Vanwall Vindicated

by Karl Ludvigsen

FINALLY acclaimed as one of the two greatest road racing drivers the world has ever seen, Juan Fangio has yet to receive the recognition due him as a seer. Yet the five-time champion reached this peak not only by his uncanny skill, but also by an equally-eerie ability to sell his talents to that *Scuderia* most likely to succeed in the coming year. His choice before 1956 was Ferrari; but before that year began *el Chueco* admitted—to the confusion of the experts—that his biggest worry would be the Vanwall.

This must have had more than academic significance to Fangio at 2:10 PM on May fifth of '56, when a cigar-snouted green machine bulked in the mirrors of his Ferrari-Lancia, hurtled screaming past and dwindled down the successive bends of Silverstone. The bulbous tail and high windshield of the new Vanwall hid all but the white helmet and the talented hands of Stirling Moss, having his first competition outing in the car with which he won three major Grand Prix races last year.

In spite of Maserati's official superiority in 1957, that season's sensation was the hard, dominant finish of the English Vanwall team. Three more varied courses than Aintree, Pescara and Monza could hardly be found; yet each event saw a decisive win by Moss and a sleek Vanwall, backed up by his compatriots Brooks and Lewis-Evans. What's more, Tony Vandervell and his tight-knit team are in excellent shape for this year, for reasons which we'll outline later.

To the best of our recollection the Vanwall is virtually unique among Grand Prix equipment in one important respect. It's built and sponsored by a component manufacturer—Vandervell Products Limited—instead of by a firm with a direct and practical interest in the production and sale of cars. Tony Vandervell's connection with racing dates from 1948, when Ferrari adopted his war-developed Thinwall bearings for the now-famous series of high-revving V-12's. As a result, Vandervell was able to borrow the current blown 1½ liter Ferraris for the British G.P.'s of '49 and '50, and in '51 he became the proud owner of one of the big 4½ liter unblown editions.

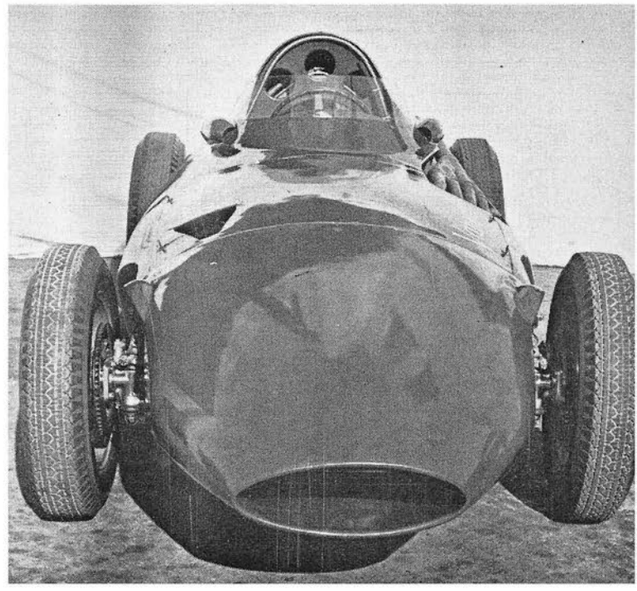
Through these and later adventures, Vandervell had no entangling alliances with specific parts suppliers, being of that breed himself. When he needed designs or mechanisms he could go to the brains and factories best equipped to provide them, while his own staff is well up on advanced engine design from fighter planes to motorcycles. When Tony goes racing it's strictly business, in contrast with the "gentleman sportsman" concept of the English team that Europeans have found so amusing for so long. But no longer!

In fact, when Vandervell and his staff finally had a V-12 4½ liter G. P. Ferrari for keeps, they immediately set about modifying this brainchild of Lampredi. By the end of 1953 it had new intake and exhaust systems, new bodywork and fuel tanks and most important – new brakes. Named the "Thin Wall Special", it spent its weekends terrorizing the blown BRM's, and established a reputation as the fastest road race machine ever.

