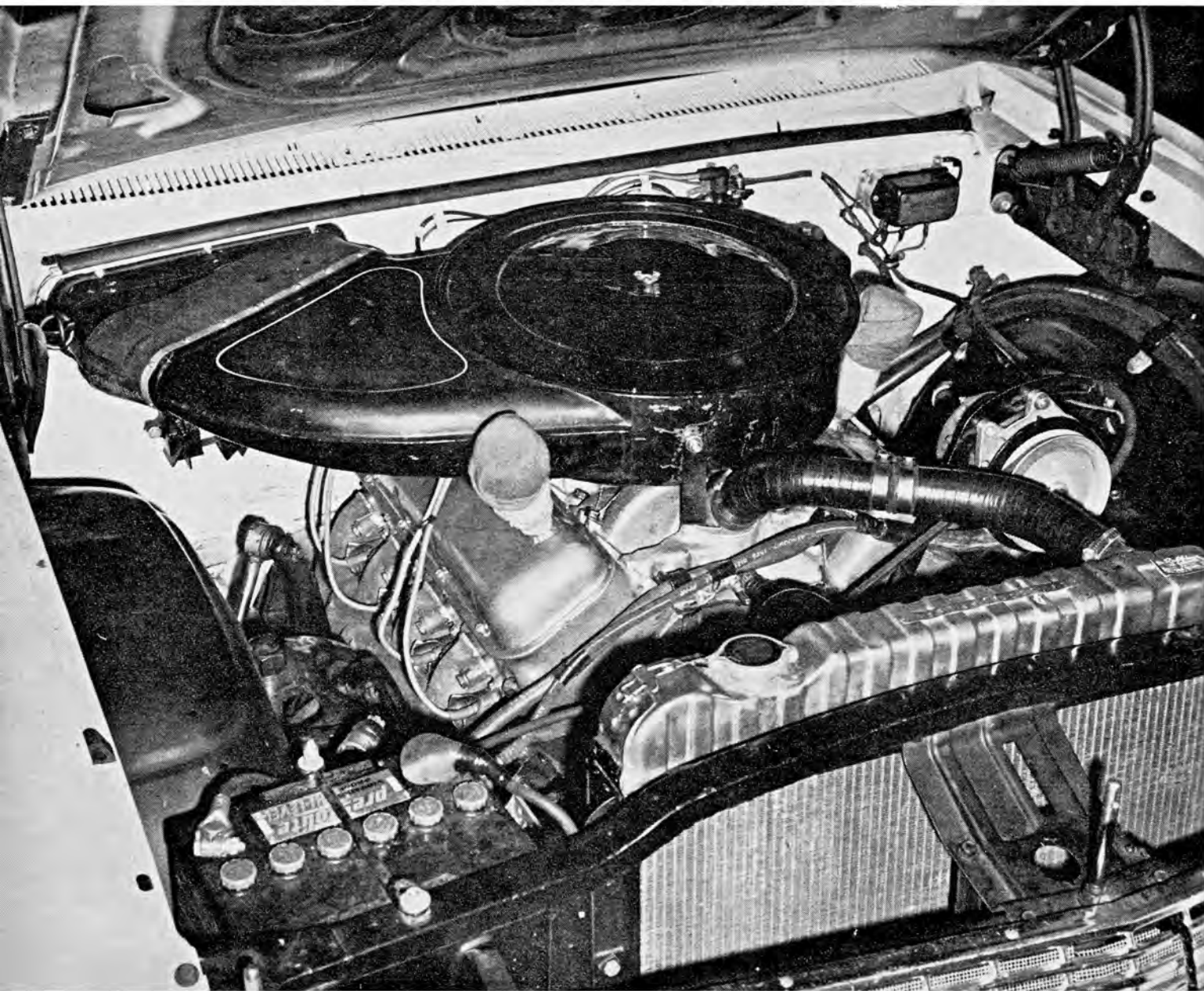


CHEVROLET'S 427 MYSTERY V8

*The most powerful high performance engine at the 1963
Daytona 500 was a new V8 by Chevrolet. Unfortunately,
these engines are not for sale*

—by RAY BROCK

Chevrolet's new 427 high performance V8 can readily be recognized by the wide, straight-sided rocker covers. One of the important reasons why the engine is so strong lies in the use of a fresh air supply from cowl vent to the air cleaner. At high car speeds, there is reportedly a mild supercharge of intake.



