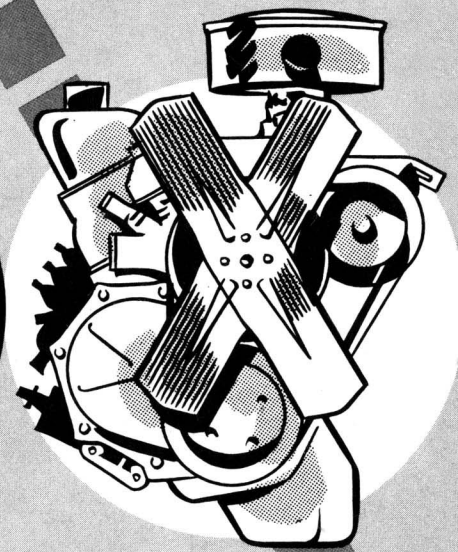
SERVICE REFERENCE BOOK

of the MASTER TECHNICIANS SERVICE CONFERENCE

session no. 144

THE NEW 6-CYLINDER OHV ENGINE

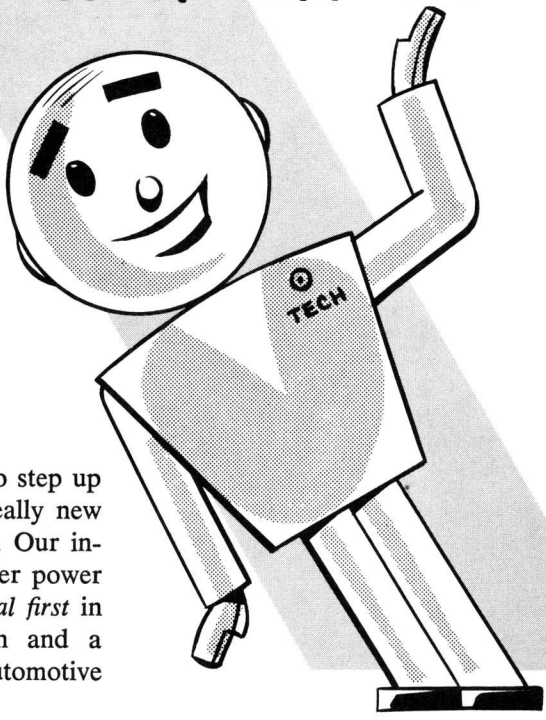


PREPARED BY CHRYSLER CORPORATION

Dodge • Plymouth-De Soto-Valiant • Chrysler and Imperial Divisions

TECH SEZ:

"Our 6-cylinder OHV engine is the newest of them all!"

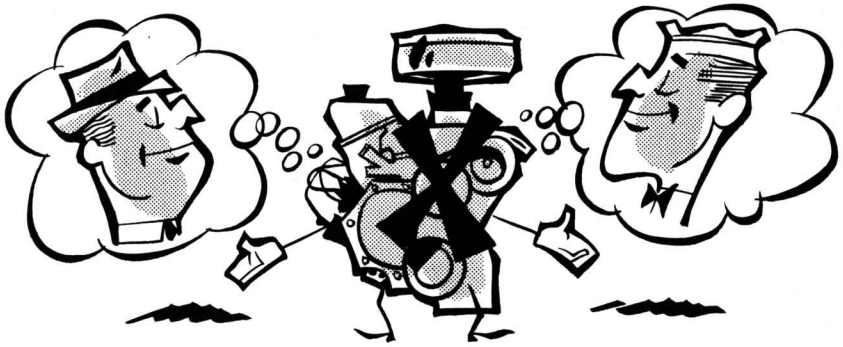


Here's your chance to step up and see something really new in 6-cylinder engines. Our inclined OHV 6-cylinder power plant represents a *real first* in passenger car design and a terrific advance in automotive engineering!

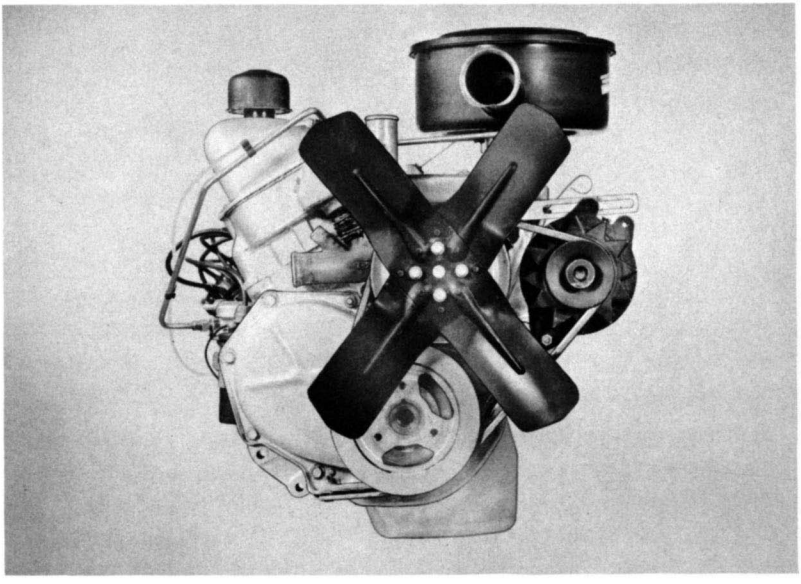
Feature-wise and performance-wise, the new overhead-valve engine is packed with surprises! As a technician, then, you'll certainly want to be one of the first to know about all the design improvements. You'll also want to be up on the new tune-up specifications and service procedures that apply. After all, the owner expects you to know the answers when it comes to keeping his car running properly.

