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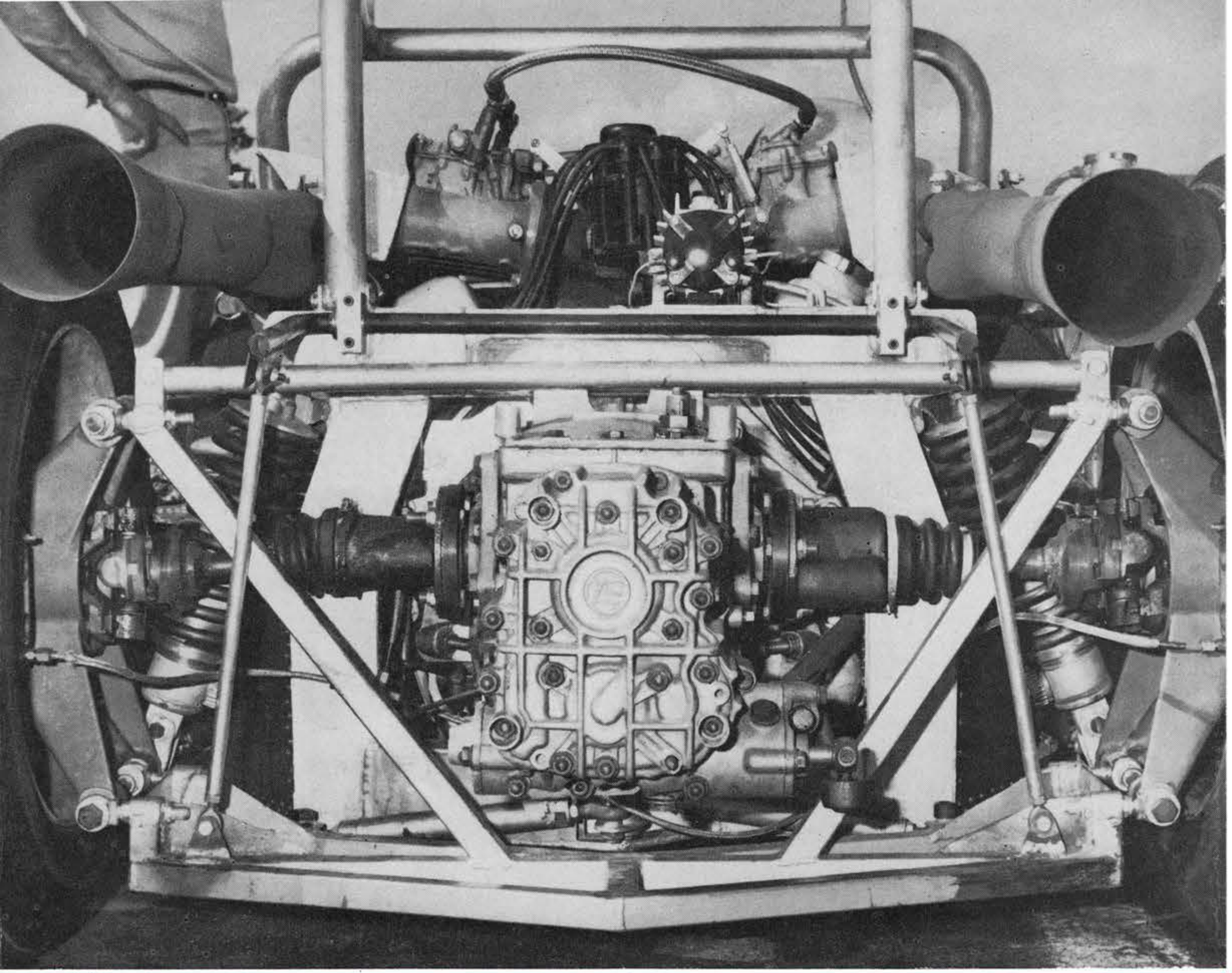


SUPER/SEVEN

From Behind a Smokescreen Comes The Posey/Caldwell Group Seven Car

TEXT AND PHOTOS BY KARL LUDVIGSEN

PRECEDING COLOR PAGES: This typical Group Seven car is a Dana Chevrolet McLaren driven by Peter Revson. The Cam Warren photo was taken at Riverside Raceway.