Five years ago, Chevrolet found that they needed a more powerful optional performance engine to handle the requirements of increased car weight and power-absorbing accessories. The little 265-inch V8 introduced in 1955 had done an admirable job and after expansion to 283 inches in 1957 satisfied most customers, but it still did not fill the desires of many buyers.

A new larger displacement Chevrolet V8 engine was ready for the '58 model year but this particular engine had been designed for Chevrolet trucks, not automobiles. The passenger car division "borrowed" the 348-inch truck engine, made a few minor changes to compression, carburetion and cam timing, and offered the engine with either four-barrel or triple two-barrel carburetion and ratings of 250 and 280 horsepower. Later in the '58 model year, more compression, mechanical lifter camshafts and other changes were made to give a pair of high performance 348 engines rated in excess of 300 horsepower.

Throughout the 1958, 1959 and the early part of the 1960 model years, Chevrolet high performance engines based on the 348-inch V8 asserted themselves strongly. Midway in

the 1960 season though, some of the other manufacturers who also offered high performance engine options seriously challenged Chevy. Buyers wanted performance and Chevrolet intended to keep pace so the 1961 model year brought a 409 cubic inch high performance engine, a bored and stroked version of the 348.

Throughout 1961 and 1962 model years, the 409 was a popular powerplant and many thousands were sold but their success became more and more limited to the quarter-mile drags and short track racing. Owners who campaigned with them on the high speed tracks like Daytona, Darlington, Milwaukee and others found that the 409's just would not match the competition. The original truck engine blood lines finally started to show and the 409 could not match the high speed output of some of the competitive engines.

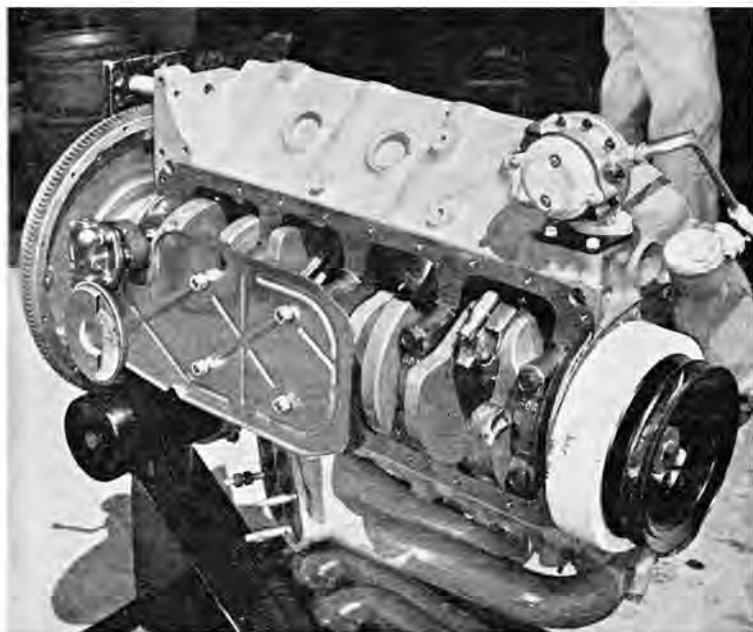
Two steps were taken by Chevrolet to improve their performance image. First, for 1963 the 409 engine was stroked to raise displacement to 427 cubic inches. Secondly, a completely new 427-inch V8 was designed by Chevrolet Engineering. The first of these 427 engines, evolved from the 348, is also known as the Z-11. The all-new 427 is a mystery engine and specifications on this V8 are almost non-existent. This story contains the first information printed on the new 427 and all data and photos were obtained in real cloak and dagger fashion.

We first heard rumors about a new high performance Chevy engine late last summer. Nothing official came out of Chevrolet but bits of information came filtering through the gossip channels that operate in Detroit. One of the best ways to find out what's happening in one company is to ask their competitor because they have usually heard something. Not always correct, but at least they'll have heard something. Some of those early rumors about Chevy's new V8 and how they proved out were: Conventional type block with head surfaces perpendicular to the bores (True); an overgrown 327 (False); overhead camshaft (False); odd valve layout (True); hemispherical chambers (False); and, fantastic amounts of horsepower (True).