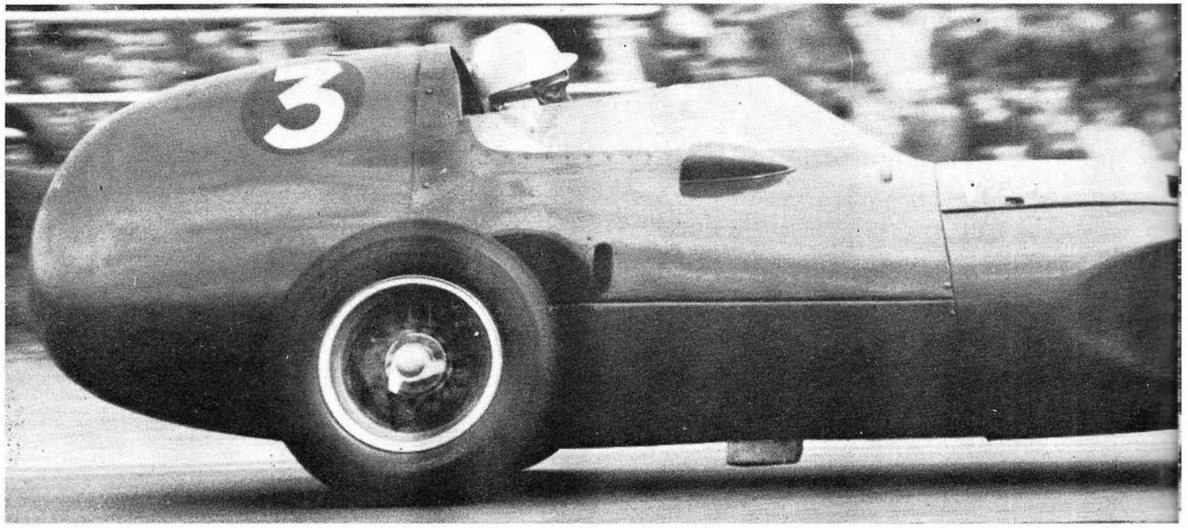
Many lessons were learned on this car, including the value of preparation. A more concrete project was the fitting of Goodyear disc brakes, very Indy-like in their simple single-spot design. An original feature was radial drilling inside the discs for lightness and heat dissipation. Simplified and lightened, these same binders halt today's Vanwall.

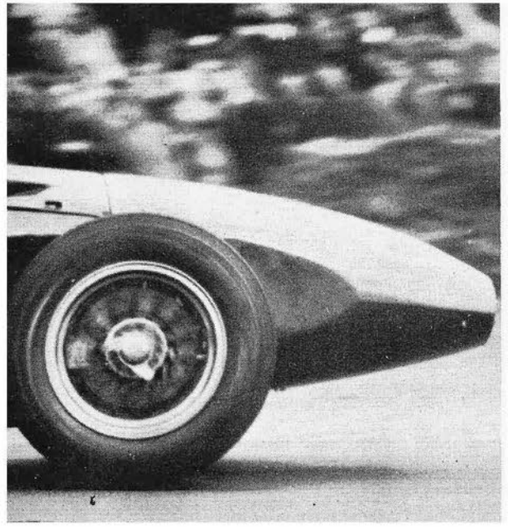
With this experience under his belt, Vandervell tightened it a notch and started work on his first original design – intended for the two-liter racing of 1953. At first the team was mainly interested in engine design, so the chassis and drive line were patterned after Ferrari ideas. The frame differed somewhat, being more space-type in layout, but the transverse leaf springs with wishbone front and de Dion rear were very familiar.

So was the gearbox, which like the disc brakes and engine is basically the same as in the 1957 Vanwall. Four speed at that time (a fifth "starting" gear was added in 1956) its shafts were placed flat in unit with and ahead of the differential, both cases being split vertically on the mainshaft centerline. An integral pump supplies pressure oil to the box bearings and the ZF differential, at the same time circulating



Tony's Vanwalls have corner all their own in busy shop, hardly spacious yet neatly arranged. Right, Vanwall's nose tapers to tiny opening whose size was calculated carefully for minimum drag with sufficient cooling. Rest of body equally thoughtful. High tail controls turbulence behind cockpit, deeply dished undertray lowers drag, minimizes effect of side winds by rounding body shape.





Stirling Moss sizzles past the line at Silverstone in Vanwall to set new track record of 100.47 mph, highest race average to '57 on the English track. This was the first time out and the first win for the new Costin-Chapman designed GP car.

it to a small radiator under the water core. More than any other factor, the position and size of this transmission forces the Vanwall's driver up high in the air, and in spite of the fact that it's been nearly trouble-free, this may force a new design for '58.

Breaking away from Enzo's dictum, the rear brake discs were mounted inboard and supplied with air from the sides. Nowadays it's about the same except that the spot calipers are above rather than below the axle shafts.

Nothing mentioned here so far indicates much potential for greatness; in fact it was a year or two behind the times. This was not the case with the powerplant, which is a curious and conflicting combination of antique and advanced techniques. Its fame was practically ensured by its origin, which was the single-cylinder half-liter Norton engine that long kept England supreme in motorcycle and Formula III Grand Prix racing. On a power-per-liter basis it had always been one of the world's great engines, but its efficiency and refinement had inevitably been lost when multi-cylinder versions were assembled. The Vanwall version is horsepower of a different color.

As might be expected the cylinder head layout is very Norton, but the rest of the engine is also astonishingly similar to the cycle one-lunger, too. Chief point of agreement is the division of the unit into three main parts: a high-topped, deep-walled crankcase, a very-shallow cylinder assembly, and a deeply-spigoted cylinder head with separate camboxes and exposed valve springs . . . the whole works bound together by exposed studs. There are a lot of pieces, but each one is (by racing standards) easy to make, inspect, remove, repair and replace. If something breaks the whole engine does not become a gaudy doorstop for Tony's office.

The cylinders themselves are wet steel liners very deeply spigoted into the crankcase and sealed at that point by a flange under stud pressure. Top-end joining is accomplished by a simple radiused countersink in the head. To hold water around the unusually heavy liners a suitably-shaped cast alloy housing is dropped down inside the studs. This housing takes little real stress, acting to steady and seal rather than support.

