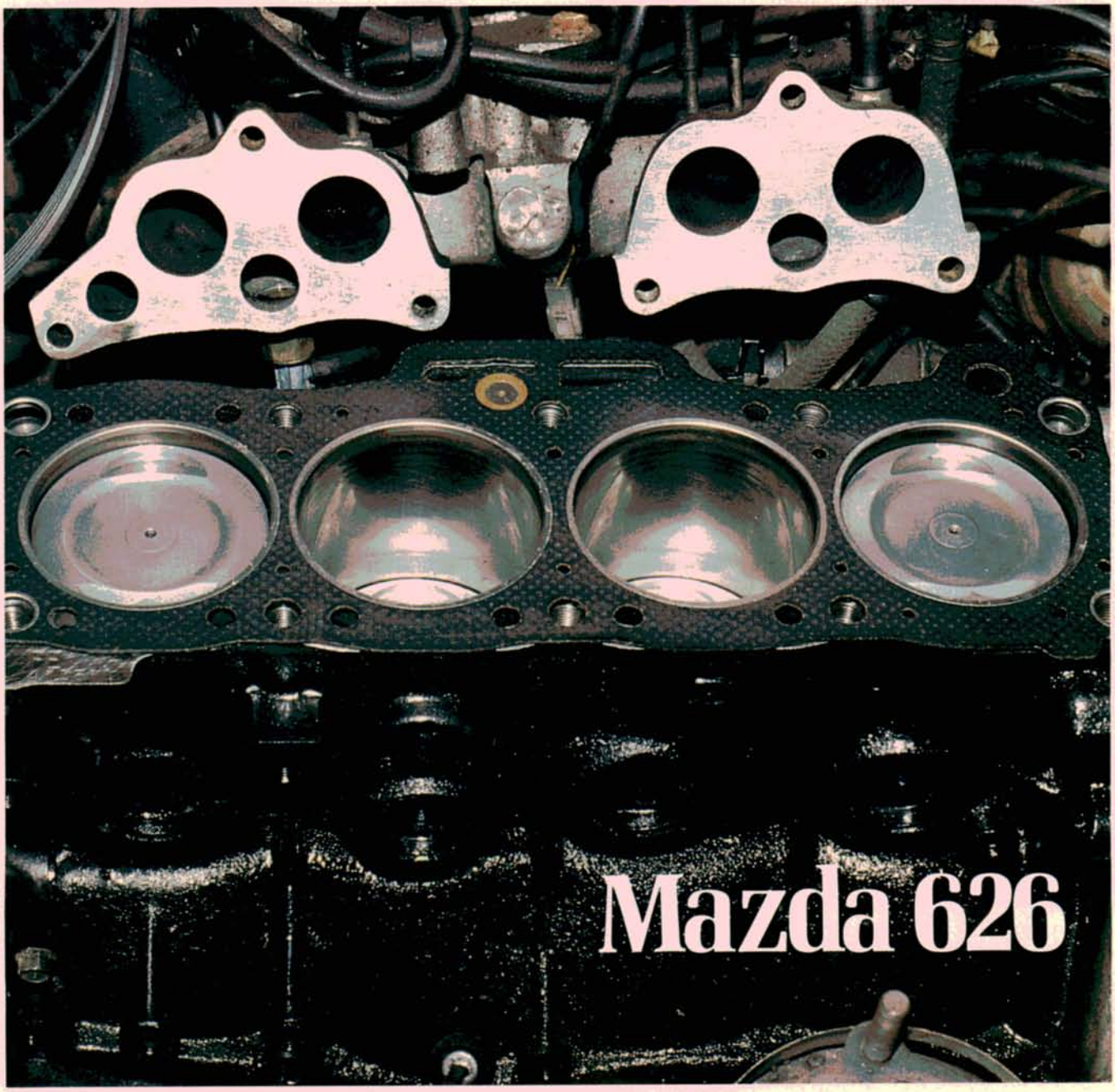
IMPORT SERVICE

One Thing Can...



