

Improved performance with only a moderate decrease in fuel mileage is the reasoning behind the auto industry's move to large-displacement cubic-inch V8's. A few years back, a 350-cubic-inch engine seemed mammoth, but these are now the baby engines in most car makers' lines. Engines have crossed the 450-inch mark this year, and nearly every car maker offers a plus-400-cubic-inch engine. Chevrolet has increased their 427 V8 by 27 cubic inches, resulting in a 454 V8 that is fitted to Chevelles, Chevrolets, and Monte Carlos. And when the Corvette and Camaro for 1970 make their

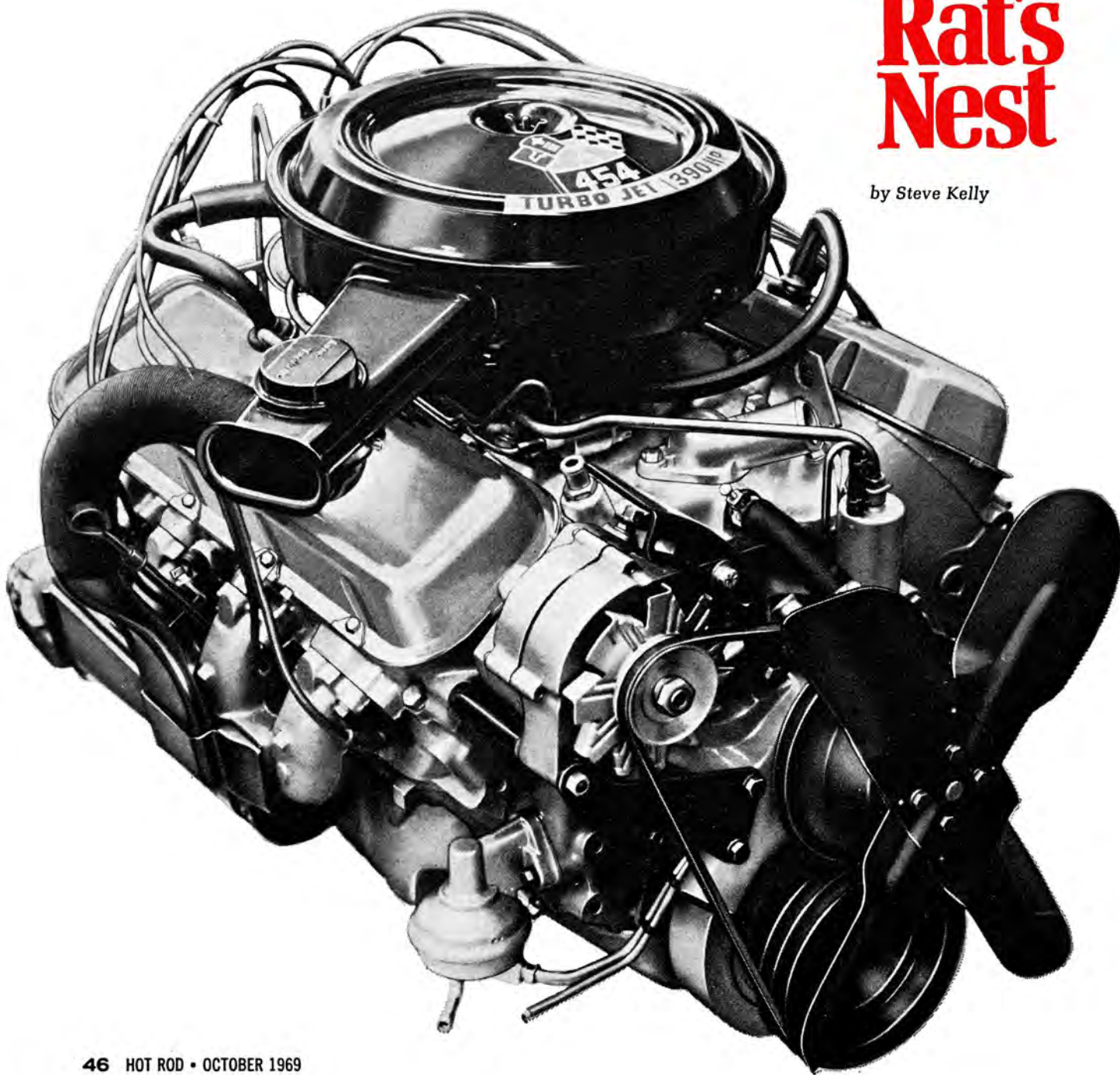
debut later in the year, it quite likely will be fitted to them also; one option will surely be a cast aluminum alloy block.

At present the 454 comes in three horsepower ratings: 345 @ 4400 rpm, 360 @ 4400 rpm, and 390 @ 4800 rpm. Each one develops 500 lb-ft torque, with the 345-horsepower engine attaining this at 3000 rpm, the 360 at 3200 rpm, and the 390 reaching peak torque at 3400. All are single four-barrel carbureted (Rochester Quadrajets) and externally are identical to 427 V8's. Large, relatively smooth flow cast iron headers are used, again identical to those on the 427.

The idea of a 454-cubic-inch Chevrolet engine is now a production reality. Somebody get the record books out; there'll be a few changes needed

Opening up the Rat's Nest

by Steve Kelly



The 345 engine is termed the LS4, and both 360 and 390 are termed LS5. The 390 LS5 comes with Chevrolet models, with the 360 being fitted to Chevelles and Monte Carlos. The LS4, 345 V8 can be ordered only in the big Chevy, as of new car introduction date. All current 454's carry a 10.25:1 compression ratio. The output difference between 345 and 360/390 engines is seen in the camshaft. From studying the specifications, it is quite obvious the 360- and 390-horsepower engines are one and the same, with only the exterior labeling changed.