VANWALL SPECIFICATIONS

POWER UNIT:

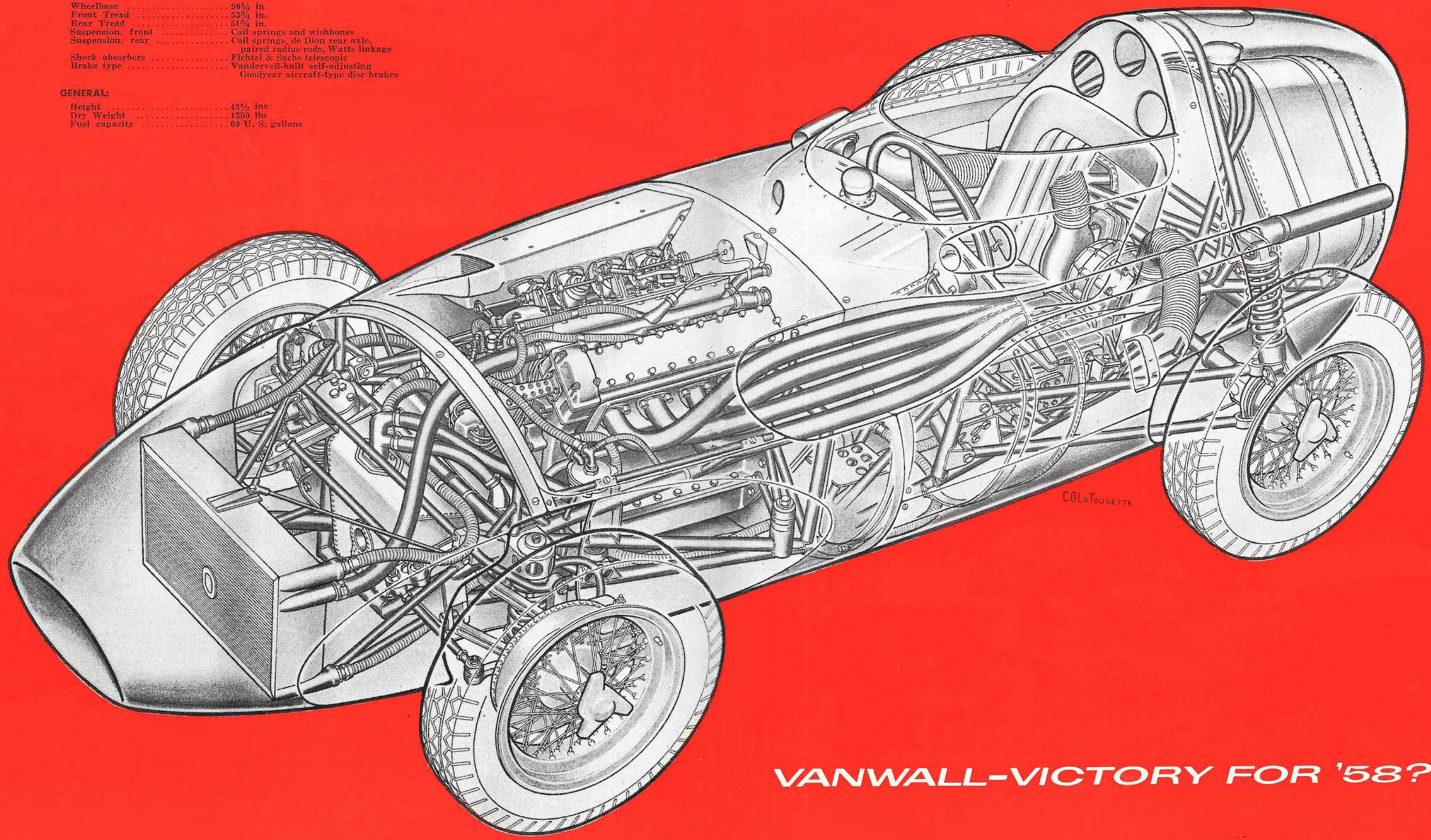
Type	DOHC in-line four
Bore & Stroke	3.79 x 3.39 in (96 x 86 mm)
Stroke/Bore Ratio	0.90/1
Displacement	152 cu in (2490 cc)
Compression Ratio	12/1 to 12.3/1
Ignition by	BTH magneto, eight spark plugs
Carburetion by	port fuel injection, Bosch pump, Amal carb bodies
Max. Power	280 bhp @ 7200 rpm

CHASSIS:

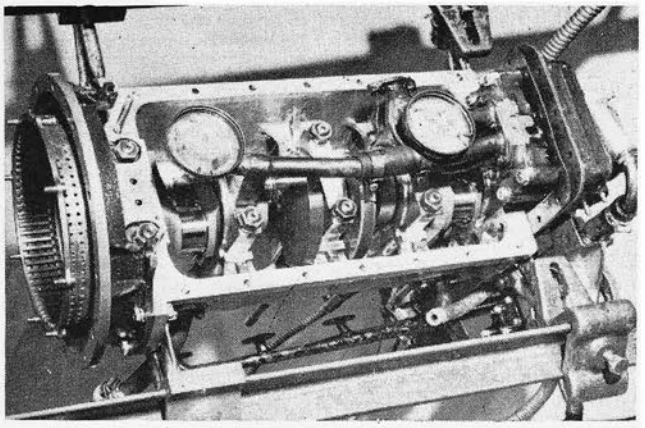
Wheelbase	90¼ in.
Front Tread	53¾ in.
Rear Tread	51¾ in.
Suspension, front	Coil springs and wishbones
Suspension, rear	Coil springs, de Dion rear axle, paired radius rods, Watts linkage
Shock absorbers	Fichtel & Sachs telescopic
Brake type	Vandervell-built self-adjusting Goodyear aircraft-type disc brakes

GENERAL:

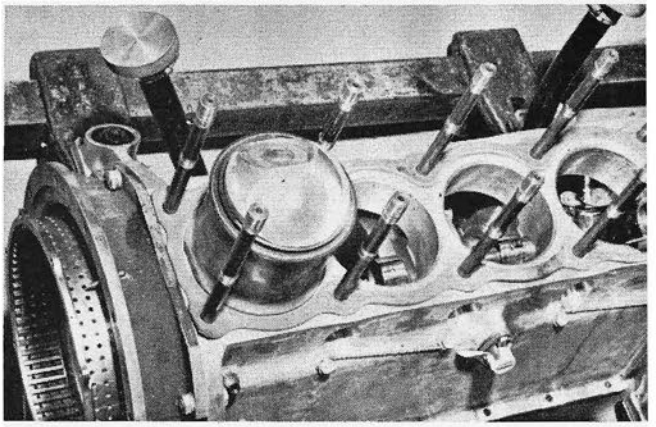
Height	43½ ins
Dry Weight	1350 lbs
Fuel capacity	69 U. S. gallons



VANWALL–VICTORY FOR '58?



Bottom end of the smooth, deep sided crankcase shows how far down the walls extend below the five-main bearing crank. Twin pickups feed the dry-sump oil system.



Top side of the crankcase. Wet cylinder sleeves and water-containing shroud are held to the crankcase by stud pressure. The whole layout betrays its motorcycle ancestry.

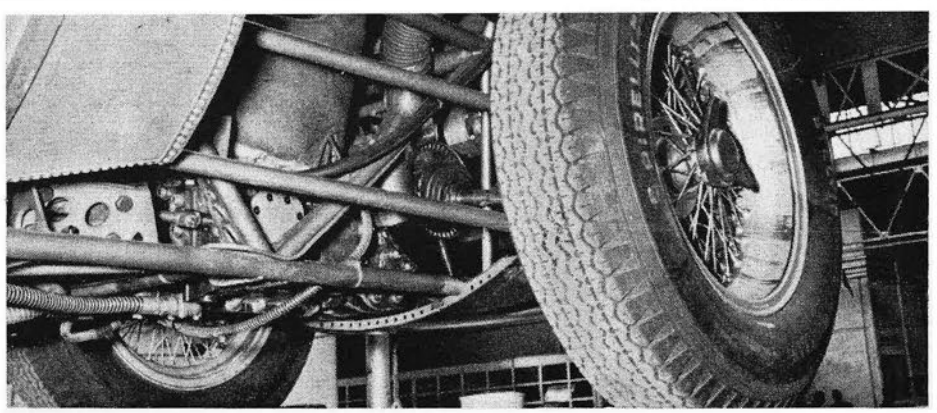
Skirts of the smooth-sided crankcase extend well below the crankshaft centerline, requiring only a shallow sump cover. Plenty of support is provided for the five big mains and the fully counterweighted crank. Also husky are the polished connecting rods, their H-section shanks blending tangentially with the wrist pin end. By modern standards the two-bolt big ends appear small in relation to the bore size, but they certainly seem to do the job.

As an amusing sidelight to this aspect of the Vanwall, we've noticed that any mention of his own cars has been conspicuously absent from Vandervell's ads, while every *other* Grand Prix make has been boosted as a user of the Thinwall bearing – and they do: it's a sound product. This hiatus was filled by the Italian R.I.V. firm, who announced that *their* bearings were used in the Aintree-winning Van-wall! This apparent contradiction is explained when you realize that R.I.V. make ball bearings, which Vanwall does not.