Lead To Another

There are times when top engine repair is like eating potato chips—you get started and can't stop. All too often, a leaking head gasket is only the first teasing taste of salt. Once you get in there and look around, you're hooked.

We decided to randomly select a candidate with a leaking head gasket, and let the chips fall where they might. Our victim is a carbureted 1985 Mazda 626 with 128,000 miles on the clock. The head gasket is leaking coolant down the front of the engine block, behind the catalytic converter. A tough leak to spot from the top, but unmistakable from down below.

The car still runs well and has no record of serious oil consumption problems. Aside from a constant thirst for engine coolant, it might not be in our stall, period. There is an additional complaint of rough running when the car first starts up in the morning, however. And even though the oil has been changed regularly, the customer complains that it's always "dirty" looking.

The car's owner replaced the original timing belt and water pump at about 100 grand. He also tried to stop a nasty oil leak on the right side of the engine by replacing both the cam and crank seals himself. Unfortunately, his Attila the Hun approach to seal removal did little to correct the oil leak(s), and actually made them worse. We'll look at that specific problem more closely in a moment.

As we said, sometimes it's hard to know where to stop once you get started. It's often tough to explain to a customer how one thing can lead to another.

Pre-teardown Quick Checks

Since the 626 has so many miles on it, we decided to do a few quick checks before tearing the engine down. Starting the engine cold showed that the choke unloader diaphragm wasn't working at all—it had a ruptured diaphragm. This helped explain the cold running problem and dirty looking oil.

We also took the time to check oil pressure. Top end repairs can lead to problems when increased compression tears up a bottom end with weak bearings. Our engine passes with flying colors. We have good oil pressure, both cold and at warm idle. This is not an absolute guarantee that the rings are sealing properly, but a differential leak test doesn't show any substantial blow by. We decide that the combination of the two tests indicates that the bottom end has some miles left in it.

Then with the engine warm, we also check for proper thermostat and electric cooling fan operation, just in case overheating is the cause of the old gasket's death. Once again, everything checks out okay.

We will be sure to let the engine cool completely before removing the cylinder head.

Know the Product

One of the toughest decisions we need to make on a job like this is how far we need to go to ensure a lasting repair. On some cars with this many miles, we wouldn't take any chances with the bottom end, since some engines have a tendency to lay down a fat blue cloud after top end-only repairs.

Having done a number of similar repairs on this type of engine with success, and knowing this particular engine's good maintenance record, convinced us to take the calculated risk of a top end-only approach.

Replacing the cam, lash adjusting screws, and rocker arm shafts without using new rocker arms is also a discretion call. We'll warn you that some people insist that cam and rockers be replaced as sets. But the rockers themselves were in almost-new condition. Our engine runs as quietly as a new one, 10,000 miles after this repair was completed. As we've already noted, knowing the characteristics of a given engine type can be a big help in knowing what you can or can't get away with.

In this same vein, we double checked our own product knowledge on this engine by calling several Mazda dealers and specialists. We did get feedback that some later model truck engines have been experiencing ring blow-by problems, but didn't get any negative feedback on the early style solid lifter engines.

You may find it worth the effort to check with other shops if you're working with an unfamiliar engine.

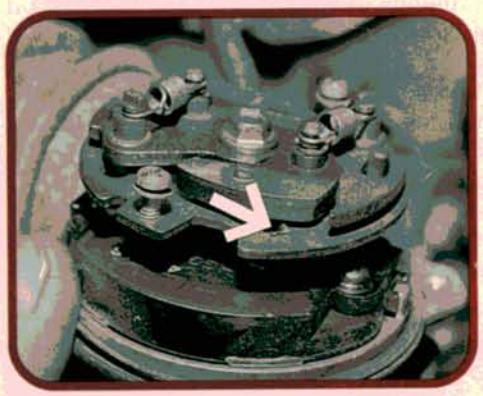
Bolted to Everything

Before we tear into the engine, we should mention the air cleaner. Removing the air cleaner from the carbureted 626 is an adventure in itself. Seems like it's bolted to everything but the rear bumper and the ashtray. It's connected to the air injection tubes, the carb, the valve cover, a support bracket on the left side of the carb, and the air intake hoses (both hot and fresh air).