This reference book, therefore, provides a quick, easy way to get acquainted. Just use the handy index to find the information you need:

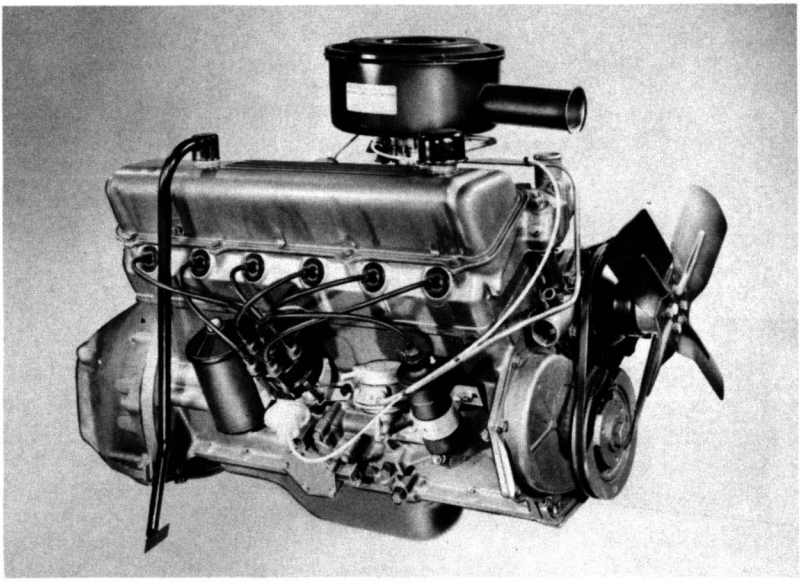
THE NEW 6-CYLINDER OHV ENGINE



General. This distinctively new engine has been designed with the technician in mind—as well as the owner. Parts are easier to get at, and easier to service. And, as long as the engine is properly tuned up, it will deliver outstanding power and economy for the owner. Who can ask for better than that?

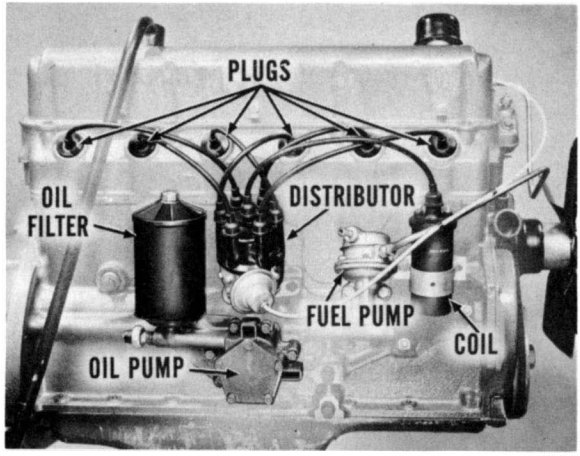


When you raise the hood on a new car with this engine, the first thing you'll notice is the engine's unusual appearance. It's inclined 30° to the right from vertical. This inclination gives the car a lower hood line, a lower center of gravity, and provides space for the entirely new manifolding system.



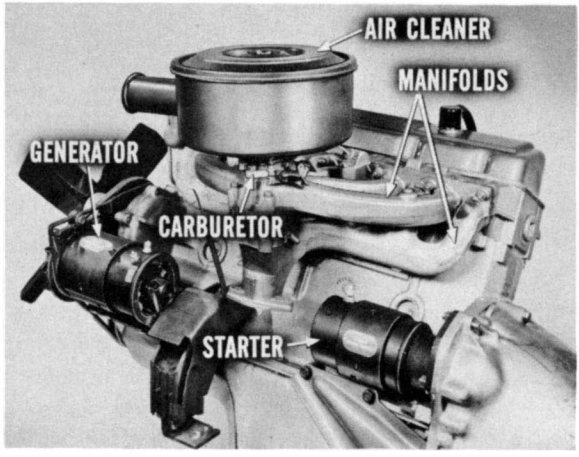
You'll be interested in specifications, too. The engine is rated 145 horsepower at 4000 r.p.m. Maximum torque is 215 foot-pounds at 2800 r.p.m., a terrific amount of output. Piston displacement is 225 cubic inches. The bore is 3.4″, and stroke is 4.125″. This engine delivers its rated performance on *regular grade* gasoline!

The service technician really gets a break from the design of this engine when performing the normal tune-up operations. Everything's a lot easier to get at. For example, on the right side, you'll find the spark plugs . . . the oil filter . . . the oil pump . . . the distributor . . . the ignition coil, and the fuel pump.



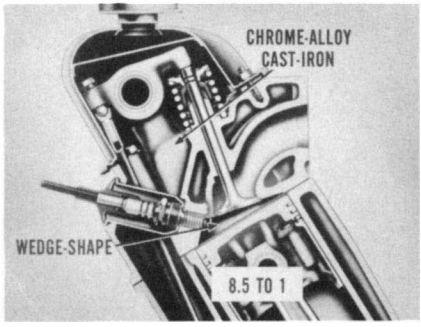
On the left side you'll find the generator, the carburetor, the air cleaner, the manifolds, and the starter motor.

Here's more. The oil filler cap is in the top of the cylinder head cover, near the front. The engine oil dipstick is at the left of the engine—just behind the generator. Anyway you look at it, you find accessibility with a capital "A"!