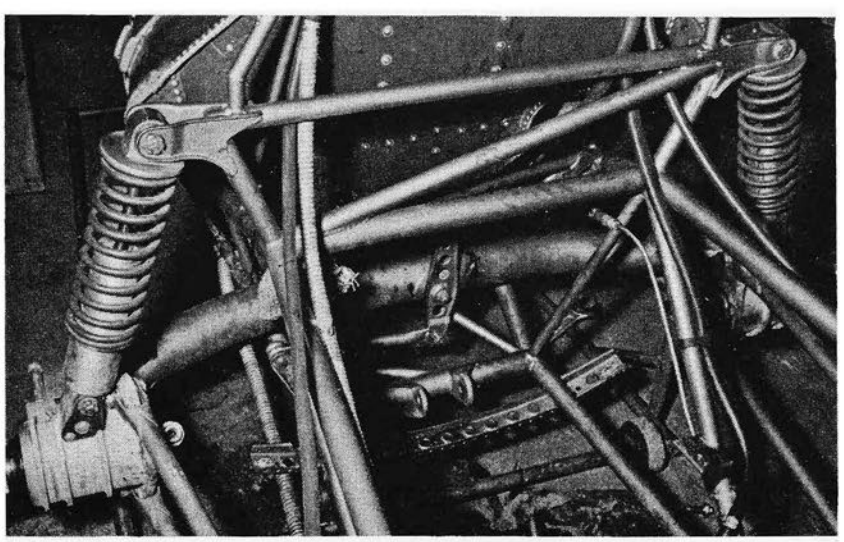
Oil for the dry sump system is stored in a riveted tank ahead and to the left of the engine, while the oil radiator is just above the main core. Flexible hoses supply the big oil filter (on the right) and such specialized points as the injection pump and the two camboxes, which are fed from a block on the right-hand cam tower.

Also betraying their ancestry are the pistons, of light slipper type as used by Norton (and the works Jags, etc.). Two Dykes pressure rings and one oil scraper make up the complement of three rings. The crowns are high and sharply peaked, with deep contoured cutouts for valve clearance.

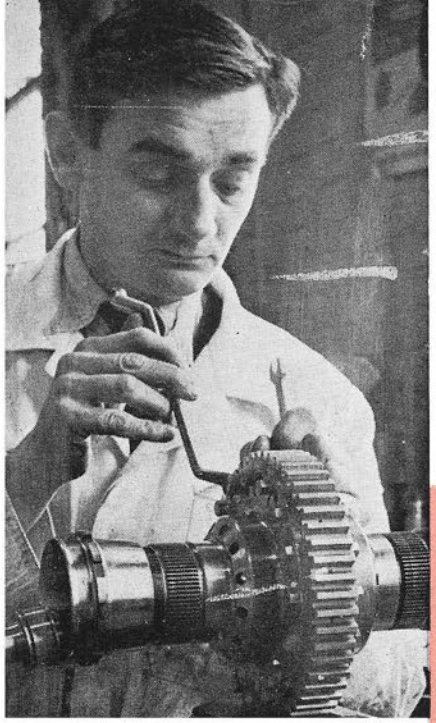
(Continued on page 56)

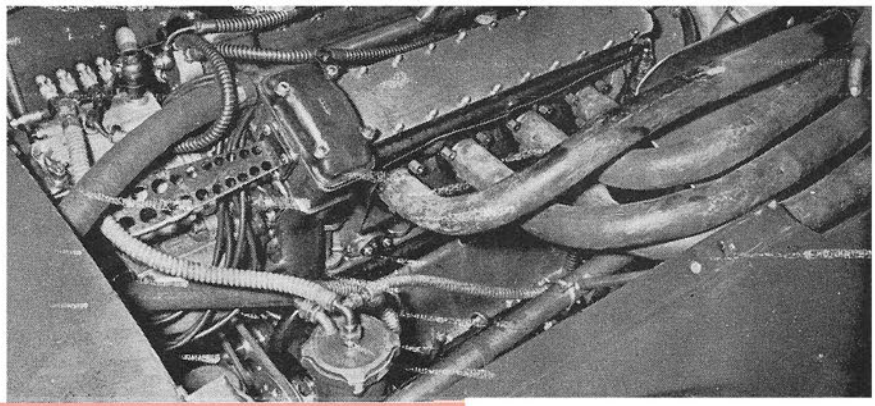


Spot brakes (deep inside) get cooling air from side vents. Air is exhausted upward through low-pressure area in cockpit. Thus the dirty faces.

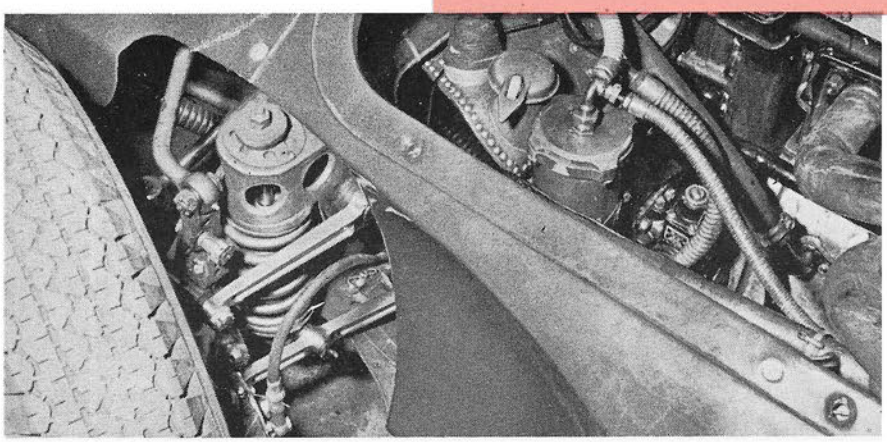


Original DeDion rear suspension was retained but re-interpreted by Colin Chapman. Lateral location is by simple Watts link rather than sliding block, fore and aft location is by long trailing arms—all very simple. Springing is typical of Chapman designs, i.e., coils and shocks mounted integrally.

