Stark Jowett-powered roadster,

an F.I. TR-2 racer,

THE SADLER CHEVROLET SPECIAL

then a ChevV-8, all-independent road-racing bomb

By EDWARD MONROE

IF a history of sports car specials is ever written, it will predominantly tell of cars which were designed (or at least intended) from the very beginning to beat everything in sight without costing a fraction as much as the factory racers. Most of these cars are interesting and even fascinating; but many of them did not really succeed in their object, as they either did not win or else they cost a not-very-small fortune. It is with real pleasure that we tell the history of Bill Sadler's Special, which has evolved over several years from a Class F machine, starkly garbed in aluminum, to a Class C entry with a streamlined fiberglass body and fully independent suspension, a car which beat *all* comers at Britain's premier sprint meet, the Brighton Speed Trials. One of the steps along the way was the installation of a fuel injection system of his own design on a TR-2 engine. Now TR-2s are in Class E, so you know there's been plenty of activity.

The special first came into being during the winter of 1953-54. A tubular frame was built to mount Jowett Javelin suspension components. While the first engine was from the same Jowett Javelin sedan which supplied the suspension, provision was made for the installation of the larger engines which came later.

The torsion bar suspension system of the Jowett provided a springing medium which had low unsprung weight and a variable rate. These torsion bars were designed for a car weighing more than the special so they always had ample strength and stiffness. By making the anchorages adjustable, the ground clearance of the car could be adjusted and one wheel or one set of wheels could be adjusted independently of the others, thus providing a simple means of altering the handling characteristics of the car.

The solid rear axle of the Jowett was retained. However, Bill considered the gears unsuitable for his modified engine so he replaced them with 4.11 Studebaker gears which fitted the Jowett carrier perfectly.

A Morris Minor rack and pinion system was converted to right hand drive by turning it upside down. Combining the Morris tie rods with the Jowett steering arms resulted in a ratio providing two turns lock to lock.

For the 1954-55 racing seasons, the Sadler was equipped with a 1486cc Jowett Javelin engine, whose modifications included a reground camshaft, Jowett competition outer valve springs and Austin Healey inner springs, Jupiter R1 pistons, and a lightened flywheel.

The Sadler Special made its first appearance at the 1954 Watkins Glen race equipped with an aluminum body and cycle fenders.

In January 1955, Bill started work on the fiberglass body at his St. Catherine, Ontario home.

Pieces of small diameter tubing were shaped to the outline which the new body was to have. These pieces were tack welded to the frame and served to support a covering of metal lath. The lath was given a coat of plaster which was worked until it was very smooth, thus forming a male mold. Two layers of glass cloth and resin were laid on this mold. After the fiberglass had cured, the mold was removed from underneath the body. Sections of ¾" mild steel tubing were shaped to fit the under surface of the body and were cemented to it with fiberglass material, adding to the strength and stiffness of the body.

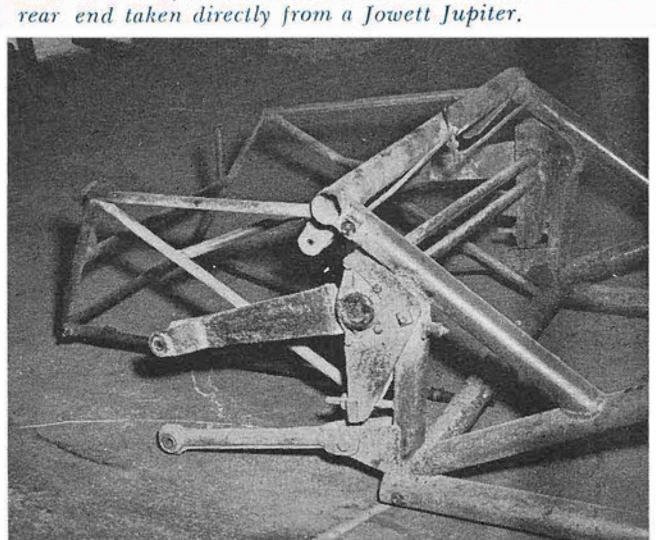
By the end of the 1955 season, Bill felt a strong desire for more power. He was now thoroughly familiar with the handling of the car and had acquired a fair amount of competition experience.

During the following winter he replaced the Jowett engine and transmission with those of a TR2. In action, this power-plant called attention to itself by its earshattering exhaust. What held attention, however, was the fuel injection system designed and fabricated by Bill who wasn't influenced by knowledge of existing F.I. designs. Comparatively simple, it proved itself to be practical for competition purposes.

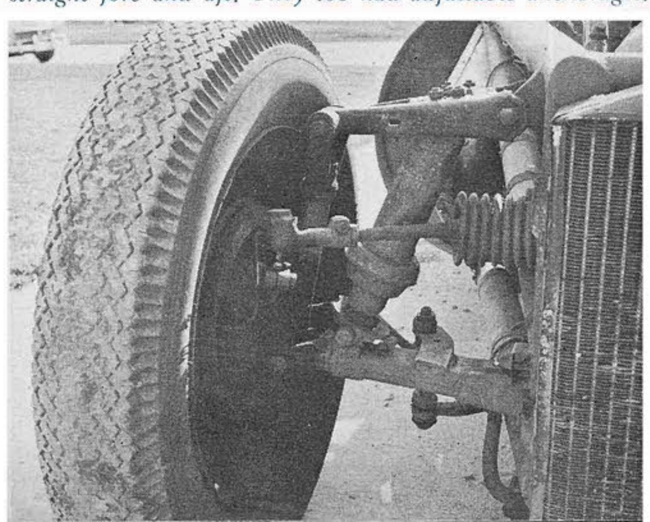
This system consists of a modified TR2 fuel pump with a bypass installed, a special metering block, a needle type metering valve, individual dump tubes for each cylinder, a ram tube containing a throttle-butterfly valve and appropriate linkage between the metering valve and the throttle.

