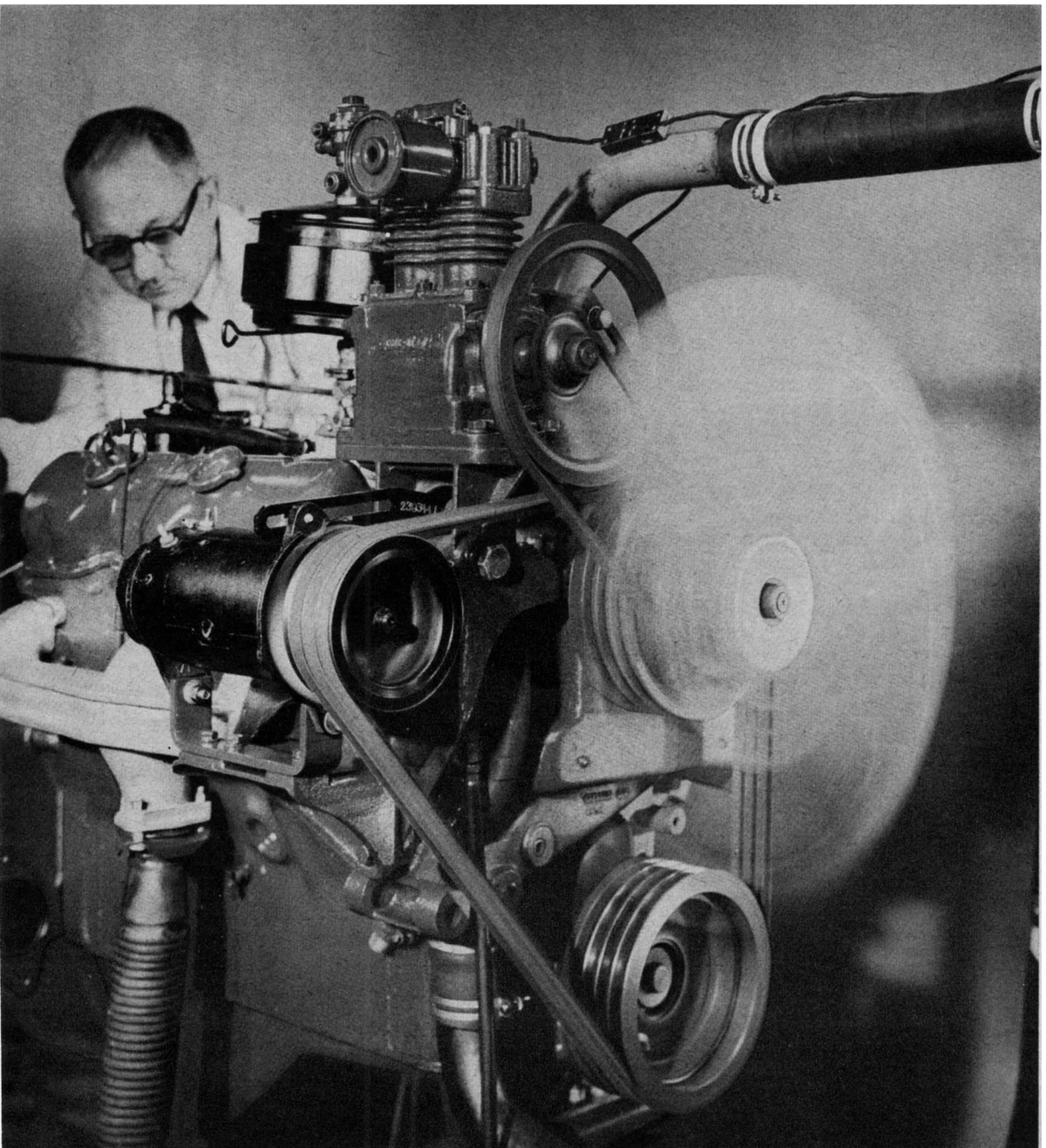
Detroit's First V-6 Engine

Developing an astonishing amount of torque at low speed, it promises up to 200,000 miles of use without major overhaul

Cylinders in 60-degree bank produce their greatest power at 1,100 fewer r.p.m. than a V-8.