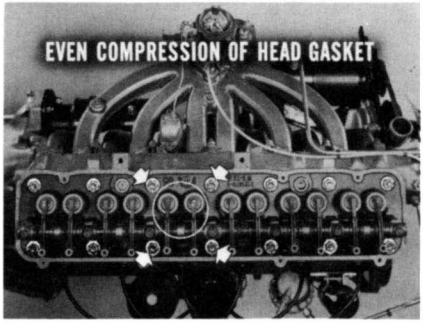


Now, one way to understand the engine better is to review the new features in detail.

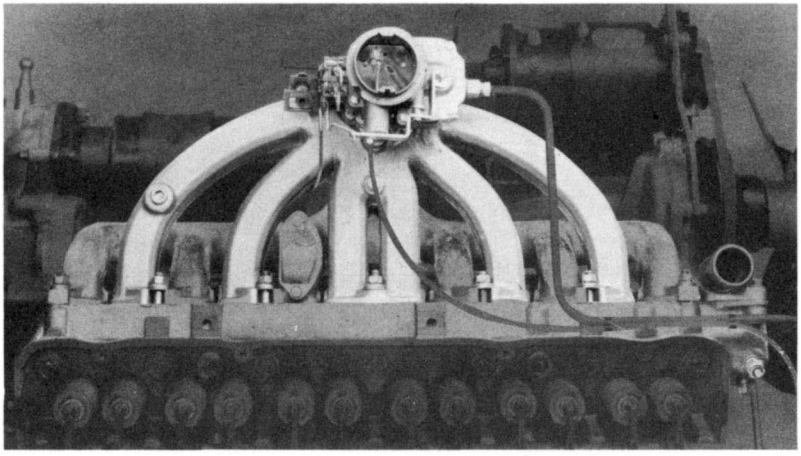
Combustion Chamber Design. The cylinder head is made of chrome-alloy cast iron. It has wedge-shaped combustion chambers about the same type as those you've seen on the 8-cylinder engines. Compression ratio is 8.5 to 1.



Cylinder head bolts—14 of them – are arranged so that there are four bolts around each cylinder. This insures more even compression of the head gasket, resulting in a tighter seal all the way around.

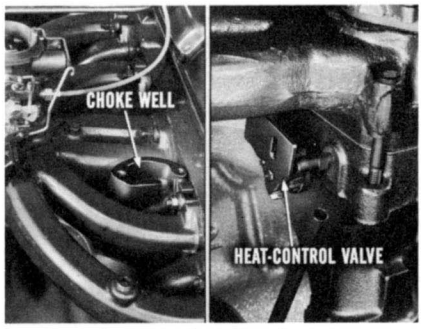


New Manifold System. Something really spectacular, of course, is the distinctive manifolding. The intake manifold is made of aluminum. In appearance it may remind you of the "Ram Induction System" available on V-8 engines. The six branches, one for each cylinder intake port, distribute the air-fuel mixture evenly to all cylinders. Intake branches have no sharp bends, which also facilitates the smooth flow of fuel. The exhaust manifold is made of cast iron. It also has separate branches, one for each cylinder exhaust port.

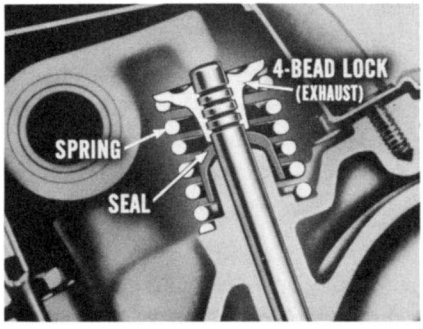


The manifold system represents a big advance in engine breathing. And as a further aid to breathing, the exhaust pipe flange is located in the center of the manifold. Exhaust gases are therefore expelled more efficiently.

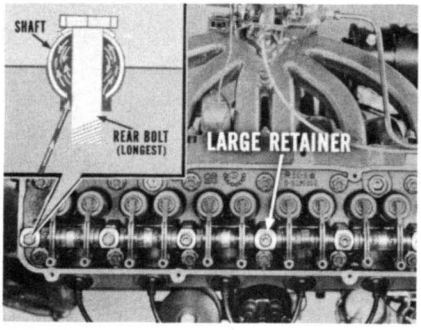
The automatic choke well is cast into the exhaust manifold. The heat control valve, mounted on the front side of the manifold, has its shaft parallel to the engine centerline. This makes it much easier to service.



Overhead Valves. When you examine the overhead valve arrangement you'll see that valves are in line but are inclined slightly to improve the flow path for the incoming mixture. Valve stem guides are integral in the head. Each valve has one spring. Both intake and exhaust valves have umbrella-type seals to keep oil from running down the valve stems and into the cylinders. Intake seals are long, exhaust seals are short. Four-bead valve spring locks permit easy rotation of exhaust valves to reduce wear and to provide better cooling and seating. Intake valves use two-bead locks.



