoid damage to camshaft surfaces in crankcase.

26. Remove crankshaft assembly by lifting straight out.
27. Remove main bearings from each crankshaft half by rotating bearings with fingers (tang and first) (fig. 55).

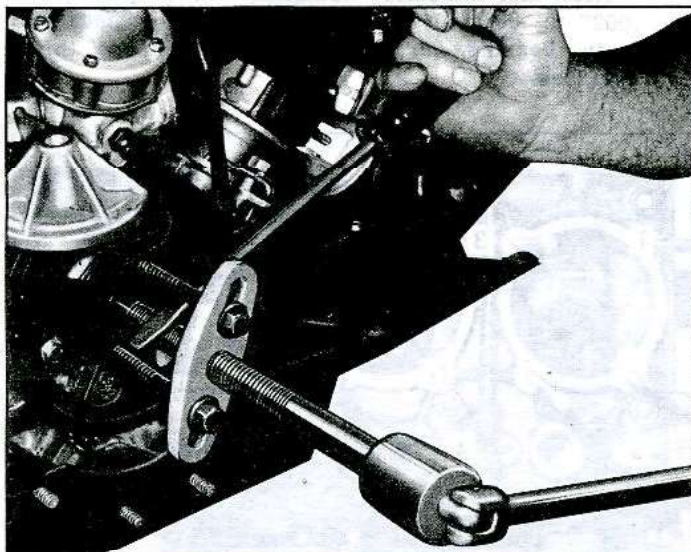


Fig. 53—Removing Harmonic Balancer

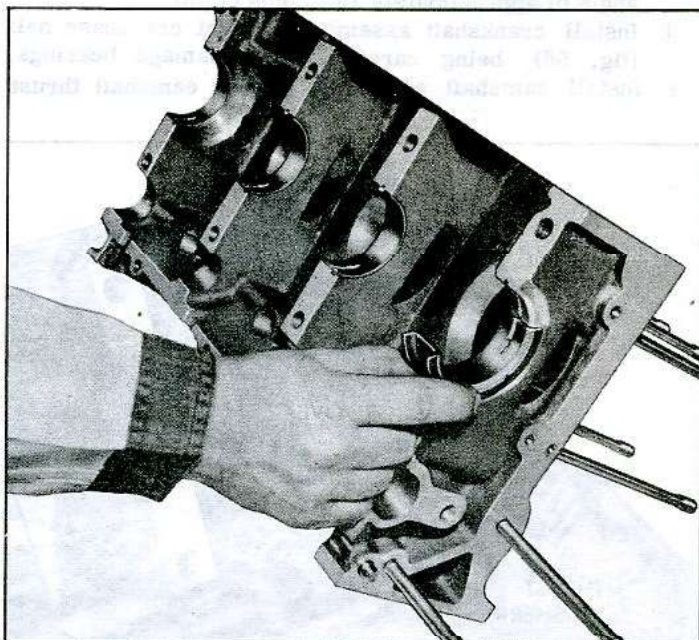


Fig. 55—Removing Main Bearings

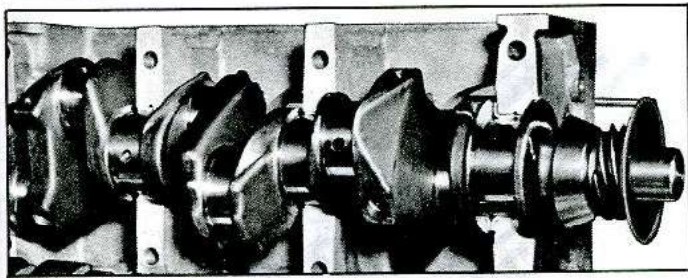


Fig. 56—Crankshaft Installed

NOTE: If main bearings are to be replaced, discard bearings. If bearings are to be reused, place on a rack so they can be reinstalled in their original location.

Cleaning and Inspection

Wash all engine shrouds and shields in cleaning solvent and dry with compressed air. Cleanliness is very important, oil or foreign material on engine shrouding may result in objectionable fumes within the passenger compartment.

NOTE: Cleaning and inspection of all subassemblies is covered under the individual subassembly being serviced.

Assembly

NOTE: All threads inserted in aluminum should be coated with Permatex 404 anti-sieze compound or its equivalent.

1. Install main bearings in crankcase halves and lubricate with a light coat of engine oil.

NOTE: For selection of correct size main bearings, refer to Repair Procedures, Main Bearings.

2. Place right crankcase half on a block of wood at an angle of approximately 15° (studs down).
3. Install crankshaft assembly in right crankcase half (fig. 56), being careful not to damage bearings.
4. Install camshaft assembly, guiding camshaft thrust

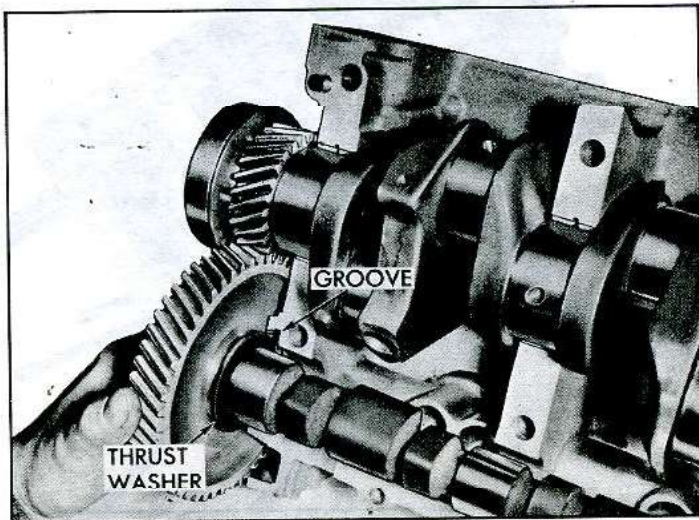


Fig. 57—Installing Camshaft

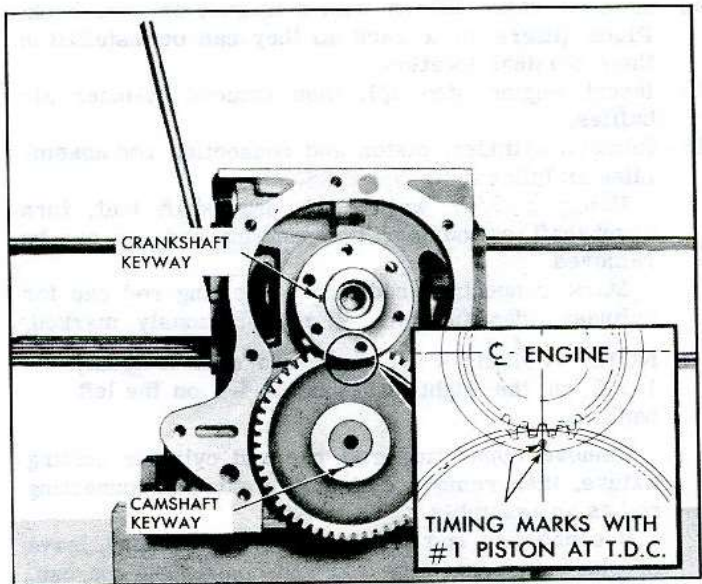


Fig. 58—Timing Marks

washer into groove in crankcase (fig. 57), while indexing valve timing marks on camshaft and crankshaft gears (fig. 58).

NOTE: If a new camshaft is being installed, coat camshaft lobes with Molykote or its equivalent.

5. Seal crankcase parting line ends with sealer and install left crankcase half to right crankcase half. Install crankcase bolts (8 long) finger tight, then place crankcase on two short lengths of wood (2 x 4) and torque crankcase bolts to specifications in the sequence shown (fig. 59).
6. Measure crankshaft end play with a dial indicator as follows:

Install dial indicator so indicator point touches end of crankshaft (fig. 60).

Push crankshaft to rear, then zero dial indicator and push crankshaft to front.

Read dial indicator. Crankshaft end play should be .002" to .006". If end play is excessive check rear main bearing, crankshaft and crankcase thrust surfaces.

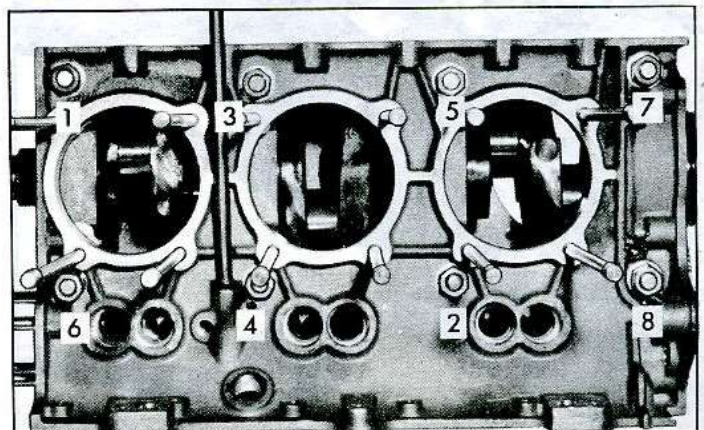


Fig. 59—Crankcase Torque Sequence

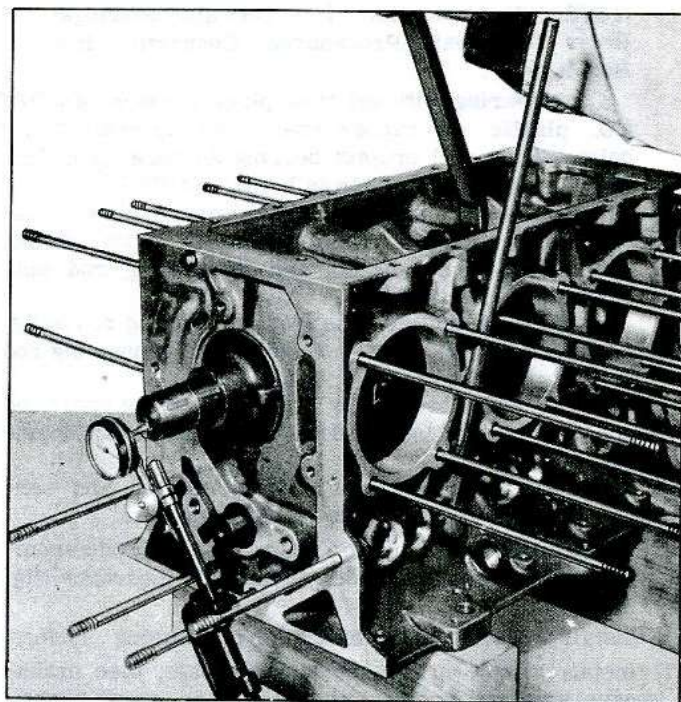


Fig. 60—Measuring Crankshaft End Play

7. Measure camshaft end play with a dial indicator as follows:

Install dial indicator so indicator point touches end of camshaft (fig. 61).

Push camshaft to rear, then zero dial indicator and push camshaft to front.

Read dial indicator. Camshaft end play should be .002" to .007". If end play is excessive, check the thrust washer and/or groove for wear.

8. Measure timing gear backlash with a dial indicator as follows:

Install dial indicator so indicator point touches camshaft gear tooth (fig. 62).

Rotate camshaft gear counter-clockwise until backlash is taken up, then zero dial indicator and rotate camshaft gear clockwise (only through backlash).

Read dial indicator. Camshaft backlash should be .002" to .004". If backlash is excessive, check camshaft gear and crankshaft gear for wear.

9. Using a new gasket, install flywheel housing (with a new seal) and torque to specifications.

NOTE: Total indicator runout for flywheel housing pilot is .015".

10. Install crankcase and flywheel housing on engine stand (Tool J-5856) by mounting flywheel housing to adapter (Tool J-8280).
11. Using a new gasket, install engine rear housing (with a new seal) and torque to specifications.

NOTE: Nuts will be installed on studs later.

12. Install crankshaft pulley and hub or harmonic balancer as follows:

Block crankshaft from rotating with a wooden wedge, then coat engine rear housing seal surface with oil.

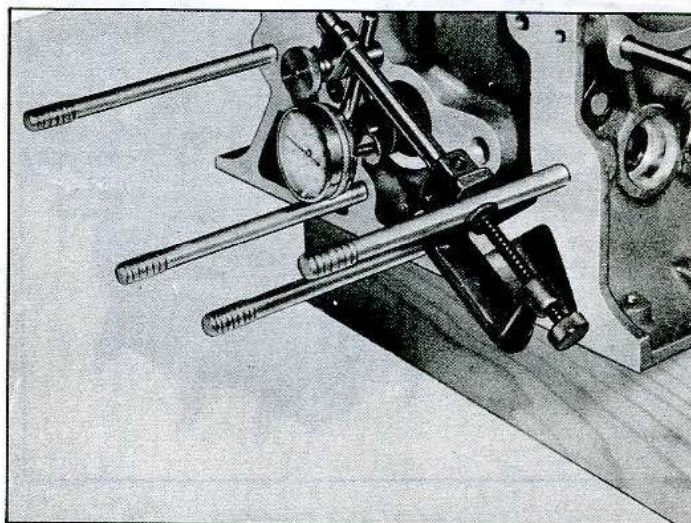


Fig. 61—Measuring Camshaft End Play

Place crankshaft pulley and hub or harmonic balancer on crankshaft with keyway lined up, then install heavy flat washer and retaining bolt and pull crankshaft pulley or harmonic balancer into place with retaining bolt.

Back retaining bolt off one turn, then torque to specifications.

CAUTION: Do not drive crankshaft pulley or harmonic balancer onto crankshaft. To do so may damage crankshaft thrust bearing and crankcase.

13. Using a new gasket, install oil cooler adapter and torque bolts to specifications.
14. Install cylinder, piston and connecting rod assemblies as follows:

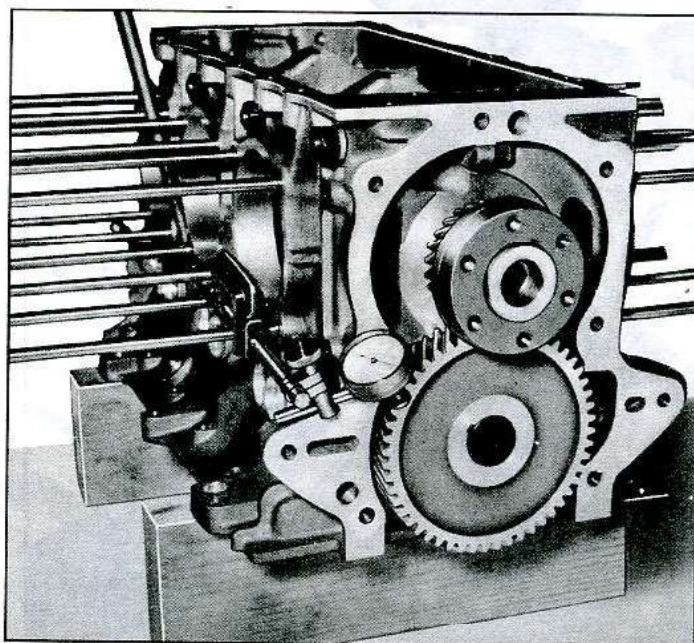


Fig. 62—Measuring Timing Gear Backlash

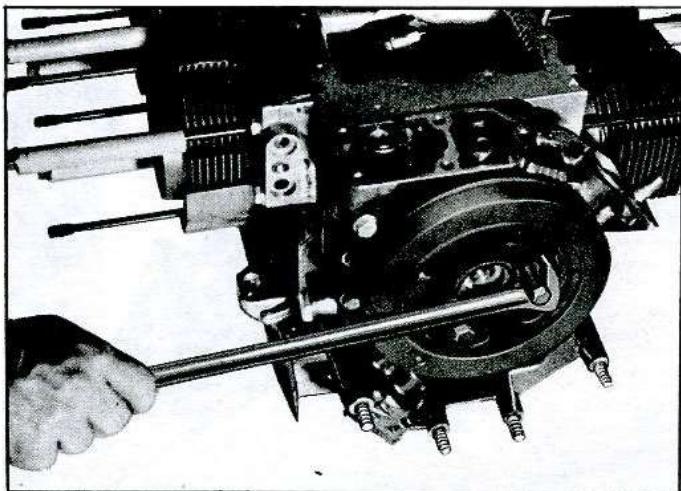


Fig. 63—Turning Crankshaft

Using a 3/4" wrench on crankshaft bolt, turn crankshaft so number 1 connecting rod can be installed.

CAUTION: If torque required to turn crankshaft exceeds specified torque for crankshaft bolt, install two 3/8" x 16 x 1-1/4" bolts in crankshaft pulley and hub or harmonic balancer. (Do not install bolts over 1/4 deep or engine rear housing seal may be damaged.) A bar, used between the bolts (fig. 63), can be used to turn the crankshaft.

Remove connecting rod cap from number 1 connecting rod and, if not previously done, place connecting rod bearing in connecting rod and connecting rod cap.

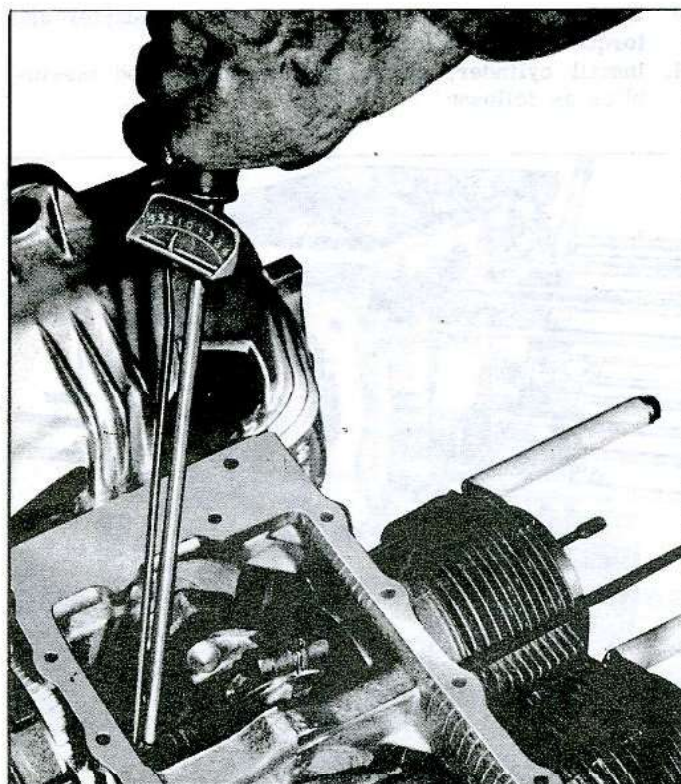


Fig. 64—Torquing Connecting Rod Nut

NOTE: For selection of correct size bearings; Refer to Repair Procedures, Connecting Rod Bearings.

Coat bearing with oil then place a piece of 5/16" I.D. plastic or rubber hose over connecting rod bolts. This will protect bearing surface on crankshaft journal while piston is being installed.

Install a new cylinder gasket over cylinder, then push piston with a hammer handle, while guiding cylinder into crankcase and connecting rod onto crankshaft journal.

Remove protective hose from connecting rod bolts, install connecting rod cap and torque connecting rod nuts to specifications (fig. 64).

Install cylinder holding fixture over one short and one long stud. (Holding fixture outlined under Engine Disassembly.)

Install the remaining cylinder, piston and connecting rod assemblies in the same manner.

15. When all cylinder, piston and connecting rod assemblies have been installed, check side clearance (fig. 65).
16. Install cylinder air baffles and retaining springs.
17. Install a new crankcase cover gasket, then crankcase vent and another new crankcase cover gasket. (fig. 66) Install crankcase cover and torque to specifications.
18. Using a new "O" ring seal, install crankcase vent tube then bracket and torque to specifications (fig. 67).
19. Invert the engine and install oil pickup tube bracket and short crankcase bolt (fig. 68) and torque bolts to specifications, then using a new gasket, install the oil pan and torque to specifications.
20. Install cylinder head assemblies as follows:
Remove holding fixture from cylinders on left bank.
Place cylinder head gaskets in left cylinder head combustion chamber (fig. 69).

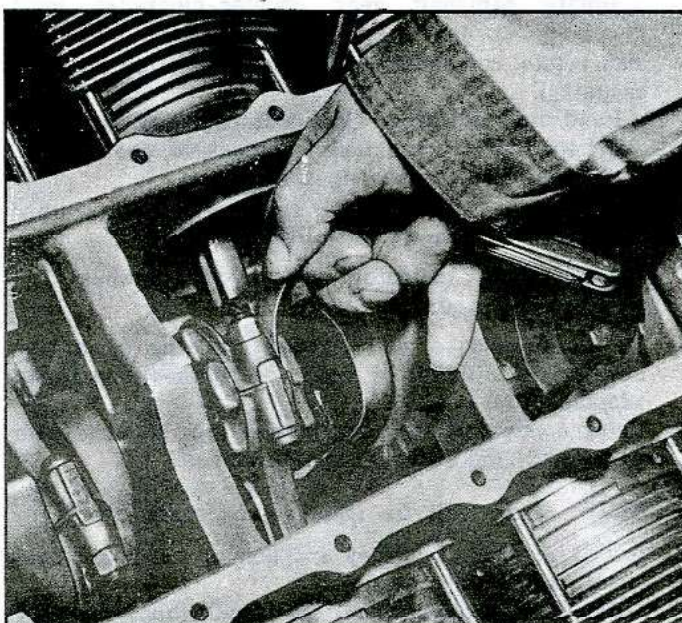


Fig. 65—Connecting Rod Side Clearance

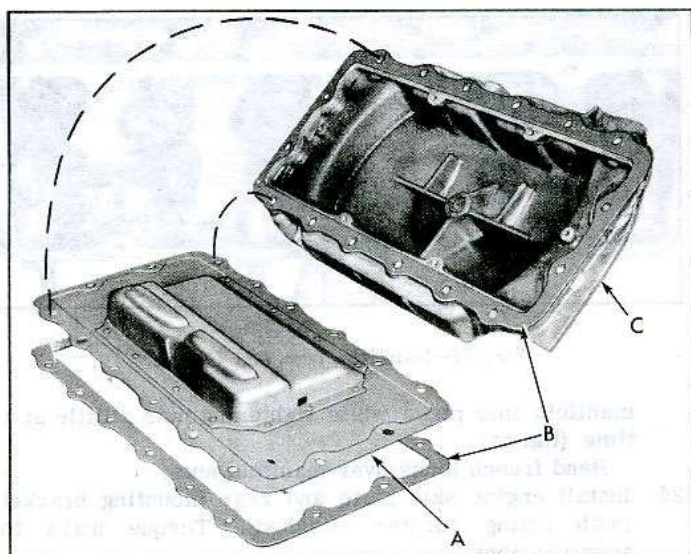


Fig. 66—Crankcase Cover and Vent

a. Crankcase Vent b. Gaskets c. Crankcase Cover

Install cylinder head over studs and carefully guide into place.