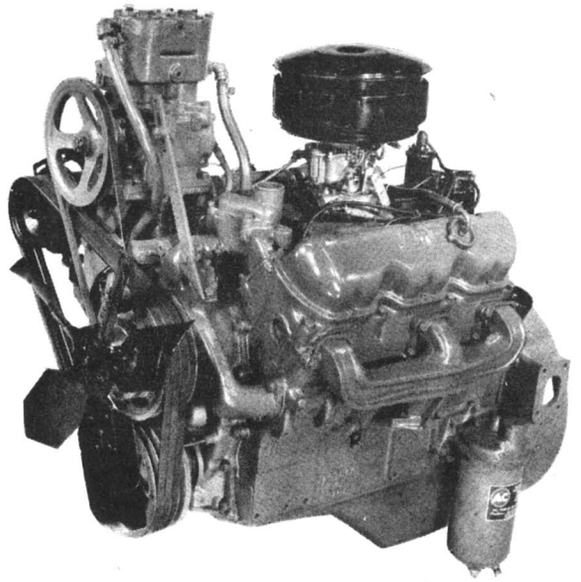
By Ken Fermoyle

"CHECK the water and oil?" I nodded yes and the gas-station attendant raised the hood of a GMC Suburban heavy-duty station wagon. He glanced at the engine, then did a fast double-take.

He counted, ". . . four, five, six," then scratched his head in amazement. "What's this? A V-8 with only six spark plugs!"

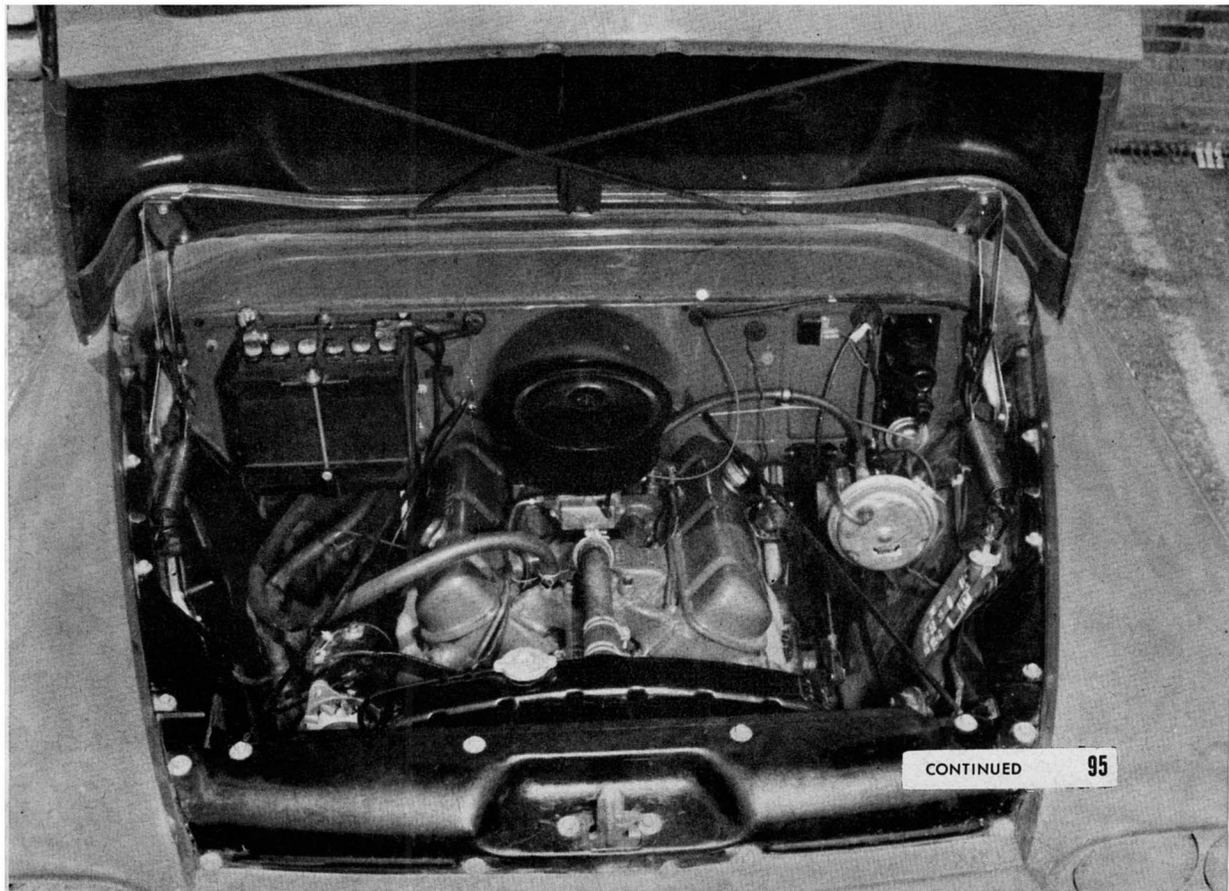
Not quite. Masked in the dowdy wagon was an exciting new V-6, developed by GMC Truck and Coach Division. A 60-degree V-type design, it will come in 6- and 12-cylinder versions. More important, it will mark the first time that Detroit has brought a V-6 out of the experimental labs and offered it to the paying customers. Italy's Lancia has, of course, had a V-6 for years; and it's been an open secret that both GM and Chrysler engineers have been tinkering with these unorthodox power plants.