Then there are the vacuum hoses hidden low on the backside of both the carb and the intake manifold. If you're not familiar with this car, you may want to mark the vacuum hoses. I've seen a lot of driveability problems on these cars caused by loose, disconnected, or improperly placed vacuum hoses. From there, the order of disassembling the top end is a matter of preference, but we'll point out some logical options.

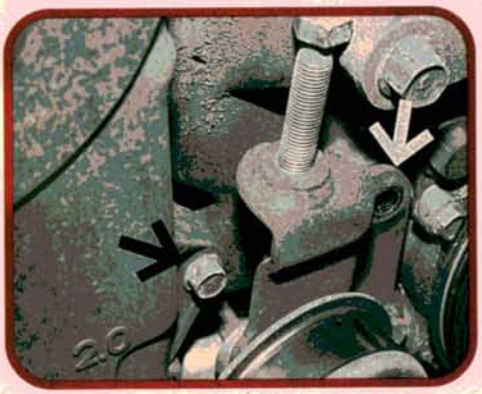
Our sequence starts with the battery terminal already disconnected, and the coolant drained. Mazda is kind enough to offer a plastic drain plug in the bottom of the radiator.

—By Ralph Birnbaum



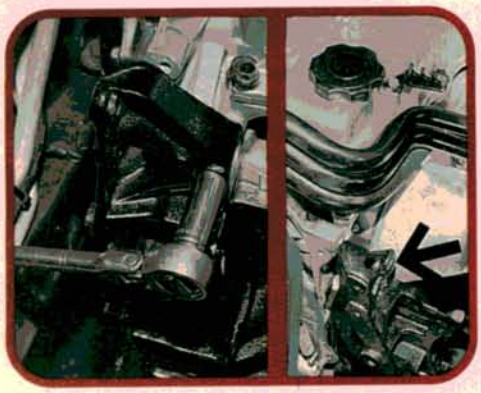
1

The fastest way to remove the distributor is to pop off the cap, loosen the distributor lock bolt, and remove the entire distributor—coil wiring and all. Check for worn centrifugals on high milers or cars which have run with loose timing belts (see the burrs thrown up when the weights bang on their stops?)



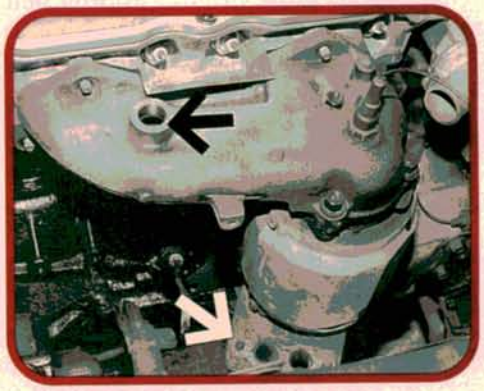
2

Three of the four upper timing cover bolts are easy to reach. One is hidden behind the A/C compressor belt idler. Back off the tensioner and move the belt off the idler. Remove the upper idler mount bolt (white arrow), loosen the lower one. Pivot the tensioner forward. Remove the last bolt (black arrow).



3

Remove the alternator. The cast bracket (arrow) in our photo is the mount for both the alternator and the A/C compressor. You don't need to remove the entire bracket from the block. You will need to remove the bolt which holds the bracket to the cylinder head, however.

