NEW RACING CARS — McLaren Indianapolis & F1 March 711, BRM P160

McLAREN M16

WE CALLED on McLaren Racing in the depths of an industrial estate at Colnbrook, almost in line with one of the main runways of London's Heathrow airport, and were just in time to see the first of the 1971 Indianapolis cars before it was air-freighted to America to begin test runs at Ontario Speedway in California. Had it not been painted bright orange and fitted with a four-cylinder Offenhauser engine we could have been excused for mistaking it for a Lotus 72, with its wedge nose and side radiators! Designated the M16 this wedge monocoque has the 2.6-litre exhaust turbo-charge four-cylinder Offenhauser engine attached to the rear bulkhead, with a supporting tubular frame holding up the bell-housing, to which a Hewland LG500 four-speed gearbox is attached. The front suspension has coil spring units operated by rocker arms and the rear suspension, of typical Formula One basic layout, is inter-connected with a link mechanism which reduces the camber-angle of the left-hand wheel as the body rolls on the Indianapolis corners. Last year the Indianapolis McLarens had a driver-controlled system of jacking for the front suspension to maintain a constant ride-height as the fuel-load reduced, but this has been abandoned as the drivers found they were too busy driving to think about using the control.

The M16 has a wheelbase of 101 inches and front and rear tracks of 58 in., while the Offenhauser engine is quoted as giving 700 b.h.p. at 9,000 r.p.m., running on American air-and-methanol-based fuel, for no one has ever had one of these engines on a European test-bed as far as we know. However, a realistic power output, with reliability for 500 miles of racing is around 670 b.h.p. on methanol fuel, which last year was pushing the McLaren down the Indianapolis straights at a quoted 215 m.p.h. With the exhaust-driven turbo-supercharger blowing air into the engine and the Hilborn injection squirting fuel into the inlet ports it is possible to adjust things for vast reserves of power which are only limited by the mechanical strength of the engine. The turbo-supercharger has an enormous pressure-release valve on the side and this can be screwed in and nitro-methane fuel powered through the injectors until the engine destroys itself. Before, the big bang outputs of 750 b.h.p. have been obtained quite easily, especially with the short-stroke Offenhauser, which can run up to 9,400 r.p.m., but four laps of qualifying would be about the limit of safety.

Once again Reynolds Aluminium and Goodyear tyres are sponsoring the McLaren cars at Indianapolis and they will be driven by Hulme and Revson. The urgency of racing programmes was brought home by the fact that when we saw the car it was still waiting for its engine cover and integral wing, and as we finished looking at it it was whisked away and flown off to America, where it was due to start testing, while the second car was being built. At the Ontario track Hulme was very happy with the feel of the car at "shake-down" lap speeds of around 177 m.p.h.

McLAREN M16—Lightweight Indianapolis contender.

McLAREN M19

THE McLaren Racing team completed a brand-new Grand Prix car, which Hulme will drive this season, by mid-February and had it out on test well before it was due to go to South Africa for the first Grand Prix. Since Marquart left the firm the design of the Formula One side has been taken over by Ralph Bellamy, who was previously with Tauranac at Brabhams. The 1971 McLaren is an entirely new car, not a rehash of the 1970 model, and its principal interesting feature is the suspension system. The monocoque chassis

McLAREN M19—Interesting suspension for F1.

is bulbous and pear-shape in section, not unlike the Brabham and BRM of last year, and the layout follows the conventional form with respect to the Cosworth V8 engine/Hewland gearbox aggregate being bolted to the rear bulkhead of the monocoque. In accordance with the manufacturer's agreement the outer panelling of the monocoque is in 16 swg aluminium. The wheelbase is now 100 inches and the track 63 inches at the front and 62 inches at the rear. There is quite a large space between the back of the seat and the rear bulkhead and, apart from containing a 15-gallon fuel tank, with 15 gallons on each side of the cockpit, this space also contains the fuel filler and various electrical oddments. The radiator is conventional in the nose with air outlets on top of the nose cowling, while the Lockheed front disc brakes are hub-mounted and the rear ones inboard on each side of the gearbox.