They're not in production yet—the Suburban that GMC let me have was powered by an experimental job. But you



GETTING AT PLUGS is simplicity itself—because they're on top, between the valve covers. Deep crankcase extends well below the crankshaft centerline. The oil pan is big. Crankshafts have four main bearings and six connecting-rod journals spaced 60 degrees apart.

OIL FILTER is easy to service. Placed at lower left of block, it is full-flow type with bypass valve to permit circulation of oil even if throw-away paper element should become clogged.



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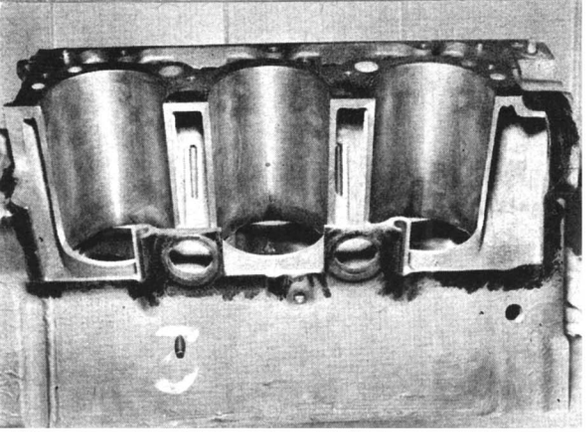
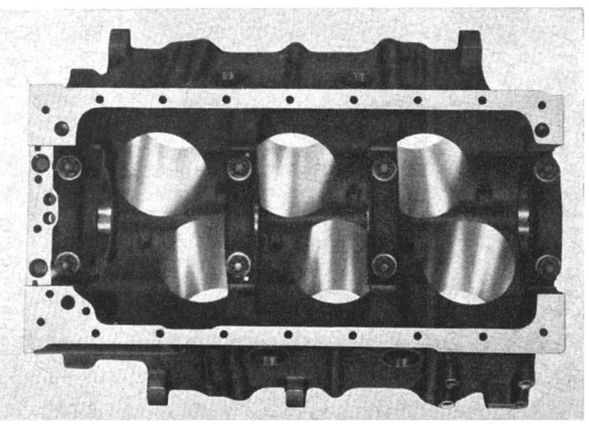


FOR MAXIMUM HEAT DISSIPATION, bores of all V-6s and twin-sixes, shown here in sawed-through cutaway, are completely surrounded by coolant. Pistons are heavy-duty cast aluminum.



BOTTOM VIEW OF V-6 BLOCK shows offset of cylinders that helps make 60-degree banks possible. Narrowness lets it sit between frame rails without interfering with steering.

couldn't be blamed for guessing that they will soon replace the V-8 and in-line six-cylinder gas engines that GMC now uses.

The new engines come in four sizes. Three are V-6s, displacing 305, 351 and 401 cubic inches. The fourth is a whopping 702-cu.-in. V-12—or Twin Six, as it is called at GMC headquarters. Gross horsepower ratings, not official yet, range from 150 at 3,600 r.p.m. for one version of the 305 engine to 275 at 2,400 r.p.m. for the big V-12.

For the truck driver, the muscular torque curves of the new engines promise a lot less work with the shift lever. For the general motorist, they promise less frustration behind crawling trucks.

How do these power plants compare with conventional truck engines? They don't, according to Phil Monaghan, GMC's boss. "Not only do they differ in design, they're far superior to existing engines. They have a potential of between 100,000 and 200,000 miles of continuous operation without major overhaul."

Other advantages include:

- Compact size; shorter than in-line engines, narrower than V-8s.
- Excellent performance; tremendous low-speed torque and plenty of reserve power.
- Superior fuel economy on regular gas, due to low friction and high combustion efficiency.
- High degree of parts interchangeability.
- Easy servicing; parts that need periodic attention are very accessible.

Some of these points showed up quickly in the experimental Suburban that GMC proudly turned over to me.

"Do whatever you like with it," said Monaghan. "But remember that this is strictly a 1959 model except for the engine. It won't give you the full picture of how good vehicles specially tailored for these engines can be."

I was still impressed.

