1958 FORD THUNDERBIRD SHOP MANUAL

FORD DIVISION FORD MOTOR COMPANY

1958 Ford Thunderbird Shop Manual

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GROUP

FOREWORD

This manual provides information for the proper servicing of the 1958 Thunderbird. Service information on air conditioning is covered in a separate manual. The descriptions and specifications contained in this manual were in effect at the time the manual was approved for printing. The Ford Division of Ford Motor Company, whose policy is one of continuous improvement, reserves the right to discontinue models at any time, or change specifications or design, without notice and without incurring obligation.

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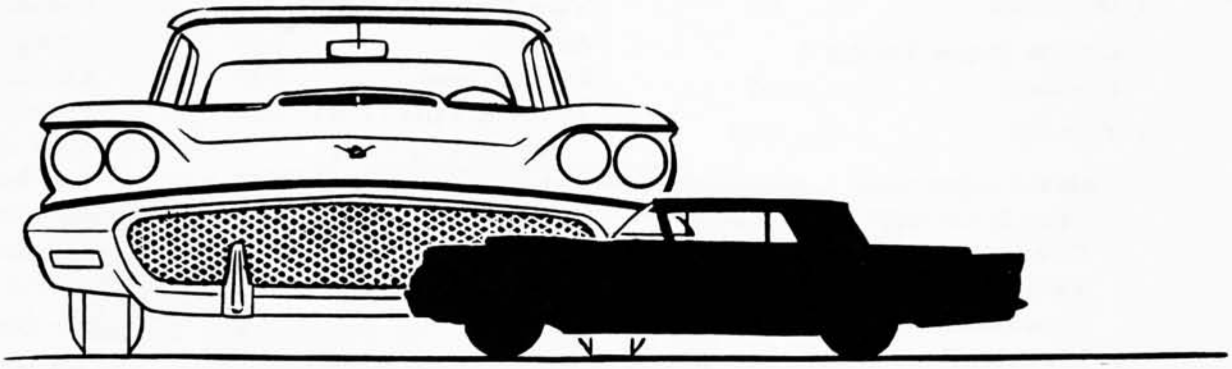

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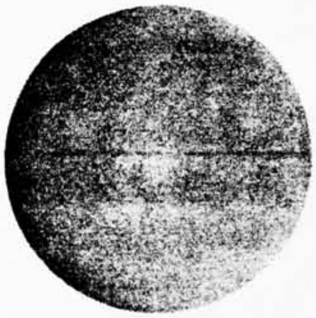

GROUP 1
POWER PLANT

GROUP 1 POWER

PART 1 ENGINE

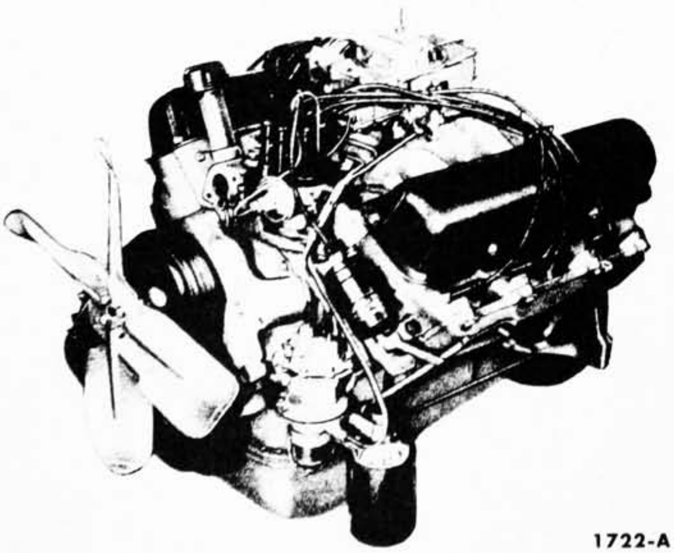

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FIG. 1—Interceptor V-8 "Thunderbird Special" Engine

1 DESCRIPTION

The Interceptor V-8 "Thunderbird Special" engine (Figs. 1 and 2) has a 4.00-inch bore and a 3.50-inch stroke and a total piston displacement of 352 cubic inches. It has a compression ratio of 10.2:1. The engine is identified by a decal on the air cleaner bearing the name of the engine. It can be identified also by the letter "H" at the beginning of the serial number on the patent plate.

