By Ak Miller and Lee Kelley

As a general rule, six-cylinder engines are only found in the utility vehicles or the so-called economy cars in this country. Of course, in Europe there are many good examples of high-performance six-cylinder cars. As far as performance six cylinders go, they are far and few between as they come from the factory. However, it certainly takes no genius to understand that if they can be made to run extremely swift in Europe, then there is no reason that our sixes cannot be improved upon to run equally as well. The Ford sixes are a case in point.

In the Ford range of six cylinders for 1970 there are three basic engines. They come in 170-, 200- and 250-cubic-inch sizes. We shall attempt to give you some information on how these three units might be warmed up by utilizing parts and pieces from one and switching to the other. First off, since the engines are made solely for economy purposes, they are not endowed with super-premium or high-performance bearings, so it would only be natural that we should consider installing some heavy-duty main bearings in any six-cylinder Ford engine that we are going to hop up. For a quick rundown on general specs, the 170 engine has a bore spacing of 4.08, and the bore and stroke are 3.50 by 2.94, respectively. The 200 has the same identical bore spacing with a 3.682 bore and 3.126 stroke. The 250 likewise uses the same bore spacing of 4.08 and the bore is the same as the 200 (3.682). However, the stroke has been increased to 3.910.

There are many other differences. For instance, the 170 uses a four-main bearing crankshaft while the 200 and the 250 uses a seven-main bearing crank. The additional mains are what make the latter engines so ideal for performance use. They give an extremely rigid lower end, and there's a lot of bearing surface to take additional stress and strain. By the way, the six-cylinder engine as a general rule cannot be revved as high as the V-8s. This is primarily due to the balance of the 120-degree in-line crank versus a 90-degree V-8. Keep this in mind and try to limit the six-cylinder revs to 6000 or less, and you will have more success. Leave the 7000-8000 shifts to the V-8 boys. Don't be disheartened; the torque the six-cylinder produces in the mid-range certainly is more than enough to offset the ability of the V-8, and some interesting competition can be brought about when you match the two size for size.

Since all three Ford sixes utilize the same bore spacing, it is quite natural that the cylinder heads of all three will interchange. Here lies one area where you can really do yourself some good. For instance, if you have a 200-cubic-inch six and you wish to add compression and make the car run a little better, the first thing that you should do is to get the new 170 Maverick cylinder head with Ford part number DODZ6049-A. The reason for our suggestion of the 170 cylinder head is the fact that it carries the same size valves (1.660 intakes, 1.399 exhausts) as are found in the 200 and the 250 cylinder heads. The difference in the heads is in the combustion chamber; the 170 chamber is much smaller in volume than the 200 and 250, thereby giving a big boost in compression ratio, which is very important since these engines are all economy jobs.

The Maverick 170 cylinder head should be used with a head gasket as follows (these are all steel shim head gaskets): for the 170 use a CODE6051C, for the 200 and 250 engines use C9DZ6051-C. Using the steel shim and milling the heads .050 is recommended if not mandatory. The cylinder head for the 200 and 250 CID engines is C9DZ6049-D. That's the cylinder head with the larger chamber. The cc capacity of the 170 head is 51-54 cc's. For the 250 head it is 59-62 cc's.

These sixes are all set up with a minimum amount of compression from the factory. The stock compression ratio ranges around 8.5-9.0-to-1. The 8.5-to-1 figure comes closer when you actually check the compression. So to get any kind of performance you want to end up with a ratio of around 9.5 or 10-to-1 at least. You can't come up with this by just milling the head of the 200 or 250 to any degree of satisfaction. So the only way to go is to use the 170 head. The chamber, being very small, looks like it is quite shrouded. But in actual practice this proves to be somewhat of a benefit because the turbulence of the chamber is very good and the response on the 200 and the 250 engines is nothing short of sensational. Even with the installation of the 170 head, we recommend milling this particular head .050-inch.

