

NATIONAL COLLEGE OF ART & DESIGN

SPORTSCAR DESIGN

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SPORTSCAR DESIGN.

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INTRODUCTION

Even before the turn of the century, when motoring in any form was an adventure in itself, racing had become quite well established. While cars of the road were still lightly built and of no great power, the demands which were unleashed on them for long distance racing, over often appalling roads, created a new breed of car. These cars were large massed, big engined vehicles, with competition as their sole aim. Indeed they were sporting cars, but they were not sportscars.

As motoring became a little more refined in its basic everyday role, a mongrel mixture of road car and racing car began to develop. These cars were built to satisfy the whims of those of the motoring public who required something more than basic transport but did not desire the potential perils of racing.

By the first decade of the twentieth century, early motoring enthusiasts were demanding that their vehicles have more body styling, greater individuality and, almost always, better performance. These were challenges which the early car designers and builders, who were pioneers themselves, were only too happy to rise to, and their customers were more than willing to pay for. And so the sportscar was born.

In this dissertation, the broader aspect of sportscar design, besides appearance and form, will be discussed. They are the aspects which, on face value, do not concern the public or perhaps even the driver but almost certainly concern the designer.

THE HISTORY OF THE SPORTSCAR

At the turn of the century a man had to be a true sportsman to desire to pilot one of these self-propelled road vehicles which the public regarded as a passing amusement. For those who believed in the car's future there was enough adventure, and danger, in a short, cross-country journey to satisfy their requirements from a sport. There was no need to race, the difficulty and hardship was contained in the journey itself. During such journeys, drivers had to contend with continual breakdowns, the unreliable tyres, dust and panic-stricken horse-drawn traffic. But it was inevitable that motorists would begin to race.

The first race of any consequence was from Paris to Bordeaux and back again in 1895. It was won by a 1½ litre Panhard at an average speed of only 15 m.p.h.

During the first ten years of motor racing, great changes were made in the design of the cars that were raced. The flexible ash frames that had been satisfactory for the leisurely drivers in the town had to be replaced by steel frames that would stand up to the battering offered to it by long distance racing on atrocious roads. Speeds began to reach higher and higher, far too high for the mundane tyres of the period. By 1905 engines had grown to gigantic proportions. The racing FIAT of that year had an engine bore of 180mm (7.08 inches) and a stroke of 150mm (5.9 inches) giving a capacity of an astounding 16 litres (973 cubic inches) and a horsepower of 110.

A racing car was already becoming a specialised and expensive vehicle, very different from the normal town carriage. Certain influential car manufacturers in Britain began to wonder if a racing formula could be devised that would give exciting and purposeful competition between ordinary touring cars (a touring car or tourer was the generic title for an open car offering seating for at least four people with access to the seats via two, three or four doors). Initially, very

few people believed that these noisy, stinking vehicles would really drive the horse-drawn carriages from the highways.

It was the Automobile Club of Great Britain and Ireland (which later became the Royal Automobile Club) that drew up the regulations for the first Tourist Trophy race which was held in the Isle of Man in September 1905. It was confusing to establish an agreed definition of a sportscar. The following solution would probably be accurate:

"....any road vehicle in which performance takes priority over carrying capacity."

This definition could be used to judge the validity of any early vehicles aspiring to the name of "sportscar".

The 1905 T.T. race was the first in a series of races that, in the opinion of several motoring historians, gave European motor manufacturers the incentive to produce the sportscar - a touring vehicle that could be raced. But if the T.T. saw the conception of sportscar racing it was left to Le Mans to bring it into blooming health with the assistance of the French "l'Automobile Club de l'Ouest", the club that organised the Le Mans race for sportscars. This race was (and still is) the "Grand Prix d'Endurance de Quatres-Vingt Heures du Mans", run for the first time on the 26th and 27th of May in 1923. A great debt is owed to this enterprising French club for the work they have done in building up Le Mans into the greatest sportscar race of them all. No motor club has fought so hard to prevent it from becoming a race for thinly disguised Grand Prix cars with one-and-a-half seats. They occasionally have been forced to compromise their concept of a true sportscar and this has almost always been at the insistence of the entrants or usually with threats of withdrawal of popular crowd-pulling contestants. The battle has been a long and volatile one for many years. The organisers, for their part, have tried in all good faith to define the cars to be raced and the essential equipment to be carried. They also have had to regulate the minimum sizes for

windcreens, seats, doors, ground clearance, luggage space, and other loopholes which entrants endeavour to cheat on. These entrants most likely see this only as a greater challenge to attain an advantage over all the other competitors, only to protest loudly the following year when they discover that the rule books have grown by an extra few pages.

Gamesmanship has been defined as:

"Winning without actually cheating."

One le Mans racer defined it as:

"Cheating without being found out."

WHAT IS A SPORTSCAR?

As to what constitutes a sports car in physical characteristics, there are those who would reply "wind-in-the-hair", and the soft top is very appealing, but that alone does not make a car a sports car. Many of the great sports cars, including most of the comparatively recent ones, are tin or hard-topped. However, taking the top off of a saloon, whatever its other characteristics, does not automatically transform it into a sports car. Neither does giving the same saloon a 150 m.p.h. performance make it a sports car. Many sports cars do indeed have exceptional top speeds, or staggering acceleration, or both - but, quite a few great sports cars have neither. The classically popular sports car of the 1940's, for example, the T-series M.G.'s (see fig.2.1) could barely reach a speed of 70 m.p.h. This was at a time when several saloon cars were capable of far greater speed. But the little M.G., which was one of the first sports cars to be accepted on both sides of the Atlantic, is every bit as much of a classic as the Ferrari Daytona of the late 1960's which could outrun the M.G. by a comfortable 100 m.p.h.

Performance, it seems, is only part of the requirement of a sports car. Perhaps more important than outright speed and acceleration is some special combination of roadholding and handling that enables the sports car, however modest under the bonnet, to utilise the power it has to the full, anywhere, anytime. All the great sports cars have that common characteristic with, perhaps, one exception which is immediately called to mind. The Gull-Wing 300SL (see fig.2.2) is probably the most famous Mercedes of all time. Its 140 m.p.h. top speed and stunning acceleration was combined with somewhat treacherous handling. It was not a car for the faint hearted. However, the combination of road-handling and performance is not exclusive to what we choose to call a sports car; quite a number of saloons and tourers still do not fit the sports car bill.

Looks are another guide, but this is not always a reliable one. There

Fig.2.1 The Popular MG TC

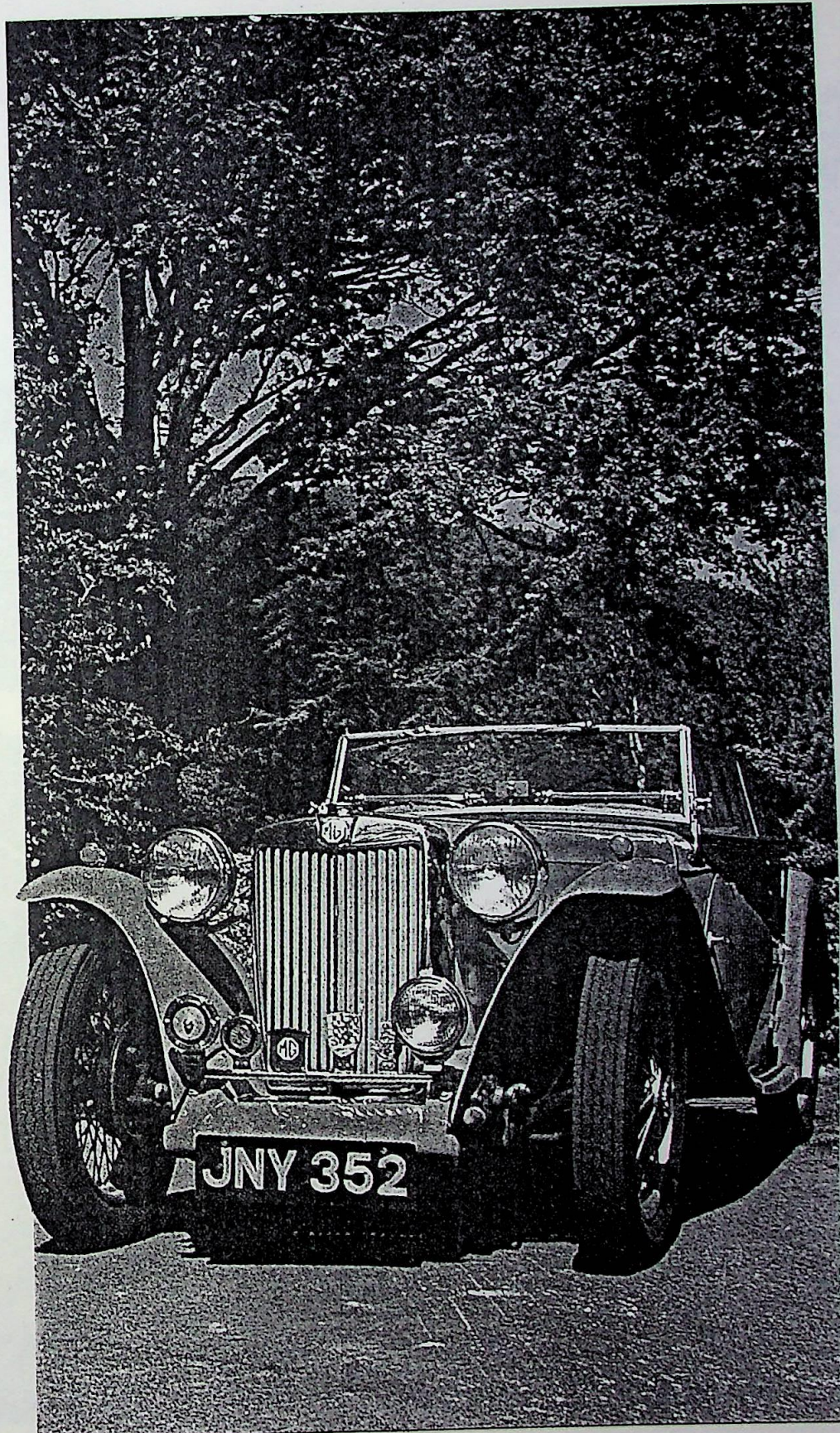
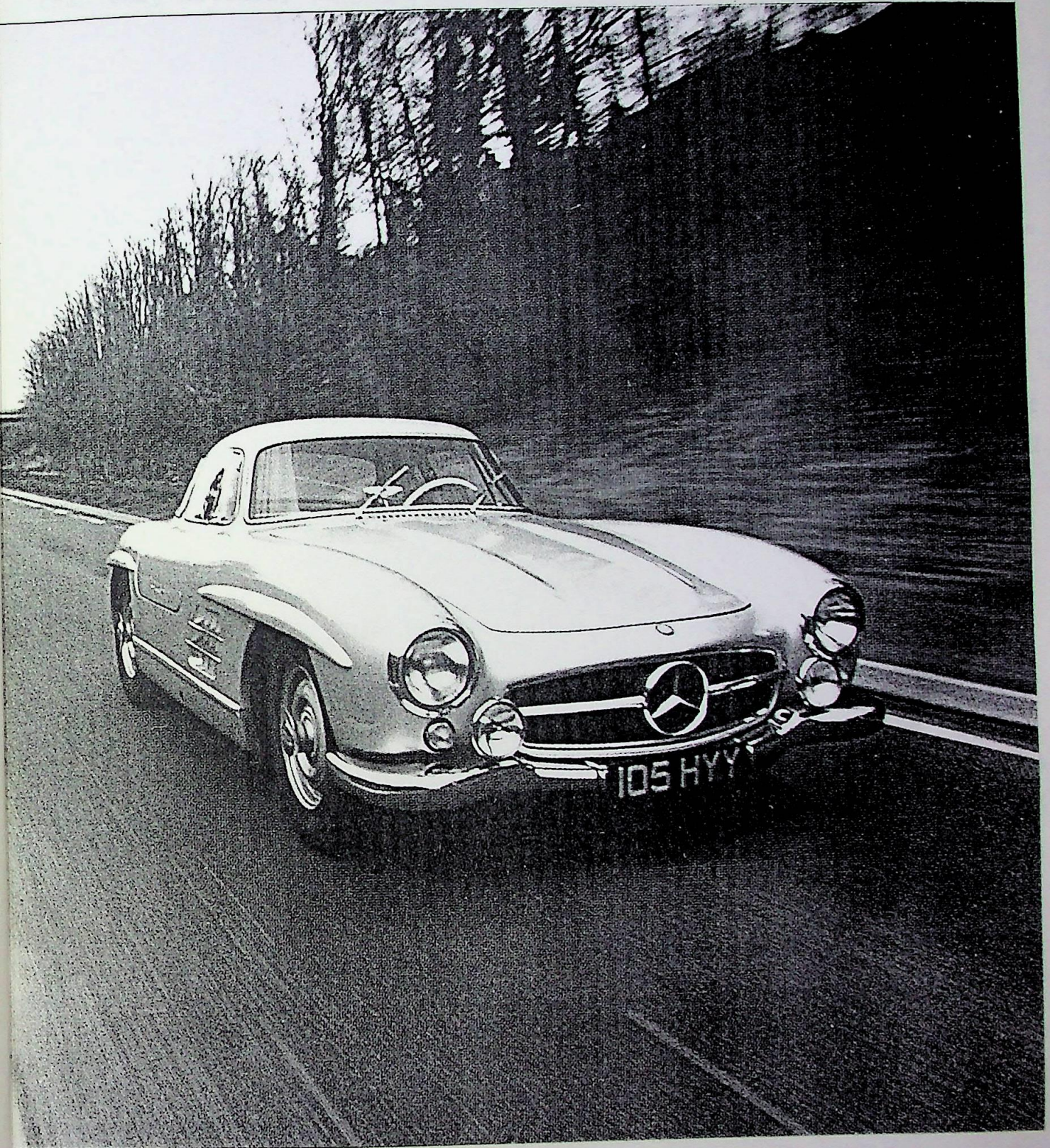


Fig.2.2 Mercedes Gull-Wing 300SL



have always been cars whose looks promised more sporting prowess than they actually offered, and just having a Bentley, Bugatti or a Mercedes badge does not automatically turn a sporty tourer into a sportscar. Since the birth of replicas the statement is even more true, although some replicas are excellent but most are not. It can be said that underneath many a latter-day Bugatti (see fig.2.3) lurks the heart of a V.W. Beetle.

It is virtually impossible to say definitely what was the first of the breed, or even where it originated. Europe (predictably enough given its early motoring lead) has the most claimants. Prominent among them are the stripped Mercedes 60 h.p. tourers which successfully stood in for the 90 h.p. racing cars destroyed by fire before the 1903 Gordon Bennett Cup race. In fact, the big Mercedes were just a one-off expediency that happened to work in an adapted role. A more convincing European claimant is the 1912 Hispano-Suiza Alfonso (see fig.3.2), a car small enough to be practical for everyday use, yet incorporating the very best of contemporary technology and a real sense of style.

Style was also something that marked out the early U.S. models, where the motor industry was rapidly gaining momentum. Generally considered to be the earliest American sportscar is the Apperson Jack Rabbit of 1904. This was another multi-purpose vehicle, which was built in Indiana. While the Apperson remained relatively unknown, cars like the later Stutz Bearcat and Mercer Raceabout (see fig.3.1), almost caricatures of the current American racing car style, are the ones remembered today as the earliest American sportscar image.

Before the Mercer Automobile Co. of Mercer County, N.J. introduced the Mercer Type 35 Raceabout in 1911, there were racing cars and there were sporting versions of touring cars. The racing car typically comprised of very big engines which were shoehorned into massive chassis, stripped to the bare bones and with minimal bodywork. This was all in an effort to save weight. In their crude way they were as specialised as any racing car of today and definitely not for everyday

Fig.2.3 1928 Bugatti Type 43



Fig.3.1 The Mercer Raceabout

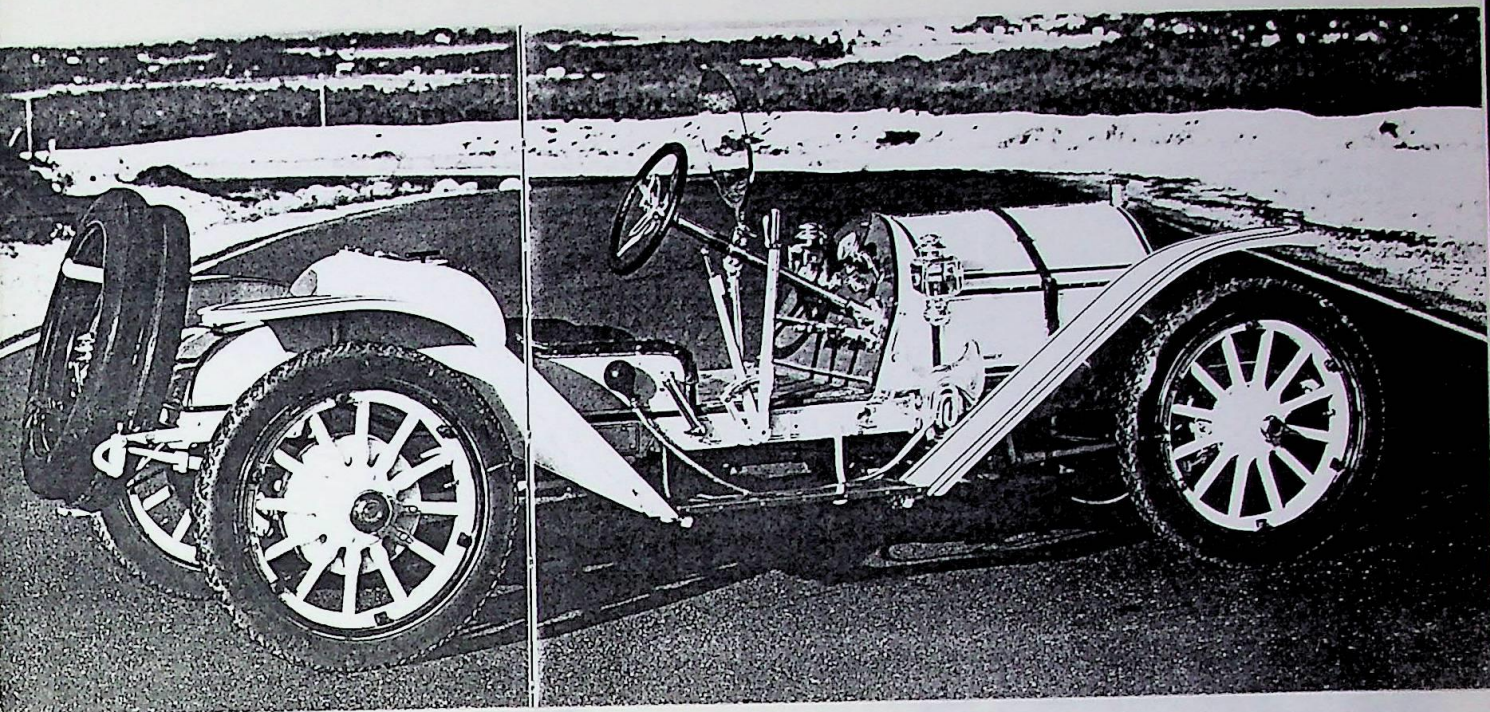
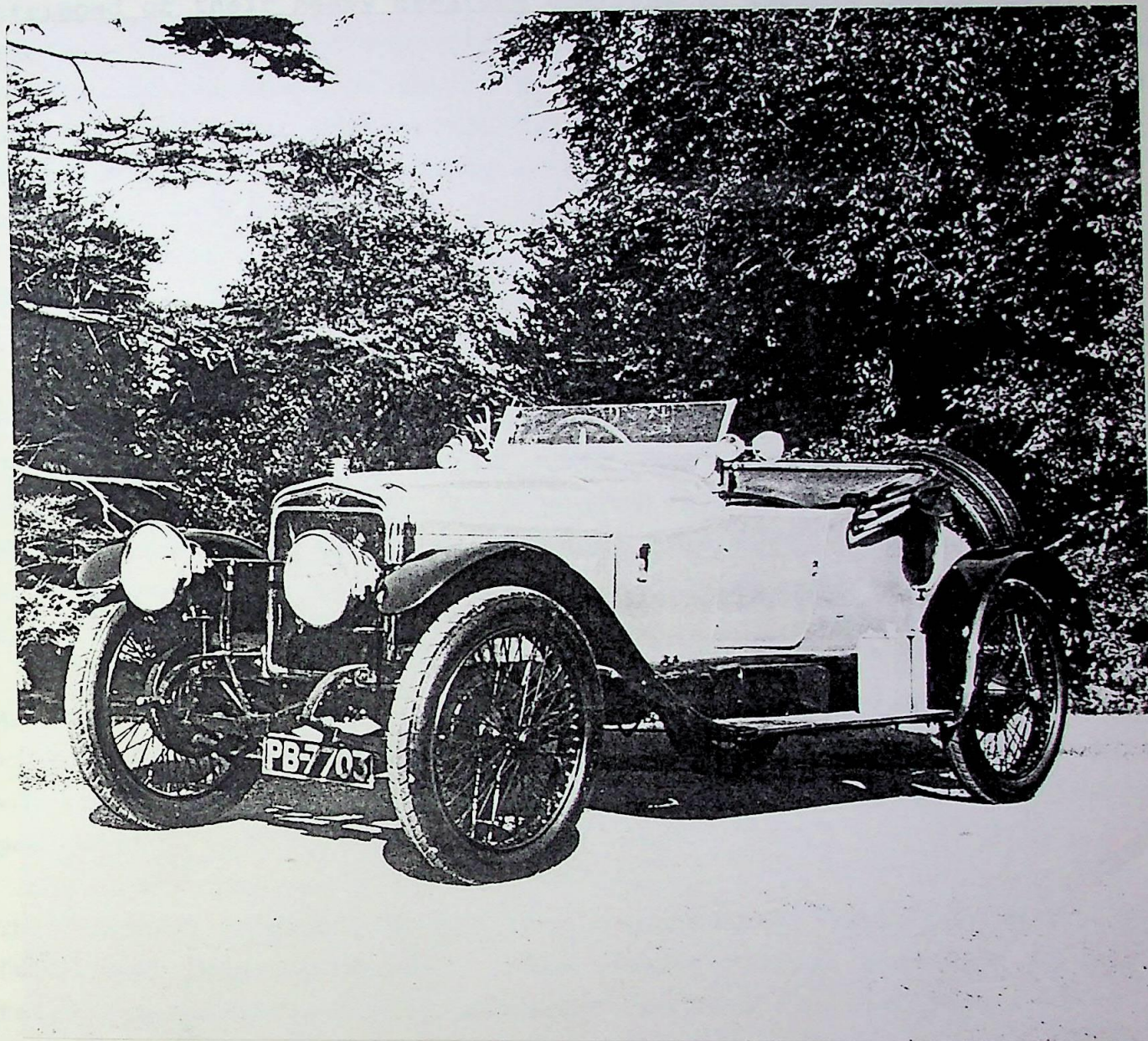