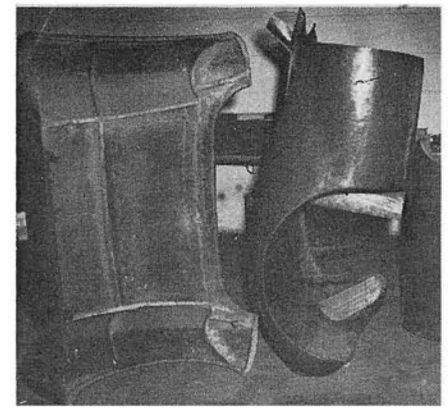
The diaphragm spring in the standard AC fuel pump was

First version of the Sadler had immense tube frame with rear end taken directly from a Jowett Jupiter.

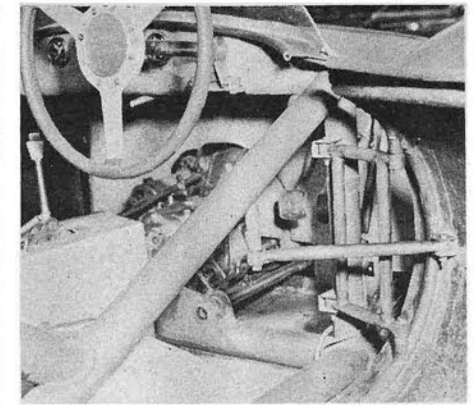


Jowett i.f.s. was welded in place with torsion bars running straight fore and aft. They too had adjustable anchorages.

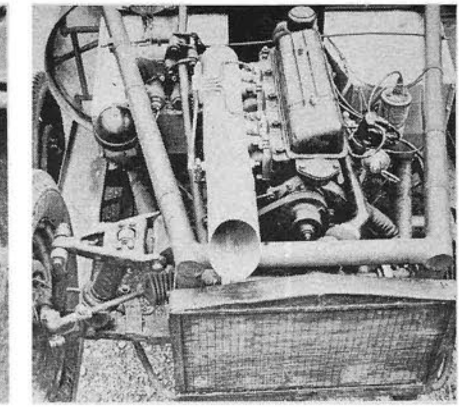




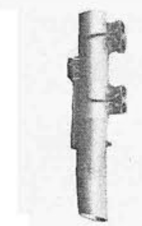
Fiberglass body panels were stiffened with pieces of tubing bent to shape, fixed to inner surface with resin, cloth.

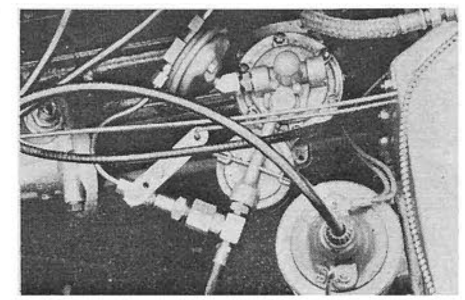


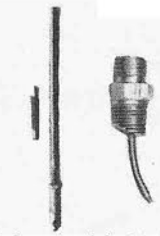
Two doors of regulation size were fitted to give access to frame, cockpit. Four bar linkage used to clear body panels.



U-jointed steering by-passes home-built fuel injection ram tube. Metering valve is operated by throttle butterfly lever.

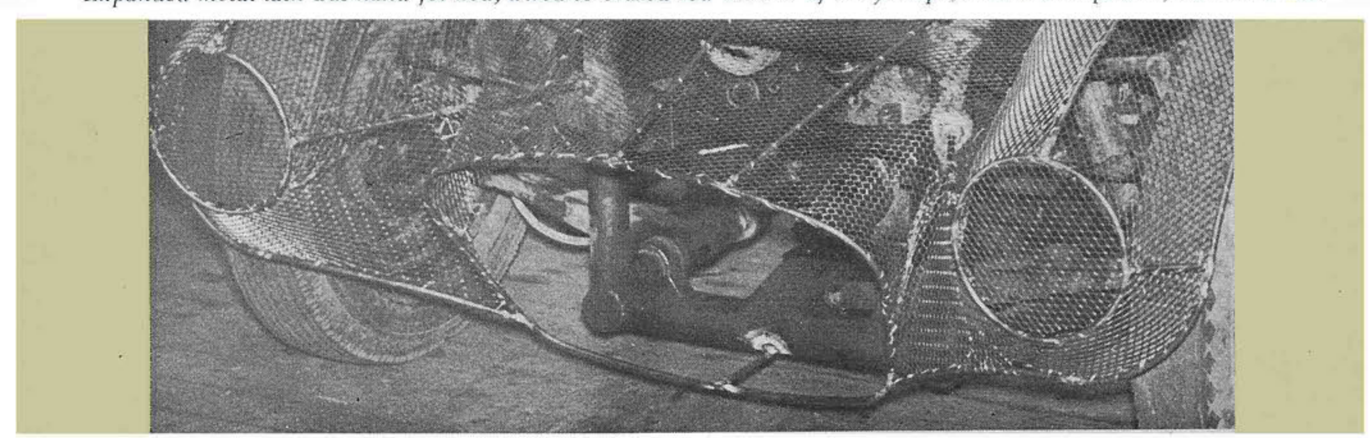






Modified 10 psi pump (right) feeds fuel into metering block on side of ram tube (left), controlled by push rod, metering rod fitted with 21 O-rings (one seals, 20 act as spring), enters airstream through dump tube (far right) made of carb jets.

Expanded metal lath was hand formed, wired to brazed rod outline of body shape, coated with plaster, smoothed out.