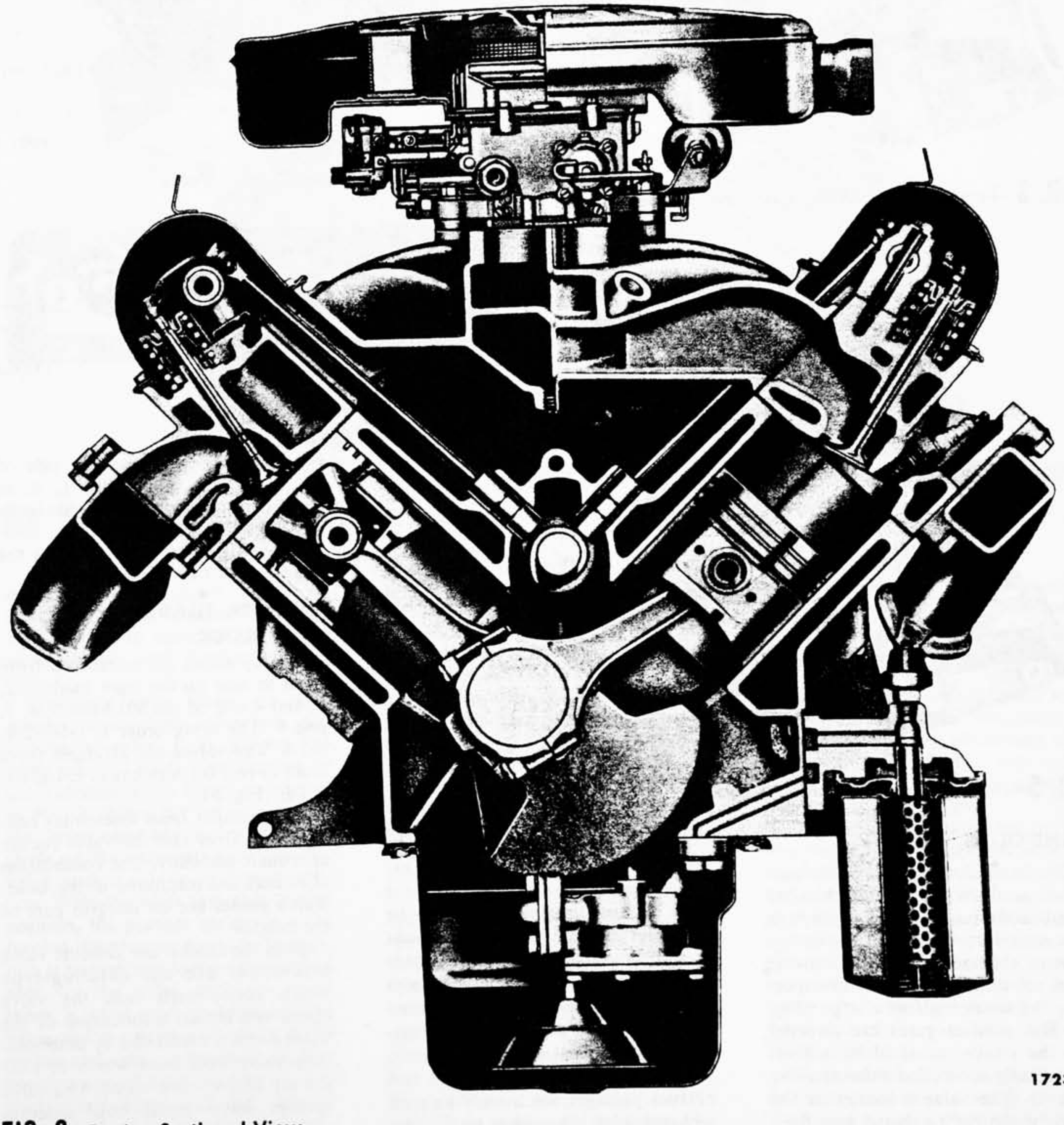

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FIG. 2—Engine Sectional View

