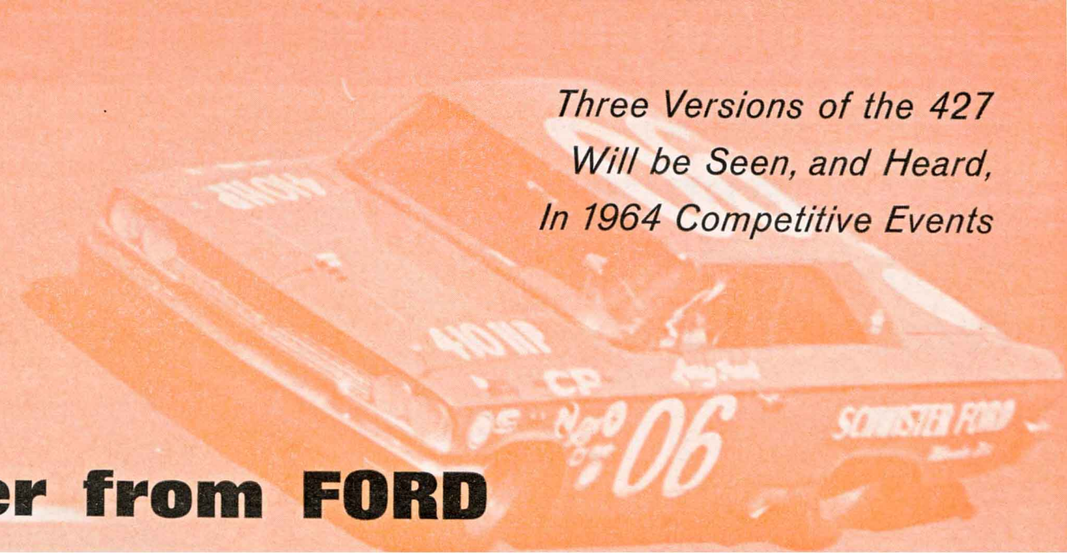


Three Versions of the 427 Will be Seen, and Heard, In 1964 Competitive Events

More High Performance Horse power from FORD

BY JOHN R. BOND

AS A PART of Ford's overall program of Total Performance, the highly successful 427-cu. in. engine again will be available in 1964 in three versions. As of this writing (just before the Daytona 500) there is no official designation for the three and we shall call them A, B and C.

A) This is the volume production version of the 427-cu. in. engine readily available as an option in the big Fords. There are no important changes over last year and the production schedules call for building 10-15,000 units during the model year. This engine develops 425 bhp and, considering this formidable output, is a reasonably practical and tractable power plant for everyday use by those who want something rather special without the problems inherent in special-purpose engines B and C. Ford calls it the 427-8V (427 cu. in., 8 venturis—from two 4-barrel carburetors).

This 427 street engine has a nominal compression ratio of 10.7:1 and it can actually be driven on normal premium fuel, though super-premium is recommended. On the lower grades of premium fuel, there is some detonation at low speed, wide-open throttle.

The block has the cross-bolted main bearing caps common to all 427 engines. The crankshaft is cast and the pistons are fitted with a clearance of 0.0042 to 0.0048 in., looser than regular production, but closer than in the other 427 (B and C) units.

B) While the 427-A engine just described costs a lot more than the 390 cu. in./300 bhp "normal" Galaxie option, a second option will be available in 1964—at even more cost. This is a new departure for Ford, and is essentially an engine designed especially for the drag racing enthusiast. The rated horsepower of this engine is the same as the A unit (425 bhp) but it develops more torque than the 427-A. It has two 4-barrel carburetors, a special intake manifold, heads with revised ports and a camshaft with minor changes to give slightly more overlap. This is a "production" engine and can be ordered through any dealer—and by anyone. However, it is definitely not recommended for street use as it is far too finicky about fuel.

C) The 427-C engine is in an entirely different category. This is the all-out track-racing engine, designed specifically for the high-speed NASCAR circuits. It is not for sale and only bona fide contestants in this area of racing can get one.

It has only one 4-barrel carburetor, as required by the rules. Ford won't say how much horsepower this new model develops, but after the shattering performance of the staggered-valve Chevrolets in early 1963 we estimate in excess of 520 bhp at possibly 6500 rpm. (The Chevrolets were reputed to have 550 bhp.)