Fig.3.2 1912 Hispano-Suiza Alfonso



use. The sporting cars were generally little more than touring cars stripped of their heavy creature comforts to improve performance. The new Mercer though was different. It was perhaps the first sportscar that could genuinely be called a "sportscar". It was neither a single purpose racing car nor a compromised tourer, but a car specifically designed for everyday motoring excitement with more than just a dash of style.

That may not be a complete definition of a sportscar, but if a car fulfills it then it is well on its way to qualifying.

The Raceabout was designed by Mercer's new Chief Engineer, Finley Robertson Porter, as a road car which could also be used as a racer by the amateur sportsman. It had a four cylinder, 55 h.p., T-head engine, two bucket seats, a handbrake, gearshift, four wheels and not much else. Even the throttle pedal was outboard of the driver's seat.

As an option, the Mercer customer could order a distinctive monocle windshield that fitted onto the long exposed steering column - this was the sum of weather protection for the Raceabout driver and his passenger.

The bodywork involved no more than a low bonnet, long, rakish wings (with small running boards), and a massive bolster fuel tank on the tail of the vehicle behind which were mounted two spare tyres on detachable rims. Mercer tended to go the "whole-hog" and paint the already conspicuous looking Raceabout in bright colours with flamboyant pinstriping. The most popular scheme was a bright sunshine yellow with black.

It was definitely a car to be seen in, but it was more than just a pretty face; it also backed up its looks with performance, which is the definition of a true sportscar. Mercer guaranteed the standard Raceabout to have a top speed of at least 70 m.p.h. which would

certainly leave most other cars of the day trailing. With its very light weight it would reach such speeds in a spirited manner.

The penalty of the light weight, short wheelbase and hard semi-elliptic springing was quite a lively ride on often appalling roads of the day. However, the steering was light and precise, the gearshift, allegedly, incredibly slick by today's standards and the roadholding was a "tail sliding delight". The brakes were quite unsatisfactory, but that never appeared to stop the Mercer's American driver from using the car to the full.

The Raceabout was not an expensive toy either. At a very reasonable \$2,250 in 1911 it created a large market for itself and the imitators which inevitably followed. Best known among these was the Stutz Bearcat which had most of the Raceabout's looks but was far from its performance

If the American Raceabout could stake a claim to being the first sports car in the world, the Hispano-Suiza Alfonso, introduced shortly after the Mercer in 1911, had an equally strong claim as the first production sports car in Europe. It was designed by Marc Birkigt, who was responsible for a number of automobile firsts, including hollow, water-cooled brake shoes (1906), a super-charger (1912), and even a shaft drive arrangement which used the vehicle's rear springs to take up the torque thus created. Birkigt was Hispano-Suiza's young Technical Director and the Alfonso was based on his successful Voiturette racing design of 1909. A long-stroke 2.6 litre development of that car won the Coupe de l'Auto G.P. des Voiturettes in 1910 and this, the first of several Hispanos to bear the Alfonso name, emerged the following year as a production version of the Voiturette, with a side-valve, four cylinder engine, further enlarged to 3.6 litres.

It became available in a number of two and four-seater versions; all with the same sporting character, and they took their name from Hispano's enthusiastic royal patron, King Alfonso XIII of Spain, where the Hispano-Suiza Company had been founded in 1904.

It was one of the few Spanish-built Hispanos to achieve any special distinction. All the great Hispanos of later years, mostly larger and more complex than the Alfonso, came from the French branch of the Company which was set up in 1911. The plant was initially set up as an assembly plant for the Spanish cars, but later as a manufacturer in its own right. The Spanish factory in Barcelona manufactured a great deal more cars than in the French plant but these were mostly cheaper versions of the French models.

French-built versions of the extremely popular Alfonso soon went into production and for a while there were even plans to build the model in Russia, a plan which was eventually frustrated by the outbreak of World War I.

By the heavyweight standards of the day, the Alfonso looked almost frail, with a high chassis (available in short or long wheelbase), delicate looking wings and narrow, wire-spoked wheels. Its look, however, disguised a rugged design which was typical of Birkigt's style.

The 3.6 litre engine was notable mainly for its very long stroke - more than twice the cylinder bore size and a feature originally prompted by racing rules. It produced approximately 65 b.h.p. (brake horse power) at something less than 2,500 r.p.m., which was enough to give the compact little car a top speed in the region of 75 m.p.h. The engine had exceptional flexibility thanks to the torque typical of the long stroke layout. This enabled the car to accelerate well from a slow speed whilst remaining in a high gear. This engine was installed in unison with the gearbox, unlike most of its contemporaries which still tended to treat the gearbox as a separate component, often installing it quite remote from the engine.

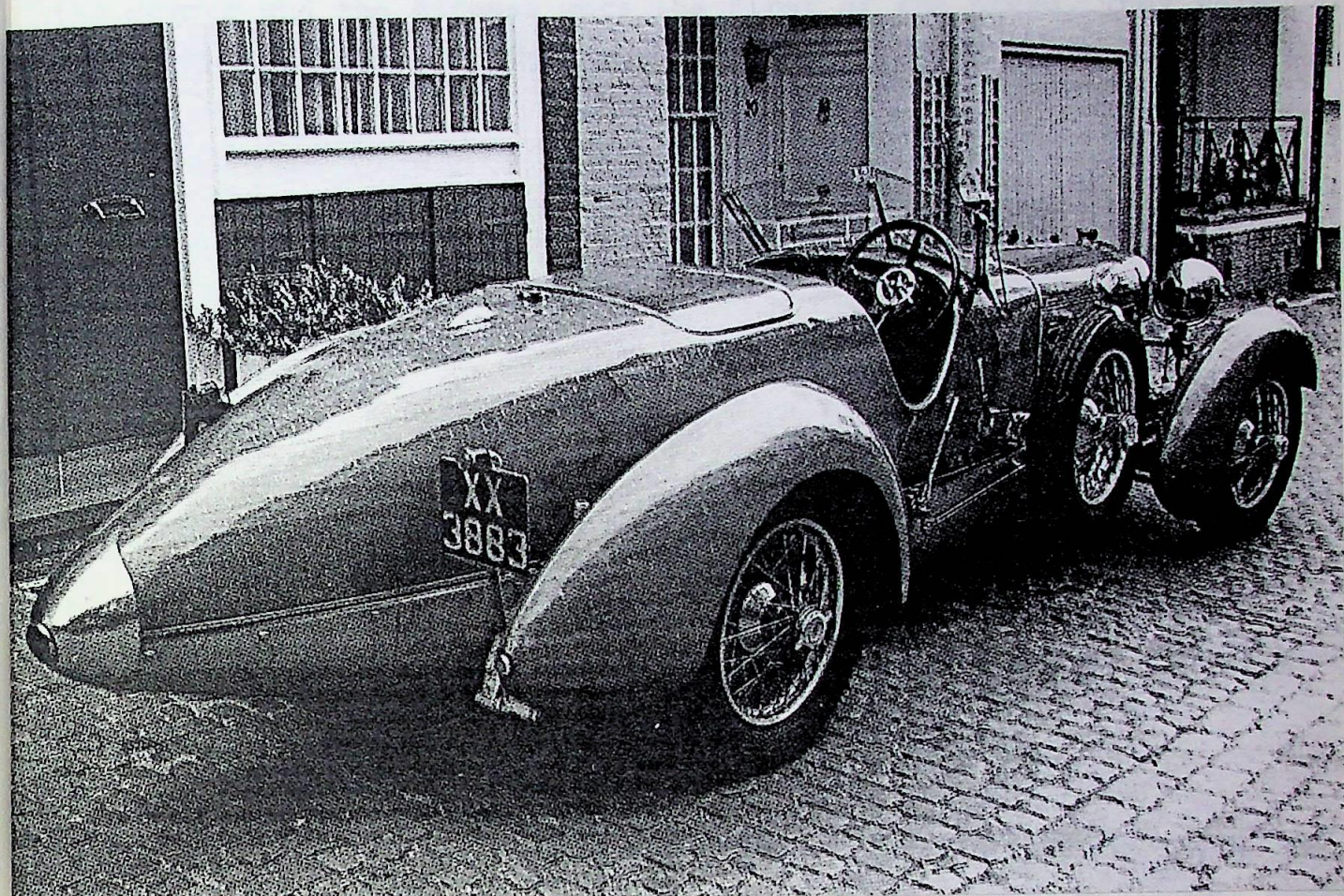
Even in 1911, there were faster cars than the Alfonso, but only either out-and-out racing cars or a very few large tourers. Where the Alfonso really differed was in its nimbleness and, like the Mercer Raceabout, in its style. The Mercer had been able to outrun the generally much

more powerful opposition in its racing days and those similar handling characteristics were successfully transferred to the Alfonso, but the car did not require the skills of a racing driver to make use of them.

For once, it was not the manufacturer who was responsible for the demise of a classic model but in this case the onset of World War I. The Spanish factory continued to build cars throughout the war but decided that the Alfonso was somewhat inappropriate for the climate of the period and so concentrated instead on larger touring cars.

After hostilities had ceased, the French factories put their wartime profits to good use and produced some magnificent luxury cars, such as the V-12, 11.3 litre Type 68 in 1934 and the 1925 Torpedo convertible (see fig.3.3) - but never again anything quite as sporty as the Alfonso.

Fig.3.3 1925 Hispano-Suiza Torpedo Convertible



SPORTSCAR STYLING

The Mercer and the Alfonso were the first of the breed. They were (more so the Mercer) almost skeletal in form for weightsaving reasons, which were of a priority for acceleration and good handling. The styling of the sportscar became more and more important as the sportscar evolved.

OPEN SPORTSCARS

The predicament of defining a sportscar has been mentioned earlier. However, the following four models have been selected which represent four successive and distinct styling phases in sportscars. All are open two-seaters (except one which was an occasional four-seater) which are found to be compatible with the generally accepted principles of a sportscar, these principles being: good performance, tenacious roadholding, crisp handling and exhilarating ride characteristics packaged into bodies which complement these qualities.

The open sportscar, as it has been known since the mid-1920's, owes much of its heritage to the light touring car of earlier times, whose reasonably good handling was marred by poor performance which rendered it prone to modification by inserting a more powerful engine. These modified cars were, for example, the small sports Salmons and Amilcars. Respect is also owed to the somewhat cumbersome but much faster and reliable open tourer of the 3 litre Bentley (see fig.4.1) and 30/98 Vauxhall style and a successful cross between reliability, performance and handling brought forth the archetypal compact sportscar towards the end of the vintage era and throughout the 1930's. Such were the Bugatti (see fig.4.2), M.G., Frazer Nash, Riley, the exclusive 1½ litre "blown" (supercharged) Squire and the Vale which are amongst a large cast of sports orientated cars of greater or lesser fame.

The Second World War was as much a turning point in sportscar design

Fig.4.1 The 3½ Litre "Blower" Bentley

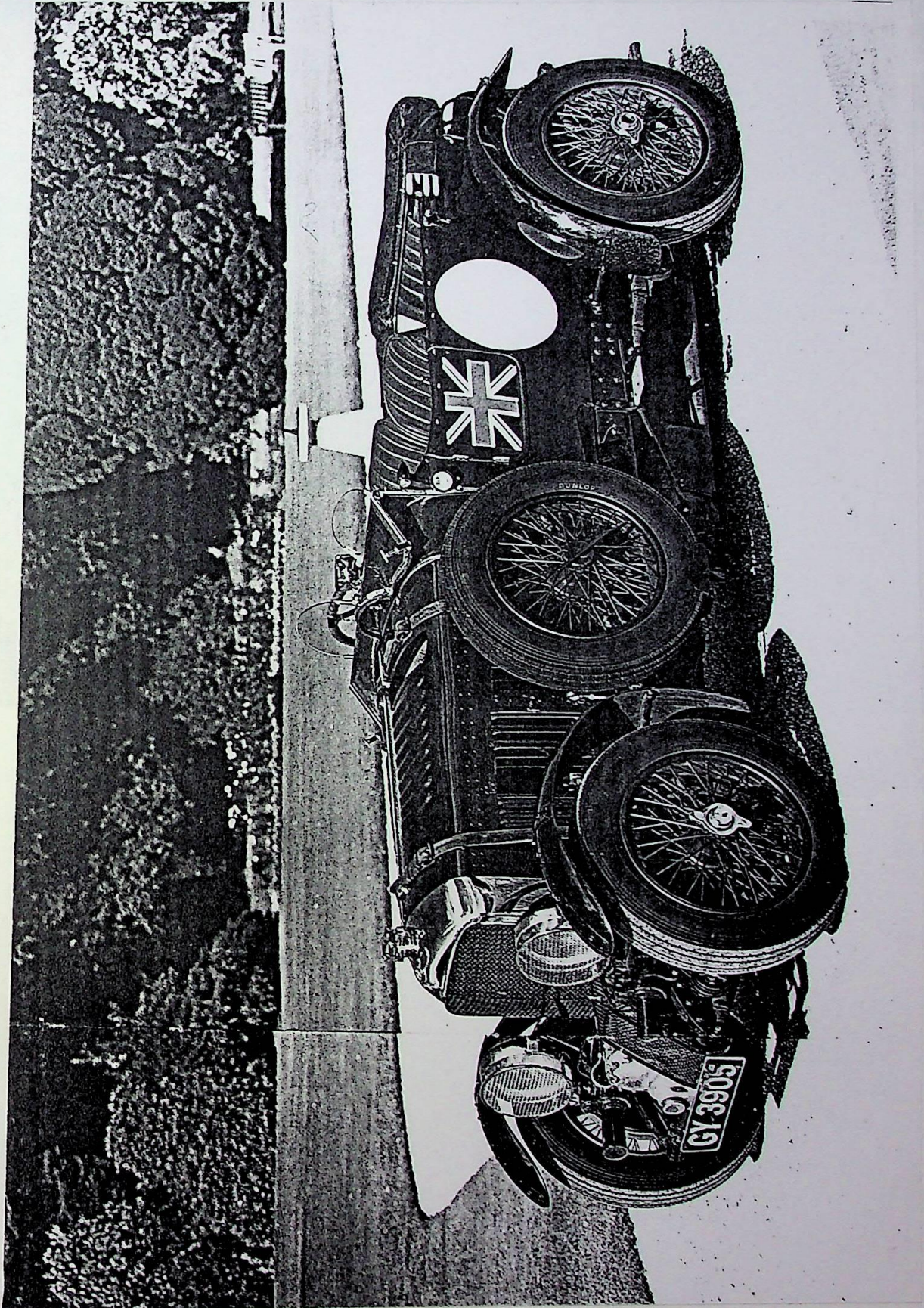


Fig.4.2 Bugatti



as in other body types; the old style separate-wing form as in the Frazer Nash T.T. replica of 1933 (see fig.4.3) was replaced by a more fluid format which was fostered initially by the Farina-bodied Cisitalia and the Jaguar XK-120 (see figs.4.4(a) & 4.4(b)). M.G. set the trend for small sportscars in the United States with the successful T.C. model (see fig.4.5). Ferrari, for their part, introduced a twelve-cylinder Spider (or Spyder; a very early bodywork), the Type 212 and quickly followed with a succession of ever faster V-12 cars. Lotus began to release a stream of aerodynamically efficient two-seaters. However, the 1960's saw changes in many former sportscars to closed gran turismo cars (G.T., a car with sleek lines and a low build) of growing size and price.

Open sportscars have progressively become more comfortable and obtainable in the past twenty-five years. Sidescreens and draughty detachable hoods have given way to winding glass windows and folding hoods (as in the 1986 TV12 Tasmin 390:SE and the 1986 Reliant Scimilar) (see figs.4.6 & 4.7), although many sports models provide snap-off hard-canopies, such models are called "T-Bars" or "T-Tops", providing the primeval sporting spirit as well as improved safety (see fig.4.8). Heaters and pile carpets are now fitted as standard and the heavy, difficult to clean, spoked wheels, which remained with the sportscar for some time after being abandoned by other body types, have become extinct in the wake of minimum maintenance, lightweight, alloy-cast wheels. Sportscars have become more luxurious and less noisy. They have become more technologically advanced and faster. Whether the synthesis of all these things still provides a sporting image is debatable.