DETAILS OF Sam Posey's new Caldwell Group Seven car, leaking out before the car's maiden race at Mid-Ohio, have been confusing and conflicting. It sounded wild, but no one could put the pieces together. "Did you notice that?" Sam Posey asks gleefully. "That's because we've been telling everybody something different. We didn't want them to know what we were putting together."

From the deliberate Posey smokescreen, and from the secluded, colonial-fronted manufactory of Ray Caldwell in Marblehead, Mass., there now emerges a sports/racing car that is every bit as bizarre as its notices, one of the most completely new and radical cars to be built for the rich ($500,000) and challenging (six races) Canadian-American Challenge Cup series. Without undue flag-waving, moreover, the Caldwell car has drawn to the maximum on American resources in its construction. Non-U.S. parts, virtually without equivalent here, are a ZF gearbox, Koni shock absorbers, Weber carburetors, the clutch hydraulics, including a 1958 Berkeley Bandit slave cylinder, and the Italian steering wheel.

Though this is the first "Caldwell" car, it's far from the first automobile designed and built by engineer Ray Caldwell. Four years old, the Autodynamics Corporation, which Caldwell heads, is famous for its Formula Vee racing cars.

A major new addition to Ray's facilities is a precision steel surface plate, used to build the new Group Seven car. This probably would not exist, nor would the G. 7 project, if Samuel Felton Posey of Sharon, Conn., had not appeared. A racing enthusiast from boyhood, Posey was impressed by events during a trip to Europe in 1958, Mike Hawthorn's Championship year. After his return, he took the first of the numberless laps he's turned at Lime Rock, under the tutelage of his Connecticut neighbor John Fitch. When Posey entered driver's school after turning 21, in the spring of 1965, his Lime Rock know-how led to his outrunning his instructor, Ray Caldwell, who admittedly was driving one of his less healthy Vees.

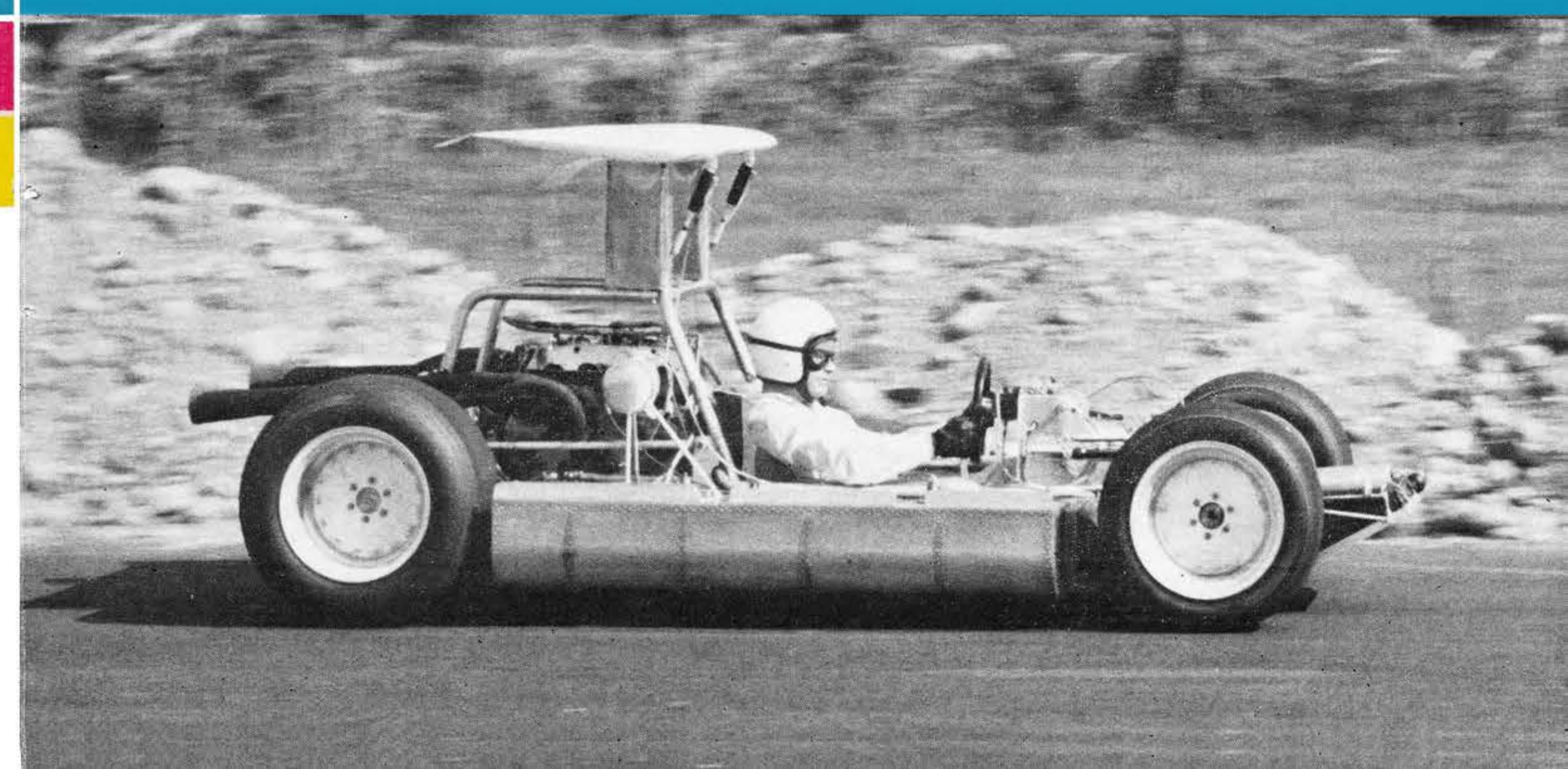
Posey campaigned in Vees during 1965, eventually acquiring an Autodynamics car. Toward the end of the year he had a Bridgehampton ride in an Alfa GTZ, and for 1966 he bought a Porsche 904 which he co-drove to a class win at Daytona. Sam clearly was building toward bigger things in his race driving career.

