Weight, once the hallmark of the American car, suffered a severe setback for '61. We now have a stock V8 that delivers 155 horses from 215 inches and a mere 318 pounds —about half the poundage that power needed a decade ago! That's what happened when . . .

BUICK BUILT A BETTER ENGINE

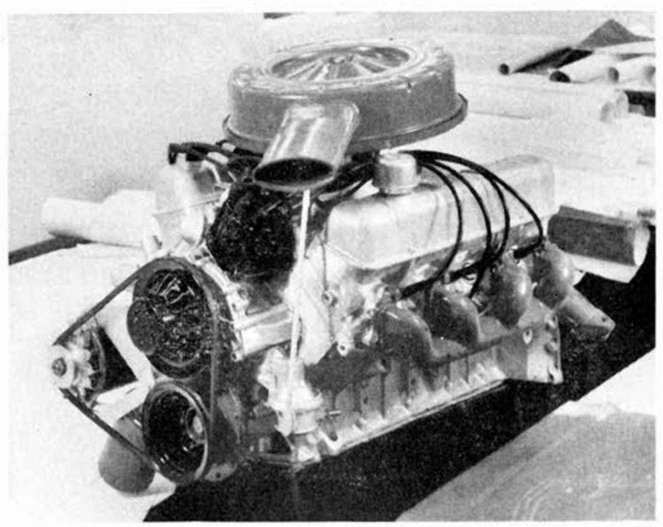
by Karl Ludvigsen

► In the last months of 1948 two new engines were introduced that set the pattern for powerplant design for the decade that followed: the Olds and Cadillac V8s. Now we've entered a new, more progressive era of engine design in which there may be no single prototype. But we'll wager the most widely copied engine in the next ten years will be the superb new aluminum V8 by Buick – now, as in 1948, significantly a product of General Motors. As we'll see later, this engine and more like it make excellent sense for production passenger cars. They'll make a dollar go a long, long way. Our strong interest in this one is also based on its vast potential for use in sports and sporting cars of today and tomorrow, a potential that's predicated more on power per pound than on sheer massive output.

Why an engine of aluminum? The reasons are very interesting. For years the producers of aluminum have urged the use of this metal on the only basis that they thought would have any effect in Detroit: lower cost. This was sound, because it did indeed seem that the industry was far more interested in saving mills than in building a better car. It seemed that aluminum could play a part only if it offered lower finished costs than comparable iron or steel parts, a point on which Reynolds, Alcoa and Kaiser were all supremely confident and infinitely helpful. But this is *not* why Buick built its light-weight V8. It's here because it makes far better overall performance possible at only a slight *increase* in manufacturing cost. It's here because GM wanted to build a better automobile.

WHAT CAN ALUMINUM DO?

Aluminum did more than just lighten the engine. A lighter powerplant meant that pounds could be trimmed off the mounts and supports, in fact off the whole front end of the car, to effect an overall reduction out of proportion to the drop in engine weight alone. If the car's lighter, it can be given the same performance as a predecessor by a smaller engine, which automatically means more miles per gallon. Lighter weight means lower running costs, and with modern



Buick sales department asked that the V8 be handled with care during production to ensure that it retained a shiny "aluminum" appearance.

suspension design it needn't mean a poorer ride. To the contrary, a lighter front end finally brings a balanced ride and stable handling within the reach of the American six-passenger car.

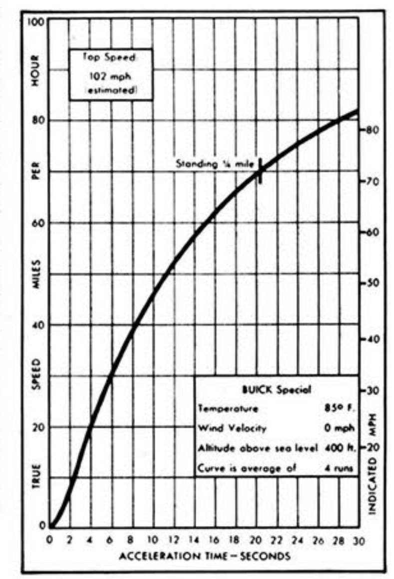
GM's plunge into aluminum is made even more remarkable by its identification in the industry as an "iron company". Its facilities for the casting of iron and forging of steel are huge enough to offer tough competition to rival materials and methods. But the iron industry hasn't improved its techniques to keep pace with the changing character of the automobile business, so Detroit has been forced to look elsewhere for metals that can do the jobs of the 1960s. This switch may inspire the apostles of cast iron to greater efforts, which is just what Detroit wanted all along!

Having decided to make a radical move, GM made it very conservatively. Once given this inch, the engineers were anxious to take a mile or more, but when facing the frown of president John Gordon and the question, "We're spending a lot of money on this; are you *sure* it's going to work?" they were naturally reluctant to go too far out on a limb. The result is that this new V8 is not so much the isolated end product of years or research as it is a cautious first effort, from which great advances are yet to be expected. Everyone associated with it at GM says, "This is just the beginning. We've only begun to learn what we can do with aluminum. Today it's where cast iron was decades ago." This is an exciting prospect.