During the winter we heard that Chevy had run tests on GM's 5-mile test track at Mesa, Arizona, and had turned trap times in excess of 180 mph with lap speeds at better than 178 mph. Our informant also reported that the test car, equipped with heavy-duty components and roll bars just like cars run in NASCAR, had run an accumulative total of 500 miles in excess of 172 miles per hour. Even though GM's Mesa track has nice gentle turns and is banked for high speeds so is "faster" than Daytona, we figured that if the speeds reported were correct, some Chevy drivers were going to shake up the troops about the time practice started for the 1963 Daytona 500. (They did. Read Daytona report on page 26).

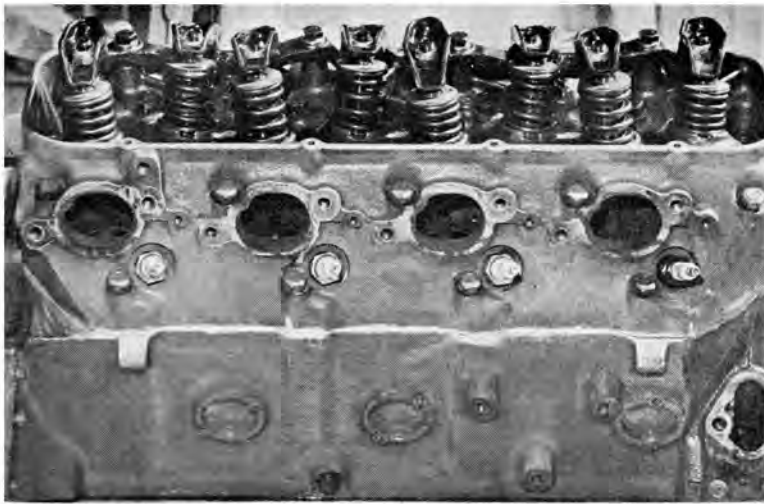
Although there were five 1963 Chevrolets with the new "mystery" 427's entered in the Daytona 500, Chevrolet had no press information available or forthcoming on the engine. In keeping with a recent General Motors top level edict that all divisions stay out of racing and de-emphasize

continued on following page



ABOVE LEFT — Lower end of the H-D 427 looks identical to earlier style V8. Crankshaft and rods are same as Z-11 and main bearing caps do not have special support or extra bolts. Oil pump is slightly larger in capacity and baffle keeps oil from sloshing. Fuel pump, oil filter same as Z-11.

LEFT — Stamped steel rocker arms have 1.65:1 ratio and are lubricated by oil through tubular pushrods from lifter. Deflector attached to inside of rocker cover directs oil to sintered metal rocker pivot ball. Aluminum intake manifold acts as engine top cover. Note directness of intake runners.



Exhaust ports are nearly round with only a slight intrusion caused by head cap screw boss. H-D 427 port is smaller than Z-11 port but more effective. Assembled valve train is erratic looking due to valve angles.



Minus springs, it's easy to see how valves are angled to favor port supplying them and also to open away from walls. Note cast pushrod guides.

CHEVY'S MYSTERY V8 continued



high performance, Chevrolet wouldn't talk about the new engine. The car owners that had been sold the new engines had gotten them before the GM edict was made the latter week in January and although they had enough parts and pieces for the early part of the racing season, they didn't know what their status would be later on because from all they had heard, Chevy was dropping plans to produce more of the new engines.

Our first look at the new 427 was in the garage area at the Daytona International Speedway ten days before the 500. As you might expect, number one conversation subject at the track was the way these engines ran. Using the known output of other brands of high performance engines and the way they ran on the Daytona track; experts who should know estimated the Chevy 427 was delivering 500 horsepower or more. What made them so strong? Chevrolet

wouldn't talk and most of the mechanics working on them refused to give information so our main objective during the ten days we were in Daytona was to find out all we could about the most fantastic engine to come out of Detroit in years.