Install 6 cylinder head nuts (finger tight).

Lightly oil valve lifters and install in their proper bores.

NOTE: Whenever new valve lifters are installed, coat foot of lifter with Molykote or its equivalent.

Install new "O" ring seals, lightly coated with oil, on long end of push rod tubes; then install push rod tubes through bore in cylinder head and install new "O" ring seals, lightly coated with oil, on inner end of push rod tubes (fig. 70).

Start push rod tubes into bores in cylinder head and crankcase, then seat the tubes with a 9/16" deep

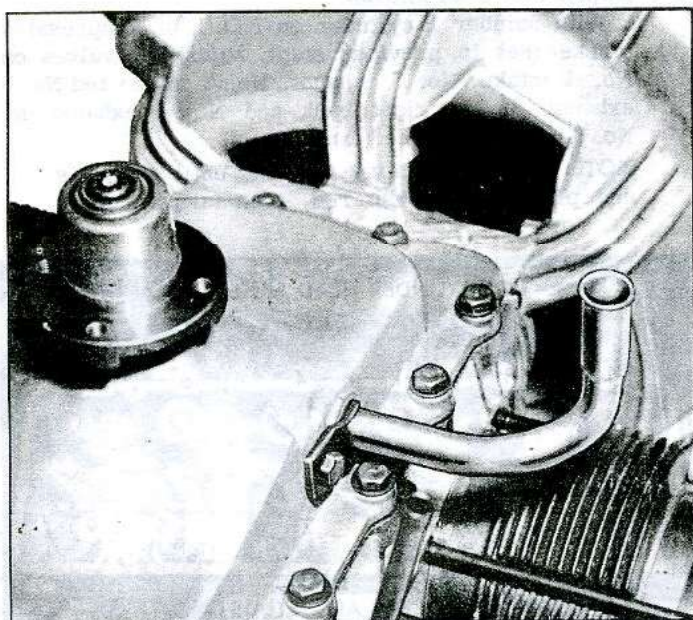


Fig. 67—Crankcase Vent Tube

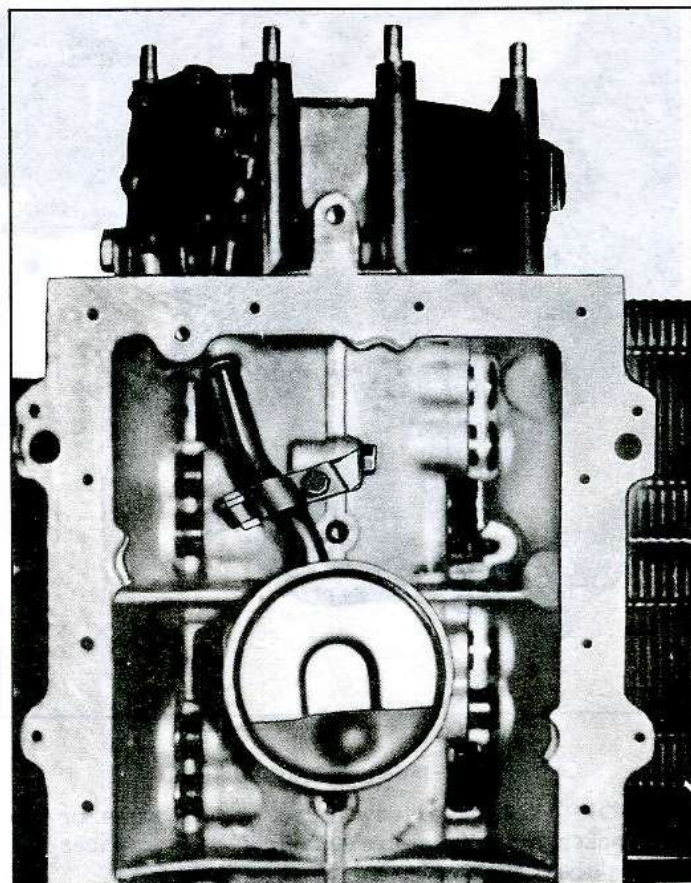


Fig. 68—Oil Pick-Up Screen Installed

socket (placed against the cylinder head end of the push rod tube and tapped lightly with a hammer) (fig. 71).

Install new "O" ring seals, lightly coated with oil into rocker arm stud bore in cylinder head.

Install push rod guides (fig. 72), then valve rocker arm studs (finger tight).

Torque cylinder head nuts and valve rocker arm studs, a little at a time, in the sequence shown (fig. 73) until the specified torque is reached.

Install push rods with the side oil hole out (fig. 74).

Install valve rocker arms, rocker arm balls and rocker arm nuts. Tighten rocker arm nuts until push rod end play is taken up.

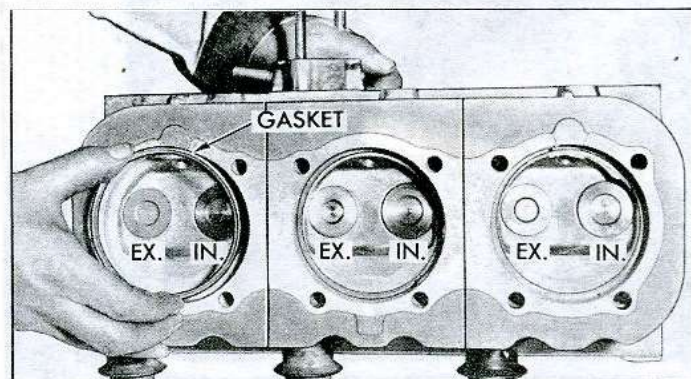


Fig. 69—Cylinder Head Gasket Installation

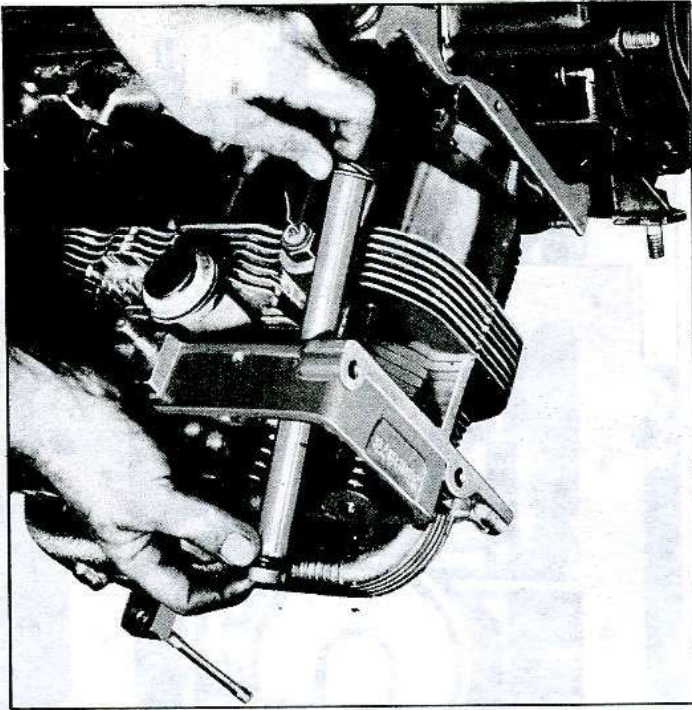


Fig. 70—Installing Push Rod Tubes

NOTE: Whenever new valve rocker arms or rocker arm balls are installed, coat surfaces lightly with Molykote or its equivalent.

Install the right cylinder head in the same manner.

21. Install muffler hanger and rear shrouds, then using new seals install oil cooler and torque to specifications.

22. Connect wire to cylinder head temperature sending unit and install front shrouds.

23. Install exhaust manifolds as follows:

Install new exhaust packings (steel flange on packing out) on exhaust port sleeves.

CAUTION: Exhaust port sleeves are a press fit in the cylinder head and exhaust manifold. The exhaust manifold must fit correctly to prevent leaks.

Install exhaust manifolds, exhaust manifold clamps, french locks and nuts. Using a plastic hammer, tap

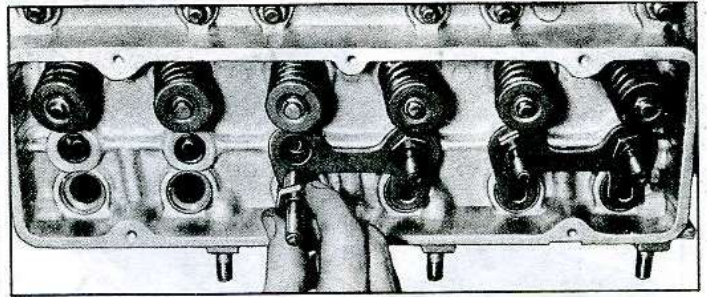


Fig. 72—Installing Push Rod Guides

manifold into place while tightening nuts a little at a time (fig. 75).

Bend french locks over manifold nuts.

24. Install engine skid plate and rear mounting bracket (with lifting adapter attached). Torque nuts to specifications.
25. Install exhaust ducts, lower shrouds, and tighten all bolts securely.

NOTE: Check exhaust damper door adjustment as outlined and adjust if necessary.

26. Turn engine right side up and install distributor as follows:

Rotate crankshaft counterclockwise until number 1 cylinder is at T.D.C. (timing mark at 0 on tab) of COMPRESSION stroke (fig. 76).

Set distributor with rotor pointing to number one cylinder position and note position of drive tang on distributor shaft.

Using a long screw driver, turn oil pump shaft (through distributor bore in engine rear housing) until slot in oil pump will match distributor tang.

Using a new gasket, install distributor and rotate until points are just opening (rotor pointing to number 1 position).

Install retaining clamp and nut and tighten securely.

27. Adjust valves as follows:

With number 1 cylinder on T.D.C. of compression stroke (set in previous step), adjust the valves on No. 1 intake, No. 1 exhaust, No. 3 intake and No. 5 exhaust on the right bank and No. 4 exhaust and No. 6 intake on the left bank.

NOTE: Turn adjusting nut out until there is end play in the push rod, then turn adjusting

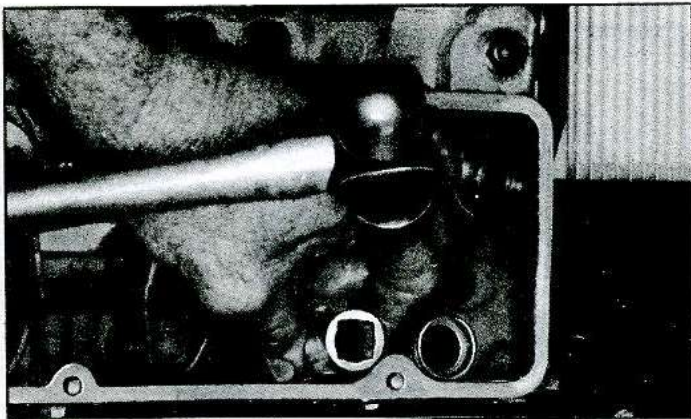


Fig. 71—Seating Push Rod Tubes

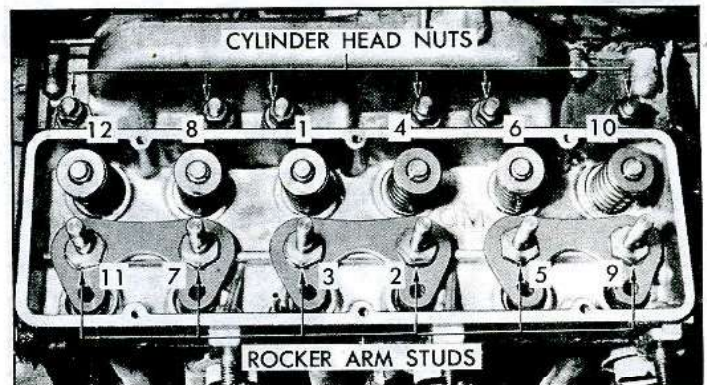


Fig. 73—Cylinder Head Torque Sequence

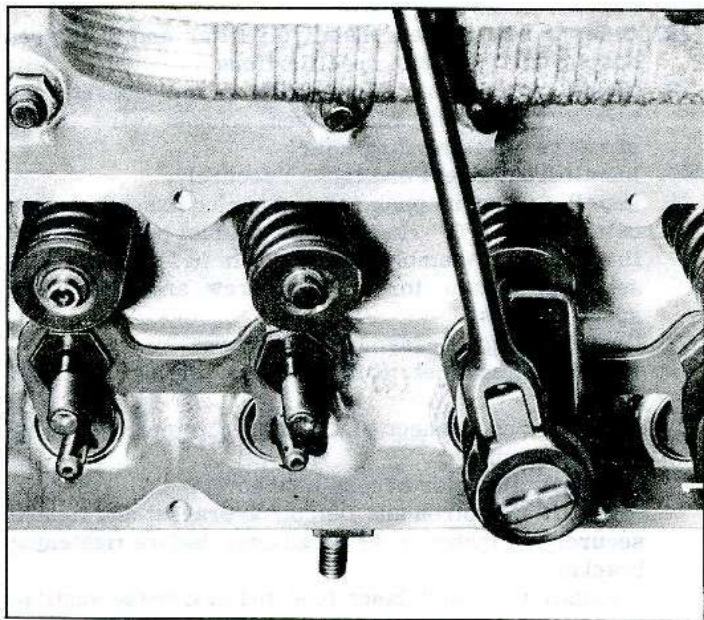


Fig. 74—Push Rods Installed

nut in until there is no end play at push rod (may be felt by twisting push rod) (fig. 77). Turn adjusting nut one additional turn in (to center plunger in hydraulic valve lifter).

Turn crankshaft one turn counter-clockwise (number 2 cylinder at T.D.C. of COMPRESSION stroke and timing mark at 0 on the tab) and adjust the valves on No. 3 exhaust and No. 5 intake on the right bank and No. 2 intake, No. 2 exhaust, No. 4 intake and No. 6 exhaust on the left bank

28. Using new gaskets, install valve rocker covers and spring reinforcements then torque to specifications (fig. 78).
29. Install muffler shield and tighten securely.
30. Install spark plugs (clean if necessary) with new gaskets and torque to specifications.
31. Install blower then blower pulley and torque to specifications.
32. Install left and right shields then top shroud and tighten securely.

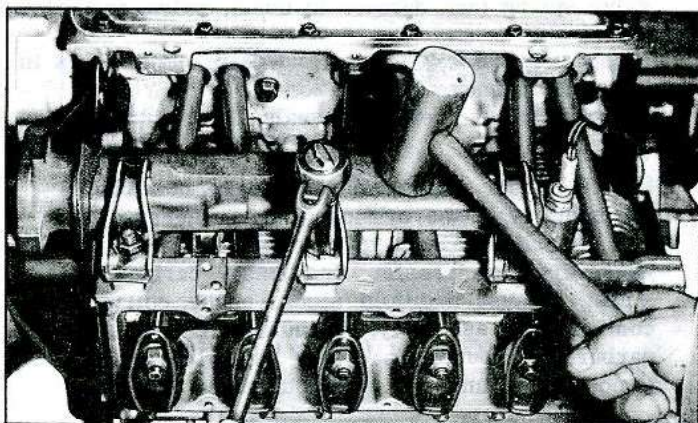


Fig. 75—Installing Exhaust Manifold

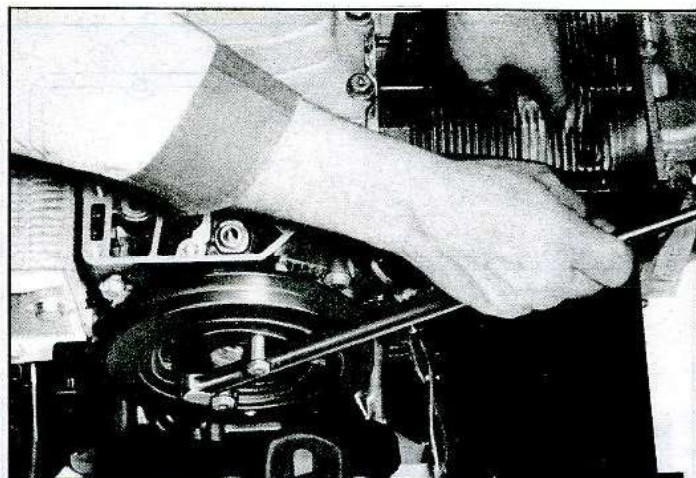


Fig. 76—Locating T.D.C. on Number Cylinder

NOTE: Rotate blower and check for sufficient clearance, while tightening top shroud.

33. Install coil and tighten securely then connect wire from distributor.
34. Attach a chain and shackle (from Tool J-4536-A) to lifting adapter and lifting eye at flywheel housing.
35. Using a chain fall or comparable lift, remove engine from engine stand and flywheel housing adapter, then install engine on lifting jack and adapter (Tool J-8280).
36. Remove chain and shackle and remove lifting adapter from rear mounting bracket.

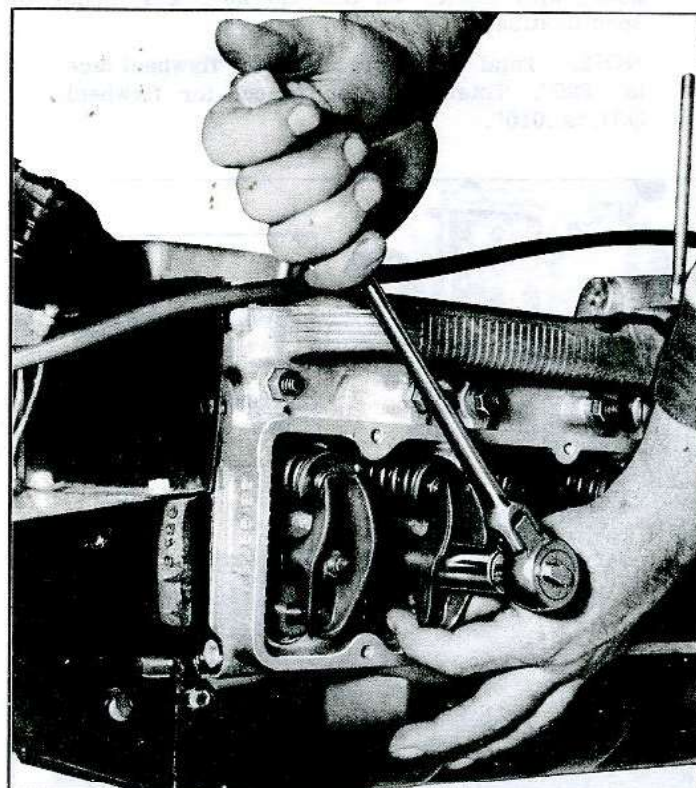


Fig. 77—Adjusting Valves

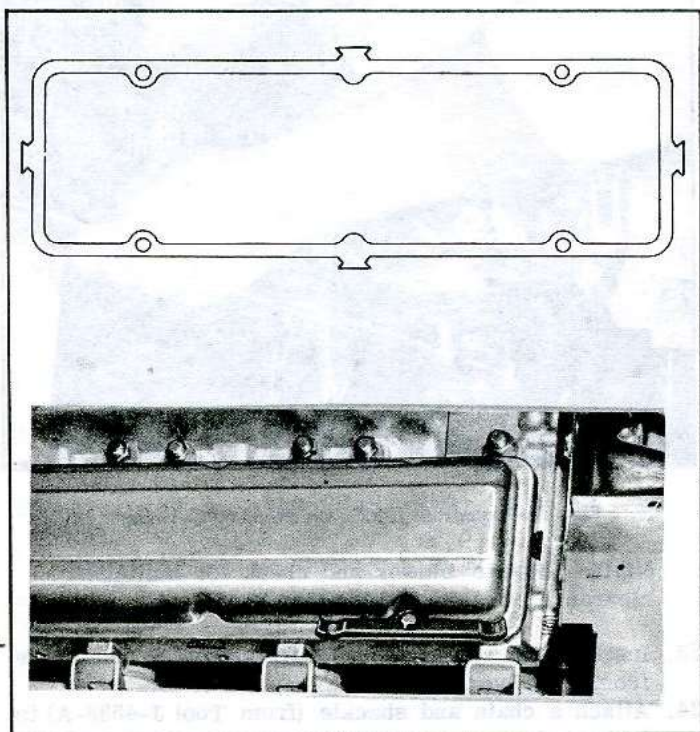


Fig. 78—Valve Cover and Gasket

37. Install flywheel (Synchromesh) or flex plate (Automatic) as follows:

Apply sealer to end of crankshaft and install flywheel or flex plate as indexed during disassembly.

