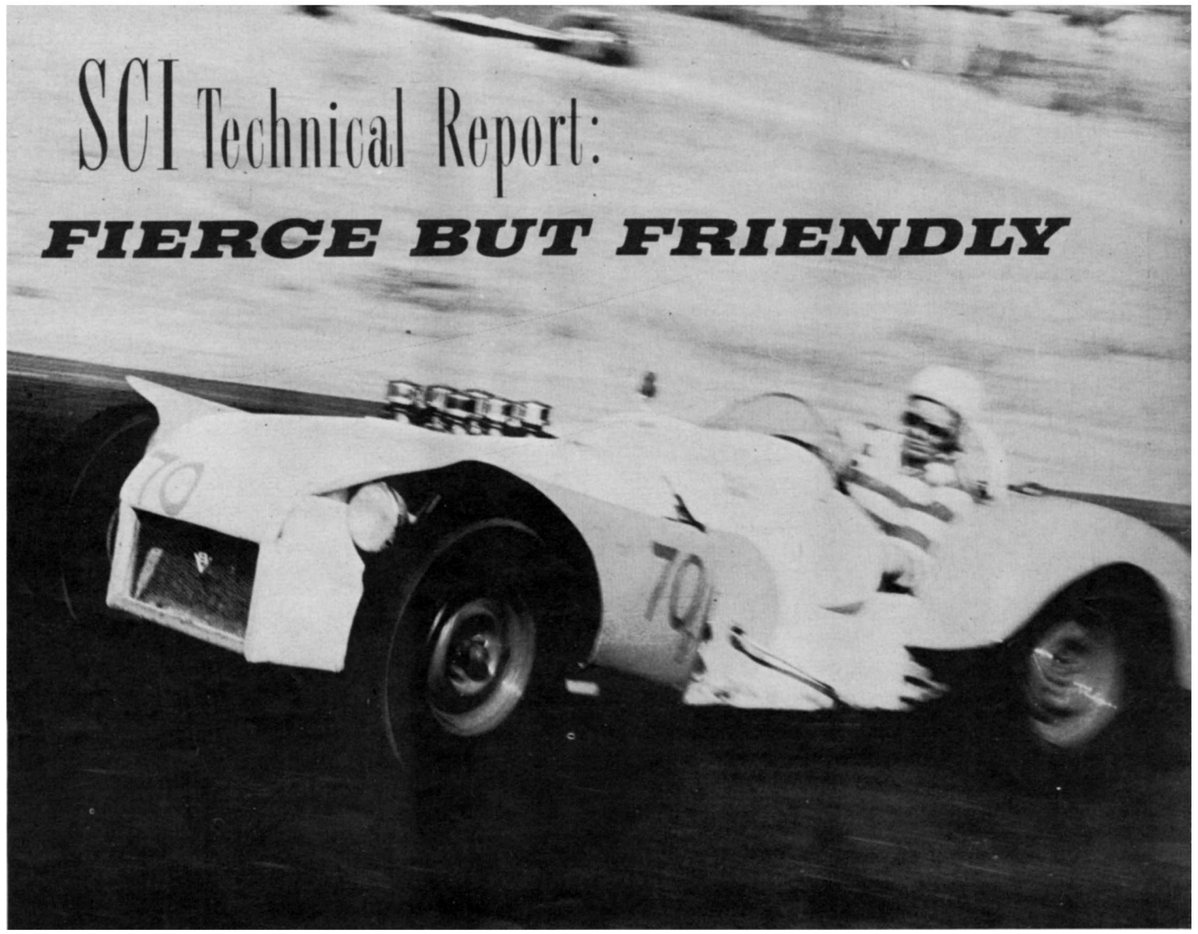
Eric Hauser charges through turn five at the tricky Paramount Ranch course in the Morgensen Buick Special, shown here in an earlier form sans "nostrils" in nose. The car has proved almost invincible on the tight Western courses for which it was built.