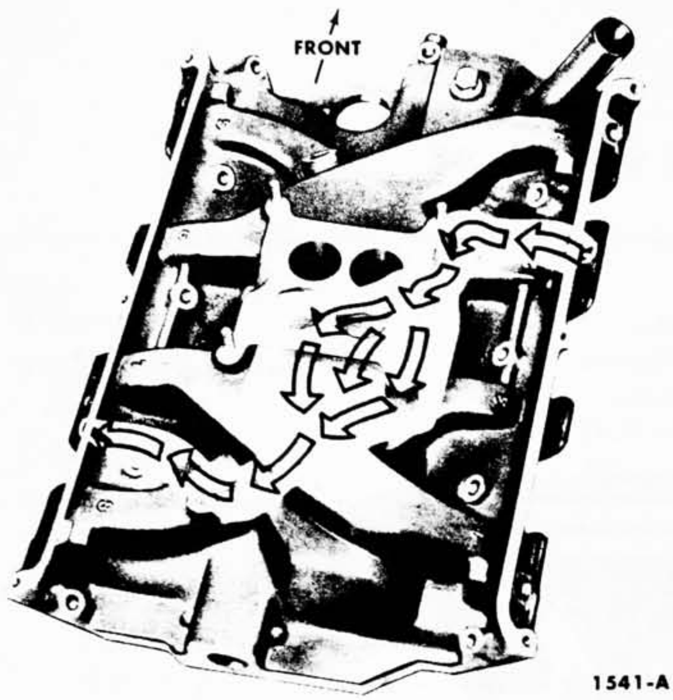

FIG. 3—Intake Manifold Exhaust Gas Passages

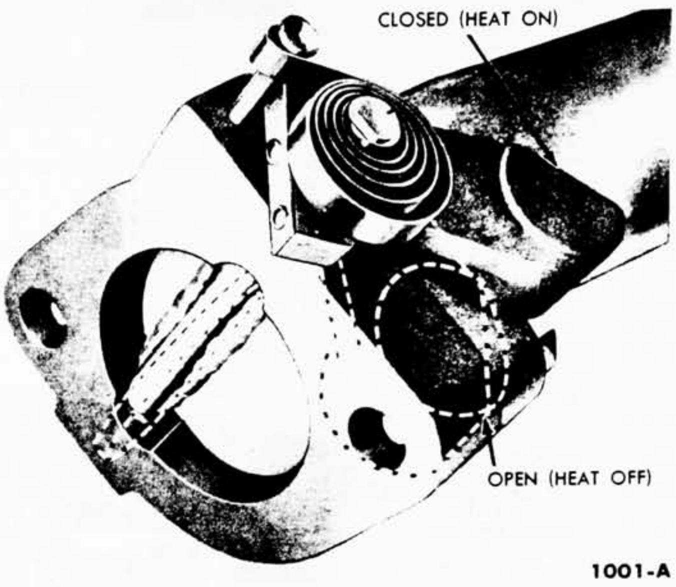

FIG. 4—Exhaust Gas Control Valve

FIG. 6—Valve Port Arrangement

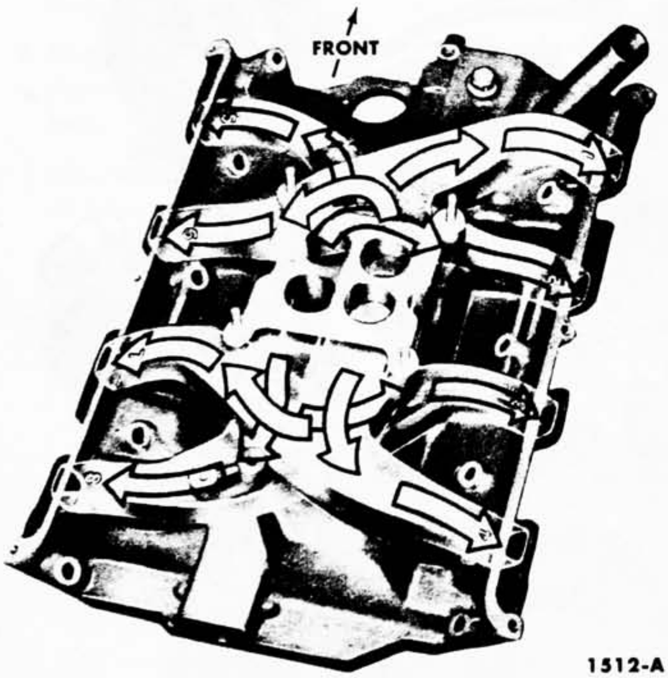

FIG. 5—Intake Manifold Fuel Passages

MANIFOLDS

The intake manifold, which also serves as the valve tappet chamber cover, contains a passage through the center section and under the carburetor, through which hot exhaust gases are directed to assist in vaporizing the incoming fuel charge (Fig. 3). The exhaust gases are directed into the intake manifold by a thermostatically controlled exhaust valve (Fig. 4). The valve is located at the outlet of the right exhaust manifold. When the valve is closed or in the "heat on" position, part of the exhaust gases are directed from the right exhaust manifold, through the heat riser passage, to the left exhaust manifold. When the valve opens "heat off," more of the exhaust gases from the left manifold are permitted to flow directly out the exhaust system in the normal manner.

The intake manifold has two sets of fuel passages, each with its own separate inlet connection to the carburetor (Fig. 5). The right side of the carburetor feeds Nos. 1, 4, 6, and 7 cylinders and the left side feeds Nos. 2, 3, 5, and 8 cylinders.

The distributor is mounted at the left front of the intake manifold.

CYLINDER HEADS AND BLOCK

The cylinders are numbered from front to rear on the right bank 1, 2, 3, and 4 and on the left bank 5, 6, 7, and 8. The firing order is 1-5-4-2-6-3-7-8. The valves are arranged from front to rear on both banks E-I-E-I-I-E-I-E (Fig. 6).

The cylinder head assemblies contain the valves and the valve rocker arm shaft assembly. The combustion chambers are machined in the head. Valve guides are an integral part of the head.

Both the intake and exhaust valve assemblies are the rotating-type which rotate each time the valve opens and closes. Lubrication of the valve stems is controlled by umbrella-type valve stem seals which fit over the top of the valve stems. The valve springs have equal coil spacings which provide more positive valve

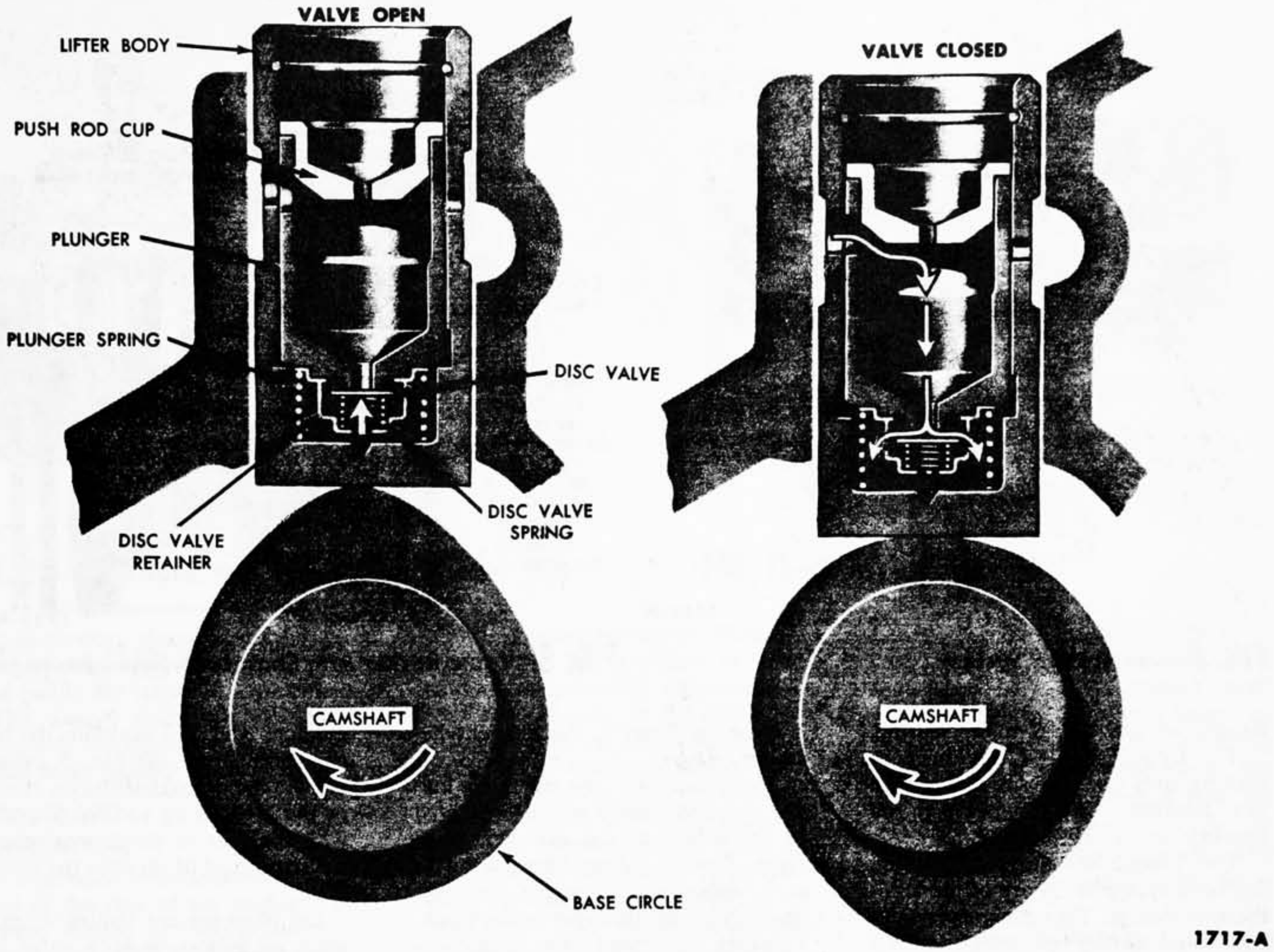

FIG. 7—Hydraulic Valve Lifter Operation—Typical

action at high engine speed. A damper spring is installed inside the valve spring to assist in preventing valve bounce and floating at high rpm.