Photographer Bob D'Olive and I haunted the garage area where all work has to be performed under NASCAR supervision. Any time a crew went to work on one of the five Chevys, we sneaked pictures and tried to see as much as possible. We got several interesting shots but still didn't have exactly what we needed by the end of the week. We got lucky the day before the race though and finally one of the car owners agreed to let us shoot pictures of engine pieces and take measurements if we'd stick around until the morning after the race. This we happily agreed to do.

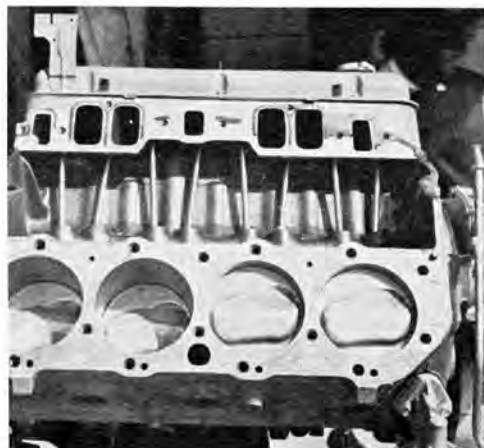
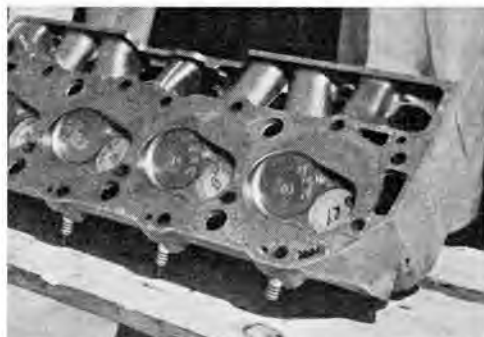
For comparative purposes, we will refer to the older style 427 engine by its code name Z-11 and the new engine as the Heavy-Duty 427, or H-D 427. This will, we hope, eliminate the confusion created by the fact that both engines have the same bore, stroke and displacement.

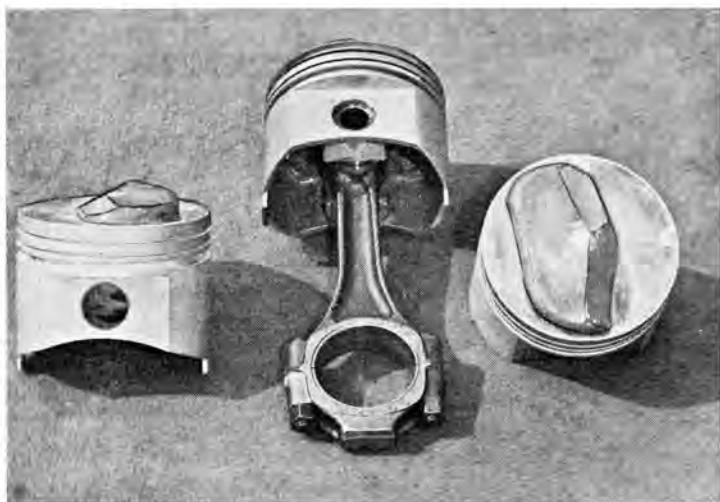
Externally, the two engines do not have too much similarity. The Z-11 has rocker arm covers that are scalloped along their bottom edge; the two center exhaust ports on each head are close together and viewed from either end, you can note the Z-11 block is cut 16° from perpendicular to the bore. On the H-D 427, rocker covers are wider and straight on both sides; exhaust ports are equally spaced along the head; aluminum tubes protect spark plug leads from manifold heat; and the block is surfaced 90° from cylinder bore.

TOP LEFT - Valve train for H-D 427 is similar to that of Z-11 except rocker ratio, screw-in rocker stud. Pushrods have tip inserts, look centerless ground.