STARTING WITH AN IRON ENGINE

To begin at the beginning of the beginning, we can go back either to the activities of GM's Engineering Staff Research Laboratories or to the Buick Division; both were doing pioneering work in the design and construction of aluminum V8s at about the same time – 1950. Since Engineering Staff did the initial planning, and also gets much of the credit for "selling" the aluminum engine to GM's top brass, it's fair to start by peering over its shoulder.

The first experimental engine built wasn't of aluminum; it was a little cast iron V8 of 235 cubic inches. Working from this basic engine, a design for aluminum was prepared and the displacement simultaneously increased to 253 inches. Quite a few basic problems had to be overcome in making this first engine structurally sound, but the result was a good test unit with cylinder walls cast integrally with the block. By 1952 these were being installed in Chevys for road testing, and another version of the engine, with wet liners to allow quick, easy changes of cylinder wall composition, was being developed. Later on, to allow direct comparisons with an existing iron engine, some 283-inch V8s were built up



Testing in Opels and Corvairs preceded V8's installation in Buick Special. Curve is for automatic-box car.

around Chevrolet bottom-end parts. All these bigger test units had aluminum blocks with wet liners; it's probably these engines that have led to the persistent rumors about light-alloy Chevy cylinder blocks.

So it wouldn't be caught off-balance. Engineering Staff had begun drawing-board work on a production aluminum engine as early as 1956, under the direction of Darl F. Caris. Thus it was more than ready to steam ahead when the word was passed, in mid-'57, to commence with the aluminum V8. It was originally drawn up as a 180-cubic-inch unit, with room to spare for future increases, but GM's Charles A. Chayne decided, "If you can make it any bigger, let's do it right now." It was then expanded to its present 215 cubic inches (3.50 x 2.80 inches). This first prototype had its cylinder block cut off at the crank centerline, and had a combustion chamber design that was a literal expression of Caris's recent researches in chamber characteristics. The head was perfectly flat, save for shallow recesses for the heads of the vertically-placed valves, and the whole chamber was a cavity cast in the piston crown. These Engineering Staff prototypes were machined by Buick, building experience in aluminum for that divison. The first one was runnng in the Summer of 1958, before the unit was finally turned over to Buick Division for redesign for production.

EXPERIMENTS WITH ALLOYS

Both at Staff and at Buick one of the prime goals was development of an aluminum alloy for the block that would be sufficiently hard and wear-resistant to make iron liners, chrome plating, metal spraying and other expensive expediencies unnecessary. The most promising alloys, after years of experimentation, had been those with a high percentage of silicon. A typical "hypereutectic" or high-silicon aluminum alloy contains 20% silicon, 2% copper, 1% magnesium and 0.5% manganese. GM tried every reasonable alloy from 16% to 20% silicon, with many other alloying elements, and got results that were often very encouraging. The GM dynamometer durability test (100 hours at peak power, 140 hours at peak torque) showed wear characteristics generally superior to those of cast iron, but there was one problem that persisted: that of scuffing of the bores by the rings when the engine was started up from cold. Aluminum engines warm up quicker than their iron counterparts, but apparently not enough to reduce this scuffing. Mainly for this reason, the decision was made to bring the engine out with iron liners cast in place in a block with a more modest silicon content.

There are some interesting sidelights on this part of the program. High-silicon aluminum alloys have a reputation for being hard to cast and hard to machine. At first, the shops agreed completely on the machining tenet. Tool life was short, even shorter than with softer aluminums, which themselves are worse in this respect than cast iron. But as they became more familiar with the material and the tools it demanded (usually tungsten carbide), the machinists found they liked the alloy's solid feel, its hard, crumbling chips that made it easier to hold dimensions.

Though inserted wet liners, in direct contact with the cooling water, have long been used in European designs (a few: Triumph, Alfa, Ferrari, Lancia), not to mention in the early Engineering Staff designs, Buick unhesitatingly ruled them out of consideration for production for several good reasons. One was concern over possible water leakage from a poorly-sealed liner. Remember, there would be eight chances for leakage per engine in this case, and more of the units must be built with less reliance on hand craftsmanship than any of the overseas examples. Also, wet liners usually contribute less to the block's structural strength than does an integral cylinder wall. So strongly did Buick feel on this point, in fact, that it would have remained with a cast iron block rather than take a chance on wet liners (remember the frown of John Gordon).

BUICK'S BACKGROUND

This evaluation of wet liners was not mere theorizing on the part of Buick, which had designed and built the aluminum-block, wet-liner V8 for the exotic Le Sabre and XP-300 experimental cars of 1951. Much of the basic design work on this supercharged engine was done by Joseph D. Turlay, now director of power plant activities for Buick and the man in complete charge of the "X-100 project," as this latest V8 was known throughout its gestation. Coincidentally, the XP-300 engine was exactly 215 cubic inches (3.25 x 3.25 inches), just the same as the X-100 or Buick Special engine.

Few features were carried over from XP-300 to X-100, but one was a crankcase extending below the crank centerline, a Buick trademark for many years and an excellent way to give rigid support to the main bearings. It also allows a more rigid engine-gearbox assembly, by virtue of better bracing between block and bell housing.