As good as the 427-A and B engines are, the technical interest centers on the changes Ford has made to offset the potential threat of certain competitors in the all-important NASCAR circuit. As mentioned, Chevrolet pulled a surprise last year with a semi-secret, but still legal, super-engine which shattered all records at Daytona, but failed to win. Pontiac doesn't ever admit it builds racing engines, but its reputation is formidable and cannot be discounted. Nor can the Chrysler engines in Plymouths and Dodges be overlooked.

Since Ford has announced that it is out to win, not to play, the principal details of the 1964 NASCAR Ford engine have been released to the readers of *Car Life*, through the cooperation of the Ford Engineering Staff.

This is a very special engine, positively not for normal street use although it has evolved from the basic 352-390-427 cu. in. production engine.

The cylinder block is an example: It goes down the same automated machinery line as do the 352, 390 and 427 high production blocks. The unique cross-bolted main bearing caps of all 427-cu. in. engines, however, call for a special, additional operation. But the 427-C, alone, gets a special machining operation in which milling cutters machine reliefs near the top end of each cylinder bore so that gas flow around the extra-large valves is not restricted.

The relieving operation brings us back to the problem of best possible breathing ability—which means ultimate horsepower. Staggered valves (*à la* Chevrolet) or inclined valves in hemispherical or pent-roof combustion chambers offer definite advantages. But Ford wanted to do the job with a minimum of changes which would require special off-the-line machining. Therefore, the engineers chose to stick to all valves in line at the standard (for Ford) valve inclination of 13.5°. Ford engineers said they do not consider this slight restriction much of a handicap.

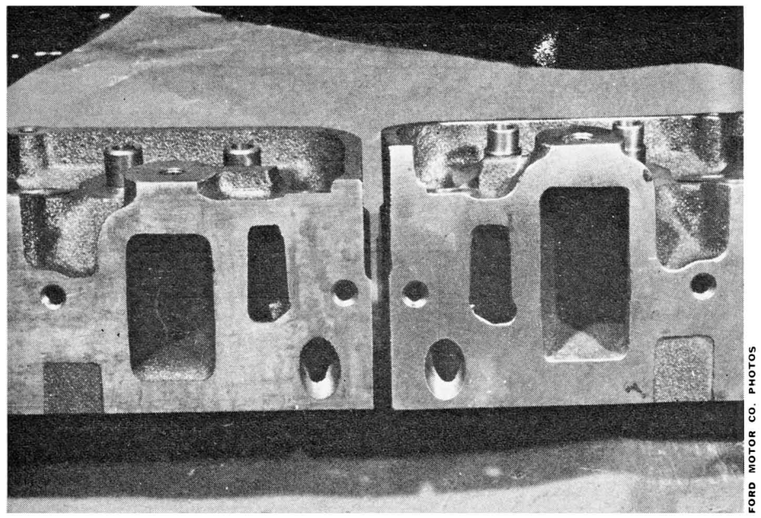
The 427-C engine also has new cylinder heads with even larger ports than before, especially streamlined to match with an all-new intake manifold similar to the elevated high-rise design announced in mid '63. This new intake manifold has larger passages and mounts a huge Holley 4-barrel carburetor. All throats are 1.75 in. in diameter.

Another, less obvious, reason for retaining in-line valves at 13.5° concerns the rocker-arm geometry. This is a very tricky business and Ford feels that, through the years, it has developed the best rocker-arm design in the field. The combination of proven design, plus even better breathing through the new manifold and heads, has obviously worked; valve head diameters and valve timing are unchanged from the 1963½ specifications.

On that subject, Ford engineers feel that valve head diameter specifications are unrealistic. They specify only the actual effective diameter at the outer seat contact point; 2.16 in. for intakes, 1.70 in. exhaust. For the record, the actual valve head diameters are 2.22 and 1.75 in. This adds up to 3.97 in. or 94% of the actual bore dimension. Good breathing demands ample clearance space around each valve, hence the need for the extra notching operations at the top of the cylinder bores mentioned earlier.