THE SADLER CHEVROLET SPECIAL SPECIFICATIONS

POWER UNIT:

Type	Chevrolet V-8
Valve Arrangement	Pushrod, in-line ohv
Bore & Stroke	3.875 x 3.00 in (98.4 x 76.2 mm)
Stroke/Bore Ratio	0.774/1
Displacement	283 cu in (4640 cc)
Compression Ratio	10.5/1
Carburetion by	dual quads, later changed to two Ford Holley dual choke carbs.
Max. Power	290 bhp @ 7200 (250 bhp @ 6500 rpm with Holleys)

DRIVE TRAIN:

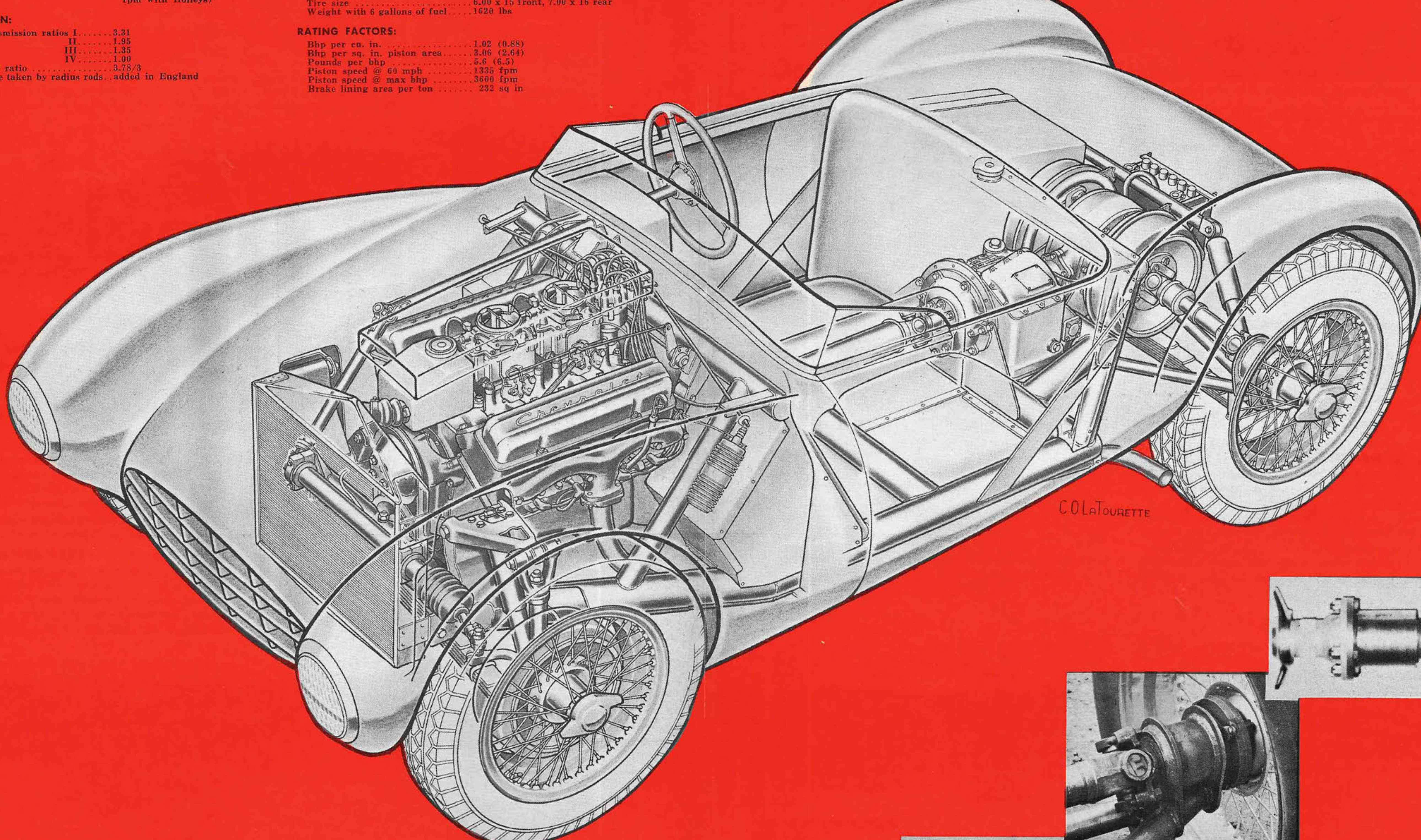
ENV Transmission ratios I	3.31
II	1.95
III	1.35
IV	1.00
Final drive ratio	3.78/3
Axle torque taken by radius rods	added in England

CHASSIS:

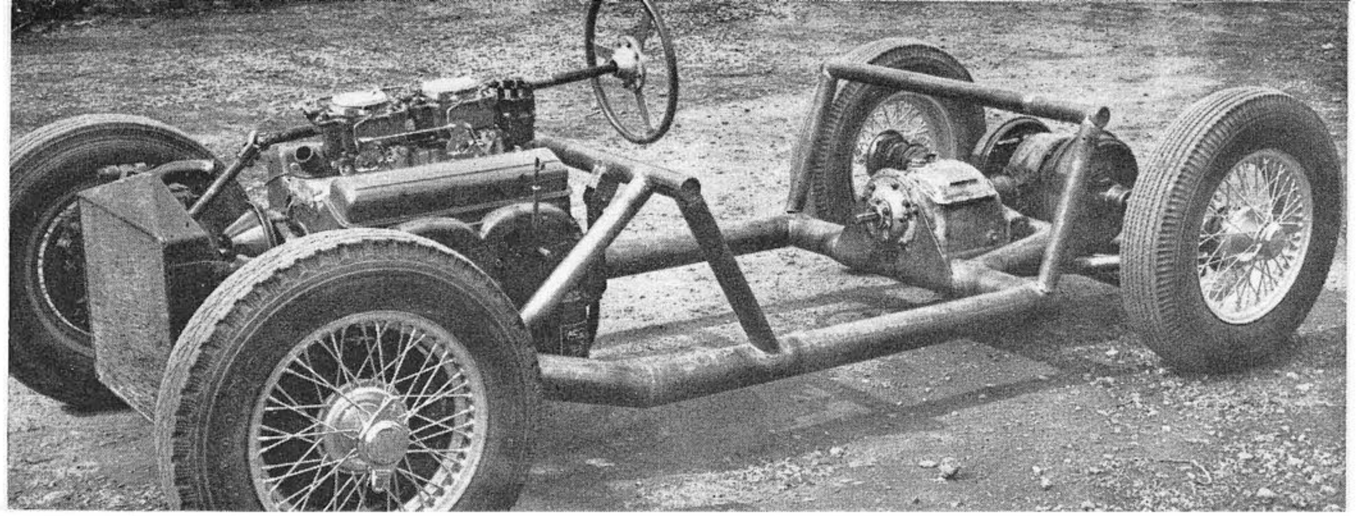
Wheelbase	90 in
Front Tread	52 in
Rear Tread	50 in
Suspension, front	Upper wishbones, low transverse leaf spring. Lately changed to double BMC wishbones, coil-shock units.
Suspension, rear	Low pivot-point swing axle, low transverse leaf spring
Shock absorbers	Tubular hydraulic
Steering	Morris Minor rack and pinion
Brakes	Austin-Healey drum type, mounted inboard at rear
Brake lining area	188 sq in
Tire size	6.00 x 15 front, 7.00 x 16 rear
Weight with 6 gallons of fuel	1620 lbs

