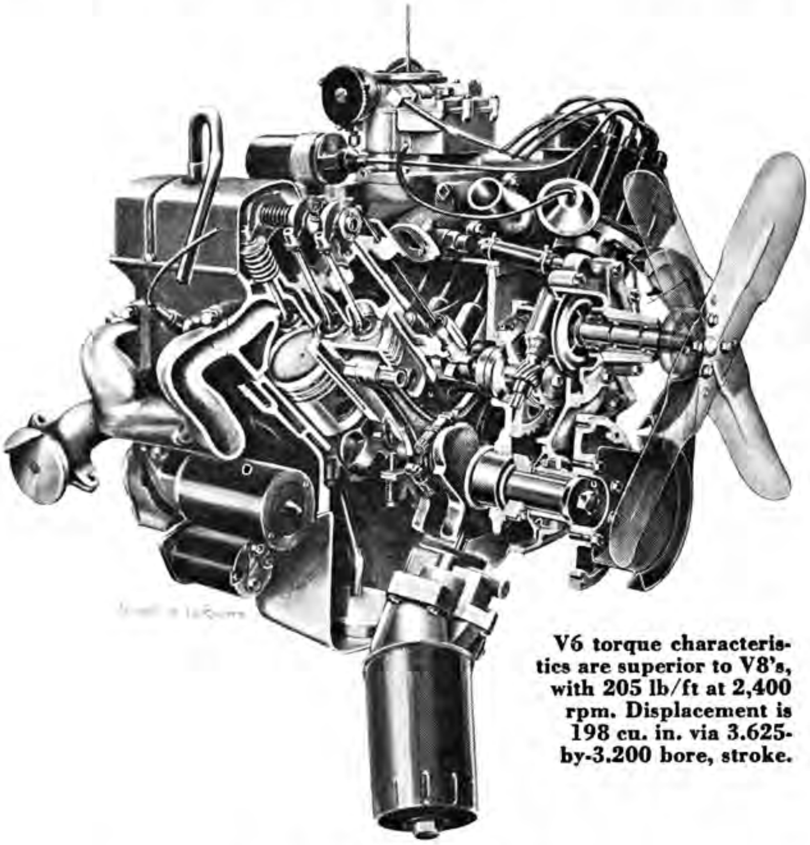
SMALL ENGINES WITH BIG PUNCH

BUICK'S NEW V6



V6 torque characteristics are superior to V8's, with 205 lb/ft at 2,400 rpm. Displacement is 198 cu. in. via 3.625-by-3.200 bore, stroke.

Block and heads are of cast iron. Exhaust manifolds are similar to V8's and many parts such as water pump, distributor housing, are identical.

There is no balance port as such between two sides of manifold. Each barrel feeds three cylinders of one bank. Small connecting passage at gasket cut-out assures a smooth idle.

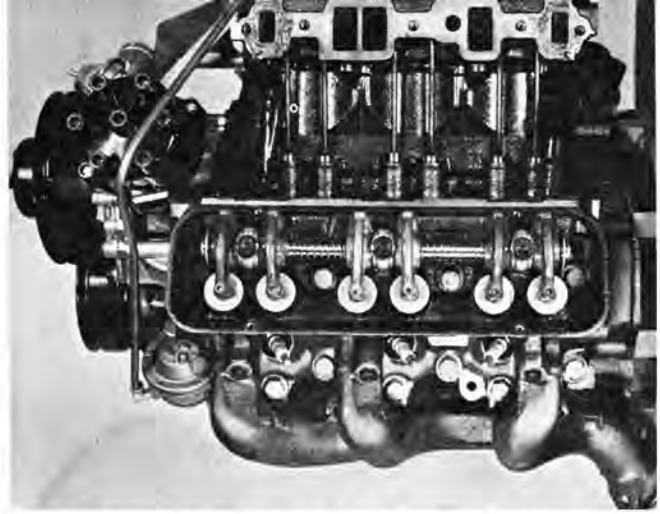
TRADITIONAL CASTING GOES BY THE BOARDS

BUICK, which last year introduced an aluminum V8, is again at the forefront with an engine all-new for '62; this time it's a 198 cubic inch V6 that delivers 135 horsepower at 4,600 rpm. Why a V6? General Motors Corporation says it is much less costly than the aluminum V8 and much easier to produce. This translates itself into approximately a 200 dollar differential between an aluminum-engined Special and one with the V6. However, a short comparison ride between the V6 and V8 in comparable weight cars quickly shows that there isn't that much of a difference during normal driving. Peak torque figures at the low end are within six per cent of each other, and the final word certainly has not been said as far as developing the V6 to its fullest potential.

To the hot rodder, the new V6 means a highly interesting engine that is likely to pull more horsepower per cubic inch than the V8 because of its superior breathing characteristics, a facet to which we'll return later. The V6 is also short, so short it will fit without too much pain into many of the foreign car bodies that are so inexpensive on the used car market now that the compacts have practically shut them out. We do not have the final figures, but the weight of the V6 is between 50 and 100 pounds more than that of the aluminum version. However, if you are trying to fit a car into a class for the strip, this is hardly a major disadvantage.