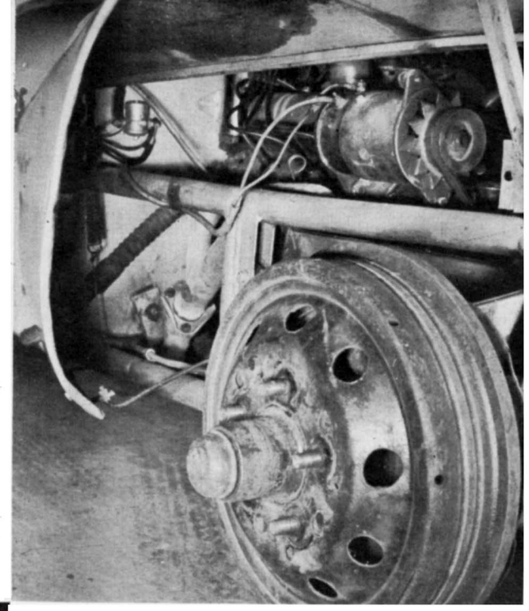


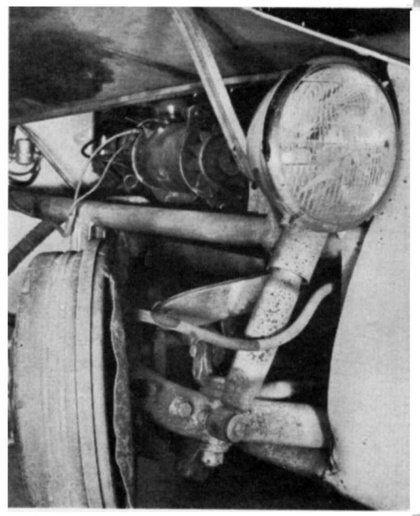
SCI Technical Report:

FIERCE BUT FRIENDLY

The Morgensen Special, stuffed full of big bore Buick, is the hottest thing in Modified racing on the West Coast. Though sizzling, it's still as docile as a puppy,

By RUSS KELLY





ABOVE: Big Lincoln brakes, with plenty of area and heavy stiffening rib at drum opening, are popular on Ford-based specials. These are vented both at drum face and backing plate. Very simple truss frame is visible, as is stock Buick generator. AT LEFT: Longitudinal "torsion bar" spring, fabricated from conventional leaf, is simple, works well. '40 Ford "60" axle is located by parallel leading arms, lateral Panhard rod. Shock absorber is 40/60 Gabriel; frame tubes of two inch diameter.

WHEN a home-built special holds the outright sports car record at four of Southern California's biggest drag strips, it calls for a look. When this same special makes Enzo's latest products look silly, not once, but twice at the Paramount road course, it's time to tell all who will listen about it.

The Morgensen has been around for quite awhile, but it has taken mechanic Max Balchowsky, a big Buick V-8 engine and a driver come alive in the form of Eric Hauser to start this reign of terror for the imports. At the recent Pomona race, under the piloting of Hauser, it completely dominated the weekend's racing. This was in competition with the most famous drivers in the country on very expensive machinery.

Not exactly lovely to look at, the Morgensen has been built by the method most aptly described as the 'direct approach'.

The chassis is of tubes; the axles front and rear are solid and borrowed from Ford. The Buick engine is a '56 unit running, among other things, six "97" Strombergs. A four speed Jaguar gearbox supplies the ratios and the weight all-up is 2300 pounds.

Hauser and Balchowsky, contacted by SCI, proved cooperative at the suggestion of a test and it was decided that Paramount Ranch would make a good site.

Interestingly enough, the car was driven the twenty odd miles from downtown Los Angeles to the ranch without incident and after removal of the mufflers, was ready to race. The course (SCI Dec. '56) is about two miles in length, has plenty of corners and in a fast car the uphills and downhills come with bewildering rapidity. The Morgensen proved plenty fast.

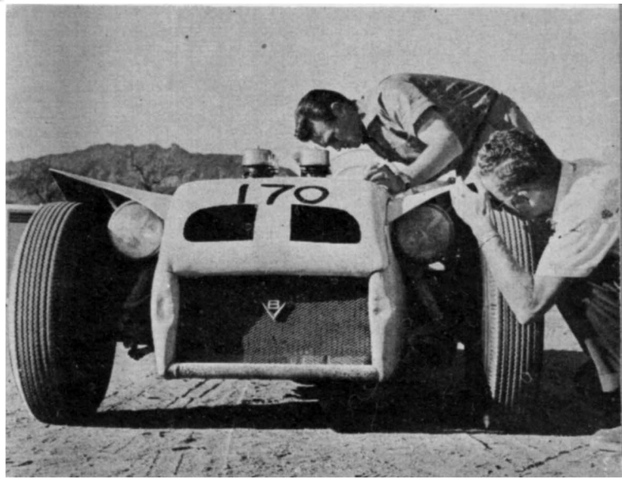
The cockpit is comfortable and a rather high seating position gives an excellent forward view. It turned out that although this position is welcome from the point of visibility, the driver is subjected to unpleasant wind buffeting at high speeds.

The gearbox lever is close at hand on the right and has a standard Jaguar bend. Further survey of the controls before starting disclosed, in addition to the normally positioned brake pedal, a clutch pedal with an unusually long throw and a button-shaped, oddly positioned foot throttle. The throttle, instead of following an arc on depression, travels straight forward and although it gave a strange feel at first, it was easy to become accustomed to and is perfectly smooth in operation.