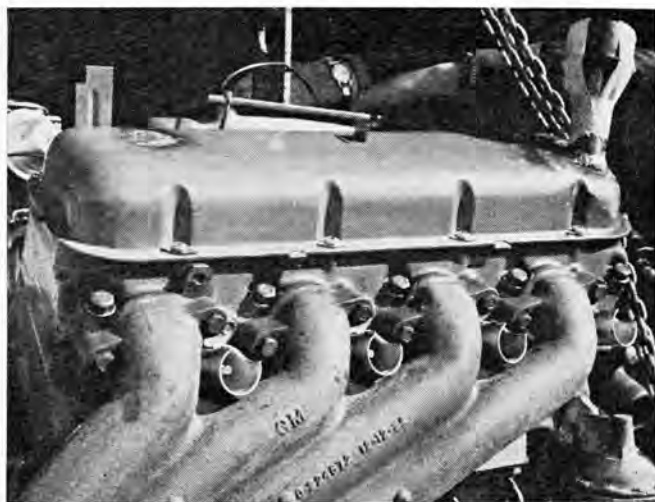
CENTER - Wedge chamber is quite deep and valves alternate length of head. The valve heads are not on parallel plane. Spark plug position favors intake valve.

LEFT - Intake ports are wide and have large corner radii. Pushrods angle so that they align with valve angularity. This also permits the extra wide ports.





Pistons are impact extrusions, have slipper skirts, three rings, large pop-up section to get desired compression ratio. Connecting rod is same as Z-11 rod, pin presses into the rod.



Headers are light considering they're cast iron, have individual round passages for each cylinder. Aluminum tubes slip into seat around plug, protect high tension lead from heat.

The intake manifold on the H-D 427 acts as the engine top cover like the 348's and early 409's used but the late '62 409's and Z-11 engine use a raised intake manifold with extra cast aluminum cover plate over the lifter chamber. External similarities of the two 427's include distributor at the rear of the block, fuel pump lower right front, identical water pump, and oil pan sump to the rear. The H-D 427 is reportedly 45 pounds lighter than the Z-11 and only 49 pounds more than a fuel-injected 327 Corvette V8.

Inside the engine, changes are more pronounced. There are a few parts in the H-D 427 that appear to be interchangeable with the Z-11 but since we did not have official information on the subject, we'll have to do a bit of guessing and might miss slightly.

BLOCK

As mentioned earlier, the big change here is the block surface in relation to bore. The Z-11 and its predecessors had deck surfaces cut 16° from perpendicular to the bores and almost the entire chamber volume was contained in the upper part of the block. The H-D 427 design returns to the more conventional 90° from bore for deck surfaces with combustion volume in the cylinder heads. The lower end of the H-D 427 appears to be almost identical to that of the Z-11. Main bearing caps are cast steel and the lower block surface is practically at the main cap part line. No cross-bolted Y-block like Ford or four-bolt main caps like Pontiac are used. Evidently, Chevrolet engineers experienced no trouble in the main bearing region with the Z-11 so had no reason to beef the lower end of the H-D 427.

The oil pump on the H-D 427 mounts on the rear main cap like the Z-11 but

appears to have slightly larger gears in the pump for increased oil capacity. The screened pickup is fixed slightly above the bottom of the sump. A baffle mounts off extensions on the number three and four main cap screws to prevent oil sloshing on corners. A full-flow oil filter mounts at the lower left rear of the block, same location as used by the Z-11.

CRANKSHAFT

With the possible exception of balance characteristics, the H-D 427 crankshaft is identical to that used by the Z-11. Main bearing and rod journals are 2.500 and 2.200 inches for both V8's. Forged steel shafts are used for both engines and the stroke is 3.65 inches. Bearing material for the two engines is the same, Moraine 500 aluminum.

PISTON AND CONNECTING ROD

There is, of course, a big difference between the Z-11 and H-D 427 pistons.

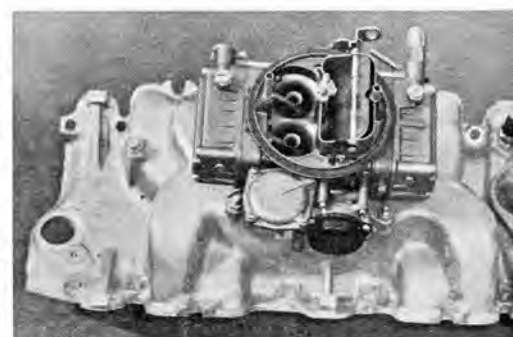
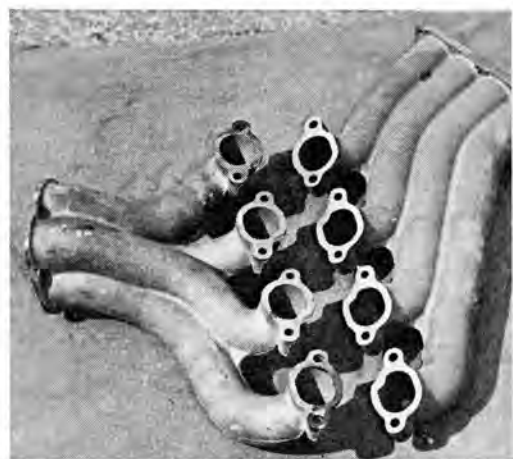
continued on page 98