A sportscar which varied little in basic design throughout its production existence of fourteen years up until 1939 was the "Chain Gang" Frazer Nash (see fig.4.9), so called because of its chain drive transmission. The 1933 T.T. Replica was a two-seater but in fact had a small rear seat which was normally protected by a cover. Its stark profile is typical of sportscar design of the late vintage period and the early

Fig.4.3 1933 Frazer Nash T.T. Replica

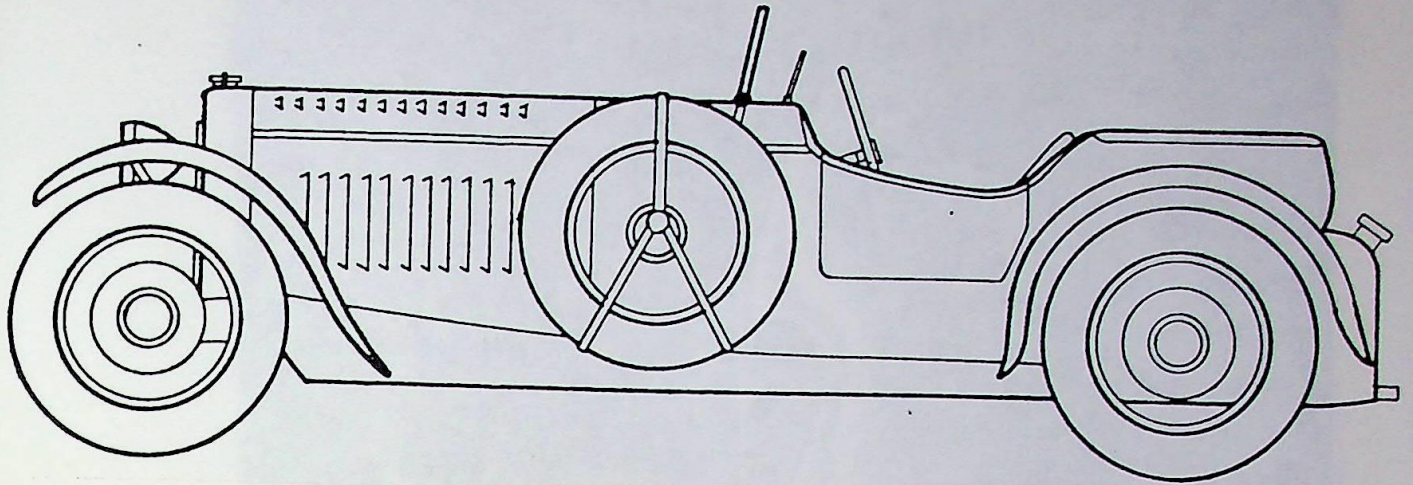


Fig.4.4(a) Jaguar XK-120

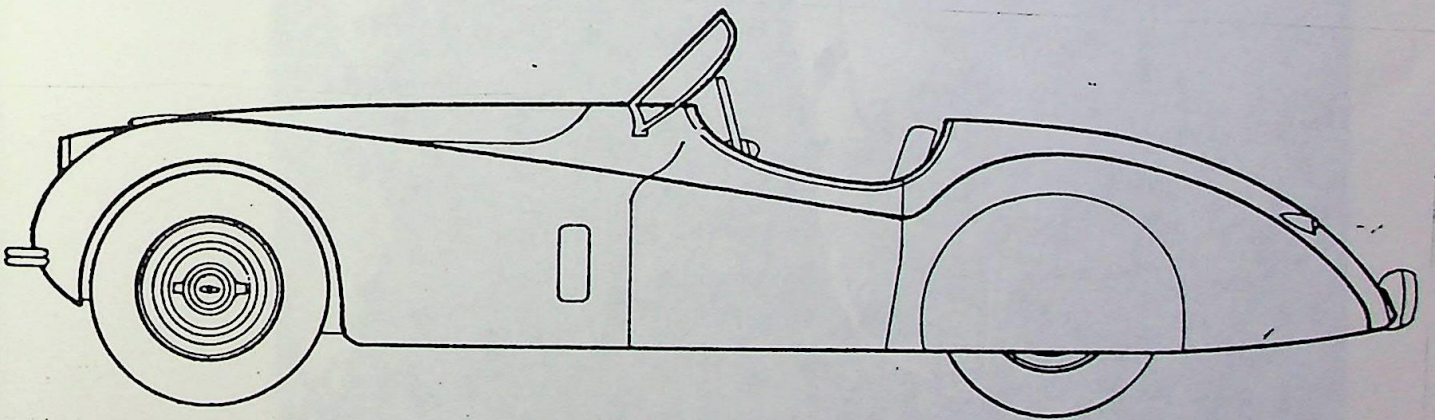


Fig. 4.4(b)

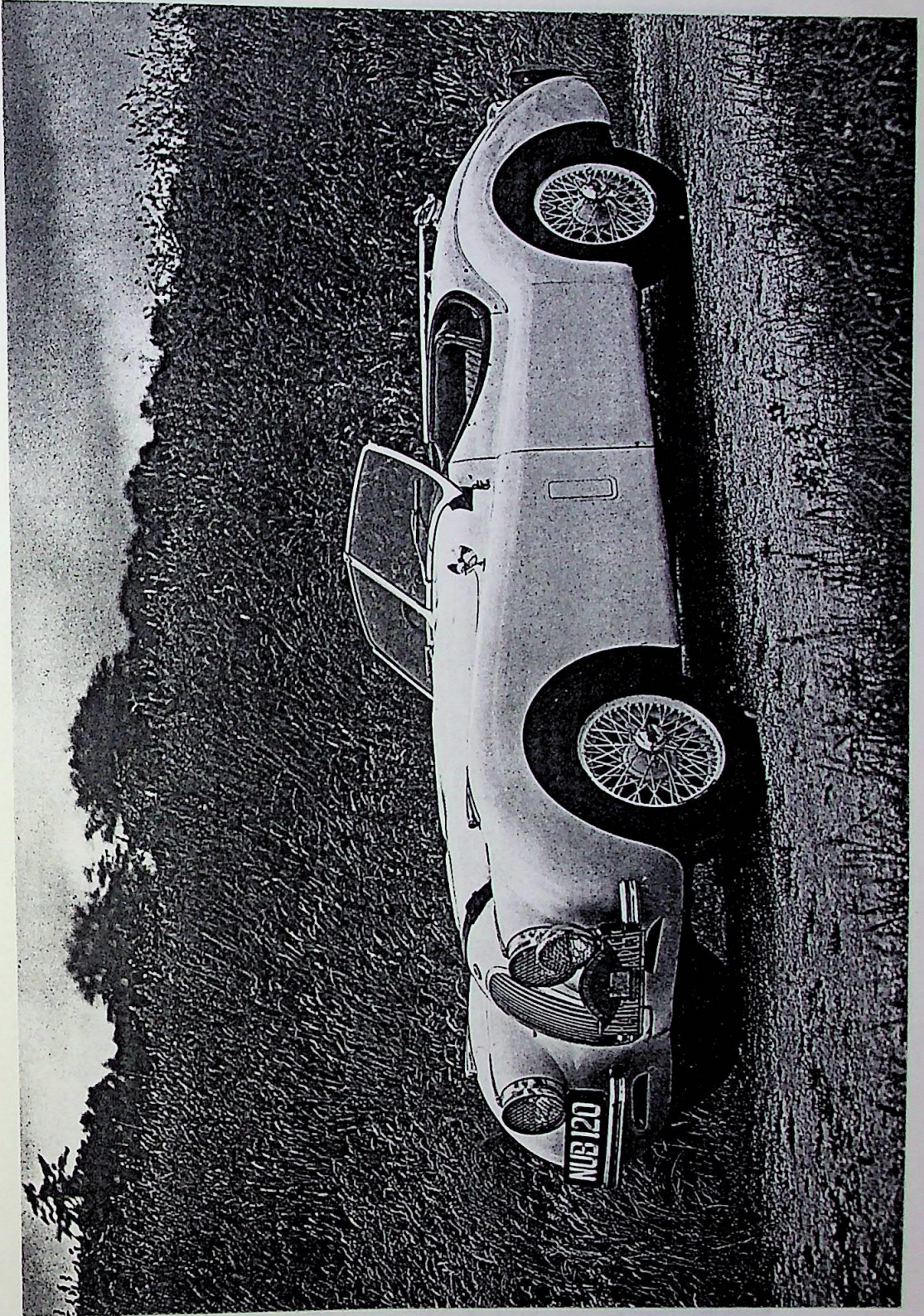


Fig.4.5

MG TC

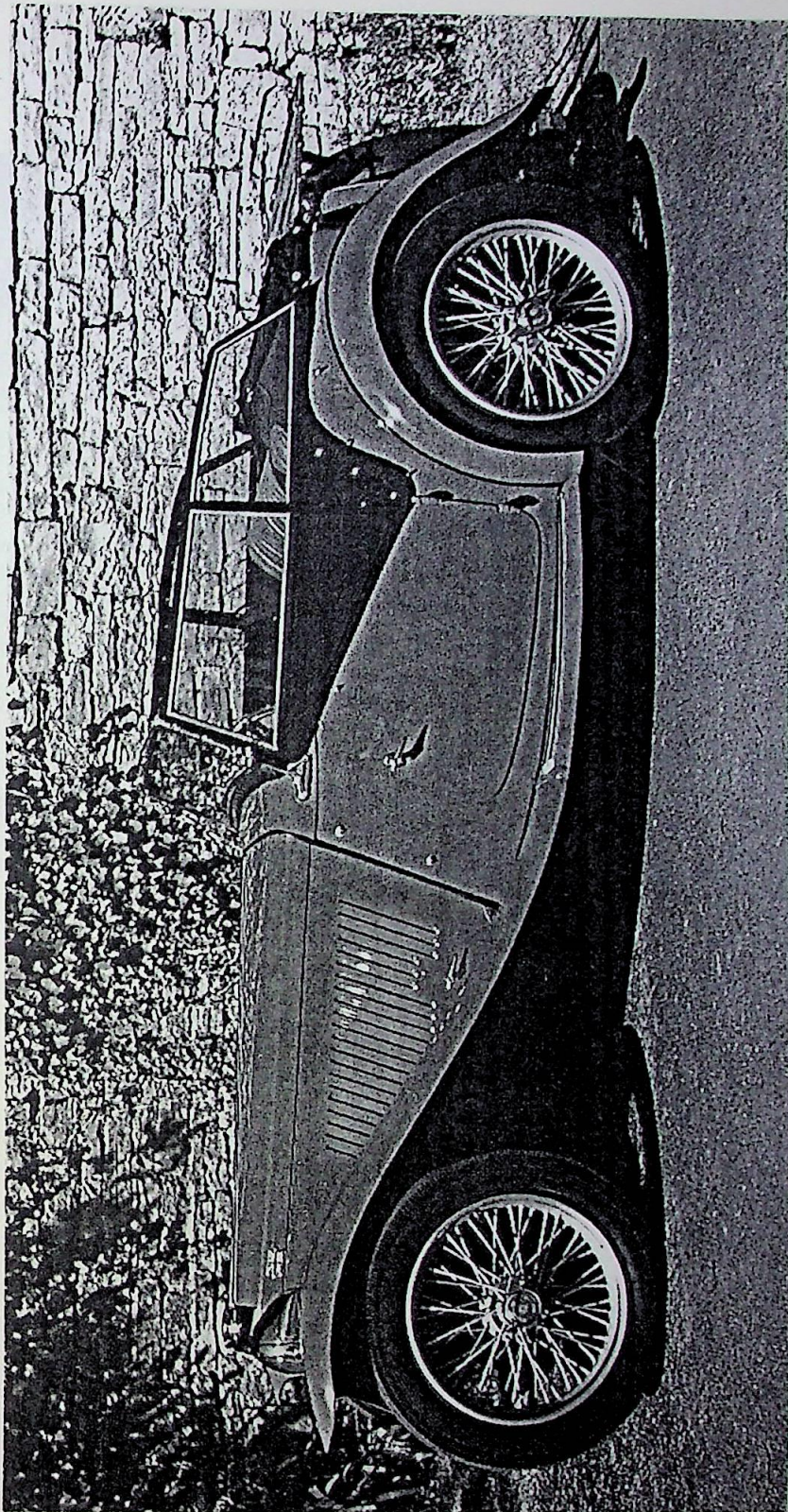


Fig.4.6 1986 TV12 Tasmin

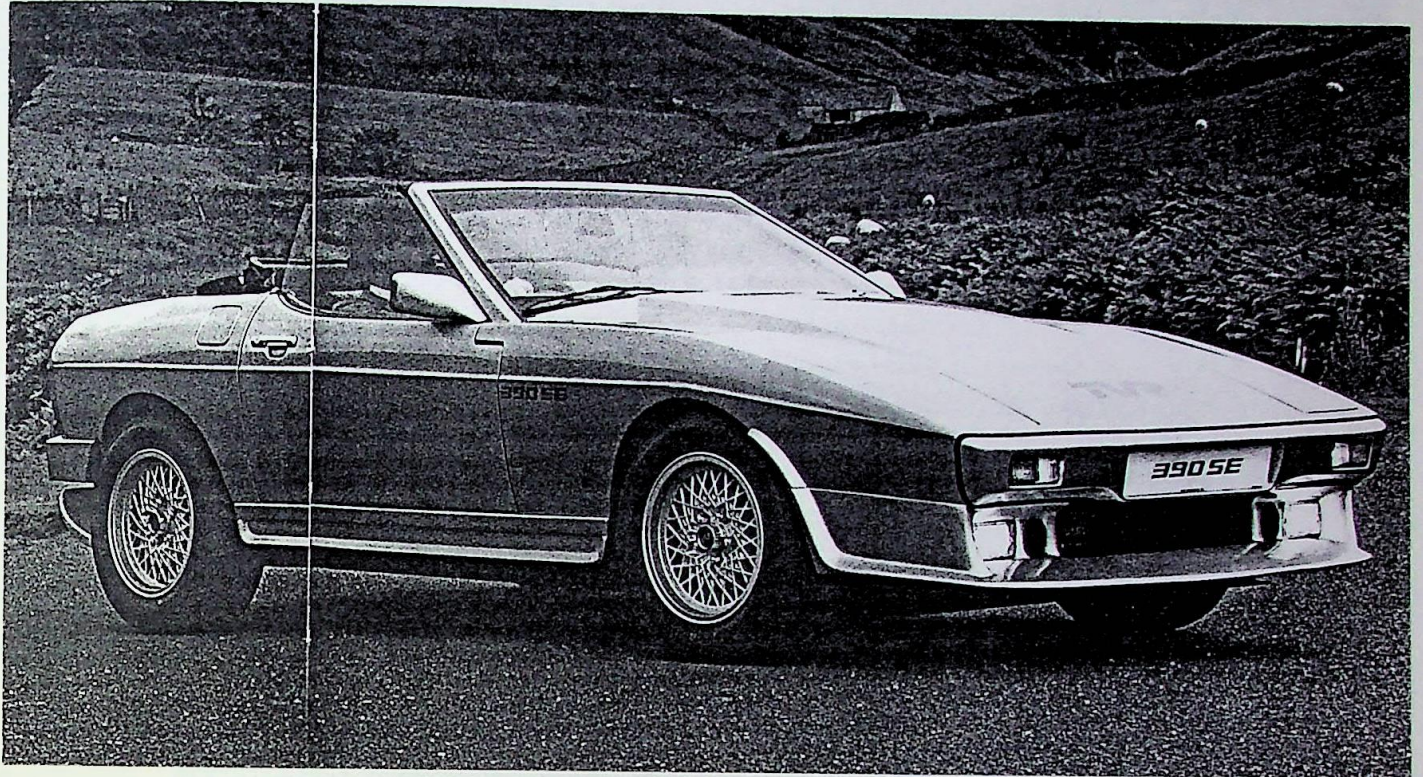


Fig.4.7 1986 Reliant Scimitar

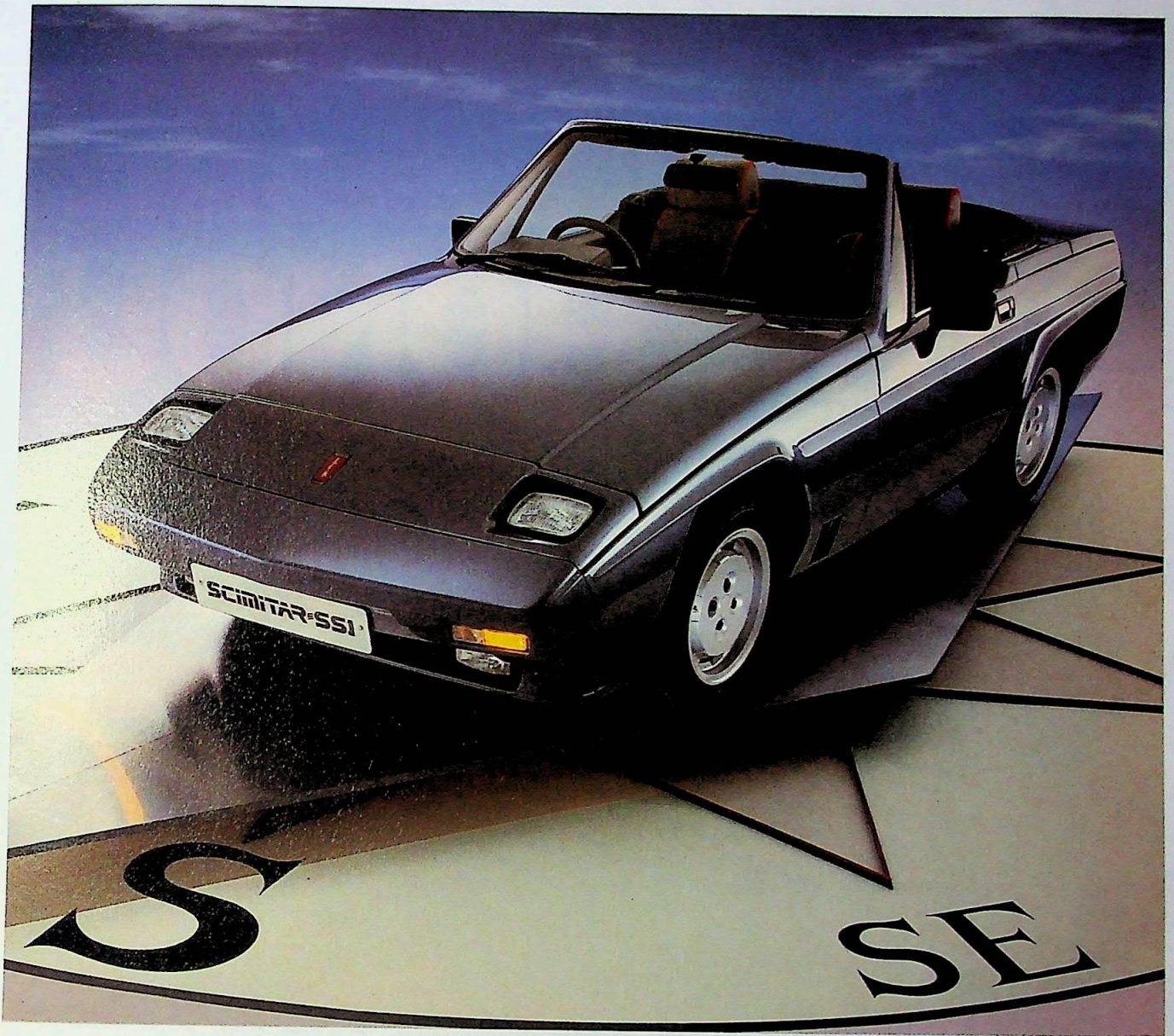
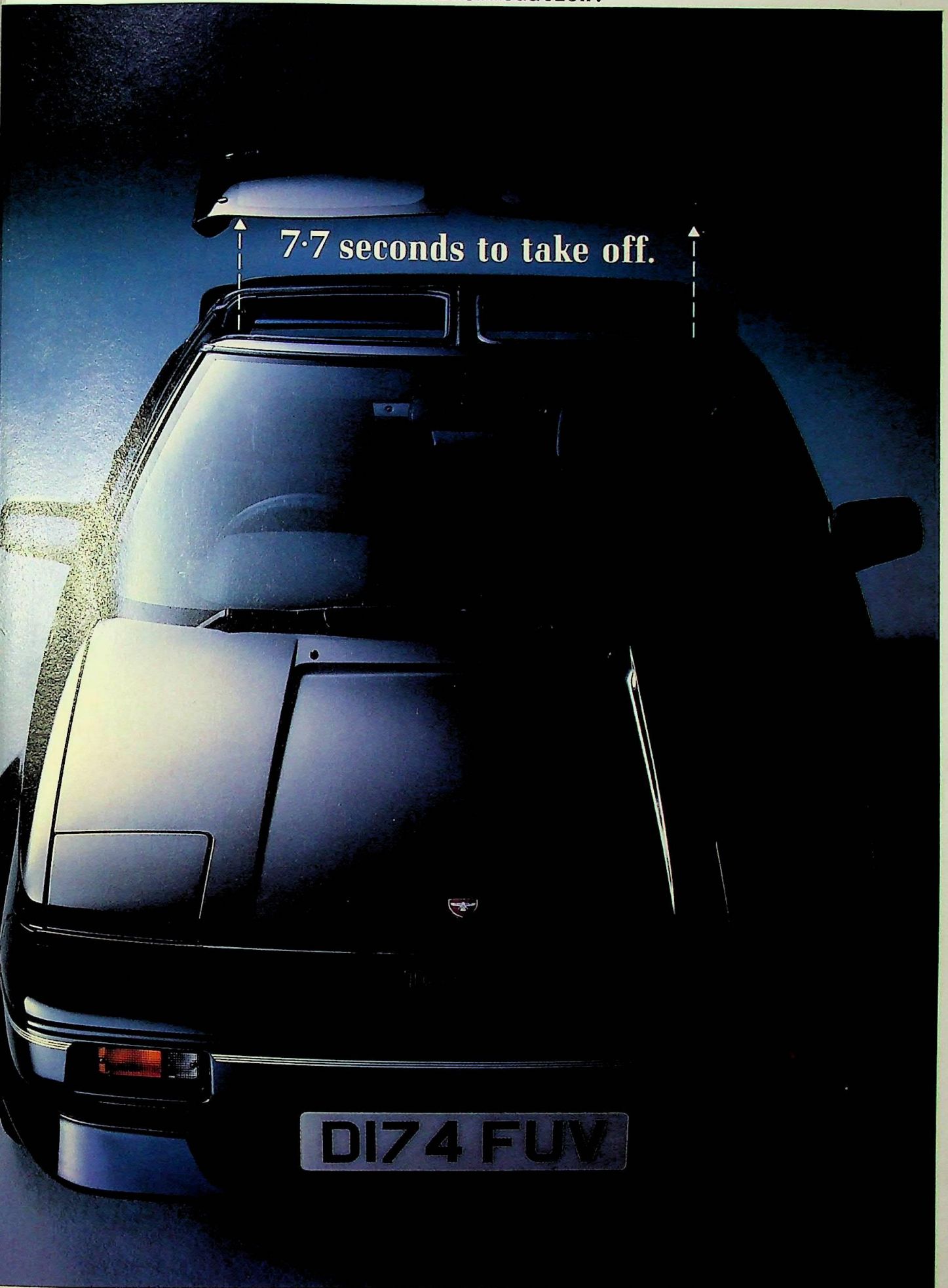


Fig.4.8 Car Advertisement Showing the T-Top Format with instant "Wind-In-The-Hair" Accommodation.

