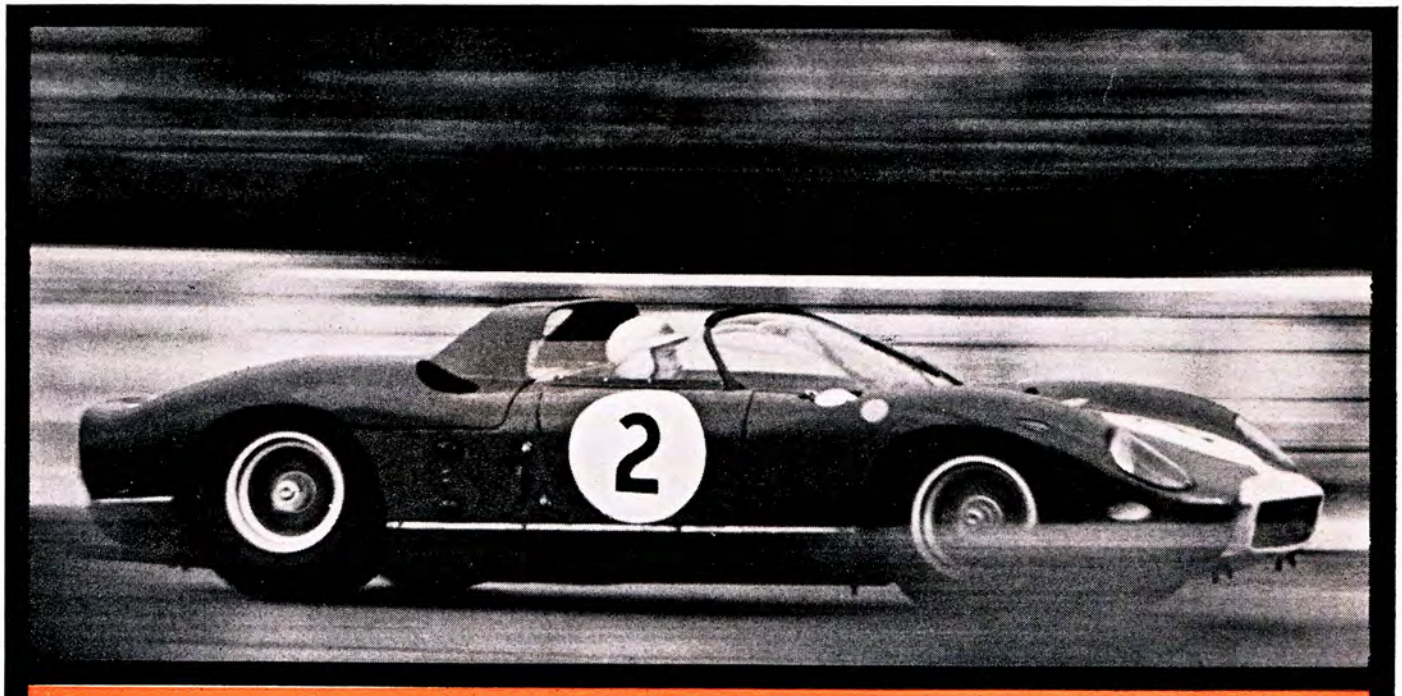

PARIS MATCH

Enzo's veteran V-12 finds success in a new location

FERRARI'S REAR-ENGINED GT PROTOTYPES

BY ERIC NIELSSEN

Rear-engined V-12 Ferraris have been around for more than two years now, but it still surprises me to hear that excruciating shriek of many little cylinders coming from a squat, truncated rear-engined object that should by rights be crackling harshly like a four-cam Ford or bellowing insistently like a big Chevy. No longer does the famed Ferrari sound signify a long-nosed roadster with twelve cylinders out front. In fact, if Commendatore Enzo Ferrari had had his way with the learned gentlemen of the FIA, his factory would be producing today nothing but rear-engined cars for competition in all categories.

After decades of a great Italian tradition of glorious front-engined racing cars, it was very difficult for Ferrari to accept the necessity to go rear-engined. The story of how he made the change, in his Grand Prix cars of 1960 and 1961, was told in *Car and Driver* of July 1961, and for those who have not treasured that issue I can only say it was a traumatic but successful turnabout. It was then logical to build sports/racing cars with V-6 engines (later, V-8s) in the rear, which Ferrari hastened to do, but I for one never thought he would put the famous V-12 in the back. There was just too much Auto Union about the idea.

Ferrari, however, did not have to pioneer the V-12 route; Maserati did that for him. For the 1961 season, Ing. Alfieri of Maserati produced a rear-engined sports car, the Type 63, built around the 2.9-liter four-cylinder engine which had powered the "Birdcage" Type 61. Early events showed the

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new car to be even more fragile than its predecessor, especially under the pounding of a big-bore four-cylinder engine. On behalf of the Cunningham *equipe*, which had financed these cars and owned some of them, Alfred Momo suggested that Maserati get out one of their old (1957) Grand Prix V-12s, taken out to three liters, and fit it into the Type 63. It would probably be more powerful and would certainly be smoother and easier on the car.