RATING FACTORS:

Bhp per cu. in.	1.02 (0.88)
Bhp per sq. in. piston area	3.06 (2.64)
Pounds per bhp	5.6 (6.5)
Piston speed @ 60 mph	1335 fpm
Piston speed @ max bhp	3600 fpm
Brake lining area per ton	232 sq in



Austin-Healey hubs, GMC-3 ton truck U-joints, plus plenty of ingenuity adds up to the outboard end of an independent rear that can handle vast torque of big-inch American engines.



To make sanitary installation of an independent rear suspension Sadler built entirely new frame, still used some Jowett ifs pieces.

replaced with a stiffer one to enable the pump to produce at least 10 psi.

An adjustable bypass valve was installed between the pump inlet and outlet in order that the delivery of the pump could be more accurately controlled.

The metering block, a small block of aluminum, was drilled and tapped to accept a fitting for the line leading from the pump. This passage leads to a jet, whose effective opening size is controlled by a metering valve. The movement of the metering valve is in turn controlled by the throttle linkage. From the jet a passage leads to a main chamber in which four holes are drilled at right angles. These holes are outlets for the lines leading to the dump tubes. The dump tubes were made from carburetor jets. Gas is supplied to the metering block at a fixed pressure.

By measuring the volume of fuel which would flow through various sized jets in a given time at this pressure and comparing this volume with the computed volume of fuel that the engine *should* consume at maximum output in the same time, a size (0.026 in.) was found which would permit sufficient fuel to flow to supply the needs of the engine at wide open throttle. These jets were soldered into tubing fittings. These dump tubes are screwed into openings in the intake tubes leading from the ram tube to the ports. The dump tubes are just long enough to extend to the center of the airstream in order to prevent the fuel sriking the walls of the intake passage.

The ram tube was fabricated from sheet aluminum. Bill cut intake tubes from the original manifold. Then he cut 4 holes in the ram tube to coincide with these tubes and then welded the intake tubes to the ram tube. A butterfly valve in the ram tube is connected to the gas pedal for throttling.

As the pedal is depressed, the butterfly throttle valve opens to admit more air. Simultaneously the rod which rests against the end of the metering needle valve moves back, relieving its pressure on the metering needle. The neoprene O-rings, which surround the needle and serve the double purpose of seal and spring, cause the needle to move away from its seat allowing gas to flow to the main chamber. From there it travels through the individual passages to the dump tubes, entering the air stream in the ports.

The TR2 proved to be very lively with this system. The fuel air ratio was good in the range from 3000-6000 rpm. Below this it became too rich. However, since an engine is tolerant of overly rich mixtures, this did not give trouble. Bill has in mind plans for automatic control of the bypass valve which should give proper ratios throughout the range. The idling system had not been installed on the TR2 and it was necessary to keep treadling the throttle while warming up. Plans called for a small idle jet located at the throttle valve to permit a reasonably slow idling speed.

At the August 4th Harewood meet, Bill was troubled with the engine throwing oil. No oil would appear at ordinary speeds but under racing conditions, the side of the engine would suddenly become covered with oil. By race time, he had been unable to locate the source of this leak and consequently he lost so much oil during the race that he burned a rod.

Before Bill had time to repair the TR2, he had an opportunity to get a Canadian-built 1956 Corvette engine. Again he succumbed to the urge for more power.

The engine was assembled to racing clearances by taking advantage of the slight tolerances permissible when machin-