More out of sheer enthusiasm than actually necessity, Joe Turlay gave the XP-300 massive main bearing caps that were laced into the block by cap screws at the sides in addition to the usual studs. The Special's caps are more normal in shape but are made of cast iron, a practice that was followed all the way through from Staff's work to production. When light alloy caps are used, they can create clearance problems. If clearance is proper when the engine's at operating temperature, it'll be too tight and tend to crush the bearing shells when cold. This hasn't occurred with the iron caps. Some designers have doubted that the combination aluminum-iron bearing bores can be line-bored accurately in production because of the different cutting rates; Daimler-Benz is one firm that says it hasn't licked this problem. Buick has managed it by taking three separate cuts wherever the two metals have to be machined together, making the last cut a very light one of only .007 or .008 inch. Rolls-Royce's wide experience with aluminum engines allows it to use forged heat-treated aluminum main caps on its new V8 engine, incidentally.

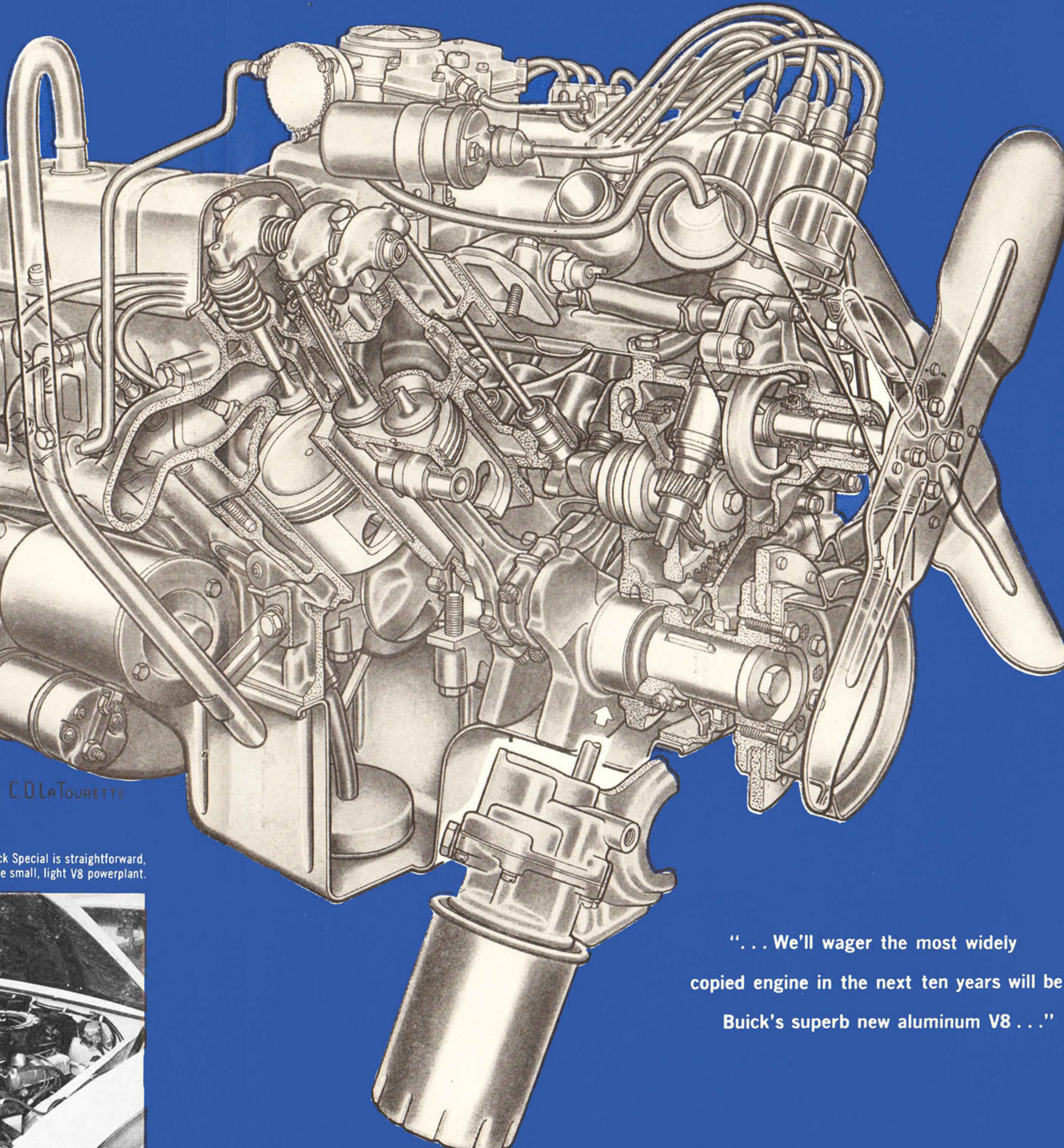
BLOCK CASTING AND MACHINING

A fully-automated line machines the 60-pound blocks, special care in handling being called for to avoid damage to the softer surfaces. The alloy finally chosen for permanent-mold casting the block and heads was GM 4323M, which is very similar to SAE 323 alloy in composition. Alloying elements are: 6.5 to 7.5% silicon, 0.25% copper, 0.2 to 0.4% magnesium, 0.6% iron, 0.35% manganese, 0.35% zinc and 0.25% titanium. The result is an aluminum that's especially suited to intricate castings that must supply high strength under extremely corrosive conditions, exactly what was needed here. On the grounds that it might not be able to take the high stresses involved, the block is given very few broaching operations. On the line, steel sleeves are pressed in the two guiding holes on the block's lower left edge; these two holes have a locating function during machining only.