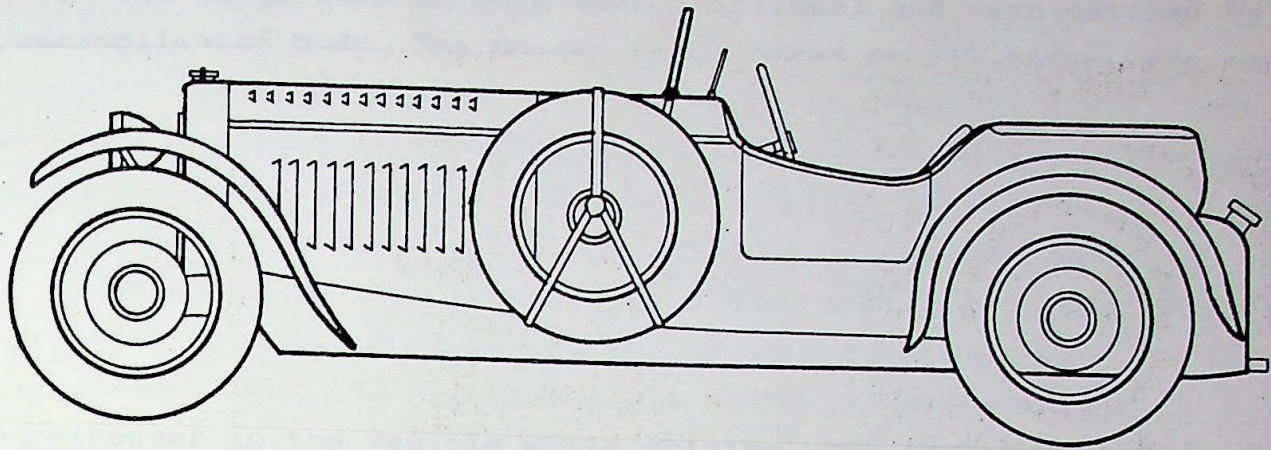


you think that's quick, just wait till you put your foot down.

TOYOTA

MR2 T-BAR-

Fig.4.9 The "Chain Gang" Frazer Nash

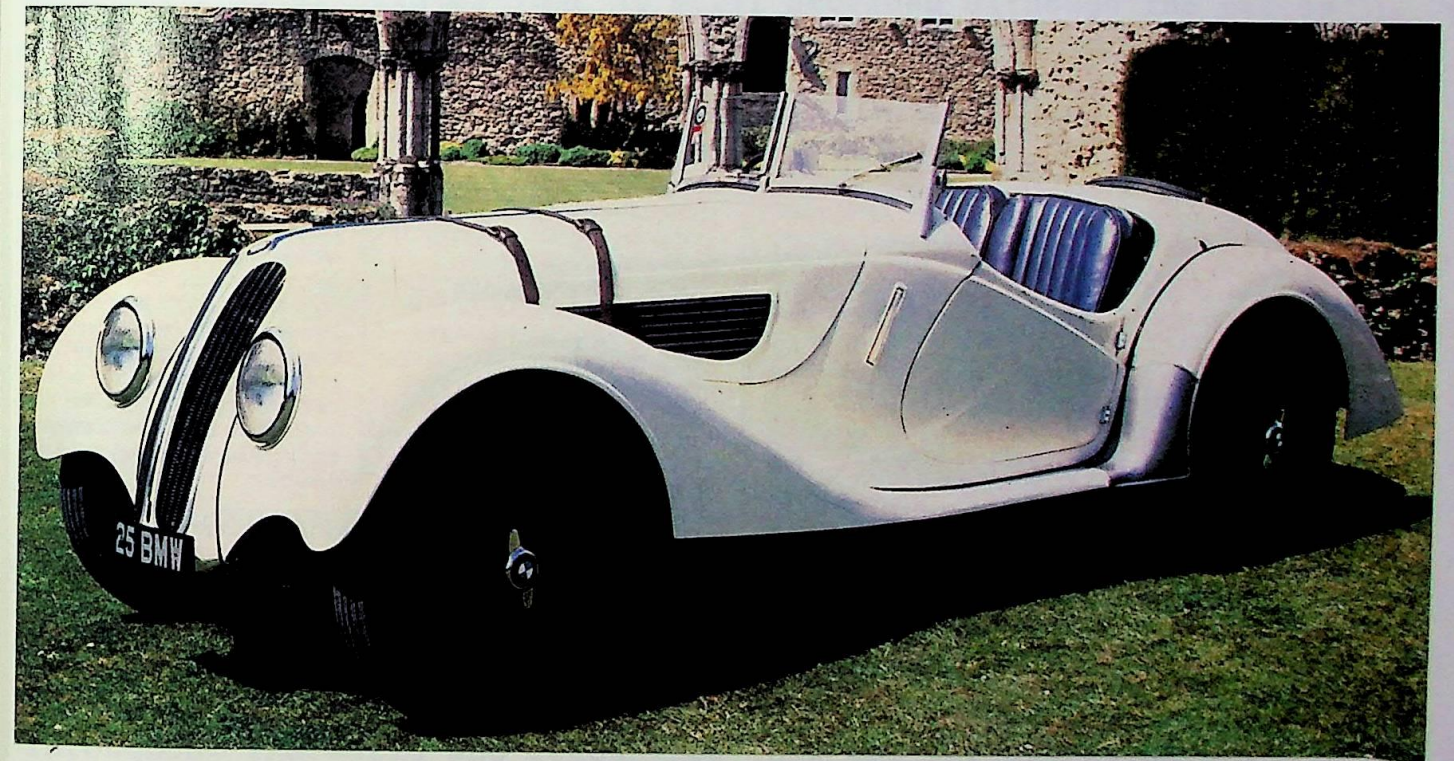
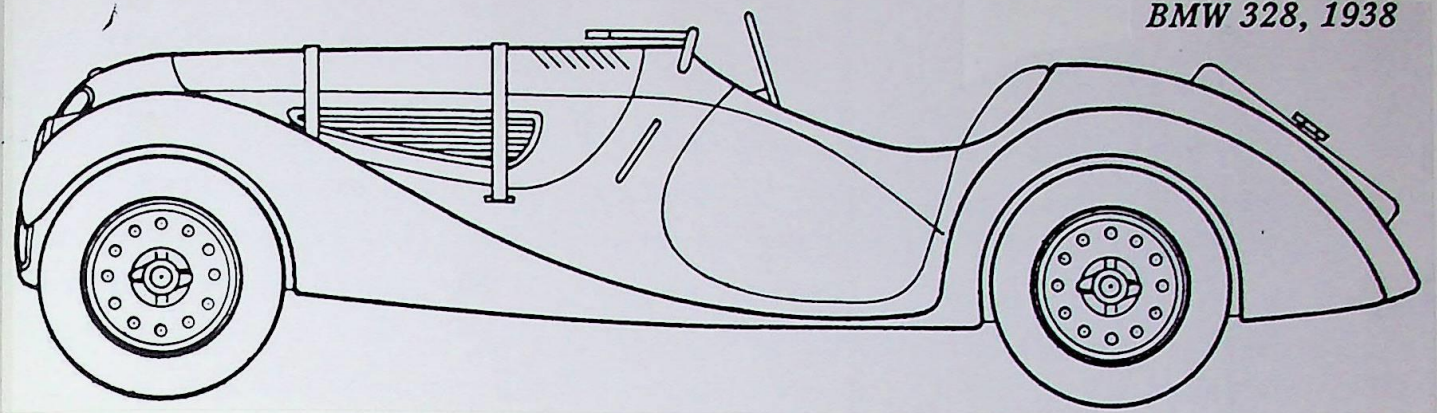


1930's. The wings were no more than functional and were matched by an uncomplicated body. The bonnet is louvered on all sides, its rear is rounded and tub-like and the model also has cutaway doors. Cutaway doors were provided to give the drivers of narrow-bodied cars shoulder room. These doors enabled the driver's left arm to protrude from the car in order to take up less space and also to operate the gearlever and handbrake which were also situated outboard of the body for space-saving restrictions. Some sports bodies were even narrower, so that the passenger seat was "staggered" in order to accommodate both driver and passenger in the vehicle while driving. The Frazer Nash's fuel tank was mounted at the extreme rear of the body, not a safe place but a typical vintage location. The spare wheel is mounted at the side and is held in place with leather straps and as well as a folding full-width windscreen, twin aero screens were provided which were tints from pre-World War I sportscars like the Mercer Raceabout. The Frazer Nash was a characterful and unpretentious sportscar which after more than half a century is still ranked highly as a member of those cars able to provide raw motoring pleasure by way of simple driveability.

The next generation of sportscars was previewed by the German B.M.W. (Bavarian Motor Works) Company in 1933 with the announcement of a drop-head coupe with visionary fluid lines. This was expanded in further models and in 1936 the renowned B.M.W. 328 (see fig.5.1) was unveiled. The 328 comprised of a wide body, wings which were no longer hanging onto the chassis in a kind of limbo, headlamps which were forced into valances that joined the front wings to the body, and a radiator concealed behind a rounded nose which had two narrow vertical grilles. The semi-streamlined shape of the body enabled a small capacity (2 litre) engine to be used which gave the car a spirited speed higher than its competitors. Earlier examples of the 328 had rear wheel spats, which were often permanently removed by purchasers, cutaway doors and a fold-flat split windscreen (with no aero screens) were provided, and the spare wheel was neatly countersunk into the "curvy" tail. Entirely different to the design of the Frazer Nash, the 328 dominated the styling of post-war sportscars and was a popular model

Fig 5.1 Frazer Nash BMW 328

BMW 328, 1938



in Britain and Continental Europe.

The world famous Jaguar XK120 (see fig.5.2) spell-bound the public when it was released in the autumn of 1948. It did not rely on any previous body shape except probably the B.M.W. 328 to a small extent in the use of lines. It was a revolutionary concept in sportscar design and it set the style for the next thirteen years until the introduction of the equally revolutionary Jaguar E-Type in 1961 (see fig.5.3). The lines of the XK120 are smooth and rounded, the wings being very much a part of the body structure, which blended and highlighted the long bonnet (under which lay a 3.4 litre engine) and the slim tail. No strips or louvres intrude into the body shape as in the previous sportscar styles as this would severely tarnish its sleek, smooth appearance. The windscreen is permanent and does not fold flat, and the traditional cutaway door is still provided although the car is sufficiently wide to seat two people with ease. A detachable hood and celluloid side screens were provided, however, as in many sportscar cases, the attractiveness of the form of the car altered when the hood was fastened in place. The headlamps are mounted in protruding fairings in the valances and in the centre is a small elliptical radiator grille. Rear wheel spats were standard fittings which (unlike the B.M.W. 326) worked in contributing to the outline and the cleanliness of the form. However, the spats were abandoned when knock-on spoked wheels were specified due to the fact that the bulging new wheels obstructed the spats.

The XK120 remains an outstanding design in sportscar history. It had a great influence not only upon Jaguar's future designs (as in the XJ6 and MK VIII) (see figs.5.4 & 5.5) but also upon motor manufacturers throughout the world who recognised this car for providing a new genre of sportscar design.

One could expect to call the Ferrari 365 GT/4 Daytona Spider (see fig. 5.6(a) & (b)) the ultimate sportscar without anticipating any contradiction. It was styled by Pininfarina in 1969 and was manufactured in

Fig.5.2 XK120 Jaguar

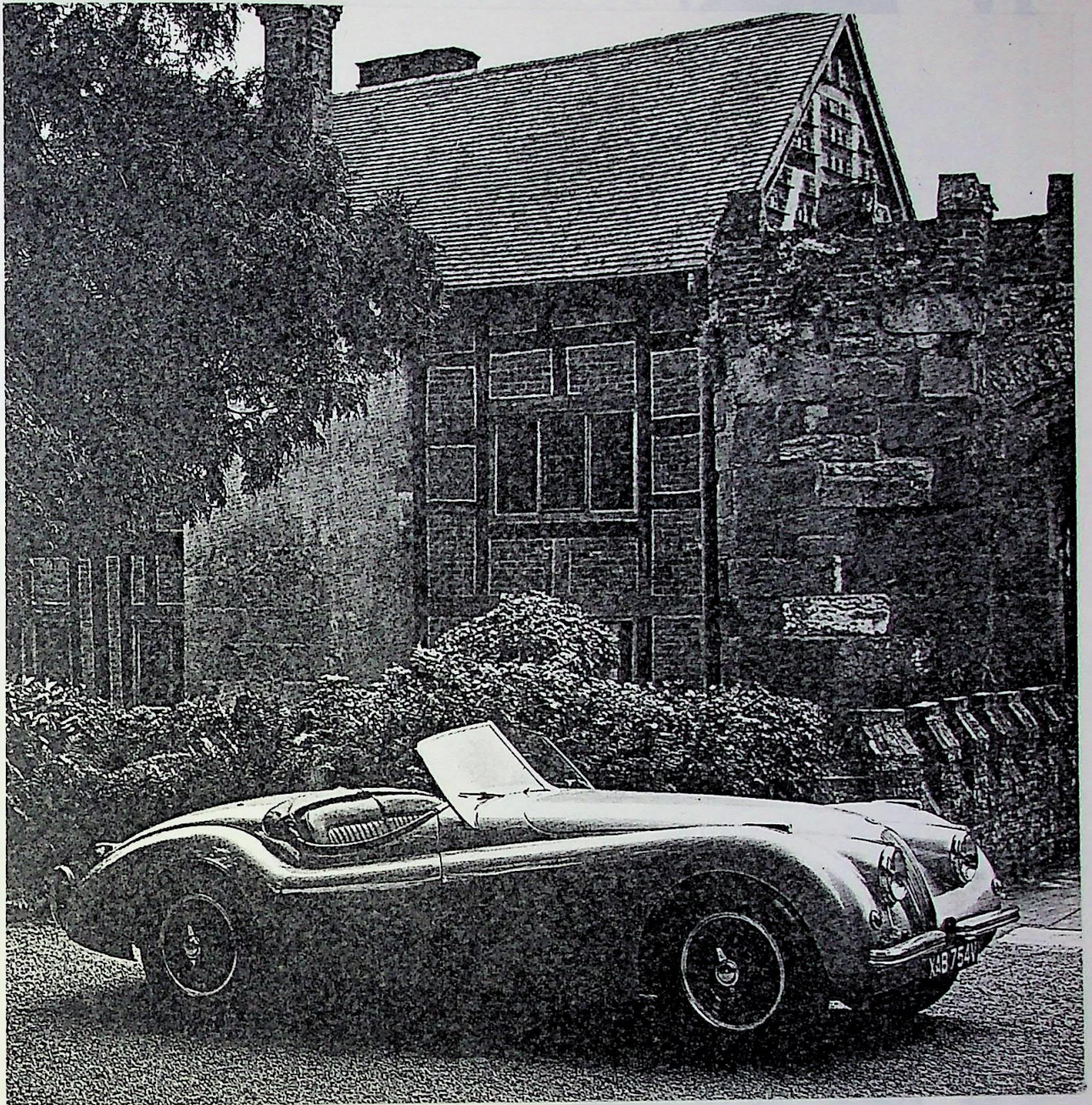


Fig.5.3

Jaguar E-Type

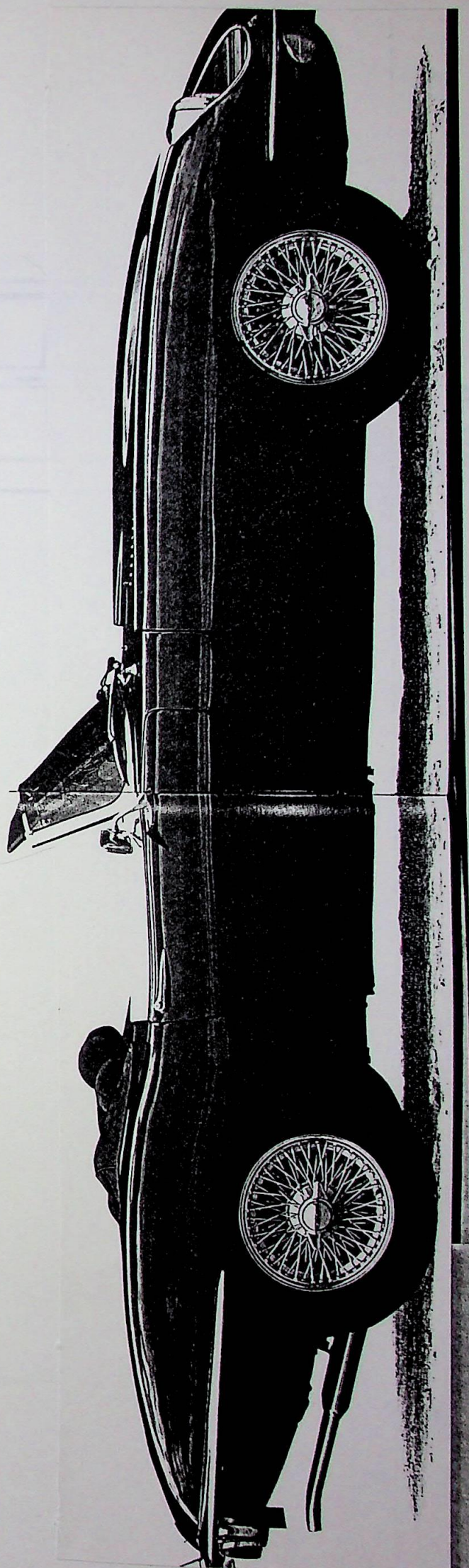
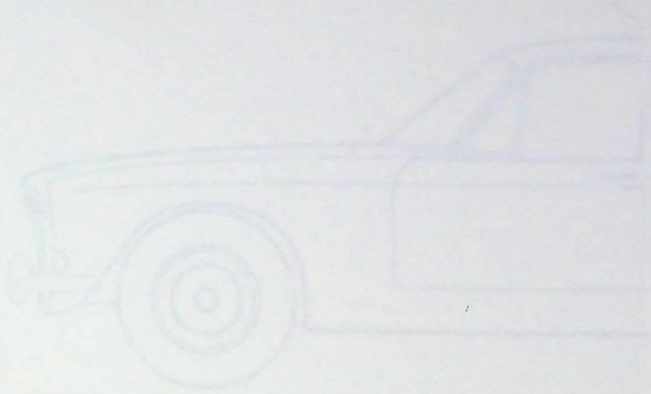


Fig.5.5 Jaguar MK. VIII .