The first Type 63 V-12 turned up for Le Mans practice on April 8, 1961, and one of the cars went on to place fourth overall in the race that year, the only time the type was run at Le Mans. These cars and their even uglier successor, the Type 64 of 1962, were modestly unsuccessful, but they did perform well enough before they broke down to show that a lengthy V-12 power unit behind the driver need not be an obstacle to competitive handling, given what we know today about competition car chassis design.

In other ways, the decks were cleared for the arrival of the rear-engined V-12 at Ferrari. The famous walkout *en masse* of a group of engineers and technicians from Maranello took place in November, 1961. The new V-8 sports car engine left behind by ex-chief engineer Carlo Chiti was not subsequently viewed with favor by Ferrari, especially since Chiti made a very similar engine for ATS, so an equally powerful alternate engine was needed. Further, the revival of the prototype category for 1963 meant that a design was necessary that could conceivably be produced in quantity at a later date.

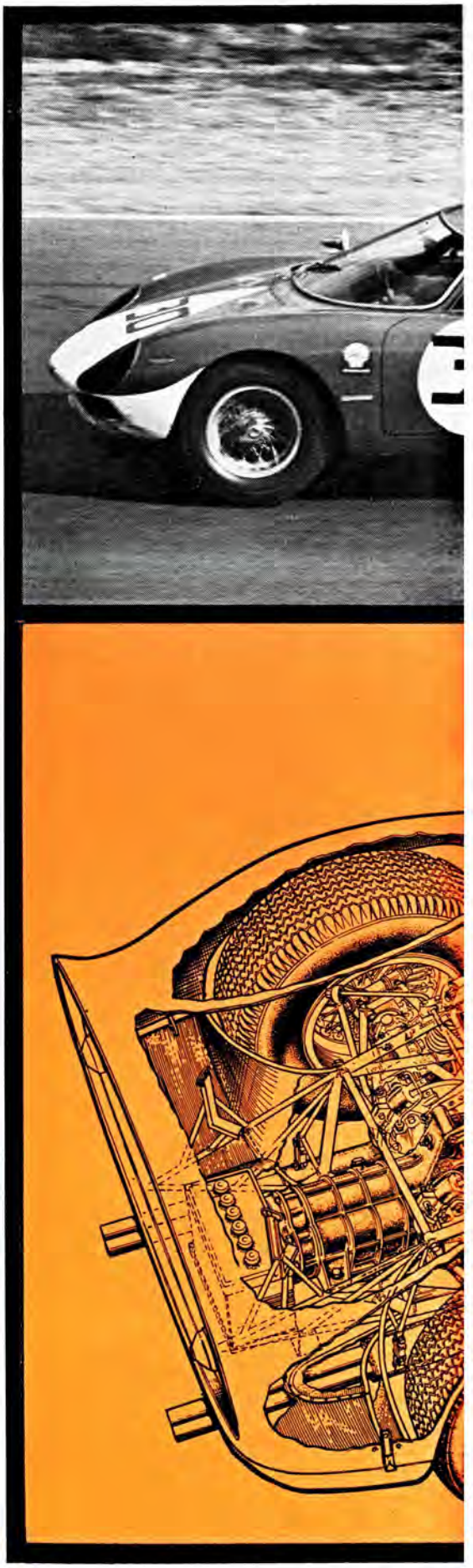
The first V-12 engine swap was made late in 1962, using a 268/SP body and chassis, with the wheelbase stretched by about three inches in the engine room (from 91.4 to 94.5 inches overall). A dry sump version of the Old Reliable three-liter V-12 was chosen, fitted with a shorter exhaust system which to everyone's amazement produced five more horsepower instead of the expected reduction.

Top man in Ferrari's considerable design staff was then and remains the youthful Ing. Forghieri. The downshaking and development of this new device on the track was the responsibility of Michael Parkes, whose suspension knowledge helped make the new combination work without major alteration to the straightforward parallel-wishbone suspension which dated from the Chiti era.

