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# Popular Science

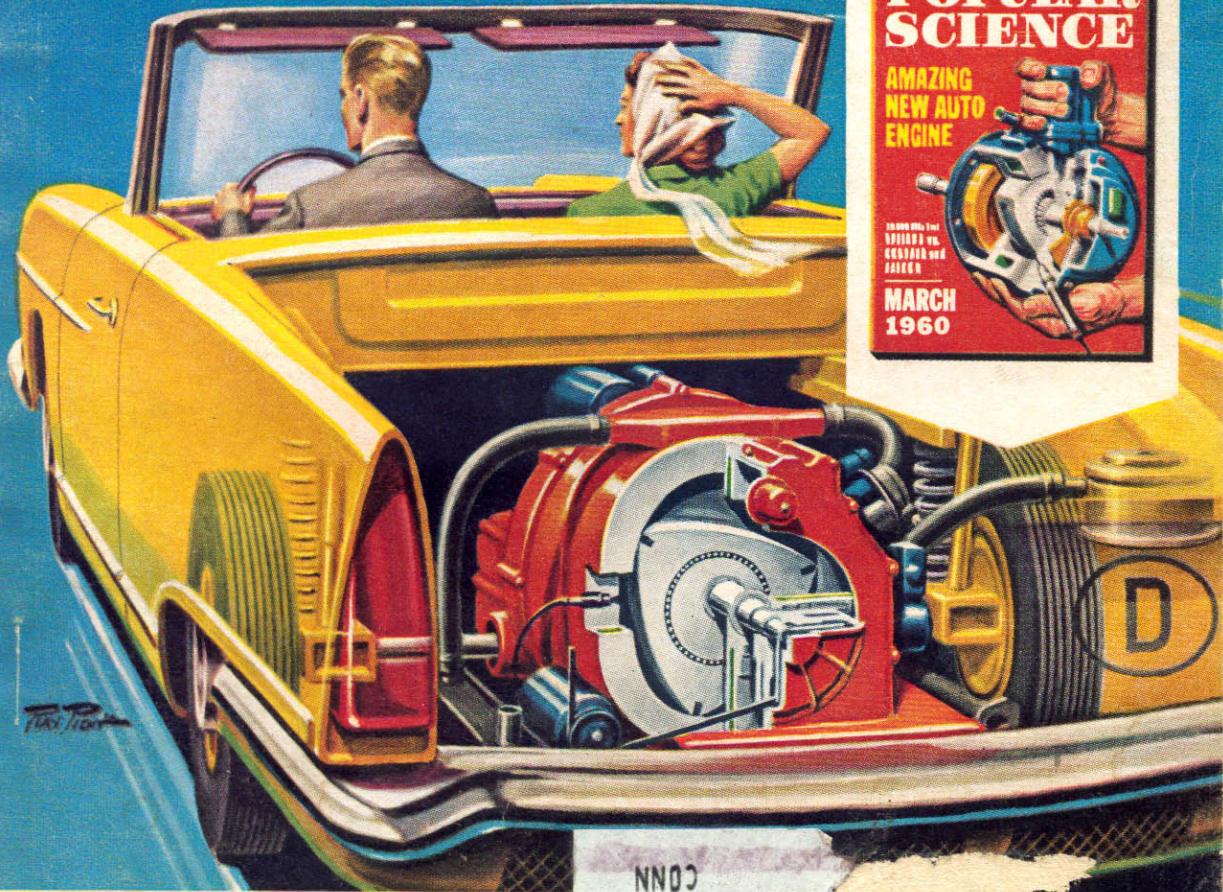
Monthly

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## Power Without Pistons

*We said it in '60... now we drive the amazing Wankel*



**WAS JOHN GLENN**

**SPACE?**

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# Gus Puts a Gas Eater on a Diet

With scientific gadgets—and a lucky hunch—the Model Garageman solves a couple of baffling mechanical mysteries

By Martin Bunn

THE '63 Chevrolet pulled in at the Model Garage and the driver grinned proudly as Gus Wilson came out to the gas pumps.

"Hi, Gus. What do you think of it?" asked the young man behind the wheel. "Sure beats the old bus I started with."

"Sure does," Gus agreed. "Had it long?"

"Only just drove it off Brenton's used-car lot. Fill it up, will you?"

Gus started the hose running and wiped the windshield. "How's the sales route?"

"Coming along. Got enough customers to break even. With this car to cover more territory, I'll get a lot more, sure as my name's Tim Foley. The payments will come hard at first, but the old crate broke down twice, and that could lose me customers."