Install spacer (on Synchromesh), then install bolts with sealer on bolt threads, and torque to specifications.

NOTE: Total indicator runout for flywheel face is .020". Total indicator runout for flywheel O.D. is .010".

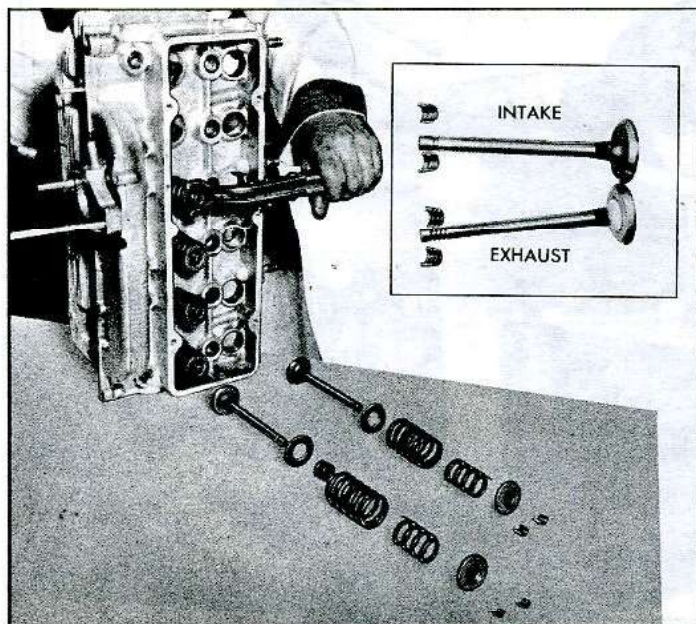


Fig. 79—Compressing Valve Springs

38. Using a new gasket, install oil filter and Delcotron adapter and torque to specifications.
39. Install a new oil filter (with a new gasket) and torque to specifications then connect wire to oil pressure gauge sending unit.
40. Install front shield and tighten securely.
41. Install fuel pump push rod and spring assembly, then using a new "O" ring seal install fuel pump and fuel lines as an assembly. Locate hole in fuel pump with set screw then torque set screw and locknut to specifications.
42. Complete engine assembly as follows:
 - Install grommet (with starter wiring in front shield).
 - Install and connect distributor cap and spark plug wire assembly.
 - Install oil cooler access hole cover.
 - Install Delcotron and Delcotron bracket and tighten securely. Tighten bolts to adapter before tightening bracket.
 - Install vacuum balance tube and crankcase ventilation tube and hoses.
 - Install carburetors and cross shaft as an assembly.
 - Install and connect vacuum advance hose at right carburetor and distributor.
 - Install upper choke control rods and adjust and connect as outlined in Section 6M.
 - Install and connect fuel lines.
 - Install and adjust blower belt as outlined.
 - Install oil level gauge.
 - Install air cleaner assembly.
 - Fill with engine oil.

CYLINDER HEAD ASSEMBLIES

CAUTION: Use extreme care in handling cylinder heads to avoid damaging cooling fins.

Disassembly

1. Place cylinder head assembly on end and using Tool J-8062, with off-set jaws, compress valve spring, then remove valve locks (fig. 79).

NOTE: It may be necessary to tap valve spring caps lightly with a hammer to loosen valve locks in valve caps.

2. Release Tool J-8062 and remove valve spring cap, valve spring (and damper is used), valve, and valve spring shims.
3. Remove remaining valves and valve components in the same manner.
4. Remove valve stem oil seals from intake valve guides.

NOTE: Under normal circumstances, no further disassembly of the cylinder head is necessary. If a cylinder head is to be replaced, it will be necessary to transfer or install carburetor studs, exhaust manifold studs, choke coil and control rod assembly, vacuum balance tube, carburetor mounting pad plug and cylinder head temperature unit as outlined under Repairs.

Cleaning

1. Clean carbon from combustion chambers and ports using Tool J-8358 (fig. 80).

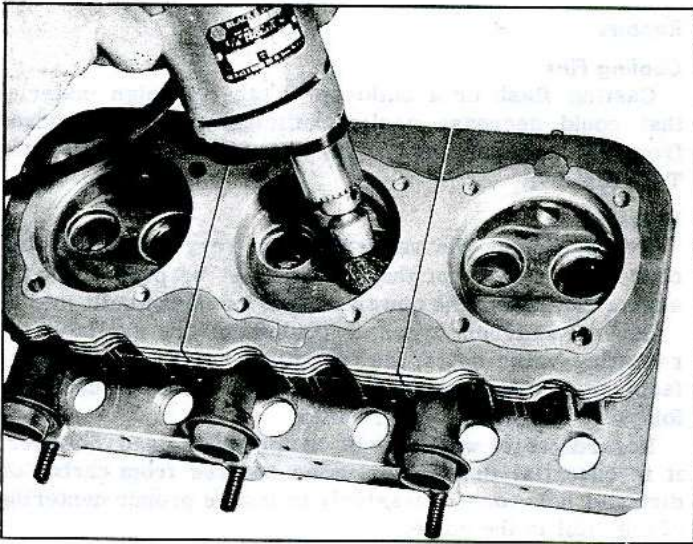


Fig. 80—Removing Carbon from Combustion Chamber

CAUTION: Avoid injury to cylinder sealing face surface in cylinder head. Injury will cause premature combustion chamber leaks.

2. Thoroughly clean valve guide bores, using Tool J-8101 (fig. 81).
3. Clean valve stems and valve heads on a buffing wheel.
4. Wash all parts in cleaning solvent and dry them thoroughly.

Inspection

1. Inspect cylinder heads for damage. Check fit of exhaust manifold sleeve assembly; if loose or cracked, replace as outlined under Repairs.

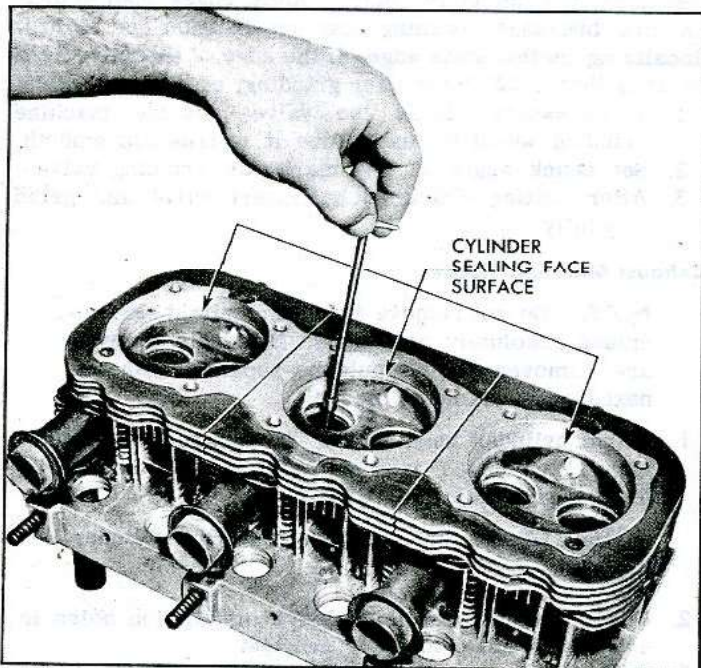


Fig. 81—Cleaning Valve Guides

2. Inspect the valves for burned faces, excessive seat pound in, cracked faces or badly scuffed or worn valve stems.
3. Inspect valve seats for cracks or burnt seats. Inspect valve guides for cracks or excessive wear.

NOTE: If valve seats are beyond repair, cylinder head replacement is necessary. Excessive valve to bore clearance may cause oil consumption. Insufficient clearance will result in noisy and sticky functioning of the valve and disturb engine smoothness of operation.

4. Measure valve stem clearance (fig. 82) as follows: Clamp a dial indicator on one side of the cylinder head rocker cover gasket rail, locating the indicator so that movement of the valve stem from side to side (crosswise to the head) will cause a direct movement of the indicator stem. The indicator stem must contact the side of the valve stem just above the valve guide. With the valve head dropped about 1/16" off the valve seat; move the stem of the valve from side to side, using light pressure to obtain a clearance reading. If clearance exceeds specifications it will be necessary to ream valve guides for oversize valve or replace valve guides as outlined under Repair.

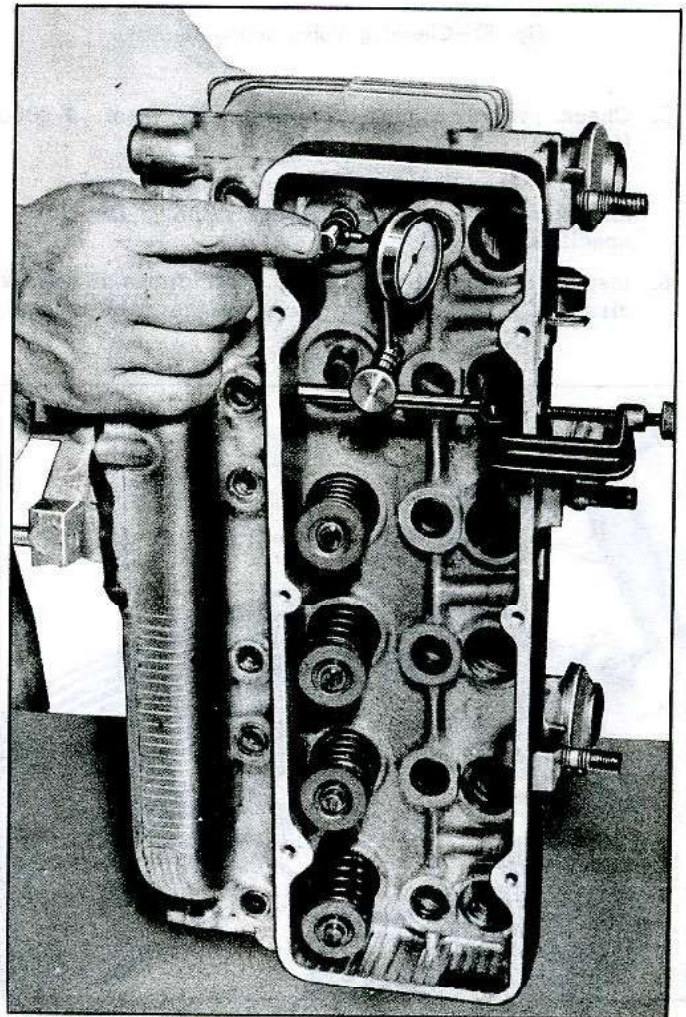


Fig. 82—Measuring Valve Stem Clearance

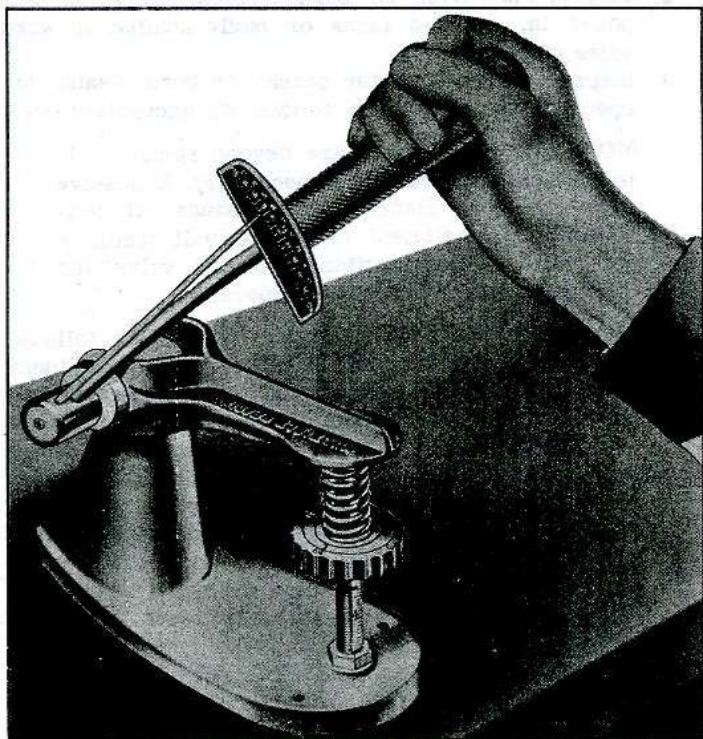


Fig. 83—Checking Valve Spring Tension

5. Check valve spring tension with Tool J-8056 (fig. 83).

NOTE: Weak springs affect power and economy and should be replaced if not within 5 lbs. of specifications.

6. Inspect the cylinder head for restrictions in the air circulating passages formed by the cooling fins.

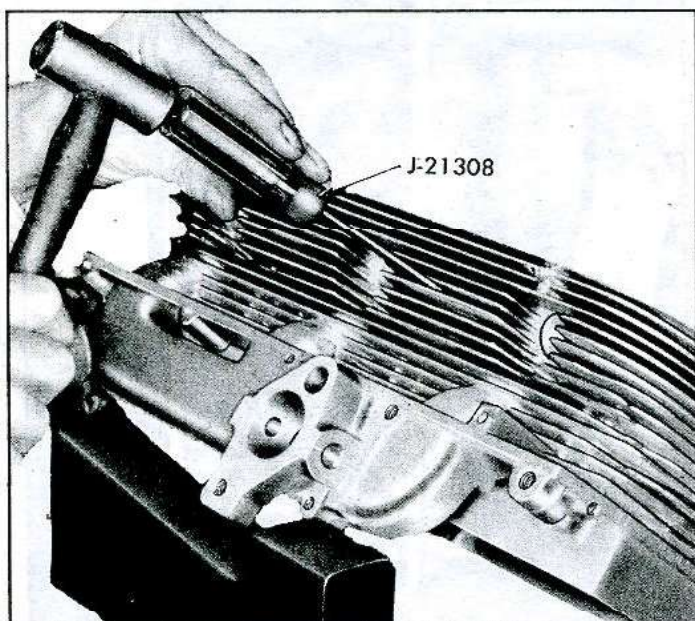


Fig. 84—Cleaning Cooling Fins

Repairs

Cooling Fins

Casting flash or a build-up of other foreign material that could decrease cooling efficiency can be removed from the air passages using the J-21308 Fin Cleaning Tool (fig. 84).

Valve Seats

Reconditioning the valve seats is very important, because the seating of the valves must be perfect for the engine to deliver the power and performance built into it.

Several different types of equipment are available for reseating valve seats; the recommendations of the manufacturer of the equipment being used should be carefully followed to attain proper results.

Regardless of what type of equipment is used, however, it is essential that valve guides be free from carbon or dirt and not worn excessively to insure proper centering of the pilot in the guide.

NOTE: Cylinder Heads have hardened exhaust and inlet valve seat inserts.

Regardless of the methods used for valve seat repair, the final seat width in cylinder head should be as stated in specifications.

Valve seat angle on all seats should be 45° and should be concentric within .002" indicator reading. Always dress stones to proper angle before grinding valve seat (fig. 85).

Valves

Valve faces that are pitted can be refaced to the proper angle, insuring correct relation between the head and stem, on a valve refacing machine. Valve stems which show excessive wear, or valve faces that are pounded in or warped excessively should be replaced. When a valve face which is pounded in or warped excessively is refaced, a knife edge will be ground on part or all of the valve head due to the amount of metal that must be removed to completely reface. Knife edges lead to premature breakage, burning and pre-ignition due to heat localizing on this knife edge. If the edge of the valve head is less than 1/32" thick after grinding, replace the valve.

1. If necessary, dress the valve refacing machine grinding wheel to make sure it is true and smooth.
2. Set chuck angle at 44° mark for grinding valves.
3. After setting chuck angle, insert valve and grind carefully.

Exhaust Manifold Sleeves

NOTE: Do not remove exhaust manifold sleeves unless absolutely necessary. If exhaust sleeves are removed, they should be replaced with the next largest diameter sleeve.

1. Warm cylinder head to 200° F. then remove exhaust manifold sleeves with a suitable pipe wrench by turning gradually (fig. 86).

NOTE: Do not tap or pry sleeves from cylinder head.

2. Check exhaust manifold sleeve installation holes in cylinder head for nicks or damage.
3. Coat new sleeves with anti-seize compound and locate flat side, parallel to exhaust push rod tube hole.

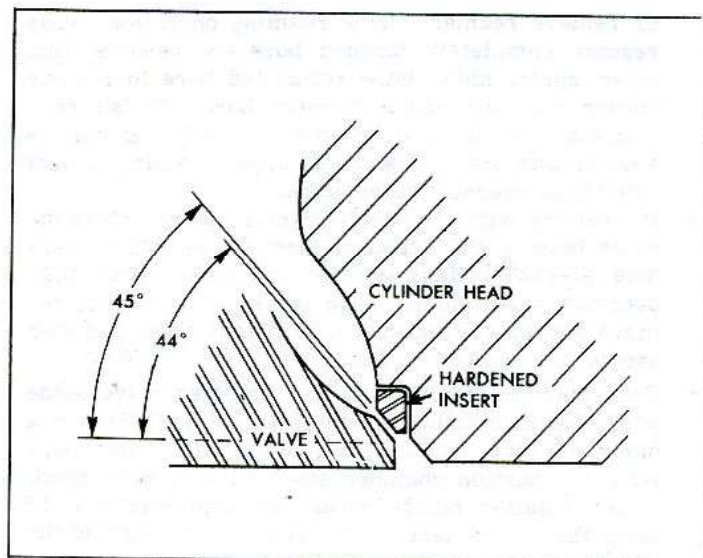


Fig. 85—Relation of Valve and Seat Angles

NOTE: Be careful when replacing sleeves. They are installed in the cylinder head with a press fit and must be started into place, true with the exhaust bore in the cylinder head.

NOTE: Sleeves are available in standard, .002" and .010" oversize for service.

4. Place sleeves in a container of dry ice (solidified carbon dioxide) for about 10 minutes.
5. Warm cylinder head to about 200° F. support cylinder head to avoid damage to cooling fins.

CAUTION: Do not use an open flame.

6. Remove sleeves, one at a time from dry ice and tap into place with a soft tool.

NOTE: Do not damage exhaust manifold end of sleeves, they are a press fit into the exhaust manifold.

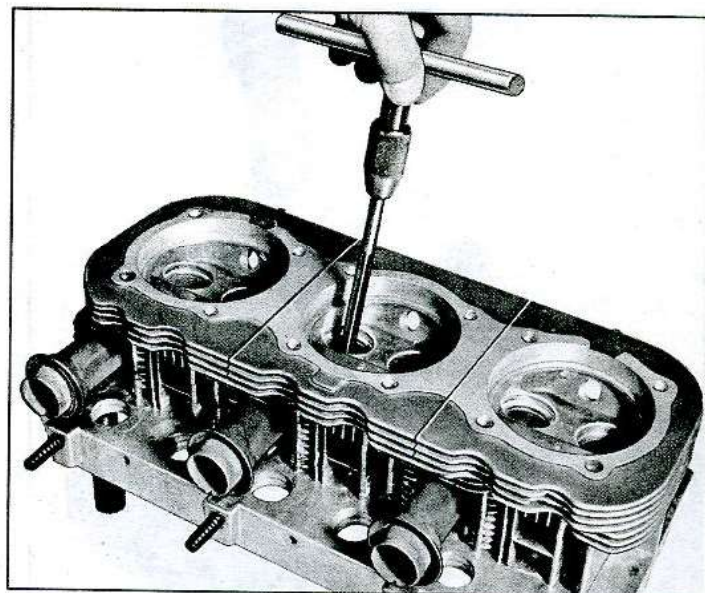


Fig. 87—Reaming Valve Guide

Valve Guides (Reaming)

Oversize valves can be utilized to obtain proper valve to guide clearance in all cases except when the guide is either cracked or is worn to the extent that reaming will not clean-up the guide bore to permit use of the largest oversize valve available.

Valves are available with: standard diameter, .003", .010" and .020" oversize stems.

1. Select from the reamers listed below, the smallest diameter oversize reamer that will provide proper refinish of the guide bore.

Reamer J-5830-1 use for .003" oversize valve.

Reamer J-5830-4 use for .010" oversize valve.

Reamer J-5830-5 use for .020" oversize valve.

NOTE: Reamers listed above are included in Hand Reamer Set J-5830.

2. Ream bore of valve guide, starting at the combustion chamber side (fig. 87) and flush with cutting oil to avoid scoring. Do not force or withdraw reamer during reaming operation. Reamer should pass completely through bore and be removed at the valve spring side of the cylinder head. Wipe refinished bore to remove cutting oil and chips; inspect bore.
3. Inspect valve seat and reface as necessary to obtain correct seat angle and concentricity with guide bore.
4. Select and use valve in same nominal oversize as that of reamer last used in refinishing the guide bore.

Valve Guides (Replacement)

Replacement valve guides for all Corvair engines, except the turbocharged engine, are available in O.D. oversizes of .002" (replacement standard), .010" and .020". The service guides are bored to permit use of valves with standard diameter stems.

1. Remove worn guides using the J-21280 Remover and a hammer (2 lb. minimum). Drive valve guide from the spring seat side (fig. 88) so that the guide will exit on the combustion chamber side of the cylinder head.