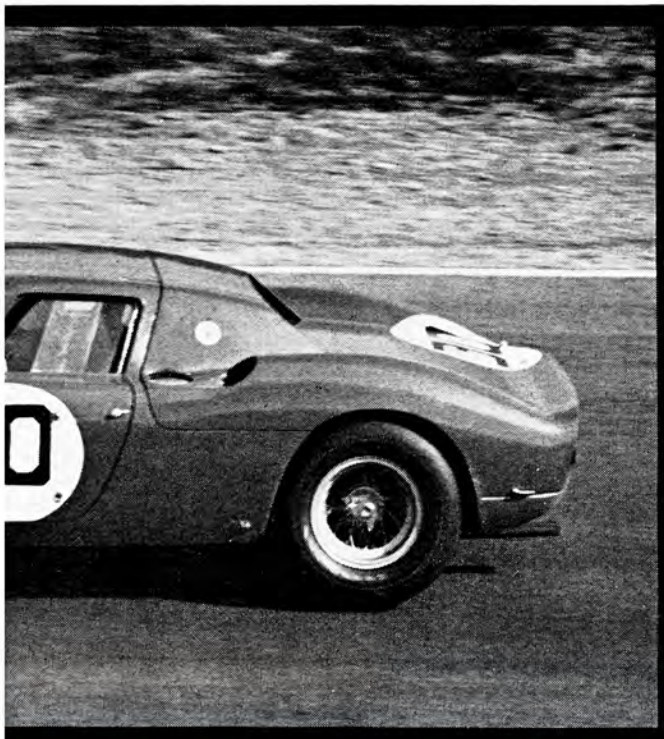
The resulting 250/P, as the new GT Prototype roadster was designated, gained a reputation for remarkably good handling. Surtees described it this way: "Light throttle gives understeer characteristics, and the suspension is designed to use tires that allow changeover from understeer to oversteer. The car is a little heavy on a slow corner, so you go to the apex of the corner in understeer and change to oversteer. It is very stable at high speed but does tend to weave a little when there is a cross wind." Its stability was specially evident at Le Mans, where the 250/P was timed at 180 mph, generally without drama.

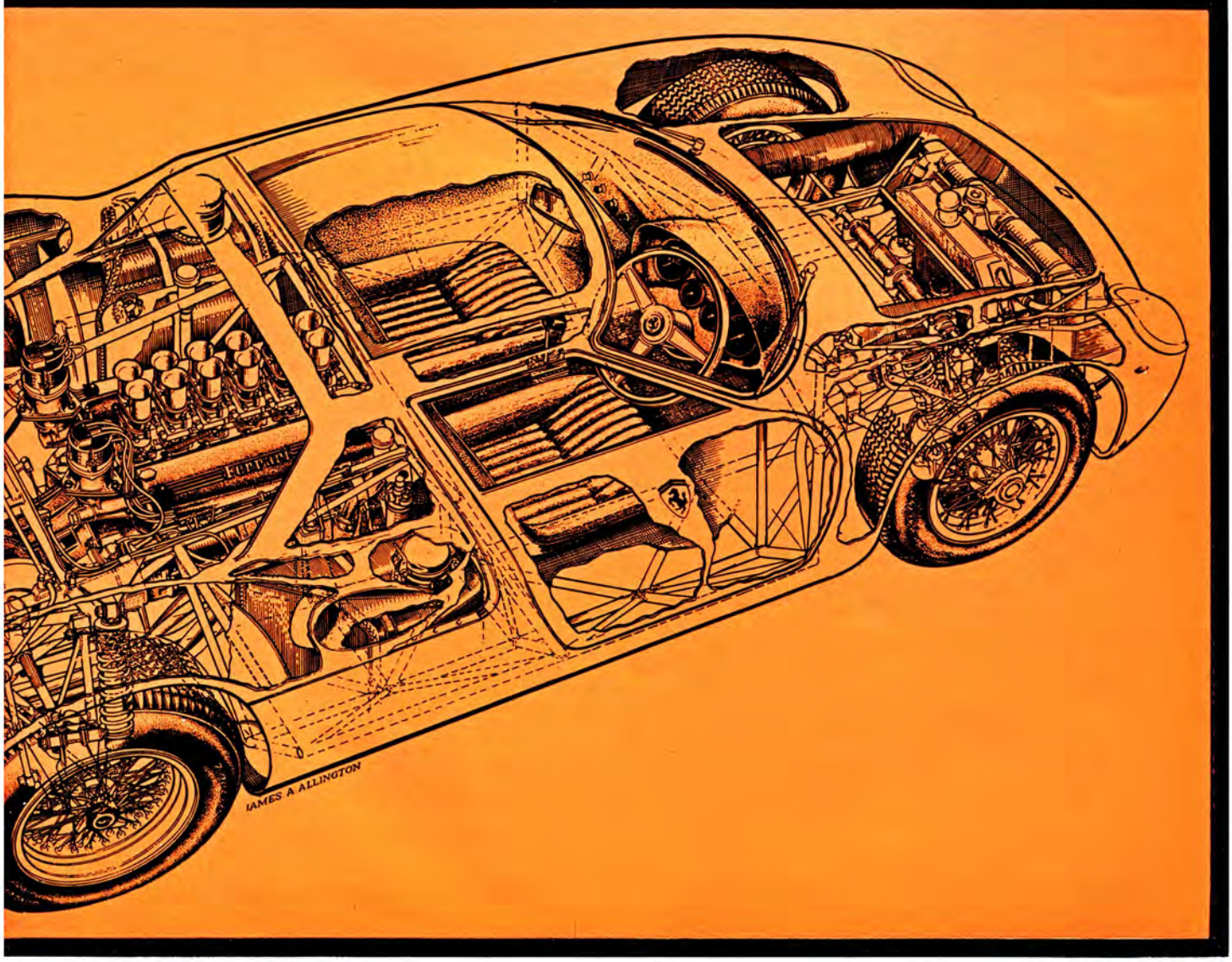
Weight of the 250/P was up to 1670 pounds from the 1450 of the preceding year's sports/racing cars, not only because the engine was slightly heavier, but also because Ferrari made this a genuine prototype with a fully-carpeted and trimmed interior, curved glass windshield and deep, full-width instrument panel including a glove compartment which would certainly pass the Rollei test. A few well-placed scoops replaced the earlier multiple slots and vents, while the double-nostril air entry, another Chiti trademark, was replaced by a single rectangular scoop flanked by built-