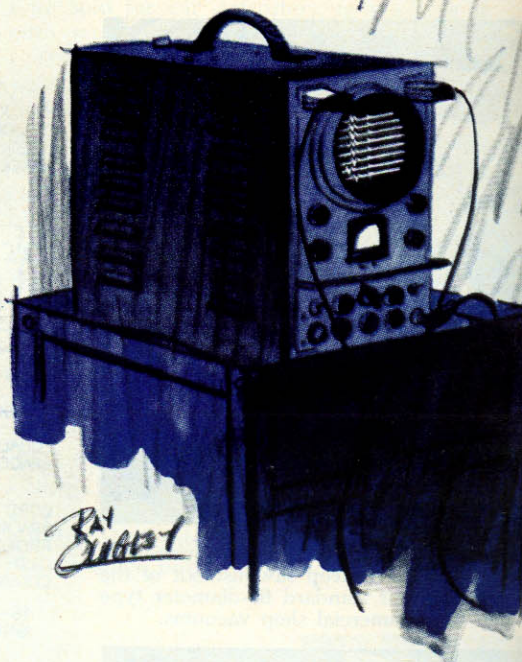
"How far do you drive every day?"

"Oh, 200 miles or so. This looks and feels like a low-mileage car—though I wouldn't swear to the 10,000 miles on the clock. It's a six with stick shift, so it ought to be easy on gas. Got a good buy. Brenton cut the price for a quick turnover."

"Good luck with it, Tim," Gus said as Foley handed over the price of the gas.

Foley winked slowly, his good-looking Irish face one vast grin as he drove out.

*Wheels crunched over a thin snow crust* as a convertible with dealer's plates rolled up. Gus raised the big garage door. The car moved in and Ed Stern stepped out.



"Hello, Gus." The newcomer jerked a thumb toward the street. "I see Brenton's sold it again."

"Tim Foley's new car? You know him?"

"Not him—the car. I sold it twice myself when I was selling for Brenton's."

"Sounds like a lemon," muttered Gus. "Think it'll let Foley down on the road?"

"Oh, no. It runs real good. That's not what's wrong with it. What's Foley do?"

"Covers an upstate sales route. He drives about 1,000 miles a week."

Stern whistled. "Well, that's his worry. Mine's a high-speed miss. I work over in Wayville now, but my customer lives here, and I promised him this convertible today."

"The engine's been retimed, has new points, a new condenser, and new plugs. But floor it on a hill or to pass, and engine performance falls off enough to notice—and



*"Looks like something out of a science-fiction TV," commented Stern. "But makes more sense," said Gus.*

this customer will. Our shop's so busy I guess the boys didn't road-test it. The miss only showed up as I was driving here. If I take it back to our shop, I'll lose a lot of time. Can you help me out?"

"Glad to try," said Gus, raising the hood. "I'll hook on an ignition scope."

He rolled over a wheeled case on which stood a louvered box that looked something like a TV set with a tube face on its front. Clipping one lead over the cable of the No. 1 plug, Gus clipped another on the coil lead to the distributor and switched on the unit.

"Want to start it up, Ed?"

The starter groaned briefly. As the tube face blossomed into phosphorescence, eight parallel white bars spread horizontally across it. Each began as a short straight line, broke into a multitoothed zigzag of about the same length, and continued as

a straight line with a secondary, smaller squiggle one fourth of the way along it.

"Looks like something out of a science-fiction TV drama," commented Stern.

"But makes a lot more sense," said Gus. "Each tracer shows ignition events in one cylinder. The short line is spark duration at the plug. The big oscillation shows the discharge, through the condenser, of energy left in the coil after the spark stops. That smaller squiggle starts when the points close. The long line beyond it is cam dwell, while the points are closed."

"For all eight cylinders?" protested Stern. "You're only hooked up to one."

Gus grinned. "Black-box magic, and it sure works. There's your trouble—No. 7 plug. Its spark line's shorter and lower than the others, meaning it takes a higher voltage to jump that plug, and the spark

doesn't last as long as the others. That leaves more energy in the coil, so the condenser oscillations are bigger. In other words, the plug has high resistance."

Ed Stern scratched his jaw. "But I saw them put in new plugs. Maybe that one's defective. Will you yank it out?"

The questionable plug was in an awkward position, and removing it took far longer than spotting it on the scope. When Gus finally had it out, it proved to be old and dirty, its insulator browned by heat.

"Now, why'd they leave that one in?" muttered Stern. "All the others are new."

"You saw how hard it was to pull it," returned Gus. "Your mechanic put in seven new plugs and skipped this one, hoping any difference would never be noticed in a V-8. Probably wouldn't have been, if this plug had been firing right. But the gap is wide and it's an off-brand resistor plug whose resistance may have gone way up, as unstable resistors in cheap plugs do."

"I'd never buy bargain plugs myself."

"It can happen to good resistor plugs, too, if they run hot," said Gus. "Too much heat or voltage can boost their resistance far over the normal 10,000 ohms."

"Well, put in a new one. Then I can deliver this car without expecting a beef. Which is more than Brenton can say," added Stern darkly, "for the one he sold Foley."

On Thursday, Tim Foley again stopped for gas at the Model Garage pumps.

"How's it running?" asked Gus.

"Oh, swell." For a moment it seemed the young Irishman was about to say more. Instead, he clamped his jaw shut and drove off without the smile Gus expected.

But that Saturday he drove into the shop in midmorning, his face grim and a muscle twitching alongside his jaw.