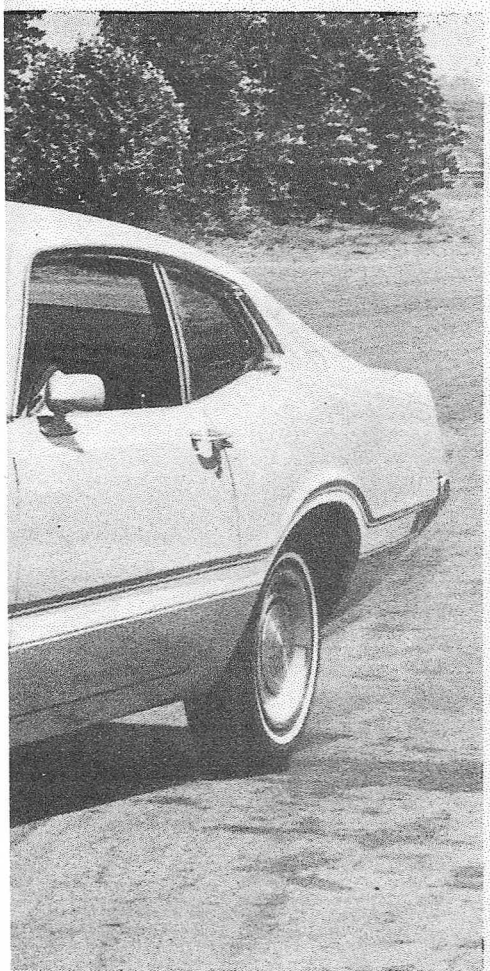
As far as porting, or additional valve work, the valve sizes that are installed are just about as large as you can go for practical purposes; however, you can juggle around and install some larger intakes or exhausts and come up with some improvement in breathing characteristics. As a general rule, the 1970 170-cubic-inch cylinder heads flow approximately 30 per cent more air than earlier models, so in all cases we would recommend utilizing 170-cubic-inch Maverick cylinder heads for your hop-up work.

SIX-CYLINDER MAVERICK HOP-UP!

THE FORD SIX CAN BE MADE INTO A DECENT PERFORMANCE ENGINE. ALL IT TAKES IS A LITTLE KNOWLEDGE AND A LOT OF HARD WORK.

For better carburetion, tests have been made trying to install a larger carburetor on the standard manifold, and the gains have been very marginal. The only real way to come up with good performance with good distribution is by mounting three one-barrel carburetors. By installing the new ports at each end of the manifold, roughly in the area of number two and number five cylinders, much can be gained in fuel distribution, which is somewhat of a problem with any six-cylinder engine running a long log-type manifold. This setup has been found to work better than most all other induction systems tried; however, some interesting things can be done in the way of sawing off the existing manifold and installing side-draft S.U.'s from the Jaguar! These will perform very well. Then, for those who want to get real exotic, there is nothing wrong with making an individual runner setup and going so far as to install fuel injection such as from the Bosch system as used on Mercedes cars. This can prove to be very worthwhile and is certainly the way to go for the all-out job.