JOHN JEROME



Evolution of the LM: the show car (upper right and below) had a short roof with built-in air-spoiler. At the Le Mans practice session, a "boat-tail fastback" (lower right) went fast enough, and the production 250/275s (upper right) have a roof line somewhere in between. Note in the show car the tall door openings and the fully appointed interior.





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in driving lights. Behind the cockpit a hoop-shaped airfoil helped redirect the air spilling rearward off the high windshield. The cars ran both with and without plexiglas fairings over the doors, depending on how bad conditions were in the very hot, poorly-ventilated cockpits.

Early in March the 250/P was given its first static display, at Monza, and later in the month it was shown to good effect dynamically when two examples placed first and second at Sebring. In April, at the Le Mans test session, Surtees positively shattered all potential opposition by lapping at over 133 mph, cutting 11.6 seconds off the track record. In the race in June, 250/Ps placed first and third, getting between seven and eight miles per gallon while winning at over 118 mph and taking the Index of Performance award as well.

These new Ferraris weren't successful in the Targa Florio, but they scored further wins in 1963 at Nürburgring and Mosport. They also placed fourth in the Riverside pro race and second at Nassau, with entries by N.A.R.T. It could be called a satisfactory first season.

Before that first season was over, at the Paris Salon in October, Ferrari introduced on his stand the Grand Touring production version of the 250/P, named the 250/Le Mans, or, more familiarly, 250/LM. Either way, it was dynamite. It was every centimeter the 250/P with a lid on, and there would clearly be no Grand Touring car that could live with it on the same stretch of race track. (Those with a penchant for making comparisons would do well to remember that at this time the Ford GT was little more than a gleam in Roy Lunn's spectacles.)

Some idea of the trussed tubular frame of the 250/LM may be gathered from the Allington cutaway, which shows the actual Paris Salon car. Much less diagonal trussing had been required in the 250/P frame, which gained stiffness in a lighter-though-dearer manner with stressed aluminum sheet pop-riveted to all frame sections where access was not needed. Heavier tubing was used in the new car's lower sill framework, lowered to allow a better entry condition. The 250/LM also had a wider, heavier cowl structure to support the more complex doors required by a coupe. Further to improve the entry situation and the interior room, the dual fuel tanks were placed between the firewall and the rear wheels. On the 250/P they extended the full length of each side sill from wheel to wheel.

With fabricated tubular wishbones and coil/shock units at all four wheels, the suspension was a more direct carryover from the 250/P. At the rear, it continued to have pigeon-toed axes for all the suspension pivots (visible in the cutaway) which, and please correct me if I'm wrong, tends to place the suspension under compression during acceleration, which reduces deflection of the members under such conditions and prevents unwanted rear-end steering effects. There are anti-roll bars at front and rear, and rack-and-pinion steering in front.

Power, of course, was provided by three liters of V-12, with Testa Rossa cylinder heads and six twin-throat Weber carburetors to produce 300 horsepower at 7500 rpm. The front end of the engine was also pure Testa Rossa, with a chain-driven water pump and a pulley on the crank nose to drive an AC generator, mounted on the frame off to one side to save longitudinal space. Within the front cover is the pressure pump of the lubrication system, *(Continued on page 92)*

PETE COLTRIN

The rear-engined Ferraris with the suffix "P" are all business. The 250/P (upper right) and the 330/P are almost identical but for displacements (3.0 and 4.0 liters), as is the successful 3.3-liter 275/P (not shown). The 330/P2 (below and upper right) is somewhat wilder, just on the border between a genuine prototype and an out-and-out sports-racing car.