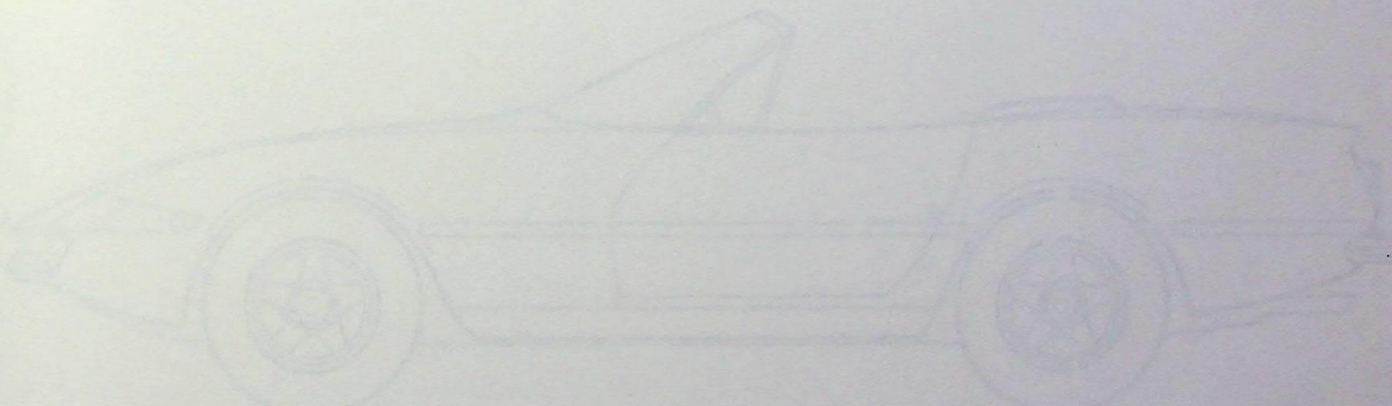
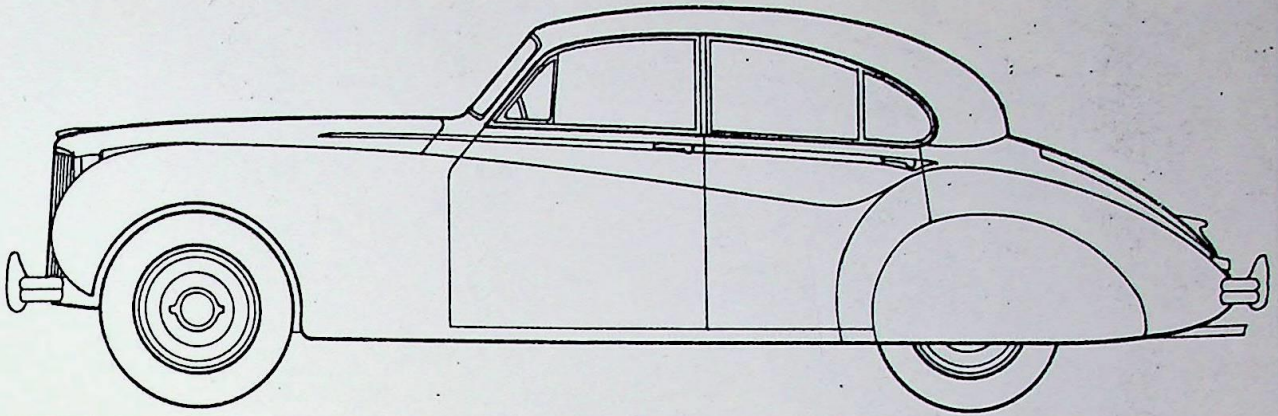


Fig.5.6(a) Ferrari 365 GT/4 Daytona Spider

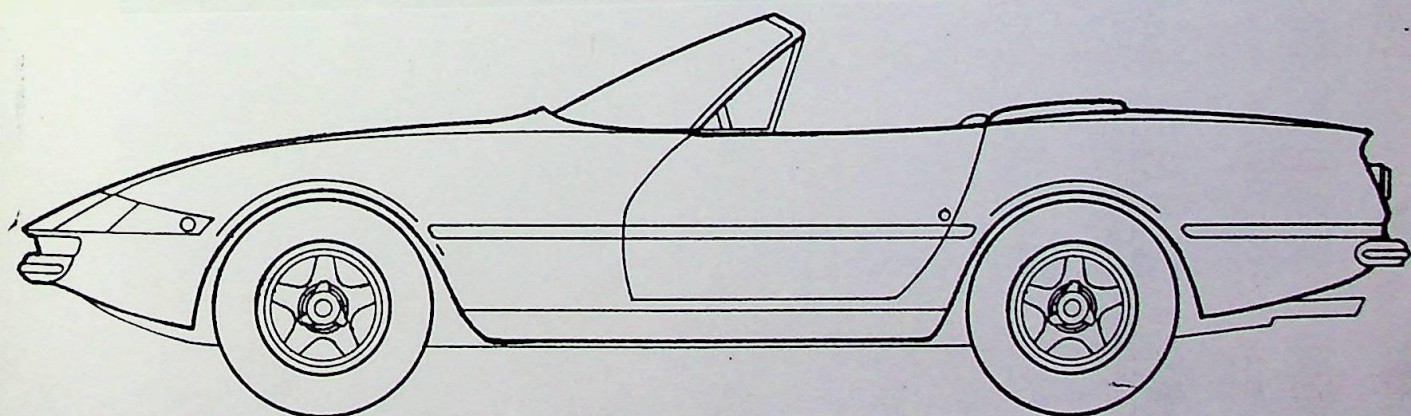
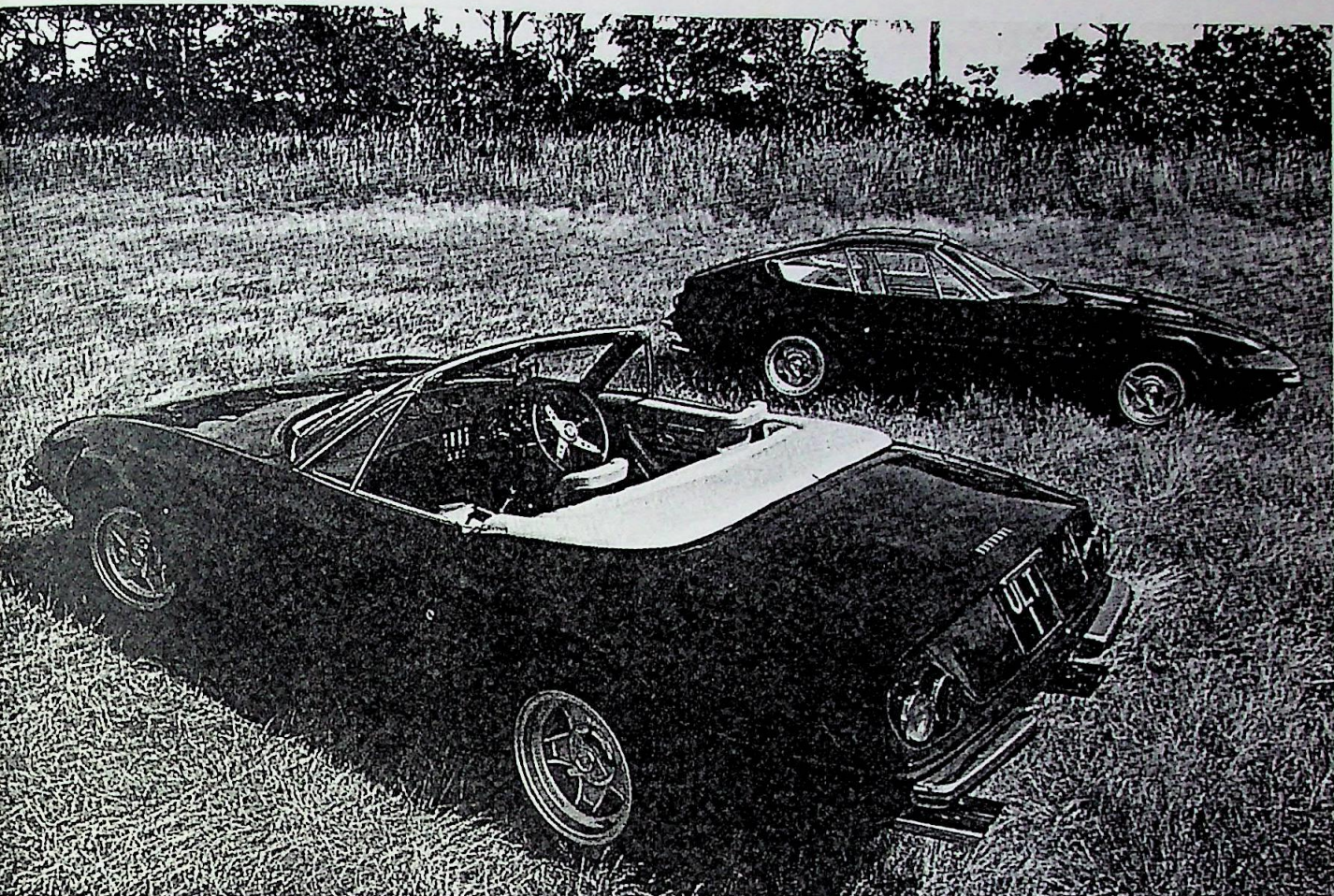
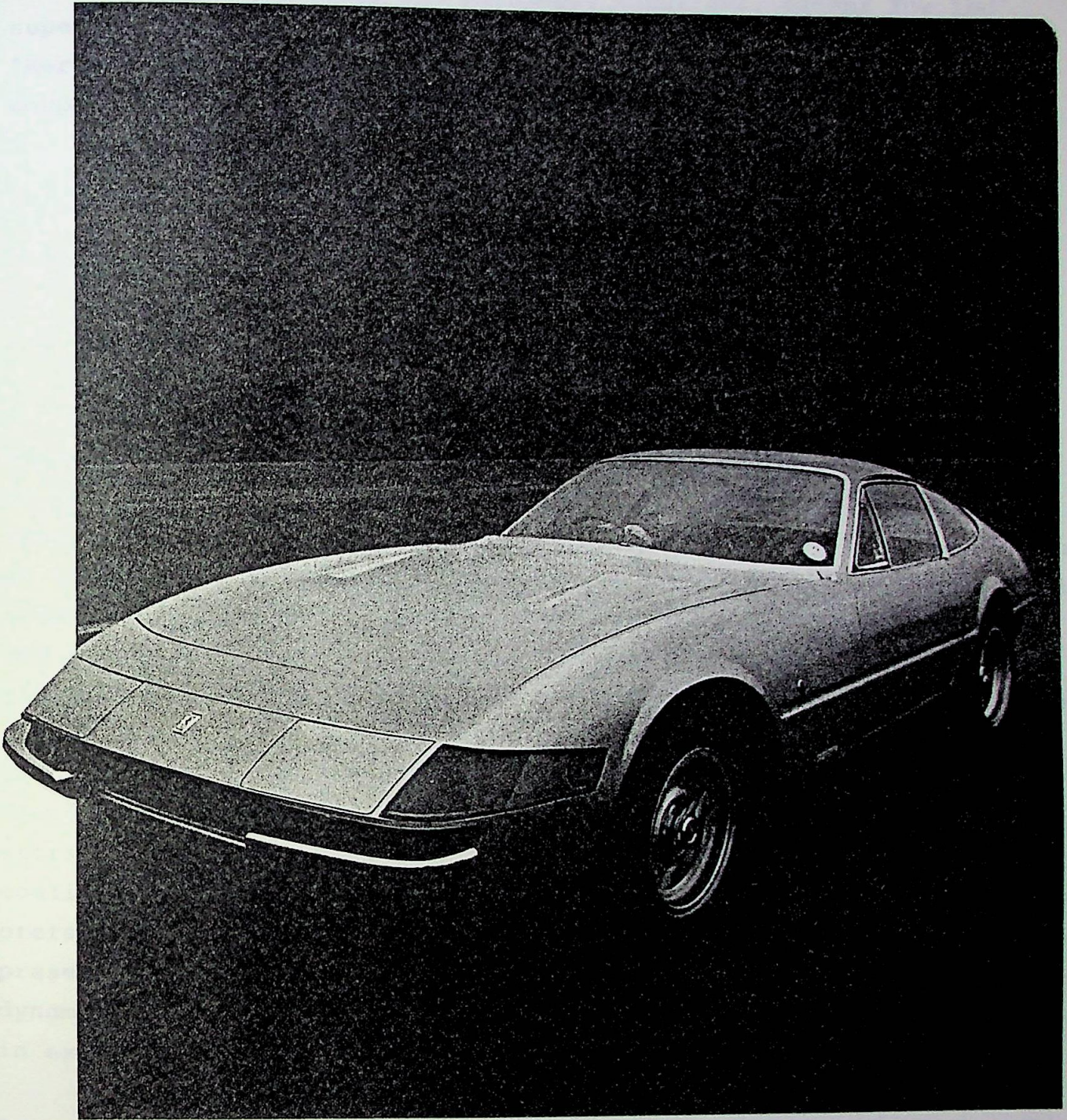


Fig. 5.6(b)



strictly limited quantities until mid 1974 by Scaglietti. It is not well known outside Italy and is almost identical, except for the superstructure and rear deck line, to the better known Daytona "Berlinetta" (an Italian term for a close-coupled saloon or saloon coupe) (see fig.5.7).

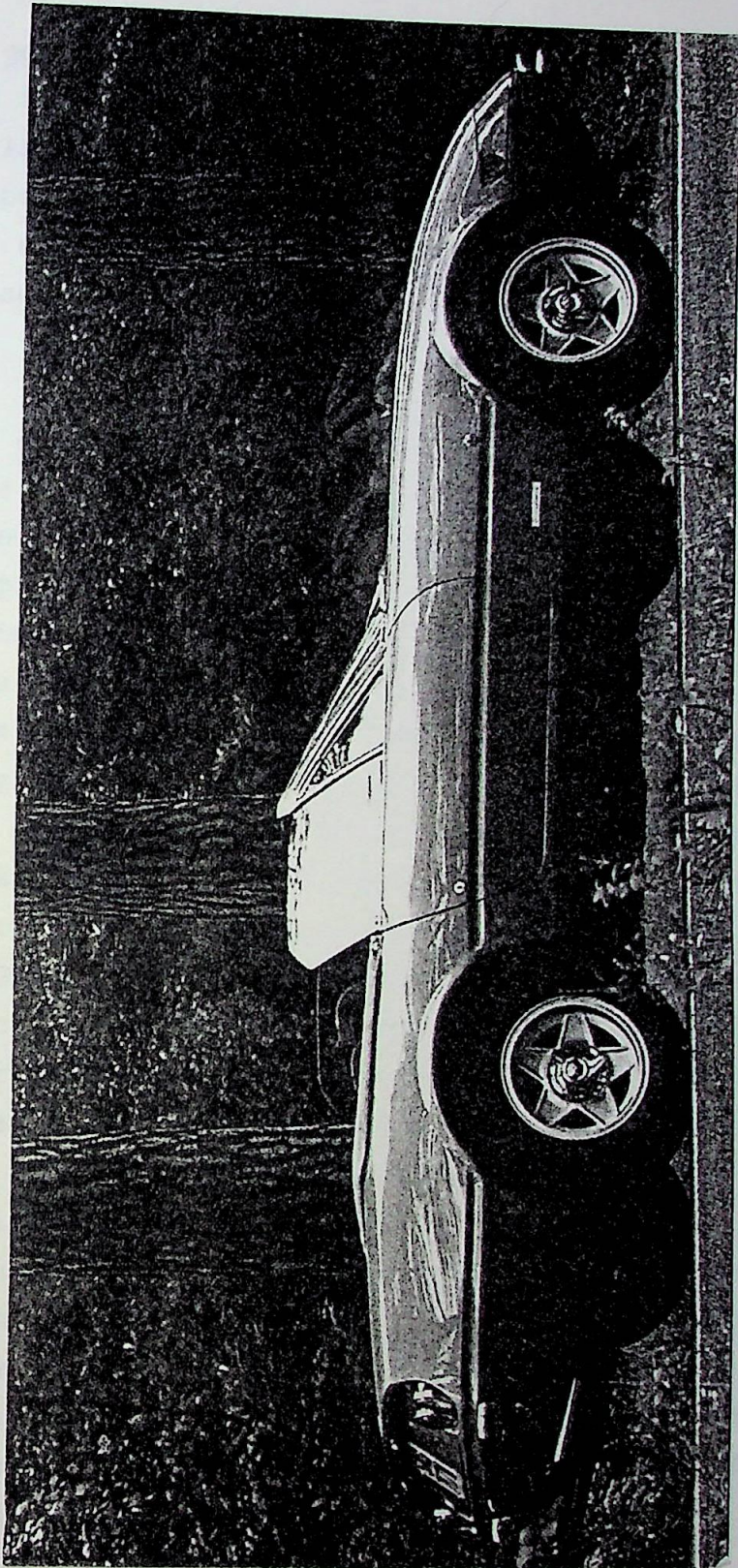
"The Daytona is hailed to be the most attractive and desirable of the modern Ferraris and, with a top speed of 188 m.p.h., is one of the fastest and most powerful production cars ever built."
Richard Nichols; "Exotic Cars".

Every modern convenience is provided inside and out and the contours of its body communicate its potential. This is conveyed by its low nose which rises up to the swept windscreen, the body line dips slightly at the door and continues backwards to the sharply cut-off tail panel; altogether providing an aerodynamically-sound body. The headlamps are concealed when not in use and are mounted in the flush units in the nose that are electrically elevated to expose the lamps; the side indicator lamps are moulded into the sides of the nose and the air intake comprises of two slots above and below the front bumper. The broad-spoked, light-alloy wheels with treble-eared hub caps, look attractive and also provide low wheel weight and assist in brake cooling. Unlike the Jaguar XK120, the design of the Daytona makes no pretensions to possessing a wing line; the shape is common to many present day sportscars and has been established to have good aerodynamic stability, a characteristic which is very important in speeds in excess of 150 m.p.h.

In conclusion, the Daytona Spider is the synthesis of the old established elements of a sportscar with a dramatic but scientifically proven safe speed range. It is the "father figure" from which most successful present day sportscars have spawned.

Fig.5.7

Ferrari Daytona "Berlinetta".