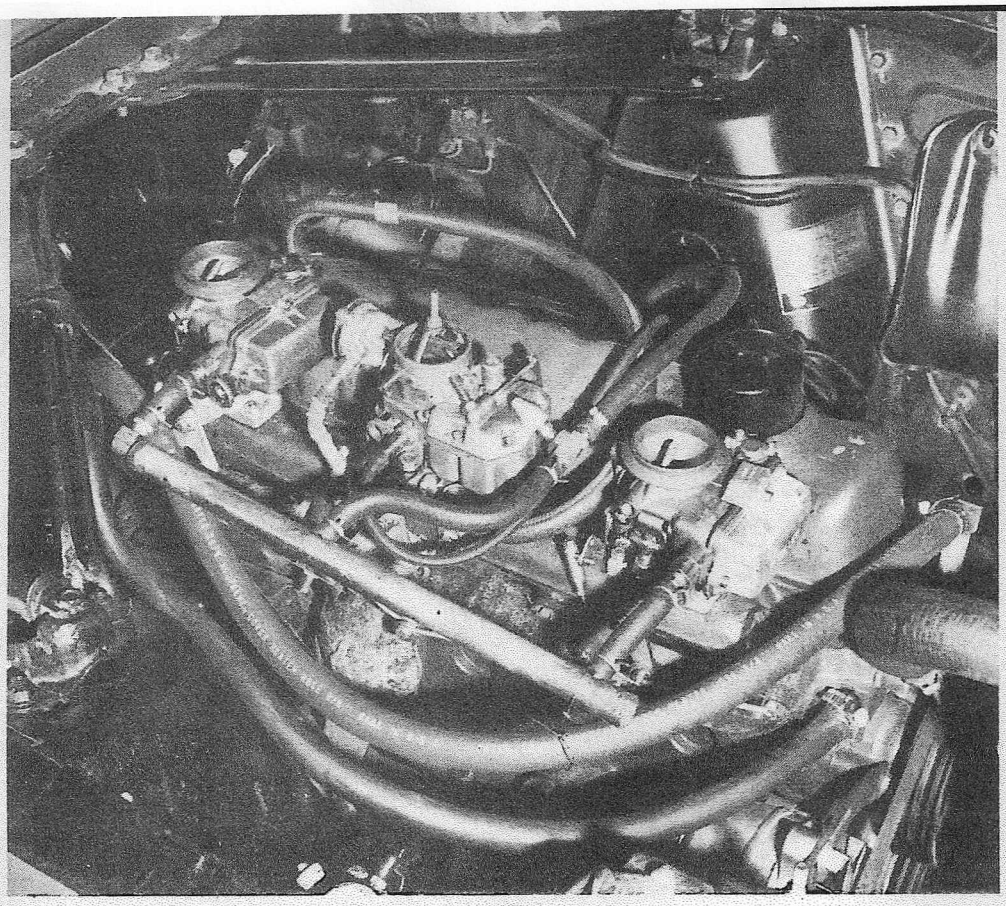
Getting back to the three one-barrel carburetors, Offenhauser Equipment Co., Los Angeles, Calif., has made adapters to accomplish this. We recommend using the 250-cubic-inch carburetor such as used on the 1969 Ford sixes for the center carburetor. This carburetor carries the number C90F-B. For the end carburetors, on the 200-cubic-inch engine we found utilizing the smaller basic carburetor, such as found on the 144-cubic-inch six-cylinder engine, worked out about the best. For the 250 six-cylinder you can utilize the carburetors such as used on the 170 engine for the end units and leave the center carburetor standard. By the way, on the carburetion, the 250-inch center carburetor has a rating of 210 cfm. The end carburetors on the 170 engine have a full capacity of 156 cfm; the little 144 carburetor drops down to around 140 cfm. The three carb setup should always be hooked up with progressive throttle linkage. This progressive linkage is available from Offenhauser. As for air cleaners, it is recommended that you use three single cleaners. These are also available from most speed equipment parts houses.



Any additional work such as porting, radiusing the valve seats and cleaning up the chambers has just the same effect as porting any other head for performance. It all helps. It's rather difficult to port these heads with the integral manifold, but good work can be accomplished in this area by head specialists. Utilizing the early cylinder head milled .050-.060 with a steel shim gasket, a 200 engine realizes approximately 9.5-to-1 compression ratio, and the 250 will realize 10-to-1. This is the best way to achieve compression in a reasonable manner; however, if you already have the later 200 or 250 cylinder heads, to achieve this kind of compression ratio you almost have to go to deflector pistons which can be acquired from one of the specialty firms such as Jahns, JE or Venolia.

While you are preparing your cylinder heads for performance, you must keep in mind that a performance camshaft is certainly in order, since the standard cam timing on any one of these six-cylinder engines is very small (240 degrees for the 170 and 252 degrees for the 250). We do not recommend going too wild on camshaft timing for six cylinders. It is recommended that you select a cam with more reasonable duration and good lift. A cam with 260-280 degrees duration and .400-inch lift should really do the job. Bear in mind that the standard lift is .348 and .368 (intake and exhaust respectively) for the 170, 200 or the 250. Any additional lift will certainly be welcome.

We find that one cam works extremely well for all-around street use. It is the Iskenderian 260 hydraulic. Bear in mind what we mentioned about the rpm. Shut the Ford six off at 6000; there is really no necessity for winding it any tighter. The horsepower is all obtained well below this range. The Isky 260 peaks out between 5600-5800 and will run up to 6000, providing you equip the cylinder head with the springs that are recommended by the cam grinder. In our case we use the 289 Ford blue valve springs. Also, the 1962 Ford 221 and early 260 V-8 retainers were made for a 5/16-inch valve stem such as found on all of the six-cylinder heads. The retainers carry the number C20Z6514-A. The spring number is B6A-6513-A. The spring loads work out at 90 lbs. closed and 190 lbs. open with the Isky 260. With a lift of .417, no coil bind is ex-



Offenhauser adapters make a three one-barrel manifold out of the stock one-barrel unit. End carburetors rate 156 cfm, center one flows 210 cfm.