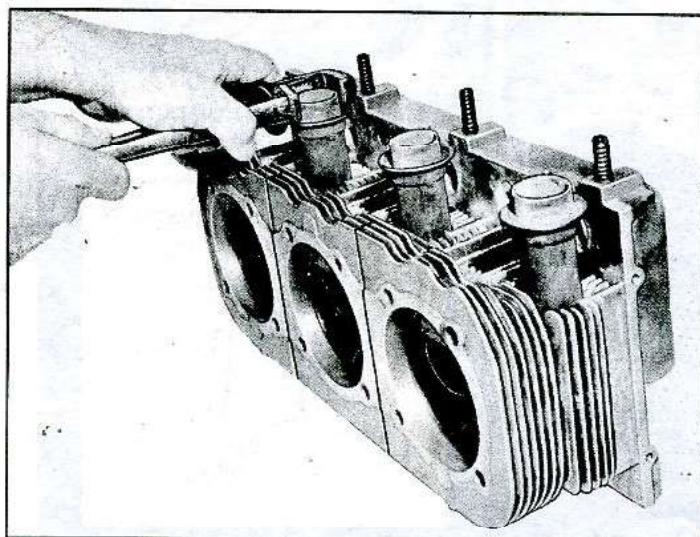


Fig. 86—Removing Exhaust Manifold Sleeves

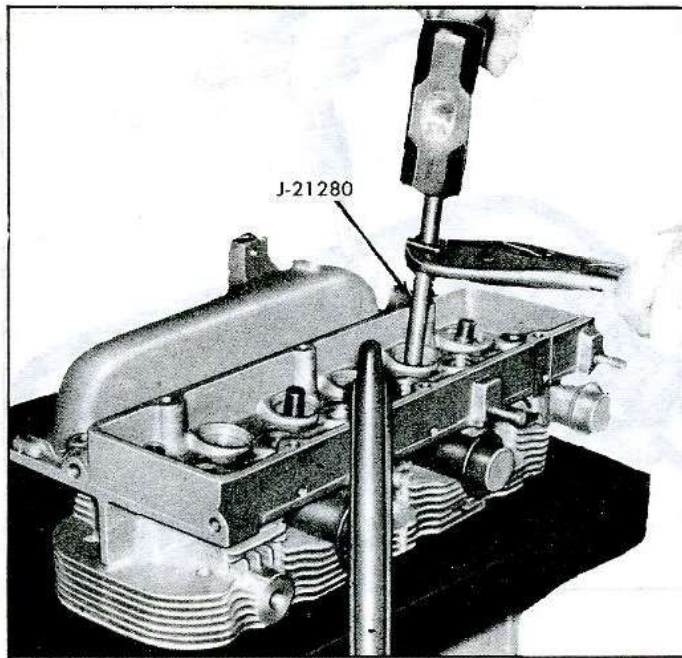


Fig. 88—Removing Valve Guide

2. Wipe out valve guide bore in cylinder head and closely inspect for scoring or damage during guide removal. Use the following method to select the replacement valve guide required for each location.
3. If guide bore in cylinder head appears smooth and free from scoring, select standard size replacement guide.
4. If some damage in bore is evident, ream bore with .010" oversize (J-21282) Hand Reamer starting at the combustion chamber side and flushing with cutting oil to avoid scoring (fig. 89). Do not force

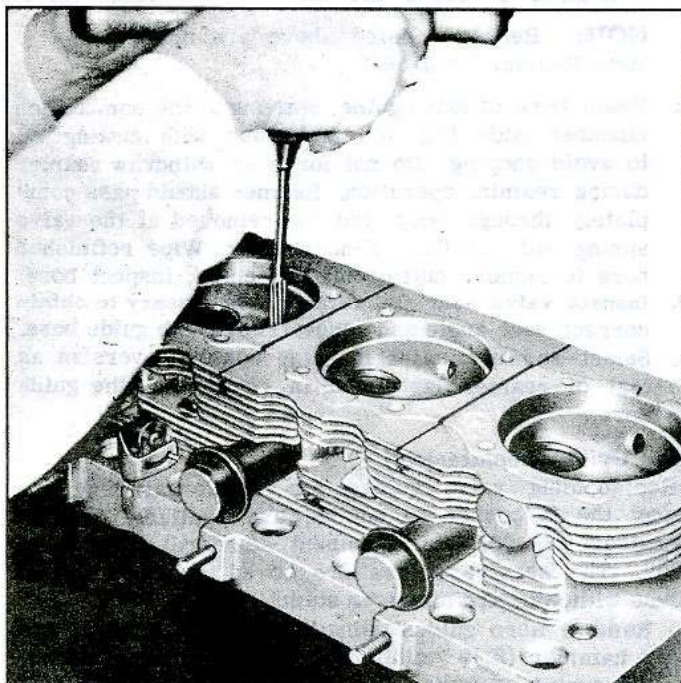


Fig. 89—Reaming Valve Guide Bore

or remove reamer during reaming operation. Pass reamer completely through bore and remove from valve spring side. Wipe reamined bore to remove cutting oil and chips; inspect bore. Finish bore diameter should now be .524" - .525". If bore is smooth and free of scoring after reaming, select .010" O.D. oversize valve guide.

5. If reaming with the .010" reamer did not clean the guide bore in the cylinder head, use the .020" oversize (J-21283) Hand Reamer and select .020" O.D. oversize valve guide. Wipe valve guide bore to remove cutting oil and chips. Finished bore diameter should now be .534" - .535".
6. Coat outside diameter of the selected valve guide with oil; then using Guide Installer J-21281 and a hammer, start guide, tapered end first, into bore from combustion chamber side of the cylinder head. Final installed height should be approximately 1" from the top surface of the valve seat insert to the end of the guide. Correct height can be determined by aligning the groove on the installer--flush with top surface of the valve seat insert (fig. 90).
7. Liberally oil valve stem bore and ream through from the combustion chamber side, using Hand Reamer J-21318.
8. Recondition valve seat as necessary to obtain correct seat angle, width, and concentricity with guide bore.
9. Select and use valves with standard diameter stem at locations where new guides were installed.

Studs Replacement

NOTE: To install carburetor attaching studs if replacement is necessary, coat threads with Permatex anti-seize compound #404 or its equivalent.

1. Install long stud 5/16"-18-24 x 4-13/16", using Tool J-8534-2, in intake manifold flange (fig. 91) on left and right bank cylinder heads to a length of 4-3/16".

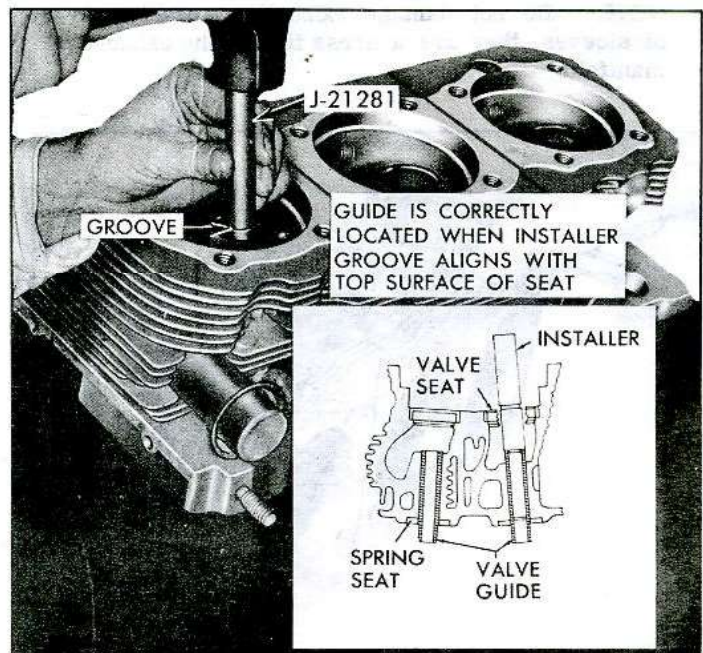


Fig. 90—Installing Valve Guide

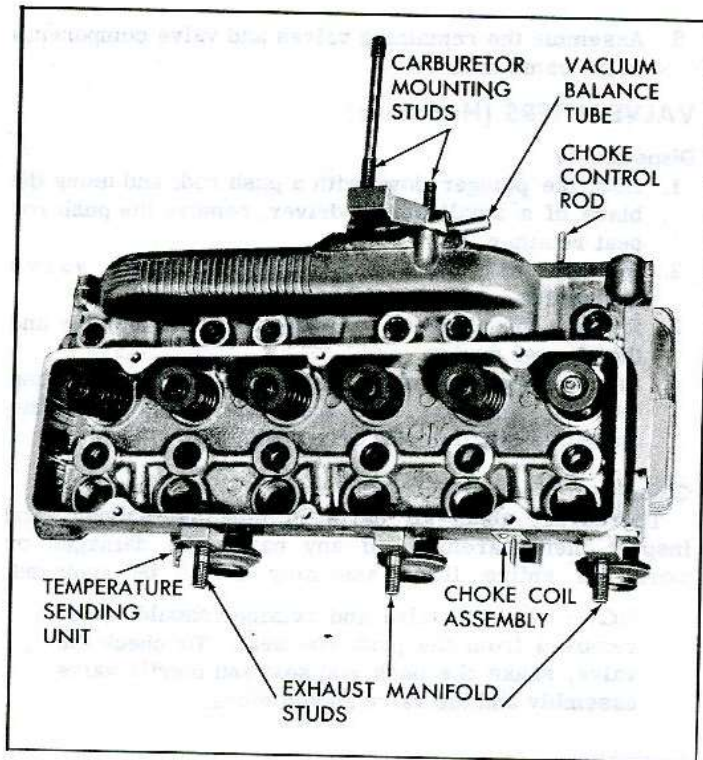


Fig. 91—Cylinder Head Assembly

2. Install short stud 5/16"-18 x 24 x 2-1/4", using Tool J-8354-2 in intake manifold flange 91) on left and right bank cylinder heads to a length of 1-5/8".
3. Install exhaust manifold studs (fig. 91) using Tool J-8354-3 into cylinder head to a length of 31/32".

Thread Repair

Inserts are commercially available for thread repairs at local jobbers and should be installed to prescribed methods furnished by the manufacturer.

Vacuum Balance Tube and Plug Replacement

NOTE: Cylinder Heads are identical except for location of vacuum balance tube hose connector (fig. 91) which is on one side of carburetor mounting pad on the right bank and the other side of the left bank. Install tube in hole to front of cylinder head and plug in hole to rear of cylinder head (as positioned on vehicle).

1. Using a hardwood block and hammer tap tube in place (to shoulder).
2. Use a suitable size drift pin and hammer and tap plug in place (flush with edge of carburetor mounting pad).

Choke Coil and Control Rod Replacement

1. Using a sharp chisel and hammer, with light blows (fig. 92) (hard blows will snap head off twist rivet), tap head of twist rivet in a counter-clockwise direction until rivet starts out.
2. Grip head of twist rivet with vise-grip pliers and remove by turning counter-clockwise.
3. Remove choke coil and control rod assembly from cylinder head.

4. Position choke coil and control rod assembly in cylinder head and tap twist rivet in place with a hammer.

Assembly

NOTE: The valve spring seats on Corvair cylinder heads are recessed, presenting a problem to measure installed height. This measurement can be easily performed before the spring is installed.

1. Measure valve spring installed height as follows:
After the valve face and seat have been refinished, install the valve in its bore, then install the spring cap and valve locks without the spring.

Hold the spring cap and pull the valve against its seat in the head.

NOTE: This locates the spring cap in its installed position.

While holding the valve as above, measure distance between spring cap and spring seat (fig. 93).

NOTE: A cutaway scale will help.

Remove the spring cap and valve locks then install necessary shims. Each valve spring must have a hardened shim (minimum .020") under spring to protect aluminum surface.

NOTE: Spring Shims are available in .030" thickness. Do not shim if shim will bring installed height below minimum specification.

2. Install each valve with the valve stem coated with Molykote or its equivalent in the valve guide from which it was removed or to valve guide it was fitted.

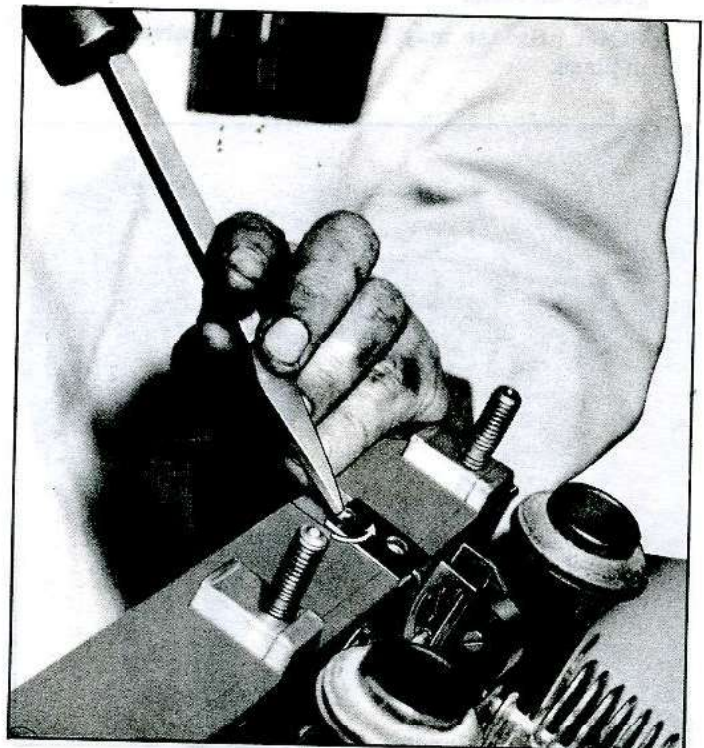


Fig. 92—Choke Coil Removal

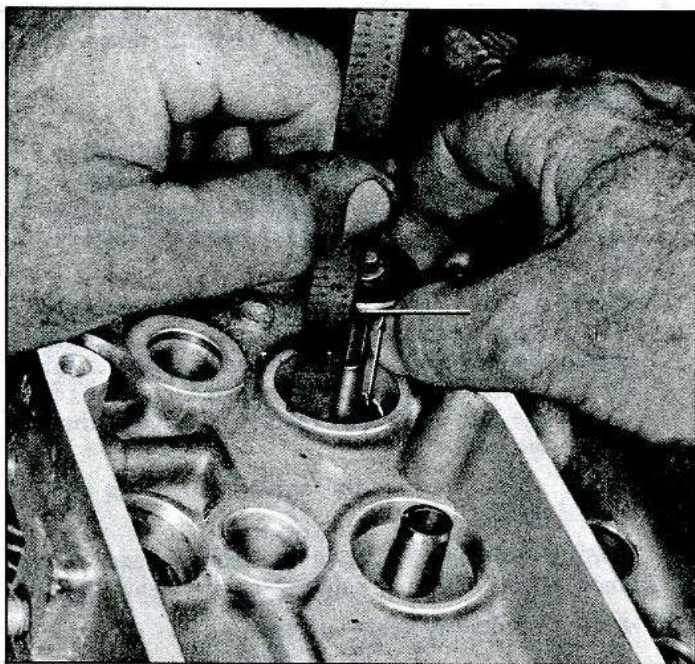


Fig. 93—Measuring Valve Spring Installed Height

3. On intake valves, install new valve stem oil seal using special plastic protector sleeve to prevent damage as seal passes over valve lock grooves. Push seal on guide until it bottoms on guide end.
4. Set valve spring (and damper if used) in place on shim in cylinder head. Place cap in position and compress valve spring with Tool J-8062.
5. Install valve locks and release spring compressor tool, making sure locks seat properly in valve groove on stem.

NOTE: Grease may be used to hold valve locks in place.

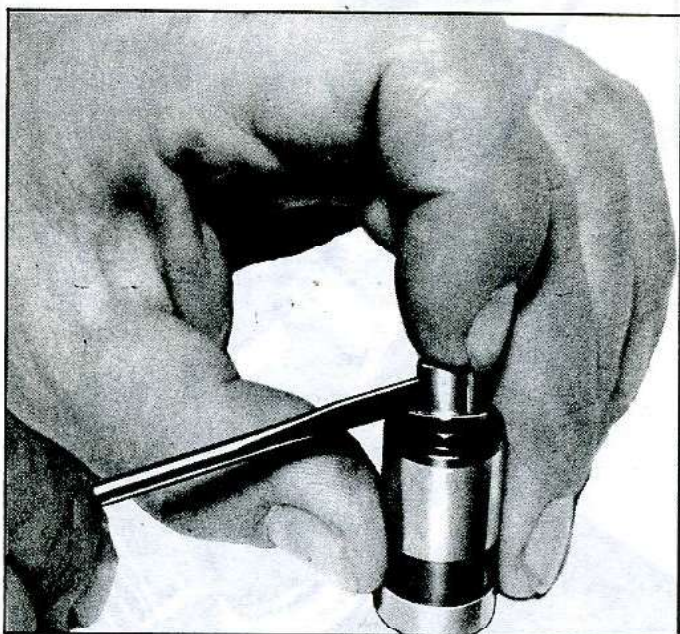


Fig. 94—Removing Ball Check Valve

6. Assemble the remaining valves and valve components in the same manner.

VALVE LIFTERS (Hydraulic)

Disassembly

1. Hold the plunger down with a push rod, and using the blade of a small screw driver, remove the push rod seat retainer.
2. Remove the push rod seat and inertia valve assembly.
3. Remove the plunger, ball check valve assembly and the plunger spring.
4. Remove the ball check valve and spring by prying the ball retainer loose from the plunger with the blade of a small screw driver (fig. 94).

Cleaning and Inspection

Thoroughly clean all parts in cleaning solvent, and inspect them carefully. If any parts are damaged or worn the entire lifter assembly should be replaced.

NOTE: Inertia valve and retainer should not be removed from the push rod seat. To check the valve, shake the push rod seat and inertia valve assembly and the valve should move.

Assembly

1. Place the check ball on small hole in bottom of the plunger.
2. Insert check ball spring on seat in ball retainer and place retainer over ball so spring rests on the ball. Carefully press the retainer into position in plunger with the blade of a small screw driver (fig. 95).

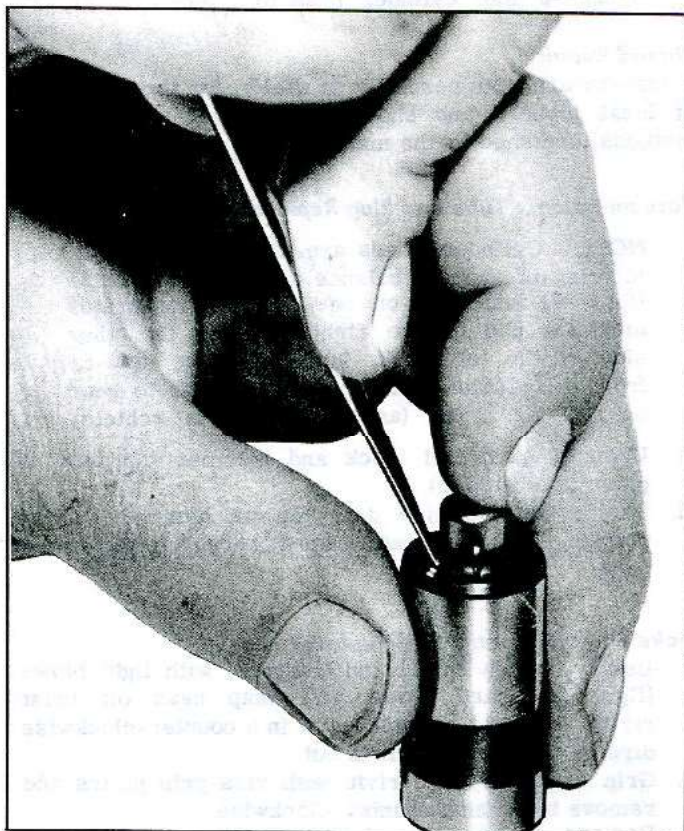


Fig. 95—Installing Ball Check Valve

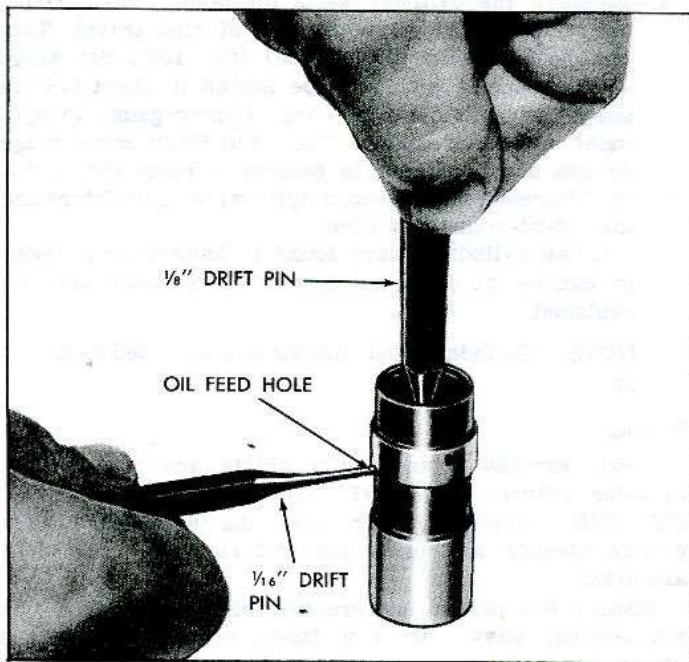


Fig. 96—Assembling the Hydraulic Lifter

3. Place the plunger spring over the ball retainer and slide the lifter body over the spring and plunger, being careful to line up the oil feed holes in the lifter body and plunger.
4. Fill the assembly with SAE 10 oil, then insert the end of a 1/8" drift pin into the plunger and press down solid. At this point oil holes in the lifter body and plunger assembly will be aligned (fig. 96).