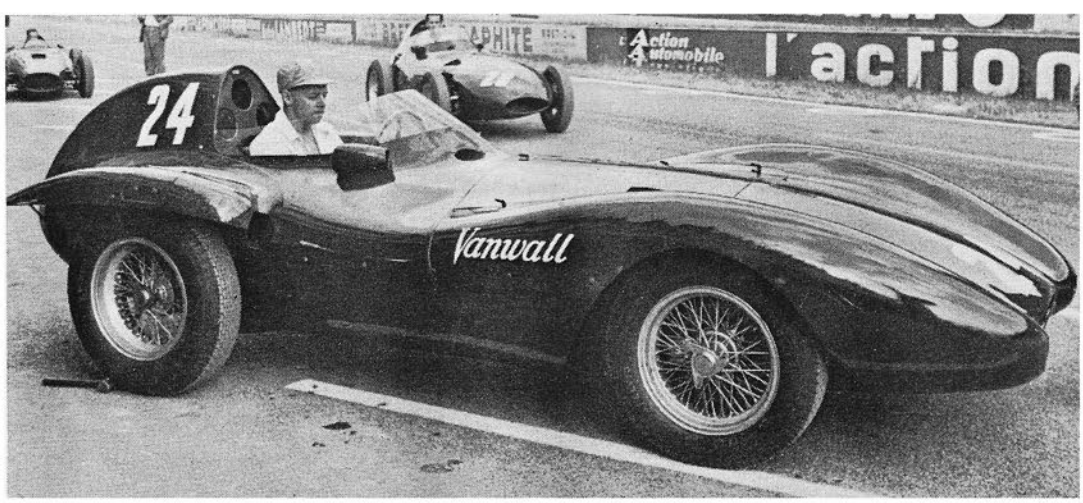




Final drive (left) is by meaty spur gear, standard European practice. ABOVE—Basic engine is starkly simple. Deep cam boxes surmount the very short cylinder block assembly. What looks like four Amal carbs is in reality an injector layout. Exhausts are precisely tuned. RIGHT, Cockpit is all business with no frills. Instruments, left to right, are tach, heat, pressure, oil temp.



ABOVE—Front suspension is also by coil springs and integral shocks with unequal length wishbones. Oil tank and cooler at front of engine. BELOW—Unsuccessful Rheims car.



VANWALL

(Continued from page 37)

The exact shape is determined by more than mechanical requirements, though, many years of development having gone into this combustion chamber design. A prime Norton feature retained by the Vanwall is angling of the intake ports to give more turbulence. Also, toward this end, some portions of the pistons and chambers mate to give modest "squish" areas.

Reduced to its essential functions, the light-alloy cylinder head is a very compact spiky-looking casting with virtually no excess baggage. It's cooled by water from a cowl-mounted header tank and a fully ducted Marston cross-flow radiator. Cooler water comes in low at the left of the cylinder housing, while the hot fluid rises through a manifold between the cams. Coolant temperature at this point seems to be only slightly less important than engine revs in preserving the Vanwall engine, judging by the sizes of the instruments concerned.

All the equipment for opening the valves is housed in Elektron castings which are bolted to the block and head and which deliberately contribute little to the strength of the entire engine. A train of gears rises at the front, with one idler twirling the single BTH magneto which supplies sparks to two KLG plugs per cylinder. Each of the two overhead cams spins in its own case under the cover of a flat plate and a multiplicity of cap screws. Eight studs with supporting flanges hold each case a short distance above the head, with the valve stems also extending up to be capped by short cylindrical tappets guided by the cam cases. This follows the Norton exactly, as does the use of twin hairpin-springs for each valve, placed out in the breeze. In car design this recalls vintage practice, which is nevertheless vindicated in the Vanwall by separation of stresses, light weight, and excellent cooling.

Like the ports the valves themselves are very large in diameter, and have deeply-tuliped and highly-polished heads.

From the first the Vanwall designers adhered to the tuned-exhaust pipe length determined by cycle experience, their exhaust extension being simply a collector to get the *auspuff* away from the driver. However, some additional extractor effect is given by the exact arrangement of the joining wyes.

For 1954 this unique four-barrel was fed by four Grand-Prix-type Amal carburetors, their slide throttles raised by four quarter-pulleys and cables pivoted from a shaft along the intake cam cover. Two Amal float chambers were used, suspended from rubber diaphragms, and big bell-mouthed stacks smoothed out incoming air flow.

Before the '55 season, a far-reaching step was the installation of a Bosch fuel injection pump. Placed just above the magneto, it's also driven directly by the camshaft gear train, and its outer end is supported by a drilled strut from the left-hand cam-gear tower. Each injection nozzle is anchored by two studs to a head passage which opens on the intake port just upstream from the valve seat. The injecting spray probably bounces off the back of the head and the stem of the intake valve. For a long time fuel piping to the nozzles was by metal tubing, resulting in a lot of embarrassing vibration-induced cracks and failures at dramatic moments (as when Moss was leading at Syracuse last spring). Finally, an aircraft-type flexible hose was found for the job.