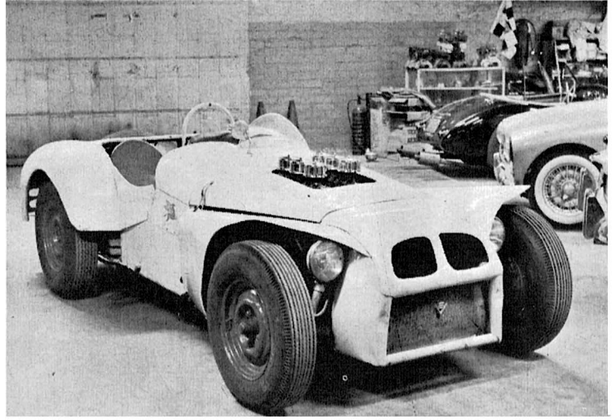
Preliminaries over, a touch on the starter button and the warm engine fired easily to a smooth idle. Care has to be taken to avoid touching the throttle before starting because of the risk of drowning the engine with fuel from the six throttle pumps.

It would be impossible to describe a ride in the Morgensen without the capitalized and italicized word *Torque*. With a 4.10 final drive, first gear in the Jag box was all but useless, except to set the tires on fire. Second gear was used for all standing starts and wheel spin could be provoked at will at any rpm. After cautiously jockeying out onto the course and through the intermediate gears into fourth, I never found it necessary on this two mile winding course to reach back down for third.

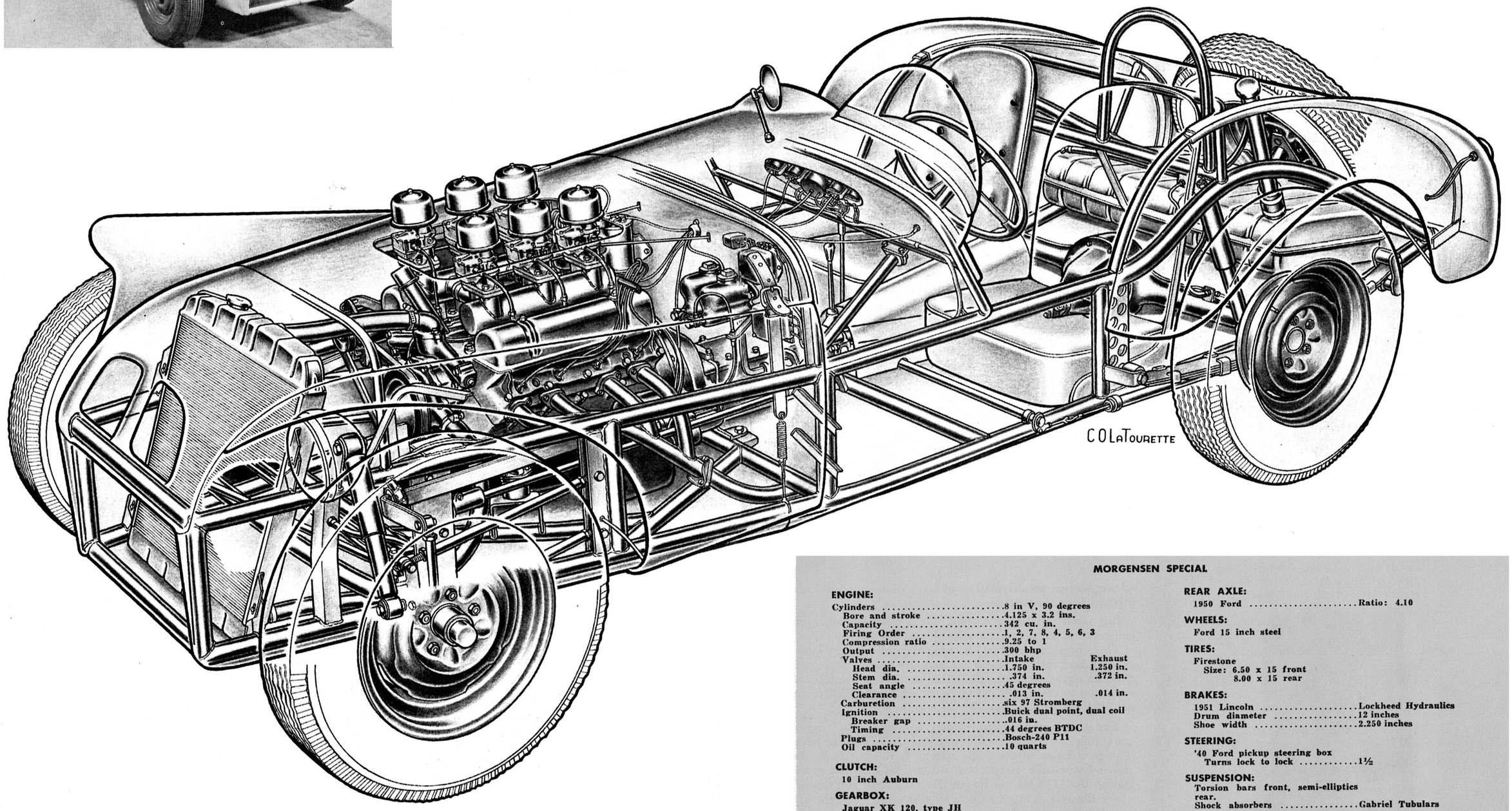
In the slowest corners, uphill or down, this big V-8 would respond in fourth to the slightest touch of the throttle. If it couldn't overcome the inertia immediately when you stepped right down on the throttle, it would spin its wheels supplying its own fluid clutch. The difference in lap times for Hauser in using fourth, or third and fourth, is one second a lap less by using the two gears. The impression gained from watching this car – that it is light on its feet – is confirmed when you drive it. If you stick it into a corner too fast with too much throttle and the back end starts around, all that's necessary is to correct, lift your foot a little and you're immedi-