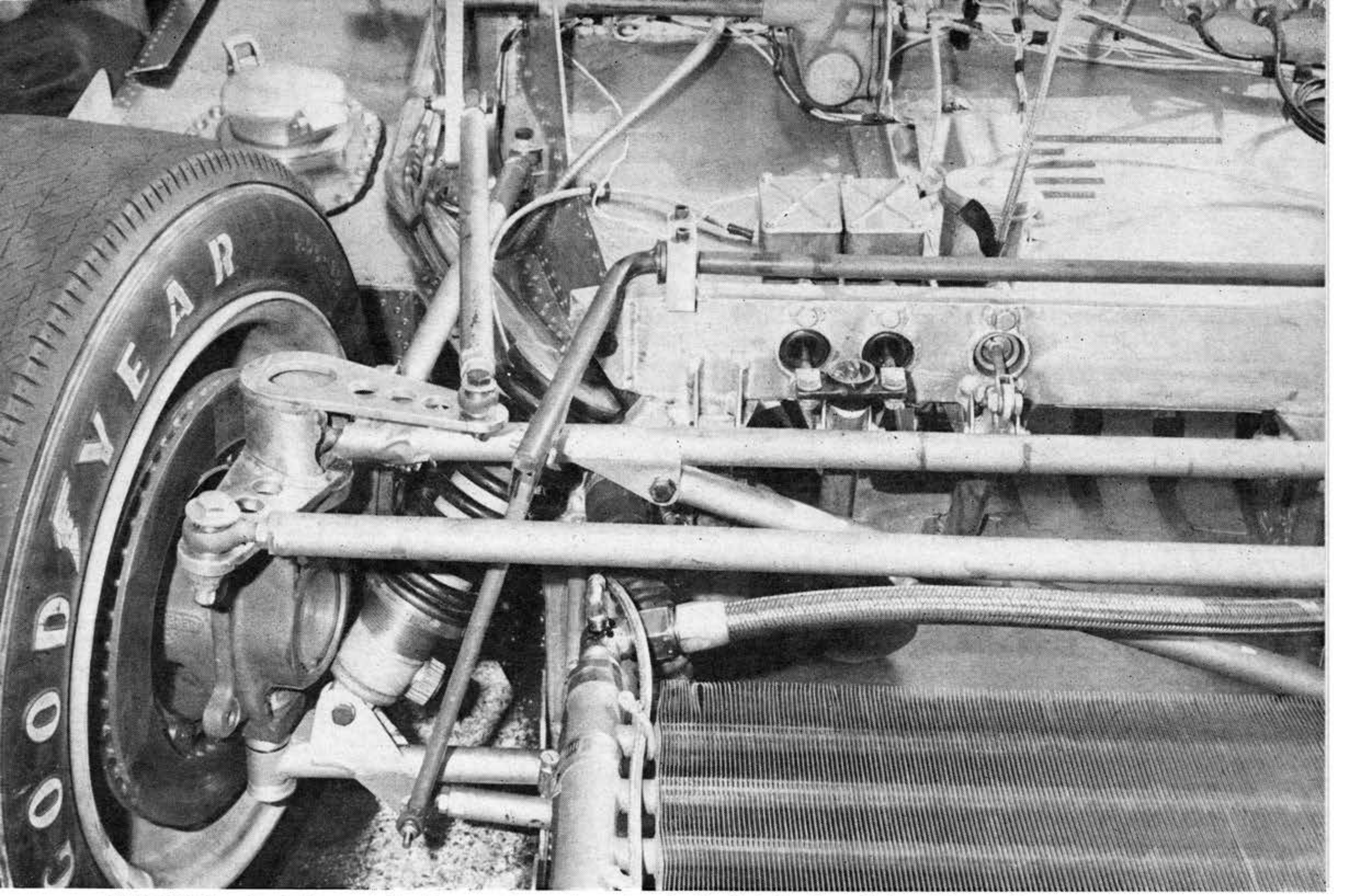
AT NASSAU, late in 1965, Posey reached an important conclusion. It was no longer enough, he decided, for the driver to buy the latest equipment to race. As have Hall, Brabham, Gurney and McLaren, Sam decided it was essential for the driver/backer of a racing project to make his own decisions. This ultimately meant construction of his own sports/racing car. Posey contacted Caldwell and asked him to take on the job.