The Amal carbs and their control system were retained, as a handy way to get slide throttles, but of course they don't feed fuel. An additional lever arm, pull-rod and shaft system regulates the Bosch pump output in proportion to throttle opening. Use of this simple yet effective injection rig, originally developed for Vandervell by ex-Norton engineer Leo Kuzmicki, is the key to the high output of this engine. Until the rest of the Grand Prix world reads the handwriting that Mercedes chalked boldly on the wall well over three years ago, the Vanwall will retain a fundamental advantage which it can increase still more by switching to direct cylinder injection.

For Uncle Tony and his team 1955 was a sporadic season at best. Feeling that he was not accomplishing much as a breaker of throttle linkages and injection pipes, Mike Hawthorn went back to Ferrari in the middle of the year. These detail faults were determined and rectified through regular race entries, and the power matched anything Italian. It was too much, in fact, for the chassis, which didn't surprise the Vandervell staff.

To keep the machine rolling for 1956, the Specialists were consulted. Harry Weslake, England's resident expert on gas flow, took over the detail development of the engine, while Daimler-Benz and Robert Bosch provided useful hints on the art of methanol injection. Most important, Tony placed his entire chassis and body design problem (a weighty package) in the talented hands of Colin Chapman and Frank Costin — creators of the Lotus sports car. Frankly these gentlemen were not then familiar with the speed spectrum ranging up from 120 to 190 miles per hour — at least as related to automobiles — but they were endowed with good sense and a willingness to learn.

Chapman's contribution was the distribution of components and the creation of a lightweight chassis to hold them together. The frame is a very deep space-type assembly of a few moderate-sized tubes (main ones 1¼ inches in diameter) placed to do the maximum amount of work. A stressed drilled sheet low at the front keeps the old Vanwall coil and wishbone assemblies rigidly aligned, while a pyramided cowl structure accepts the high bending stresses at the center of the car. With all attachment brackets the latest frame balances 87½ pounds.

The steering box is placed high next to the right-hand front suspension group, and attacks the wheels through a three-piece track rod. Extending forward virtually parallel with the wheels and inboard from the knuckles, the I-section steering arms give negligible Ackermann effect. The Vanwall's steering is almost disconcertingly light as a result. Ball track rod joints are by Thompson.

De Dion rear suspension was retained, but completely reinterpreted by Chapman. The parallel trailing arms were lengthened and repositioned, and a Watt's link system used for lateral location. Wheels were given strong negative camber, to increase "bite" on the outside. High above the hubs a slim five-leaf spring was transversely mounted between rollers (as is now common) to increase stiffness in roll.

From the first, brackets were provided for the anchoring of coil spring and shock units, which were installed for good at the end of 1956. Lots of research during 1957's practice periods, including some valuable days at the Nürburgring, minimized this layout's teething troubles: front wheel patter and a hesitant transition to the "Grand Prix Slide." Many detail changes, an important one being a switch from Armstrong to German Fichtel and Sachs shocks, allowed Moss to fling the Vanwall around like a Cooper at Pescara.

Frenchman Maurice Trintignant is if anything shorter than Moss, and when he first tried on a Vanwall at Monaco he was dismayed at having to look *through* its high curved windshield. He was no happier when told that its height determined the volume of air that was drawn over the rear brakes, and thus couldn't be changed. This is typical of the taut, rigorous way in which Frank Costin integrated a body with friend Colin's chassis.

One striking feature of the standard open-wheeled Vanwall's aluminum shell is the thorough attention given to underbody streamlining. Other cars have long featured useful belly pans, but we suspect that the deep curve of the Vanwall's underside helps prevent power-wasting pressure buildups between the car and the pavement. Combined with the topside shape, it should also reduce the effects of side winds.

Ducting is ascetically simple. A trapezoidal hole lets air down through a mesh screen into the fibreglas (once aluminum) air box shrouding the Amal intake stacks. Cockpit vent scoops are built into the rear view mirror housings, while radiator air finds its way out to the low-pressure areas at the front suspension openings. The fully-shielded cockpit diverts buffeting winds and is a big plus in driver comfort, but drawing the hot and dirty rear-brake air up that way causes Moss, Brooks, Lewis-Evans *et al* to act as filters for outgoing lining and disc dust, and explains their chimney-sweep complexion at the end of a long grind.

The main 39-gallon fuel tank is stashed in the tail, strapped to a triangulated frame extension. Two 15-gallon auxiliaries are slung outboard on either side of the cowl, with heavy flex hoses to join the three at a selector valve on the right of the cockpit. A big fuel filter and pump are mounted at the engine left-front, and are belt-driven from the crankshaft nose.

Early Vanwalls had impressive but overbearing engine-turned dashboards, which have given way to a more livable flat-black finish. Instruments are tach (either 8000 rpm Jaeger or 9000 rev Smiths), oil and water temperature, oil pressure and fuel pressure. Gear lever is handy at the left, emerging from a simple gate atop a massive cast housing. A tiny handbrake is at the right.