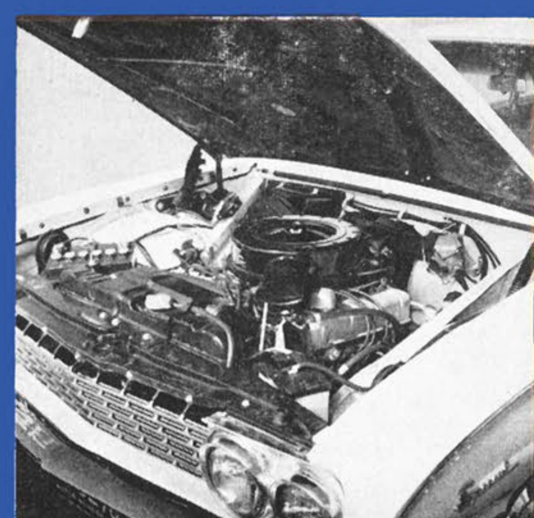
No significant holes are cast into the block, as can often be done by die casting. They're all drilled, some of the longer oilways by bits that look more like wood augers than metal drills. Though there was hope that the higher cutting rates allowed by aluminum would shorten overall machining time, Buick's experience has been that it takes about as long as an iron block—at this early stage in the refinement of the production process. Tool life is eventually expected to be better than that experienced with iron. As a precaution against possible porosity in the block castings (aluminum has been described as "a bunch of holes fastened together") they're given several tests for leaks under air pressure, along the machining line, and can be given as many as three impregnations with sealants if necessary.

IRON LINER CHARACTERISTICS

Perfect Circle makes and machines the cylinder liners, from the same cast iron GM uses for cylinder blocks (GM 13M).



Under-hood appearance of Buick Special is straightforward, with plenty of space around the small, light V8 powerplant.



". . . We'll wager the most widely copied engine in the next ten years will be Buick's superb new aluminum V8 . . ."

At present the liners are centrifugally cast, but there's some doubt at Buick whether this is any better for this application than ordinary gravity casting. To hold the liner rigidly in place in the block, a series of small, shallow grooves is turned over its whole outer surface, giving it a ribbed appearance. This turning operation is expensive and produces waste metal, however, so development is continuing on a knurled surface that may do the same job at less cost. Preheated to prevent chilling in the mold, the liners are held in place by mandrels as the block is cast around them. The liners are of course cleaned before casting, but no special bonding-type surface treatment is applied, as in the Al-Fin process.

Insertion of this liner does slow the rate of heat transfer to the coolant, compared with an aluminum cylinder wall, but on the other hand the heat transfer characteristics of the high-silicon aluminum alloys aren't very favorable either. In any case, Buick is just as happy to have the bores running a bit warm, as this reduces power loss through wall friction. There is some feeling that the engine's octane requirement may have been raised a fraction by the use of the liners.

On the service side, the only piston oversize that will be offered at first will be .010 inch. Questioned as to the absolute maximum that might be bored out of these liners, Buick suggested .060 inch, with the warning that this would need a very careful examination of liner position in the block and a mighty steady hand at the boring bar. They definitely do *not* recommend such an oversize. Though the engine has already been expanded from its original design size, as mentioned, there is still limited room for bigger liners and a longer stroke. And by the time a bigger bore is needed, GM will probably have come up with a workable high-silicon alloy that will allow them to leave out the liners entirely.

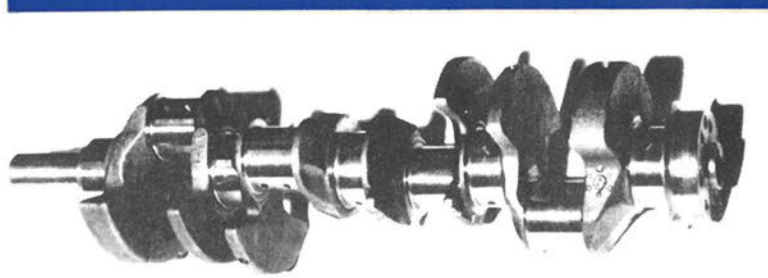
Asked how he'd reduce the engine's displacement to 180 cubic inches again, to get into the three-liter competition class, Joe Turlay said if it was for racing purposes he'd shorten the stroke only. This would call for a stroke reduction from 2.80 to 2.34 inches, or a reduction in crank throw of a little less than 1/4 inch—easily handled by a good crank specialist. For the first time at Buick, the crank is made of cast malleable iron or "Armasteel", as GM calls it. Iron is used here, and in every other possible location in the engine, for two reasons. One is that GM's iron facilities are extensive, as we said earlier; the other is that iron costs less than the alloys of steel that might be employed. Even with this kind of economizing throughout the engine, to offset the still-high costs of aluminum, it remains slightly more expensive than a comparable iron unit.