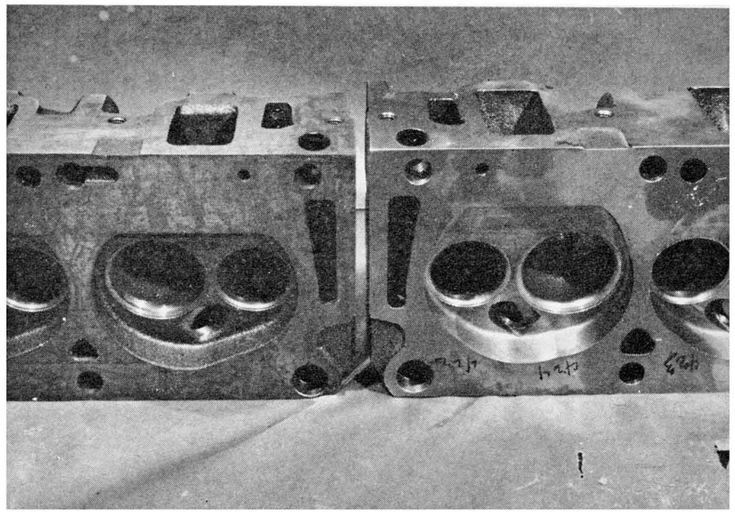
Ford also feels that the usual valve timing specifications are also meaningless. The engineers say that their NASCAR camshaft, with 0.1 in. tappet clearance, gives a valve timing sequence of 8.5-36.5-39.5-11.5°. This is an accurate and practical way to check valve timing because of the discrepancies caused by opening and closing ramps at actual running tappet clearances. However, for the record, the theoretical valve timing sequence in ▶

THE NEW intake ports (right) are raised and have more area for an easier turn with the high-rise manifold.



FORD MOTOR CO. PHOTOS

THE LATEST combustion chamber (right) is machined with special scallops to match the cylinder bore machining.



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normal parlance at 0.025-0.028 in. clearance is 46.5-97.5-100.5-49.5°, by our calculations. This means 324° duration and an overlap of 96°, which is pretty wild by any standards. Valve lift is 0.5 in. and valve spring pressure is 255-280 lb., maximum. These springs are the single type with special dampers to eliminate flutter at critical speeds.

The cross-bolted main bearings caps are made from a special high-strength alloy cast iron. The crankshaft is drop-forged steel and all bearing surfaces are surface hardened by the Tocco induction heating process. The cast shafts are perfectly satisfactory for street use, or even the occasional weekend drag, where 6000-6500 is reached only intermittently. But 6500 rpm (plus) continuously, for several hours, calls for a forged steel crank. Pistons are impact extrusions and have narrower rings than before, only 0.062 in. wide for the two compression rings, only 0.125 in. for the oil rings. The oil pick-up tube has been enlarged to 0.625 in. inside diameter and special Perfect Circle oil seals are used on each valve guide. These are Teflon wiper-type, bonded to the valve guide for good oil control at continuous high speed.

The high-rise intake manifold raises the 4-barrel carburetor mounting flange by 2 in. In NASCAR high-speed events, underhood temperatures are no problem because of the high-speed air blast, so the usual carburetor insulating flange can therefore be omitted. The fan belt, though a minor detail, has been improved by eliminating the usual tape-type wrapping (which frays) and taking advantage of the space available for additional Dacron circumferential cords inside the molded rubber.

A rather unique, cast, valve tappet has been evolved as a result of drag racing experience and it will be used on all 427 engines. In drag racing even the best of drivers will occasionally miss a shift and cause the rpm to go sky high—as much as 9 or 10,000 rpm. When this happens, something usually breaks. In previous engines, it was the tappets. The new tappet is cast with spiral shaped passages to give adequate lubrication, full length bearing surface and low weight.

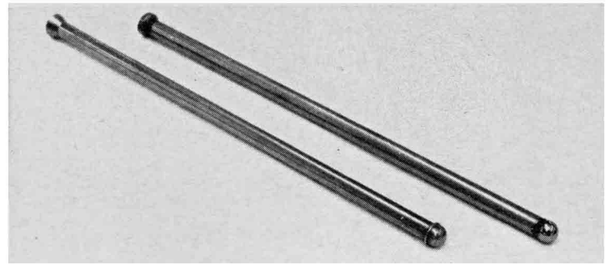
Pistons for the 427-C are similar to last year's except that narrower rings are used, as mentioned earlier. The narrower oil control ring is a new development though of fairly conventional design incorporating two narrow steel scrapers and a special expander spring to hold the scrapers apart and in contact with the cylinder walls. The extruded piston is formed with a pop-up type crown and cam-ground slipper skirts. The clearance specified for these pistons is remarkably close, 0.006 to 0.007 in., considering the over 6000 rpm continuous duty requirement. The nominal bore size is 4.2336 in. and production tolerances allow a maximum bore of 4.2364 in. (stroke is 3.784 in., plus or minus 0.004 in.).