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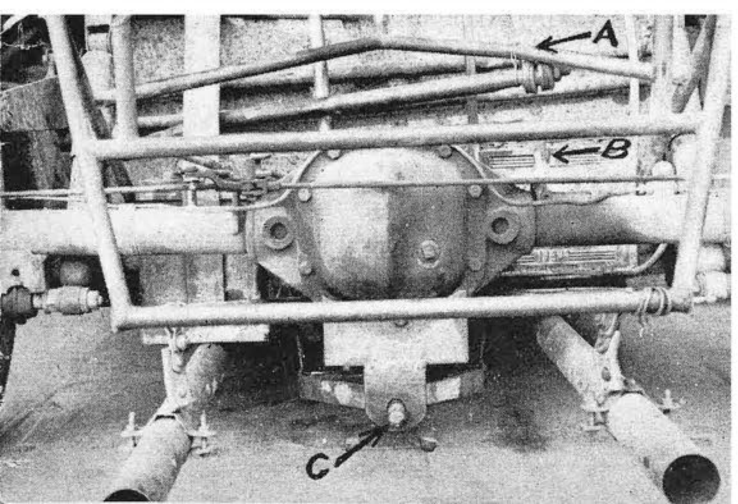
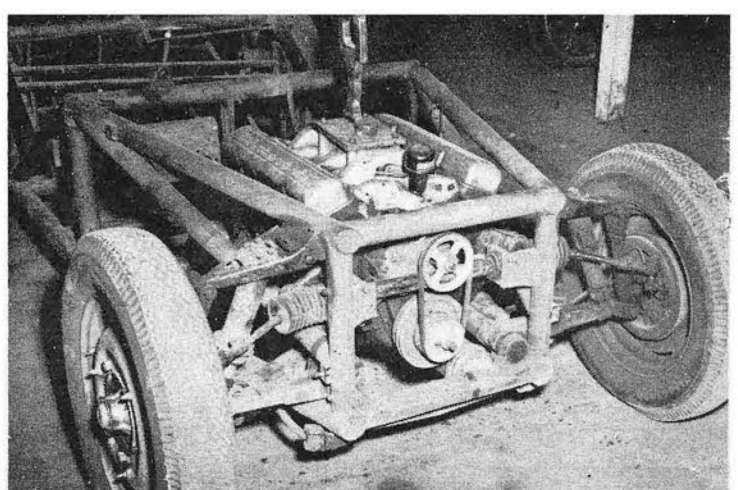
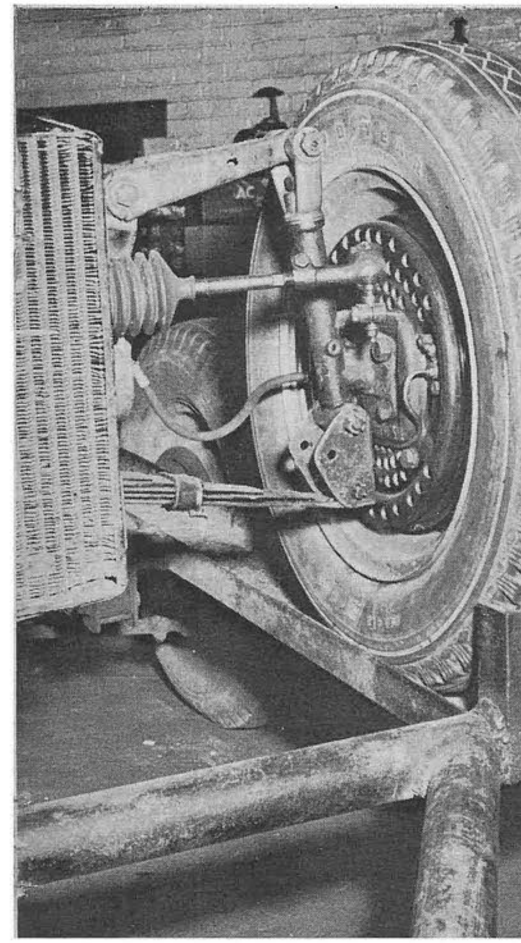
Vast increase in power available caused wheelspin problems. Sadler disconnected Panhard rod (A) from frame bracket (B), installed built-up A-bracket, dropping roll center to C.

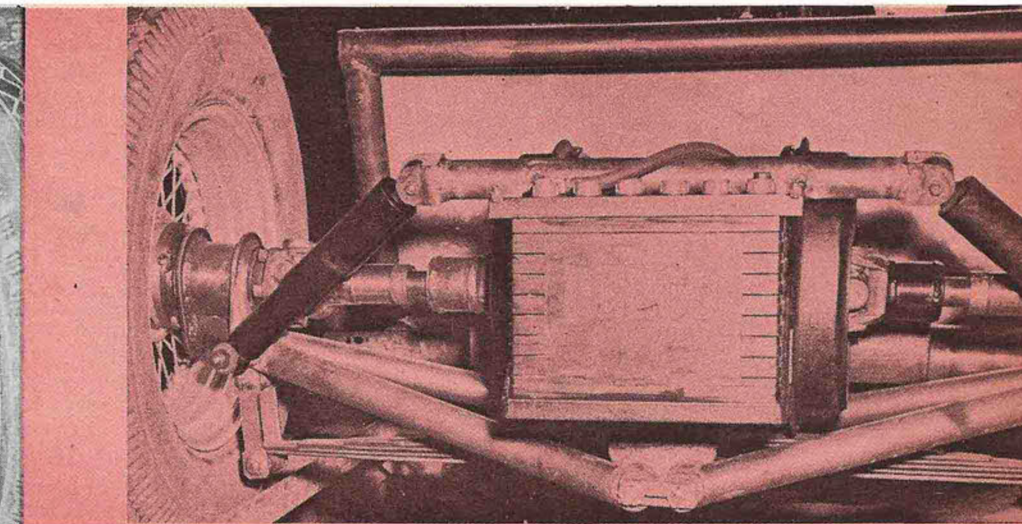


1958 Chevrolet V-8 was "easily" lowered into space formerly occupied by Jowett and Triumph engines. Bill used shock absorber eyes as engine mounts to limit movement within frame.

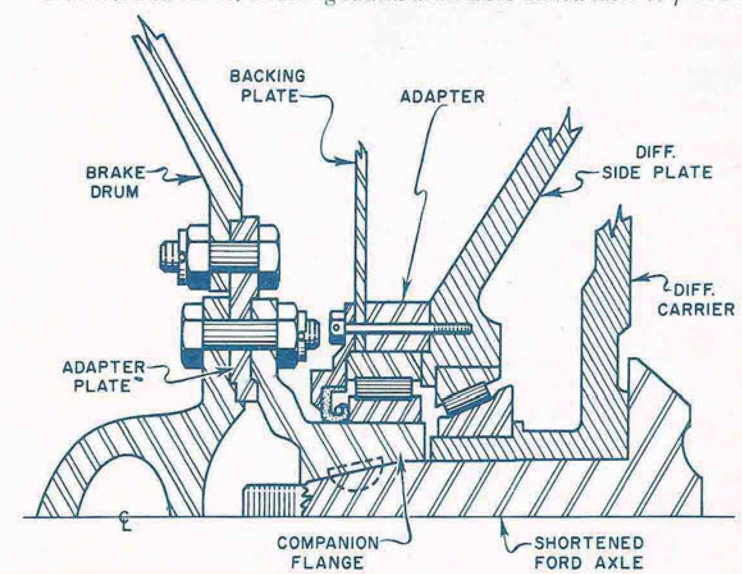




On the all-new frame, torsion bars were abandoned. Original Jowett spindles and kingpins were shackled to transverse leaf spring. Drilled out Austin-Healey backing plates, drums, wheels added.

