

MAY 1969 50 CENTS

# Popular Science

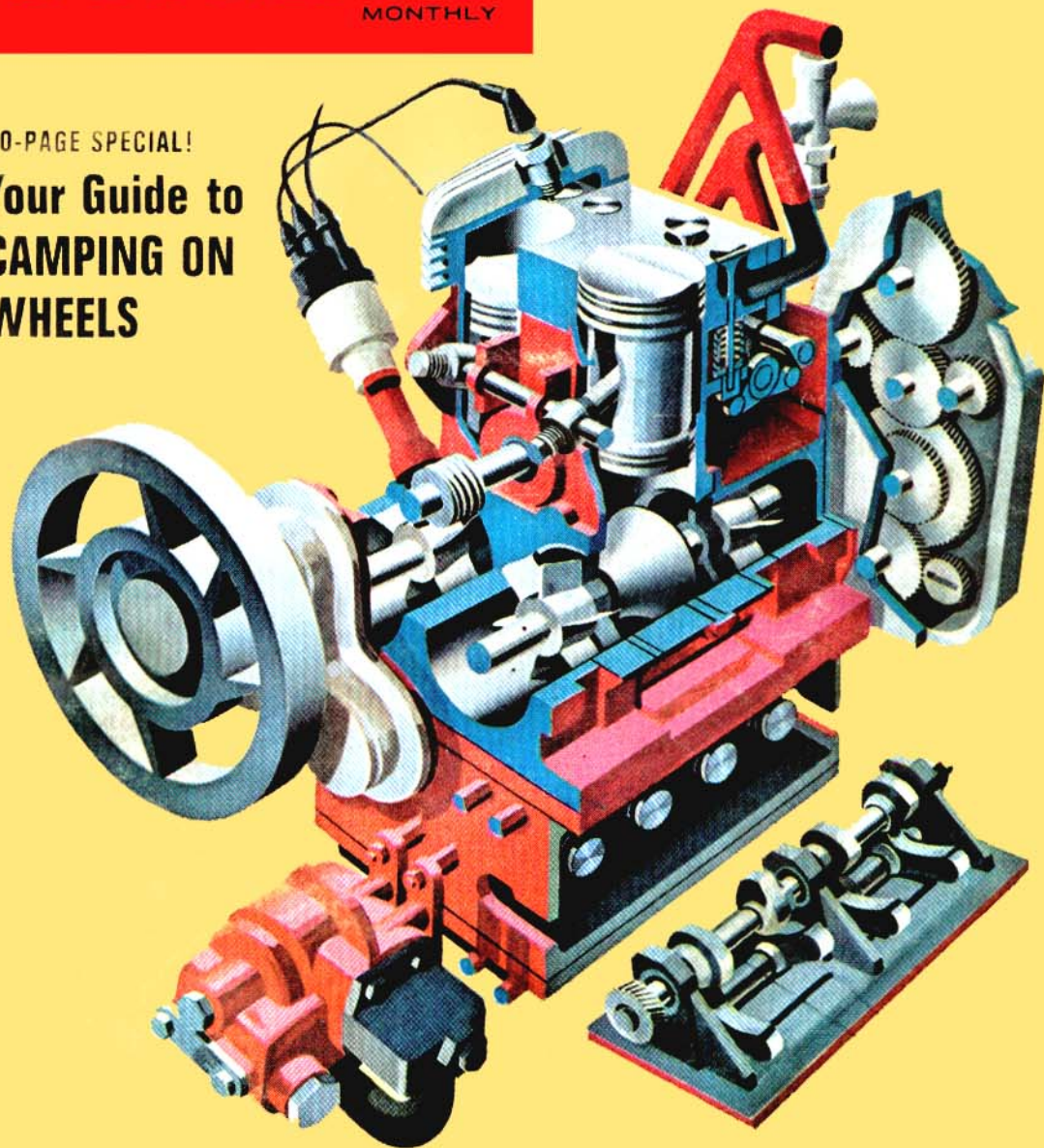
MONTHLY

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**PISTON POWER WITH NO CRANKSHAFT**

# Gus Chalks One Up for the Model Garage

Eddie Bauer was boiling when Stan accused him of selling a bent drive shaft. It was up to Gus to straighten it out

By MARTIN BUNN

**"H**ey, buddy! Are you the drive-shaft expert?" The gruff, angry voice boomed through the Model Garage.

Gus Wilson spun around to face a tall, heavy-set man wearing a grim expression.