Sam continued to race the 904 during 1966, but when the Can-Am series began to shape up as an outstanding group of events, Posey and Caldwell decided to race a current car as a yardstick on the other cars, or as Caldwell says, "to get a handle on the problem." They bought a near-new McLaren-Elva with a 289-cid Ford engine. As they had hoped, this was a reliable combination, but not fast enough to race wheel-to-wheel with the competition, so midway in the Can-Am a 325-cid Ford was installed. They knew this engine wouldn't stay together, but it did allow Posey to charge with the leading half of the pack before the 325 let go.

FOR THE 1967 USRRC races, the SCCA's season-long championship for Group Seven cars, Posey and Caldwell decided to repower the McLaren to match the equipment of the competition. They selected Traco Engineering as their exclusive engine source. They told Jim Travers and Frank Coon of Traco they would run their engines as they came from the crate, and send them back for a check and rebuild in case of the slightest malfunction. Posey pays the extra $1000 required for Traco to run, test and tune the engine on a dynamometer. He believes this to be an excellent investment. So far, the arrangement has worked out well, so well, in fact that they plan to carry over the same engine and drive train to the new car. That, Sam and Ray feel, will be one part of the car they won't have to worry about.

The crate from Traco contains a Chevrolet V-8 of 365 cid, topped by 58-mm Weber carburetors on a crossdraft manifold. Its output is 520 bhp and 490 lb.-ft. of torque. Traco initially suggested a 6500-rpm limit, but ▶





FRONT HUBS are located by parallel leading arms. Beam axle configuration is effected by diagonally braced lateral tubes, mounted above and below wheel spindle centerlines. An adjustable antiroll bar pivots above and behind the axle structure.

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others with similar engines have run at 7000, so Posey now allows himself to come close to that.

With the Chevrolet, Caldwell uses a Judson Electronic Magneto ignition, a Corvette aluminum radiator, and a Hayden Trans-Cooler employed as an oil radiator for the wet-sump engine. Some 10.5 qt. of SAE 50 oil are carried in the complete system, and an additional 4 qt. are available in a tank ahead of the left rear wheel. At the flick of a dashboard switch, a concealed Bendix electric fuel pump transfers oil from the tank to the sump, as required to counterbalance engine oil consumption during a long race. Posey, with Mark Donohue, was among the first to use such a system in a Group Seven car.