Mechanical Tappets. Mechanical tappets are used, along with a new rocker arm and shaft assembly design. The tubular push rods have hardened steel ends. And, the stamped steel rocker arms are channeled for lubrication. A hardened steel bushing, welded into the

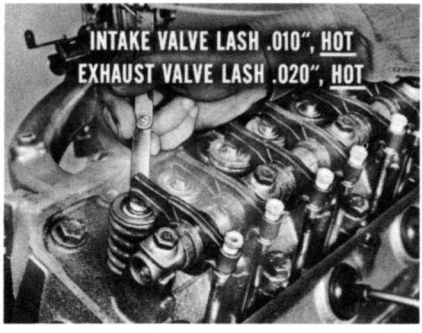


arm, acts as a bearing on the shaft. The rocker arm shaft, mounted on pedestals cast in the cylinder head, is retained by seven bolts and stamped steel retainer caps. The large retainer is located in the center. The rear bolt, which is the longest, goes through the oil passage leading to the rocker shaft.

Hardened steel spacers are used between the rocker arms. The push rods, which contact the arms at a slight angle, tend to force the arms against the spacers. Therefore, no springs are needed to hold the rocker arms in alignment.

How to Adjust Tappet Clearance. Final tappet adjustments must be made after the engine reaches normal operating temperature. If the rocker arm and shaft assembly has been removed, tappet clearances should be set according to the following procedure.

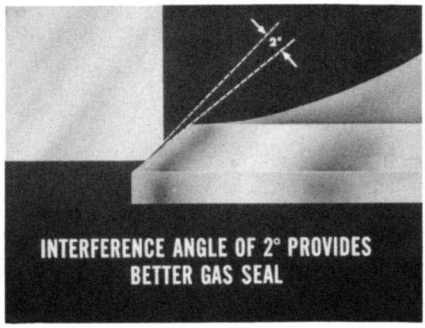
Adjust intake rocker arms to have .012″ clearance, and the exhaust rocker arms to have .023″ clearance, when the engine is *cold.* Install the cylinder head cover and drive the car for two to five miles to bring the engine up to normal operating temperature.



Now, with the transmission in neutral, adjust engine idle to 550 r.p.m. for cars with manual transmissions, and 500 r.p.m. for cars with automatic transmissions. Remove the cylinder head cover. With the engine hot and running, *readjust* intake rocker arms to have

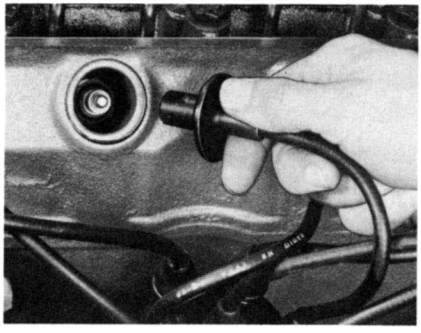
.010″ clearance, and the exhaust rocker arms to have .020″ clearance. Place a new cylinder head cover gasket in position and re-install the cylinder head cover. Tighten the nuts to 40 inch-pounds. Finally, install the outlet vent tube.

Here's another engine specification that's slightly different. *Intake* valve face and seat angles are 45°, just like those on our other engines. But the *exhaust* valve *face* angle is 47°. Exhaust valve *seat* angle is 45°. This results in what is called an interference angle of 2° on exhaust valves. It is used to provide a better gas seal and also to minimize formation of carbon deposits on the valve face and seat.

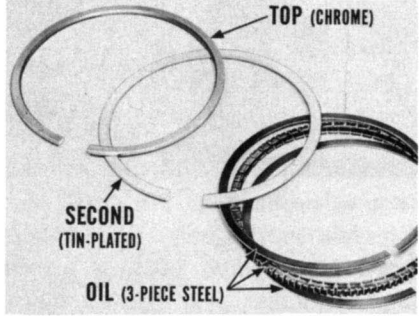


New Spark Plugs and Cables. You've probably seen a spark plug and tube arrangement similar to the one on this new engine. These aluminum tubes, though, are shorter than those used in former engines. They help protect the plug from moisture and dirt, and also serve as the plug gasket. A seal at the outer end of the tube seals the tube to the head.

The plugs are Autolite AG-42, non-resistor type. You still gap them at .035″ and tighten them to 30 foot-pounds. The spark plug

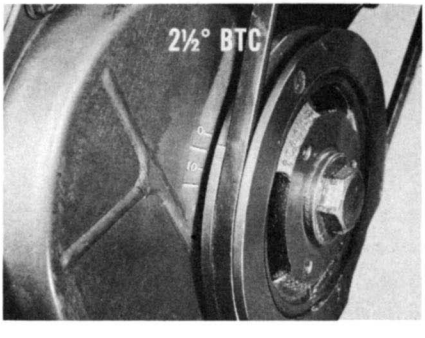


cable has a combination terminal and plug. The terminal provides a firm contact to the spark plug, while the rubber plug of the cable seals the outer end of the spark plug tube, protecting the spark plug from moisture and dirt. All high-tension cables are the resistance-core type marked "RADIO".



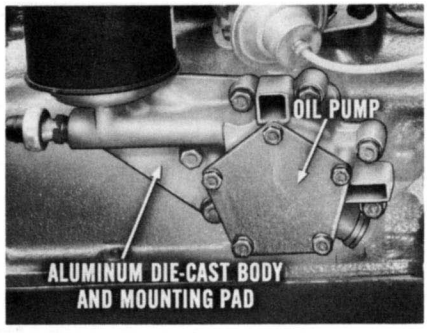
Pistons. Pistons are aluminum, cam-ground, slipper-type, with a cast-in steel insert across the pin bosses. The insert helps control thermal expansion. The piston ring line-up consists of a chrome-plated top ring, a tin-plated second ring, and a three-piece steel oil ring.