The Morgensen always surprises people, and they have to take a good look. Two citizens were about to whip out tape measure. Dents in front probably from pushing stalled truck.



MORGENSEN BUICK . . . so much torque you can throw the gear lever away.



MORGENSEN SPECIAL

ENGINE:

Cylinders	8 in V, 90 degrees	
Bore and stroke	4.125 x 3.2 ins.	
Capacity	342 cu. in.	
Firing Order	1, 2, 7, 8, 4, 5, 6, 3	
Compression ratio	9.25 to 1	
Output	300 bhp	
Valves	Intake	Exhaust
Head dia.	1.750 in.	1.250 in.
Stem dia.	.374 in.	.372 in.
Seat angle	45 degrees	
Clearance	.013 in.	.014 in.
Carburetion	six 97 Stromberg	
Ignition	Buick dual point, dual coil	
Breaker gap	.016 in.	
Timing	44 degrees BTDC	
Plugs	Bosch-240 P11	
Oil capacity	10 quarts	

CLUTCH:

10 inch Auburn

GEARBOX:

Jaguar XK 120, type JH

Ratios: 4th	1:1
3rd	1.36:1
2nd	1.98:1
1st	3.75:1
Oil Capacity	3 pints

REAR AXLE:

1950 Ford — Ratio: 4.10

WHEELS:

Ford 15 inch steel

TIRES:

Firestone
Size: 6.50 x 15 front
8.00 x 15 rear

BRAKES:

1951 Lincoln	Lockheed Hydraulics
Drum diameter	12 inches
Shoe width	2.250 inches

STEERING:

'40 Ford pickup steering box
Turns lock to lock — 1½

SUSPENSION:

Torsion bars front, semi-elliptics rear.
Shock absorbers — Gabriel Tubulars

CHASSIS:

Wheelbase	95 inches
Front track	56 inches
Rear track	55.5 inches

ately forgiven. It has to be seriously provoked before it will push its front wheels, but if it does, you lift your foot and wait it out because you feel that conditions will get better, not worse.

Although the handling and performance of this or any other car is always open to debate, one fact about the Morgensen is incontestable . . . it's fast and fun to drive. Non-temperamental, forgiving and almost unbreakable, the brute showed only one fault during the test. At speeds approaching 100 mph down the straight, the front end showed a slight tendency to 'hunt'. This tendency for the car to steer itself was negligible and suggested either slight front end misalignment or gyroscopic kick from the not-too-light front wheels and tires.

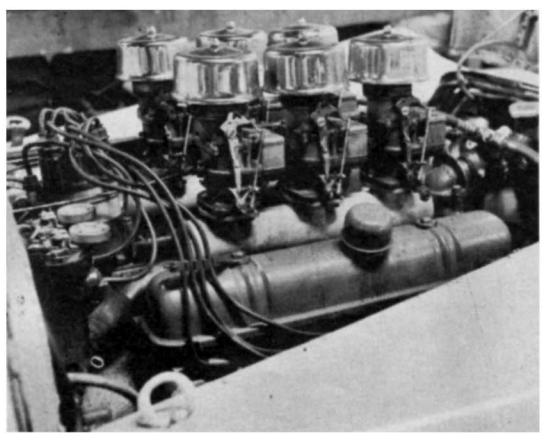
Chassis

The tubular chassis frame is a non-complex truss type that takes advantage of the simplicity of the solid axle front suspension. In general layout the lower tube of each side member passes straight back from the front of the radiator to the tail. The upper side member tubes also start in front of the radiator and pass back on a level plane to just aft of the cockpit, where they then kick up to clear the gas tank. These side members are tied together front and rear by cross members of the same diameter tubing. Undeniably strong in beam, this layout is also extremely rigid in torsion, partly by virtue of its depth and partly by virtue of the materials used. Fabricated of two inch diameter .125 wall chrome-moly tubing, little consideration was given to saving weight. The bare frame weighs in at 140 pounds.