Hydraulic cams are used throughout, and the rocker ratio is 1.70:1. Intake valve lift on the 345 is .2342-inch, and .3983-inch at the valve. Exhaust lifts .2529 at the cam and .4300-inch at the valve. The 345 cam readings are: Intake opens 30° Before Top Center, closes 70° After Bottom Center, and has 280° duration; exhaust opens 77° Before Bottom Center, closes 61° After Top Center, and has 318° duration. Overlap is 91°. The 360/390 camshaft is just like the one used in the earlier 390-horsepower 427 V8. It reads: Intake valve



Externally identical to the 427, Chevy's "super rat" 454-cubic-inch V8 promises 390 hp at 4800 rpm in the LS5 version. A .24-inch stroke increase accounts for the 27-cubic-inch difference between the 427 and 454. Block height was not altered.

opens 56° Before Top Center, closes 114° After Bottom Center, and has 350° duration; exhaust opens 110° Before Bottom Center, closes 62° After Top Center, and has 352° duration. Valve opening overlap here is 118°. It's a much healthier cam, especially on the intake side, than the 345. Intake valve lift at the cam for the 360/390 engine is .2714-inch, and .4614-inch at the valve. Exhaust lift is .2823-inch at the cam and .4800-inch at the valve.

Benefit could be gained by installing the mechanical lifter L71 series cam from the 427 435-horsepower engine used with Corvettes, but piston clearance because of the higher lift (.5197 intake and exhaust) would be a problem. Special pistons or valve reliefs in the stock pistons would be required. Valve-face diameters on 454-cubic-inch engines are 2.065-inch nominal on the intake and 1.720-inch nominal on the exhaust. These are the same measurements that earlier 396- and 427-sized engines had, except for the 435-horse 427, which used 2.190-inch-diameter intakes.

The additional 27 cubic inches in the 454 V8 is the result of a stroke increase of .24-inch. The 454 has a 4.251-inch-diameter cylinder bore, the same as the 427. Stroke is 4.00 inches, whereas the 427 and 396 have 3.76 inches of stroke (396 bore is 4.094 inches). Only the crankshaft was changed to accommodate the larger displacement. Block height wasn't

raised, though an internal casting change was made to the bottom of the bores directly over both front and rear main bearing locations. This new forged steel crank carries Chevrolet parts No. 3967416 and can be fitted to all earlier big Chevy blocks. However, the casting change made to the front and rear bores was done to allow crankshaft throw clearance. Some material has to be ground away on pre-1970 big-blocks when a 454-type crank is used. The best way to find these two spots is to fit the crank into the journals and revolve it until the crank comes against the protrusions. A steady hand with a port grinder is all you need to clear away the offending iron, and there's plenty of material in this area to allow grinding the required notches without weakening the structure.

Bore spacing is 4.84 inches on all big-block Chevrolet V8's, including the 454. Rod journal diameter is 2.199-2.200-inch on 396, 427, and 454. Bearing clearance limits of .0009-.0025-inch is called for on all production engines. Main bearing journal diameter on the crank is 2.7503 inches by .992-inch width on the numbers one through four positions, and 2.751-inch diameter by 1.2525-inch width on the rear (No. five) spot. Tolerances are shown to be a very slight amount less on the 396/427 mains, but use of bearings and crank from the 454 would produce perfect matching in 396 or 427 engines. All 427 crankshafts used in earlier Corvettes were forged steel, while engines in general passenger car use had cast nodular iron. Exceptions to this are the 390-horsepower 427 in regular Chevrolets and 350- and 375-horsepower 396-cubic-inch engines in Camaros and Chevelles. The 454 crank weighs more than any of the older designs because of its greater length stroke and increased counterweight size due to a heavier and greater rotating mass.

Connecting rod length is 6.130-6.140 inches center to center, and this applies to 396, 427, and 454 displacement blocks. They are interchangeable and are forged steel. Bearings differ from 396/427 blocks to the 454, and as pointed out previously, the 454 bearings have to be used with that crank. It's a good idea to replace bearings, anyway, on any lower end parts swap.

Pistons aren't directly interchangeable from 427 to 454. The added stroke length dictates a shorter-skirt piston design. The '70 cast aluminum, domed-head piston weighs 25.12 ounces, against the 427 piston weight of 24.67 ounces. Skirt clearance is .0020-.0028-inch measured 1.74 inches below the top of the piston, while the 427 cylinder filler calls for .0012-.0020-inch clearance limits on the skirt, at a point 1.91 inches down from the top. Pins are identical: chromium steel, 2.930-2.950 inches long, .9895-.9898-inch diameter, and are locked in the rod. The pin is offset to the major thrust side a distance of .060-inch. Thorough research hasn't been made to find whether the piston could be altered from a 427 to fit a 454, but that task is most easily and most reliably solved by just substituting new pistons. A higher compression design on the replacements will help performance, and this might as well be included in an early big-block update.

Two-bolt main caps will be the general rule on 454's, though 360 and 390 engines may see four-bolt main caps in certain applications. Many good four-bolt main caps, with the outside bolts angled away from the crankshaft, are available and offer better crank retention because of the splayed design outside bolts and the increased height cap usually used.

Internal changes and refinements on this new big-block are few, exterior configuration is unchanged, and the potential is far-reaching. Large cars can make good use of this high-torque powerplant, but its effects as an all-out performance engine can't help but turn out pleasing. This surely isn't the end of progress for the 454; it's fairly certain the Chevrolet Engineering Center is playing with digging out buried horsepower in this design. They shouldn't have any trouble; someone at Chevrolet has already found a way of rating a 360-horsepower engine as a 390, and vice versa. ■ ■