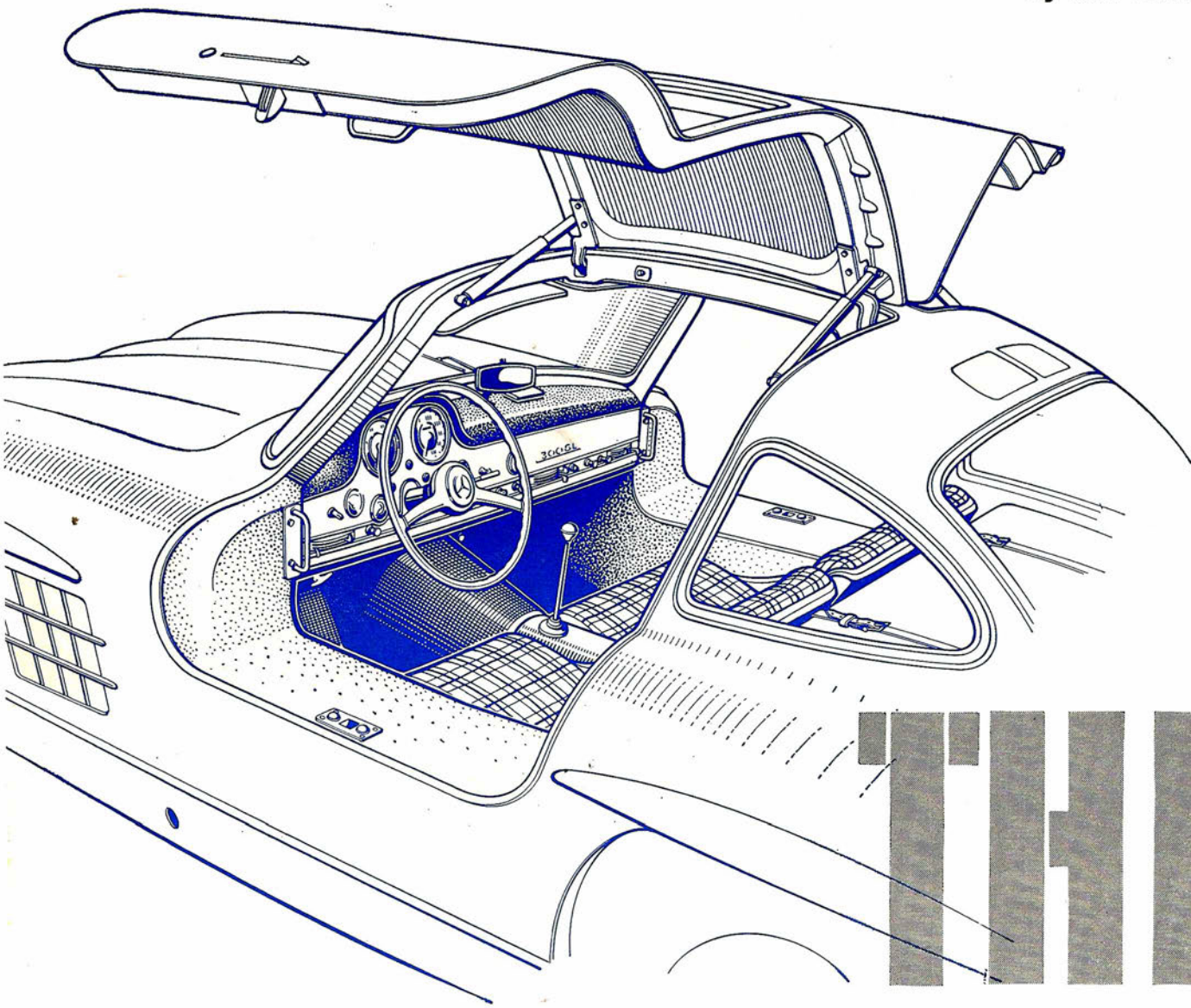
by Karl Ludvigsen



THE 300SL STORY

It's unusual enough for a successful sports-racing car to reach the open market completely outfitted for touring, but rarer yet for the road edition to be *hotter* than the original!

But this was precisely what Mercedes-Benz achieved with the near-incredible 300SL series, a line of cars which enhanced the gloss of the already glittering Stuttgart star. Interestingly it was only by virtue of a series of happenstances that the car was built, that it was raced, and that it was eventually produced for sale. The complete story appears here for the first time.