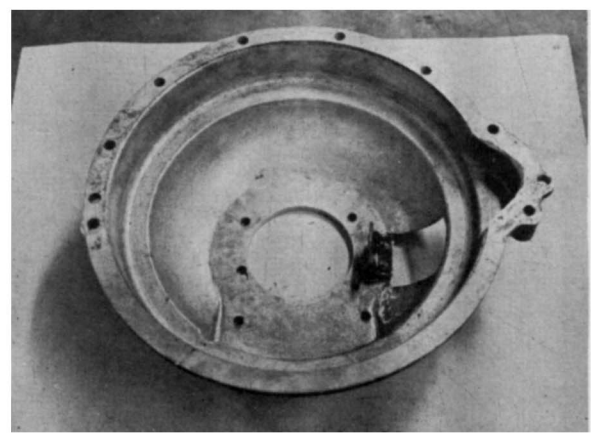
Front Suspension

The solid axle front suspension is basically Ford, although the builders replaced a lot of Henry's iron with original ideas and chrome-moly steel tubing. The front axle is the 1940 V-8 60 tubular unit fitted with 1948 Ford pickup spindles. The standard '40 Ford pickup steering linkage layout of transverse drag link and tie-rod is used but chrome-moly tubing and Heim aircraft joints have been substituted for stock parts. A '40 Ford pickup supplied the steering box, and in conjunction with a Ross pitman arm from a White truck gives a steering ratio of 1½ turns from lock to lock. Transverse location of the axle is obtained by a long track rod that attaches to the axle on the extreme left and to a cross member tube on the right. Fore and aft location is accomplished by two short parallel radius rods on each side. The paired radius rods are attached to the axle by a vertical bracket. This very effectively prevents the axle from winding up under braking stresses and since the rods are adjustable, front wheel caster can be quickly altered or corrected.

Front axle damping is controlled by two 40/60 Gabriel telescopics that are disposed at an angle of about 30 degrees inboard from the vertical.

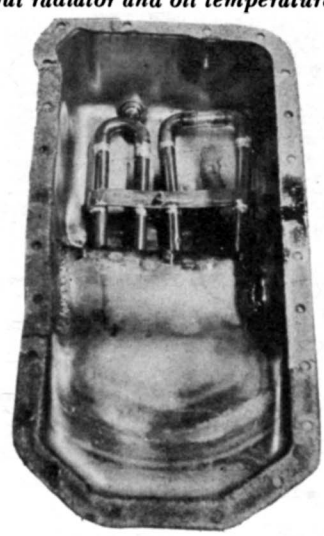


Carburetion on 342 c.i. Buick is by six Stromberg 97's on Crower manifolds. Ignition is Harman-Collins Buick unit.



Jaguar gearbox was adapted to big Buick engine by means of commercially available Cook adapter. Jag box takes the torque easily.

Pan has been enlarged and fitted with water-circulating tubes that act to even out radiator and oil temperatures.



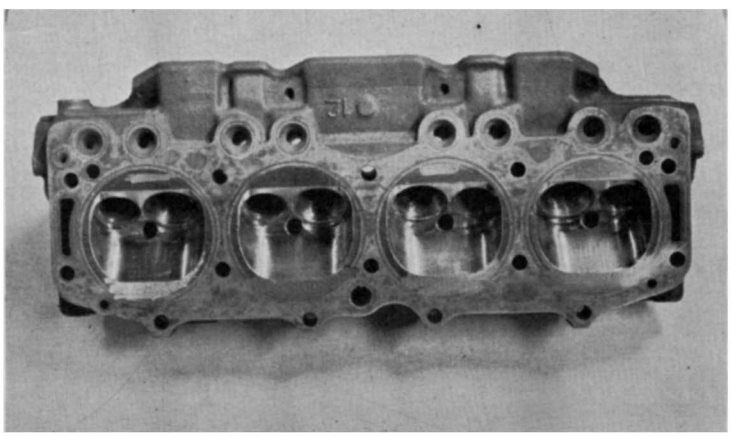
Just when this begins to look like a conventional, even conservative, front end layout, up jumps the devil.

The suspension medium is laminated torsion bars fabricated of leaf springs. Novel but basically sound in concept, this idea has worked out very well in practice. Two units are used, one to each side, and are made up of 32-inch lengths of 1940 Ford front springs.

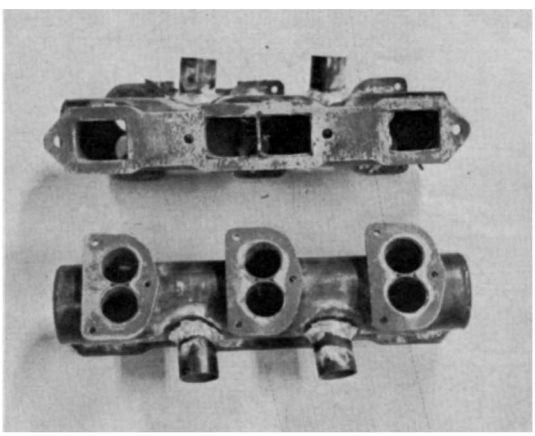
The spring eye has been removed from the 'small' end of the spring portion and a 90 degree bend made 8 inches back. The greater part of this angle extends to the rear along the upper frame tube, is attached to the tube, and acts as the torsion bar. The shorter length lies parallel to and slightly above the axle, is attached to it by a link and forms the torsion lever.