BOTTOM-END SIZES AND WEIGHTS

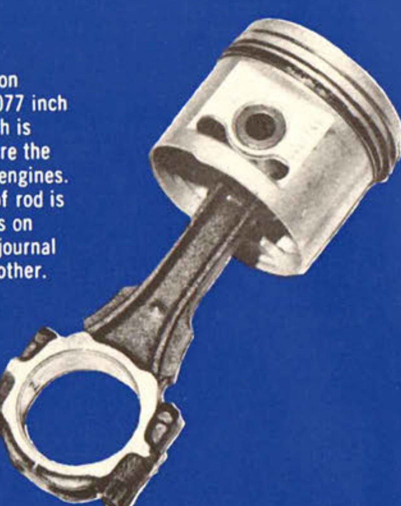
The accuracy of the Armasteel casting process is such that the cheeks of the six crank counterweights can be left in the as-cast condition, no machining for width being required. But since there's still a greater tolerance in casting than there would be in machining, this type of crank demands more generous end-to-end clearances within the crankcase than would otherwise be granted. The cylinder centers are spaced at 4.240 inches, and the offset of one bank of cylinders from the other is .740 inch. All the main bearing journals are 2.2986 inches in diameter – 2.3 inches in other words – and all are .802 inch wide except the center main, whose .821-inch width includes extra space for thrust surfaces. The rod journals are an even 2.0000 inches in diameter with bearings .737 inch wide. All the bearing shells are GM's steel-backed Durex 100A.

Connecting rods are conventional in design, forged of SAE 1141 steel along lines time-tested by Buick. They're 5.66 inches long, center to center, which compares logically with the 5.70 inches of the small Chevy V8 and the Corvair's 4.72 inches, the shortest in U.S. industry. Weight of the Special's rod is 17½ ounces, against 19 ounces for the Chevy V8 and 13¾ for the Corvair. The piston pin, .875 inch in diameter, is pressed into the rod little end, and retains a piston with a short, full skirt. Two compression rings and one oil ring are carried below a piston crown that bears a circular depression in its center, forming a significant portion of the combustion chamber.

Designated a "spheroid-shaped" chamber by Buick, the combustion volume is a practical application of the more radical design originally proposed by Engineering Staff for



Cast nodular iron crankshaft construction is new to Buick but has been tried by Pontiac. Ford, however, uses many cranks made this way.



Two compression rings on cam-ground piston are .077 inch wide, while oil ring width is .185 inch. Both widths are the same used in big Buick engines. Small pimple on shank of rod is aid to assembly: pimples on rods sharing one crank journal must face toward each other.

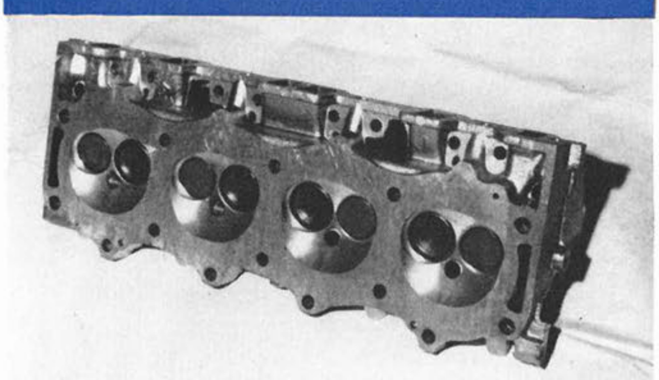
this engine. New to the industry, it's a promising design that's given good results. Our illustrations show the shallow, ovoid-shaped depression that's machined in the head for maximum accuracy, slightly asymmetrical in depth to cater to the valve placement—a modest 10 degrees from the cylinder centerline. Machining of the chambers is a nice touch, typical of Buick's thoroughness, but we were impressed by the as-cast finish of the chamber. This may be a point where money can be saved later without affecting efficiency.

NOVEL CHAMBER, CONSERVATIVE HEAD

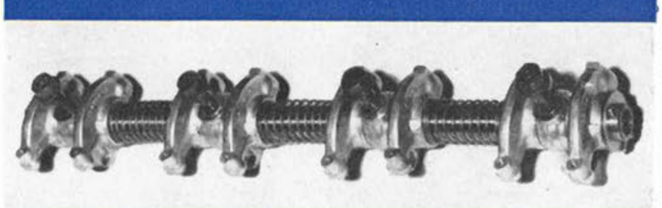
The head chamber roughly matches up with the depression in the piston crown, leaving an area all around the rim of the piston, amply cooled by water passages in the head, to serve as a quench area. The spark plug, an AC 45-FFS, is placed as close to the center of the chamber as possible, right next to the valves. From both these techniques a chamber results that has the ample quench area of a wedge-type volume combined with the short flame travel typical of the hemispherical chamber. It's a happy alliance that's said to allow regular gasoline to be used with the Special's 8.8-to-one compression ratio. If the depression in the piston is reduced to a depth of 1/16 inch, the ratio is increased to 10 to one, the figure that's being considered for a future power pack.