photos by Bob D'Olive

TOP RIGHT — Inside diameter of cast headers is just under 2 inches. Each passage is designed to match individual head pipes, give 40-inch total length.

CENTER — Worm's-eye view shows how headers end in flanges. Chassis clearance dictates the in-line position on right, cluster arrangement on left side.

RIGHT — Large Holley carburetor tops intake manifold. Runners in manifold have minimum of bends and are high so they direct charge straight into ports.



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CHEVY'S MYSTERY V8

continued from page 43

Since the Z-11 had the major portion of the chamber in the angled block, the piston was much higher on one side to close off the chamber to desired degree and get required compression. The result was a heavy, lop-sided piston. The H-D 427 has a square top-to-skirt arrangement but with a large pop-up section slightly off-center in the top to project into the combustion chamber for compression requirements. Quench area between piston and head is very substantial. The pistons are aluminum impact extrusions from cast blanks. They are of conventional three-ring design and have a slipper skirt for stability.

Connecting rods for the H-D 427 appear to be the same as those used in the Z-11 with length, bores and design identical as far as we could tell. Like the main cap design, they are not particularly impressive appearance-wise in size but they seem to do the job quite well.

CYLINDER HEADS

This is where the H-D 427 starts looking unlike anything else on the market. The combustion chamber is all within the head and is of a wedge design but quite different than any other wedge we've ever seen. This wedge is very deep and each chamber is angled approximately 18° from the longitudinal plane of the head. Valves alternate I-E-I-E-I-E-I-E with no two like valves adjacent. Compression ratio is approximately 11.5 to 1 for the H-D 427 according to chamber volume information we obtained.

One of the important reasons why this H-D 427 is so strong is obviously the arrangement of valves and ports. It is a little hard to explain the valve layout but try to visualize it this way: Each valve is tilted in two directions from the conventional wedge chamber valve layout. First, the intake valve stem is tilted several degrees toward the intake manifold side of the head. The exhaust valve stem is tilted sev-



Head pipes have individual 1 7/8-inch steel pipes of varying length so that total of header and pipe is 40 inches from valve to the 4-inch collector pipe.

HOT ROD MAGAZINE

eral degrees toward the exhaust manifold side of the head. This places the intake and exhaust valve heads in a common chamber several degrees off a parallel plane. Secondly, the stems of both intake and exhaust valves in each chamber are tilted away from each other at the rocker arm end. The final result is an arrangement where each valve favors the port feeding it and also each valve head opens away from the combustion chamber and cylinder walls to provide better gas flow.

As you might expect, the port areas are very generous on the H-D 427 but not quite as large perhaps as those on the Z-11. The splayed valve layout on the H-D 427 permits wider, not-so-high intake ports in relation to Z-11 intakes and the corners have large radii, compared to the Z-11's sharp corners. Exhaust ports on the H-D 427 are almost round with just a slight protrusion caused by a head cap screw boss next to each port. The Z-11's ports are larger in area but square in design. Valve guides in the H-D 427 are of press-in design instead of integral with head casting.

The well-proven individual Chevrolet rocker studs are retained for the H-D 427 but instead of being pressed in the head casting, they are of screw-in design with $\frac{7}{16}$ -inch N.C. threads about an inch long which screw into the head. Each stud hole is placed at the same angularity as its valve so when everything is assembled on a head, the whole setup is pretty cockeyed looking. It sure works though.

Long-reach spark plugs are used and they enter the head at a slight angle so that they favor the intake valve in the deepest portion of the chamber. Standard plugs delivered in the engines are AC 41N but all of the Chevys competing at Daytona used a comparable range in Champion, Autolite or Prestolite since these three companies offer prize money in racing and AC does not.