A run through traffic from Pontiac to Detroit was my first experience behind the 150-hp., 350-cu.-in. engine. Although the engine was tight, it jumped the heavy wagon away from lights at a rate that surprised me. The V-6 also pulled very smoothly from low speeds in high gear. I could drop below 15 m.p.h. and still accelerate quickly and easily in high—something that conventional sixes don't do happily.

Next day I checked fuel mileage in rush-hour traffic. I spent several hours driving the type of stop-start pattern the engine would encounter in delivery or pickup truck service. I didn't baby the Suburban. Its acceleration was used freely in getting away from lights and taking advantages of holes in traffic. Then came a stint on expressways, running at legal limits of 55 and 65 m.p.h. In the afternoon it was back to crosstown shift-change traffic of the bumper-to-bumper variety. I expected an average of 11-12 m.p.g. I got 15.5. All this despite a rugged gas-drinking driving schedule, and an engine with less than 800 miles on it.

Easy servicing will be a strong point of these new engines. The gas-station attendant mentioned earlier, after he recovered from his confusion, agreed.

The spark plugs caught his eye because they're right on top of the engine. "Man, those sure will be easy to change!" said the service-station man enthusiastically—doubtless remembering wrists burned by hot exhaust manifolds on typical V-8s. Cooler operation, because they're well away from exhaust heat, won't hurt plug life, either.

The fuel pump is conveniently located at top right of the engine front cover. Starting motor, oil filler cap and dipstick and generator are on the right. Distributor and coil are mounted at top rear between the cylinder banks.

Valve tappets can be removed through an opening in the cylinder head without removing the head, a real time-saver.

Not so apparent are features that, prolonged dynamometer testing indicates, will give the new engines as much as three to four times the durability of existing engines:

- Blocks and heads are fine-grain nickel-chromium alloy iron. Blocks have deep three-inch skirts for reinforcement.
- All are over-square, have bigger bore than stroke for reduced friction.
- Crankshafts are heavy, rugged. The 401 V-6 shaft, for example, weighs 110 lb. vs. 63 lb. for a comparable V-8 shaft. V-6s have four main bearings; the V-12, seven.
- Lubrication is excellent; rotor-type oil pumps supply more oil at greater pressure than ordinary gear-type pumps.
- Areas of high stress have oversized sections to minimize flexing. Generous fillets and web reinforcements add strength and rigidity to moving parts.
- Careful attenion to engine cooling eliminates wear-producing hot spots.

This last factor is particularly important in producing long-lived engines. Two to three times more coolant flows through the new power plants than in engines of previous design. Bores are surrounded by wide water channels for their full height. To overcome short life ex-

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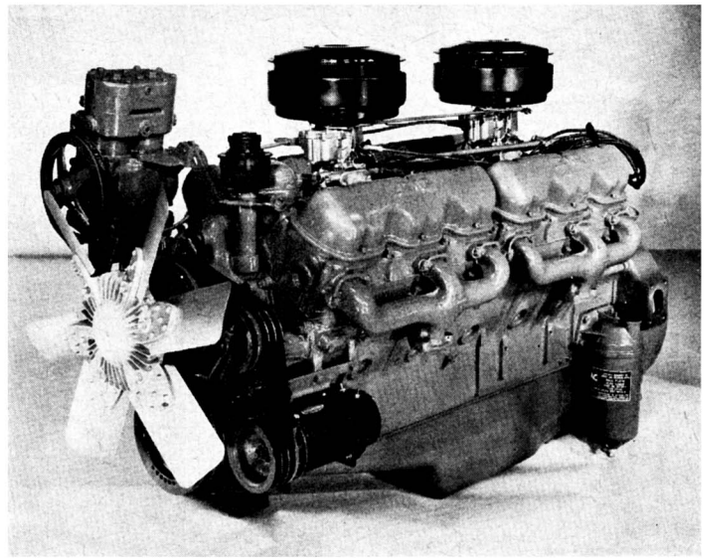
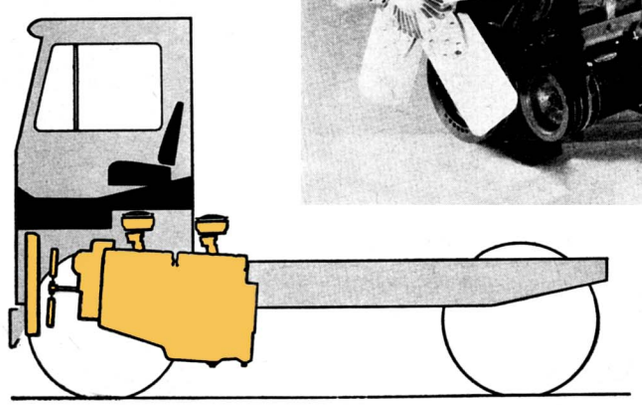
Whopping V-12 will give the big babies plenty of hill power



TWO CARBURETORS, synchronized so throttle openings match, and mounted on separate manifolds, are used on V-12. Each has its own hydraulically actuated governor. Crankcase ventilation is boosted by manifold vacuum.