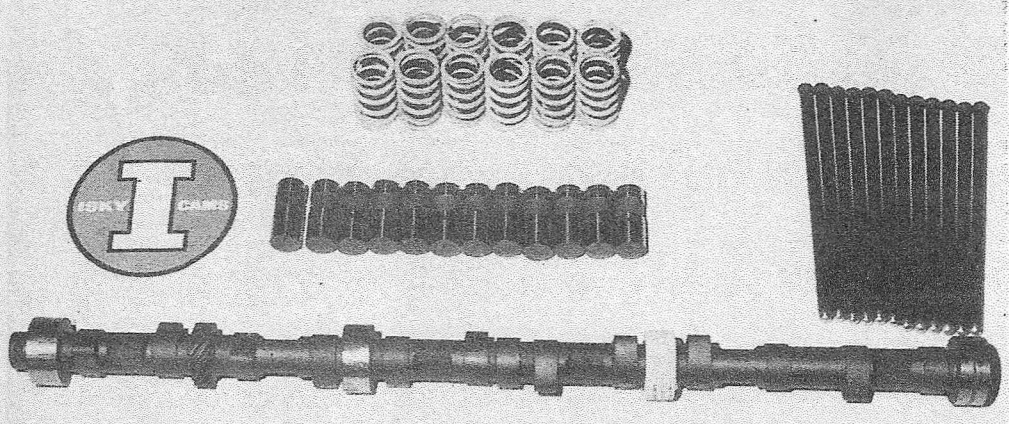
perienced and the whole system works quite well. However, many people just shim their stock springs. For a matter of $1.50 worth of shims you can come up with reasonable performance from the standard springs. Remember that the spring setup in these particular engines is very short. The installed height on this assembly is in the order of 1.59 inches. You must be very careful not to incur coil bind when installing the higher lift camshafts. Your cam grinder will advise you of the proper spring to use with this particular cam grind.

All three of the engines under discussion drive the camshaft via a chain, which is probably the weakest link of this particular engine. When utilizing this engine for performance work (that is, high rpm, stiff valve springs and wild cams), it is found that the timing chain has a tendency to stretch at an early age. You should always look for a loose chain in any of these old six cylinders. Grab a wrench, put it on the crankshaft and move the crank back and forth, and you will notice quite a bit of play before the valve gear starts moving. If this exceeds six degrees, we certainly recommend that you put on a new chain, and gears if necessary; however, the gears generally do not give any problem. It's just the chain. One of the reasons for this, of course, is that the six-cylinder crank puts quite a bit of vibration up in the front end of the crankshaft. Since the crankshaft is nothing but a torsional bypass, it has a lot of vibrations running fore and aft. This all tends to shake the chain links up a little more than usual, so the word here is to change the timing chains quite often. They do not break, but they certainly do stretch.

As far as valve lifters and push rods, the standard Ford units are as good as one can buy. The upstairs rocker system on all of the later six-cylinder Fords is a non-adjustable setup; however, if you care to go to an adjustable rocker setup, all you need to do is go to the earlier six cylinders which were all equipped with adjustable rocker arms. These will interchange by changing over push rod and rocker assembly. One note of caution here: the early sixes were plagued with oil starvation to the rockers, so don't assume that you can just go buy a junkyard unit and come up with a reasonable fix. Our recommendation is a new shaft and new rockers. This is the sanitary way to do it.