"Got a problem, Gus," he said harshly.

"Get 10 miles to the gallon. Ten, with a six-barrel engine and stick shift. It should be 20! With the car payments, I just can't afford that kind of gas bill.

"I had the car back to Brenton's twice this week. First they adjusted something, but it made no difference. Then they offered to put in new plugs—if I'd pay for them! This morning Brenton offered to take the car in on any other on the lot—for 200 less than I paid!"

Gus slowly punched tobacco into his pipe. "Mind saying what you did pay?"

Foley told him. The figure was surprisingly low. "It sure looked like a buy. But a lemon's sour at any price."

Nodding, Gus put away the unlit pipe.

"To save time," he said, "I'm going to get a little information. Relax, Tim."

In his office, Gus dialed the Wayville agency where Ed Stern worked.

"I've got that Chevrolet of Foley's in the shop, Ed," he told the car salesman. "What's the story on it?"

Stern hesitated. "Nothing I can tell you will help you fix that gas hog, Gus."

"You mean it's always been one?"

"The boys at the agency say it was a hard-luck car from the start. The first buyer stalled on the thruway a week after he

bought it. Dirt in the gasoline. A mechanic cleaned the car on the spot. It ran okay then, but it was back in the shop every week on a complaint of poor gas mileage. They tried every fix in the manual and a lot that weren't. The owner finally sold it in disgust when his warranty expired.

"Actually, Brenton's made a good thing of that car. He sells it cheap. Every time a buyer squawks, he winds up trading it for another Brenton car and taking a loss on the trade-in. Foley better swap it back, too—every other dealer around knows that crate by now, and he'll do better at Brenton's than anywhere else. Brenton enjoys trading that car."



### Pushbutton streetcar

Conductors on trolley cars in Zurich, Switzerland, have been replaced by a pushbutton. Self-service doors are opened by the passenger when the motorman stops at the corner.

Travel on the cars is reserved exclusively for those holding commutation tickets. Anyone caught trying to ride free faces a fine of five Swiss francs.

Thoughtfully, Gus hung up and went back to the shop floor.

**Foley spun around.** "Find out anything?" "Only that you've got lots of company," muttered Gus. "But let's see . . ."

There was no smell of gas or trace of leakage around the carburetor. Gus started the engine, watching for any sign of seepage from the fuel pump, gas line, or carburetor bowl. None showed. Besides, if the trouble were a leaky float, bad float valve, or clogged bowl vent, any one of those would have caused flooding, stalling, and hard hot starts.

Killing the engine, Gus detached the air filter. A clogged filter could restrict air flow to the point where you'd get a chronically rich mixture. He took out the filter element. It wasn't clogged.

Gus put the filter together again but, instead of replacing it, stared thoughtfully at the carburetor. This model had a power piston to furnish extra gas on heavy load or acceleration. It was possible . . .

He detached the gas line and vacuum line, loosened the carburetor, and carefully lifted it off. The gasket tried to come with it. Gently he pried it loose all around, until it fell back on the manifold. Then he looked at the underside of the carburetor from which he had loosened it.

Setting the carburetor down, he lifted off the gasket itself and examined it for damage. It was still in good condition. He put it back and lowered the carburetor onto it.

"Okay. Your trouble is gone," said Gus as he tightened the nuts. He reconnected the gas line, set the air cleaner back in place, and grinned at Foley.

"Let's check before I crow any more," he suggested. "Stan! Roll the exhaust analyzer over here."

Gus had the engine going before Stan

could install the pickup unit in the tailpipe.

Soon Gus pointed to the instrument.

Its needle indicated *lean*. "That says decent gas mileage from now on, Tim."

"But what'd you do?" asked Foley. "All I saw you do was take off the air cleaner and carburetor, and put 'em back"

"I took off the gasket, too."

"Well, sure. But what did that do?"

"Fixed the trouble," said Gus. "That gasket was installed backwards. The vacuum passage to the power piston on the carburetor didn't line up with the hole in the gasket. It was on the other side, so the passage and the piston were blocked off from the manifold."

Foley shook his head. "Don't get any of it, Gus. What's a power piston?"

"An automatic control to feed more gas when the engine needs it most. When you open the throttle, manifold vacuum drops. As it falls below about 10 inches of mercury, the lowered pressure lets a spring-loaded piston move. This opens a supplementary fuel jet, which feeds extra gas into the venturi to give you more power in a hurry.

"With the gasket turned around, all manifold vacuum was blocked off. The spring held the piston and fuel jet in the open position constantly. You ran on a super-rich mixture all the time. No wonder the car gulped gas. When I put back the gasket, I flipped it over. The hole registers with the vacuum passage, supplementary fuel will feed only when needed, and your gas mileage should be normal."

Tim Foley sighed. "Begorra, as my grandfather would say, that time I got it! But how you thought of it I'll never know."

"Part of the luck of the Irish, Tim."

"Mine? You mean I'm the lucky one?"

"Sure. Who else," asked Gus, "would get such a good buy in a car—just because some mechanic goofed?" ■ ■