The length of spring that is in torsion is anchored solidly to the upper chassis tube at its back end by a bracket made

Frontal aspect may lack the esoteric qualities of the European coachwork, but it gets the job done. "Nostrils" were cut to increase cooling.



Heads used are '56 units, which, used with Jahns pistons, give a 9.25/1 compression ratio. Chambers and ports were cleaned but not gouged.



Intake manifolds were made from Crower kits. Despite lack of routing, give good response all through range.

from a Ford connecting rod. The forward end of the length in torsion is carried in a bronze bearing supported by a bracket also made from a Ford connecting rod. The lever end of the spring is connected to the axle by means of a short adjustable rod fitted on each end with Heim joints. A forged bolt passing through the axle is used as the attachment point.

Apparently, the eight-inch-long lever section with approximately three times this length in torsion has never called for alteration. Even with the elaborate precautions taken to ensure lateral and fore-and-aft location of the axle, it seems a much simpler answer to a complex problem than some.

Rear Suspension

The rear suspension also leans heavily on Henry's parts bin, but modifications have been freely made. A '50 Ford rear axle with open drive shaft and semi-elliptic stock springs are the main components. The spring pads were moved out as near as possible to the backing plates, thus gaining a wider spring base. The springs are mounted conventionally to the chassis at their forward end. In the rear, however, the lower shackle bolts have been replaced by a solid steel bar that extends all the way across the chassis. This method of linking the springs so that action on one spring produces an immediate reaction on the other eliminates the need of a stabilizer bar. Rear axle torque is controlled by a short radius rod on the right side attached to a bracket that extends downward from the rear axle housing. It passes forward in an almost horizontal plane and anchors to a bracket on the lower side member tube. Final drive ratio is 4.10 to one, and the differential is locked by the simple method of welding it up solid.

Brakes

Braking is supplied by '51 Lincoln units that bolt right on the Ford front spindles and the rear axle. These hydraulic units are the favorites of the special builders who use Ford suspension parts. Their advantage comes partly from their

(Continued on page 60)

M 196

(Continued from page 27)

acts as a positioner and prevents the tappet from turning. The sole job of this fork, otherwise, is to pull the valve back up to its seat, just as the peak of the opening cam is passed. To do this, then, the closing cam starts to rise from its base circle just as the opening lobe rides past peak. When the ramp of the opening cam brings the shoe tappet back to closed position, the closing lobe has reached its peak and, through the bell crank, has pulled the valve closed. Actually, all the opening cam had to do was get out of the way as the fork pulled the stem back up.

Then, for the long closed period, the closing cam is at its peak, and the valve is actually being held shut by gas pressure, under power or compression. When the opening cam again starts to push down the shoe tappet, the closing lobe turns past its other peak and allows the finger and fork to follow the stem to open position. Since the working surface of the finger is roughly 75 degrees out of phase with the shoe tappet, the opening and closing lobes are displaced by the same amount on the camshaft.

Between these two cams and drive mechanisms, each valve is kept under perfect control every step of the way. Only by complete breakage or a severe strain could a valve head touch a piston, and the size of the parts was such that this never happened. The closing cam is a big, heavy devil, so it's been drilled fore-and-aft for lightness. It also has oil outlets at each of its two sharp radii.

The shims under the tappets that we mentioned before actually adjust the main static clearance between the tappet, with valve seated, and the back face of the opening cam. There's another clearance to be considered, that affects the running free play in the valve gear. It can be expressed as the accumulated clearance along the closed circuit of opening cam, tappet, valve stem, bell crank fork and finger, and closing cam—the first and last being on the same shaft. This clearance is very cleverly and closely adjusted by moving the vee of the bell crank toward and away from the cam and tappet group.

As mentioned above, a single rocker shaft runs parallel to each cam, and is hollow and drilled for lubrication. Between each bell crank rocker and this shaft, there are two concentric sleeves, free to be rotated, and running at as close a total clearance as can be devised. Each of these sleeves is machined to be very slightly eccentric—that is, the inner and outer cylindrical surfaces are slightly offset with relation to each other. Thus, by rotating these sleeves under the bell crank, either individually or together, the working pivot location of the bell crank can be slightly shifted in any desired direction. This sets clearance, to sub-micrometric tolerances.