(Continued on page 58)

VANWALL

The smashing Silverstone debut of the "new" Vanwall is now history, as is their brilliant speed during 1956 and their outright 1957 victories against Italy's finest. During '57 Vandervell froze the basic design of his cars, and assigned his designers the advanced task of creating specialized editions to suit particular circuits, as Mercedes had done in 1955. One example was the pug-nosed Monaco team cars, complete with nerfing bars (the year before two Vanwalls had retired prematurely, their long snouts dented during early-lap infighting and the cooling suffering as a result).

Most outlandish Vanwall machine, though, was the Reims "streamliner." Costin must have had a ball with this assignment, for he brought forth a highly-original interpretation of a racing car. Front wheels were fully enclosed by sweeping fenders, pierced at the nose by three intakes for brakes and engine. A curious clamshell-like lid capped each rear wheel. The impression was of a vehicle that might easily become a potent sports car if its builder willed it — though this is not likely, at least in that form. Evaluation of the Reims variant was made impossible by confusion over gear rations and engine power; but frankly it did not seem to be a success.

As we write, Vanwall plans for 1958 are not finalized, but the big problem for all G.P. entrants will be conversion to 100 octane gasoline. Other things being equal, the most successful gas-fuelled car is usually the one with more cylinders (and thus smaller combustion chambers, which can swallow higher compression ratios without preignition). The Vanwall, with four barrels, thus looks bad next to the V-8 Ferrari and V-12 Maserati.

Two big factors will stand in its favor: Vandervell's great familiarity with fuel injection, and Weslake's long experience with Jaguar's sports/racing cars. There's already a striking similarity between Vanwall and Jaguar combustion chambers, and it may be more marked soon. No, even without a new engine they can't be counted out.

Chapman has now experienced the new challenges of the super-speed ranges, and is rumored to be at work on a lower, more compact toy for Uncle Tony. If so, it will be built with the detail care and fine finish shown by most Vandervell machines so far, and nothing will be spared to service and repair it properly.

From this humble seat we can't predict the Vanwall '58 fortunes, but if, as strong rumor has it, a canny old Argentine seer appears on the premises, with helmet in hand — well, that'll be *their* turn for the Championship, that's all.

Karl Ludvigsen

TRIUMPH TR3

conditions. Within a split second a dog ambled into our path. We stepped on the brakes — hard — and the TR3 stopped *straight* in a distance that seemed no longer that if we had been on dry concrete. It's pretty hard to do better than that.

In order to determine just how well our TR3 handled, we then took it racing (against the clock) at Lime Rock. When we drove through the gate, we were somewhat perplexed to find that part of the track was covered with *snow;* nonetheless we had a crack at it.

The steering is very quick, and when cornering at low speeds there is a tendency (or a need) to straighten the car out a bit after it's been committed to a line. However as the speed picks up, this necessity seems to disappear, and tracking is quite easy. It's a stiff-feeling wheel, with no play and very little return, but it feels good regardless of vehicle velocity.

We ambled around the course a few times, and on one turn a combination of road ice and driver enthusiasm sent the tail out a little too far. Fact is, we spun. But the important thing is that we spun *flat* — it never even came close to going over, and we always had it under control even when it was out of shape. And despite the biting cold weather, the heater kept us comfortable.

The interior is finished in leather, with rubber mats on the floor. It's a lot easier to get into this TR3 than it was last year, because real, honest-to-goodness twist handles have been placed on the outside of each door (ever close the doors with both curtains snapped shut?). There is a large range of seat adjustment, enough to cater to anyone under seven feet tall. The seats are soft, bucket-type, placed so that there is plenty of elbow room.

And there's also room under the hood to get at and work on the engine. The plugs are in the open, as well as the SU's, carb linkage, battery, hydraulic fluid etc. When we completed the first of our high-speed runs over the SCI course, and turned around for the return, the engine developed a terrible miss. The Tech Editor raised the hood, located the trouble, and secured the hood within one minute. The trouble was in a carb dash pot that had loosened. He didn't even need a light.

There is one thing about the car that we complained about last year, and we will have to pan again. The exterior of the doors are curved surfaces, however the mating surfaces of the side curtains are flat. The result is that the surfaces meet only at the center, allowing cold air to channel onto the back of the neck. We made the car very comfortable by stuffing two wool mufflers into the gaps, however it seems a shame that Triumph couldn't either have curved the side curtains to the contour of the door, or installed a simple piece of insulating rubber.

On the other side of the ledger, the things that impressed us most was the excellent quality control at the Coventry works. The dash panel is fitted with finely made instruments, and you get the feeling that if you own a Triumph for a hundred years, nothing is going to fall off of it. This, unfortunately, can not be said of all our domestic automobiles.

Last year's TR3 sold for $2625; this year's sells for $2675. It would appear there is a price increase, but we don't think so: you get more automobile. The improvements and conveniences that were put on at the factory would cost more than fifty dollars, even the do-it-yourself way. And every one of them is worthwhile.

—Len Griffing