Hydraulic valve lifters are used which provide zero valve lash and minimizes valve train noise. The operation and parts identification of the hydraulic valve lifters are shown in Fig. 7. When the valve is closed, the lifter assembly is on the base circle of the camshaft lobe and the valve push rod is in its lowest position. With the lifter assembly in this position, the plunger spring expands forcing the plunger upward. This action is transmitted to the valve rocker arm via the valve push rod until there is solid contact between the valve and the valve end of the valve rocker arm (zero valve lash). In this position, the oil hole in the lifter and plunger is indexed with the lifter oil gallery and oil is forced under pressure into the plunger. This creates a pressure differential above and below the valve disc. The high pressure above the valve disc forces the valve disc open and the oil fills the area below the plunger equalizing the pressure on each side of the valve disc.

Whenever clearance between the valve and the valve rocker arm tends to be present, the plunger spring expands pushing the plunger until there is solid contact between all parts of the valve train mechanism.

As the camshaft rotates (valve opening) the valve lifter is raised and the sudden increase in oil pressure below the plunger forces the valve disc closed and the lifter becomes a hydraulic ram. During this period a slight leakage of oil from below the plunger occurs. As the high point on the camshaft lobe rotates past the lifter, the push rod forces the valve lifter down and reseats the valve. The pressure on the oil below the plunger is relieved and the valve disc opens so the chamber can again be filled. This cycle is repeated at each revolution of the camshaft.

The push rods are solid steel with oil cushioned sockets. Inasmuch as there is no valve lash adjustment with hydraulic valve lifters, the valve rocker arms do not have adjusting screws.

The camshaft is supported by five insert-type bearings pressed into the block. It is driven by a sprocket and timing chain in mesh with a sprocket on the crankshaft. Camshaft end play is controlled by a thrust button and spring located between the camshaft sprocket bolt and the cylinder front cover. An eccentric, bolted to the front end of the camshaft, operates the fuel pump.

The crankshaft is supported by five insert-type main bearings. Crankshaft end thrust is controlled by the

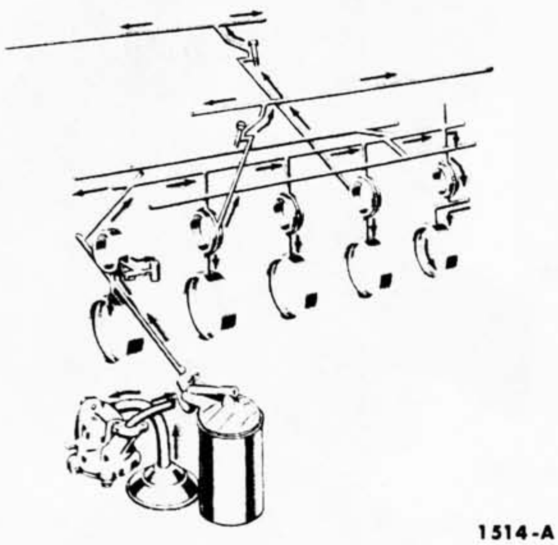

FIG. 8—Lubrication System

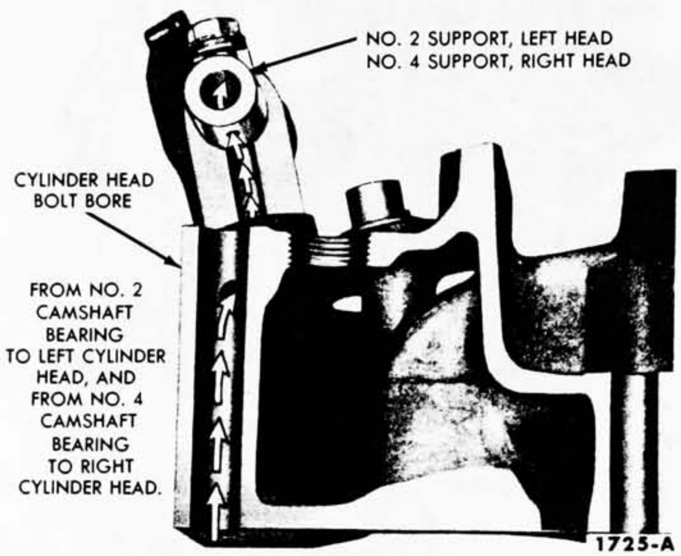

FIG. 9—Valve Rocker Arm Shaft Lubrication Passages

flanges of the No. 3 main bearing.

The forged steel, "I" section connecting rods contain a bronze piston pin bushing. The connecting rod bearings are the insert-type.

The aluminum alloy, three ring, flat head-type pistons are of the autothermic design. This design provides controlled piston expansion which allows closer initial piston fits without binding or excessive friction. The top compression ring is chrome-plated and the lower compression ring is phosphate-coated for extra protection against wear and scuffing. The oil control ring assembly consists of a serrated spring and two chrome-plated steel rails.

LUBRICATION SYSTEM

Oil from the oil pan sump, located in the front of the oil pan, is forced through the pressure-type lubrication system (Fig. 8) by a rotor-type oil pump. The oil pump, mounted in the front of the crankcase, is driven by the distributor through an intermediate drive shaft. A spring loaded relief valve in the pump limits the maximum pressure of the system. Oil relieved by the valve is directed back to the intake side of the pump.

All the oil discharged by the pump passes through a full flow-type filter before it enters the engine. The filter is mounted in a vertical position at the lower left front of the engine. A relief valve in the filter permits oil to bypass the filter, if the element becomes clogged.

From the filter, the oil flows into the main oil gallery which is located in the center of the valve chamber floor. The oil gallery supplies oil to each individual camshaft bearing, through drilled passages in the block. Passages are drilled from each camshaft bearing to each main bearing. Number 1 camshaft bearing feeds No. 1 main bearing, and No. 2 camshaft bearing feeds No. 2 main bearing, etc. The oil then flows through notches or grooves in the main bearings to lubricate the crankshaft journals. A metering plug at the front of the main oil gallery allows any air that may be trapped in the oil to escape.