LOW CONTOUR fits twin-six neatly under seat of exceptionally short cab. General Motors considers its new family of engines the first major progress in U. S. truck-engine design in more than 20 years.

pectancy usual in truck-engine valves and valve seats due to lack of proper heat transfer, coolant is circulated through cylinder heads at the rate of 120 to 200 gallons per minute—enough to fill a 12-by-27-foot swimming pool in an hour.

Stroke for all four engines is 3.58 inches. The 305 has a bore of 4.25 inches; the 351, 4.56 inches; the 401, 4.88 inches. The V-12 bore is 4.56 inches, same as the 351 V-6.

Similarity of bore size between the 351 V-6 and 702 V-12 is a tipoff to the general interchangeability of the engines. No less than 70 parts are common to all V-6s and more than 50 are common to all V-6s and to the V-12, too. Just two different types of cylinder heads are needed for the entire line, for example—one for 305 engines and the other for the two bigger V-6s and the V-12. They just double up, use four heads instead of two, on the V-12. And its block actually is run down the same line as the V-6s; drilling machines make two passes instead of one to bore out the cylinders.

The engine is smooth. Judging from my experience, GMC has licked the imbalance problem chronically associated with V-6 engines. [PS, Aug. '55]. I had asked Monaghan about this before driving the Suburban.

"That has caused us no difficulty," he said. "We engineered them to minimize imbalance as much as possible. Remember, too, these engines have been designed as truck power plants. There is a lot more structure and built-in rigidity in them to soak up vibration than would be possible in automobile engines."

I wouldn't have been able to tell there was a V-6 and not a V-8 under the hood if I hadn't known in advance. The engine churned without undue shake. There must be some secondary imbalance present, but it doesn't show. It was quiet enough so that maybe Monaghan wasn't kidding with his comment that they might "build a little more noise back into it just to let people know it's working!"

One thing that obviously helps here is that combustion chambers—formed partly in the head and partly cut into the piston top—are fully machined. This insures uniform compression ratios between cylinders and eliminates uneven power

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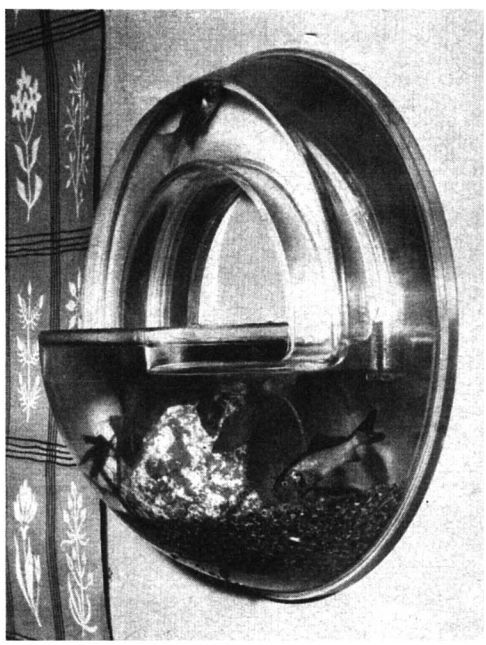
impulses common in simple cast chambers, which often have varying ratios.

High-turbulence combustion-chamber design is also an important factor in the excellent low-speed torque of these engines. The design causes rapid burning of the fuel-air charge early in the power stroke, giving the piston a firm "push" through its full trip down the cylinder.

Low-speed torque of the huge V-12 is especially impressive. Its maximum gross torque of 630 lb.-ft. is developed from 1,600 to 1,900 r.p.m.—and it is not very far from that maximum over a considerably wider engine speed range. The great reserve power will permit use of five-speed transmissions in big tractor-trailer units in place of the usual eight- or 10-speed transmissions. The V-12's ample power will haul trucks up grades at good speeds with a minimum of downshifting, and without holding up long lines of motorists behind.



GOLDFISH-LOOP. When the fish in this bowl get tired of swimming in horizontal circles, they can change to vertical. The upright ring of the British-made wall acquarium is filled by complete submersion. Atmospheric pressure on the central open surface of the bowl proper then holds the water in place.