We haven't told you yet how they keep the eccentrics from turning, once the clearance has been set. Each eccentric sleeve has a collar on one end, the two collars for one pair of sleeves being right next to each other and of the same diameter. The outer edge of each collar is serrated. Each pair of serrated collars is kept from turning by a toothed, L-shaped clamp, held down by a single bolt. The clamps for adjacent pairs of valves are placed next to each other, the original idea being that one light, fabricated clamp and bolt would suffice for the serrations of two valves. This was done on early engines, and in fact through the entire 1954 season. At Monte-Carlo in 1955, though, these were the bolts that broke loose and ran wild inside the engines of Simon, Fangio and Moss. The latest versions use two separate machined clamps and two bolts, tightly wired in place. This gave no more trouble.

One other major change in the layout, which appears to have taken place during the 1954-55 winter, involves the position of the rocker shaft. On early engines, the shafts were so placed that the closing cams rotated "into" the bell crank fingers—in other words, from the finger tip toward the pivot point. This isn't the best from the loading and wear standpoint, so the whole works was switched around to allow the big cam to drive from the pivot out.

As the engine is placed in the chassis, the early shafts were on the "lower" side, and they're now on the "upper" side. The cams turn counter-clockwise, as viewed from the front, and, as a matter of fact, so does the crankshaft. Rotation of the driveshaft has been kept clockwise, as in most cars, to have someplace to start.

To take the lifting stress of the rocker fork, plus the opening forces, the end of the valve stem has been forged larger than

Fierce But Friendly

(Continued from page 37)

tremendous area, the shoe having an effective width of 2.250 inches and the drum having a diameter of 12 inches.

The Engine

The power plant that delivers torque so impressively is the work of Max Balchowsky, a long-time Buick enthusiast. In discussing the Morgensen engine with Max, the impression came through strongly that this particular engine has suddenly and startlingly borne the fruits of all he has ever learned about Buicks. It idles from 300 to 400 rpm and will actually pull 8000 in third. Hauser will not admit to the use of more than 7000, however. The fact that on a course such as Paramount only a second a lap would be lost if you threw the gear lever away is a healthy endorsement of Max's methods and makes a close look at this engine worth while.

The cylinder block, the heads, and crankshaft assembly are '56 Buick V-8. The stroke, of course, is the stock 3.2 inches but the cylinders have been bored to 4.125 inches, an increase in bore of .125 inches and an increase in the swept volume to a total of 342 inches. Jahns pistons are used and supply a compression ratio of 9.25 to one. Ignition is by a Buick unit modified to Harman Collins specifications with dual points and two coils. The oil sump has

the stem itself. This, plus non-detachable head construction, complicates installing the valves. The trick lies in having removable *split* valve guides. The upper end of each half-guide has an integral collar, which is both held down and kept from rotating by the bottom end of the inserted tappet guide. One side of this guide is also cut away to allow the fork to reach the valve stem. Finally, the tappet guide is held in by a nut and washer, placed at one side. To review, the nut and washer hold down and locate the tappet guide, which in turn holds down and places the split valve guide.

Lubrication up here is thorough and studied. One gallery runs the length of each cambox, at the base of the tappet guides and through holes in the latter. There's also the supply to the rocker shafts that we mentioned. In addition a gallery runs along each cambox, at the level of the tappet shoe and on the opposite side from the bell cranks. Just opposite each tappet a hole is drilled and tapped, and a calibrated jet is screwed in and locked. This gives precise control of a jet of oil aimed right at the working surfaces.

With the racing versions of the 196 engine, noise was not a problem. This being the case, the valve gear covers were held down both by studs around the outside, and by nuts on extensions of the cam bearing cap studs. This held the covers on well, but transmitted a lot of operating noise to the surface of the cover and on to the ear. In the present search for silent running, the bearing stud extensions have been eliminated and the number of surrounding studs increased from four, on the earliest engines, to thirteen on the latest. To "economize", the two cam covers on each block are interchangeable.

Frankly, we could go on forever analyzing the unusual features of this powerplant. You can see a lot more in these drawings: The fabricated breather baffling, the complex oil distribution system, the ducting of cool water through the center of the crankcase casting, and the gasketing and sealing methods. General opinion is that this engine will never be produced in anything like its present form. We just wonder, though, when we see the steady, directed research that is still being carried out, side-by-side with the development of new production models. If anyone can do it Mercedes can and if it's necessary for either publicity or competition they won't hesitate. *Karl Ludvigsen*

been enlarged to ten quarts and the oil temperature is controlled by a seldom-seen method. Fixed in the pan is a layout of .750 inch diameter tubing that circulates water from the radiator through the oil. This warms up the oil quickly on starting and tends to maintain a temperature balance between water and oil on long runs.

The top end of the engine shows Max's reluctance to go along with what others are doing, and results show that in engine building too there is more than one way to skin a cat.