Most V6's which have appeared to date have been of the 60 or 120-degree "V" type. Width problems precluded going to a 120 or 180-degree angle between banks. A

Cast combustion chambers leave the valves entirely free from shrouding. Spark plugs are centrally located to insure a short, even flame travel. Dishes in the pistons form part of the combustion chamber volume.



The intake manifold is heated by an exhaust crossover. Almost equal lengths of the passages to the individual ports allow tuning for peak torque at given rpm. Water outlets connect from the head to the thermostat housing at the center front of the manifold.

A lot of weight can be shaved from the engine by switching to an aluminum intake manifold and tubular exhaust headers. Switching from forged to cast connecting rods was an unusual step for Buick. The pistons are very similar in design to those of the aluminum V8.

60-degree V6 left to its own devices would have a tendency to yaw about its center, so that the front and rear of the crank describe small circles at twice engine speed. To counteract the secondary imbalance, we would need a balance shaft with a counterweight rotating at twice engine speed.

By going to a 90-degree "V," Buick not only simplified tooling problems but confined the oscillations to the horizontal plane, taking care of them by means of engine mount-tuning. When you pop the hood of a Special with a V6 engine, it appears every bit as smooth as the best V8. In the car, you certainly cannot tell the difference, except by driving a Six and an Eight in quick succession.

The front engine mounts are of a 45-degree type designed to give freedom of motion in the horizontal rather than in the vertical plane. At the rear, the mount is of the horizontal type. Hence, again, there is considerable freedom of motion in the horizontal plane. The amplitude of engine motions does not exceed that of a V8.

The pearlitic malleable iron crank of the V6 is so short and stiff that the rubber-cushioned damper assembly used on the Eight was replaced by a one-piece unit. A series of holes is drilled along the outer edge of the damper. When the engine is being balanced as a unit, steel pins are pressed into these holes to act as counterweighting. This feature is common to all of Buick's engines.

Incidentally, for the benefit of engine balancers, the bob weights are figured just as on the Eight; all of the roatating weight plus half the reciprocating weight, with minor variations possible in coefficients. The flywheel flange also serves as the running surface for a cord seal. And further oil control is gained by a slinger built into the crank. Side seals at the rear main bearing cap are designed to swell on contact with oil, which simplifies installation.

A deep block with sides well below the main bearing center line provides ample beam stiffness, a Buick landmark. Some differences appear between the cast iron and aluminum versions due to casting practice. The aluminum allows more undercutting, since the dies part along the sides of the engine while with cast iron the patterns part from each other top and bottom, calling for simpler draft lines. However, on main bearing webs, more material is taken out since cast iron is stronger than aluminum per unit volume. The water jackets reach to a point just below the ring travel, but do not extend to the bottom of the cylinders. Particular care was used in tying-in the bottoms of the cylinders so that distortion is avoided at operating temperatures.

A glance at the top of the block shows that care was also taken to divorce the cylinder bores from the forces imposed by the cylinder head bolts. The threaded bosses are tied into the outside wall of the block and to ribs running along the valve valley. Since the head is more rigid in the valve valley area than along the outer edges of the block, Buick felt it wise to add extra bolts along the outer edge of the block. Hence the distorted five-bolt pattern around each cylinder. For a given torque wrench reading, the clamping load in aluminum is higher than in cast iron. This is due to a difference in the coefficient of friction between aluminum and cast iron against steel bolts. Thus the V6 cast iron block calls for 65-70 ft/lbs of torque against 50-55 ft/lbs for the aluminum head bolts.

Connecting rod and main bearings are of the Morraine 100 A type, but Morraine 400's are available from Oldsmobile should you decide to go all-out. Bearing sizes are the same as on the aluminum V8. The second main from the front carries the crankshaft end thrust. One remarkable change was the use of cast connecting rods instead of forged ones.

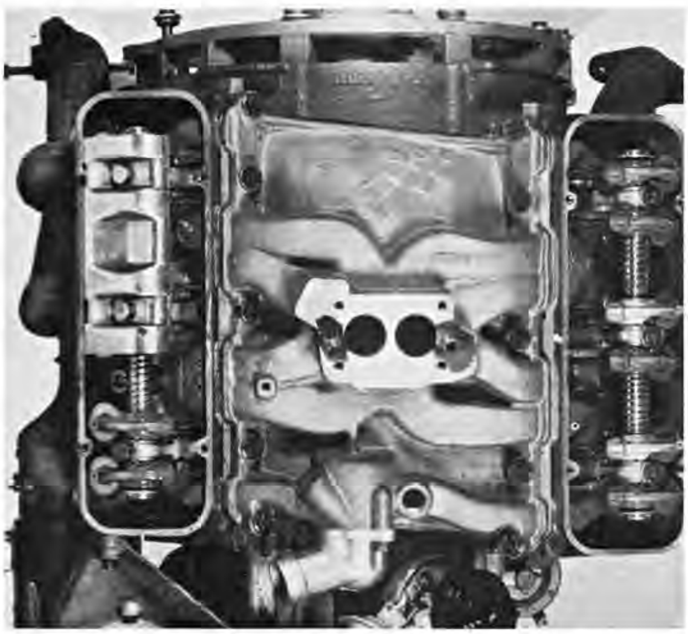
The entire valve train, except for pushrods, cam and rocker shafts, is interchangeable with the aluminum V8's. Die-cast aluminum rocker arms with steel-tipped inserts at the valve and pushrod ends are standard Buick practice, even in the large engine. The V6 cam is slightly hotter; intake and exhaust durations are 295 degrees against 280 for the aluminum engine, and valve overlap is increased from 62 to 77 degrees for the V6.