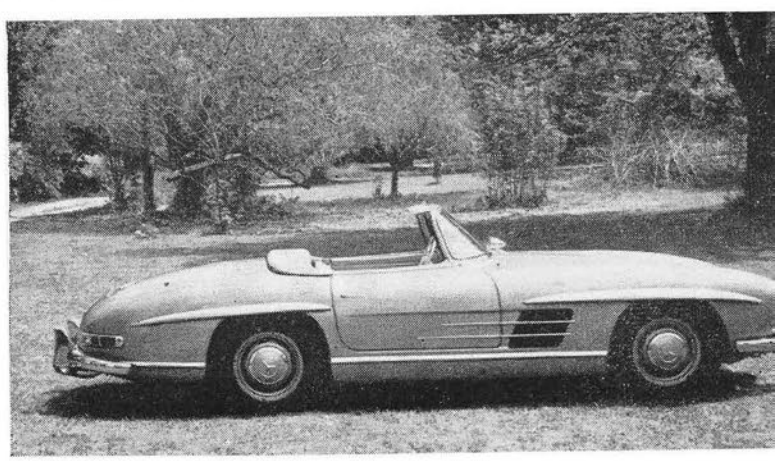
Immediately after the war Mercedes' talented development chief Rudolf Uhlenhaut busied himself with some very personal racing car design projects, primarily to stimulate himself and his personnel. One of his main preoccupations was with the space-type chassis frame, which had not at that time been used in any important racing cars and which Uhlenhaut saw as one of the major ingredients of postwar competition car design. He designed a tiny supercharged 500 cc car, with its four-cylinder engine placed transversely behind the driver, utilizing a small-tube trussed frame structure. In connection with some Grand Prix studies he also toyed with the idea of uniting some components of the 300 sedan with such a frame to make a fast sports car. These whims of his were humored by the Mercedes directors so long as they didn't interfere with the more serious business of building up the Mercedes passenger car line.

As it finally evolved, the 300SL's frame is probably one of the most complex of its kind ever built, certainly ever built in any quantity. The whole idea of a space frame is to place its various members so that they will be under tension or compression only; so that none of them will be bent or twisted. Accomplishment of this naturally calls for three-dimensional designing of the highest order, allied with thorough testing of small models as was done here. When this is achieved the separate members can be very small in size or thin in section, giving extreme lightness in proportion to the rigidity obtained. Since the 300SL was destined for sports car racing over all kinds of terrain the emphasis was placed on rigidity, the tubular structure finally weighing 181 pounds.