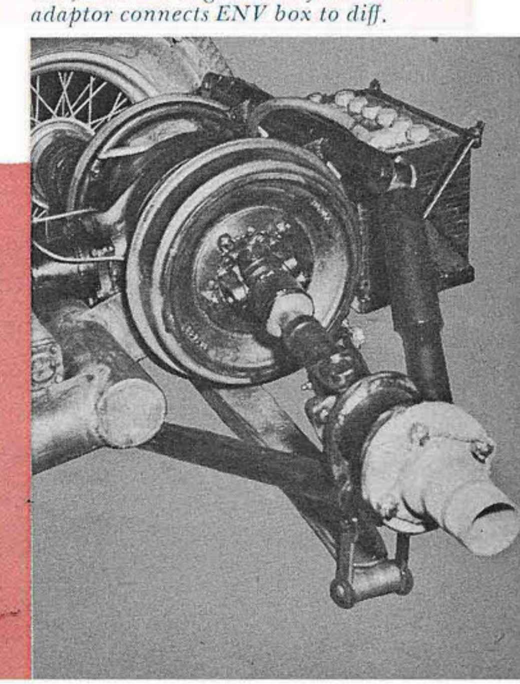


Low pivot point swing axles, similar to Mercedes and Porsche sports-racing cars, were made up, ingeniously using standard American parts with simply fabricated brackets and tubes. Trailing radius arms were added later to prevent toe-out.

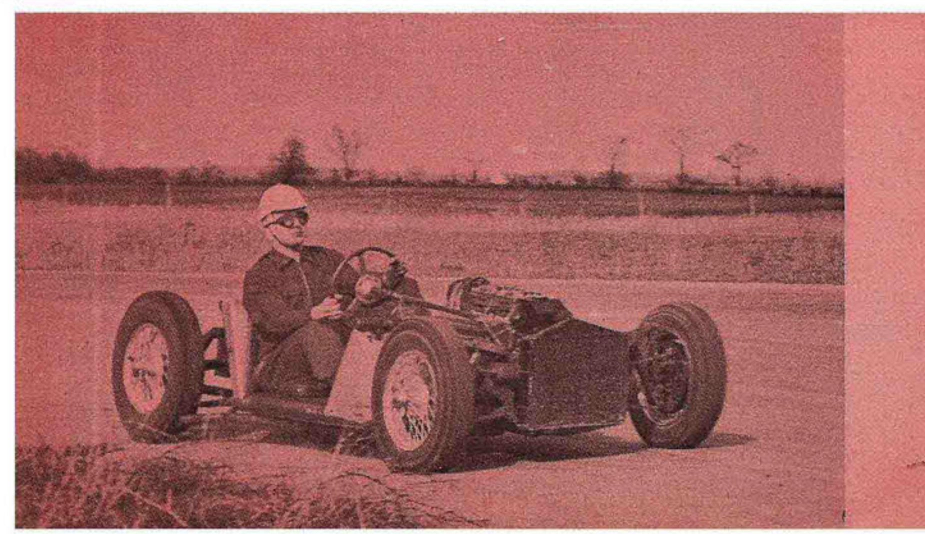


Heart of Sadler's independent rear suspension is Ford V-8 diff case. See text.

Entire frame ends at rear wheel centerline, contributing to stubby lines. Short adaptor connects ENV box to diff.



Before leaving for England, Bill tried out latest version without the body at Harewood race course. Highly encouraged by performance, he happily departed.



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ing parts, for example pistons were selected which had been machined to the smallest permissible diameter and these were installed in the block having bores machined to the maximum diameter. This was equipped with a single four barrel carburetor making the equivalent of the 200 HP version of the 1956 engine.

This engine was approximately the same length as the TR2 which made it possible to mount it in the same location. The TR2 flywheel, clutch, bell housing and transmission were retained. The TR2 flywheel was machined and redrilled to match the flange on the Corvette crankshaft. An adapter plate was made to enable the TR2 bell housing to be attached to the Corvette engine. This was made from ¼ inch steel plant. It was cut with a torch and marked and drilled to match the holes in the Corvette and the TR2.

The TR2 gearbox has proven to be very reliable even when handling the greater torque of the V-8. It was given a real workout at Thompson where (except for short bursts on the straight) it ran the entire race in third).

A semi-rigid method of mounting was necessary as there is very little room in the frame for engine movement. New front motor mounts were made from ⅛ inch mild steel plate. Shock absorber eyes were welded to the outer ends so that the rubber bushings made for these eyes could be used, isolating some of the engine vibration.

A lip or flange was formed on each of the mounts for added stiffness. The lip on the right extends back and that on the left folds forward to clear the block due to the offset of the cylinder banks. The inner ends were bolted to the machined surface underneath the water pump.

Where to mount the generator so as not to interfere with the closing of the hood, was a problem. Bill solved this by bracketing it to the frame underneath the left side of the engine. Since the engine movement relative to the frame was very small, it was possible to keep a relatively constant belt tension. This was driven by an additional pulley at the end of the crankshaft. The original pulley has about one inch of its inner diameter which extends over the shaft. An adaptor shaft was machined and pressed into the outer end of this pulley. Another pulley was mounted on the outer end of this new shaft.

Final drive ratio was changed from 4-1 to 3.54-1.

A homemade radiator was designed to use all the area that the chassis and body will allow.

An airscoop was added to the hood which serves the double purpose of providing clearance over the carburetor and supplying cool air to it.

This engine proved to be very reliable. At first, Bill experienced difficulty with the carburetor flooding in the corners. To correct this, he lowered the float level ¼ inch. Lowering the float level causes the mixture to be lean so main jets about five sizes larger than normal were used to correct this.

At the Watkins Glen Race in September 1956, Bill found that he could not use the entire potential of the new engine due to wheelspin which occurred even in top gear. He reasoned that this was due to the high rear roll stiffness which caused the side thrust developed in a turn to lift a wheel. To correct this, he relocated the roll center at the rear to about four inches above the ground. This was done by removing the panhard rod originally used and replacing it with a locating device of his own design. It consists of a steel frame made in two sections and hinged to conform to the relative up and down motion between frame and differential due to the flexing of the springs. The front of this device was attached to the lower part of the car frame. At the rear of the device is a pin which passes through a hole in a steel plate attached to the differential.