"Your name Hicks?" the man barked. "Stan Hicks?"

Gus deliberately took his time. "My name is Wilson," he finally said. "Stan is my assistant. What can we do for you?"

"Your assistant has a big mouth," the stranger growled. "I want to tell him to keep it shut. Where is he?"

Gus fought to control his temper. "I think you'd better explain just . . ."

"I got nothing to explain!" the man cut Gus off. "But Hicks sure does. Like why he tells my customers that I sell bad parts?" Almost as an afterthought, he said, "I'm Eddie Bauer—of Eddie's Auto Parts."

"And I'm Stan Hicks," said Stan, as he peered cautiously around the office doorway. "I heard you, but I don't understand . . ."

Bauer's left arm shot out and propelled his index finger to within an inch of Stan's nose. "All my parts are top quality," he roared. "I've never sold a bent drive shaft in my life."

Stan just gawked at Bauer.

Bauer kept his finger wagging at Stan. "You told Chip Sherman that the replacement drive shaft I sold him for his '61



Chevy was bent. That's an outright lie."

Stan's bewildered look melted into a sheepish grin. "I . . . uh . . . I told him the shaft was probably bent, but . . ."

"That shaft is straight as an arrow!" interrupted Bauer.

"No, sir!" said Stan emphatically. "At highway speeds the car shakes like a cement mixer. I traced the vibration to the drive train, and then pinpointed the drive shaft. A slight bend could make . . ."

"Impossible!" blurted Bauer.

"Stop it—stop it—both of you," said Gus. "Stan is a good mechanic," he said to Bauer, "and if he says the drive shaft is causing the vibration, I believe him. However"—Gus paused to choose his words carefully—"his diagnosis of a bent shaft may be . . . uh . . . premature."

"A fine way to run a business," Bauer growled, "making guesses that ruin other people's reputations."

Gus nodded gravely. "I see your point, Mr. Bauer, but I also accept Stan's appraisal of the trouble."

Stan and Bauer glowered at each other

"You and your assistant still have a lot of convincing to do," said Bauer, as Stan wheeled a jack under the Chevy's rear bumper.



ILLUSTRATION BY RAY QUIGLEY

while Gus continued talking. "Under the circumstances, I think the Model Garage should take another look at the drive shaft. Agreed?"

The '61 Chevy hardtop rolled to a stop on oversize "mag" wheels, its twin straight-through exhausts rumbling mightily.

"Zero to 60 in about six seconds?" asked Gus.

"Closer to five seconds flat," said Chip Sherman with a triumphant smile. "There's 480 horses up front, and a 4.4:1 ratio out back."

Eddie Bauer arrived in his panel truck a few moments later, greeted Chip warmly, and threw a sharp nod and a grunt toward Gus and Stan.

"I suggest," said Gus to Stan, "that

you briefly run through the tests you made earlier."

"Okay," said Stan grudgingly, "we'll start with the road test—specifically, coasting with the engine idling. That will show that the vibration is either in the drive train or the running gear."

"Great," said Bauer. "Start proving."

The other three were inside the Chevy, and Gus was hanging a "back in 30 minutes" sign on the garage door, when a service convoy pulled up in front of the service bay: Trooper Jerry Corcoran's state police cruiser followed by a '69 Lincoln Continental sedan. A tall, distinguished-looking man stepped out of the Lincoln and followed Jerry over to Gus.