The crankshaft is drilled from the main bearings to the connecting rod bearings. The oil flow is as follows:

Main Bearing		Connecting Rod Bearing
No. 1	Serves	No. 1
No. 2	Serves	Nos. 2 and 5
No. 3	Serves	Nos. 3 and 6
No. 4	Serves	Nos. 4 and 7
No. 5	Serves	No. 8

A small groove is located in the connecting rod at the mating face where the cap contacts the connecting rod. This groove is used as an oil squirt hole for cylinder wall lubrication. Oil from the connecting rod squirt hole lubricates the opposite cylinder wall. For example, the No. 1 connecting rod oils No. 5 cylinder, etc. As the crankshaft turns, the hole in the connecting rod bearing aligns with the hole in the journal causing a direct squirt of oil onto the cylinder wall.

Oil passages are drilled from the main oil gallery to each valve lifter oil gallery. Oil from here feeds the valve lifter assemblies. A reservoir at each valve lifter bore boss traps oil so that oil is available for valve lifter lubrication as soon as the engine starts.

An oil passage is drilled from No. 2 camshaft bearing web to the left cylinder head between Nos. 5 and 6 cylinders to lubricate the valve rocker arm shaft assembly (Fig. 9). The oil passage in the cylinder head is drilled from the cylinder head bolt bore to the No. 2 valve rocker arm shaft support. The oil flows through the valve rocker arm shaft through drilled holes in each valve rocker arm to lubricate the bushing and both ends of the valve rocker arm. The excess oil spirals down the rotating push rods and lubricates the push rod seats. The right valve rocker arm shaft assembly is similarly lubricated from No. 4 camshaft bearing via the No. 4 valve rocker arm shaft support. A baffle located under the valve rocker arm shaft assembly shields the valve stems from oil splash. Excess oil is returned to the

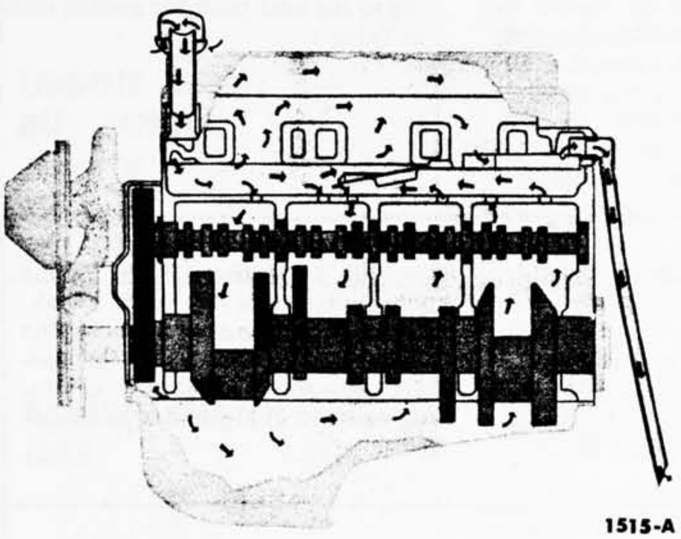

FIG. 10—Crankcase Ventilation System

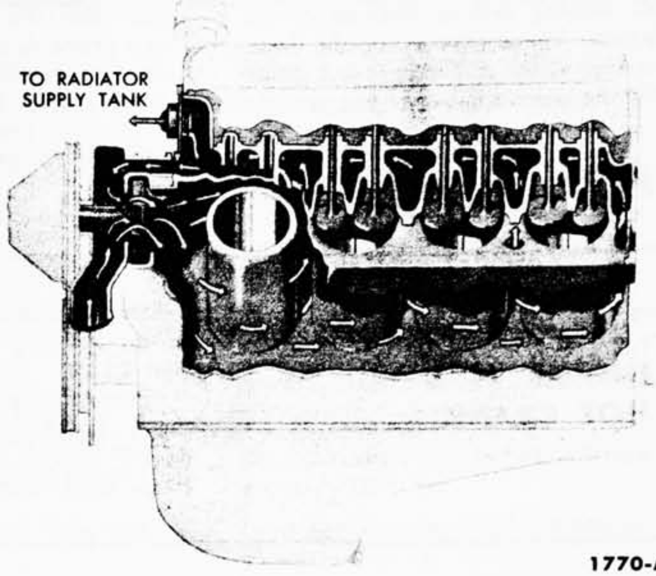

FIG. 11—Cooling System

oil pan through drain back holes located at each end of the cylinder head and in the tappet chamber floor.

The timing chain and sprockets are splash lubricated by a jiggle pin in the main gallery front plug.

CRANKCASE VENTILATION

A crankcase ventilation tube is located at the rear of the engine. The forward motion of the car causes a partial vacuum to be formed at the tube. This vacuum action causes air to be drawn through the engine from the oil filler cap located at the front of the intake manifold (Fig. 10). The filler cap contains a filtering element which filters the incoming air.

From the filler cap, the air flows into the front section of the valve push rod chamber where there are few contaminating vapors. Here, the incoming air has a chance to warm up before contacting contaminating vapors originating in the crankcase. Warm ventilating air minimizes the formation of crankcase sludge.

The ventilating air is directed by a baffle, located on the underside of the intake manifold, upward into the front of both valve rocker arm chambers. The baffle also directs air to the front of the lower crankcase and into the timing chain chamber.

Air from the valve rocker arm chamber and from the crankcase flows into the rear of the valve push rod chamber. All air is then directed out the crankcase ventilation tube.

COOLING SYSTEM

The coolant is drawn from the lower tank of the radiator by the water pump which delivers the coolant to the cylinder block (Fig. 11).

The coolant travels through cored passages to cool the entire length of each cylinder wall. Upon reaching the rear of the cylinder block, the coolant is directed upward into the cylinder heads where it cools the combustion chambers, valves, and valve seats on its return to the front of the engine.

The coolant from each cylinder head flows through the water passages in the intake manifold and past the water thermostat, if it is open, into the radiator supply tank. If the thermostat is closed, a small portion of the coolant is returned to the water pump for recirculation. The entire system is pressurized to 13-15 psi by a pressure-type radiator cap.