Although traction was considerably improved with the new locating device, it still left much to be desired. Bill felt that the logical way to get still more traction was to use an independent rear suspension.

While these alterations were still in the planning stage, Bill acquired a reconditioned ENV pre-selector gear box. This seemed made to order for the new set up. It could be used without a clutch (thus eliminating the weight and inertia of a clutch, pressure plate and flywheel) as the bands in the gear box serve as a clutch (similar to the Model T Ford). It has 4 closely spaced forward speeds, (3.31, 1.95, 1.35, and 1.00) a reverse. It permits very fast shifting as the desired gear may be selected at any convenient time, the actual shift being accomplished by depressing and releasing a "clutch" pedal.

With this gearbox it was possible to attach the driveline directly to the engine crankshaft at one end and to the input shaft of the gearbox at the other. The gearbox in turn could be coupled directly to the final drive housing.

As plans progressed, it became evident that if the new gearbox and the IRS were to be installed, it would require extensive alterations to the frame and the end result would be a compromise and rather butchered chassis. The logical solution was to build a new frame designed for the new rear suspension system.

Since Bill planned to race in England and on the Continent, his decision to build a new frame was considerably influenced by the FIA ruling which requires the interior of the cockpit to be 47" wide. The body panels of the special allowed ample width but the actual width of the cockpit was restricted by the upper framework in his early frame. This might be a technicality which would bar him from FIA controlled races and this, therefore, was the determining factor in his decision.

The new frame is made of $3\frac{1}{2}$ inch diameter, 14 gauge seamless chrome-moly-tubing weighing 3.2 lbs. per foot. Stands of 16 gauge steel are built up in front to provide attachment points for the upper A arms. Fore and aft of the cockpit are well-braced roll bars of $1\frac{5}{8}$ inch tubing.

The Jowett Javelin king pins and upper A-arms were retained. However, a transverse leaf spring replaced the torsion bars

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and the lower control arms of the original chassis. An extension at the bottom of the king pin lowers the pivot point 2½ inches.

The new chassis is equipped with Austin Healey wire wheels and brakes. The Austin Healey outer front wheel bearing is the same as the Jowett's but the inner one is larger, so a sleeve was made to go over the Jowett spindle to make up the difference in diameters.

The Morris Minor steering gear was retained; however, Bill felt that the Ackerman effect of the original front end caused the wheels to toe-out too much on the turns. It was reduced by moving the entire rack and pinion assembly forward.

Bill used a 1940 Ford V-8 rear end as the basis for his new final drive. The axle housing tubes were cut off from the gear housing. The driving torque is transmitted from the ENV gearbox through the Ford ring and pinion to short axle shafts. These shafts were made from Ford axles, cut off and machined at their outer ends for a thread, taper and keyway to accept the companion flange from a Spicer series 1310 U-joint (1950 Canadian Chrysler).

The sides of the final drive housing, exposed by the removal of the axle tubes, were each machined to locate an adaptor to house an SKF 209 roller bearing.

These roller bearings perform two important functions; they support the outer end of the short axle shafts and they locate the backing plates concentrically.

The inner races of these roller bearings ride on the turned-down outer diameter of the U-joint companion flanges which in turn are secured to the stub axle shafts by taper and key. The bearing housings were made slightly narrower than the width of the outer races so that the bearing extends beyond the face of the adaptor, locating the brake backing plate, an oil seal housing and a bearing retainer.

Sandwiched between the Chrysler U-joint companion flange and the U-joint itself is an adapter plate made from quarter-inch steel plate. It has locating rings or steps machined on its face to match similar machining on the companion flange and the U-joint, insuring concentricity. This plate serves as a means of attaching the inboard mounted brake drums.

These Spicer series 1310 U-joints were designed for 3 inch dia. propeller shafts. Bill cut the Chrysler's propeller tube away and machined the end of the U-joint, which was originally pressed into the tube, down so as to be a press fit in GMC 3 ton truck propeller shaft tubing. Then he cut a GMC propeller shaft leaving a short piece of the tubing attached to the spline. Into this tubing he pressed the machined end of the Chrysler U-joint and arc welded them together. Riding on these sliding splines are 1350 series Spicer U-joints (GMC 3 ton truck—around 1950). These U-joints are in turn attached to the stub shafts.

The stub shafts are made from GMC truck midship stub shafts. The tubing was cut away from the splined end. A piece of

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half-inch steel plate was bored out to be a heavy press fit on the large end of the shaft exposed by the removal of the tubing. This plate was then arc welded to the shaft. After welding, the plates were machined in a lathe so as to have a true face and a locating ring, forming a flange for the Austin Healey rear hubs. The hubs bolt to the flanges with four ¼ inch bolts. These stub shafts are carried by two 6208-RS SKF ball bearings. These bearings are sealed on one side and they are installed in the outer retainer so that the seals are to the outside. The inner bearing rides on a machined surface diameter of the end yoke of the GMC U-joint which is splined to the shaft. The outer bearing rides on the surface of the shaft itself. These bearings are retained in a carrier machined from 3 inch pipe.

Any lateral movement between the shaft and the bearings is prevented by shoulders on the shaft and end yokes and by a tube spacer between the inner races of these bearings. Similar movement between the bearings and the housing is prevented by leaving a shoulder between the outer races of the bearings.

The rear suspension is unique. It consists of a single transverse spring (made by a local spring shop to Bill's specifications) and long, wishbone-like, lateral control arms rigidly connected to the wheel hubs. The arms are made from 1⅝ inch diameter chrome moly tubing having 0.160 inch wall thickness. They pivot approximately two inches below the bottom of the differential housing. The latter carries the pivot pins for the rear of the arms and also provides a seat for the rear spring. The front pivot points are attached to the rear cross member. The outer ends of the arms are welded to quarter-inch steel plates, which in turn are arc welded to the hubs.