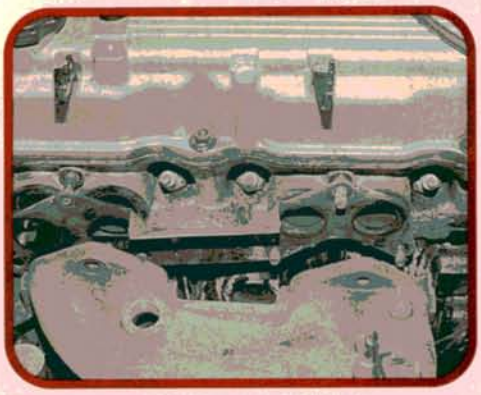


4

Remove the air injection pipes. Two of them bolt to the exhaust, just below the catalyst (white arrow). The third pipe screws to a fitting in the manifold. Remove the pipe and fitting from the manifold threaded hole (black arrow). Remove the three 8mm bolts holding the shield to the manifold and remove the shield.

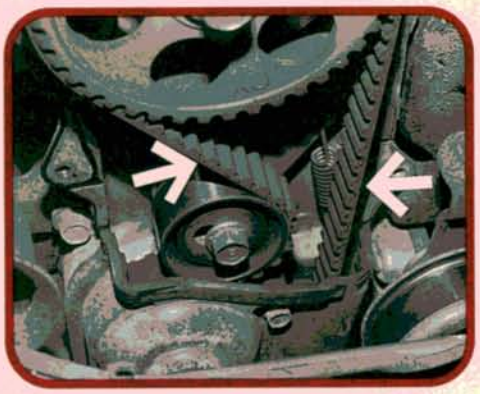
5

We're leaving the oxygen sensor in the manifold since we're removing the thermostat housing. One or the other has to go to get the manifold heat shield off. Unplug the wires for the temp sensor sending unit and coolant fan switch on the 'stat housing. Disconnect the main upper hose and small bypass hose.



6

You can unbolt the exhaust manifold and move it away from the head without disconnecting the manifold from the catalyst. There are support bolts holding the front catalyst to the block (front of the engine, just above the oil pan). Then unbolt the manifold and slide it forward, off its studs.



7

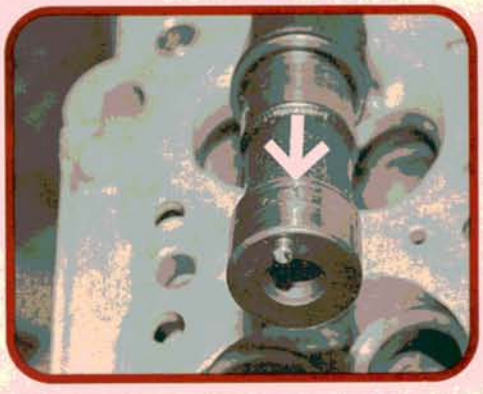
Loosen the cam belt tensioner pinch bolt. Don't pry on the belt to move the tensioner if you intend to reuse the belt. Instead, squeeze the belt with thumb and forefinger to move the tensioner aside. Tighten the tensioner pinch bolt to hold it in that position. Pull the belt off the cam sprocket.

8

Remove the intake manifold and carb as an assembly. That way you don't need to fuss with the remaining vacuum hoses. Disconnect the hose between the fuel pump and carb, and remove the pump. With the pump pulled back, it's easier to get at the intake manifold nuts and bolts located on the pump side of the intake.

9

Leave the throttle and cruise control cables connected to the carb. Pull them out of your way and hang them in place with a piece of wire. Be careful not to kink or bend them. Remove the valve cover. If the engine is cold by now, start loosening head bolts in reverse order of the normal tightening sequence.

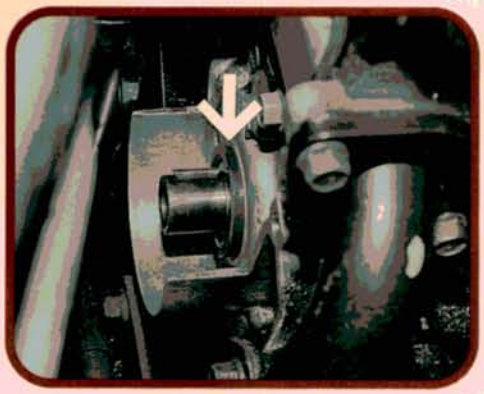


10

After removing the cam sprocket and seal, we see that whoever removed the last seal scored the machined surface of the cam where the cam's sealing lip rides. The shop manual shows a screwdriver being used to remove an old seal, but the words "use extreme caution to avoid camshaft damage" are missing.