Also cast in a semi-permanent mold, with an intricate core, the Buick's bare cylinder head weighs a mere 14 pounds. Its general valve and porting layout is very sound. In each chamber the intake valve is the one nearest the center of the engine, which makes manifold passages as short as can be and allows the best possible distribution. The four intake ports lead into their respective chambers at an angle of about 20 degrees, to impart a turbulent swirl to the incoming charge, and there are also four separate exhaust ports. In keeping with the conservative approach to this first aluminum V8, inserts are used at the valve seats and guides. Of cast iron, the guides are pressed in place. At this writing, two ways of installing the sintered iron valve seats are being evaluated. One, the likely choice when the necessary machinery is made to work unfailingly, is heating the head to 375 degrees in an oven and pressing the seats in at ambient temperature. The other is to bring the head to a more moderate 200 degrees (by infra-red lamps or even by the heat of a wash bath) and insert seats that have been pre-chilled.

The valve head diameters are generous by Buick standards: 1.50 inches for the intake and 1.3125 for the exhaust. The actual port diameters just past the valve seats are 1.280 inches and 1.10 inches respectively. Seated directly on the head, the single valve springs are stiff, exerting 64 pounds force with the valve closed and 168 pounds with it open. The opening is handled by the usual rocker gear, with some new techniques. Four die-cast aluminum stands support each rocker shaft, which in turn carries eight die-cast aluminum rockers, as first used on the big Buick V8s in 1960. Sintered iron inserts are used at the contact points: an anvil at the valve end and a cup at the pushrod end. The rocker ratio is 1.6 to one. Some preliminary consideration was given the type of stamped rocker used by Chevrolet and Pontiac, but it was felt that tooling up for it would be a needless expense while these neat die-cast rockers were available. Zinc-plated to simulate aluminum, the rocker covers were "styled" by Engineering to resemble those of the bigger Buick engines.



Machining of combustion chambers is complete, even to unusual removal of exposed threads in holes for 14 mm AC spark plugs.



Aluminum really is everywhere. Four die-cast stands support shaft that carries spring-held die-cast aluminum rocker arms.

BUICK'S APPROACH TO VALVE TIMING

As in the Corvair, hydraulic lifters solve the problem of consistent valve clearance with the varying expansion rates of an aluminum engine. They're fed with oil by two galleries that run along the outside of their guide bores, whence two small passages also run to the forward rocker stands on both heads. The right-hand lifter gallery, being nearest the oil pump, doubles in brass as the main oil gallery for the camshaft and crankshaft bearings. Unusually for a production aluminum engine, there are five removable steel-backed bearings for the cast alloy iron camshaft, again from well-warranted conservatism. They'll probably vanish as experience is gained.

The Buick philosophy of cam and valve design makes use of valve and port sizes that might be considered small in relation to the displacement, to keep mid-range torque at a maximum, but used with cam timing that can be called radical, to preserve power at the high end. It's a canny combination that's produced some remarkably versatile engines at Flint, where they take special pains with the exact shapes and flow values of the ports, using equipment similar to but better than that of England's Harry Weslake.

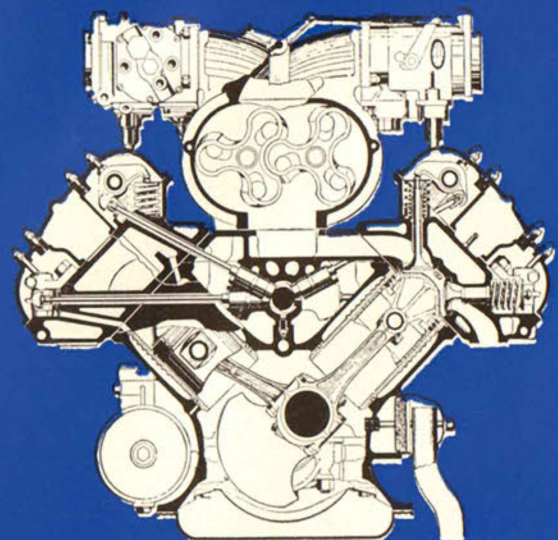
When this Special engine was first put together, then, it had a cam much like that used in the big Buick, with durations around 290 degrees. With the valve sizes they had (which were proportionally a bit large, as we said) this worked fine at the high end but not so well in the mid-range. So the timing was cut back to its present figures, which follow:

	Intake	Exhaust
Opens	29° BTDC	67° BBDC
Closes	71° ABDC	33° ATDC
Duration	280°	280°
Overlap	62°	
Lift	.383 inch	.383 inch

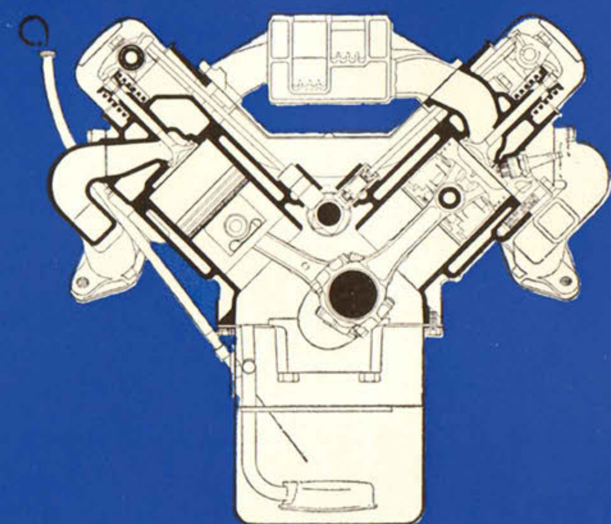
Rotated by a sintered iron crankshaft sprocket and a chain ⅞-inch wide, the cast iron cam sprocket drives more parts than the camshaft alone. Just outboard of the upper sprocket is a sintered iron eccentric for the fuel pump and a skew drive gear for the distributor and oil pump — sprocket, eccentric and gear are all locked to the camshaft by the same key. The Delco distributor is conventional, but fires in an order that differs from the bigger Buick V8s and is the same as that used on the small Chevy: 1-8-4-3-6-5-7-2.