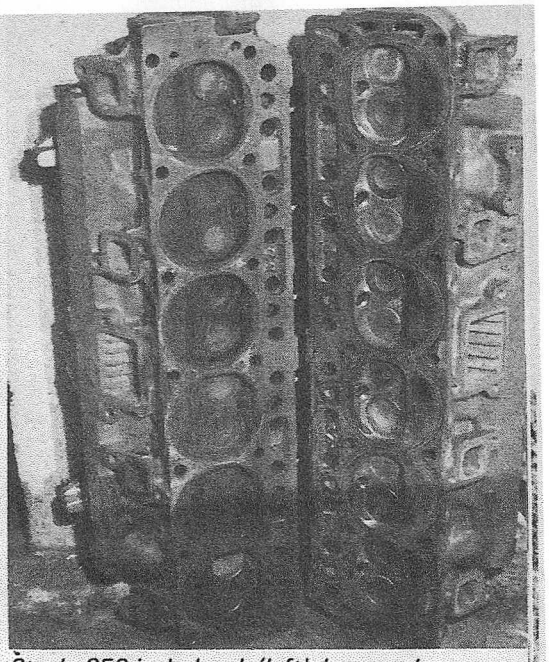
Since the bore spacing is all the same, camshafts can be interchanged; however, a note of caution here. The 200, due to its longer stroke, is compelled to run camshafts that are thinned out between the lobes so that they miss the connecting rod bolt as it swings around toward the camshaft. The 170s, on the other hand, are endowed with a complete full circle, so do not make the mistake of trying to interchange these or you are going to have some interference problems. The same goes for the 250. The 250 engine has a further increase in stroke, obtained not by raising the block but by lowering the crankshaft in the crankcase. This necessitated a longer chain and here again we have a problem: The camshaft is degreed off seven degrees from the standard 170 and 200. When interchanging cams here, you could come up with some bad timing in the 250 unless you make provisions for reindexing your gear. Just remember: the 170 and the 250 cams will interchange and, of course, the 200 cams will also go into the 250. It has lots of space due to the crank centerline being lowered. The 250 cam can be utilized in the 170 and 200 engines providing the dowel pin is moved to line up on center. But be careful! It is real easy to make mistakes and sometimes they can be very costly ones.

As for ignition it is found that the standard six-cylinder distributor, when equipped with high-performance points readily available from Ford-



Iskenderian 260 hydraulic cam and kit gives the Ford six a real boost in the performance department. This unit reaches peak horsepower at about 5800 rpm.

Notice width difference of the 250-cubic-inch Ford six (left) and the Ford 170-incher. Bellhousings do not interchange between these two engines.



Stock 250-inch head (left) has much larger combustion chamber than the 170 head (right). The 170 head has the same size valves and is an easy way to gain compression in the larger Ford six.

Autolite dealers, will more than take care of the 6000 rpm that we recommend for limits. So it certainly is not necessary to spend money on additional ignition for the six-cylinder venture.

In the clutch department, the 250 uses a large bellhousing such as found on the Ford 289 V-8. You cannot interchange bellhousings from the 250 down to 200 and 170. However, the blocks on the 170 and 200 are drilled for either housing. The 200 uses a larger clutch than the 170 and also utilizes a different flywheel and bellhousing. We strongly recommend that you use the 200-cubic-inch clutch on any of the 170 engines. The bellhousing will accept four-speed transmissions, which is certainly an asset for any of the six cylinders.

As for the rest of the chassis, when you have the six-cylinder hopped up, it's going to tax the differential rather heavily. For normal performance work the differential will do a reasonable job. We recommend for street use a 3.5-to-1 ratio and for drag racing the 4.0-to-1 ratio. The gears are available in the 7-1/4-inch ring gear which is found in all Ford vehicles utilizing the 200-cubic-inch engine. The 250 Mavericks and Mustangs are equipped with an eight-inch differential which is much stronger. If you are going to drag race your 200 every weekend, it certainly is the differential to use. The later differential, the eight-inch type as used on the 250-equipped cars, uses a five-bolt wheel pattern instead of a four-bolt as used on the 170 and 200-equipped vehicles. As stated before, for general usage the standard differential will suffice behind the 200. If you are going to hop up and down on the dragstrip every weekend, take our advice and go the eight-inch differential. It is found on all of the V-8 Mustangs and Fairlanes and will slip right onto your present vehicle with nothing more than just changing the driveline length and U-joint at the rear. You will also have to use a five-bolt wheel. This five-bolt configuration is the same size as used on all V-8 Mustangs.

Some general recommendations: do not attempt to bore any of these engines beyond .060 since they are thin-wall castings and overboring could cause some serious problems with regard to headgasket sealing. When installing cams with higher lift than .440, be sure to check for possible coil binding in the valve spring area. Another point here is to be sure that the valve guides are cut so as not to have interference between the retainer and the top of the valve guides with high lift cams. Oil pump in stock trim seems to be adequate for this setup. The only way to strengthen the lower end would be to add larger bolts in the rods; however, for normal usage