Also carried over to the new car are the clutch and gearbox they used in the McLaren-Elva. The engine and the synchronized German ZF 5DS-25 transmission are mated by a specially welded and machined adapter, actually a marriage of two adapters. The hydraulically operated single-disc clutch is a Schiefer, made originally for drag racing. Posey and Caldwell also pioneered the use of this component in a sports/racing car. From the ZF box, drive to the wheels is through two pot-type inner joints, which accommodate lateral shaft movement, and through two conventional outer Cardan joints.

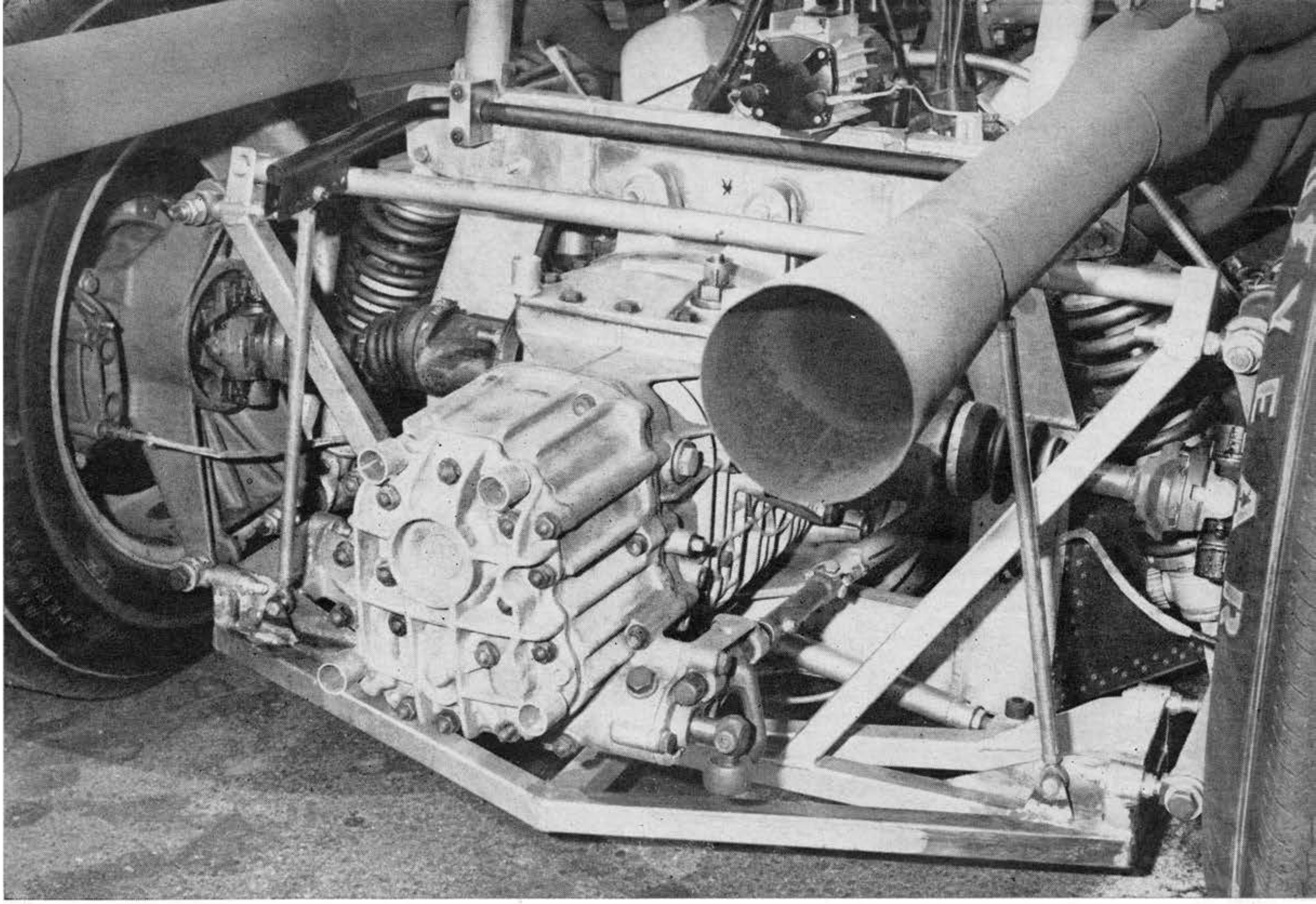
This power package is bolted solidly —no rubber—into the monocoque frame of the new G. 7 Caldwell, to add to its structural stiffness. This is typical of the total integration that Caldwell applied to this radical 2-seater. So thoroughly planned is the car's architecture that it is difficult to distinguish between body, chassis and suspension. Wheelbase is 92 in., rear track 50 in. and front track 52 in. Ground clearance is the practical minimum, 3 in.