AERODYNAMICS

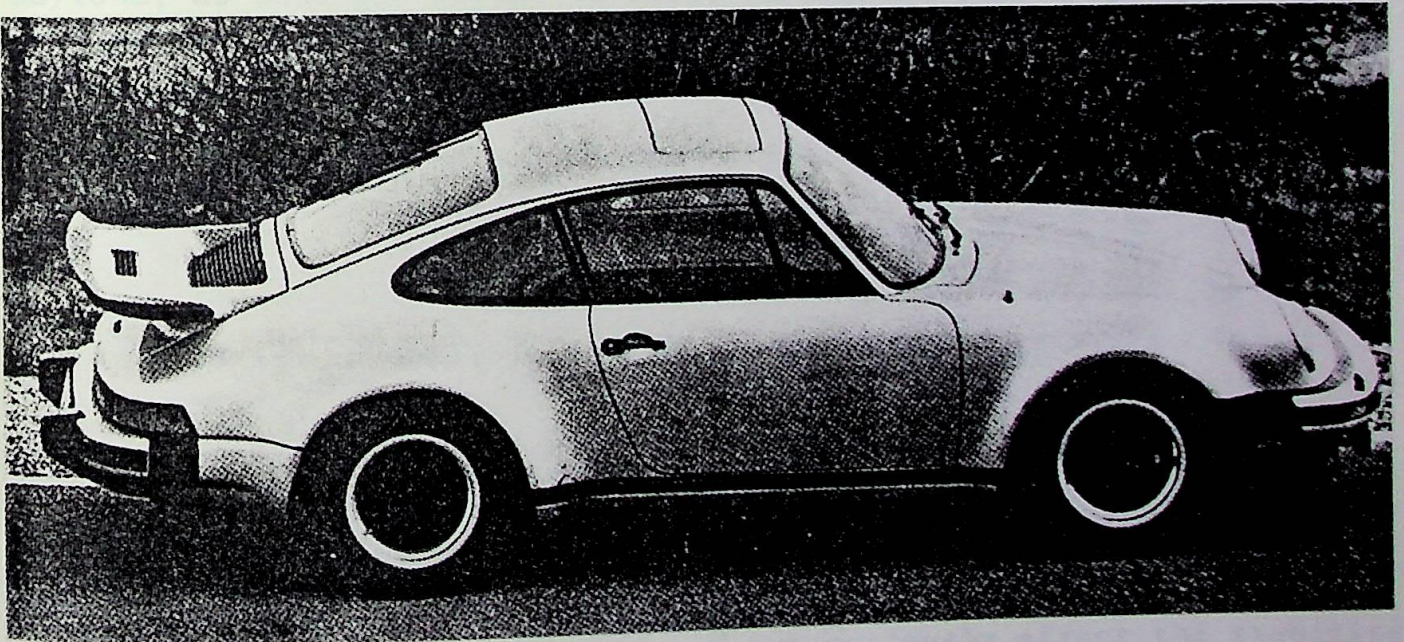
A factor which goes hand-in-hand with sportscar styling is the aerodynamics of the form. Even in the early days, designers recognised that the large flat radiator grilles and flat front ends did not assist the sportscar as it forced its way through the air. The B.M.W. 328, for example, was one of the models which attempted to adapt its body accordingly. From then on aerodynamics proved itself to be essential to all high performance automobiles.

There is always a conflict of requirements when designing an automobile body. The family motorist is probably the most difficult to please, since he or she demands a large seating capacity or luggage storage within practical dimensions and at the same time expects the stylist to provide something with extravagant sweeping lines. The sportscar enthusiast (I say enthusiast rather than owner because today there exists quite a difference which will be discussed later on in this essay) is more interested in performance and will sacrifice some body space in the interest of aerodynamic efficiency. The typical pre-war motor car wasted a lot of power while pushing a flat-fronted, angular body through the air at a typical top speed of 60 to 70 m.p.h. The 1½ litre M.G. saloon (see fig.4.5), post-war design, was typical of these early cars, with a rather square body, a flat windscreen, square upright radiator and separate headlamps mounted between the radiator and the wings. To propel such a car at 60 m.p.h. required about 32 b.h.p. (brake horse power) at the road wheels. The Porche 911 (see fig.6.1) with a body developed by extensive wind tunnel testing requires less than 20 b.h.p. to propel it at the same speed. To reach a speed of 100 m.p.h., the 1½ litre M.G. saloon would have required an engine producing about 150 b.h.p. The Porche, in comparison, requires only half this power to maintain a speed of 100 m.p.h. So, the shape of a sportscar body, whilst possibly being visually pleasing, is fundamental to the car's performance.

The body-shape of a sportscar encounters two types of drag. The first

Fig.6.1

Porche 911



is called "form drag" and is explained simply as the work done by the sportscar in pushing air out of the way. The less streamlined the body, the greater the form drag for a given frontal area. A flat plate represents the ultimate in poor streamlining since its movement through the air produces resulting eddies (air movements) over a much wider area than that of the actual plate. The perfect streamlined form only disturbs the air in its own vicinity.

The second type of drag is called "friction drag" and is the resistance to motion set up by the layers of air adjacent to the surface of the sportscar. The replacement of a square-type body by a streamlined design, while decreasing the form drag, will, however, sometimes increase the friction drag, since the total surface of the streamlined design tends to be greater.

In the same way, an open cockpit and an erect windscreen can completely spoil the airflow pattern over a sportscar and a higher maximum speed is always given with a hard top fitted and the side windows closed. It is here, for instance, where the "wind-in-the-hair" imagery of sport-car driving has to suffer at the hands of technology. The Ferrari Daytona, as does the Porche Carrera, suffers in this respect but in the interests of motoring spirit the sportscar pilot should always be given an option to satisfy his priority of speed married with driving pleasure.

When a sportscar is travelling at speed through the air, areas of positive and negative pressure are created on its body. The profile of the body can be likened to that of an aeroplane wing. An aeroplane wing receives lift from the difference between high pressure (positive) at the top surface of the wing and the low pressure (negative) of the bottom of the surface. It is not surprising, then, that lift can be produced at high speed. On a typical sportscar a lift of about 150 lbs is produced at 100 m.p.h., most of this occurring at the rear end. At higher speeds the lift increases and can seriously effect the stability and controllability of the car. In 1966 Hap Sharp of the Chaparral

racing team described this effect:

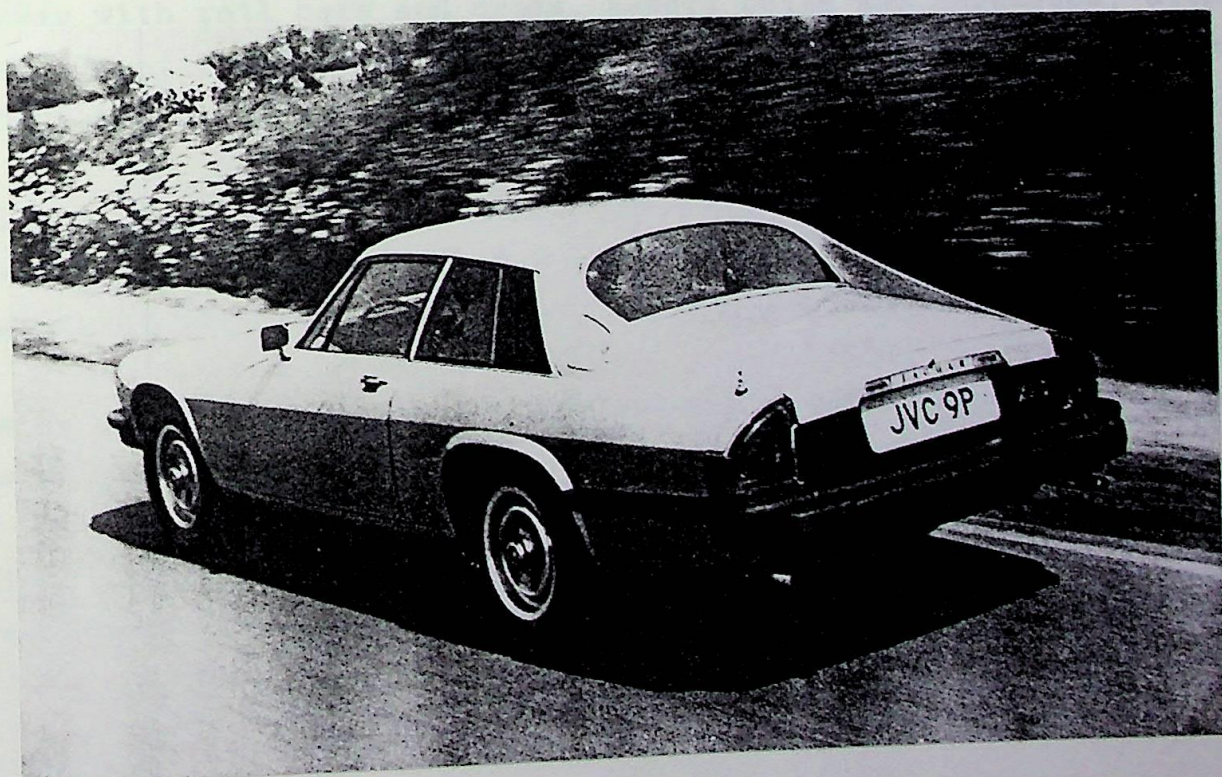
"You're blasting down the straight...
and then you begin to hear this kind
of high-pitched whine, a kind of
whirring noise, and everything begins
to go soft on you. And you better
believe you are trying to fly."

The 1967 Chaparral was fitted with an aerofoil at the rear of the car to produce the desired downthrust at high speed, to reduce a wheel spin whilst accelerating and to increase cornering power in fast bends. The Porsche 911 Turbo (see fig.6.1) utilises such an aerofoil to prevent rear-end lightness at speed.

Wind tunnel tests on the Jaguar XJ-5 (see fig.6.2) made by Malcolm Sayer led him to incorporate curving fins at the rear quarters. This was necessary since at high speeds the car encountered frontal pressure areas at a greater rate than the negative ones at the rear resulting in the centre of gravity of the car moving forward. The result was a treacherous swinging movement of the car at high speeds which was only remedied by these additional vertical surfaces at the rear.

Fig.6.2

Jaguar XJ-5



SAFETY

As to the "wind-in-the-hair" syndrome, sun-roofs have contributed somewhat but they only satisfy the requirement literally. What they do satisfy, more importantly or not, is safety standards. Open sports-cars are appealing but they also do not provide the driver with adequate protection. Roll bars are fitted to some open sportscars such as the Porche Targa but not all sportscars would be complemented by such a fitting such as the Ferrari Daytona. This is why motoring insurance for sportscars of this type is nothing short of enormous and this is another factor, besides the initial purchasing price, which contributes to the sportscar remaining in the upper echelon of society.

All sportscars are required to meet certain Federal and European safety requirements and designers and manufacturers have done a great deal on their own to improve their vehicles on a constant basis. Safety glass, better tyres, stronger bodies, vastly improved handling, deep-dish steering wheels, antilock-braking systems, to name a few, are features that came along without government legislation. Racing showed the way with roll bars and cages, safety belts and harnesses, although these came from aircraft originally. The following are the five basic tests carried out on sportscars:

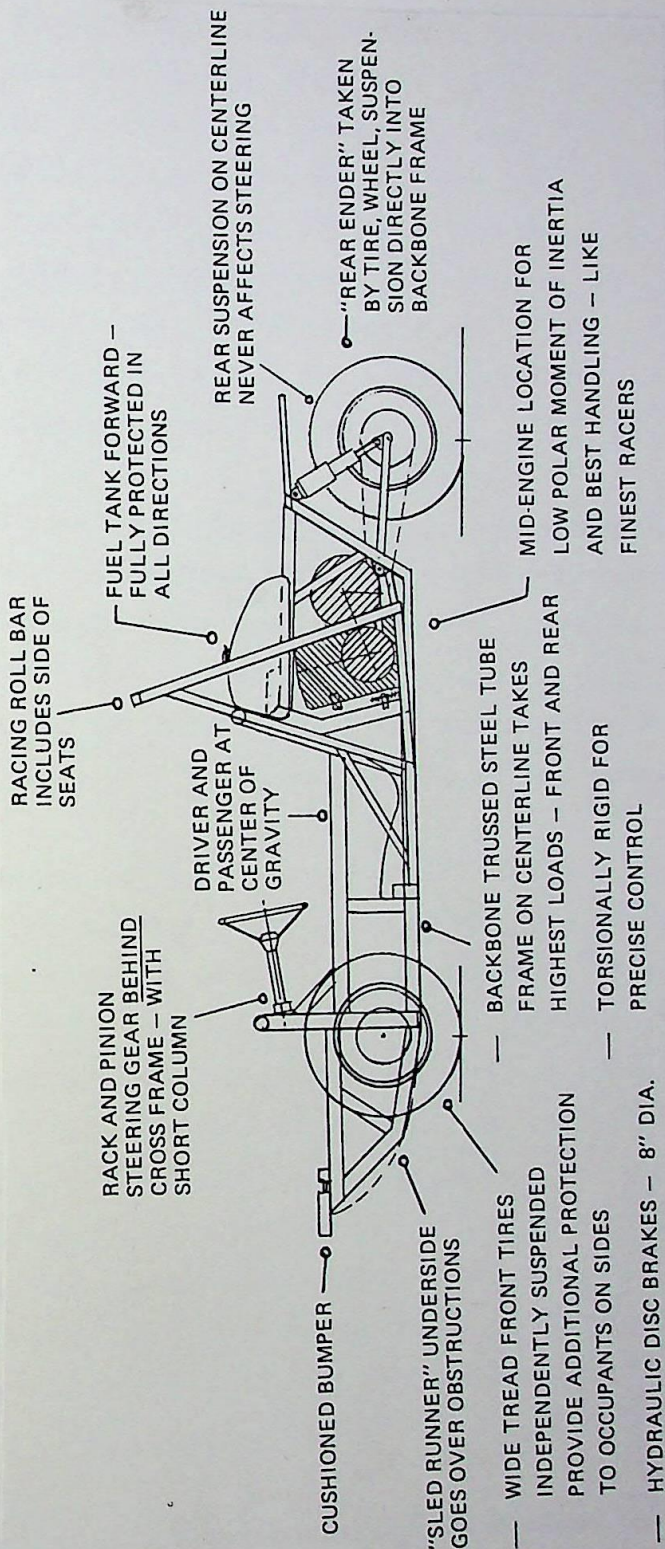
1. 5 m.p.h. Federal bumpers (for cars sold in the U.S. only), in which the car withstands 5 m.p.h. barrier collision and 5 m.p.h. pendulum striker impact without sustaining damage.
2. Roof crush resistance. Maximum allowable deflection of 5 inches when subjected to static load of $1\frac{1}{2}$ times vehicle weight.
3. Side impact resistance. Pole shaped former is pushed into door with body clamped firmly in place.

4. Steering wheel displacement in a 30 m.p.h. barrier collision. The maximum permissible value for the displacement is 5 inches.
5. 30 m.p.h. crash test. Decelerations and forces are measured on instrumented dummies, wearing seat belts during the crash. (Fig.7.1 gives basic design features of a sportscar).

Due to their "fast" reputation, sportscars have generally been given greater attention than saloon models and it is probably true to say that some sportscars are amongst some of the safest cars in the world to drive. There is one factor, however, which the designer cannot engineer, and that is the driver. The proverbial "nut behind the wheel" has, due to the car's performance, a greater chance of fatality in a sportscar than in a family saloon, yet as there is no specially tailored driving test for potential sportscar owners, all that one requires is money.

Fig.7.1

Safety Features of a Sportscar



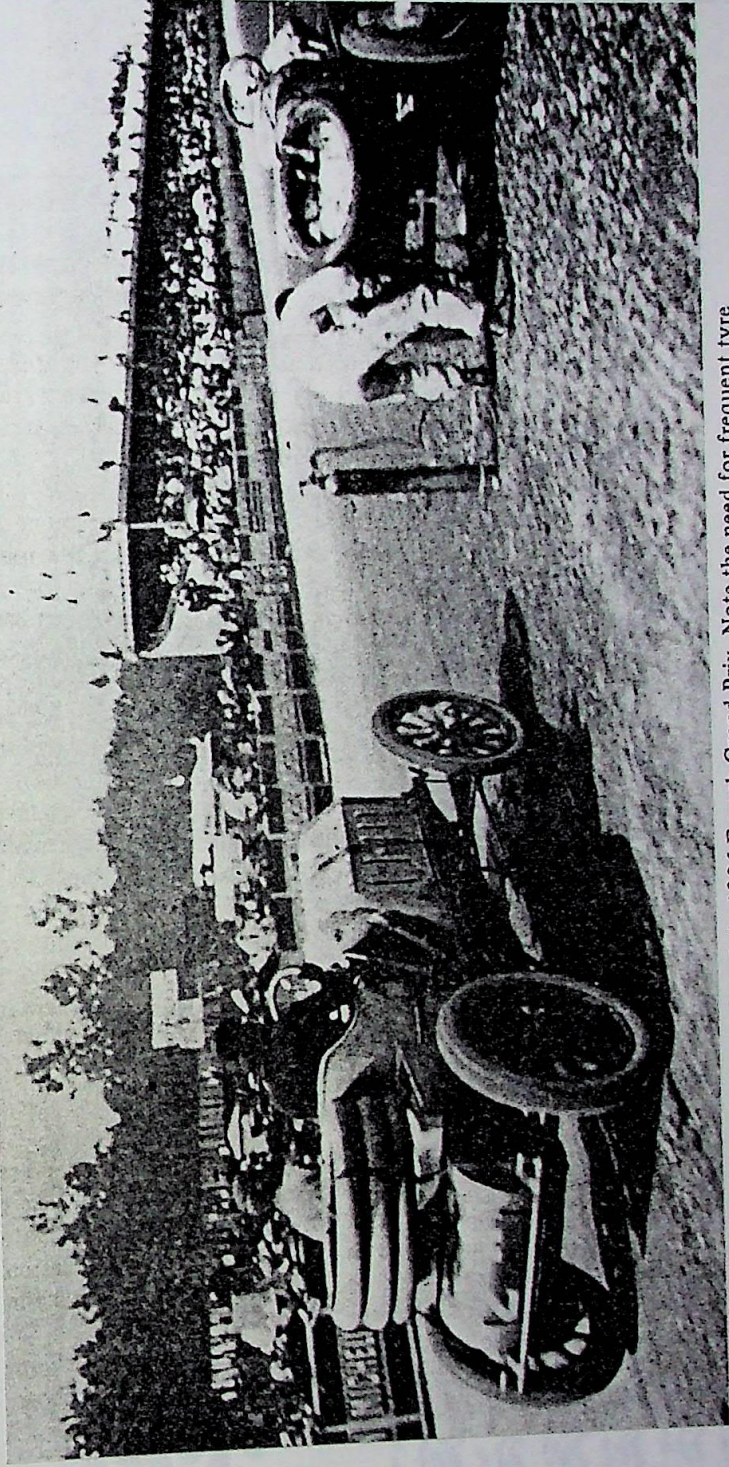
ROAD HOLDING

Probably the most important characteristic, both safety and performance wise, is road holding. The feature of a sportscar which transfers all of the sportscar's power to the road is the tyres. Tyres were a source of great trouble to the early motorist, particularly when racing. Fig. 8 shows a competitor in the 1906 French Grand Prix struggling with a tyre change at the side of the road while Vincenzo Lancia hurtles past in his 16 litre FIAT. The spare covers strapped to the back of the Lancia's car suggests that he also anticipated tyre trouble.

The only roads that existed for the early motorist were of crushed stone and these soon disintegrated until the surface became an unpredictable loose mixture of broken stones, smaller debris and dust. Even a modern tyre thread fails to get a grip on such a surface and the early motorist was forever haunted by what the motoring journals of the time called "the dreaded side-slip".

The grip of the tyres is just as important when braking, accelerating and cornering and it is the need for large tyre footprints (see fig. 8(a) that provides us with with the sporty wide wheels and tyres of a sportscar which are synonymous with sportscar identification and imagery. Sportscar designers and engineers give considerable attention to the specification of a type of tyre for a particular car. The Jaguar XJ-S, for instance, was provided with a 70 Series S.P. Super Sport radial tyre which had a large block thread pattern with wide channels for water drainage. The "Series" title denotes the width of the tyre (see fig. 8.1). This particular tyre was also specified for the Porche 911 whilst the Lotus Elite (see fig. 8.2) used the tyre in the 60 Series form.

There are various types of rubber compounds used in tyres. Some of these consist of:



16-litre F.I.A.T. driven by Vincenzo Lancia in 1906 French Grand Prix. Note the need for frequent tyre changes. (Photography from the Cyril Posthumus collection).