The general layout of the front-end accessory drive, with its single shaft at 33 degrees to the vertical, was conceived by Engineering Staff and greatly simplified by Buick. In particular it was possible to combine several castings into a single clever die-casting serving as a cover for the oil pump, a housing for the bypass and pressure-relief valves, and a mount for the oil filter. The sintered iron oil pump gears are actually housed in the aluminum front cover, which also carries the fuel pump and acts as half the water pump housing, incorporating two passages to carry water into the front of the block.

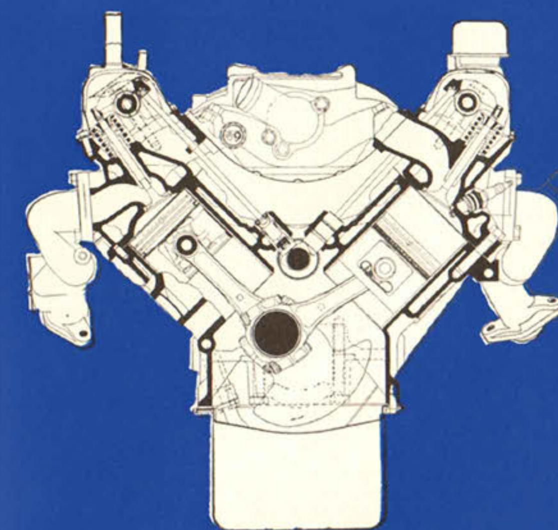
"Buick feels the engine is still overdesigned, based on the remarkable fact that there's never been a major component failure during the whole testing program!"



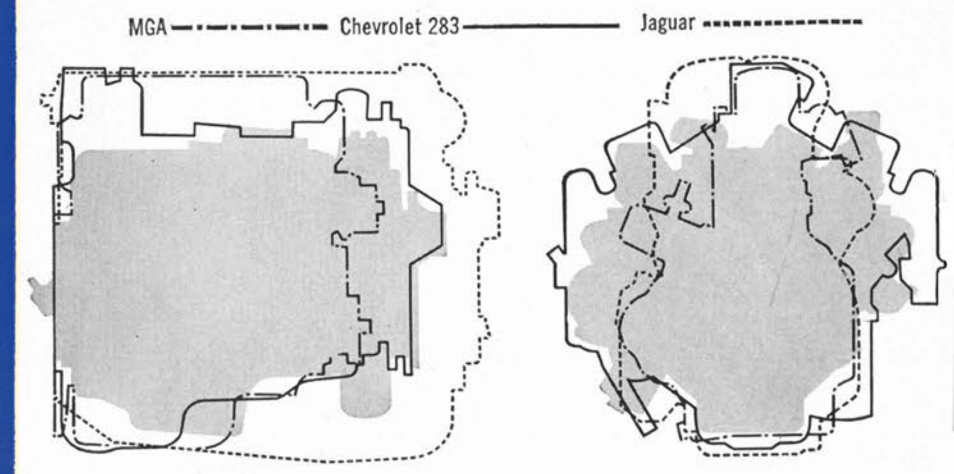
Buick gained much experience with aluminum construction, wet cylinder liners with 335-horsepower supercharged V8 built for XP-300, Le Sabre.



215-inch X-100 engine, as originally laid out by GM Engineering Staff, lacked cylinder liners and valve guide inserts and had vertical valves.



As finally readied for production by Buick, the X-100 had deeper crankcase and different chamber design.



For would-be engine swappers, drawing compares V8 in gray with popular sports units.

COOLING FLOW AND CORROSION

A point-to-point fan belt system is used, i.e., the only belt to round three pulleys will be the actual fan belt, which also drives the generator (at 2.35 times crank speed) located on the right. Power steering pumps or air conditioning compressors get individual drive pulleys and belts. Turning at .85 engine speed, the water pump impeller is die-cast aluminum over a sintered-iron hub insert. Cooling water must flow all the way back through the block to the very rear before it can rise upward into the heads, through which it flows forward again to outlets forward of the front intake ports. Since the same cylinder head is used for both sides, rearward extensions from the intake manifold must be supplied to block off the superfluous outlets. It's cheaper and easier to treat all the heads the same than it would be to make distinctions between "left" and "right" layouts, even though a couple of machining operations go unused in the former case.