2 GENERAL ENGINE TROUBLE SHOOTING

Poor engine performance can be caused by the need of a general engine tune-up, by gradual wear of engine parts, or by a sudden parts failure. A good trouble diagnosis will indicate the need of a complete engine tune-up, individual adjustments, part(s) replacement or overhaul, or the need of a complete engine overhaul.

Engine performance complaints usually fall under one of the following basic headings: **engine will not crank; engine cranks normally, but will not start; engine starts, but fails to keep running; engine runs, but misses; rough engine idle; poor acceleration; engine does not develop full power, or has poor high speed performance; excessive fuel consumption; engine overheats; or the engine fails to reach normal operation temperature.**

Table 1 is a general trouble shooting chart which lists basic engine troubles with procedures and checks to be performed to help isolate the cause of the trouble in a particular system. The reference after each check refers to that part of the manual which covers, in detail, checking procedures as well as corrections to be made in the various systems. When a particular trouble can not be traced to a definite system by a simple check, the possible systems that could be at fault are listed in the order of their probable occurrence; therefore, in most cases, the checks should be made in the order listed. Some consideration, however, should be given to logical order. For example, if the spark plugs are removed for testing and they are not the cause of the trouble, and several checks later calls for a compression test, to save time, check the compression while the spark plugs are out.

Separate trouble shooting charts are included in the ignition, fuel, and cooling system sections of the manual. These charts list the basic troubles listed in Table 1, but cover only the items relating to the particular system under consideration. For example, in Table 1 under Poor Acceleration, the ignition system is listed as a probable cause of the trouble. In the Ignition System Trouble Shooting Chart under Poor Acceleration, all the ignition system items that affect acceleration are listed. These items should all be checked before proceeding to the next probable system listed in Table 1.

TABLE 1—General Engine Trouble Shooting

ENGINE WILL NOT CRANK	The cause of this trouble is usually in the starting system (Group 7—Part 2). If the starting system is not at fault, check for a hydrostatic lock or a seized engine. Remove the spark plugs, then attempt to crank the engine with the starter. If the engine cranks, it indicates that water is leaking into the cylinders. Remove the cylinder head(s) and inspect the gasket(s) and/or head(s) for cracks. Also examine the cylinder block for cracks.
ENGINE CRANKS NORMALLY, BUT WILL NOT START	Check the fuel supply. If there is sufficient fuel in the tank, the cause of the trouble probably lies in either the ignition or the fuel system. To isolate the cause: Remove the ignition wire from one spark plug, and insert a piece of proper sized metal rod in the insulator so that it protrudes from the insulator. With the ignition on and the starter cranking the engine, hold the end of the rod approximately 3/16 inch from the cylinder block. If there is no spark or a weak spark, the cause of the trouble is in the ignition system (Group 1—Part 2). If the spark is good, check the spark plugs (Group 1—Part 2). If the spark plugs are not at fault, check the fuel system (Group 1—Part 3). If the fuel system is not at fault, check the valve timing (Group 1—Part 1).
ENGINE STARTS, BUT FAILS TO KEEP RUNNING	If the engine starts and runs for a few seconds, then stops, check the: Fuel system (Group 1—Part 3). Ignition system (Group 1—Part 2).
ENGINE RUNS, BUT MISSES	First, determine if the miss is steady or erratic and at what speed the miss occurs by operating the engine at various speeds under load. **Misses steady at all speeds.** Isolate the miss by operating the engine with one cylinder not firing. This is done by operating the engine with the ignition wire removed from one spark plug at a time, until all cylinders have been checked. Ground the spark plug wire removed. If the engine speed changes when a particular cylinder is shorted out, that cylinder was delivering power before being shorted out. If no change in the engine operation is evident, the miss was caused by that cylinder not delivering power before being shorted out, check the: Ignition system (Group 1—Part 2). Engine compression to determine which mechanical component of the engine is at fault (page 1-13). **Misses erratically at all speeds.** If the miss cannot be isolated in a particular cylinder, check the: Exhaust gas control valve (page 1-30). Ignition system (Group 1—Part 2). Fuel system (Group 1—Part 3). Engine compression to determine which mechanical component of the engine is at fault (page 1-13). Exhaust system for excessive back pressure. Cooling system for internal leaks and/or for a condition that prevents the engine from reaching normal operating temperature (Group 1—Part 4).

TABLE 1—General Engine Trouble Shooting (cont'd)

ENGINE RUNS, BUT MISSES (cont'd)	**Misses at idle only.** Check the: Fuel system (Group 1—Part 3). Ignition system (Group 1—Part 2). Vacuum booster pump, lines and fittings for leaks. Engine compression for low compression (page 1-13).	**Misses at high speed only.** Check the: Ignition system (Group 1—Part 2). Fuel system (Group 1—Part 3). Cooling system for overheating or internal leakage (Group 1—Part 4).
ROUGH ENGINE IDLE	Check the: Fuel system (Group 1—Part 3). Ignition system (Group 1—Part 2). Exhaust gas control valve (page 1-30) Vacuum booster pump, lines and fittings for leaks.	Power brake vacuum booster for leaks (Group 6—Part 2). Engine supports for looseness (Group 1—Part 1). Improper cylinder head bolt torque (Group 1—Part 1).
POOR ACCELERATION	Check the: Ignition system (Group 1—Part 2). Fuel system (Group 1—Part 3). Exhaust gas control valve (page 1-30). Brakes for proper adjustment (Group 6).	Clutch for slippage—Conventional Drive and Overdrive Transmission (Group 2—Part 1). Cruise-O-Matic transmission for proper adjustment (Group 3—Part 2).
ENGINE DOES NOT DEVELOP FULL POWER, OR HAS POOR HIGH SPEED PERFORMANCE	Determine if the trouble exists when the engine is cold, at normal operating temperature, or at all engine temperatures. **Engine cold.** Check the: Exhaust gas control valve (page 1-30). Fuel system (Group 1—Part 3). Cooling system if engine reaches operating temperature slowly (Group 1—Part 4). **Engine at normal operating temperature.** Check the: Exhaust gas control valve (page 1-30). Fuel system (Group 1—Part 3).	**All engine temperatures.** Check the: Engine compression (page 1-13). Ignition system (Group 1—Part 2). Fuel system (Group 1—Part 3). Camshaft lobe lift (page 1-11). Valve timing (page 1-12). Cooling system if the engine overheats (Group 1—Part 4). Exhaust system for excessive back pressure. Torque converter (Group 3—Part 3). Brake adjustment (Group 6). Tire pressure (Group 4—Part 3).
EXCESSIVE FUEL CONSUMPTION	Determine the actual fuel consumption with test equipment installed in the car. If the test indicates that the fuel consumption is not excessive, demonstrate to the owner how improper driving habits will affect fuel consumption.	If the test indicates that the fuel consumption is excessive, make a preliminary check of the following items before proceeding to the fuel and ignition systems. **Preliminary checks** Tires (Group 4—Part 3).