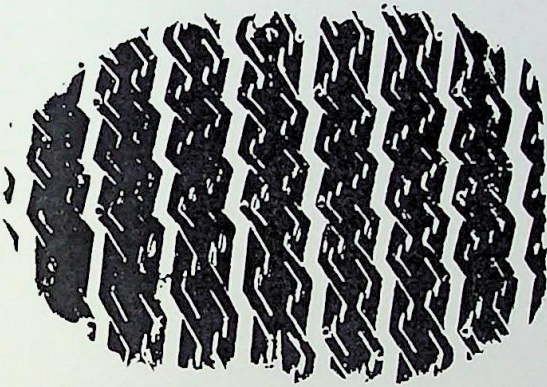
Fig. 8 "Tyre Trouble"

Fig.8(a) Tyre Footprints

70 series



60 series



50 series

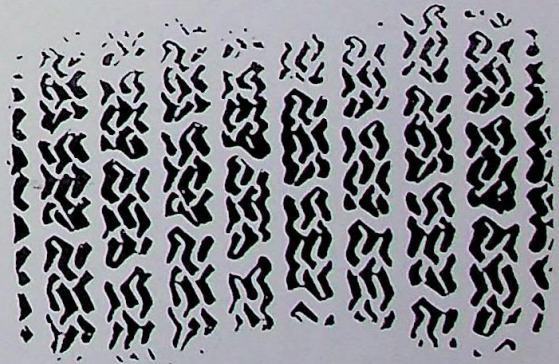
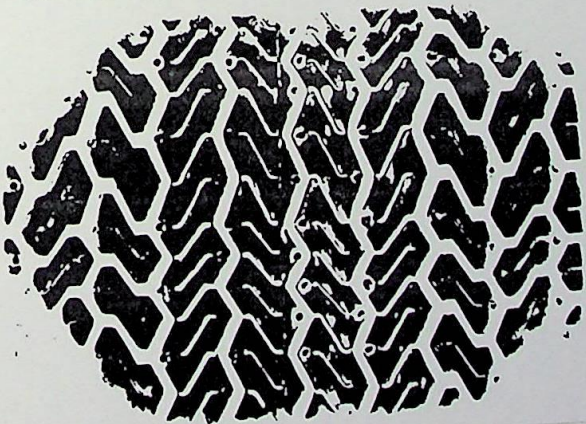


Fig.8.1 The Variuos "Series" Type Tyres

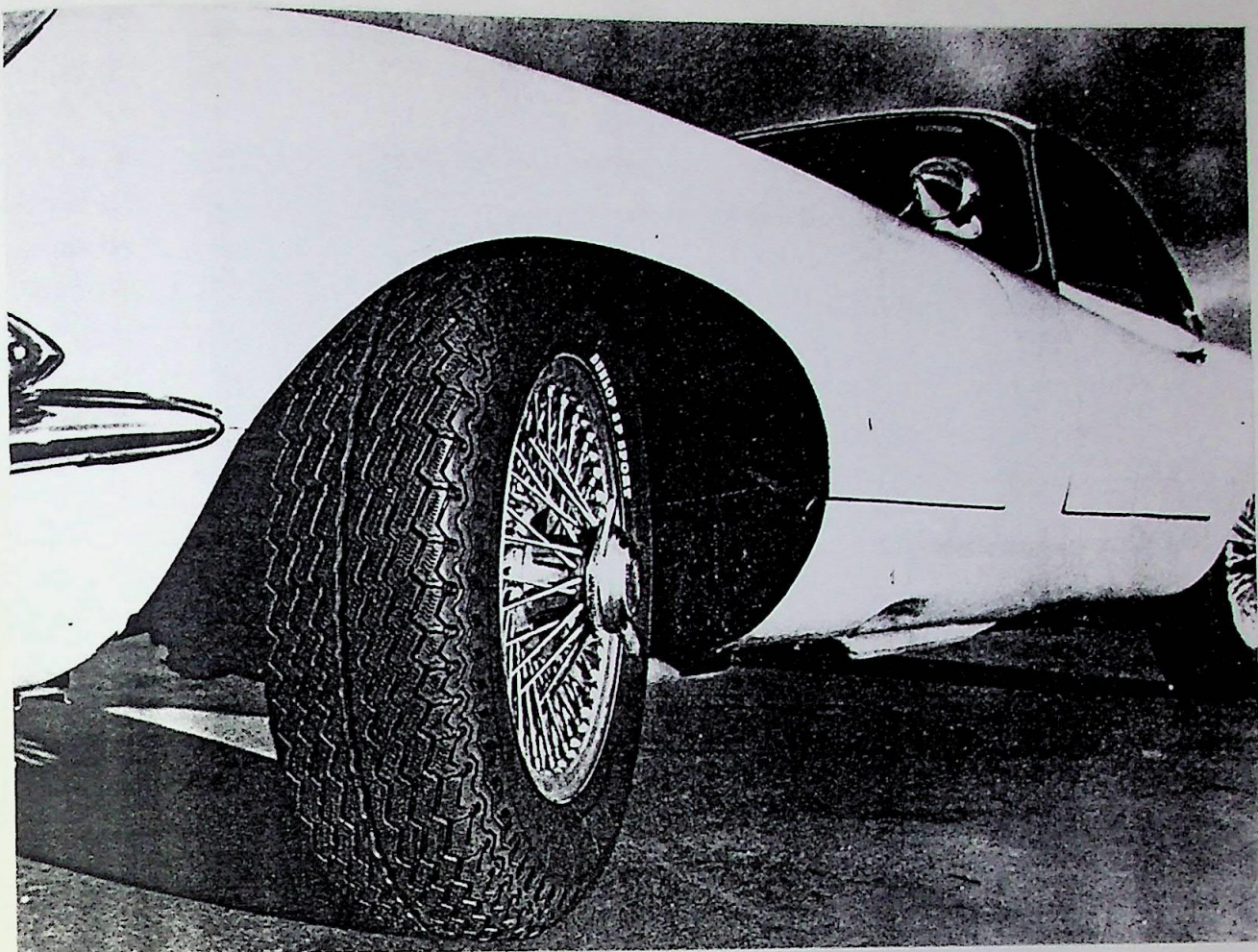
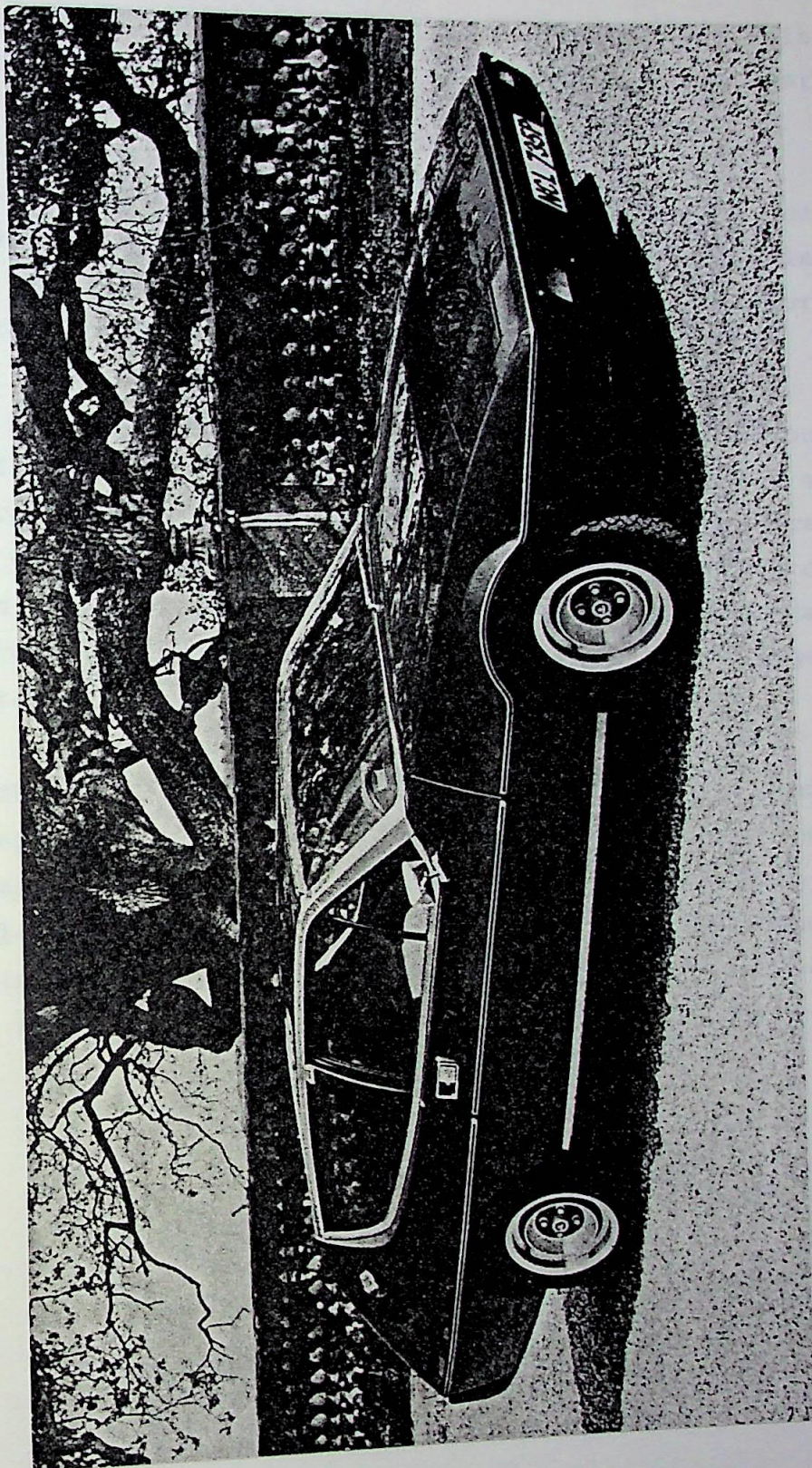


Fig.8.2

Lotus Elite



1. Natural rubber - which is very soft but has good flexibility at low temperatures. It has poor resistance to oxidisation and attack from atmospheric ozone.
2. Chloroprene copolymer (neoprene) - this compound is not as flexible as natural rubber but is far superior in resistance to high temperatures and ozone. However, it becomes very rigid at low temperatures.
3. Styrene butadiene copolymer (S.B.R.) - when this compound was combined with fillers it was found to have properties similar to natural rubber. It possesses good resistance to abrasion and has contributed largely to the much improved grip of modern tyres in the wet. However, companies who added large amounts of S.B.R. to their tyres found that the tyres became dangerously overheated when used on dry roads.

Today the choice of tyres at the start of a race is a headache for team managers, but this, fortunately, for the sportscar owner is not the case. For a sportscar to be used every day of the week we need an all-weather tyre and the rubber should be compounded to give a satisfactory compromise between wet and dry requirements and always with the need for excellent abrasion resistance in mind.

SOCIAL ASPECTS

The sportscar as it is known today has become as difficult to identify as it is to define. Mass produced cars have flooded the market from Europe and Japan sporting names such as; G.T.S., G.T.i., G.T.t.i., G.L.S., Turbo etc. in pursuit of exclusivity. The result has been the public's uncertainty as to what a sportscar truly is.

This dilemma does not exist for sportscars with exclusive price-tags. These cars tend to look distinctly like sportscars and cannot, by any form of enthusiast or layman, be regarded as anything less. Then there exists the sportscar of a lesser cost and thoroughbred such as the Porche 924 which has been derogatorily been called:

"The poor-man's Porche....."

in circles where anything less than up-market sports models are regarded with a kind of exclusive "snobbery". A possible reason for the Porche 924 being ill-favoured by such enthusiasts could be that the 924 is actually manufactured by Audi and possibly has suffered since Audi do not specialise in sportscars.

So, the sportscar in its exclusive niche has a niche within itself. It has social status but also has a social class. Farther removed from this "middle class" sportscar must be the "Replicas" (see figs. 9.1 & 9.2), those fibreglass imitators built on V.W. Beetle or Ford Escort chassis. These are the ultimate imposters and, to the enthusiast, undermine everything which the original model offered. This is a fair point since most of these replicas are badly finished, toy-like and the fibreglass panels will rattle whilst driving along. They only resemble (vaguely as it may be) sportscars on the exterior; the rest of the carcass is somewhat home-made. They do, however,

Figs. 9.1 & 9.2 The "Imitators" (Sportscar Replicas)

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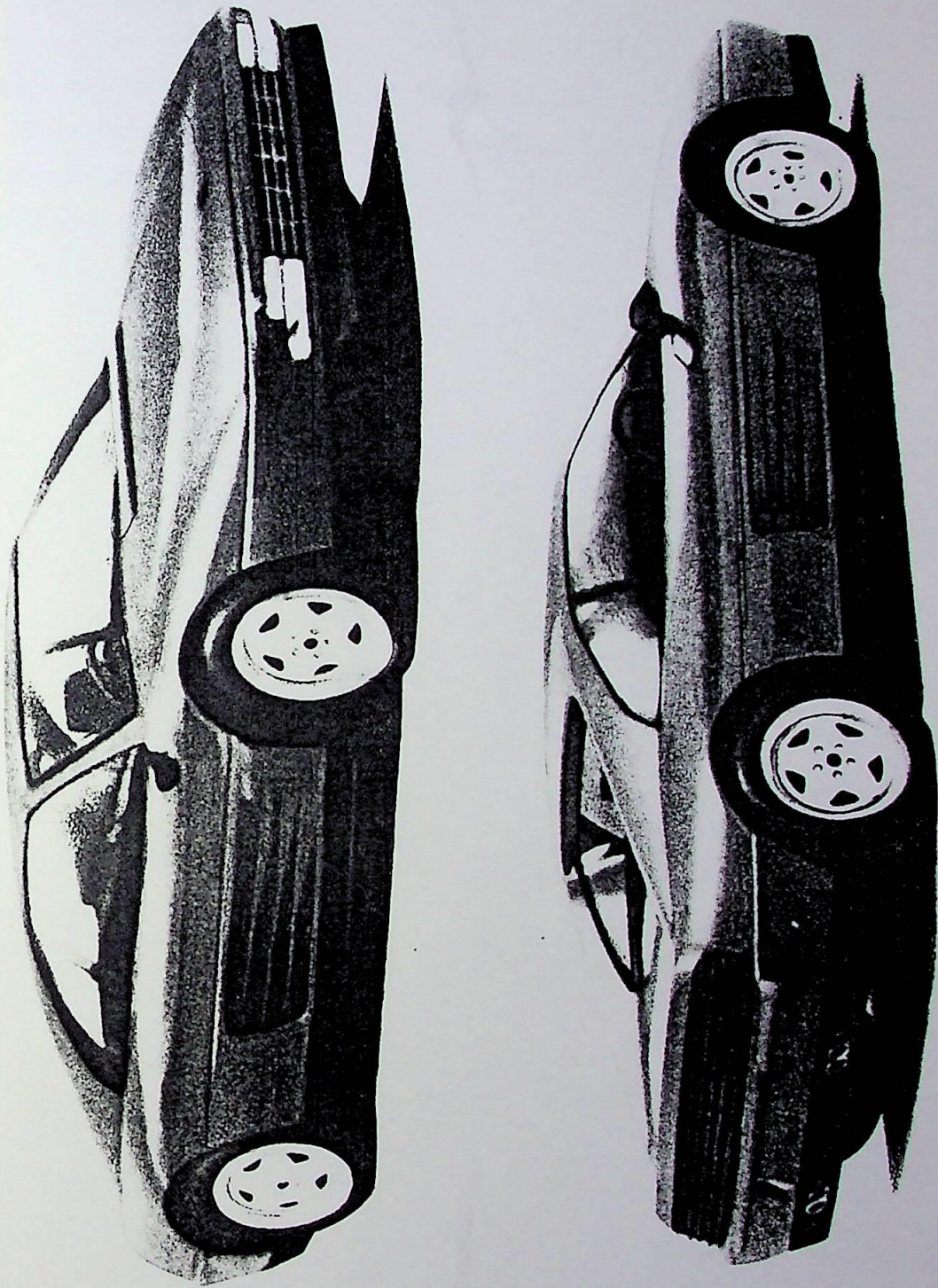
For details send £1 to

provide those members of the public with a desire for a sportscar with a desirable vehicle of sporting proportions. At the risk of sounding condescending, it could be said that the replica provides a fantasy to those who may never aspire to greater things. Perhaps the replica has more of the owner's true personality than the owner of a factory built model has in his car. This third member of the sportscar ownership structure could possibly be placed alongside the family saloon car owner in financial terms since kit-cars, or replicas, after assembly, cost approximately the value of a new four-door saloon.

As mentioned earlier the designers and manufacturers of a sportscar cannot determine who will buy their vehicle. Today, sportscars are not solely being bought by enthusiasts. They are purchased to impress in what may be an ego-trip in pursuit of attention, to represent prosperity and, among other reasons, to attract members of the opposite sex. The "playboy" image of the sportscar still exists but now, in these days of the Japanese mass produced M.R.2., Mazda RX-7, and the range of G.T.i's from Europe, sportscars are becoming commonplace and only the rare appearance of a car from the upper sportscar class mentioned earlier will cause the public to stop and admire. Hence, companies such as Ferrari are designing more and more exclusively styled cars in order to preserve their status. Concern is expressed by this author when discussing the new Ferrari 348 G.T.B. (see fig.9.3)

"The 348 G.T.B. is timely and welcome, in my book, though I do hope that in curing the old 308's old headroom problem and access problems, Ferrari hasn't erred - as it did with the Testarossa - too much on the side of catering to the comforts of paunchy Swiss millionaires, who demand cars that aren't

IG.9.3 FERRARI 348 G.T.B.



too low or too hard to drive."

Steve Cropley, in his remarks about the new Ferrari 348 G.T.B. for CAR Magazine, June 1987.

The true enthusiast speaks out against the pretentious, wealthy owners at whom, it must be said, Ferrari and other exclusive sportscar firms are aiming and for whom they are designing their sportscars.

CONCLUSION

Perhaps the sportscar is really more an attitude of mind than anything else. What it is really about is plain and simple fun. All the cars in this dissertation offer that; some combine it with sophistication, some sacrifice the frills for cheap availability, but who can say that the owner of a 1930's SS100 or a 1950's Triumph had any less fun than today's Lambourghini or Porche pilot?

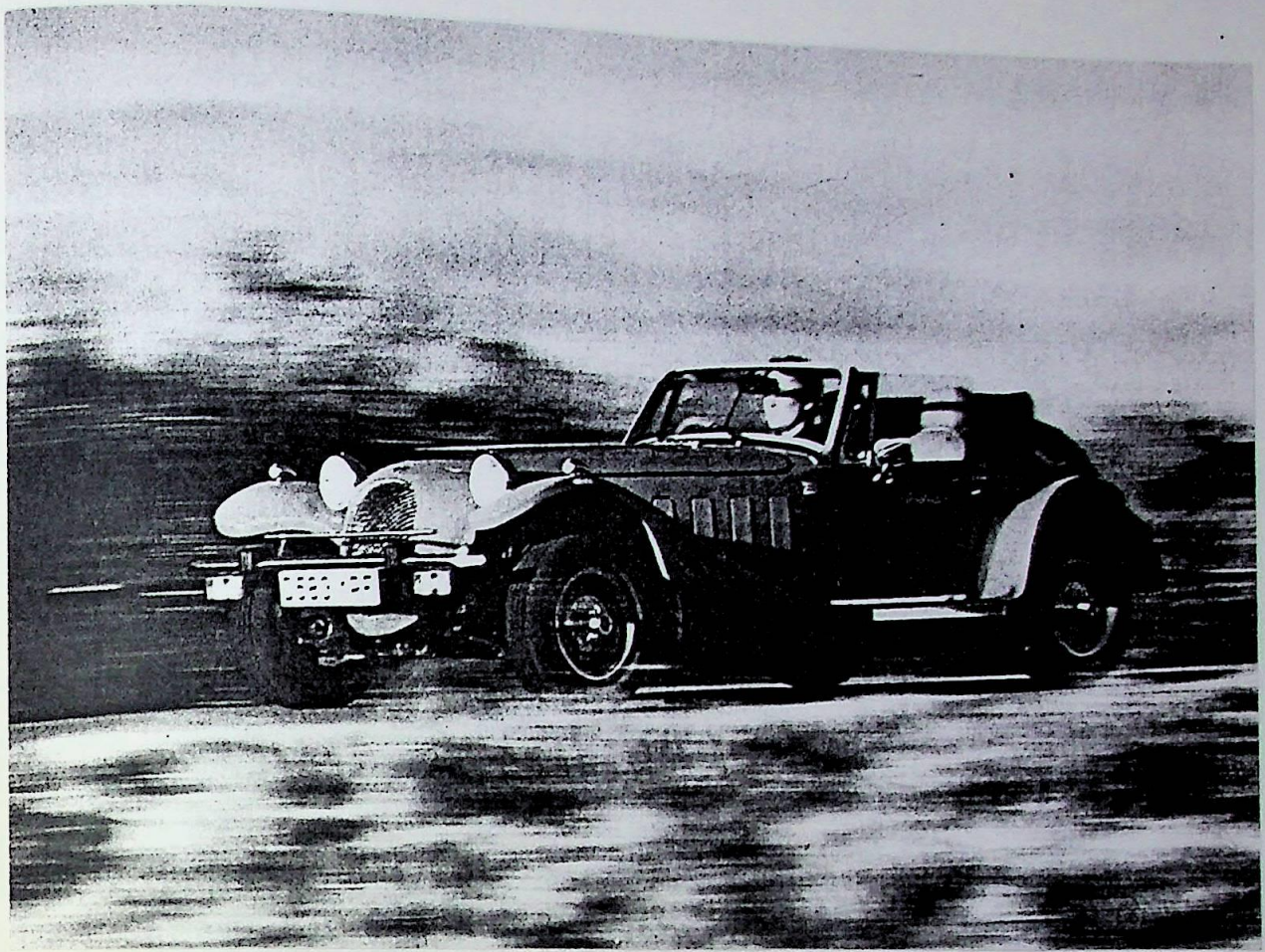
The designer, for his part, will continuously strive for those physical characteristics which, knowingly or otherwise to the buyer, enable the sportscar to qualify its looks with according performance. For whatever reasons people will buy sportscars or whether or not they acknowledge what it is they are driving, the sportscar is there to be admired and driven by those who appreciate its true worth.