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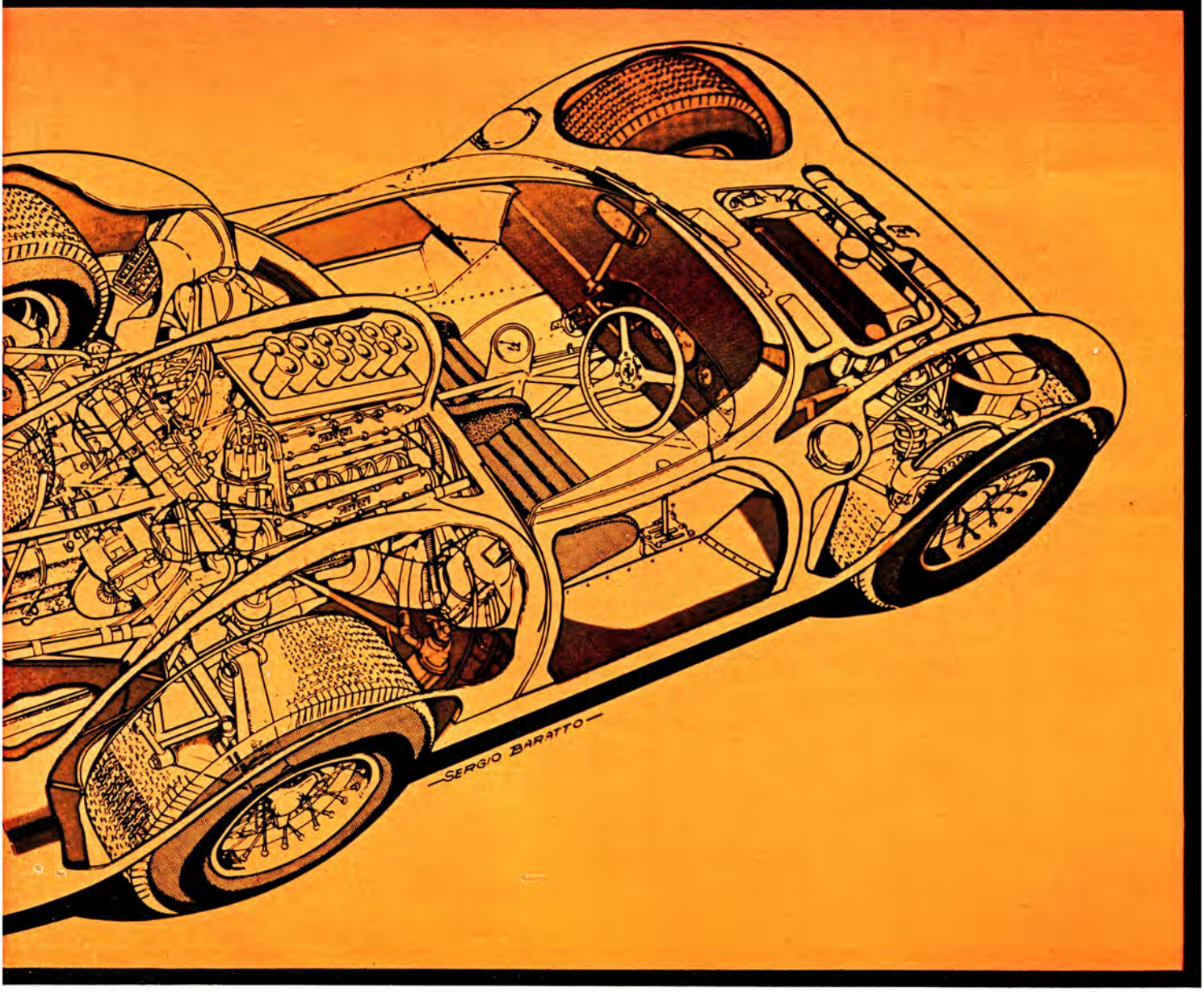
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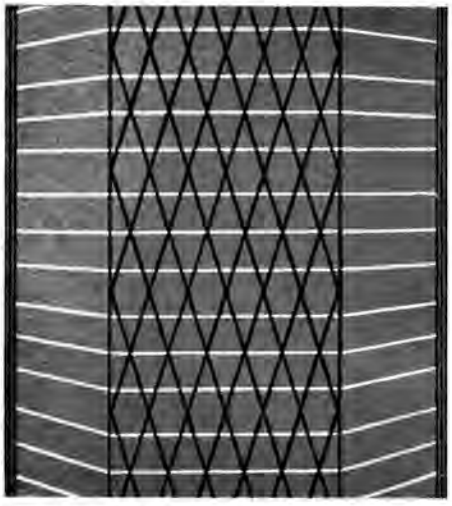

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which for the first time in a Ferrari designed as a GT car is of the dry sump variety. This was adopted to allow the engine to be placed as low as possible to keep down the center of gravity of the whole machine. A tank behind the radiator holds the oil supply, and a separate radiator is provided to cool it.