By placing the control arm pivot points very low underneath the differential housing, the arms could be made extra long, both steps helping reduce camber changes as the wheels ride over bumps.

The engine which powered the car during the latter part of 1956 racing season was replaced with a Canadian-built, modified version of the 283 cu. in. 1957 Corvette engine. This engine is equipped with the latest Duntov cam and special light valves (seating on inserts). The special Delco Remy dual point distributor has no vacuum advance.

The engine is mounted one inch to the left of center in order to give more room for the driver's feet and the pedals on the right side of the engine. This also tends to partially balance the weight of the driver.

After he returns from England, Bill plans to install a fuel injection system of his own design on this engine, this system to be basically similar to the one used on the TR2 engine.

He feels that the present Corvette fuel injection system is unnecessarily complicated for competition and that the airflow is too restricted for maximum output.

Bill took the car to Harewood Race

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Course for testing prior to his departure for England. The body was left off to permit the action of the suspension system to be observed and to enable adjustments to be made quickly.

The car ran remarkably well and the acceleration was fantastic, being comparable to that of the specialized drag machines. The *two* streaks of rubber showed clearly the value of an IRS for a car using an engine of this potential. As an experiment, two leaves had been left out of the rear spring, but after testing, it seemed advisable to replace them. A stiffer type of rear shock absorber seemed indicated and it was necessary to lower the float level on the carbs to prevent flooding on the curves.

A week later, Bill Sadler and his wife Anne left for England, where he was to spend a year working for John Tojeiro (designer of the A.C. Ace). Naturally, the Special accompanied them, and Bill was able to race it extensively on such interesting circuits as Goodwood, Snetterton, Brands Hatch, and Oulton Park. Hill-climbs at Shelsley Walsh and Prescott and a standing kilometer sprint at Brighton (we'd call it a drag race) filled in the remainder of his calendar. The latter event provided him with his most outstanding performance of the year, as he took F.T.D. against all comers, 260 of them, race cars, sprint specials (dragsters?) and all.

During the season many practical lessons were learnt and applied, but only by burning the midnight oil. Daylight hours saw Bill busy at the Tojeiro Car Co., where he did all the design, pattern and final machine work on a rear-mounted gearbox/final drive units for Tojeiro's new F-2 car and a Climax 1100 cc car.

The four barrel Rochesters persisted in flooding in the turns, causing the engine to cut out. All attempts to correct this by adjustment or modification came to naught, so Bill finally replaced them with two Ford Holley carbs, which dropped the horsepower to 250 @ 6500 rpm. Even though the Brighton course is straight, the dual quads weren't used, so his performance there is all the more creditable.

The suspension came in for adjustments and changes, as might be expected on such a novel design. Rear radius rods were added to cure a tendency to hop under acceleration. Lower wishbones were installed in the front together with Armstrong spring-shock units in order to correct toe-out during hard cornering.

The next time we see this car in these parts, we will look for the streamlined headrest that Bill talks about. It may sport a new paint job, a well-earned coat of British Racing Green perhaps. (The British press referred to the body, which has been on two different cars now, as "scruffy".) We heard him mutter something about Bendix disc brakes before he went to Europe, perhaps these will be the next change. There will certainly be improvements as Bill sees the need for them, for as no one can deny, he doesn't mind making changes.

Ed. Monroe

THINGS TO COME

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It's seldom that Ferrari has a car tested and ready to go six months ahead of schedule, but that's exactly what's happened with this new V-6. It first appeared at Reims in Formula II form, displacing 1490 cc, (90.8 cu. ins) where it proved itself to be just as fast if not a bit quicker than the FII Cooper-Climax. They went back to Maranello and began to bore out two blocks. One was set at 2200, while the other was taken out a bit farther to displace 2385 cc. Ferrari knew he was on to a good thing and set test drivers hustling with the new machine. Tragically, Ing. Fraschetti was killed at Modena when he was trying the new V-6; but development went on. As is typically Italian, fantastic horsepower claims were being made, Maranello quoting 290. Whatever the exact figure is, and 250 bhp is probably closer to the truth, the car goes—and goes well; it is light — dry weight is reportedly less than 1200 pounds. Brakes are Lancia-Ferrari D-50. The whole car is a scaled down version of the big V-8 in its ultimate form that has now been scrapped. A Ferrari mechanic obligingly stuck his finger into the V-6's tank at Casablanca to prove that they were running on "benzina super-carburante"—not alcohol or any other special fuel. Collins and Hawthorn spent the first practice session learning their way around the new circuit, but by the second day the V-6 was third fastest. If the Argentine "Temporada" comes off according to schedule, the Ferrari is going to be a very real threat.

The dark horse off in the middle distance is BRM. After a year or more of activity behind closed doors, Raymond Mays and Peter Berthon have finally gotten their car to the point where it is reasonably reliable and will corner, and have all the "gow" characteristics of a quarter-mile dragster. Casablanca was one of the few times in 1957 that this car started with all of the current opposition on the starting grid. Harry Schell and Jean Behra have both driven BRM's to victory in small events during the year, but both times no works Vanwall, Maserati or Ferrari cars were on hand. But now that the car seems to handle properly and is safe enough to permit driver confidence, there is an acute shortage of driver talent.

Rumor has it that both Schell and Behra will leave Maserati for BRM in 1958, and even though Trintignant's third place at Casa in the English car was overshadowed in some respects, it still was an achievement. It proved that the car will last: it averaged 111.2 mph for 2 hours and 19 minutes. The BRM, a very attractive machine to look at, is much prettier than the Vanwall. It is powered by a four cylinder dohc unit with a fantastic bore and stroke ratio. Bore is 102.87 mm while the ultra-short stroke is only 74.93 mm. It uses two double-choke side-draft carburetors. Brakes are disc-type with a single disc fitted at the rear, centrally mounted off the differential housing. Wishbone suspension at the front, coil springs all around and slight chassis revision has improved the car's road holding immensely. The BRM is considerably lighter than its

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