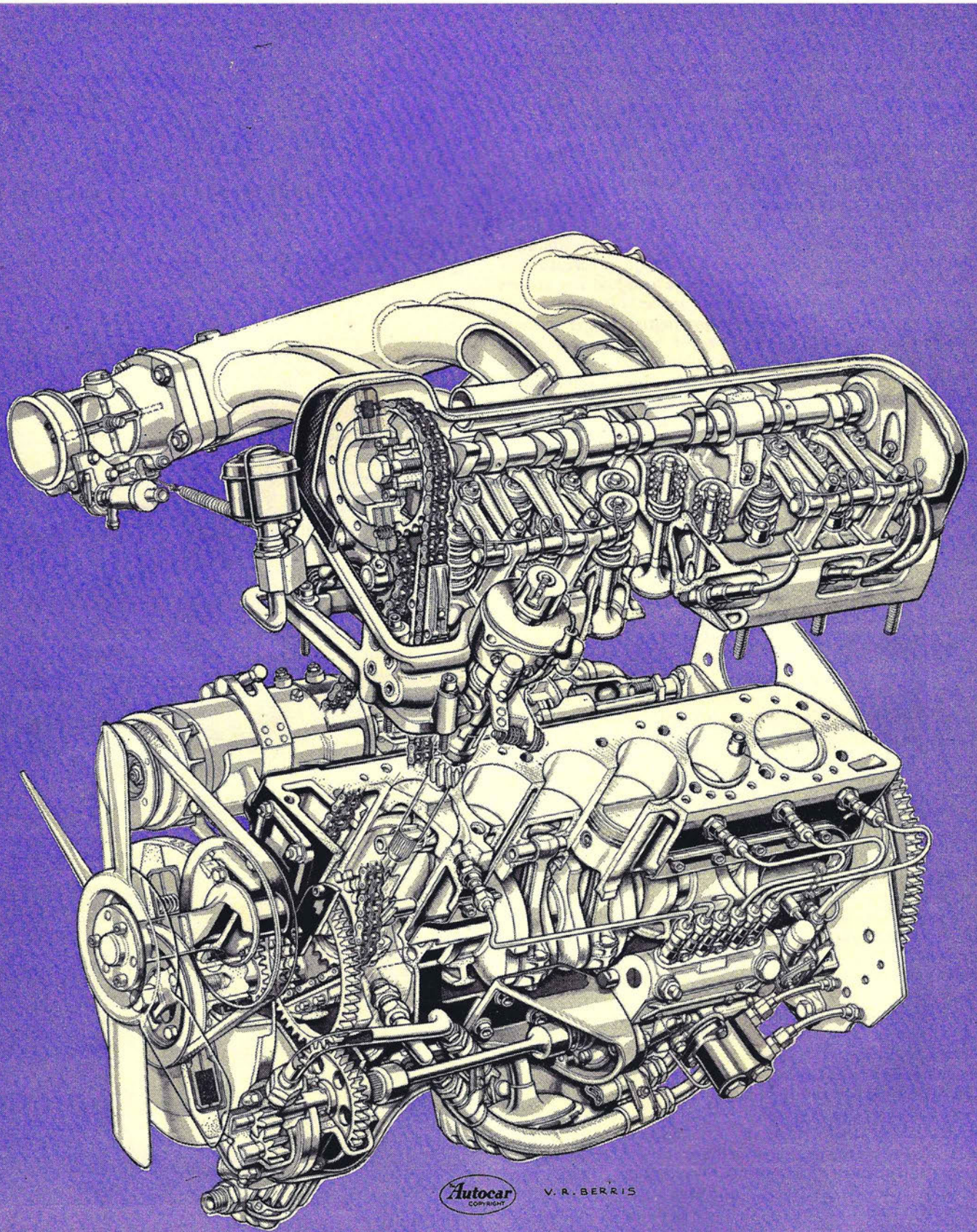
Part of the complexity of the SL frame is caused by the large passenger volume that must be supplied in the middle of a sports car. This forced the use of a very deep sill framework, and the resulting upswinging doors, but it was not quite possible to maintain the same level of torsional stiffness through the center that was obtained at the front and rear thirds of the frame. The same was true to a lesser degree of the space frame for the later W196 Grand Prix car which, through being more compact, had better torsional stiffness overall than the 300SL frame with less than half the weight!

A big crossmember at the front joins the network of tubes to stock Type 300 suspension units, modified only in shock and spring rates and tiny details of geometry. The unequal-length wishbones are made up of separately-forged side pieces, united in the bottom arm by a pressed pan which actuates the vertical coil spring with its enclosed tubular shock absorber. As in all high-speed Mercedes cars since the early Thirties, the wheels are allowed a tiny amount of fore-and-aft as well as up-and-down motion. This is provided by swinging the whole suspension system from a vertical pivot, and limited by a rod and bushings restraining an inboard arm. Also from the 300 is the micrometrically precise Daimler-Benz recirculating ball steering gear, which actuates a three-piece track rod system and is protected from road shock by a small damper linked to the central track rod.

Another legacy from the 300 is the original rear axle assembly, though the tread was narrowed 3½ inches from the even 5 feet of the sedan. This still left the front tread of the coupe about two inches narrower than the rear di-



First 300SL prototype (above) had a much simpler shape than later cars. Wind tunnel testing of this form showed the need for side vents to relieve under-hood pressures. These were included in production versions. New Roadster body (below) has conventional doors and fair-sized trunk.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mension, an arrangement that broadly speaking promotes oversteer. Hypoid bevel gearing is within the center section (of light alloy in the 1952 cars), as is a ZF cam-type differential – *not* used in the standard 300! The half-shaft housings are guided by close-spaced trunnions at both sides of the three-point-mounted differential casing, giving a true swing axle motion. In the standard coupe, laden, the negative camber of the rear wheels should be between 3 and 4 degrees, but some cars had more camber for competition use. Big coil springs, with smaller overload coils inside, work together with sea-legged tubular shocks.

To power this highly experimental rig, a 300 (M186, to be precise) engine was somewhat modified and placed in the chassis at an angle of 50 degrees to the vertical, leaning to the left with the crankshaft and gearbox offset a couple of inches to the right to bring the c.g. back to the middle again. With the chassis taking absolutely all stresses, the body could be and was a simple lightweight shell, shaped for maximum aerodynamic smoothness at the expense of a fairly large frontal area. This idea was carried through by using a very narrow coupe top, also to provide comfort during long-distance races, while the oval grille shape was derived from the 1939 Grand Prix cars.