When the definitive version of the 250/LM was shown in May of 1964, it was found to have a bore of 77 mm and displacement of 3286cc in place of the traditional 73 and 2953 respectively. This didn't affect the peak power dramatically, and in fact the rating was not changed, but it provided a superlative torque curve. Some drivers preferred this engine's torque characteristics to those of the much larger four-liter engine. Technically this version should have been called the 275/LM, but Ferrari didn't change the name because he didn't want to make his existing homologation problems even worse, so I'll play it his way.

The low displacement of the dry sump engine is allowed by the design of the gearbox, which dates basically back to the experimental 2½-liter Grand Prix car of 1960. The drive from the engine is taken by shaft underneath the gearsets to the rear of the box, where a pair of reduction gears takes it up to the lower, primary shaft of the transmission. The upper, secondary shaft takes the drive forward again to the ring and pinion and the gear-type limited-slip differential. Gear ratio changes are made by swapping the reduction gears, reasonably accessible at the back of the box.

There are two places to put the clutch in this drive train, and Ferrari makes use of both. Originally a multiple-disc clutch was exposed at the rear, mounted at the back of the primary shaft and driven at less than engine speed through the reduction gear. When the 250/P was introduced, however, the clutch was found to be a normal single-disc mounted at the engine flywheel. That's the way they ran at Sebring in 1963, but one of the three cars at the Nürburgring later in the year had the outboard clutch, and two out of three had it by Le Mans time. Since then all the Prototype Ferraris have had the outboard clutch, while the 250/LM has from the start had the simpler, enclosed flywheel-mounted clutch, which seems to get the job done. One small disadvantage is that it requires the engine to be mounted some three inches farther forward.

No synchromesh is provided for the five forward speeds, with indirect ratios of 2.214, 1.555, 1.250 and 1.105. The four sets of reduction gears in the 250/LM catalog are good for maximum speeds ranging from 131 through 143 and 157 to 178 miles per hour, all with the same 11/35 ring and pinion gears. While the 250/P had its gear shift lever on the right (all these cars are right-hand drive) the 250/LM has it in the center, between the seats. Its handsome, narrow gate is fully exposed, including the simple interlock mechanism that helps guide you through the five-speed sequence with minimum error. For example, you can't shift up from first to fourth by mistake.

Dunlop disc brakes stop the 250/LM, mounted outboard in the front and inboard, next to the differential, in the rear. Front/rear disc diameters are 12.4/11.8 inches, and the hand brake caliper is arranged to act on the left rear disc only. Individual ducts carry cooling air from fender scoops to each of the disc calipers.

As for all Ferraris that are catalogued for sale, Pininfarina designed the body for the 250/LM. Lest we forget this fact, each production Ferrari now carries a small plaque proclaiming "disegno di Pininfarina". The firm earned its fee and its plaque on the 250/LM project, which posed new problems in aerodynamics and insulation from noise and heat. In contrast to the otherwise similar ATS coupe project, the Ferrari was given a heavy firewall between engine and seats with no glassed opening communicating with the engine room. The car was provided with a pickup-like cab which, like recent competition Porsche coupes, could be completely isolated (in theory and, to some degree, in practice) from the fumes and fury of the power package.

The original Paris Salon 250/LM had a radically abbreviated roof line with an aerodynamic slot at the rear, identical to the roof used on the 1964 version of the 250/GTO and a product of wind tunnel work by Pininfarina. At the Le Mans tests in April, however, the lone 250/LM was tried with a sleek, pure fastback with practically zero rear visibility. When the definitive version appeared in May, it was seen to be a compromise between the original and the fastback, somewhat extended and minus the slot. The carburetors now drew air from the rear deck area sheltered by the extended roof, instead of from the fender scoops as before. These

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FERRARIS *CONTINUED*

scoops were raised and enlarged and allowed to handle the rear brake cooling only.

As compared to the Paris exhibition car, the production 250/LM had additional venting in the Kamm-type tail, exposed twin fuel filler caps, and two plexiglas scoops in the "trunk lid" which ventilated the cockpit by way of the FIA luggage compartment. Street versions of the 250/LM have an interior much like that shown in our cutaway, while those delivered for racing have more bucketed seats and the main driving instruments radically recessed deeply in the crackle black panel. Perfectly adequate space is provided for both ends of the body in the comfortable driving position, which is angled across the car toward the centrally-placed pedals.