Emerging from the heads, the now-hot water flows back through the complex aluminum intake manifold, first through a lower level all the way to the back of the casting, then forward again on a higher level to a single main water outlet at the front. Here the thermostat (170-degree) is installed, with a small warm-up bypass pipe to the water pump fitted just below it. While we're dealing with the coolant, you may well ask what Buick's experience with corrosion has been. If galvanic corrosion is referred to, the kind occurring where iron and aluminum are cheek by jowl in contact with the coolant, the answer is that there are very few such places in this new V8. In fact, Buick has been engaged in a gradual changeover to aluminum on its big V8s for several years, beginning with the water pump outlet, then the pump housing, finally the whole timing chain cover. In these engines, where there was far *more* iron-aluminum contact, galvanic corrosion was no problem.

Every kind of water known to the American motorist has been tried in the Special engine, without producing corrosion. The water passages develop a hard, black aluminum oxide coating that protects them. There's been much talk about the supposed dangers of using anti-freeze with aluminum, but the facts are just the opposite. Any anti-freeze with the usual corrosion inhibitors will be better for the cooling system than plain water. Wondering about salt water? Thinking this compact, light engine would be ideal for a marine conversion? You're not the first to come up with that idea. All we can say at this point is that many die-cast aluminum outboard motors work fine in salt water.

GOOD BALANCE FOR SMOOTHNESS

Atop the intake manifold, with its nicely-laid-out pipe work, is a Rochester 2GC two-throat carburetor with a bore size of 1 5/16 inches. Higher yet is an air cleaner of the low-priced polyurethane foam type that's being more and more widely used in the industry. Out on the exhaust side is manifolding that's as smooth and simple as anything from Detroit, the two $1\frac{5}{8}$-inch down-pipes joining below the engine at the right to exhaust into the single $1\frac{3}{4}$-inch main pipe. The muffler is neatly placed across the car behind the rear axle, with both inlet and outlet at its right end.

As the engines come off the assembly line, they're balanced while running under their own power on natural gas, in a new line of special balancing benches developed by GM Research. Balance is obtained by inserting appropriate plug weights in a dozen holes around the vibration damper in front, and by either inserting plugs or punching holes at the back, depending on whether the flywheel is for standard shift or automatic. The result is an uncannily smooth and quiet powerplant, judging by our driving experience with it at the proving grounds. It has a wonderfully solid "feel", at whatever speed you care to run it. With hydraulic lifters, that will be anything up to about 5300 rpm. Tests with solid lifters were just getting under way as we write, but the engine has already shown a willingness to turn 5600 all day long. Buick feels the engine, for all its lightness, is still overdesigned, based on the remarkable fact that there's never been a major component failure during the whole testing program!

Rating of the Special engine, as we go to press, is 155 horsepower at 4600 rpm and 220 pound-feet of torque at 2400. Though Oldsmobile has designed completely different pistons, heads and manifolding for its version of the engine, it's expected to be rated at a similar level. At the last minute, after the production budget for these engines had been settled, Pontiac decided it wanted some as optional equipment for its Tempest, and had to take the same engine that Buick's using. Pontiac won't get many, so if you want a V8 in a transaxle chassis, you'd best order it right away.

Buick's power pack, still in the works right now, will probably include the 10-to-one compression ratio, a four-throat carb with new manifolding, and a single exhaust pipe enlarged to 2 inches (the narrow floor pan tunnel probably won't have room for two pipes). This should bring power up around the 175 mark, which puts one horse per cubic inch within remarkably easy reach of this egregious engine. After that's attained, the next mark will be one horse per pound, which infers 318 horses—assuming an engine with no mounts, automatic transmission flywheel, and with all standard accessories. This lightness is a marvelous breakthrough, impressive in all respects. In comparison the Corvair engine weighs 282 pounds for only 140 cubic inches and the Falcon engine, using the most up-to-date cast iron techniques for 144 cubic inches, weighs 348 pounds.

APPROPRIATE TRANSMISSIONS

Obviously this Special V8 is going to be in furious demand among enthusiasts for all kinds of sporting uses, most especially for engine swaps in all popular imported sedans and sports cars. Why? A highly typical imported car engine, the 1.6-liter Volvo four, weighs almost exactly the same as this remarkable V8, at less than half the displacement! An illustration directly above gives you an idea of the relative sizes involved.

Assuming you're about to swap, you'll probably want to know whether or not the Corvette four-speed box will work well with this engine. But for a few decibels of sound, we'd be able to report that you could bolt one right on! Buick no longer offers standard shift at all in its larger lines, so there was no point in building its own three-speed box. Looking about for a three-speeder for the Special, Flint decided to use the Chevrolet unit, and tooled up for the necessary special bell housing while routine testing of the combination was begun. Only after quite a few bell housings were cast and machined was it decided that the Chevy was a shade too noisy for Buick's taste, and a switch was made to a Borg-Warner transmission with a different mounting bolt pattern *but* with the same pilot bearing size.

So there are some nice aluminum bell housings around, but the word is that sporting types around GM have appropriated all the ones that weren't scrapped. As a matter of interest, a Special sedan was equipped with a Chevy four-speed with a wider ratio spread and with the 3.08-to-one axle ratio that's used with the automatic transmission cars (3.36 is now standard), and the resulting performance was so impressive, so versatile, that they were thinking of trying a 2.9 rear end! That was with the standard Special tune. With the power pack this engine should perform spectacularly, and once the speed shops have had their way with it—as they will when its potential is made clear—it should become one of our best competition engines. This deserves to be said: when a better engine was built, Buick built it. —*KEL*