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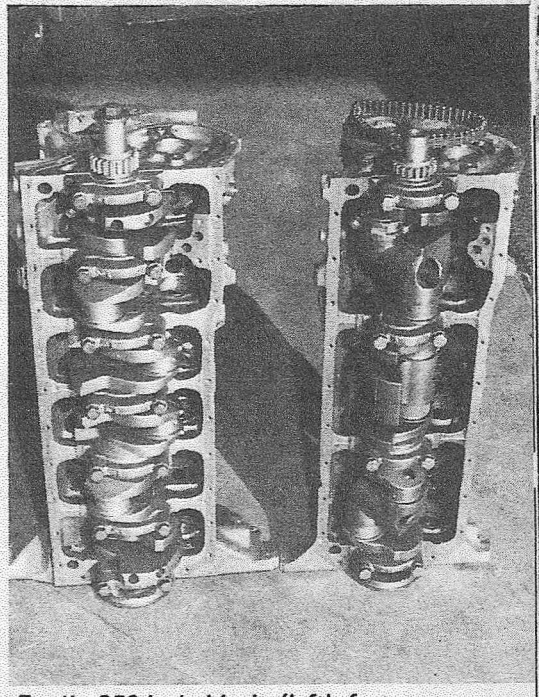
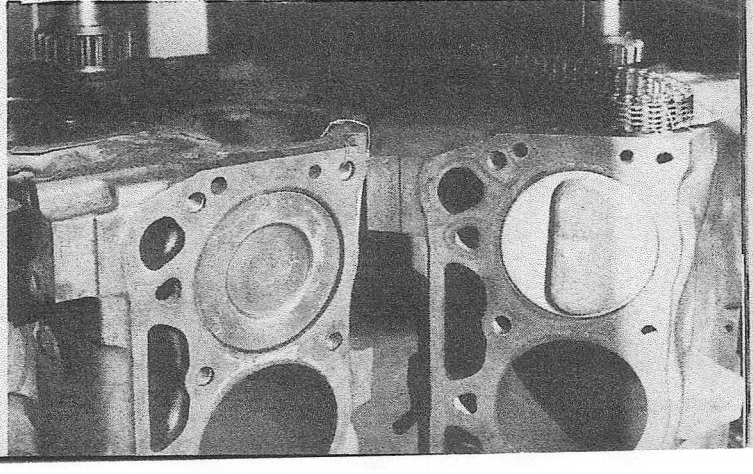


Ford's 250-inch block (left) features seven main bearing crank and is far stronger than the 170-inch block (right).



Stock factory piston (left) has a "dish" and is not a performance item. For increased compression, it's necessary to go to a pop-up piston such as the Jahns unit (right).

MAVERICK

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this has not been found to be necessary. In the exhaust department, it has been found that the three-cylinder setup is the best. This system has the three front cylinders going into one collector and the back three into another collector. In this area both Doug's Headers and Cyclone have made systems for all of the 200-cubic-inch cars, but not for the 250 as yet. It would take a little widening to clear the starter due to the larger bell-housing of the 250; however, the bolt patterns are identical since the head is the same on this particular engine.

If you do not want to go to the added expense of headers, be sure to use the 250-cubic-inch exhaust manifold. Also, the head pipe and muffler system is very good since it is a very large section pipe and has a larger muffler than is used on the smaller engines. This is a good reasonable way to go for some additional horsepower without using headers. As a general rule, headers do not add anything to the performance of this engine before 4000 rpm. For spark lead we recommend to go easy because six cylinders are not too fond of a lot of spark lead. Somewhere in the area of 34 to 36 degrees total should suffice. The engines that are reworked in the manner in which we recommended usually get along nicely on BF32 Autolites.

So what kind of performance can you expect from these six-cylinder Fords? Well, a stock 200-inch Ford Maverick automatic turns the quarter-mile in about 18.3 seconds at 72 mph. A three-speed 200-inch Maverick with Offenhauser's three one-barrel carburetion setup and Doug's headers can stop the clocks at around 80 mph in just over 17 seconds. With a four-speed transmission, this same car can run 16.6-second ETs! A stock 250-inch Maverick with absolutely no work except a four-speed transmission will equal the 200-inch Maverick with the three one-barrels and headers, about 79 mph in 17.2 seconds. These figures may not seem impressive at first, but consider that we're working with engines half the size of the so-called super cars and we haven't even scratched the surface yet as far as all-out modifications go. Six cylinders are a new way of life for most of the hot rodding fraternity, and they take a little getting used to, but pound for pound they can hold their own with the V-8s. Just to prove it, we'll be doing articles in the near future on the Ford 250, progressing from the stock version to a modified unit that'll strike terror in the hearts of many a V-8 super car fan. Stay tuned for the fun and excitement as POP ROD explores the world of the six-cylinder.