CAUTION: Do not attempt to force or pump the plunger.

5. Insert a 1/16" drift pin through both oil holes to hold the plunger down against the lifter spring tension (fig. 96).

NOTE: The drift pin must not extend inside the plunger.

6. Remove the 1/8" drift pin, refill assembly with SAE 10 oil.
7. Install the push rod seat and inertia valve assembly.
8. Install the push rod seat retainer, press down on the push rod seat and remove the 1/16" drift pin from the oil holes. The lifter is now completely assembled, filled with oil and ready for installation.

CYLINDER, PISTON AND CONNECTING ROD ASSEMBLIES

Disassembly

1. Remove piston assembly from cylinder, by pushing piston through cylinder with the end of a hammer handle (fig. 97).
2. Remove all piston rings by expanding them and sliding them off the top of the pistons. Tool J-8016 is available for this purpose.
3. Install piston and connecting rod assembly on support J-6994-1 and Adapter J-8355-1. Place assembly

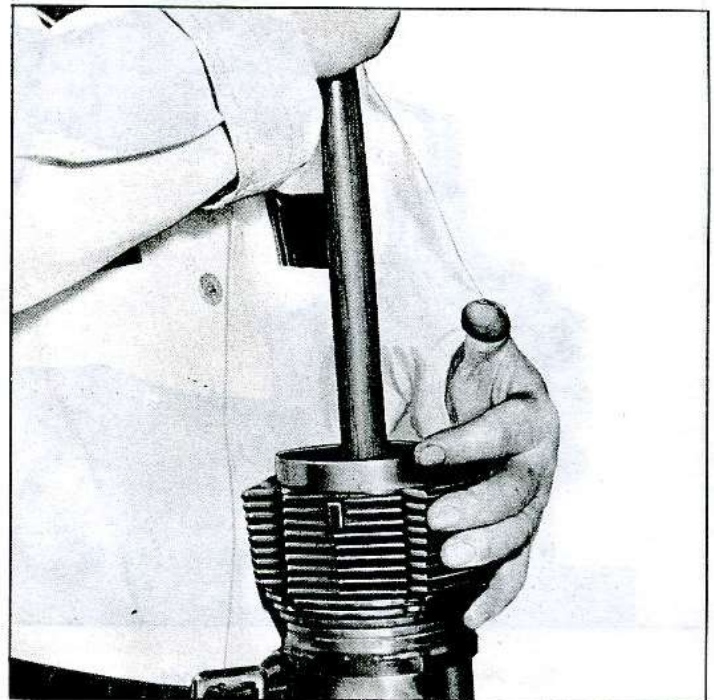


Fig. 97—Removing Piston from Cylinder

in an arbor press (fig. 98). Press pin out of connecting rod, using Tool J-8355-3.

4. Remove from press and remove piston pin from support and remove tool from piston and rod.

Cleaning and Inspection Cylinder

NOTE: Ridge and/or deposits on the head end of the cylinder can be removed after piston is

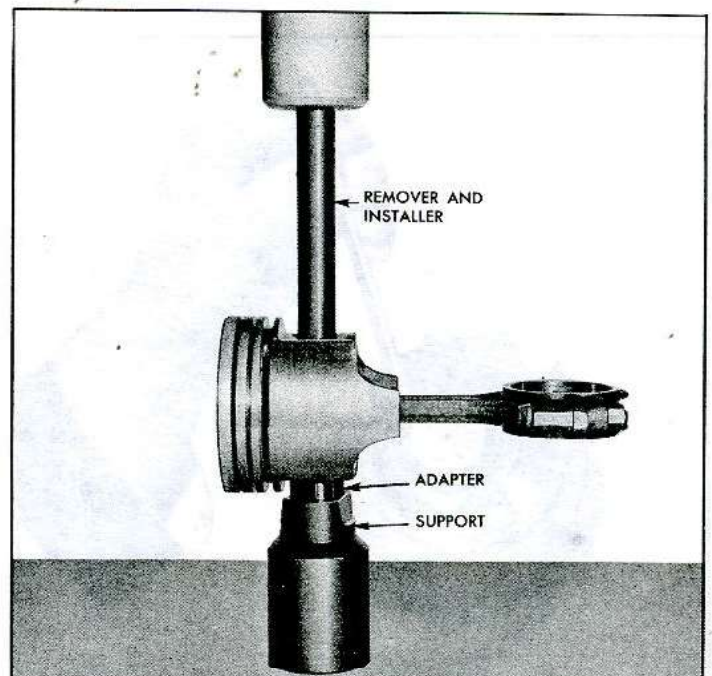


Fig. 98—Removing Piston Pin

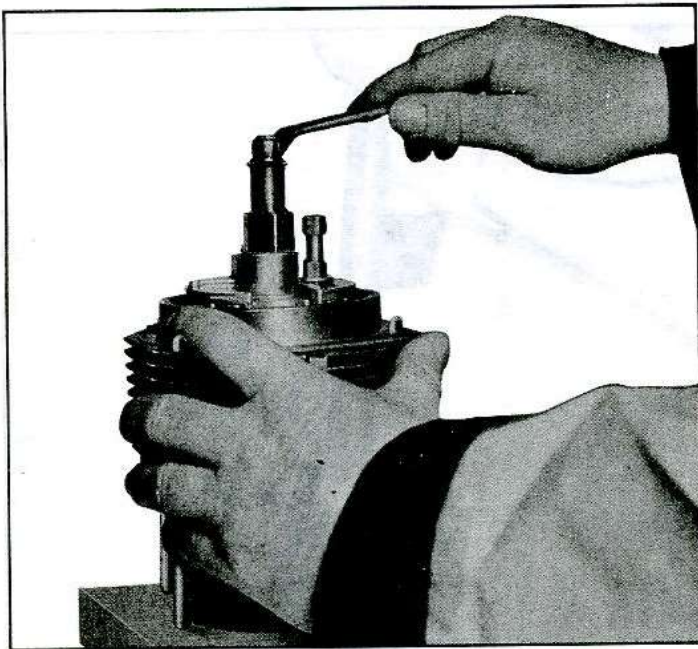


Fig. 99—Removing Ridge from Cylinder

removed from cylinder. A cylinder mounted ridge reamer is available at local jobbers.

1. Using a block of wood for a fixture, drill two holes, spaced to provide a location for two long bolts, holes should be small enough to require driving the bolts into the block of wood.
2. Clamp wood block fixture in a suitable vise.
3. Install cylinder over bolts on wood fixture. Holding cylinder with one hand, insert ridge reamer and remove ridge and/or carbon from cylinder (fig. 99).



Fig. 100—Measuring Cylinder Bore

4. Measure the cylinder walls for taper, out-of-round or excessive ridge at the top of ring travel. This can be done with Tool J-8087 (fig. 100). Set gauge so that thrust pin must be forced in about 1/4" to enter gauge in cylinder bore. Center gauge in cylinder and turn dial to "O". Carefully work gauge up and down cylinder to determine taper and turn it to different points around cylinder wall to determine the out-of-round condition.

If the cylinders were found to have taper or wear in excess of .005" the cylinder and piston must be replaced.

NOTE: Cylinders and pistons are serviced as a unit.

Pistons

Clean varnish from piston skirts and pins with a cleaning solvent. **DO NOT WIRE BRUSH ANY PART OF THE PISTON.** Clean the ring grooves with a groove cleaner and make sure oil ring holes and slots are clean.

Inspect the piston for cracked ring lands, skirts or pin bosses, wavy worn ring lands, scuffed or damaged skirts, eroded areas at top of the piston. Inspect the grooves for nicks or burrs that might cause the rings to hang up. If pistons are damaged or show signs of excessive wear replace cylinder and piston assembly.

Piston Pin

The piston pin clearance is designed to maintain adequate clearance under all engine operating conditions and prevent cylinder and piston pin bore scuffing. Because of this, the piston and piston pin are a matched set and not serviced separately.

Inspect piston pin bores and piston pins for wear. Piston pin bores and piston pins must be free of varnish or scuffing when being measured. The piston pin should be measured with a micrometer and the piston pin bore should be measured with a dial bore gauge or an inside micrometer. If clearance is in excess of specifications and the .001" wear limit, the piston and piston pin assembly should be replaced.

Connecting Rod

Wash connecting rods in cleaning solvent and dry with compressed air.

Check for twisted or bent rods and inspect for fatigue or cracks. Replace connecting rods that are damaged.

Assembly

Piston and Connecting Rods

1. Lubricate piston pin holes in piston and connecting rod to facilitate installation of pin.
2. Position connecting rod in its respective piston.
3. Install piston pin on Installer J-8355-3 and pilot spring Adapter J-8355-1 and pilot in support (fig. 101).
4. Install piston and rod on support, indexing Pilot J-8355-4 through piston and rod.
5. Place support on an arbor press, start pin into position and press on installer until piston pin pilot bottoms.
6. Remove installer and support assembly and adapter from piston and connecting rod assembly.
7. Check piston pin for freedom of movement in piston bore.

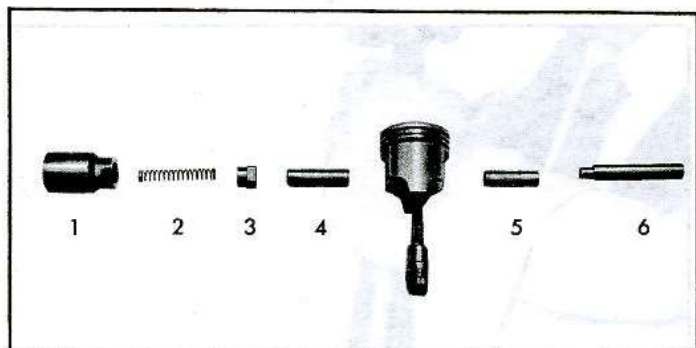


Fig. 101—Piston Assembly and Tool Layout

- | | |
|------------|--------------------------|
| 1. Support | 4. Pilot |
| 2. Spring | 5. Piston Pin |
| 3. Adapter | 6. Installer and Remover |

NOTE: Piston pins are a matched fit to each piston and are not available separately.

Piston Rings

All compression rings are marked on the upper side of the ring (fig. 102). When installing compression rings, make sure the marked side is toward the top of the piston. The top ring is chromed for maximum life.

The oil control rings used are of the three piece type, consisting of two segments (rails) and a spacer.

1. Slip the compression ring in the cylinder bore; then using the head of a piston, press the ring down into the cylinder bore about two inches.

NOTE: Using a piston in this way will place the ring square with the cylinder walls.

2. Measure the space or gap between the ends of the ring with a feeler gauge (fig. 103).

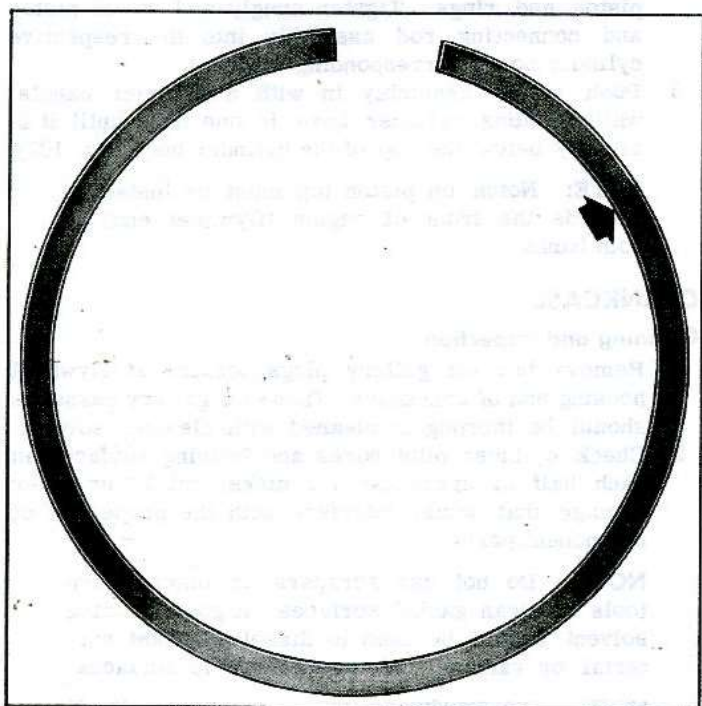


Fig. 102—Compression Ring Marking



Fig. 103—Measuring Ring Gap

3. If the gap between the ends of the ring is below specifications, remove the ring and try another for fit.
4. Fit each compression ring separately to the cylinder in which it is going to be used.
5. If the pistons have not been cleaned and inspected as outlined, do so.
6. Install the oil ring spacer in the oil ring groove and position gap so when piston is installed gap will be in line with engine bottom. (Anti-rotation tang will lock in oil slot.) Hold spacer ends butted and install steel rail on lower side of spacer. Position gap so when piston is installed gap will be in line with top of engine 45° from piston pin (fig. 104), then install

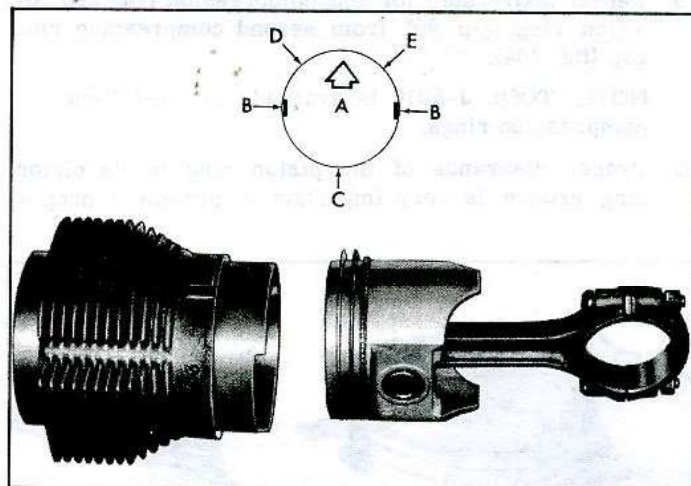


Fig. 104—Piston Rings Installed

- A. Top of Piston (Installed)
- B. Piston Pin Location
- C. Oil Ring Spacer Gap
- D. Top Oil Ring Rail Gap, Top Compression Ring Gap
- E. Bottom Oil Ring Gap, Second Compression Ring Gap

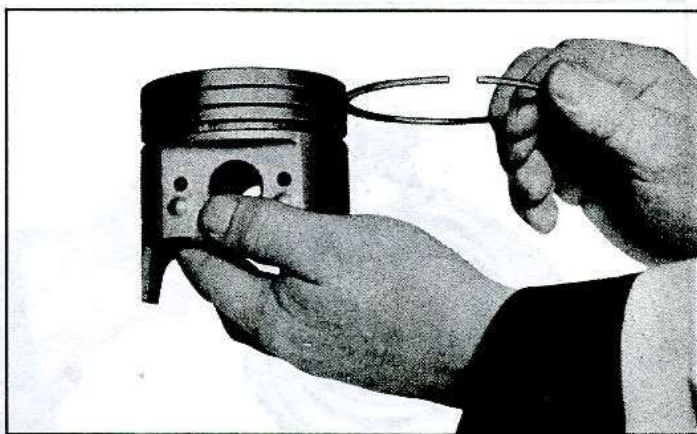


Fig. 105—Rolling Ring in Groove

second rail on upper side of spacer. Position gap so when piston is installed gap will be in line with top of engine 90° from lower rail (fig. 104).

7. Flex the oil ring assembly in its groove to make sure ring is free and does not bind in the groove at any point. If binding occurs, the cause should be determined and removed by carefully dressing with a fine cut file. However, if the binding is caused by a distorted ring, check a new ring.
8. Slip the outer surface of the second compression ring into the piston ring groove and roll the ring entirely around the groove to make sure that the ring is free and does not bind in the groove at any point (fig. 105). If binding occurs, the cause should be determined and removed by carefully dressing with a fine cut file. However, if the binding is caused by a distorted ring, check a new ring. Install ring and position gap so when piston is installed gap will be in line with top of engine 45° from piston pin (fig. 104).
9. Repeat above step for top compression ring and position ring gap 90° from second compression ring gap (fig. 104).

NOTE: TOOL J-8016 is available for installing compression rings.

10. Proper clearance of the piston ring in its piston ring groove is very important to provide a proper



Fig. 106—Measuring Ring Groove Clearance



Fig. 107—Installing Piston in Cylinder

ring action and reduce wear. Therefore, when fitting new rings, the clearances between the top and bottom surfaces of the ring grooves should be measured (fig. 106). (See Specifications.)

Cylinder

1. Apply a light coat of engine oil to the piston rings.
2. Install piston ring compressor Tool J-8037 over the piston and rings. Tighten snugly and insert piston and connecting rod assembly into the respective cylinder bore (Corresponding number).
3. Push piston assembly in with a hammer handle, while holding cylinder bore in one hand until it is slightly below the top of the cylinder bore (fig. 107).

NOTE: Notch on piston top must be installed, towards the front of engine (flywheel end) on both banks.

CRANKCASE

Cleaning and Inspection

1. Remove two oil gallery plugs located at flywheel housing end of crankcase. These oil gallery passages should be thoroughly cleaned with cleaning solvent.
2. Check cylinder pilot bores and bearing surfaces in each half of crankcase for nicks, cracks or other damage that would interfere with the proper fit of component parts.

NOTE: Do not use scrapers or other sharp tools to clean gasket surfaces. A good cleaning solvent should be used to dissolve gasket material or varnish that may adhere to surfaces.

NOTE: The crankcase unit is serviced with all main bearings installed. Crankcase studs must be installed or transferred.



Fig. 108—Installing Pick-Up Screen and Tube

Repairs

Oil Pump Screen and Tube Replacement (Fig.)

1. Using Tool J-8369 remove oil pump screen and tube from left crankcase half.

CAUTION: Before installation of oil pump screen and tube, the end of the tube (on the outside diameter) must be tinned.

2. Using Tool J-8369, install oil pump screen and tube in the left crankcase half. The screen must be positioned parallel to the oil pan rail.

Oil Dipstick Tube Replacement

The oil dip stick tube can easily be replaced by driving tube out from oil pan side with a hardwood block and hammer. Install a new oil level gauge tube using Permatex anti-seize compound or equivalent on the leading surface and tap oil level gauge tube into crankcase with block of wood and hammer until rolled ring bottoms at the crankcase.

Stud Replacement

Always use Permatex #404 anti-seize compound or its equivalent on all threads entering aluminum.

1. To install crankcase studs, install long cylinder studs to a projected length of 8-9/32" and short cylinder studs to a projected length of 7-9/16" (fig. 110) using Tool J-8354-1 (3/8-24) (fig. 109). For easy measuring of stud installed length, measure from Tool J-8354-1-2-3 shoulder.

NOTE: Cylinder stud torque should be a maximum of 30 ft. lbs. and a minimum of 10 ft. lbs. Under 10 ft. lbs. another selected stud should be used.

Studs are available for service in the following oversizes, .003" and .006".

NOTE: All cylinder studs installed in the crankcase adjacent to the crankcase main bearing webs have blind holes, while all other cylinder studs entering the crankcase do not.

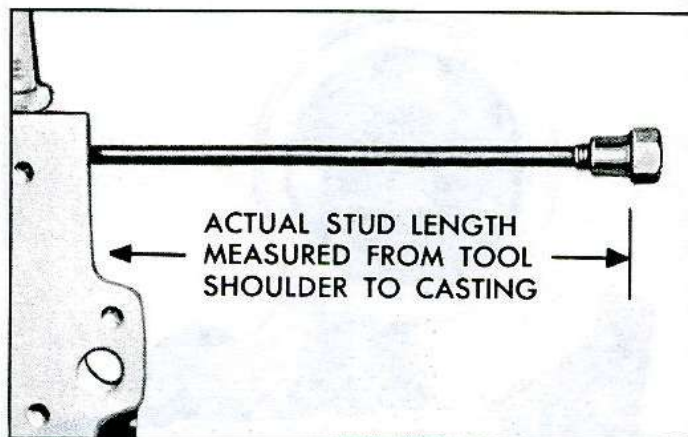


Fig. 109—Installing Studs

2. Install engine rear mounting bracket studs, to a projected length of 4-9/16" (fig. 110) using Tool J-8354-3 (3/8"-16).

NOTE: Rear mounting bracket studs should be torqued 5 ft. lbs. minimum.

Thread Repair

Inserts are commercially available for thread repairs at local jobbers and should be installed to prescribed methods furnished by the manufacturer.

OIL FILTER AND DELCOTRON ADAPTER

Cleaning and Inspection

1. Wash all parts in cleaning solvent and dry with compressed air.
2. Inspect gasket surface for nicks or scratches.
3. Inspect oil filter by-pass valve for damaged valve or spring.
4. Inspect for cracks at flange for mounting Delcotron.