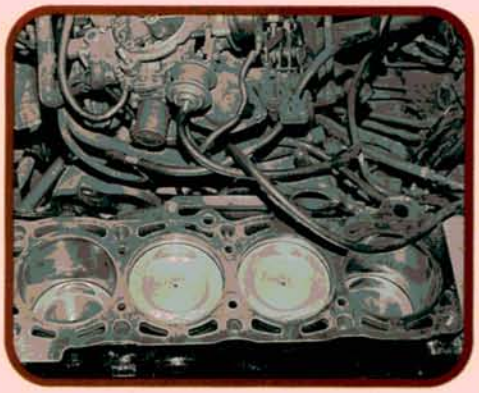
11

As you can see, one thing IS leading to another. A closer look at the rocker shaft assemblies shows that while the rocker arms are in very good condition, the heads of the adjustment screws are badly pitted. The underside of the rocker shafts where the rocker arms ride are also badly gouged and worn.



12

If you're not replacing the timing belt you don't need to remove the lower timing cover. But we have a leak at the crank seal, so we remove the splash shield and the crankshaft pulley/sprocket. The crank seal is falling out! It's so far out in fact, that we simply reach down and lift it out with our fingers.

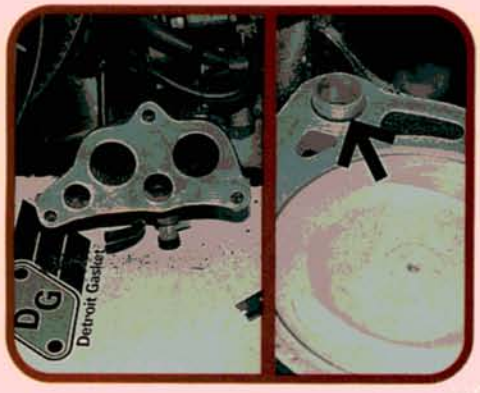


13

As we cleaned off old gasket material and carbon, we noticed that the cylinder head locater sleeves weren't in the block. These thin-walled tubes drive into two of the head bolt holes at the rear corners of the deck to help locate the gasket and head on the deck. Where'd they go?

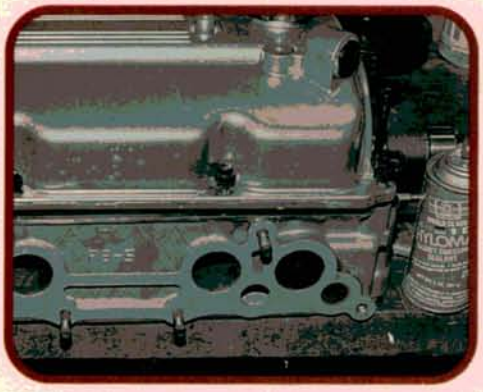
14

We find the sleeves pushed all the way into the mating holes in the head. Removing them with pliers usually means they end up oblong or dented. A good removal tool is a carriage head bolt inserted into the sleeve as shown. Use the bolt head to catch one side of the sleeve and slide hammer it free.



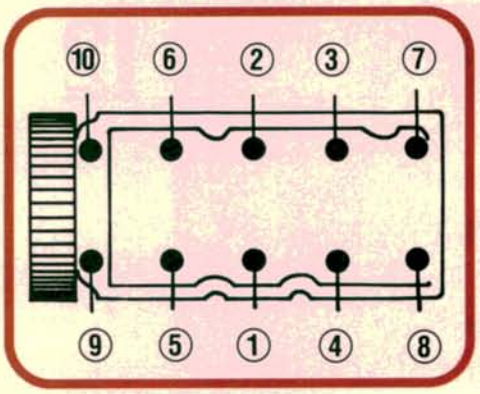
15

We removed the sleeves, and tapped them back into their proper locations in the block. Then we placed the old gasket box across the deck and laid the intake manifold on it while removing the old gasketing. The box makes a nice disposable work bench and keeps the old gasketing out of the cylinders.