One of the primary objectives of going to all the trouble of building a rear-engined GT Ferrari had to be a reduction in weight, so this aspect is worth a look. The official dry weight of the 250/LM is 1870 pounds, just 200 pounds more than the 250/P. The Le Mans wet weight of the 250/P in 1963 was 2050 pounds, and the equivalent weight of the 1964 3300cc 250/LM was 2100 pounds, remarkably light even considering that it was running as a Prototype. On the same scales the normal 250/GTO Ferraris were weighing in at around 2375 pounds, indicating that the new car had saved weight at a rate of more than 10 percent. As a matter of interest the Ford GTs weighed between 2308 and 2355 pounds at Le Mans, so they had not gained a great deal —and in fact were still behind Ferrari—with their monocoque construction. (Instructive to compare this month's cutaway with that of the GT in *C/D*, June 1964.)

The racing debut of the 250/LM was going all right, at Sebring in 1964, up to the time it caught fire and burned to the ground. It was running then as a prototype, but Ferrari was confident that it would be accepted as a GT car at the April session of the FIA's homologation committee. Only a handful had been built by then, and anyway the request was filed too late, so April passed without acceptance of the car. Another application filed shortly thereafter, for the "production" version with 3.3-liter engine, was denied when it was clear that only ten of the required 100 cars had been made.

During the July sitting of the homologation committee the major 250/LM homologation blowup occurred. This time the committee sent a delegate to Maranello to see the situation for himself. Ferrari showed him seven cars ready for delivery, six completely finished bodies and nine chassis ready for bodies at Scaglietti, four chassis under construction, four cars awaiting their engines and transmissions, and seven cars being assembled on a special line at Maranello. This was excellent evidence of a serious production program for a small manufacturer like Ferrari, with 37 units in progress, but it wasn't good enough for the hard-nosed 1964 model FIA, which again snubbed the 250/LM.

In spite of this lack of homologation, which still continues, there was no lack of customers for the confident-looking 250/LM. Those who handed over the reported $22,000 per copy without extensive haggling included Bob Grossman, John Mecom, the Swiss Scuderia Filipinetti and the Belgian Ecurie Francorchamps, assorted Austrian and English individuals, and Luigi Chinetti on behalf of his American customers. The Grossman car was on the used market early this year at $17,000, in case you're interested.

These cars went through 1964 as Prototypes, tuned a bit higher than the GT 250/LM to develop 320 bhp at 7700 rpm from the 3.3-liter engine. In May at the Nürburgring 1000 Kilometers one of the cars worked up as high as fifth place but crashed and retired. Of the two entered at Le Mans, one blew its oil filter on the first lap while the other went through to finish 16th. They came back strong with their first big win, a one-two placing in the Reims Twelve-Hour, and went on to win the Elkhart 500, place second in the Tourist Trophy, place third in the Bridgehampton Double 500, and set fastest lap in the 100 Kilometers of Paris. Additional wins were posted by the type in the Sierra Montana-Crans hillclimb, the Coppa Intereuropa at Monza and the Grand Prix of Angola (another one-two finish).

While all this was going on, Ferrari had been taking steps to ensure that his prototype cars would not be edged out of the outright wins by various Ford-powered products during 1964. Still roadsters (Ferraris were in fact the only roadsters entered at Le Mans in 1964), their body shapes were cleaned up further over 1963 and their ductwork improved, while their chassis were basically unchanged.

Fitted with the 3.3-liter V-12, some of the prototypes were desig-

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nated 275/P, while others, Ferrari's counter-Cobra weapons, had the basically-different 4-liter V-12 and were named 330/P. This combination was first tried in public at Reims in June of 1963, when Mike Parkes cooked the clutch at the start of a sports car race but came back to set successive lap records. In practice this first 330/P turned just the same lap speed, 132 mph, as Jim Clark's pole-sitting GP Lotus.

The early Ferrari four-liter engine, as used in the first 330/Ps, was based on the familiar three-liter engine with a lowered crankshaft centerline. A new longer cylinder block, with dry cylinder liners and four-bolt caps for all main bearings, has been used in later editions of the 330/P. The new cylinder heads of this engine have more "open" hemispherical combustion chambers than the older V-12, providing improved breathing to match the added displacement. In the 330/GT this 3967cc engine produces 300 bhp at 6600 rpm; with additional carburetion, a competition accessory drive and a dry sump lubrication system it delivers 370 bhp at 7200 rpm in the 330/P. Dry weight of the machine was increased somewhat by the bigger engine, to 1730 pounds compared to the 1660 pounds of the 1964 275/P.

It would have been difficult to have sketched out a more successful season than that enjoyed by these Prototypes in 1964. First and second at Sebring were filled by the 275/P, with a 330/P third. At the Nürburgring a 275/P won. One of each type appeared for the Le Mans test day, turning the expected 133+ mph laps and, in the case of the 330/P, reaching just 190 mph on the Mulsanne Straight.