The unusual body shape of the G. 7 Caldwell was derived from three main considerations: 1) What to fit into it; 2) Group Seven regulations and, 3) aerodynamic cleanliness and stability. Styling, as such, played no part except in a small way at the rear of the body.

Parts 1 and 2 were straightforward parameters. Part 3, the aerodynamic know-how, was obtained through consultation with Eugene Larrabee, a professor at M.I.T. Scale model test work was conducted in a low-turbulence wind tunnel, with easily available 1/24 scale slot car models as subjects for comparison.

Tunnel tests of model Lolas and McLarens showed they tended to lift, as do full-scale cars, so Posey and Caldwell believed the results were likely to have some validity. They then produced their own design, which the tunnel showed to have no more drag, complete with a wing, than a Lola with no spoilers at all. Their basic vehicle shape, with an extremely low nose, has very little lift. The 4° wing angle proved to be just right to counterbalance lift generated at speed.

THE WING WAS fitted for several reasons. It is expected to assist in braking. In addition to the 0.1 G drag, it will exert at its full downward 17° angle, its effect will be to shift force



REAR SUSPENSION is based on the de Dion principle. Hub carriers are maintained perpendicular to the road surface by fabricated square tubes. Watt link is mounted underneath to provide lateral wheel location. The antiroll bar is fully adjustable.

to the rear wheels under deceleration to permit application of greater wheel braking force at the rear. Also, Ray and Sam hope to manipulate the wing on the move to produce handling that varies from mild oversteer at low speeds for tight turns toward understeer for fast bends. With this in mind the wing was mounted to the frame, rather than to the rear suspension, and is carried above the car's approximate center of gravity location.

An aluminum tubing structure, which also serves as a rollover bar, supports the wing through two airfoil pylons. The wing itself, an NACA symmetrical design, is formed of two fiberglass halves braced by balsa formers and filled with foam. It is pivoted close to its own center of aerodynamic pressure. In the first installation it was actuated by twin hydraulic cylinders at the leading edge working under the engine's oil system pressure and controlled by a 2-position valve on the dash. With small oil lines required to keep from draining the lubrication system, however, wing actuation has been too slow. Alternate systems are being explored.

First aerodynamic considerations, size and shape of parts to be housed inside the body, was mainly a function of the wheel and tire sizes. This was most important at the front, where low lift and high stability are aided by the smallest possible body section size. For this reason, and for maximum traction at all four wheels, Autodynamics enlisted the help of Goodyear to develop the lowest, widest sports car tires yet. Now fitted to the car are 9.95-15 front tires. and 12.60-15 rears, mounted on rims that are 9 in. and 15 in. wide, respectively.

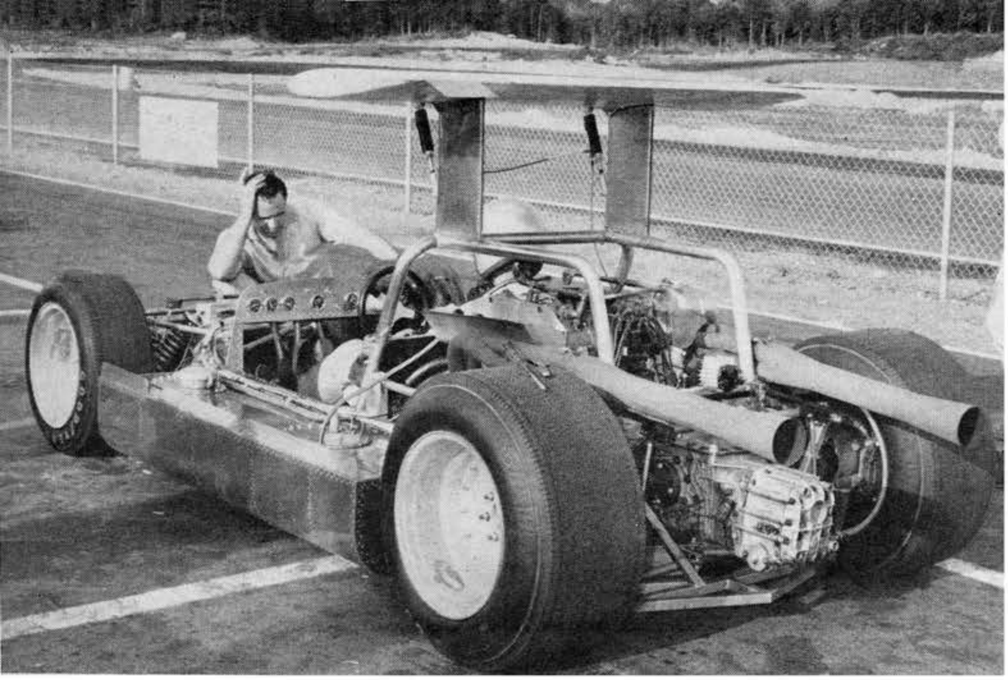
RAY CALDWELL praises Fred Puhn of Chassis Engineering in National City, Calif., for production of the special wide wheels. These wheels are spun of 6061-T6 aluminum in two halves. The halves gain in strength through the cold working of the spinning process. The wheel is formed by bolting the two anodized halves together to a central sandwich plate. Caldwell notes that the rear wheels, like those of the Formula I Lotus, are "square" with 15 in. in diameter as well as width.