A CRITICAL DEVELOPMENT

October, 1951 was a pivotal month in the embryonic life of the 300SL, for it was then that the F.I.A. decided to begin a new Grand Prix formula in 1954, making it inadvisable for Mercedes to proceed further with the 1½ liter blown car that was then in the drawing board stage. (An interesting side note is that the 1939 Tripoli V8 car had been tried on the Nürburgring in August of that year as a guide to their efforts.) Still wanting to gain some experience in postwar racing, the directors now turned benevolent gazes on Uhlenhaut's sports car experiment. There was still snow on the fields around the Stuttgart-Heilbronn Autobahn as the prototype underwent its first tests. A few drag races with a 300S were staged to amaze the press.

Further amazement for the whole racing world was provided by the well-known 1952 performances of the ten cars that were built for factory team use. A few variations on the basic theme are of interest, the most grotesque and demoralizing being the roof-mounted air brake that turned up for Le Mans practice. Manually operated, it flicked up with a "whoomp" that visibly slowed the car at the end of the Mulsanne straight. It went unused then but surely provided data for 1955.

For a sports car race at the 'Ring, where average speeds are low, four open roadsters were prepared, two of them having wheelbases experimentally shorter than the standard 94½ inches. With hopes of showing up the Grand Prix cars, two roadsters were fitted with triple-carbureted Roots superchargers, driven from the camshaft. The engine of this colorful 300SLK bore type number M197, hinting that the famous M196 Grand Prix engine was well into the planning stage by mid-1952! The charger didn't agree with the six's cooling system and the 300SLK's weren't raced, though one of the normal roadsters did show up later under John Fitch in the Mexican Road Race.

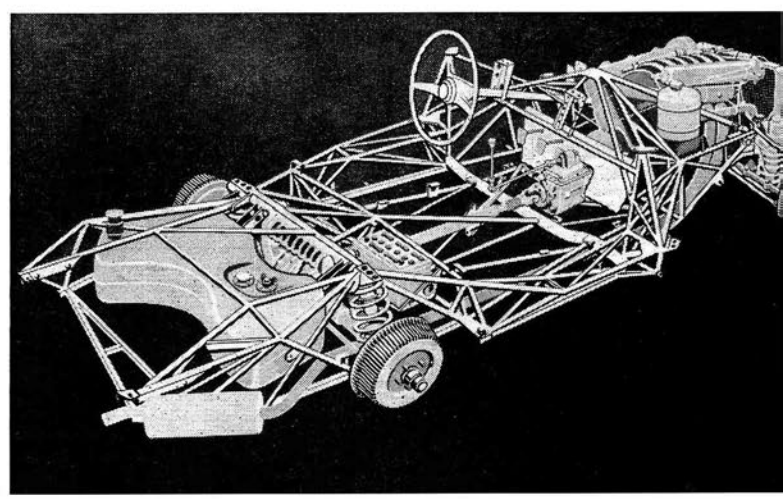
After the '52 season work was immediately under way on revised cars for the next year, but in January word was passed down that there'd be no racing in 1953, because of the pressure of production car development, not to mention the new Formula 1 cars. Some time could still be devoted to the 300SL, however, and by October, 1953 another prototype was seen which embodied virtually all the features that jolted the motor sporting world when the production car was unveiled at the New York show in February of 1954.

A LOOK UNDER THE HOOD

Since one of these features was found under the hood, it's time I described the engine in more detail. The six-cylinder block is of cast iron and ends, at the bottom, right at the crankshaft centerline. It is thus short, for minimum weight, and both sides of the block are cast completely open for (1) good control of the casting cores, (2) easy inspection after casting and (3) light weight, since the large openings are covered with sheet steel plates. A surprisingly light engine was thus obtained without sacrificing the sturdiness, simplicity and fine wear character of cast iron. Seven main bearings, with dowel-located two-bolt caps, support the forged crankshaft. The 1952 SL engines had a fair-sized vibration damper at the crank nose, but the production version swings a weighty disc that looks more like a flywheel, to cope with sustained high rpm.