16

Installing the intake manifold gasket on the head with some spray adhesive is much easier to do with the head removed. We've taken the time to check the head for distortion and thoroughly cleaned the gasketing surface. The adhesive will keep the gasket in place until the head is installed.

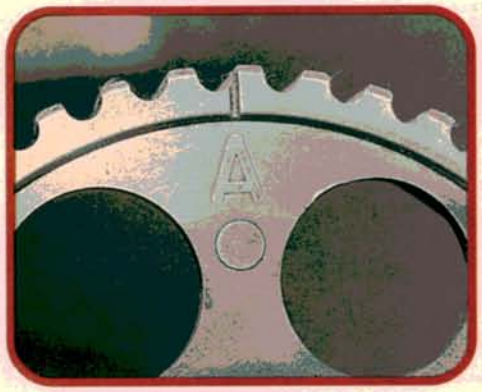


17

Here's a diagram showing the head bolt tightening sequence. Make sure the head bolt threads are clean and lightly lubed. Follow this sequence and tighten the bolts in steps to a final torque of 82-88 Nm (59-65 ft-lb). Don't forget to use all the flat washers for the head bolts.

18

We use these marks to set our Number 1 piston at TDC. If you don't remove the crank pulley as we did, simply use the timing marks on the lower cover and crank pulley to set the engine at TDC. Either way, make sure the belt teeth are fully seated in the crank sprocket.

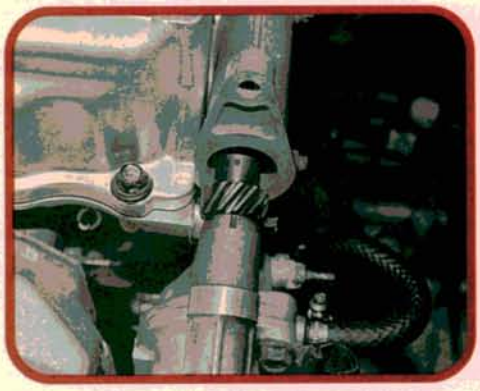


19

The correct cam timing mark for the 626 is the one marked with the letter A. With crank and camshaft in position, pull all the slack from the side of the belt away from the tensioner. Slide the belt onto the cam sprocket teeth and loop the slack side over the tensioner pulley.

20

Loosen the pinch bolt on the tensioner and let the tensioner spring pull the belt tight. Turn the crankshaft two full turns in a clockwise direction. This centers the belt on the sprockets and equalizes belt tension. Tighten the tensioner bolt and double check belt timing with the engine at TDC on number One.



21

With the engine still at TDC on number One, reinstall the distributor. Align the marks on the distributor housing and driven gear as shown. Align the adjustment slot in the distributor with the bolt hole in the end cover. Then wiggle the distributor rotor as you slide the distributor into the head to align the gears.