VALVE TRAIN

Valve sizes for the H-D 427 are the same as those on the Z-11, 2.19-inch intakes and 1.72-inch exhaust, but they are obviously of different length due to the angular arrangement. There does not seem to be anything unusual in their design with the underside of the heads fairly flat and ground to a smooth finish. Two grooves are used at the end of each valve, one for an O-ring oil seal, the other for the locks.

Single springs are used for each valve on the H-D 427. From all appearances, they have the same center-less ground, shot-peened aircraft quality wire as used in the Z-11 engines. A

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CHEVY'S MYSTERY V8

continued

flat-wound damper inside each coil suppresses spring harmonics.

Chevy's stamped steel rocker arms are again used but for the H-D 427 the rocker ratio is 1.65 to 1 instead of the 1.75 ratio on the Z-11. The sintered metal pivot ball is held in place by a $\frac{3}{8}$ -inch N.F. self-locking nut. We heard that later H-D 427 studs have $\frac{7}{16}$ -inch N.F. threads on the top portion of the rocker studs to give increased rigidity.

Two lengths of tubular pushrods are used for the H-D 427. Steel ends are welded into the tubes and holes in each allow oil passage through the tubes for rocker arm and valve lubrication. The upper ends of the push-rods are closely held to a prescribed travel by a pair of cast iron guides that bolt to each head. These guides have an elongated hole for each pushrod to permit deviation fore and aft in relation to the rocker motion but side travel is restricted to close tolerances. The angle of each guide hole is made exactly the same as the valve it serves.


Lifters are the same as those used in other solid lifter Chevrolet engines. A hole in the pushrod seat passes oil from a small hole in the side of the lifter which picks up a supply from the oil gallery along each row of lifters.

INTAKE SYSTEM

Another important reason why the H-D 427 is such an outstanding performer is the intake manifold design. It is of conventional 180° design, meaning that four cylinders feed from one side of the carburetor, four from the other and arrangement is such that intake strokes in each portion of the manifold are 180° (crankshaft) apart. Another important feature is the direct flow of air-fuel mixture from carburetor to cylinder. The manifold sits "high" with runners dropping straight into each intake port. This arrangement, with a minimum of corners and flow directional changes, ensures maximum efficiency. Heat riser passages are made in the manifold (and heads) but they were undoubtedly blocked by mechanics at Daytona.

The intake manifolds we saw at Daytona appeared to have been originally made for a Carter four-barrel but adaptor plates had been fitted to accept the larger bolt pattern of a Holley carburetor. This Holley has $1\frac{1}{16}$ -inch throttle bores for both primary and secondary barrels and this is just about the largest four-barrel we know of. Venturi clusters appear to be less restrictive than the type used by Carter and this, too, probably increases air

continued on page 102

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CHEVY'S MYSTERY V8

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flow and prompted the selection of a Holley.

The air cleaner used on the H-D 427 engine is similar to that used on the '63 Chevys with Z-11 package. It is very large in diameter and has a wide, flat duct on the right rear side which connects via a rubber boot to a flange in the firewall. This flange picks up cool, fresh air from the air box beneath the cowl vent. Not only is this air much cooler than underhood air, so more dense, the cowl vent location is in a high pressure area at the base of the windshield and at the 160-plus speeds turned at Daytona, there was probably a mild supercharge effect. A paper-pack filter element was used. It's a certainty that Ford, Merc, and the Chrysler representatives at Daytona noted this feature so it will probably be commonplace on high performance cars from these companies in the near future.

EXHAUST SYSTEM

There has been a lot of development work done on high performance engines in recent years and most manufacturers have pretty efficient exhaust systems but the new H-D 427 goes the rest of them one better; it has what we would call a "perfect" exhaust system. The cast iron headers are a thing of beauty with individual, round passages for each cylinder and flanged outlets arranged for chassis clearance near the bottom of the engine. Fabricated steel tubing headpipes continue the individual exhaust for each cylinder back to large 4-inch collector pipes.

Information is sparse on the H-D 427 but a quick glance is all that's needed to spot the tuned length of the exhaust. Each passage is slightly under 2 inches inside diameter and from valve to the point of joining the large collector, they measure approximately 40 inches in length. The collector pipes extended to a point just ahead of the rear wheels on the Daytona cars.