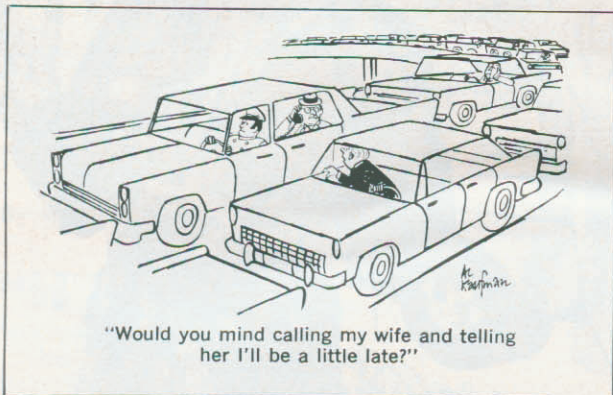
"Gus, meet Judge Whitmore," said Jerry. "The Judge has a problem—or,

*Continued*

rather, his car seems to have a problem.”

“Perhaps I should explain,” interrupted Whitmore. “My car insists on being a fugitive from justice and not even the police garage mechanics have been able to correct its evil behavior. Would you please examine it? I had planned to drive to a law seminar at the State University this evening, but that’s impossible now.”

Gus chomped down hard on his pipe stem, thought for a moment, and then nodded. “Certainly, Your Honor,” he said. He walked over to Stan, in the



driver’s seat of Sherman’s Chevy. “You’re on your own,” he said. “I have to reform a criminally inclined car—whatever that means. You get going, Stan.”

“Light bulbs,” the Judge said. “That’s the problem.”

“Light bulbs?” asked Gus.

“Yes,” said the Judge. “They repeatedly burn out at unpredictable—and inopportune—times. This week I’ve been stopped by three different police officers at night. Once for driving without tail lights; once for driving without a license-plate lamp; and once for driving with only a single headlight.”

Gus was smiling. “Fast-failing light bulbs,” he said, “are a classic symptom of voltage-regulator trouble. The relatively high voltage output of an unregulated alternator—about 18 volts—sizzles the filaments in a very short time.”

“No good, Gus,” said Jerry. “Our boys checked out the regulator and the alternator. Both are fine. But you’re half right—the problem *is* high voltage, but we don’t have an inkling why.”

A few moments later, Gus was stooped below the raised, massive hood, clipping the test leads of a voltmeter across the alternator output terminals. He turned the carburetor idle adjustment to produce an engine speed of about 1,500 r.p.m., and watched as the voltmeter reading climbed to a steady 18 volts.

“No regulation at all,” Gus muttered.

He unbolted the connector that joined the cable from the alternator’s field winding to the regulator. The voltage reading didn’t waver at all.

“The field winding is disconnected,” he said, “yet there’s obviously field current flowing to produce the output voltage.”

His practiced eye scanned the wiring assembly connected to the alternator, and stopped at the molded-rubber connector that joined the assembly to the alternator terminals.

On a hunch, he jiggled the connector. Instantly, the voltage output dropped to zero. Gus squeezed the connector slightly, and the voltage soared back up.

He smiled. “That connector,” he said, “is actually bypassing the voltage regulator. An internal short circuit is connecting the field winding directly to the positive battery terminal, making the alternator run at full tilt all the time.”

“And my drive tonight?” asked the Judge.

“No problem,” said Gus. “I’ll cut away some of the connector’s insulation, spread the shorting contacts apart, and tape the works together. It’s a temporary fix, but it’ll hold together until you can replace the wiring assembly.”

Chip Sherman’s Chevy was back, and Stan was wheeling a portable jack under the rear bumper.

“There’s vibration all right,” Bauer admitted to Gus, “but you and your assistant still have a lot of convincing to do.”

“Fine,” said Gus, “and while we’re convincing you, we’ll also eliminate that vibration.”