Tolerance stack-ups allow the compression ratio to vary somewhat. Ford recommends selective assembly for racing purposes so that the actual ratio comes out exactly 12.0:1. This is said to be optimum with the Pure Oil racing fuel generally supplied around the NASCAR circuit.

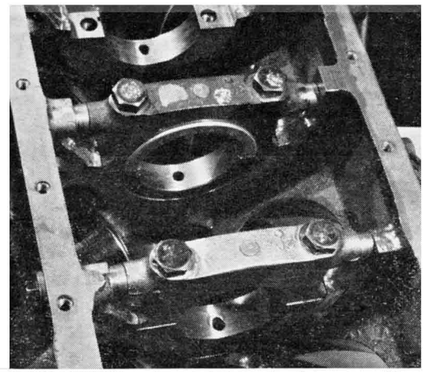
Another recommended tailoring job for this engine involves bearing clearances. Special color-coded bearing inserts are available to the racing group so that bearing clearances can be maintained at exactly 0.003 in. without the need for grinding the mains and pins 0.001 or 0.002 in. undersize (a very difficult operation).

Spark plugs for NASCAR usage will be Autolite BF-601 and it is very interesting to note that these engines will not use a transistor-type ignition system. The reason for this is that a special double-breaker distributor has been developed which is perfectly adequate, is somewhat more reliable and is better understood by the mechanics responsible for these engines.

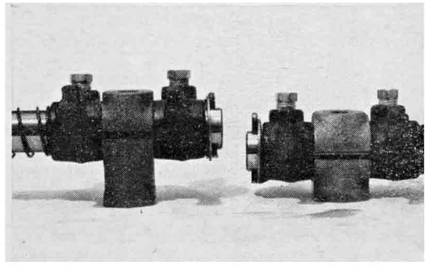
The big question, before the first race, remains: What will Chevrolet, Chrysler and Pontiac send to Daytona? Ford makes no secret of its plans and ambitions and it looks as if Ford now has a clear road, at least in NASCAR racing, barring any serious problems. ■



NEW PUSH rod (lower) has stronger attachment areas between tube and end fittings.

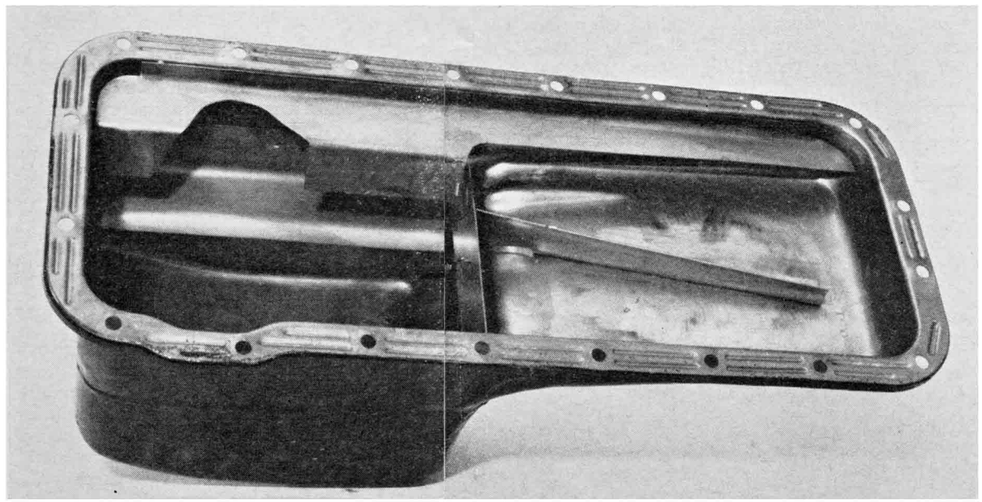


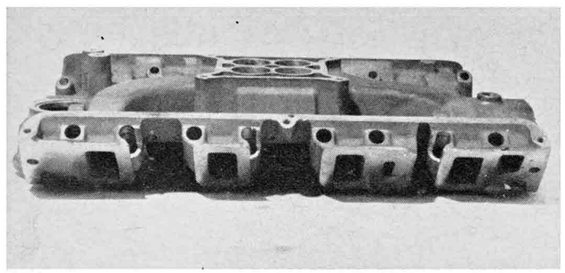
CROSS-BOLTED mains apply to center 3 bearings; the e bearings are well supported by the crankcase structure