In 1964, Ferrari was extremely concerned about the American challenge at Le Mans. We can tell because he did a most uncharacteristic thing. Alfa Romeo has a small test track, at Novara, west of Milan. Ferrari obtained the use of this track and there, with a representative sample of cars, carried out a full-dress simulation of the Twenty-Four Hours of Le Mans. As if this were not enough of a shakedown, they also tested the team cars thoroughly at Monza. Small wonder the Le Mans finishing order showed a 275/P first, 330/P second and another 330/P third. The winning car averaged eight miles per gallon at a blistering record average of 121.6, up almost four mph from the previous year, and again added the Index trophy to the bag.

Later in 1964 330/P Ferraris were winners in the Tourist Trophy and the 1000 Kilometers of Paris. As Ferrari turned his attention to his Grand Prix cars to eke out a Championship for John Surtees, the sports cars went farther from home to such exotic climes as Bridgehampton and Nassau. At the Long Island circuit a 330/P (a one-off example) was fastest in practice but could not hold the pace of the American-engined machinery; a 275/P finished second. At Nassau the N.A.R.T. 330/P placed third, again fast but no match for the Chaparrals and the McLaren-Olds. Nevertheless, most of the Prototype versions of these durable, maintainable sports cars are being refurbished by Ferrari and fitted with low sports screens for sale to those in America and elsewhere who would like to buy themselves some fast, competitive rides.

Ferrari can afford to turn these cars loose because he has a new Prototype on the stocks which will surely eat them alive. This automobile, designated 330/P2, is the first new concept in Ferrari sports/racing cars since Chiti and company left Maranello, and it is certainly Ferrari's answer to the renewed threat posed by Ford (although the Ford rebuttal at Daytona was convincing enough).

Heart of this hairy projectile is a four-overhead-camshaft V-12, not a new engine but one plucked out of the capacious parts bins that hold the fruits of 18 years of racing V-12s. In late 1956, this engine was developed as a set of special cylinder heads for the big 4.5-liter-type V-12 block, which means it had wet cylinder liners screwed into the heads. It started out at 3490cc, but in early 1957 it was "bored" to 3781cc, and for the Mille Miglia that year it was further expanded to 77 x 72mm, for 4023cc. Like the famous Maserati 450/S V-8, this engine was put out of business at the end of 1957 by the arrival of a three-liter limit for sports cars, though Ferraris powered by it continued to find successes in American racing.

Then and now this engine has been lubricated by a dry sump system whose dual scavenge pumps reside in the sump proper. A separate double-roller chain system for each cylinder bank drives the cams, at the front of the engine, and the valve gear is of the light, simple screw-on-tappet type propagated by Vittorio Iano, who is still a consultant to Ferrari. Dual ignition is a now somewhat-dated feature of the engine, and the twin Marelli distributors are driven from the backs of the exhaust camshafts and are inclined inwards. This is exactly the same layout seen in the last previous application of this engine by Ferrari, in the larger of the two specials he prepared for the Monza 500-mile race in 1958. That car also had the same layout of six twin-throat Weber carburetors that feeds the 330/P2, though the new car has, logically, slightly longer ram tubes.

In its earlier heyday, this King of the Twelves was rated at a maximum of 452 bhp at 7800 rpm, and a figure of 410 bhp on gasoline would probably be close today. It has the inherent advantage of design from scratch as a racing engine, which cannot be said of either of the engines used in the previous 330/P, which it overmatches by some 40 bhp. Yet remarkably enough it isn't a very heavy engine, weighing 430 pounds in 1957, comparing well with some 385 lbs. for the 250/GT V-12.

The chassis of the 330/P2 is of new lighter design, though it doesn't differ in broad layout and construction philosophy from the previous prototypes. A major change has taken place at the rear, where the suspension system is now precisely that used on the Grand Prix Ferrari. Notable differences include the addition of long parallel radius rods forward, and much larger and deeper hub carrier castings.

There is no Pininfarina plaque on the side of the 330/P2, whose shape was developed in model form in the small wind tunnel at Maranello. It is low, simple and shapely with a minimum of sheet metal; the side fuel tanks are visible below the waistline. In its early tests it has had only a low sports windscreen, but Ferrari has projected for it an almost completely enclosed cockpit fairing that looks like a squat coupe with a sunroof right over the driver's head.

Without a more intimate knowledge of the involved prototype regulations than I possess I am not going to hazard a guess at the (not yet divulged) weight of the 330/P2, except to say that it is a car that can be made light enough to do whatever it needs to do. Its early tests at Modena, Monza and, in extended sessions, at Vallelunga near Rome have been highly satisfactory. With such a car it is easy to visualize 200 mph on the straight at Le Mans and, perhaps, the first 140 mph lap. In John Surtees, Ferrari has the man who could do it. In the 330/P2, as usual, Ferrari also has the car everyone else must try to beat. **C/D**