TABLE 1—General Engine Trouble Shooting (cont'd)

EXCESSIVE FUEL CONSUMPTION (cont'd)	Wheel alignment (Group 4—Part 1). Brakes (Group 6). Exhaust gas control valve (page 1-30). Odometer calibration (Group 8—Part 1).	Ignition timing (Group 1—Part 2). **Fuel system** (Group 1—Part 3). **Ignition system** (Group 1—Part 2). **Engine compression** (page 1-13). **Cooling system** (Group 1—Part 4). **Torque converter** (Group 3—Part 6).
ENGINE OVERHEATS	Temperature sending unit (Group 8—Part 1). Temperature gauge (Group 8—Part 1). Exhaust gas control valve (page 1-30).	Cylinder head bolt torque (Group 1—Part 1). Cooling system (Group 1—Part 4). Ignition timing (Group 1—Part 2). Valves (page 1-32). Exhaust system. Brakes (Group 6).
ENGINE FAILS TO REACH NORMAL OPERATING TEMPERATURE	Temperature sending unit (Group 8—Part 1). Temperature gauge (Group 8—Part 1).	Engine thermostat (Group 1—Part 4).

3 TUNE-UP

A tune-up is a systematic procedure for testing various engine components, and, if necessary, bringing them within recommended specifications to restore engine efficiency and performance.

The Tune-Up Schedule (Table 2) is applicable for either a minor or major tune-up. A minor tune-up is recommended each 6000 miles and a major tune-up is recommended each 12,000 miles.

The reference after each operation refers to that part of the manual which describes, in detail, the procedure to be followed. Perform the operations in the sequence listed.

TABLE 2—Tune-Up Schedule

Operation	Perform on		Recom-mended Procedure
	Minor	Major	
SPARK PLUGS Clean, adjust, and test.	X	X	Group 1 Part 2
ENGINE COMPRESSION Take compression reading of each cylinder.		X	Page 1-13
INTAKE MANIFOLD Check and tighten bolts.	X	X	Group 1 Part 1
DRIVE BELTS Check and adjust the tension of all drive belts.	X	X	Group 1 Part 4

Operation	Perform on		Recom-mended Procedure
	Minor	Major	
BATTERY Clean battery cables and terminals.		X	Group 7 Part 1
Tighten cable clamps.		X	
Grease battery terminals.		X	
Check battery state of charge.	X	X	
ELECTRICAL Check generator output.		X	Group 7 Part 1
Check starter motor current draw.		X	
Check coil output.		X	Group 1 Part 2
Perform a primary circuit resistance test.		X	

TABLE 2—Tune-Up Schedule (cont'd)

Operation	Perform on		Recommended Procedure
	Minor	Major	
ELECTRICAL (Cont'd) Perform a secondary circuit continuity test.		X	Group 1 Part 2
DISTRIBUTOR Check the condition of the breaker points.	X		
Replace the breaker points and the condenser.		X	
Check and adjust breaker arm spring tension.		X	
Lubricate the distributor cam. Oil the lubricating wick. Lubricate the distributor bushing through the oil cup.		X	Group 1 Part 2
Check and adjust point dwell.	X	X	
Check and adjust centrifugal advance.		X	
Check and adjust vacuum advance.		X	
Clean distributor cap and rotor.	X	X	

Operation	Perform on		Recommended Procedure
	Minor	Major	
FUEL SYSTEM Clean fuel pump filter bowl.	X	X	
Replace fuel pump filter bowl strainer.		X	Group 1 Part 3
Check fuel pump pressure and capacity.		X	
Clean carburetor fuel bowls and adjust float setting.		X	
ADJUSTMENTS Check and adjust ignition timing.	X	X	Group 1 Part 2
Check and adjust engine idle speed.	X	X	Group 1 Part 3
Adjust idle fuel mixture.	X	X	
VACUUM Check manifold vacuum.	X	X	Page 1-13
EXHAUST Free the exhaust gas control valve.	X	X	Group 1 Part 1
COOLING SYSTEM Inspect the radiator, hoses, and engine for leaks.		X	Group 1 Part 4
Add rust inhibitor to radiator.		X	

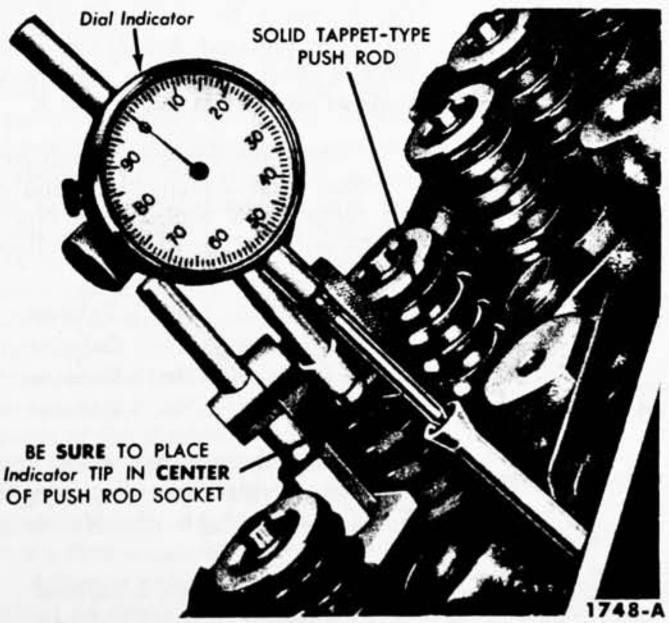

FIG. 12—Camshaft Lobe Lift

4 TESTS AND ADJUSTMENTS (ENGINE IN CHASSIS)

CAMSHAFT LOBE LIFT

Remove the valve rocker arm shaft assembly and install a solid tappet-type push rod in the push rod bore of the valve to be checked. Make sure the push rod is in the lifter push rod cup, then install a dial indicator in such a manner as to have the actuating point of the indicator in the push rod socket and in the same plane as the push rod movement (Fig. 12). Rotate the crankshaft slowly in the direction of rotation until the lifter is on the base circle of the camshaft lobe. At this point, the push rod will be in its lowest position. Set the dial indicator on zero, then continue to rotate the damper slowly until the push rod is in the fully raised position. Compare the total lift recorded on the indicator with specifications. Continue to rotate the crankshaft until the indicator reads zero. This later step is a check on the accuracy of the original indicator reading.