Bearings. Main and connecting rod bearings are steel-backed babbitt, with extra-large bearing surfaces. Fore-and-aft thrust is absorbed by two flanges on the number three main bearing. Upper bearing halves have oil holes and grooves, lower bearings do not.



A quiet 50-link chain drives a hardened cast-iron camshaft. Valves are properly timed when marks on the sprockets are on a straight line between sprocket centerlines. Correct ignition timing on the new engine is 2½° BTC. There's a mark on the vibration damper. Four marks, 5° apart, are

on the chain case cover. When you set ignition timing, remember to disconnect the vacuum advance line at the distributor, and plug the line to be sure there is no distributor vacuum timing advance at idle speed while you make the adjustment.

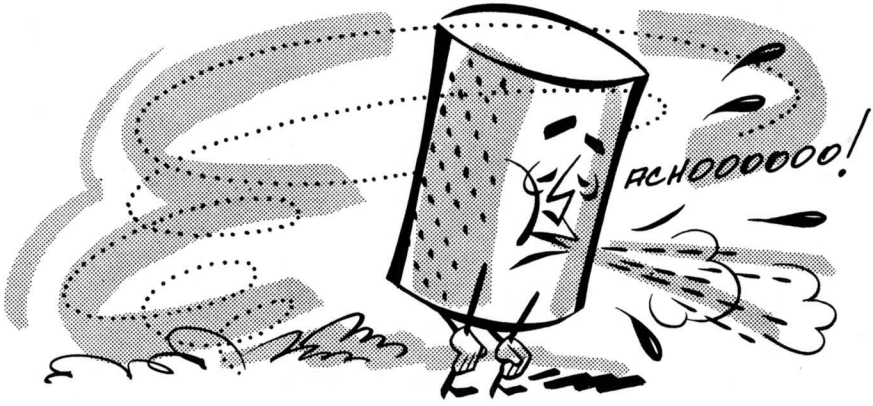


New Oil Pump. The oil pump, which is externally mounted on this new engine, has an aluminum die-cast body which incorporates the oil filter mounting pad. It is a rotor-type pump, and is driven by the same camshaft gear that drives the ignition distributor. The oil filter is a full-flow, replaceable-element type. It is easy to get at and service.

Oil Pan, Inlet Screen. Another feature is the deep-sump oil pan. The bottom is horizontal, but the sides are slanted 30°. The oil pump inlet screen is pressed firmly against the bottom of the pan when the pan is installed. That prevents rattles at that point. So, remember to maintain the interference fit whenever you install the oil pan. It *must* press against the oil screen.

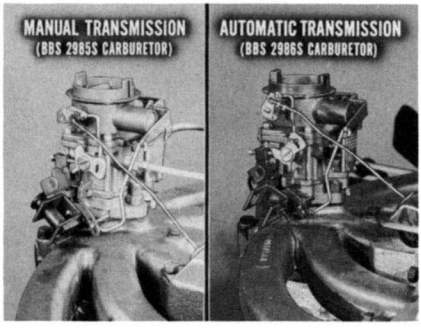
Oil and Filter Change Periods. After the initial oil change at the end of the first 1,000 miles of operation, the oil should be changed at 2,000-mile intervals under normal driving conditions. If the car is operated in heavy dust areas or under short-trip conditions, the change may have to be made more frequently.

The oil filter should be replaced at 4,000-mile intervals under normal operating conditions—more frequently if local driving conditions make it necessary.



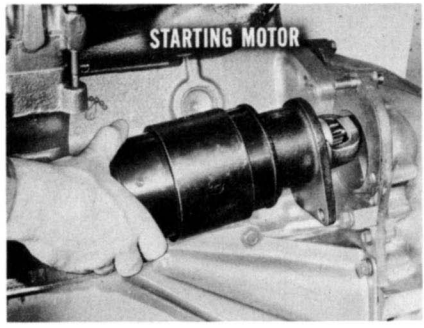
Crankcase oil capacity is four quarts, plus one for the filter.

Carburetor. The carburetor is a single-barrel, downdraft, Ball and Ball. It's a new, low silhouette design, aluminum and zinc unit. On manual transmission cars a BBS-2985S carburetor is used. On cars with an automatic transmission, the BBS-2986S carburetor is used. Both carburetors use a well-type automatic choke that is connected to the choke valve by an inclined rod.



You'll notice that the air cleaner features a dry paper element similar to other models. It is fastened by a wire bail and stud with a wing nut. This attachment makes it a cinch to remove, clean, and replace the element. It can be cleaned by using an air hose, directing the air against the inside of the element.

Starting Motor. The starting motor is mounted high above the oil pan. That puts it out of the range of road splash. One big feature on the starting motor is an especially quiet Follow-Through Bendix drive. This silencing is brought about by enclosing the spring in a shield. Besides that, a rubber disk is placed at the front end of the drive to cushion the shock of pinion return.