In the final analysis, the spirit of the sportscar today is exactly the same as it always was right through its history - a screaming piece of individuality or exhibitionism and a dash of something more than the average - for the designer, builder and the buyer. It has survived everything that politics, economics and legislation have thrown at it and cars such as the mass market Toyota M.R.2. or the stunning M.G. EX-E prototype show that manufacturers big and small, east and west, still see the sportscar as part of our motoring future.

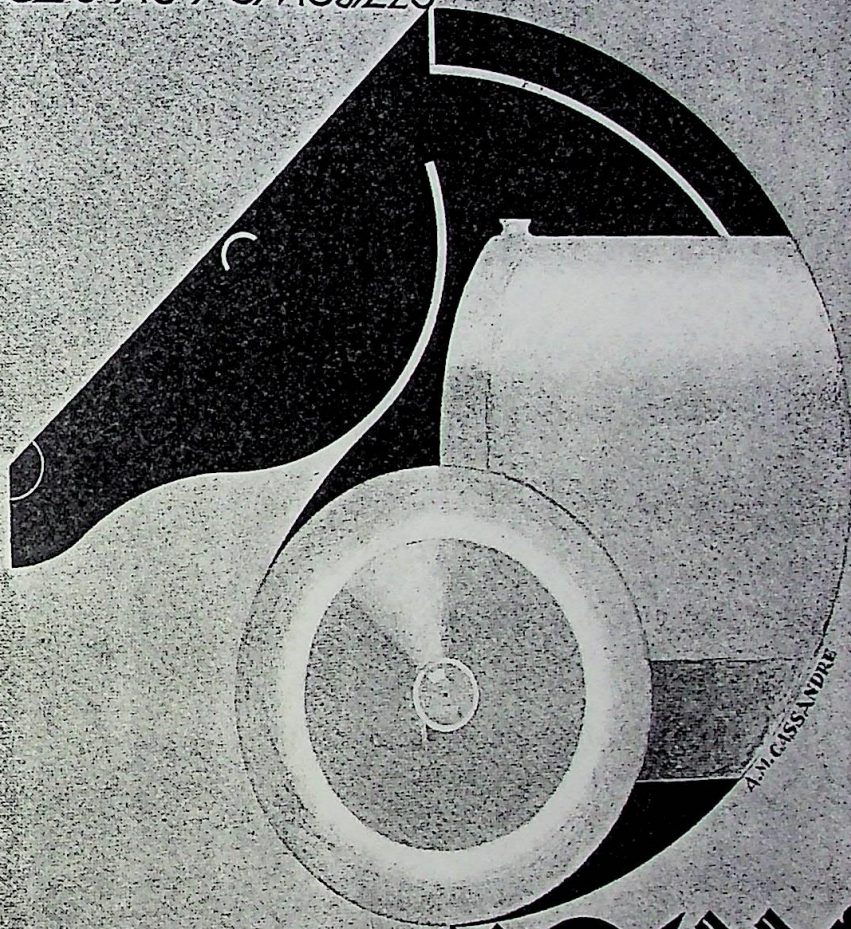
So long as motoring enthusiasts exist, the sportscar will continue to exist for them.

MISCELLANEOUS ILLUSTRATIONS.

The "Wind-In-The-Hair" Image



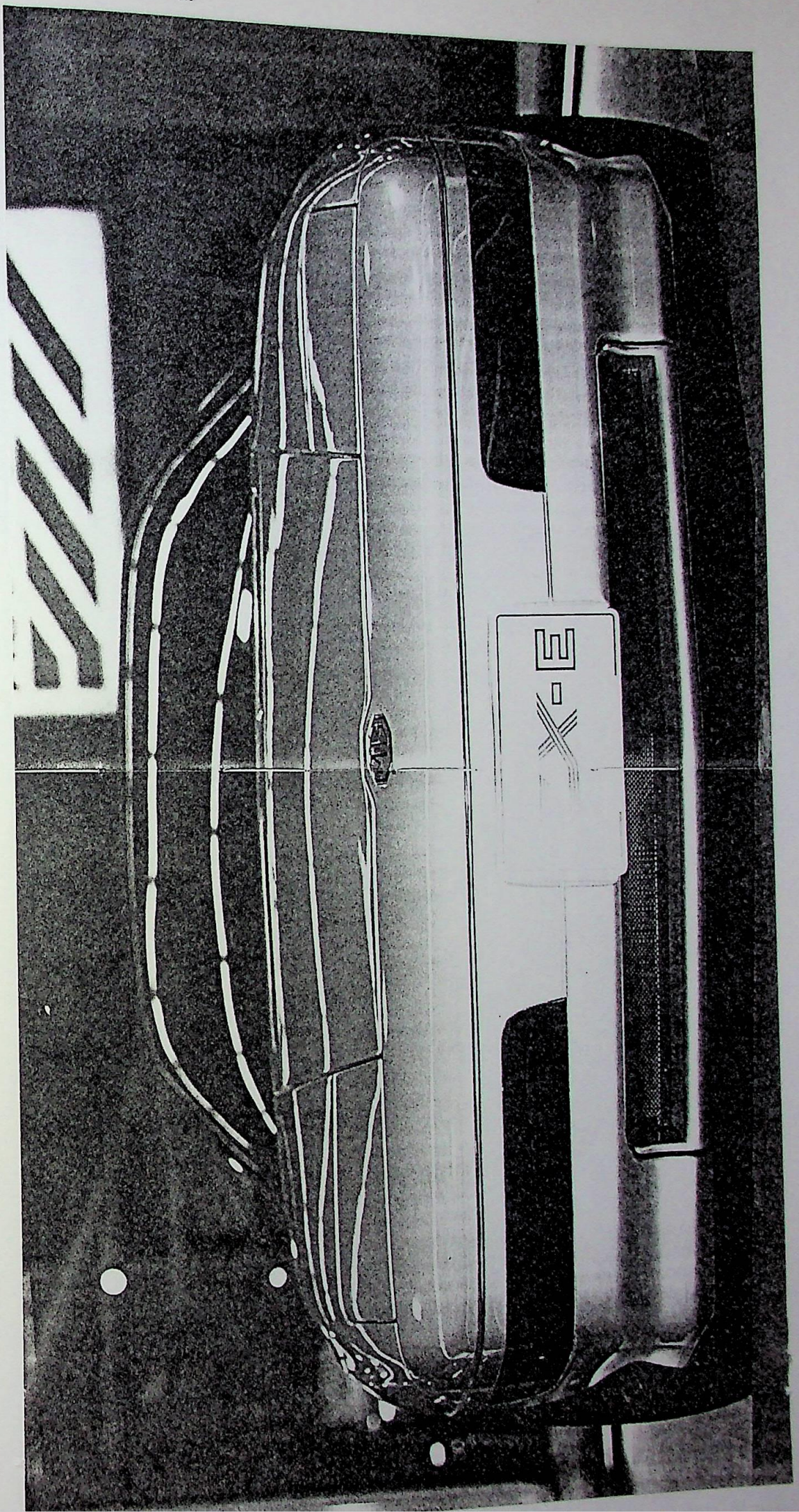
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DES AUTOMOBILES



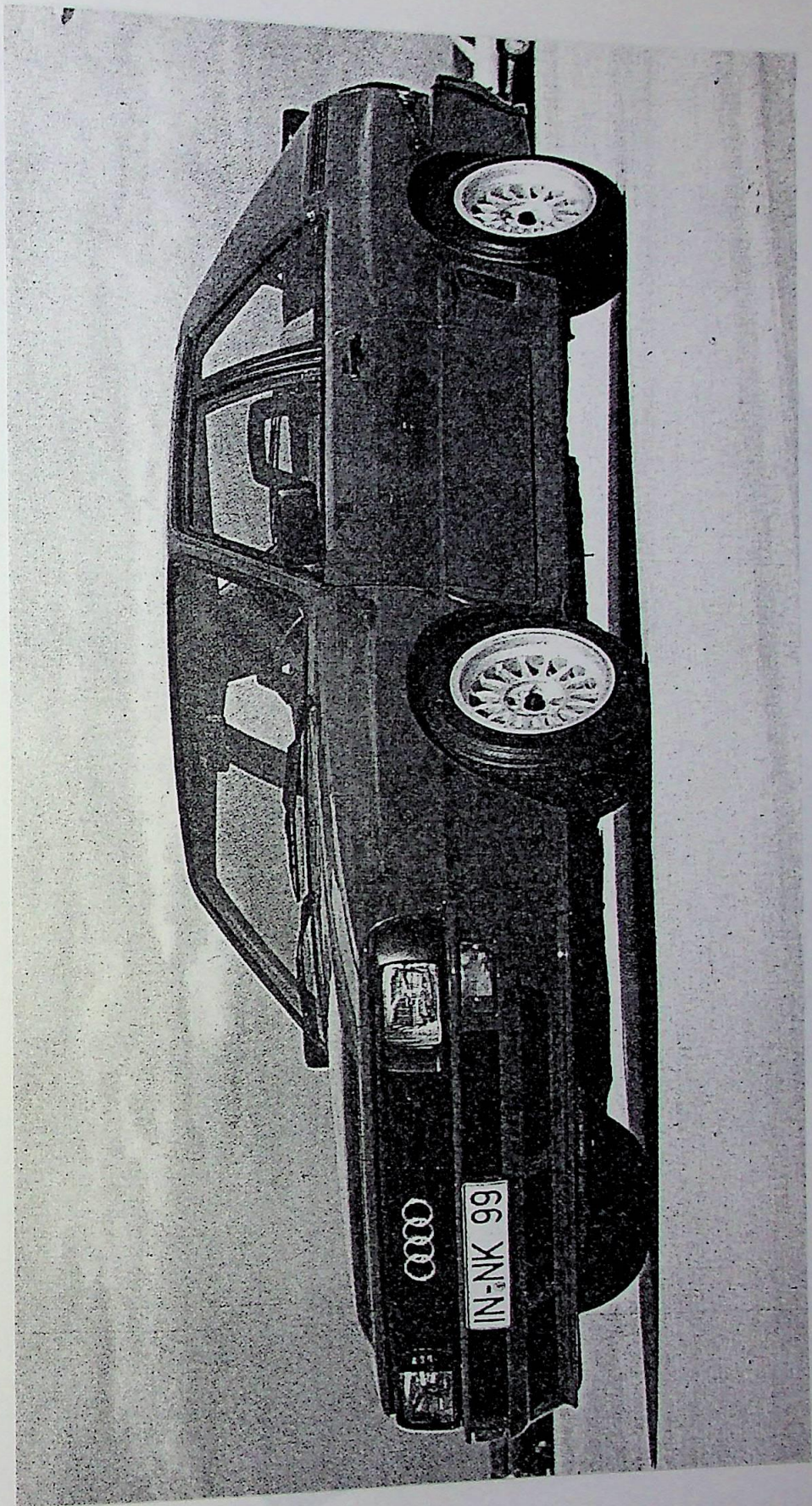
A. H. CASSANDRE

BUGATTI

The MG EX-E Prototype

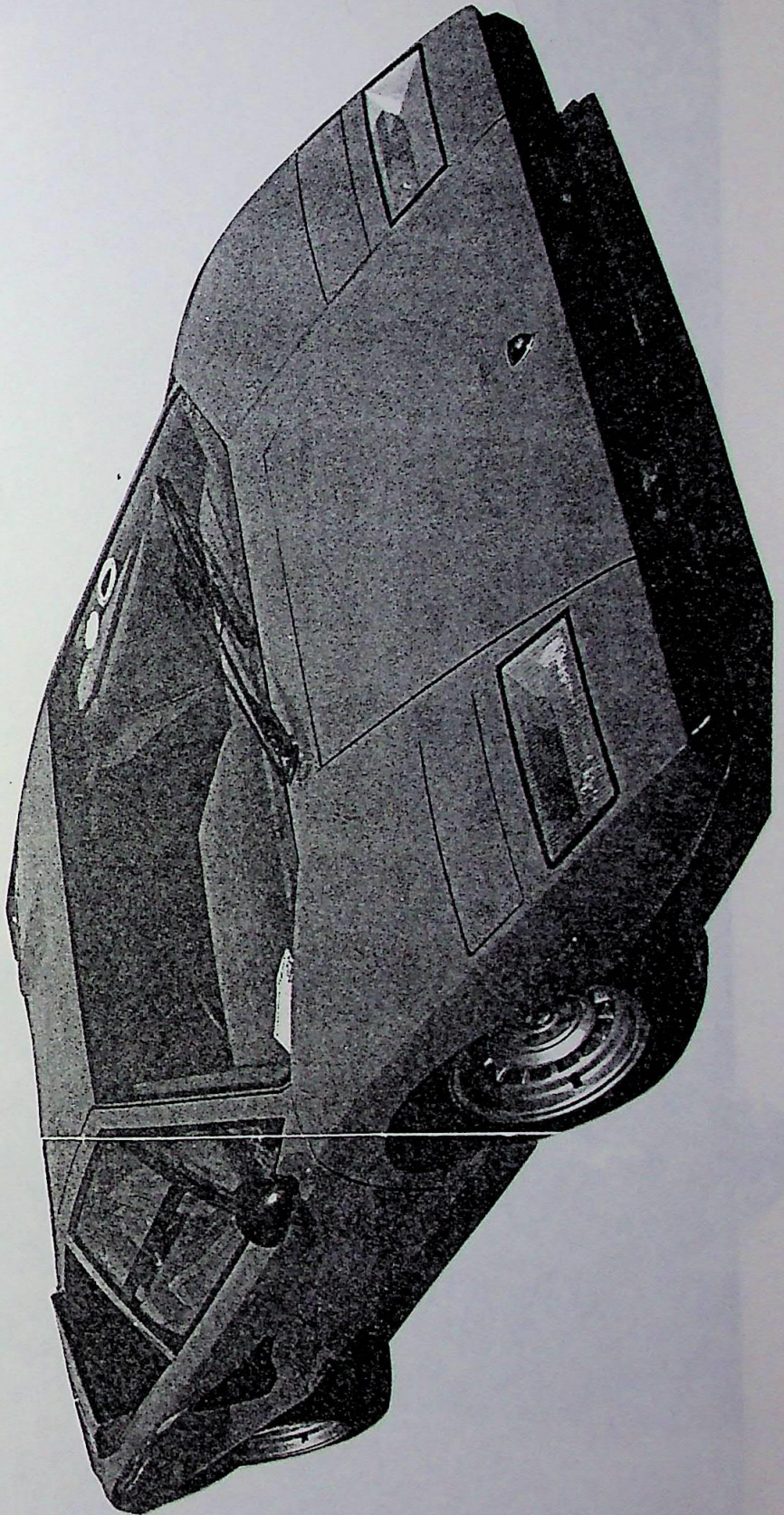


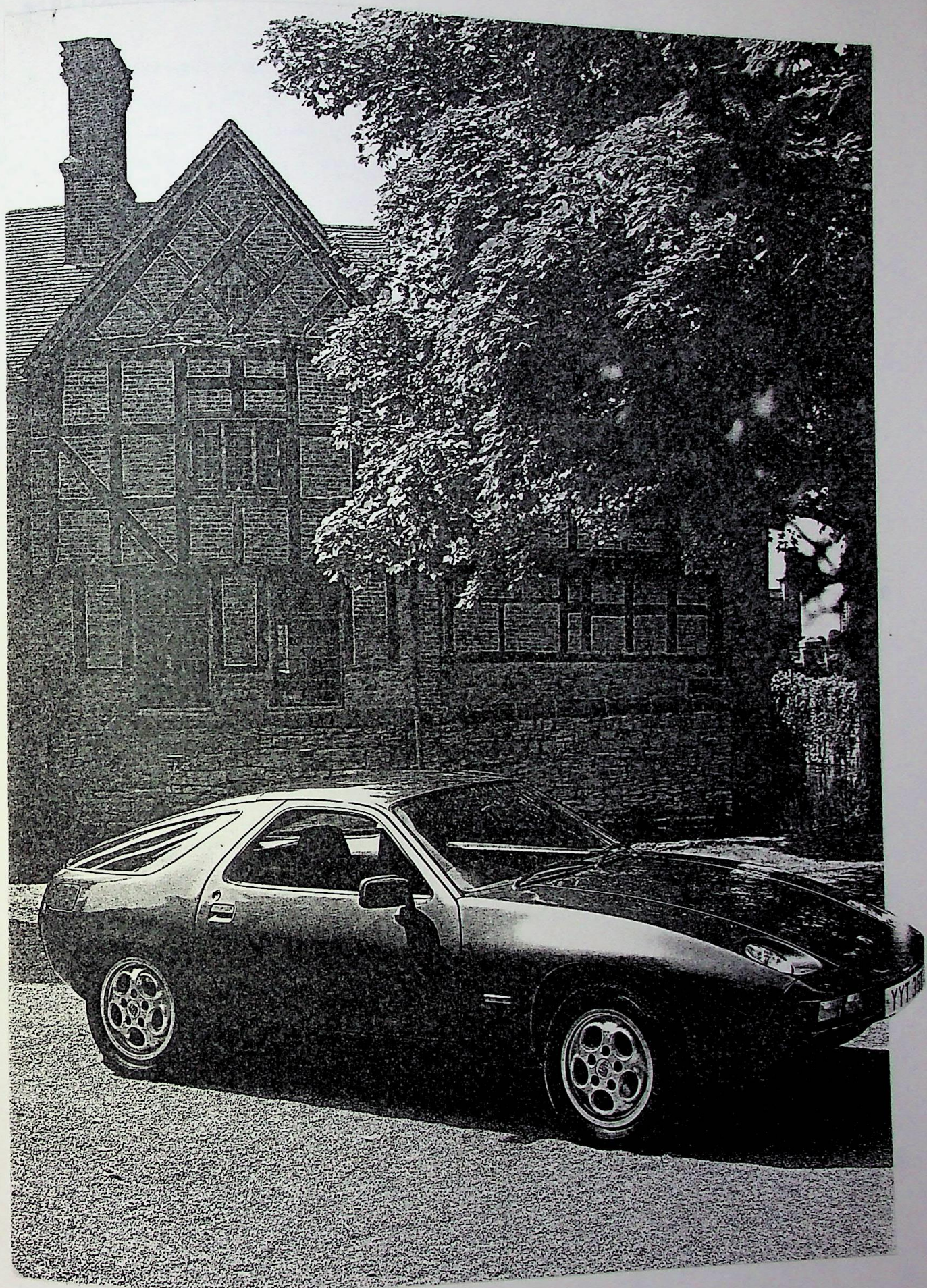
Audi Quattro Sport (4-Wheel Drive)



The Lamborghini Countach

1986 LAMBORGHINI COUNTACH QUATTROVALVOLE	
Engine	V12, 40hc, 48v
Capacity	5.2 litres
Maximum power	455bhp
Chassis/suspension	Multitubular spaceframe, coil spring iars
Top speed	190mph
0-60mph	4.5 seconds





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