The heads have not been radically reworked. The ports, other than nominal cleaning up, have not been touched, although the combustion chamber is pol-

(Continued on page 62)

Fierce But Friendly

(Continued from page 61)

ished and relieved slightly around the valves. The valve diameters are extremely modest, the intake valve measuring 1.750 inches and the exhaust valve, 1.250 inches. If the valves are small, the cam is big. An Iskenderian grind, it's called the LDB special. The intake opens 33 degrees before top dead center and closes 77 degrees after bottom dead center. The exhaust opens 77 degrees before bottom dead center and closes 43 degrees after top dead center. This gives duration and overlap seldom seen in anything other than an aircooled racing motorcycle. Intake duration is 290 degrees; exhaust 300 degrees, and overlap, 76 degrees. In these days of fuel injection and dual quad carburetor installations, the six Stromberg 97's on log manifolds might seem an anachronism, but they work. Max admits that they are not fancy, but gives them the credit for a lot of the flexibility of the engine. The headers are simple four-branch units fabricated by Hough on the direct approach principle.

The flywheel is Buick chopped to 25 pounds. The clutch is an Auburn 10 inch unit that seems small but hasn't given any trouble. Friction material is Johns-Manville, and the clutch is operated by a hydraulic master and slave cylinder.

The Jaguar gearbox joints to the engine with a Cook adapter and is a type JH with the normal wide ratios.

The power plant has never made the acquaintance of a dynamometer, but on the basis of the car's performance, its bhp could hardly be less than 300. What the torque must be defies guessing, but it would certainly be interesting to know.

A '54 Chevrolet sedan supplied the radiator, which has proved adequate. It is located well forward and the filler opening is in the upper return hose.

Gas capacity is 22 gallons with the tank located over the rear axle.

Ford 15 inch steel wheels are used front and rear with Firestone tires. The tire diameter in the rear is 8.00 x 15; in the front, 6.50 x 15.

Body paneling is extremely simple and is for the most part fixed semi-permanently to the frame. The front fenders are no more than simple wheel shrouds designed to meet the specifications. Sheet aluminum is used for front fenders, engine panels, cowl and for the hood which hinges forward. The rear fenders are direct grafts from a '49 Chevy pickup and the turtle deck is sheet steel.

The hardwood instrument panel carries a complete layout of Stewart-Warner gauges.

To close this without putting down something of the personality of the Morgensen would be a mistake. Anything this powerful and fast is usually reported as being a tiger, growling and ominous. The Morgensen, instead, seems as patient and friendly as a St. Bernard in spite of the arbitrary way it deals with time and distance.

Only one conclusion is possible. The Morgensen is a big step toward domestic products dominating our road courses.

Russ Kelly

Metropolitan

(Continued from page 41)

Seats are high and firm and vision all around is excellent. Entry to and from the car is easy even for the six and over footers. The front seat is one piece from door to door and offers no lateral support. There is good support under the thighs, and the back rest is inclined at a very comfortable position. With adequate arm and shoulder room, a third passenger can ride up front without too much discomfort. The rear seat is only a suggestion—with no headroom, but will accommodate one adult sitting sideways for a very short trip. For children it's ideal. They can be thrown back there with the laundry bag and practically forgotten until home again. Driving position is erect, chair-style, and all the instruments are within fingertip control. Six and over footers, however, will find driving quarters cramped with knees wedged against the dash panel. The lever-type handbrake is on the left, placed well forward and upright. Very easy to use.

Interior appointments are nicely finished, being neither the ultimate in luxury or shoddy or cheap. A map light is placed conveniently under the dash and can be used for a courtesy light as well. The heater is thermostatically controlled and anything from very hot to moderate cool can be selected by pulling the knob out to various positions. The heater fan is controlled by twisting this temperature knob. Windshield wipers are electrical and noisy. The defroster can be relied on to de-fog or de-ice with efficiency—with all windows closed and three adults blowing smoke or hot air on the windshield. The cowl air-intake is ducted directly into the heater so that when driving it is unnecessary to have the heater fan whirling in order to get heat. In this way a fresh stream of air into the car is insured even with the windows buttoned up.

The dash panel is neatly laid out and the instruments, what there are of them, are easy to read. The speedometer sits directly in front of the driver unobstructed by the steering wheel. Ammeter and water temperature gauges are conspicuous by absence and replaced by two tiny red warning lights at the bottom of the speedometer. Included in the price is a radio: clear, loud and sensitive. The dash pocket is only a vestige of what was traditionally a glove compartment. The trunk is accessible only through the rear seat back rest which is hinged to form a door and can be locked. Space in the trunk is minimal, full of sharp edges and corners. It's not meant for much use, the "back seat" being a good spot for short-distance package carrying.

Wherever we parked, the car always gathered a cluster of interested spectators whose remarks were invariably complimentary especially when they were told the price — $1529 complete. That's the general feeling from here and from the public — an excellent city car that is also good for short trips.

— Albert Prokop