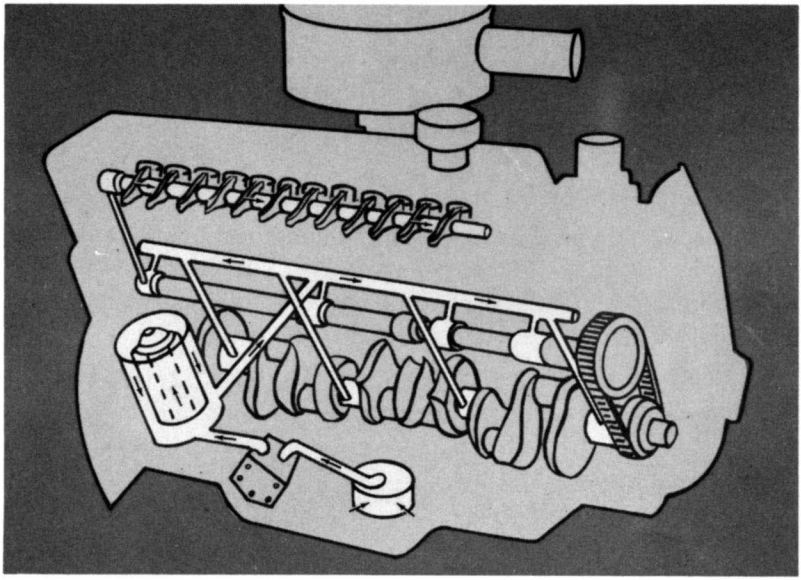
Generator. The generator, a 12-volt, shunt-wound unit, is rated at 35 amperes. It is pivot-mounted on the left side, and driven in the conventional way by a V-type belt from the crankshaft pulley. Pivot the generator away from the engine to increase belt tension.

Distributor. The newest-type distributor, built by Chrysler Corporation, is used. It features an all-aluminum housing, and has the conventional vacuum and mechanical timing controls. When you remove the cap, you'll recognize the single breaker point set-up. A nylon gear on the distributor's short shaft meshes with the same camshaft gear that drives the oil pump.

Engine Lubrication. Basically, engine lubrication is the same as that on previous engines. Oil is picked up by the pump and forced through the full-flow filter element. From there it goes into the main oil gallery for distribution throughout the engine.

Drilled passages from the gallery feed the main and camshaft

bearings. Passages in the crankshaft carry oil from the main bearing journals to the connecting rod bearings. A hole in each rod bearing matches a drilled hole in the top left shoulder of the rod. Oil sprays from this hole to lubricate cylinder walls and piston pins.

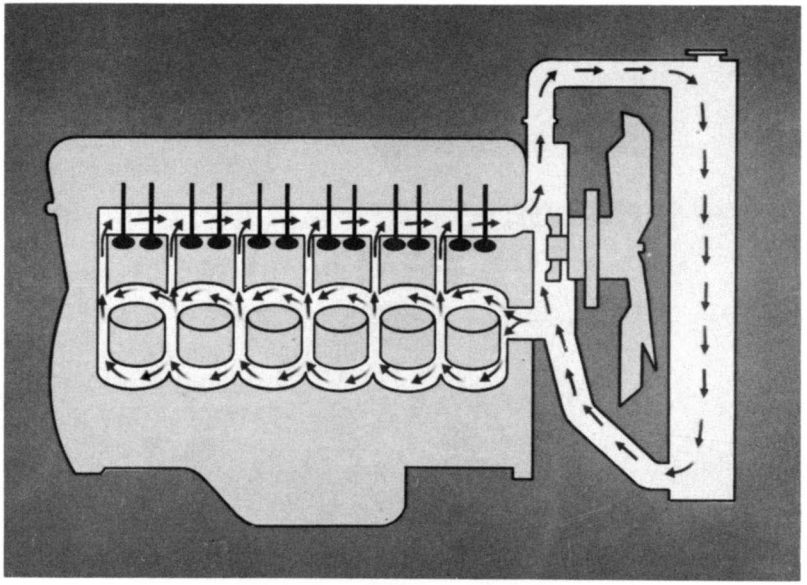


A drilled passage from the number four camshaft bearing carries oil to the rocker shaft rear pedestal. From there, oil goes into the hollow rocker shaft which feeds oil to each rocker arm. The rocker arms are channeled to lubricate push rod sockets and valve stem tips. Oil returns to the sump past the spark plug sleeves and through holes between the tappet bores.

The upper half of the number one main bearing has a chamfer. This forms a metered passage for lubricating the timing chain.

Cooling System. The cooling system uses a semi-series circuit. In this circuit, most of the coolant flows through the engine block from

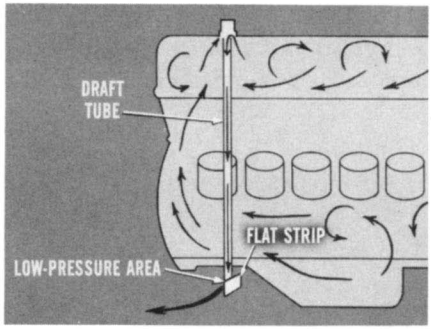
front to rear. It returns through the cylinder head passages. About 10% of the coolant bleeds directly from the block to the head passages. This provides continuous coolant circulation around the exhaust valve ports.



The side-mounted water pump housing is integral with the block. This is a centrifugal-type pump and has an aluminum body. The cooling system thermostat is mounted in the cylinder head, at the left front side. An aluminum water outlet elbow holds the thermostat in place in the head.

Cooling system capacity is 13 quarts, plus an extra quart for the hot water heaters (U.S. measure). On Canadian cars, cooling capacity is 10.8 quarts, plus an extra quart for the heater (Imperial measure).