Each part of this car is closely related to the next. For the best and simplest utilization of the wide, flat tires, Caldwell decided to fit the car with solid axles at front and rear. Suspension members are of SAE 4130 steel tubing with 0.049-in. wall. Hub carriers are cast of magnesium and adaptable to independent suspension.

The rear suspension is de Dion in principle. The two hub carriers are joined together by a low square-tube truss and by a removable tube, braced by diagonal square tubes, at the top. Threaded hub carrier attachments permit variation of the rear wheel position. Normal attitude is 0.5° of negative camber. Parallel trailing arms at each side run rearward from the firewall line to locate the "axle."

At the front the hubs are guided by shorter parallel leading arms, pivoted from the frame at the dash line. The front "axle" is no more than a pair of tubes, tied to each other laterally by a diagonal strut, which join top and bottom hub pivots across the chassis. It is a remarkably simple layout, not unlike the one A. J. Watson tried on one of his Indianapolis cars this year.

Lateral location of the axles is accomplished by Watt linkages, not unusual for this purpose, except that Caldwell has laid the pivoted center link on its side to conserve space. The pivot placement gives a 4-in. roll ▶



INITIAL HYDRAULIC system for wing actuation proved ineffective. Thus development of a new method of airfoil control has become necessary.

EARLY FORD J Car, mid-vintage Chaparral, a little Lola and, perhaps, a smidgen of McLaren make up the Posey/Caldwell styling theme.

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center height in the front, and a 5-in. height in the rear. Coil springs are used front and rear. Koni double-adjustable, aluminum-body shock absorbers, which represent a per-car investment of some $550, are fitted. Antiroll bars are provided at either end of the chassis, with drilled fittings to provide alternate lever arm lengths.

To accommodate solid-axle geometry, Caldwell abandoned rack-and-pinion steering for a layout that appears unusual on a sports/racing car, but actually is one of the oldest known. A worm and nut steering gear is mounted to the forward face of the dash panel. Its braced output shaft, to the right, ends in a Pitman arm that is attached to a drag link that extends forward to a steering arm atop the right front hub.

In the original steering layout, shown in the photos, a high placed track rod linked the two front wheels through forward-facing steering arms. The track rod has since been lowered, fixed to new lower steering arms, so that it runs below the oil cooler. This provided a stiffer wheel-to-wheel brace and less obstruction of the ducting away from the radiators. Caldwell also has revised the drag link position and has stiffened the cowl, which at first "oil-canned" under the reaction stresses applied through the steering gear.

The 12-in. steering wheel, an Italian import, is anodized aluminum with a padded-rubber leather-covered rim. Posey likes its extra padding for the thumbs, as well as an off-center mounting devised by Caldwell. Its center is offset one in. downward, in relation to the steering column. The effect is that the wheel turns up and away from Posey's long legs when rotated away from the straight-ahead position.