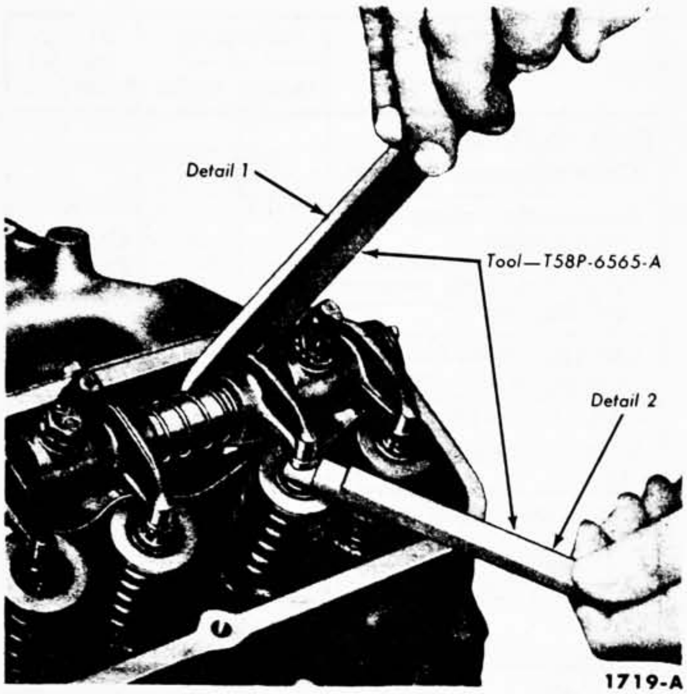

FIG. 13—Valve Clearance

TABLE 3—Valve Timing Specifications

Intake Valve			
Opens		Closes	
Crankshaft Degrees	Camshaft Lobe Lift	Crankshaft Degrees	Camshaft Lobe Lift
21° B.T.C.	0.017	51° A.B C.	0.019
Exhaust Valve			
Opens		Closes	
Crankshaft Degrees	Camshaft Lobe Lift	Crankshaft Degrees	Camshaft Lobe Lift
67° B.B.C.	0.017	9° A.T.C.	0.019

VALVE TIMING

The valve timing should be checked when poor engine performance is noted and all other checks, such as carburetion, ignition timing, etc. fail to locate the cause of the trouble.

Before the valve timing is checked, check for a bent timing pointer. Bring the No. 1 piston to T.D.C. on the compression stroke and see if the timing pointer is aligned with the T.D.C. mark on the damper.

If the valve timing is not within specifications, check the timing chain, camshaft sprocket, crankshaft sprocket, camshaft, and crankshaft in the order of accessibility.

To check the valve timing with the engine installed, proceed as follows:

Install a quadrant on the crankshaft damper. Remove the right valve rocker arm shaft assembly and remove the No. 1 intake valve push rod (the second push rod) and install a solid tappet-type push rod in its place. Make sure the push rod is in the lifter push rod cup, then install a dial indicator in such a manner as to have the actuating point of the indicator in the push rod socket and in the same plane as the push rod movement (Fig. 12). Turn the crankshaft damper slowly in the direction of rotation until the lifter is on the base circle of the camshaft lobe. At this point the push rod will be in its lowest position. Zero the dial indicator and continue turning the crankshaft slowly in the direction of rotation until the dial indicator registers the specified camshaft lobe lift (Table 3).

Compare the crankshaft degrees indicated on the quadrant with specifications (Table 3). After the valve opening is checked, continue to rotate the damper to check the valve closing.

VALVE CLEARANCE

A 0.060 inch shorter push rod is available for service to provide a means of compensating for dimensional changes in the valve mechanism. Valve stem to rocker arm clearance should be 0.062-0.1875 inch with the hydraulic lifter completely collapsed. Repeated valve reconditioning operations (valve and/or valve seat refacing) will decrease this clearance to the point that if not compensated for, the hydraulic valve lifter would cease to function. To determine whether a shorter push rod is necessary, make the following check:

1. Position the hydraulic lifter compressor tool on the rocker arm and slowly apply pressure to bleed down the hydraulic lifter until the plunger is completely bottomed (Fig. 13). Hold the lifter in the fully collapsed position and insert the clearance gauge (Fig. 13) between the valve stem and the rocker arm of the valve being checked. If the first step of the gauge enters, the old push rod may be used. If the first step will not enter, replace the standard push rod with a shorter service push rod. If the second step of the gauge enters, the operating range of the lifter is excessive which indicates that the incorrect push rod has been installed or severe wear has occurred at the push rod ends, rocker arm, or valve stem. In this case, it will be necessary to determine the area of discrepancy and the incorrect or defective part(s) should be replaced. **Before the clearance is checked position the crankshaft as outlined in step 2 and 3.**

2. Rotate the crankshaft until No. 1 piston is on T.D.C. at the end of the compression stroke. With No. 1 piston on T.D.C., check the following valves:

No. 1 Intake	No. 1 Exhaust
No. 3 Intake	No. 4 Exhaust
No. 7 Intake	No. 5 Exhaust
No. 8 Intake	No. 8 Exhaust

3. After these valves have been checked, position No. 6 piston on T.D.C. and check the following valves:

No. 2 Intake	No. 2 Exhaust
No. 4 Intake	No. 3 Exhaust
No. 5 Intake	No. 6 Exhaust
No. 6 Intake	No. 7 Exhaust