The close proximity of exhaust manifold and spark plug location on the H-D 427 prompted the use of short aluminum tubes around each plug to protect the secondary wiring from heat. These tubes slip into a machined pocket around the plug and a single 1/4-inch cap screw through a tab holds them in place.

ACCESSORIES


The Delco-Remy distributor fitted to the H-D 427 has single contacts and a vacuum advance. Advance characteristics are unknown at this time but

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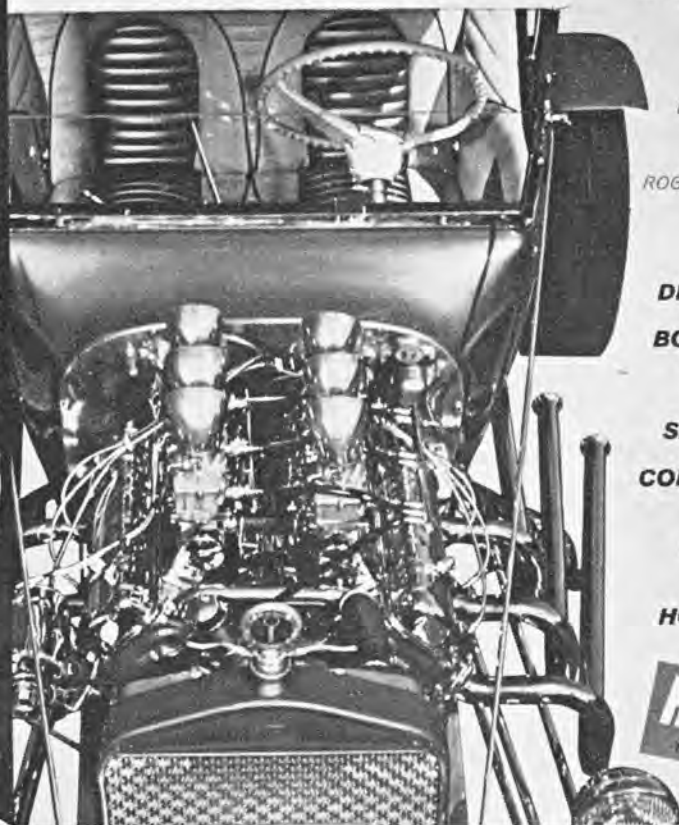
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CHEVY'S MYSTERY V8

continued

they are probably quite similar to the Z-11. Total advance run by the Daytona cars was a close-kept secret but we doubt if it exceeded about 36°-38°.

Water pump, fuel pump, starter, bell housing, flywheel and clutch all appeared to be identical to those used by the Z-11 engine.

POWER

Power output by the H-D 427 is an unknown quantity but from the way the first few engines performed at Daytona, it is considerable and a lot more than any of the competitive makes could produce. As we mentioned earlier, men who have been around the racing game for a long time estimate in excess of 500 horsepower was available.

Now that we have you all fired up on Chevrolet's new high performance engine, you'll probably want to know about the availability of the bomb. Well, this is going to come as a blow but from all we've been able to learn, this engine will no longer be produced in the 1963 model year. We mentioned that General Motors policy makers had put the lid on performance and this engine is due to be shelved. We don't know how many of these engines were built but none were released for drag racing and the few that were released prior to the Daytona 500 seem to constitute the total amount. Whether NASCAR will continue to let them race in view of the fact that they won't be readily available to the public also remains to be seen.

Whether they are allowed to race the remainder of the year or not, the new Chevys made their presence known in a spectacular fashion. It's obvious that the efficiency of this new engine is well above current engines being produced by Chevrolet so maybe it will show up in a milder version later this year as a truck engine or regular passenger car engine. We are going strictly on speculation at this point but we'd guess that the 1964 model year will certainly find this design in Chevy's lineup. Maybe not as large in displacement, certainly not as potent in power unless GM changes their views on performance, but still something to attract sales.

One other little thing we'd like to mention. You can bet that Ford and Chrysler Corporations are going to get busy in the engine development department to see what they can come up with that's a little stronger. Chevrolet may have just performed a nice service to enthusiasts favoring the other camps. They can undoubtedly look forward to better engines, too.

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