Bauer’s eyes narrowed. “Eliminate it?” He added sarcastically, “Is your assistant going to hammer out the ‘bend’?”

"Nope," said Gus. "My assistant, in fact, owes you an apology."

"That's more like it," said Bauer.

"And you," said Gus, "owe him one. Now Stan is going to prop the car up on blocks and remove the rear wheels and brake drums."

"What for?" snapped Bauer.

"So when he runs the engine and transmission at highway speeds," Gus answered, "we can be sure that the drive shaft is the source of the vibration. I believe you when you say the drive shaft isn't bent—but I'll bet it's slightly unbalanced at the rear end."

"Unbalanced?" asked Chip.

"Uh-huh," said Gus. "One side of the shaft is slightly heavy. A machinist would say that the runout is excessive. As a result the shaft wobbles as it turns. And the car's high rear-end ratio makes the shaft spin faster than in most cars, which accentuates the vibration."

Bauer softened a little. "You're still saying that I sold a faulty drive shaft," he said, "and I don't like it."

"Let's not say faulty," soothed Gus. "Rather that the shaft is slightly out of specification."

"How are you going to eliminate the shake?"

"By installing home-brew balance weights," replied Gus. "It's like balancing a wheel."

With the Chevy solidly propped off the ground, Stan started the engine.

"How fast, Gus?" he asked.

"Hit a speedometer reading of 50 m.p.h."

Gus looked underneath the quivering car. "The drive shaft is wobbling like a go-go dancer." He reached for a piece of chalk. "Now for the fix."

Gus carefully edged the chalk up against the rear of the spinning shaft, until he felt it barely touch. "I'm marking the heavy side," he said. "It picks up the chalk mark, since it sticks out a bit farther than the rest of the shaft . . . Okay, Stan, kill the engine."

Gus rummaged through a parts shelf and came up with a pair of screw-type hose clamps. "Here are our balance weights," he said. He installed the clamps around the drive shaft, spaced about an inch apart, and positioned so that their screwheads were on the opposite side of the shaft from the chalk mark.

"The weight of the heads," he said, "should counterbalance the excess shaft weight on the other side. Let's see how it works."

Stan restarted the engine. The shaft began to wobble—but not as severely.

"No good, huh?" asked Bauer.

"Now the clamp heads are overbalancing the shaft runout," said Gus, "but we can fix that in a jiffy."

He loosened the clamps, and rotated the heads away from each other through an angle of about 30 degrees.

"This dodge should do it. I'm changing the effective weight distribution," he said, as he tightened the screws. "Start her up, Stan."

The speedometer reading soared past 70, and the shaft spun true as a lathe spindle.

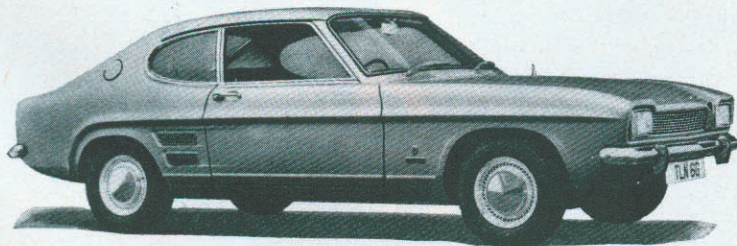
After Bauer and Chip had driven away—both satisfied—Stan turned to Gus: "Whew, I'm glad that's over. I hate sticky situations."

"Nothing really sticky," said Gus. "Just a case of a man and a machine both throwing too much weight around." **PS**

## Ford's sporty Capri

This new European Ford is made in both England and Germany. Its styling was derived from the latest Mustang, and its engineering is based on the Cortina.

This is the car that made Chrysler's executives decide to build a small car in America [see "Detroit Report"]. It is comparable



to the Maverick in size and weight, but four-wheel disk brakes are standard, though the car has only a four-cylinder engine.