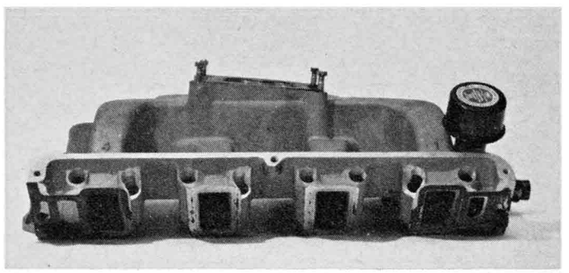
THE ROCKER shaft is not lower; the head is thicker and shorter brackets (right) provide a sturdier support.

SPECIAL OIL pan doubles capacity and baffles are used to insure oil feed to the pump intake.

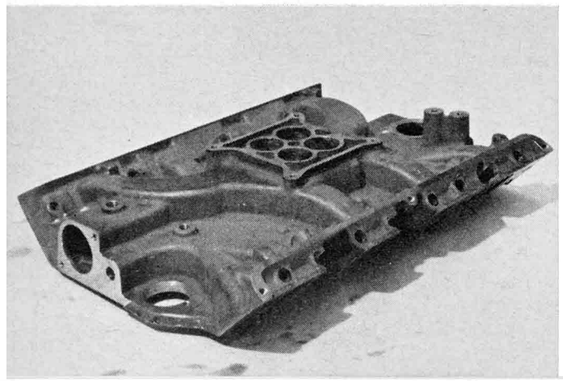




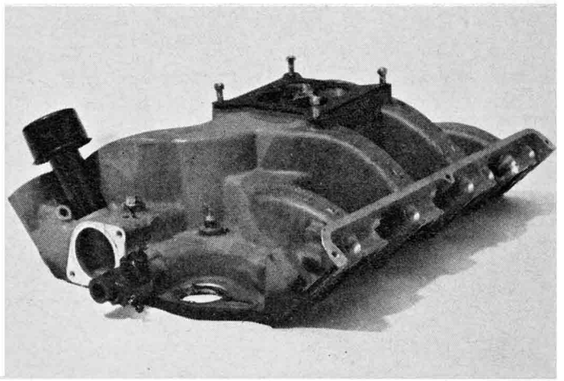
LAST YEAR'S high-rise Daytona intake manifold had nearly square ports.



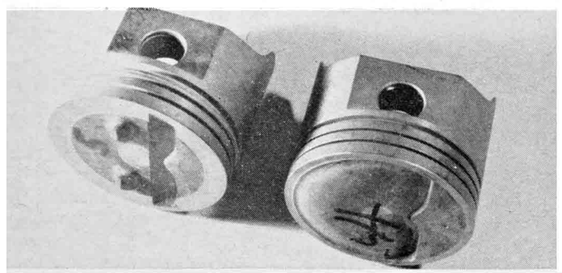
NEW HIGH-rise manifold has taller ports for better fuel charge flow.



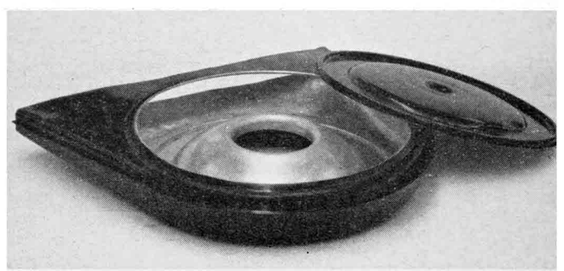
THE 1963 manifold required a bolt-on spacer for carburetor mounting.



EXTRA HEIGHT of 1964 manifold is obvious; no spacer is required.



NEW PISTON (right) gives better combustion, runs cooler. Good valve train reliability allows removal of former buttons.



SPECIAL AIR intake chamber is designed for smooth, easy entry of ram air at 160-plus mph.

SLIGHTLY exaggerated dotted lines show how cylinder bores are scalloped for better airflow with oversize valves.