Wide, deep fillets characterize the forged rods, which have drilled shanks for pressure lubrication of the wrist pin bushings. The forged Mahle pistons are non-compensating types with full skirts but with the aluminum around the wrist pin holes relieved so that only the thrust faces, slipper-like, contact the bores. Use of three compression rings may be bound up in some way with the problem of oil dilution in a fuel-injection engine (a not inconsiderable bother with a 300SL that must be cold-started and driven slowly, God forbid). A drainage slot is cut between the bottom compression ring and the single oil ring.

The single overhead camshaft is serviced by a very long double-roller chain, to the amazement of the English experts who feel that a two-stage drive is near-indispensable to prevent thrash, etc. On the driven or tension side the Mercedes chain turns an intermediate sprocket, shaft and spiral gear set which drives the Bosch distributor and scavenge oil pump. There's a tensioning sprocket on the "loose" side, placed to wrap the chain as far around the cam drive gear as possible. Chain flutter is virtually prohibited by long synthetic-faced guides along every open stretch of chain, and another friction-type vibration damper is overhung at the driven end of the camshaft.



Roadster frame has lower sill line and revamped gas tank. Rear suspension has also been softened with the aid of a compensating coil spring.

Four big journals on the cast iron camshaft run direct in the light alloy supporting pylons cap-screwed to the head. Originally a mild type 300 camshaft (part number 186 051 2101) was fitted as standard with a "sports" cam (part number 198 051 0001) optional, but the hotter cam, with its improved output over 3,800 rpm, was made standard on the Roadster model. Very long heavy-sectioned fingers recall vividly the valve gear of Porsche's big sixes; the surfaces that contact the cam lobes are nitride-hardened.

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Two valves per cylinder are made of austenitic steel, the exhausts having hollow stems partially filled with sodium salts for cooling. Their chrome-iron seats are slightly countersunk into the smooth face of the head, leaving the intake valve head actually slightly below the face when closed, and the exhaust valve head just in line with it. Long bronze valve guides have very special sealing provisions to exclude excesses of oil. Their upper ends are surrounded by double coil valve springs.

Daimler-Benz long anticipated the present Detroit trend in engine design, with its angled upper block and smooth head face combined with staggered valve placement to get maximum valve size in a precisely-machined chamber with plenty of squish area. The top of the block is cast and cut at 20 degrees to the horizontal, and a small gouge is taken from the top of each cylinder to form a combustion chamber in conjunction with a specially-shaped piston. The 300SL block has a shallower gouge and a thicker piston crown than the 300, to give a better chamber shape at higher compression ratios.

At the very first the SL engine used the actual type 300 or M186 block, with the spark plug screwed in through the block rather than the head (this block is no longer used in any Mercedes), but as the shallower chamber was developed during the '52 season it was found useful to screw the plug into the light alloy head so that its points entered a small pocket opening into the combustion chamber close to the bridge between the valve seats. This head and plug placement has been used on all new engine types since the M188, which was the three-carb 300S. For the racing 300SL's of 1952 a block was made up without plug holes, rather like that now used for M189, the fuel-injection 300d engine, and a further block with conventional coring, instead of the open faces, seems to have been projected for the 300SL production engine, but it was not used.

Always incisively practical in their outlook, the Mercedes engineers fitted large-capacity cast alloy sumps to the first 300SL prototypes, keeping the conventional wet sump lubrication system. They were obviously not going to involve themselves with a dry sump system unless it proved indispensable, as it eventually did. For the 1952 cars a larger scavenge pump was placed below the original pressure pump, the whole being encased in a cylindrical housing below the oil pan. The latter was reduced to a rectangular collector for the oil pickup.

Special care was given crankcase breathing, as is usual with Mercedes since the war, and a large oil reservoir and oil cooler were incorporated. In the production SL's, however, the pressure pump was moved to the gear drive for the injection pump; the first production prototype had the 1952 arrangement.

A SECRET WEAPON

No chances were taken with induction during '52, a straightforward layout of three downdraft Solex carbs being mounted on short stub manifolds. This engine was initially rated at 175 DIN bhp at 5,200 rpm, but finally delivered 185 horses at 5,500. More serious researches were under way in the test cells, however, where in mid-'52 engines were already being run with Bosch fuel injection. This was to have been the prime secret weapon for 1953, and it did appear finally on the late-'53 prototype.

The arrangement on that car was much like that used in production, though the ram pipes were a bit more sharply kinked and the throttle assembly placed farther forward, drawing from a scoop instead of an air cleaner. On the 1954 Motor Show car the pairs of ram pipes were blended together, seemingly, and highly polished, but this wasn't carried through to production.