Posey hopes the G. 7 Caldwell, when developed, will gain ground on its rivals through superior straightaway speed, thanks to low drag, and through exceptional stopping power with wing and dual-circuit Airheart disc brakes. The latter have ventilated discs and lightweight calipers. Light weight is the chief reason for use of Caldwell's own make of brake hose, comprised of nylon tubing encased in electrical shielding for protection and strength. The Airheart system required pressure bleeding before it developed a firm pedal, but now it is performing well.

POSEY AND Caldwell originally bought a McLaren instead of a Lola for 1966 Can-Am races because they thought then that their own car would have a tubular frame, not monocoque construction. They believed a tube frame would be easier to maintain and repair in the event of a crash. Their Can-Am experience convinced them, however, that the competition is so tough that the strongest possible frame is required, and that no one fixes anything they've bent. It has to be just right, which usually means a new frame. This reasoning led to the G. 7's monocoque structure.

The frame is a true monocoque, made up of sheets of 6061-T6 aluminum riveted to L-shaped stringers. (Square-tube stringers were used in a full-size practice chassis Caldwell fabricated to test construction methods.) The aluminum sheets vary in thickness from 0.040 in. to 0.065 in., depending on the application. Main frame strength is provided by fore-and-aft vertical sheets that form the inner side of the fuel tank containers. These are braced by triangular sections, front and rear, that taper outward to provide maximum interior width through the cockpit. Aluminum box-section rings at the front and rear of the frame join the tips of the triangular frame extensions at each side, and accept coil spring and Watt link loadings. Bracing through the cockpit is added by lateral sheets riveted in to form the seat back and bottom.

To prevent deformation of these aluminum panels in this deep-section frame, Caldwell elected to fill the side triangular frame elements and the under-seat volumes with polystyrene plastic foam. The foam expands within the desired frame volumes, filling all the corners under low pressure, after two reagents are mixed and poured in. The resulting foam weighs 2 lb./cu. ft., and there are about 6-7 cu. ft. used in the G. 7.

The foam used in the first car can withstand up to 30 psi pressure before it deforms. For the later cars, Ray may use foam which weighs the same, but resists 70 psi. Other builders, notably Lola, have used foam filling, but not to as great an extent. Some have run water and oil pipes through foam-filled frame sections, a practice Caldwell has scrupulously avoided. "Can you imagine what that looks like in there after a water pipe lets go?"

The frame weight, including outboard fuel tank containers which add strength, is 115 lb. This compares favorably to the 123 lb. of a Group 7 Ford's honeycomb frame. Within the outboard tank housings Caldwell neatly tucked away the auxiliary oil tank to the left, and the battery to the right.

Two separate Goodyear bladder tanks, each with its own complete fuel system, provide a combined capacity of 50 gal. Each tank is filled with hollow plastic balls to keep it from collapsing. Each also has one such ball attached to the fuel pickup at the extreme rear of the tank to insure that its entry will not be blocked. At the bottom of an aluminum well, sunk in each tank housing, is an electric fuel pump, placed as low as possible so its inlet side is not forced to lift fuel—something such pumps do poorly. Each pump feeds into the end of a horseshoe manifold which supplies the four Weber carburetors.

SO FAR, POSEY and Caldwell have been too busy testing the first car to weigh it, but they estimate that its actual weight will be 300 lb. less than the 1760 lb. of their McLaren. The approximately 1460 lb. would be distributed about 30% on the front and 70% on the rear axles, respectively. With fuel tanks full, the proportion would shift forward.

Posey has enjoyed some sponsorship this year from the Hudson Wire Co., which will continue to back his new G. 7 in a modest way. Hudson has also wired the Caldwell and believes that its recent sales increases are associated with its activity in racing. Posey hopes, however, that the new car will demonstrate sufficient speed in this year's Can-Am competition to warrant an investment in 1968 from a major oil company sponsor. Posey is wealthy enough to initiate a project such as this, but he wants his racing to be on a businesslike basis.

Construction of the first G. 7 Caldwell was started on May 20 of this year, and was completed by August 15. A second car is being built for Brett Lunger of Wilmington, Del., to drive in later Can-Am events. A third, incorporating many improvements, is slated to be built before the winter. Posey and Caldwell stress they are not expecting wins or even finishes this year, that this is the beginning of a 2-year program to develop a car that can win overall in 1968. "We'll race the car to get it right even if we're not doing well," Posey says, "and we'll take it to Florida and test all winter if we have to. We're new in this league and we need experience." ■