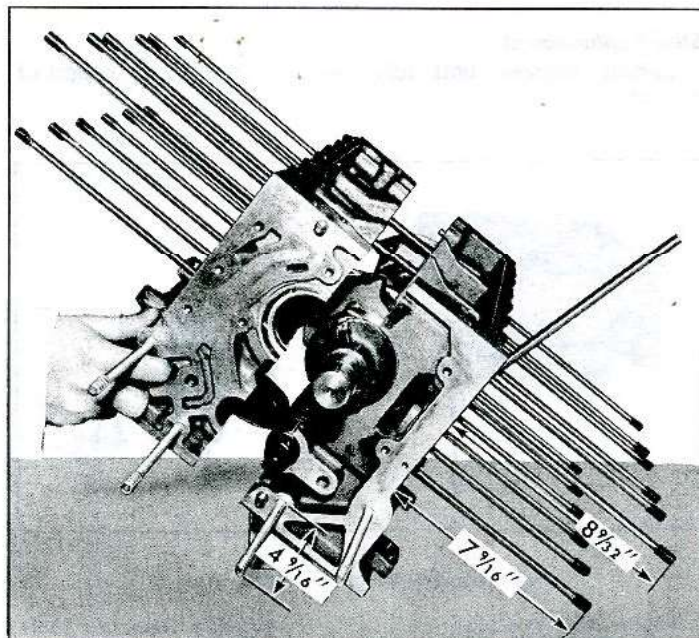


Fig. 110—Stud Installed Length

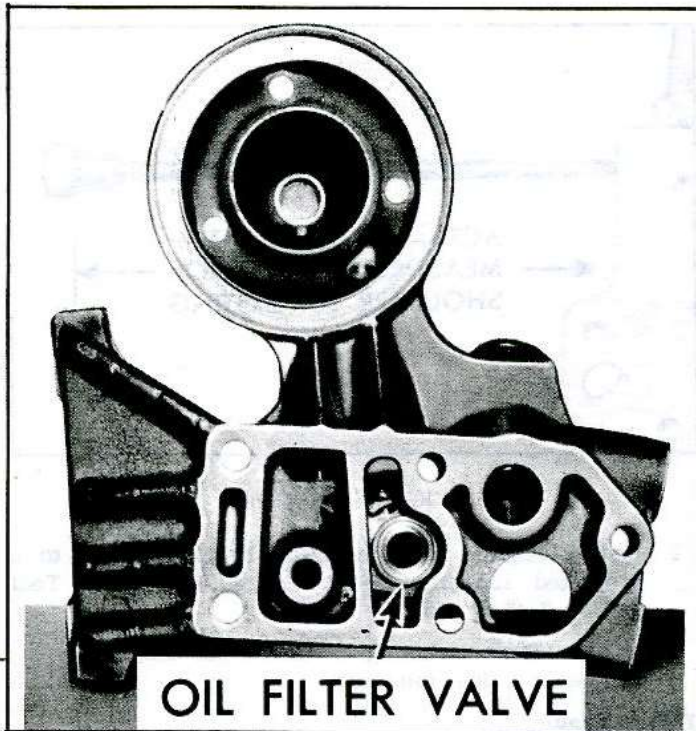


Fig. 111—Oil Filter By-Pass Valve

Repairs

Oil Filter By-Pass Valve Replacement

NOTE: The oil filter by-pass valve opens at 10 psi.

1. Remove oil filter by-pass valve from the oil filter and Delcotron adapter by catching the inner edge of the valve with a suitable hook or small screw driver.
2. Install a new oil filter by-pass valve with the spring up in the adapter housing (fig. 111).

Stud Replacement

Install blower belt idler pulley stud to a height of 1-1/4".

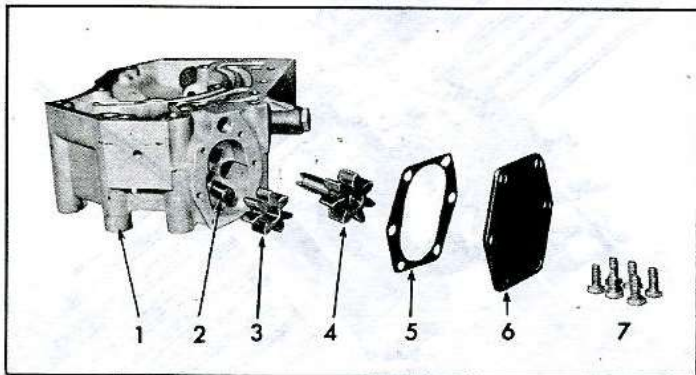


Fig. 112—Oil Pump—Exploded View

- | | |
|------------------------|-------------------------|
| 1. Engine Rear Housing | 4. Drive Gear and Shaft |
| 2. Idler Gear Shaft | 5. Gasket |
| 3. Idler Gear | 6. Cover |
| | 7. Bolts |

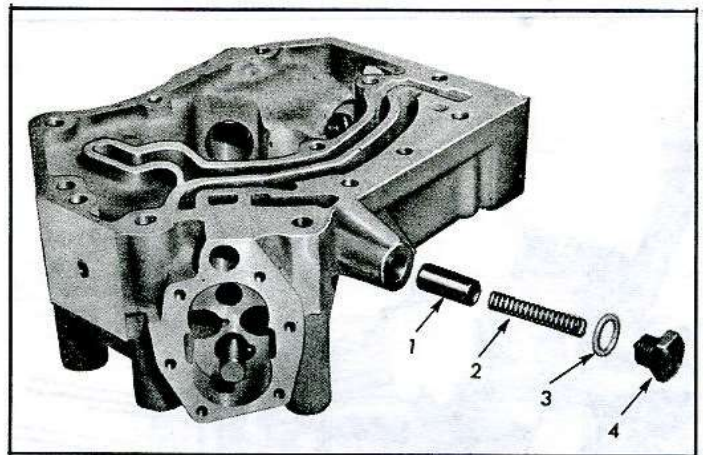


Fig. 113—Pressure Regulator—Exploded View

- | | |
|-----------|-----------|
| 1. Valve | 3. Gasket |
| 2. Spring | 4. Plug |

ENGINE REAR HOUSING

Disassembly

1. Remove pump cover attaching bolts, cover, gasket, idler gear and drive gear and shaft (fig. 112).
2. Remove pressure regulator plug, gasket, spring and valve (fig. 113).

Cleaning and Inspection

1. Wash all parts in cleaning solvent and dry with compressed air.
2. Inspect engine rear housing gasket surfaces for nicks or scratches.
3. Inspect oil pump gears for wear or damage.
4. Inspect pressure regulator valve for wear or damage.
5. Inspect oil cooler by-pass valve for broken fibre valve or spring.

Assembly

1. Install idler gear on idler gear shaft. Idler gear shaft should be .010" to .020" below gasket surface (without gasket installed).
2. Place drive gear and shaft in pump housing.
3. Check the following measurements: Projection of oil pump gears above gasket surface; .0025"-.0045" (without gasket installed). Clearance between gears and housing; .002"-.005". Gear backlash; .002"-.008".

NOTE: Since end clearance of oil pump gears is essential to oil pump prime, selective oil pump gears are available in .001" oversize thickness. Lubricate oil pump gears with engine oil before installation.

4. Install pump cover and attaching bolts, and torque to specifications.
5. Insert a long screw driver down the distributor mounting hole in the engine rear housing and turn oil pump drive shaft to see that oil pump turns freely.
6. Install pressure regulator valve, spring, gasket and plug.

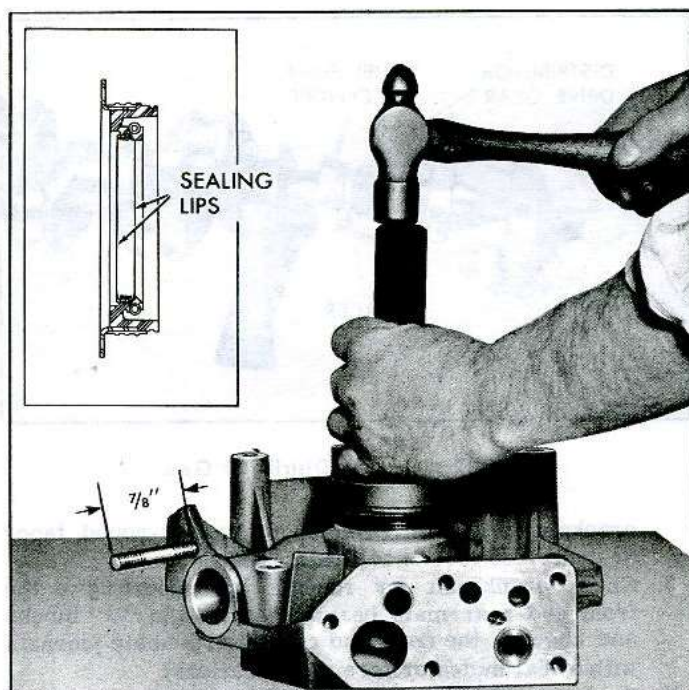


Fig. 114—Installing Rear Housing Seal

Repairs

Seal Replacement

1. Tap seal out of rear housing assembly with a wood or fibre drift.
2. Clean rear housing seal surface with a suitable solvent and check surface for nicks or damage.
3. Lubricate seal outer surface (beaded area) with lubriplate or petrolatum and install with a suitable tool (fig. 114).

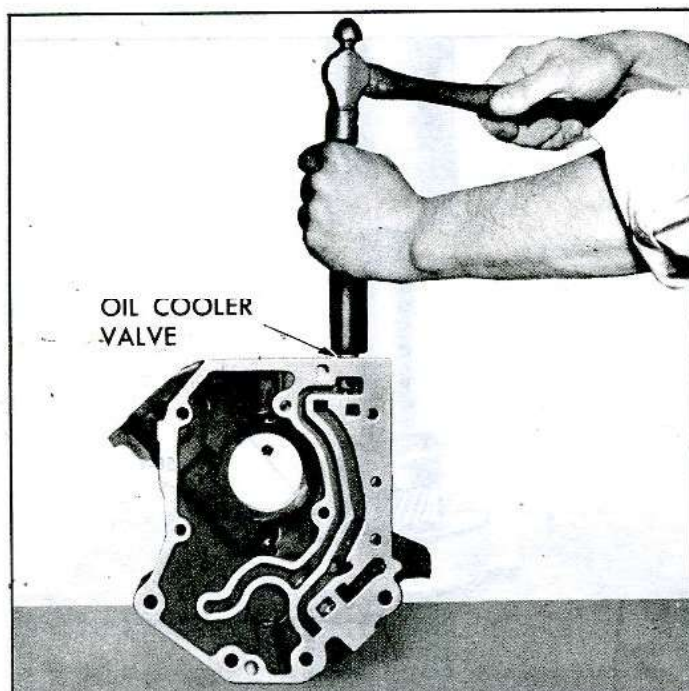


Fig. 115—Installing Oil Cooler By-Pass Valve

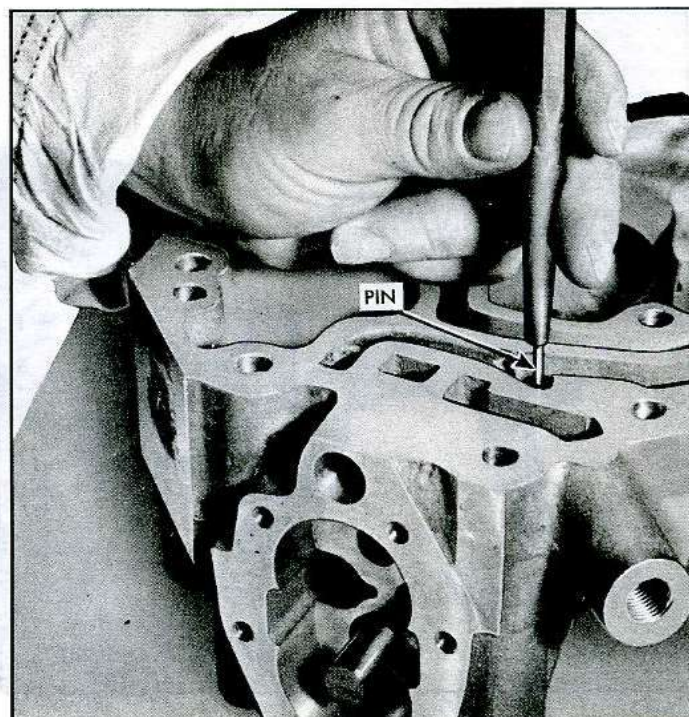


Fig. 116—Installing Pressure Regulator Groove Pin

NOTE: Seal is coated with a high melting (350°F) point cup grease between sealing lips on the inside diameter. Seal to be installed must have this cup grease, which is maintained for the life of the seal.

Oil Cooler By-Pass Valve Replacement

1. Remove oil cooler by-pass valve from the engine rear housing by catching the inner edge of the valve with a suitable hook or small screw driver.
2. Install a new oil cooler by-pass valve with the spring down (fig. 115).

Housing Replacement

When replacing the engine rear housing as a new unit, certain operations are required as outlined below.

1. Install groove pin (fig. 116) which holds oil pump pressure regulator valve in place (if so equipped).
2. Install oil pump gallery plug flush with the counter-bore using sealing compound (fig. 117).
3. Install a new rear housing seal as previously outlined.
4. Install distributor holding stud to a height of 7/8", measured from distributor pad on engine rear housing (fig. 114).

FLYWHEEL HOUSING

Cleaning and Inspection

1. Wash in cleaning solvent and dry with compressed air.
2. Inspect gasket surfaces for nicks or scratches.

Seal Replacement

1. Tap seal out of flywheel housing with a wood or fibre drift.
2. Clean flywheel housing seal surface with a suitable solvent and check this surface for nicks or damage.

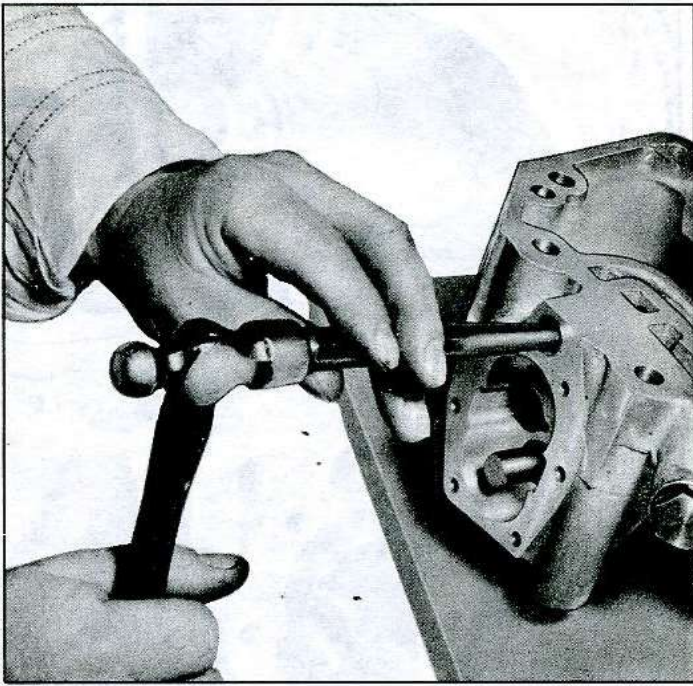


Fig. 117—Installing Oil Gallery Plugs

3. Lubricate seal outer surface (beaded area) with lubriplate or petrolatum and install with Tool J-21768 used with Tool J-8092 (fig. 118).

CRANKSHAFT

Cleaning and Inspection

1. Wash crankshaft in solvent and dry with compressed air.
2. Measure dimensions of main bearing journals and

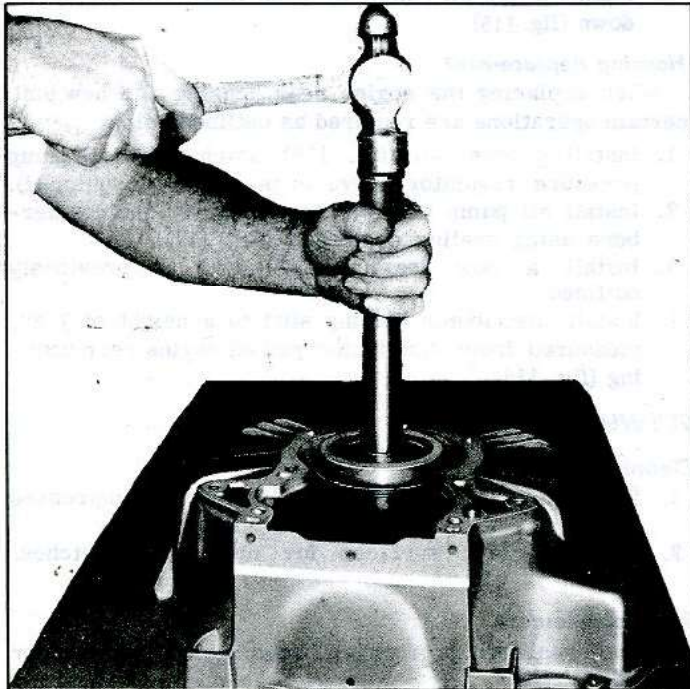


Fig. 118—Installing Flywheel Housing Seal

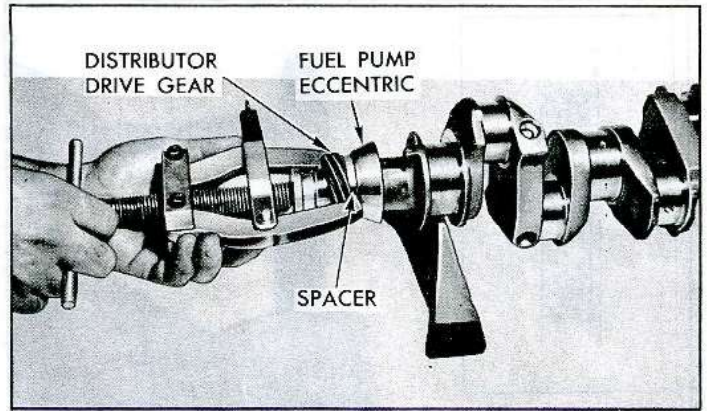


Fig. 119—Removing Distributor Gear

crankpin with a micrometer for out-of-round, taper or undersize (see specifications).

3. Check crankshaft for run-out by supporting at the front and rear main bearing journals in "V" blocks and check at the front and rear intermediate journals with a dial indicator (see specifications).
4. Replace or recondition the crankshaft if out of specifications.

Disassembly

NOTE: Crankshaft end thrust is taken at the rear bearing and crankshaft rear journal flange surfaces.

1. Remove distributor drive gear with Tool J-7112-1 with adapter Tool J-7112-2 (fig. 119).
2. Remove spacer and fuel pump eccentric.

NOTE: Be sure Tool J-7112-1 is on distributor gear solidly, so gear will not be damaged during removal operation.

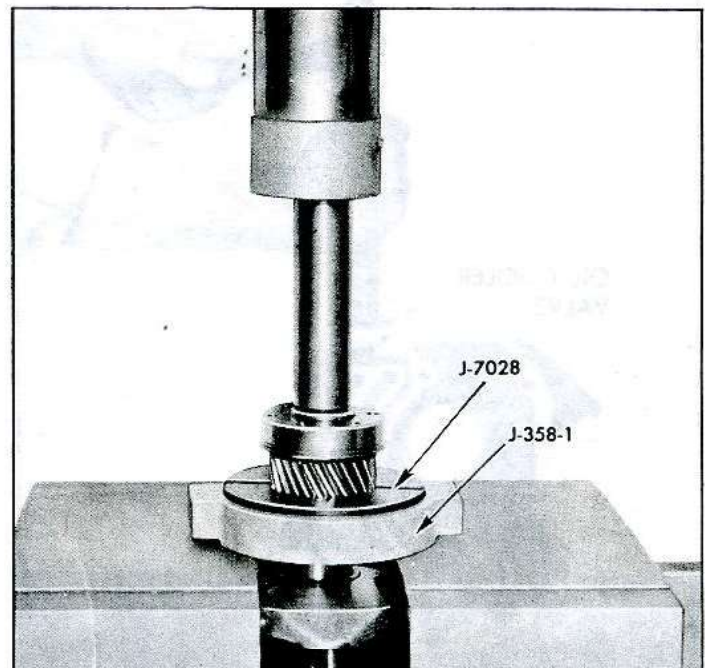


Fig. 120—Removing Crankshaft Gear

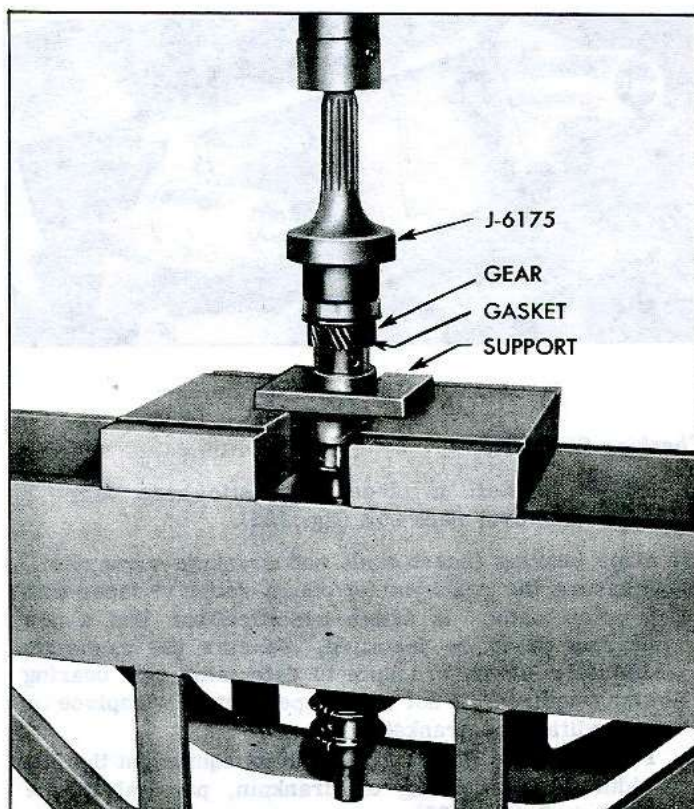


Fig. 121—Installing Crankshaft Gear

3. Remove crankshaft gear by placing each half of Tool J-7028 under gear.
4. Install crankshaft with Tool J-7028 into Tool J-358-1 on a hydraulic press (fig. 120).
5. Remove gear from crankshaft using a small piece of round steel to press crankshaft out of crankshaft gear, then remove and discard gasket.