To appreciate the manifold design, we must first take into account the firing order and firing intervals on a V6. The left bank has the odd numbers and the right bank the even ones which, with a 1-6-5-4-3-2 firing order, insures that firing always alternates from one bank to the other. Conflicting intake or exhaust pulses of the V8 are avoided, as firing between adjacent cylinders on one bank is always spaced by 240 crank degrees. This allows a manifold design where one barrel of the carburetor feeds three logs on one bank, and the other barrel feeds the three cylinders on the other bank. The shortness of the engine results in logs of comparatively even length tuned for torque.

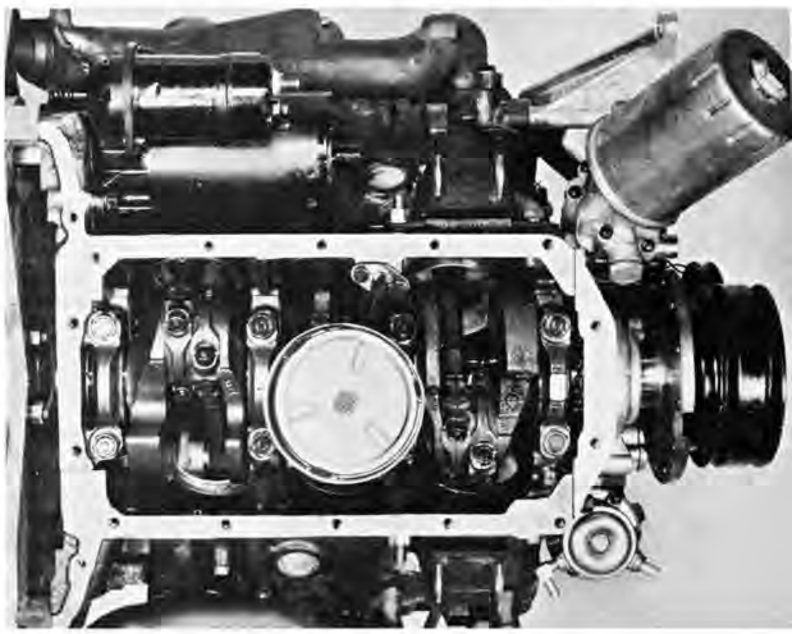
An odd characteristic of the V6, though one that has not caused any performance problems, is that the firings are uneven. The engine is constantly firing at 90 and 150-degree crankshaft intervals. Since the angle between banks is 90 degrees, the transition between cylinders on the same crank throw such as 6-5, 4-3 and 2-1 will take 90 degrees. Transitions from cylinders of one bank to the other take 150 degrees. This happens because in the direction of crank rotation the distance between banks is 270 degrees (360 minus 90) while the consecutive crank pins lead each other by 120 degrees (270 minus 120 gives you the 150-degree spacing). Firing between cylinders of one bank is 90 plus 150.

There is no balance pipe between the manifold sides, but for evenness at idle there is a small cutout in the carburetor base that provides a balance passage. It has no effect at part or full throttle, nor is such an effect needed. The cast iron undersides of the carburetor receive a small supply of exhaust heat from the crossover passage. Buick originally contemplated a water-heated manifold as on the aluminum engine, but quickly changed over to exhaust heat since cast iron does not offer the heat transfer properties of aluminum. A sheet metal baffle on the underside of the manifold prevents oil from hitting the hot crossover passage and charring.

The V6 is an engine that offers limitless tuning possibilities for extracting maximum horsepower per cubic inch. It is certainly to the credit of Buick engineering that they took a bold step forward by disregrading old traditions and coming up with an efficient, workable and low cost mill. It would be interesting to see a car repackaged to take full advantage of the small size of the all-new Buick V6.



The spark plugs have been angled to clear the exhaust ports, and the rockers are aluminum die castings with steel inserts at the push rod and valve ends. Most valve train parts are interchangeable with the V8's.



V6's short, stubby crank has same bearing sizes as V8's, is stiff enough to be used without rubber-mounted vibration damper. Oil filter is angled forward to clear crossmember. Damper holes are for factory use.