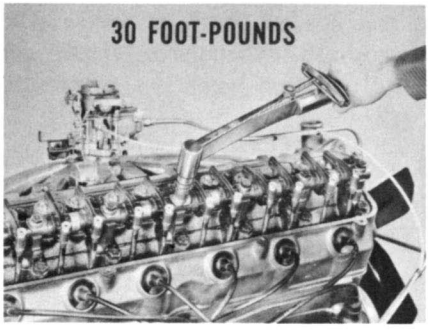
Crankcase Ventilation. Condensation and corrosive vapors that tend to form heavy sludge are efficiently eliminated by the crankcase



ventilation system. It features a draft tube that discharges crankcase vapors underneath the car. This tube, attached to the top rear of the cylinder head cover, extends into the air stream below. A flat strip across the front of the tube creates a low-pressure area behind the tube.

NEW-CAR PREPARATION FOR DELIVERY

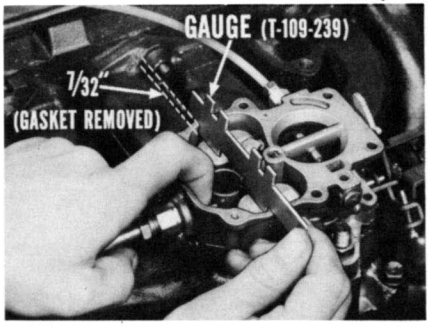
When you get a new car ready for delivery, it pays to see that engine bolts, studs, and nuts are torqued to specifications. One tightness check to make is on the rocker shaft and arm assembly bolts. These should be snugged down to 30 foot-pounds torque. Start with the center bolt, and work toward each end alternately.



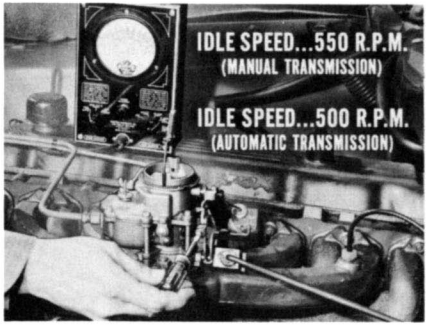
Put the torque wrench on the manifold stud nuts, too. It's important to tighten these nuts cold . . . and to not more than 10 foot-pounds. If these nuts are drawn down too tightly, expansion and contraction that takes place at extremes of operating temperatures may crack the manifold flanges.

After the manifolds have been tightened to the cylinder head, make sure that the intake-to-exhaust manifold bolts are tightened to a torque of 200 inch-pounds.

Carburetor Adjustments. It's also smart to see that carburetor adjustments are made to specifications before turning the new car over to the owner. If you have difficulty getting a smooth idle, you may want to measure float level. Use float level gauge (T-109-239) and see that level is set at $\frac{7}{32}$". Make this measurement with the cover gasket removed.

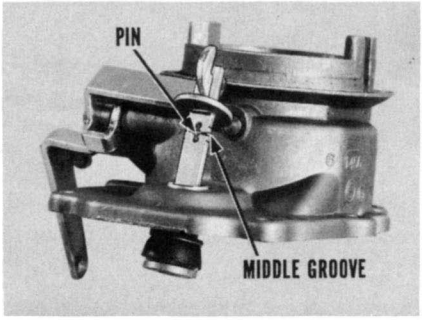


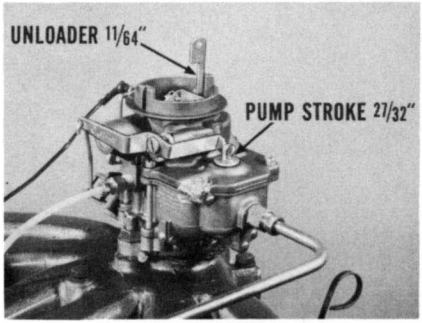
The mixture screw setting should be about one full turn open, and idle speeds adjusted with the engine at normal operating temperature. There are two specifications to keep in mind. On cars with a manual transmission, idle speed should be 550 r.p.m. On cars



with the automatic transmission, set idle speed at 500 r.p.m. When you get that setting, smooth out the adjustment by turning the mixture screw in or out to get a steady idle performance.

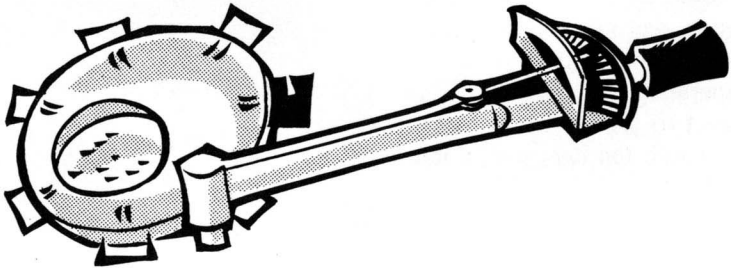
The float bowl vent is tied in with the accelerator pump stroke. This feature improves hot starting performance by acting like a relief valve for vapors in the bowl. The vent cover is lifted by a pin spring in a groove on the pump plunger shaft. When the pump connector rod is in the center hole, the pin spring should be in the middle groove. So, while the bowl cover is off, make sure the pin is properly located.





The choke unloader should be set at $^{11}/_{64}$". The accelerator pump stroke should be set at $^{27}/_{32}$", with the connector rod in the center hole, and the throttle fully closed.

Ignition Inspection Reminders. With a round wire gauge, see that the spark plugs are gapped at .035". And use a torque wrench to see that spark plugs are tightened to a torque of 30 foot-pounds.



Use a dial indicator to check ignition point gap. The new gap specified is .017″ to .023″. If you gap the points at .020″, you'll be well within the limits.