One of the most valuable features of fuel injection is the freedom of intake pipe design that it allows, the big ramming ducts on the SL being 17 inches long. This gives maximum ram effect at a theoretical 5,500 rpm, which is a good balance between the 5,000 rpm torque peak and 6,000 revs at maximum power. The use of injection brought a 10 percent increase in output — from 200 to 220 bhp on experimental engines, SAE rating, with standard cam.

Power is transmitted through a four-speed all-synchro transmission lubricated under pressure from a small gear pump driven by the tail end of the countershaft. With their very wide Al-Fin drums, laterally finned as in the 1952 cars, the brakes of the SL are very special. Added braking power in front is supplied by two leading shoes augmented by larger wheel cylinders, and overall braking help comes from an Ate vacuum booster.

THE BODY CHANGES SHAPE

Development during 1953 brought changes in the body shape from two directions. Wind tunnel testing showed the importance of relieving under-hood pressures by means of vents along the sides of the body, while the stylists found a more interesting shape for the front end — though rather more squarish than it was later to become. Actually there might have been no "later" had it not been for the commercial interest that Max Hoffman took in the 300SL. Especially after exhibiting and driving the original prototype in the U.S., Max became convinced that a market existed for a production version of this fabulous car, and pressed his ideas — backed by orders — on Stuttgart. The factory was really never convinced until the cars scored their obvious successes in every realm in which an automobile can distinguish itself.

Dealers in the U. S. were, however, always aware of a demand for a convertible version of the SL. This was duly registered in Untertürkheim and aligned with plans for the low-pivot swing axle system, the eventual result being the 300SL Roadster seen fleetingly in David Douglas Duncan's fine essay in *Collier's* of October 12, 1956 and more concretely at the Geneva Show in March of 1957. In between these dates bodiless chassis were thrashed around the back roads of the state of Württemberg in attempts to destroy the new chassis frame that allowed conventional doors, luggage room (of all things) and installation of a special low-pivot axle.

From the cowl forward the frame was substantially as before, and the height of the big crossmember above the rear axle was unaltered, but everywhere else the tubing frameworks were made more compact and lower. Frame depth at the doors was reduced by half, and the formerly somewhat casual layout of spare tire and fuel tank was wonderfully integrated and lowered to leave room for a few bags under the lid. A heavy-duty version of the Daimler-Benz low-pivot swing axle assembly was incorporated, including as usual a single low pivot point for both axle halves, the ring and pinion gear being carried in the left half, connected to the right-hand shaft by a universal joint and a roller-bearinged sliding spline.

Most significant was the springing, though, which harked back to a device used on the 540K chassis. A "compensating spring" — a large coil — is placed transversely above the axles and is actuated by them only when both wheels swing up together; in other words it helps support vertical loads like bumps, added luggage, etc. When the car rolls, however, only the outer coil springs come into action, the compensating spring being shifted bodily to one side or the other. In this way the roll stiffness of the rear suspension is reduced without impairing its load-carrying ability. Such diminution of stiffness at the back moves the whole chassis in the direction of understeer, making the Roadster somewhat more "forgiving" to drive than the coupe, whose chassis was tuned for racing. Actually, by changing the relative stiffnesses of these three springs the Roadster chassis can be set up for anything from violent oversteer to lumbering understeer.

THE FIRST U. S. INVADER

The first roadster to come to the U. S. was set up for Paul O'Shea to drive in competition, Paul having done wonders with the coupe and having come to Germany to assist in early trials of the new chassis. This car was basically stock but had no fan and a special induction system. Air entered through a scoop rather than a filter, passed through a simplified throttle assembly without cold-starting provisions, and entered the cylinders through ram pipes fabricated of sheet aluminum. The cockpit was shades of '52 with lightweight racing seats and quick-removable four-spoke wheel. All the roadsters and some of the late coupes have a twin-coil ignition system with a heavier-duty distributor. It gives more reliable high speed ignition but must be set up with hairline precision.

Another interesting detour from standard was followed by Chuck Porter with his famed 300SLS, which made the transition from a crashed, burned and totaled coupe to a movie star ("The Devil's Hairpin"). Chuck first rebuilt the engine and chassis to standard and shrouded it with an SLR-like roadster body, but then went through the tricky task of adapting a McCulloch blower to the engine. It still didn't have the poke to be competitive, so in went a full-house injected Buick! At last report it was running a Chev V8 and is still running races. Aside from this one, few SL's have run the modification route.

—*KEL*