Assembly

1. Place crankshaft in a hydraulic press and firmly support crankshaft between front crankshaft throw and front journal (fig. 121).

NOTE: Since the crankshaft gear to crankshaft uses a high press tolerance, a hydraulic press is required for removal and installation.

2. Install new gasket on crankshaft, then lubricate crankshaft with hypoid lubricant, and install woodruff key in shaft keyway.
3. Install crankshaft gear and press into place, using Tool J-6175.
4. Install woodruff keys (two) on rear end of crankshaft (Engine Rear Housing End), one for the fuel pump eccentric and distributor drive gear and the other for the crankshaft pulley. Position fuel pump eccentric and spacer on crankshaft. Lubricate crankshaft and distributor drive gear with engine oil and using Tool J-5590, install distributor drive gear until it bottoms. Install oil slinger with concave side away from distributor drive gear.

MAIN BEARINGS

Main bearings are of the precision insert type and do not utilize shims for adjustment. If clearances are

found to be excessive a new bearing, both halves, will be required. Bearings are available in standard size, .001", .002" and (No. 4 only) .003" undersize for use with new and used standard size crankshafts, and in .010" and .020" undersize for use with reconditioned crankshafts.

Inspection

Whenever the crankcase is parted, the bearing inserts and the crankshaft journals should be inspected.

If upon inspection bearing shows evidence of wear or fatigue, both halves should be replaced. Never should one-half be replaced without replacing the other half.

If the running clearance of a bearing is too great with used inserts, it will be necessary to install both bearing halves. Should this become necessary, the crankshaft journal should be checked with a micrometer for out-of-round, taper or undersize dimensions. Experience has shown that clearance increase from wear in main bearings is not only due to bearing wear, but is also due in part to crankshaft journal wear.

Checking Clearance

To obtain the most accurate results with Plastigage, (or its equivalent) a wax-like plastic material which will compress evenly between the bearing and journal surfaces without damaging either surface, certain precautions should be observed. All crankcase bolts must be torqued to specifications. The crankshaft journals and bearings must be wiped clean of oil and crankcase split line surfaces must be free of nicks or foreign matter.

1. Remove one-half of the crankcase, while the other is supported on its side, wipe oil from journal and bearings with a soft clean cloth.
2. Place a piece of gauging plastic the full width of the bearing parallel to the crankshaft on the journal (fig. 122).
3. Install other half of crankcase with bearings and evenly torque all crankcase bolts to specifications.

CAUTION: Do not rotate the crankshaft while the gauging plastic is between the bearing and journal.

4. Remove one-half of crankcase. The flattened gauging plastic will be found adhering to either the bearing shells or journals. On the edge of gauging plastic packing envelope there is a graduated scale which is correlated in thousandths of an inch.

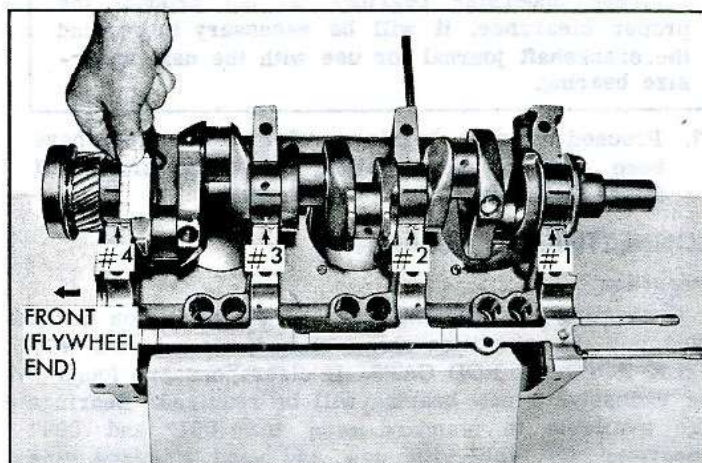


Fig. 122—Measuring Gauging Plastic on Journal

5. Without removing the gauging plastic, check its compressed width (at the widest point) with the graduations on the envelope (fig. 122).

NOTE: Normally, main bearing journals wear evenly and are not out-of-round. However, if a bearing is being fitted to an out-of-round journal be sure to fit to the maximum diameter of the journal. If the bearing is fitted to the minimum diameter of the journal and the journal is out-of-round .001", interference between the bearing and journal will result in rapid bearing failure. If the flattened gauging plastic tapers toward the middle or ends, there is a difference in clearance indicating a taper, low spot or other irregularity of the bearing or journal. Be sure to measure the journal with a micrometer if the flattened gauging plastic indicates more than .001" difference.

6. If the clearance is not within specifications, replace the bearing.

CAUTION: Do not install No. 4 main bearing in No. 2 or No. 3 bearing locations. The No. 4 main bearing halves are .0015" thicker than No. 2 and No. 3 main bearings at the ends which are located at the top half of the crankcase and are thinner by the same amount at the opposite ends. This has the effect of lowering the center line of the bearing .0015". The No. 4 main bearing is identified by a brown dye on edges of the bearing shell.

REPLACEMENT BEARINGS

If clearance with gauging plastic is	Install bearing sets
.0010	.000 (Std.)
.0015	.001 U/S
.0020	.001 U/S
.0025	.002 U/S
.0030	.002 U/S
.0035	.003 U/S
.0040	.003 U/S

If these undersize bearings do not produce the proper clearance, it will be necessary to regrind the crankshaft journal for use with the next undersize bearing.

7. Proceed to each bearing. After all bearings have been checked and installed, rotate the crankshaft to see that there is no excessive drag.

CONNECTING ROD BEARINGS

Inspection

Connecting rod bearings are of the precision insert type and do not utilize shims for adjustment. **DO NOT FILE RODS OR ROD CAPS.** If clearances are found to be excessive a new bearing will be required. Bearings are available in standard size and .001" and .002" undersize for use with new and used standard size crankshafts, and in .010", .020" and .030" undersize for use with reconditioned crankshafts.

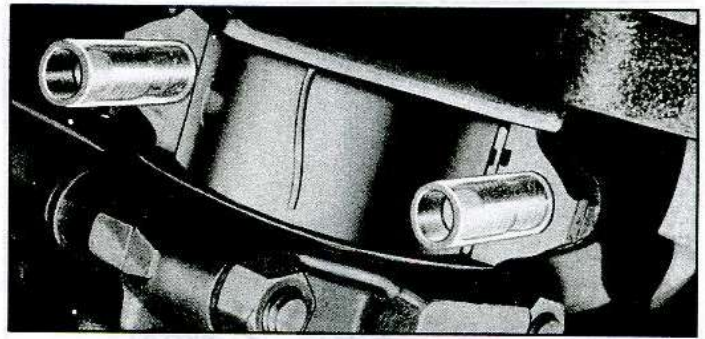


Fig. 123—Gauging Plastic on Crankpin

Checking Clearance

NOTE: Install a piece of plastic hose with 5/16" I.D. over each bolt (fig. 122).

1. Wipe bearing insert shell and crankpin clean of oil.
2. Measure the crankpin for out-of-round or taper with a micrometer. If within specifications and a new bearing is to be installed, measure the maximum diameter of the crankpin to determine new bearing size required. If not within specifications replace or recondition the crankshaft.
3. Place a piece of Plastigage or its equivalent the full width of the bearing or crankpin, parallel to the crankshaft (fig. 123).

NOTE: If a bearing is being fitted to an out-of-round crankpin, be sure to fit to the maximum diameter of the crankpin. If the bearing is fitted to the minimum diameter and the crankpin is out-of-round .001", interference between the bearing and crankpin will result in rapid bearing failure.

4. Reinstall the bearing cap and evenly torque the nuts to specifications.

CAUTION: Do not turn crankshaft with the gauging plastic installed.

5. Remove the bearing cap and without removing gauging plastic, check its width at the widest point with the scale on the gauging plastic envelope (fig. 124).
6. If the clearances are not within specifications, replace the bearing with the proper undersize bearings.

NOTE: The insert bearing shells are not adjustable and no attempt should be made to adjust by filing the bearing caps.

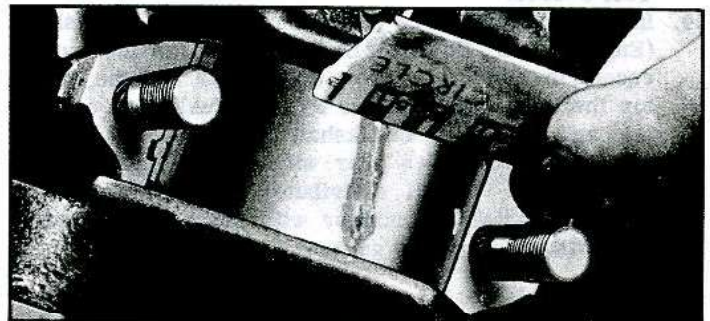


Fig. 124—Measuring Gauging Plastic

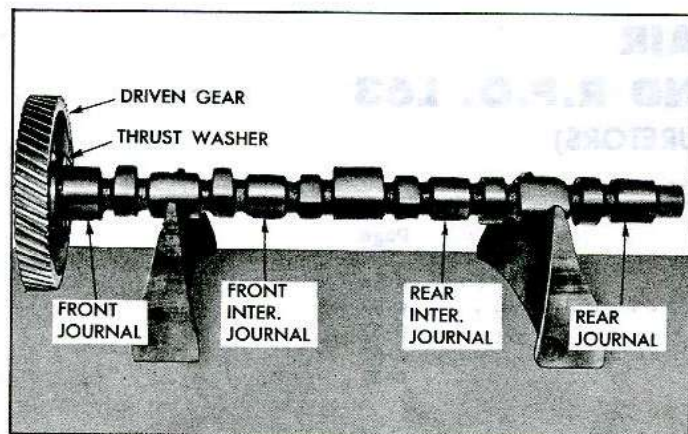


Fig. 125—Checking Camshaft Alignment

7. Rotate the crankshaft after bearing adjustment to be sure the bearings are not too tight.

CAMSHAFT AND TIMING GEAR

Inspection

NOTE: Each exhaust cam lobe serves two exhaust lifters, one on each bank.

1. Check the journals with a micrometer for an out-of-round condition. If the journals exceed .001" out-of-round, the camshaft should be replaced.
2. Check camshaft alignment. The best method is by use of "V" blocks and a dial indicator. The dial indicator will indicate the exact amount the camshaft is out of true. If it is out more than .002" dial indicator reading, the camshaft should be replaced (fig. 125).

NOTE: Camshaft journal clearance should be .0015" to .0035" (new) and .002" to .004" (used). If camshaft clearance is beyond these limits either the crankcase or camshaft should be replaced.

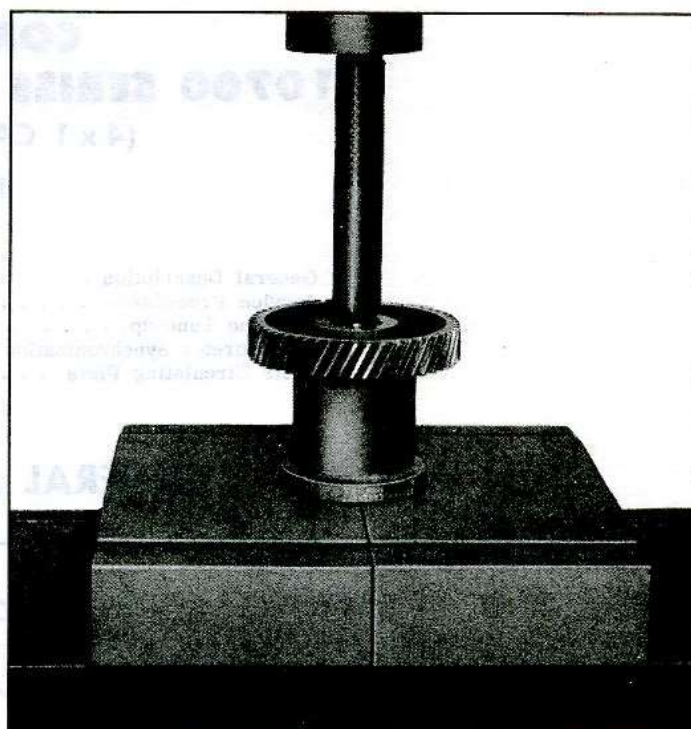


Fig. 126—Removing Camshaft Gear

Disassembly

1. Install Tool J-971 under camshaft gear and place assembly in an arbor press to remove camshaft gear (fig. 126).
2. Remove camshaft gear then remove woodruff key and thrust washer.

Assembly

1. Firmly support shaft at back of the front journal in an arbor press.
2. Place thrust washer over end of shaft, and install woodruff key in shaft keyway.
3. Lubricate camshaft with hypoid lubricant. Install camshaft gear on camshaft and press into place.

CORVAIR

10700 SERIES AND R.P.O. L63

(4 x 1 CARBURETORS)

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GENERAL DESCRIPTION

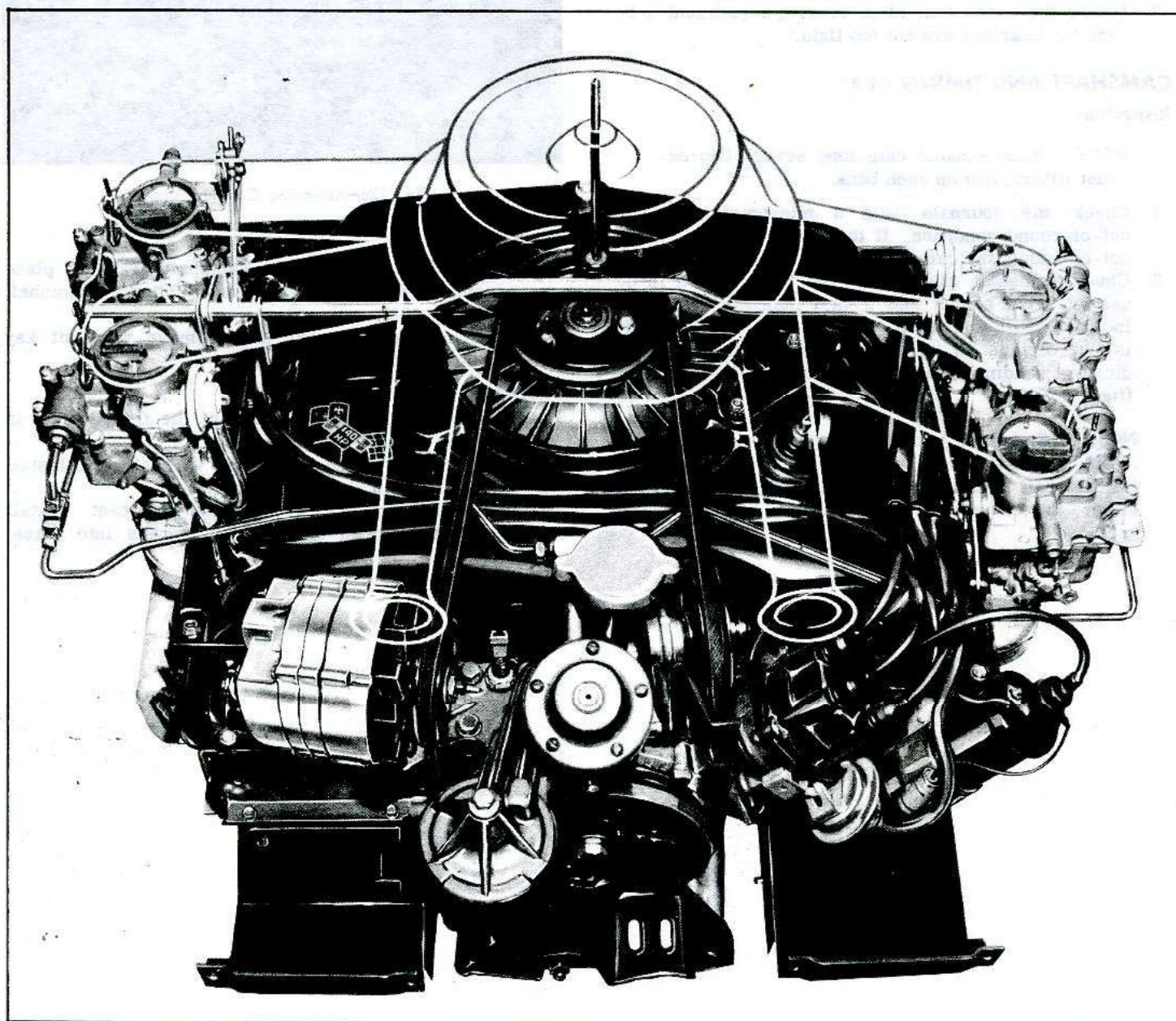


Fig. 127—Corsa Engine (4 x 1 Carburetor)

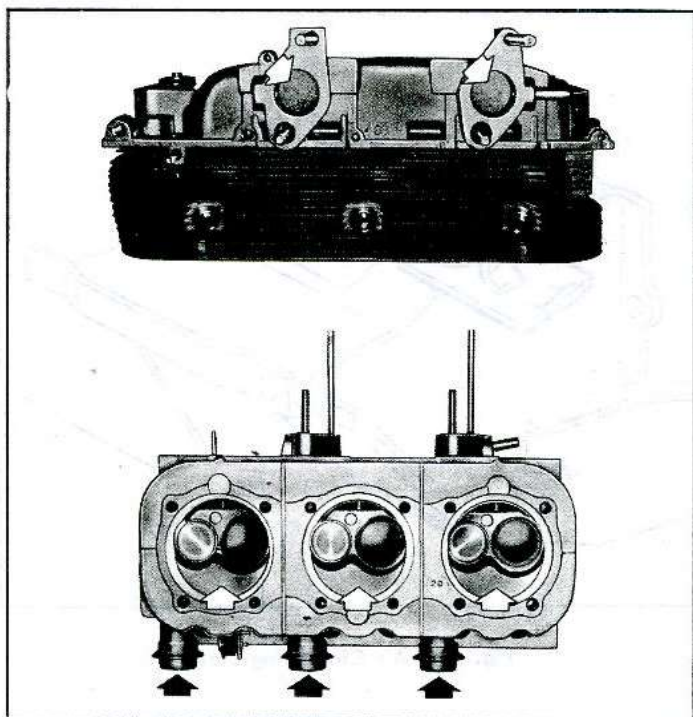


Fig. 128—Cylinder Head

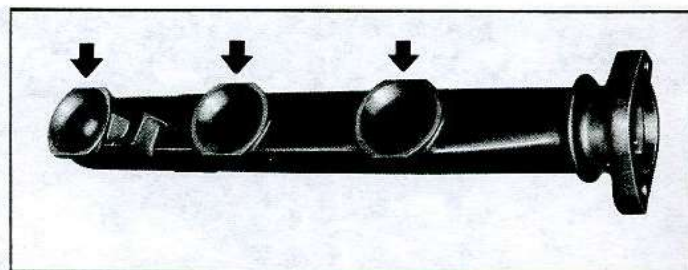


Fig. 129—Exhaust Manifold

The special hi-performance engine (fig. 127) used on the Corvair (10700 series) and optional on the 10100 and 10500 series Corvair has larger exhaust manifolds (fig. 129), a special camshaft and cylinder head with larger valves, larger exhaust port tubes and larger intake manifolds with cast mounting pads for four single barrel carburetors (fig. 128). The engine also has special piston rings and crankshaft (same as turbocharged engine) and a 12 plate oil cooler.

Service and repair procedures remain basically the same as for the 10100 and 10500 series Corvair, except for the service procedures outlined. For carburetor service and carburetor removal for access to engine components refer to Section 6M.

SERVICE PROCEDURES

TUNE-UP

Tune-up procedures for the 10700 series Corvair engine (4 x 1 carburetors) are basically the same as outlined for the 10100 and 10500 series Corvair engine except for the mechanical carburetor synchronization.

Carburetor Synchronization

1. Synchronize the primary carburetors as outlined under Carburetor Synchronization, Mechanical Adjustments in Engine Tune-up for the 10100 and 10500 series Corvair.
2. Disconnect left and right secondary carburetor actuating rods at the cross-shaft levers.
3. Disconnect the accelerator return spring and rotate accelerator control lever on cross-shaft until primary carburetors are at full throttle position.

CAUTION: Do not actuate cross-shaft at any linkage point other than the accelerator control lever on the cross-shaft. To do so may disturb primary carburetor synchronization.

4. While holding primary carburetors at full throttle position, position left secondary carburetor at full throttle position, then adjust actuating rod by turning rod in swivel until rod will just enter front of slot in cross-shaft lever. (fig. 130).
5. Repeat above step for the right secondary carburetor.
6. Return primary carburetors to the idle position, then connect left and right secondary carburetor actuating rods at the cross-shaft levers.
7. Slowly rotate cross-shaft towards full throttle position, checking for simultaneous engagement of the secondary carburetor actuating rods.
8. Continue to rotate cross-shaft to full throttle position checking that all carburetors reach full throttle position simultaneously.

AIR CIRCULATING PLATE

Air circulating plate (left side only); removed in winter - installed in summer (fig. 131).