Correct ignition timing, again, is 2½° BTC. Remember to disconnect the vacuum line and plug it when you make this inspection so there won't be any advance.

Part number of the Chrysler Corporation-built distributor is 2-92590. Centrifugal and advance specifications are listed in the table below:

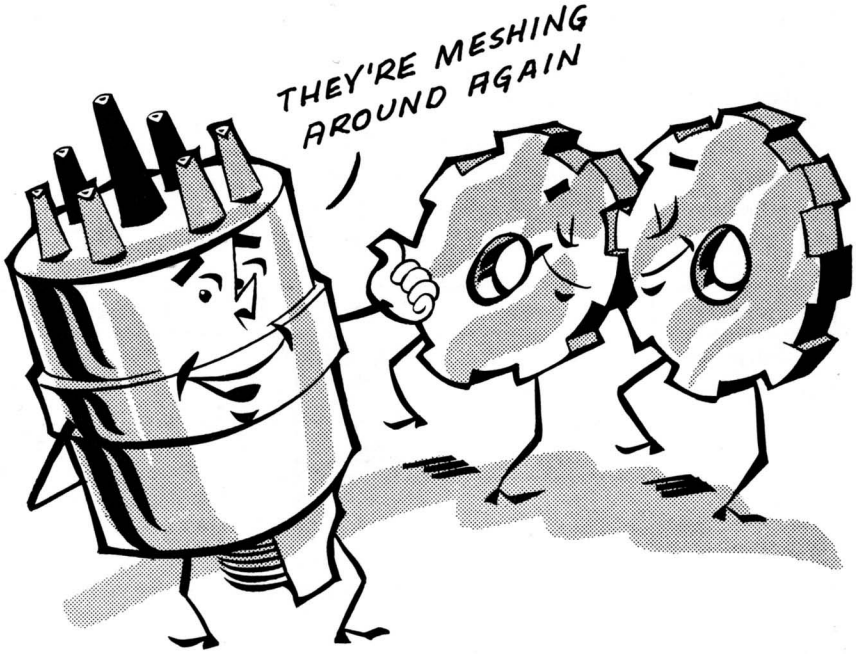
Advance	Degrees	R.P.M.	Inches of Mercury
Centrifugal	0	250 to 450	–
	0 to 2	450	–
	5.5 to 7.5	1000	–
	10.5 to 12.5	2200	–
Vacuum	0	–	4.9″ to 6.9″
	4.5 to 7	–	9.5″
	7.8 to 10.3	–	12″

Other specifications that apply are as follows:

Rotation	Clockwise
Dwell Angle	36° to 42°
Breaker Arm Spring Tension	17 to 21.5 oz.
Condenser Capacity	.25 to .285 microfarad
Firing Order	1-5-3-6-2-4

Distributor Installation. Turn the crankshaft until the vibration damper timing mark is in line with the 0° mark on the timing chain case cover. Both valves of the number one cylinder will then be closed.

Hold the distributor with the rotor pointing forward, and parallel with the camshaft. As you lower the distributor into position, the gears will mesh and put the rotor under the number one terminal in the distributor cap.



Tappet Clearance. While the engine's at operating temperature, see that intake valve lash is adjusted to .010". Exhaust valve lash should be .020". When you finish adjusting valve lash, be sure to use a new cylinder head cover gasket. It's good protection against an oil leak at that location.

SUMMARY

Here's your chance to show what you can do service-wise on the new 6-cylinder OHV engine. Since it is designed to give the owner the finest performance and economy available, its acceptance depends a lot on the care with which you perform the tune-up operations.

Suggestions in this reference book are designed to help you do first-class maintenance work. So, look them over carefully. Then you'll have no trouble doing your part in keeping our new, 1960 customers pleased with our product, and happy with Master Technician service.

CORRECTION

Page 29 of the Service Reference Book for Session No. 143 shows the exhaust valve tappet clearance for the 318 cu. in. 4-bbl. engine as .081". Correct figure is .018". Please make this correction in your copy.

RECORD YOUR ANSWERS TO THESE QUESTIONS ON QUESTIONNAIRE NO. 144

When installing the rocker arm shaft assembly, remember that longest bolt is to be installed in the front pedestal.

RIGHT **1** WRONG

Set intake valve lash at .010", exhaust at .020" with the engine at normal operating temperature.

RIGHT **2** WRONG

Spark plugs in the new 6-cylinder engine require an electrode gap of .035".

RIGHT **3** WRONG

When setting ignition timing, disconnect the distributor vacuum advance line and plug it.

RIGHT **4** WRONG

Cooling system capacity of the new 6-cylinder engine is 13 quarts, plus one for the heater, U.S. measure; and 10.8 quarts, plus one, Imperial measure.

RIGHT **5** WRONG

Manifold stud nuts should be tightened cold, and to not more than 10 foot-pounds.

RIGHT **6** WRONG

The normal setting for the accelerator pump stroke is for the connecting link to be in the center hole of the lever.

RIGHT **7** WRONG

Engine idle speed on cars with *manual* transmission should be 550 r.p.m., and 500 r.p.m. on cars with *automatic* transmissions.

RIGHT **8** WRONG

Distributor point gap should be .017" to .023".

RIGHT **9** WRONG

Change the oil in this 6-cylinder engine at 2000-mile intervals and replace the oil filter at 4000-mile intervals.

RIGHT **10** WRONG

Litho in U.S.A.