22

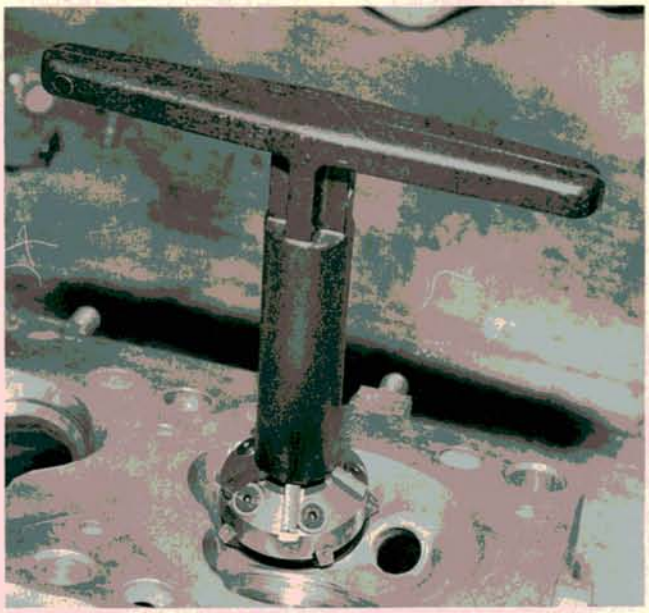
Reinstall all the other goodies we've removed in reverse order. Please take an extra moment to double check the vacuum hose connections at the back of the carburetor. I have seen many of these cars stumbling around with an assortment of driveability problems caused by dangling vacuum hoses.

The head's off the car anyway, so we decide that we ought to spend a little extra time making sure it's fit for service. After all, we already know we have a damaged camshaft, worn adjusting screws, and two badly scored rocker shafts. And in terms of miles driven, this engine has gone halfway to the moon.

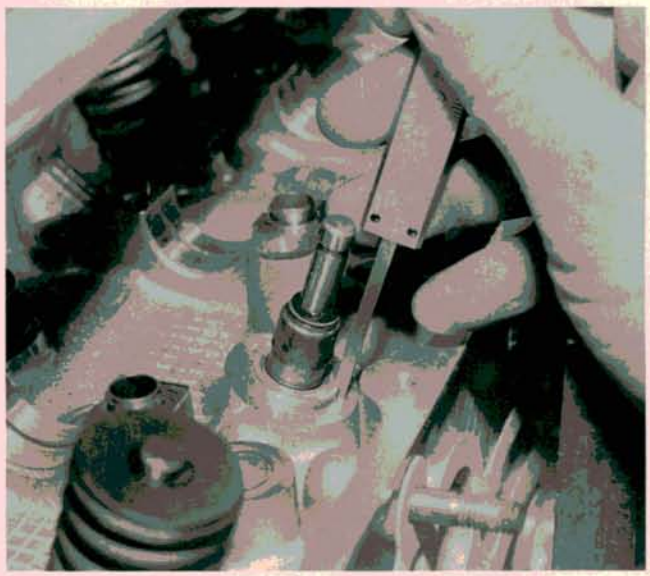
We use the shop manual procedures for checking camshaft oil clearance, end play, valve spring free length and straightness, etc. We don't have room here to show you all of those procedures, but there are a few things we wanted to emphasize.

Talk about intake valve deposits on fuel injected cars! This car is carbureted. You'd think these were exhaust valves 'fer cryin' out loud. Amazingly, valve stems are okay, and valve stem-to-valve guide clearance is still within factory specs. Valve seal replacement is a snap at this point.

The valve seats need attention, but they're hardly beyond refacing. We'll cut the seats with our Neway cutters. The Neway valve refacing tool cuts a nice new face on the intake valves, which clean up well. Unfortunately, by the time the faces of the exhausts clean up, they're below spec for valve margin. We have no choice but to spring for new exhaust valves.



Since we're cutting both the intake valves and their respective valve seats, we need to be careful to remove as little metal as possible and still get a good finish. If we cut too far, the valves end up sitting too deep in their holes. Then the stems stick up too high, ruining valve geometry.



After installing new valve seals, we pop the valves into their respective holes and check their installed height. This tells us if we've removed too much metal from the valves and/or seats. Our spec for installed height is 48 mm. We're within that limit. Beyond that point, valve seat replacement, or a new head would be options.

The original installed height was 46.5 mm. We're at 47.5. So we need to install a 1 mm shim between the spring and spring seat to maintain the correct valve spring installed height. Be careful about valve lash specs, there are two—0.30 mm for intakes and exhausts at the valve side, and 0.20 mm if you check clearance at the cam. Adjust lash with the engine warm.