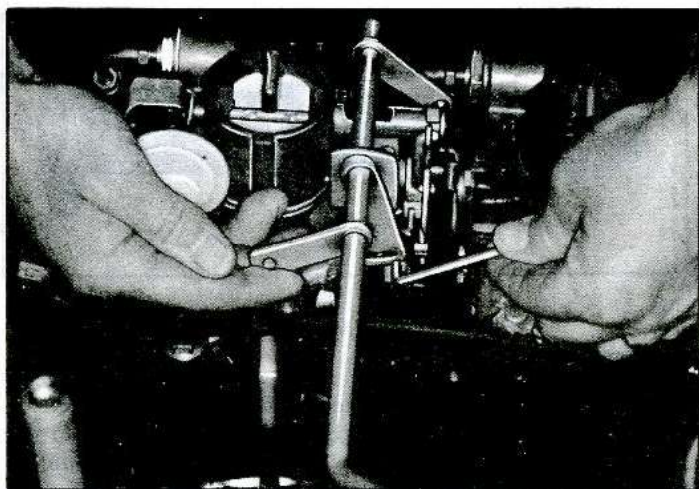


Fig. 130—Synchronization of Secondary Carburetor

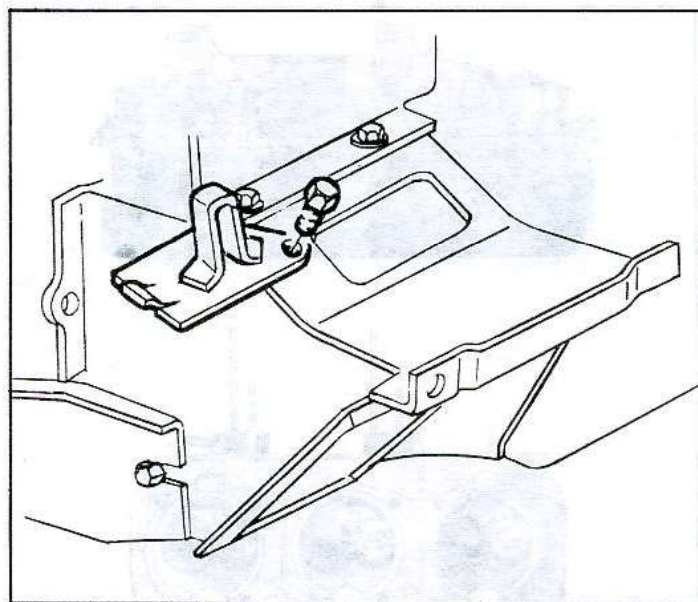


Fig. 131—Air Circulating Plate

SERVICE PROCEDURES

1. With the engine running, synchronize the carburetors. This is done by adjusting the idle mixture screws on the carburetors. The engine should be running at 1000 RPM.
2. Adjust the idle mixture screws on the carburetors. The engine should be running at 1000 RPM.
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9. Adjust the idle mixture screws on the carburetors. The engine should be running at 1000 RPM.
10. Adjust the idle mixture screws on the carburetors. The engine should be running at 1000 RPM.

AIR CIRCULATING PLATE

1. The air circulating plate is used to improve the flow of air through the carburetors. It is located in the air intake manifold.
2. The air circulating plate is used to improve the flow of air through the carburetors. It is located in the air intake manifold.

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10. The air circulating plate is used to improve the flow of air through the carburetors. It is located in the air intake manifold.

CORVAIR WITH TURBOCHARGER

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GENERAL DESCRIPTION

The optional turbocharged engine (fig. 132) for the 10700 series Corvaire has external changes to provide for mounting the Turbocharger and internal changes for the increased power. THE TURBOCHARGER UNIT SHOULD NEVER BE REMOVED FROM THIS SPECIAL ENGINE TO BE INSTALLED ON ANOTHER CORVAIRE ENGINE.

Internal changes include the following:

- Piston rings and crankshaft.

- Cylinder heads.

- a. L.H. includes sending unit (Thermister), for head temperature gauge.
- b. R.H. includes Turbocharger oil drain.
- c. 8:1 compression ratio.

External changes include the following:

- 12 plate oil cooler.
- Single side draft Carter YH carburetor.

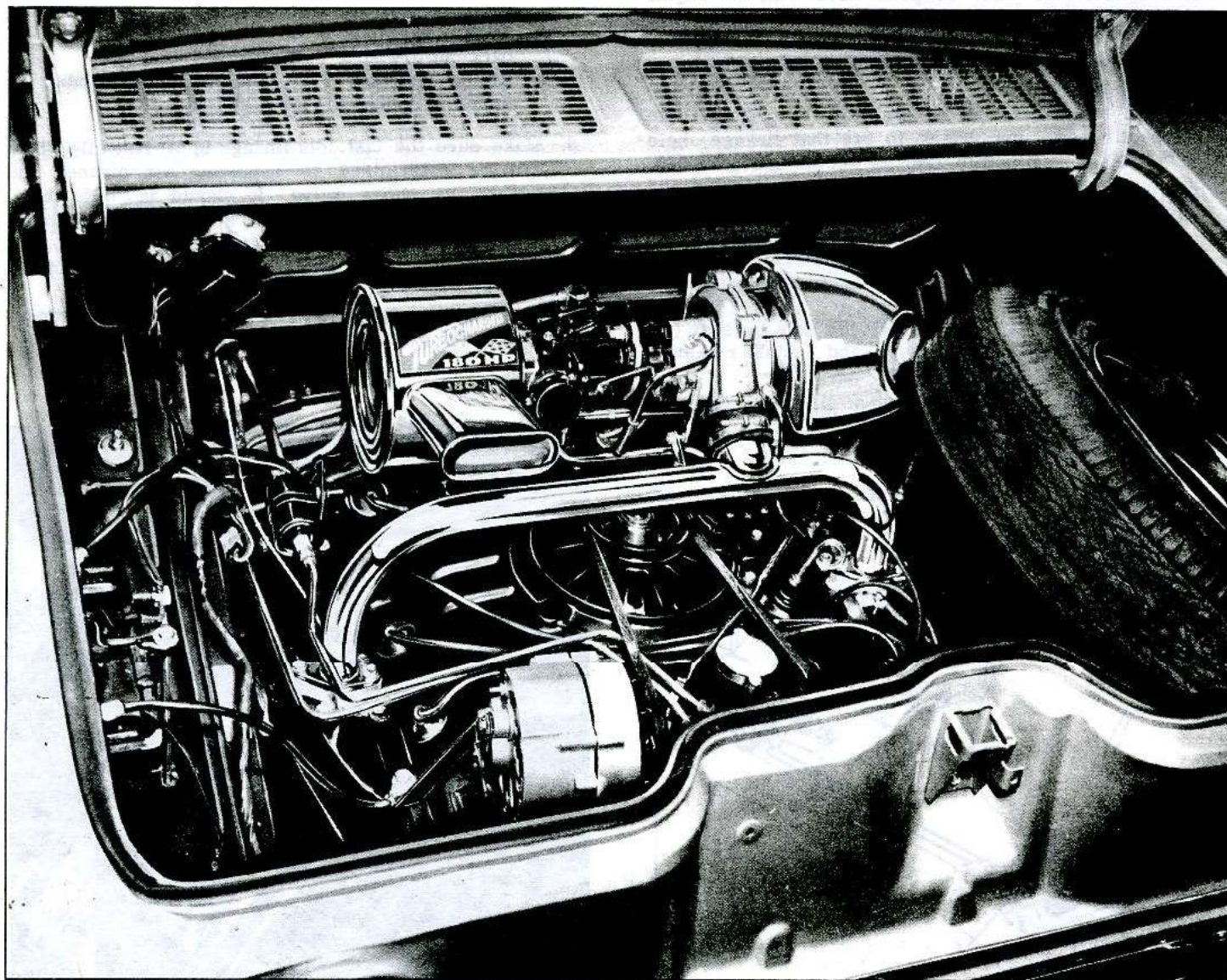


Fig. 132—Turbocharged Engine (Installed)

- Fuel lines and routing.
- Distributor assembly and timing tab.
- Front and right side seal shield revised to bring exhaust pipes to Turbocharger.
- R.H. heater duct revised for exhaust pipe clearance.
- Exhaust pipes and muffler.
- Front shield material (heat resistant) on right side and heat insulator material around exhaust pipes.

- Wiring harness changed to include heat indicator and warning buzzer system.
- Engine rear housing gasket and oil filter adapter changed to provide oil feed to the Turbocharger.
- Air recirculation—same as air conditioned Corvair vehicles.

Since the Turbocharger is an exhaust driven compressor, refer to Section 8 for Exhaust Service Procedures.

SERVICE PROCEDURES

ENGINE TUNE-UP

Engine Tune-up remains basically the same as outlined for the Corvair 10100 and 10500 series except for the procedures outlined.

Accelerator Linkage Adjustment (Fig. 133)

This adjustment must be performed with the engine at operating temperature or with air cleaner off to block choke valve open (engine stopped).

1. Disconnect accelerator rod swivel (3) from cross-shaft lever (4).
2. Check throttle lever to see that it is against idle speed screw, then check to see that linkage angle "X" is approximately 126° as shown in Figure 9-5. Adjust this angle by lengthening or shortening rod (1).
3. Pull accelerator rod (5) rearward against bellcrank stop on transmission and rotate lever (4) to full throttle position (throttle lever on carburetor will rest against stop boss on flange).
4. Adjust swivel (3) to just enter the hole in lever (4), then connect swivel to lever and install retaining clips.

NOTE: It is better for swivel pin to be just short of lever hole than just past, or linkage may be bent.

5. Move accelerator rod from idle to full throttle and check to see that the throttle lever on carburetor goes to full throttle and back to idle with no bind.

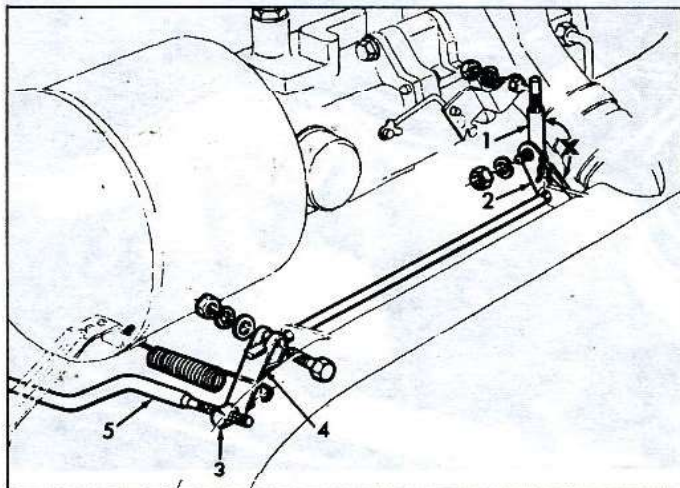


Fig. 133—Accelerator Linkage

Idle Speed and Mixture Adjustment

1. Start engine and bring to operating temperature.
2. Stop the engine and perform following preliminary adjustments:
 - a. Back idle speed screw away from throttle lever, then adjust in until the throttle valve is slightly open.
 - b. Turn idle mixture screw lightly to its seat and back out 3/4 turn.
 - c. Attach tachometer at coil and vacuum gauge at manifold connection for distributor.
3. Make sure the fast idle linkage is off fast idle. This can be determined by removing air cleaner and looking at choke valve. It should be wide open.
4. Start engine and adjust idle speed screw to obtain speed of 850 rpm, then adjust mixture screw and speed screw (alternately as needed) to obtain the highest steady vacuum at 850 rpm.
5. Stop engine, disconnect instruments and reconnect distributor pressure retard hose.

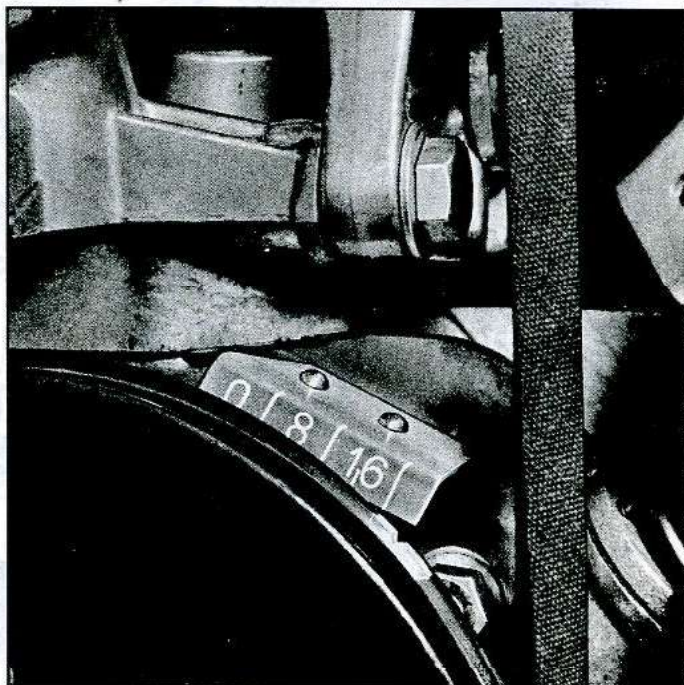


Fig. 134—Ignition Timing

Automatic Choke Adjustment

The automatic choke setting is index and accomplished by loosening three choke coil housing retaining screws and rotating (by hand) the housing; then hold in position and tighten the screws.

Adjust Ignition Timing

1. Connect tachometer and timing light to engine.
2. Start engine and adjust idle (if necessary) to 850 rpm (with engine at operating temperature).
3. Aim timing light at timing tab (fig. 134) above crankshaft pulley and adjust timing to 24° advance by turning distributor the same manner as on regular Corvair engine.

CAUTION: Under no conditions should the timing be set more than 24° advance.

NOTE: It is not necessary to disconnect the spark advance hose and block the vacuum port on this engine.

4. Stop engine and disconnect test instruments.

UPPER SHROUD

Upper shroud removal requires removal of Turbocharger (outlined in Section 6M), turbine inlet and exhaust piping, turbocharger oil lines, and diffuser tube as outlined. Shroud may then be removed in the same manner as outlined for 10100 and 10500 series.

LEFT SHIELD

Left shield is removed as outlined for 10100 and 10500 series, after removal of fuel filter and disconnection of manifold pressure line.

RIGHT SHIELD

Right shield is removed as outlined for 10100 and 10500 series after removing exhaust insulator plate screws and sliding the plate upward 1/2" to 1" clearance.

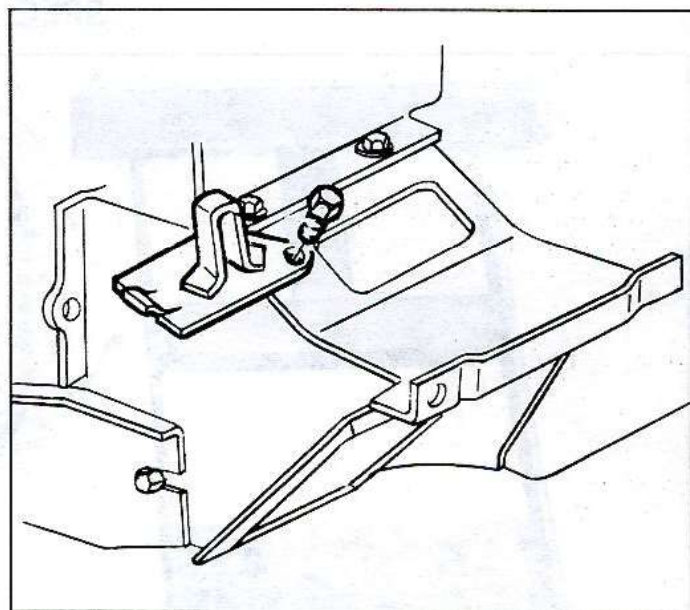


Fig. 135—Air Circulating Plate

FRONT SHIELD

Front shield is removed as outlined for 10100 and 10500 series, after removal of Turbocharger assembly, (including carburetor and air cleaner) and removal of the fuel filter.

AIR CIRCULATING PLATES

Air circulating plate (left side only); removed in winter - installed in summer (fig. 135).

SPECIAL TOOLS

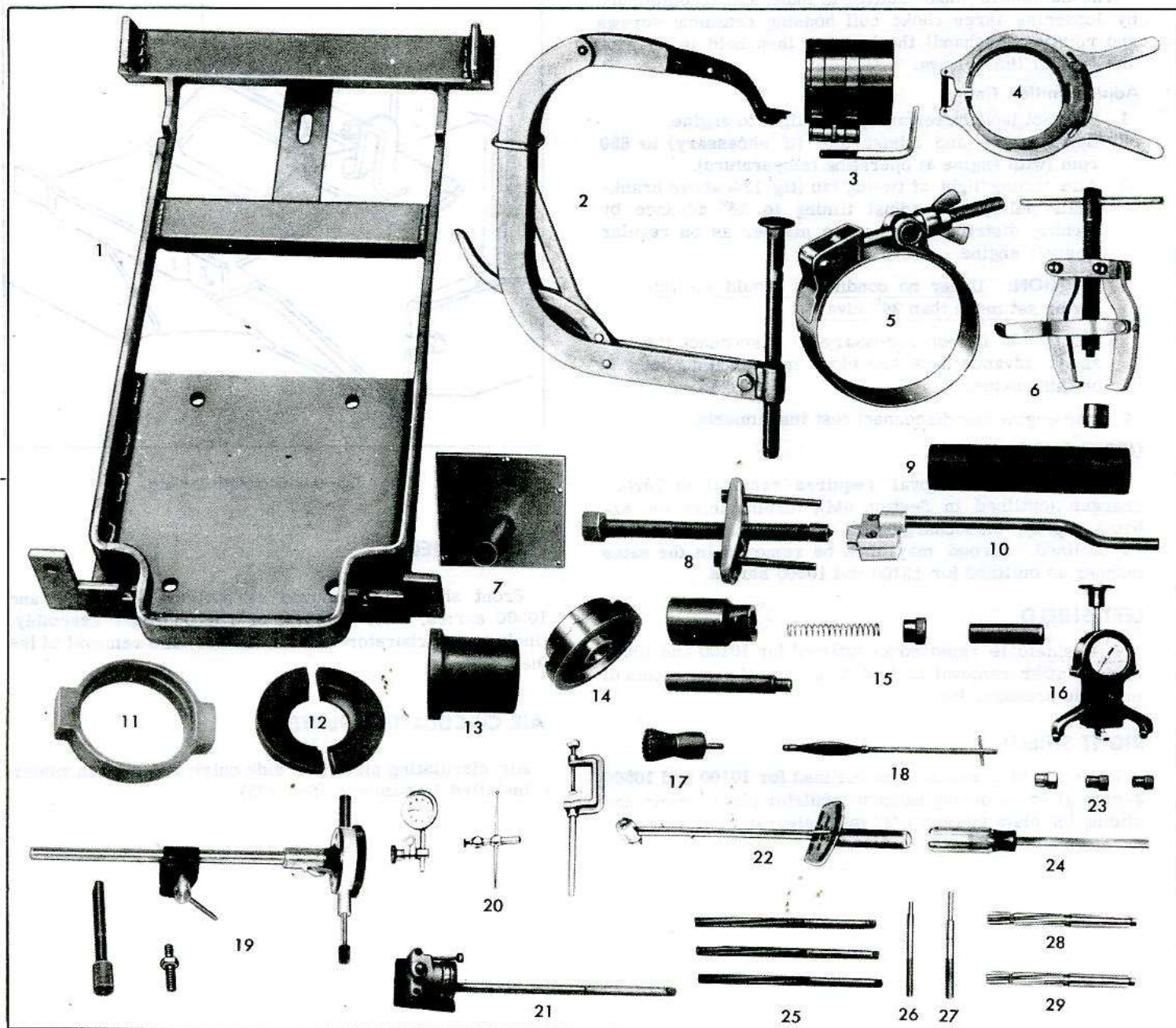


Fig. 136—Engine Special Tools

- | | | | |
|-------------|--|-------------|---------------------------------|
| 1. J-7894 | Power Train Cradle | 17. J-8358 | Carbon Remover Brush |
| 2. J-8062 | Valve Spring Compressor | 18. J-8101 | Valve Guide Cleaner |
| 3. J-8037 | Piston Ring Compressor | 19. J-8520 | Indicator Set (Camshaft Lobe) |
| 4. J-8016 | Piston Ring Expander | 20. J-8001 | Indicator Set (Universal) |
| 5. J-8356 | Piston Ring Compressor | 21. J-8087 | Indicator Set (Cylinder Bore) |
| 6. J-7112 | Puller (Distributor Drive Gear) | 22. J-1264 | Torque Wrench (0-200 Ft. Lb.) |
| 7. J-8280 | Engine Stand Adapter | J-8058 | Torque Wrench (0-50 Ft. Lb.) |
| 8. J-8105 | Crankshaft Pulley Remover | J-5853 | Torque Wrench (0-100 In. Lb.) |
| 9. J-5590 | Installer (Distributor Drive Gear) | 23. J-8354 | Stud Replacer Tool Set |
| 10. J-8369 | Oil Pick-Up Screen Installer | 24. J-21308 | Fin Cleaning Tool |
| 11. J-358 | Press Plate Holder | 25. J-5830 | Valve Guide Reamer Set |
| 12. J-7028 | Press Plate Tool | 26. J-21280 | Valve Guide Remover |
| 13. J-971 | Camshaft Gear Support | 27. J-21281 | Valve Guide Installer |
| 14. J-21768 | Seal Installer (Used with J-8092) | 28. J-21282 | Valve Guide Bore Reamer (.010") |
| 15. J-8355 | Piston Pin Assy. Tool (Used with J-6994) | 29. J-21282 | Valve Guide Bore Reamer (.020") |
| 16. J-7316 | Tension Gauge (Blower Belt) | | |

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