The suspension breaks new ground for the coil-spring/shock-absorber units are mounted inboard as sprung weight both front and rear, but more important they are operated through a link mechanism which gives a progressive movement to the spring unit, ranging from maximum travel at normal riding altitudes and minimum movement when the suspension nears the end of its travel. This is achieved by means of a swinging link pivoted on the chassis which is operated at the front by an inner extension of the top wishbone. At the rear a push-rod from the suspension operates the swinging link, the rear suspension being orthodox lower wishbone, upper transverse strut and two radius arms on each side. At the front there is a normal lower wishbone, while at the top the rocker arm member is fabricated from small diameter tubing.

As with all the McLaren racing cars the detail work is a joy to see, the standard of finish being very high indeed. The first M19, using one of the team's pair of 1971 Cosworth DFV engines will be raced by Hulme, while Gethin will use one of the 1970 cars to begin with. The McLaren spare engines will be prepared by their own engine department. Sponsorship for this new orange car continues to come from Goodyear, Gulf Oil and Reynolds Aluminium, the monocoque being built from the Reynolds company's NS4 specification 16 swg aluminium. The wheels are 13-in. diameter of cast-magnesium with peg drive and knock-off wheel nuts, while alternative 15-in. ones are available for the rear. Adjustable nose fins are used on the fibreglass body and the rear aerofoil is mounted above the gearbox, supported on two fixed-length struts at the rear and a central adjustable one at the leading edge. Overall length of the car is 160 inches and the maximum width of the monocoque is 42 inches, the weight being quoted as 1,230 lb.

MARCH 711

THE 1971 series of March Formula One cars, designed by Robin Herd, shows a new approach to chassis layout, not new in racing, but new to the Bicester factory. It is not possible to get excited about inboard front brakes and side-mounted radiators, but none-the-less this is what the 711 has, though it does not have the Lotus 72 wedge nose. Instead it has a stumpy, bulbous nose cowling with a unicorn like protuberance on it carrying a remarkably large aero-dynamic fin. The monocoque centre-section is very low and flat with the narrow cockpit sticking up like a streamlined conning-tower that merges into a head fairing which in turn merges into a very full engine cover and rear aerofoil. The head fairing is shaped so that the back of a Bell-star crash-hat fits into it like an egg in an eggcup.

With the inboard-mounted 10½ in. ventilated front disc-brakes and the drive shafts where the suspension normally goes, the coil-spring units are mounted inboard ahead of the front bulkhead and are operated by an extension of the front of the upper wishbone, in a similar manner to that employed on the un-raced Cosworth 4-w-d car, which Herd also had a hand in designing. The engine/gearbox unit forms the rear of the chassis, being bolted to the rear bulkhead of the monocoque and orthodox Formula One rear suspension is hung from the bell-housing and gearbox, the inboard rear brakes being mounted on each side of the Hewland 5-speed FG 400 unit.

The first car has been built using an Alfa Romeo V8 engine, while the remaining cars will use Cosworth V8 engines, and once again the works team have the backing of STP and will run under the name of STP-Oil Treatment, painted bright red. Andrea de Adamich will drive the Alfa Romeo-powered car and Peterson and Quester will drive the Cosworth-powered cars, although the last-named driver has been suffering from "on-off-on" contract trouble and the truth will not really be known until March 6th, when the three works cars take part in the South African GP. The wheelbase of the 711 is 96 in. and track front and rear is 60 in., with an overall length of 156 in. and an overall height of 36 in. to the top of the roll-over bar. The Cosworth engine is quoted at a bore and stroke of 85.6 × 64.8 mm. and the Alfa Romeo at 86 × 64.4 mm., and as the chassis of 711/1 and 711/2 are identical it will be interesting to compare the two cars.

Whereas the March 701 utilised the body shape to provide down-thrust from the flow of air over it, the 711 has been made much smoother and more "slippey", the large nose aerofoil and the complex rear aerofoil provide all the down-thrust, and it is unusual and a nice change to see a Grand Prix car designed with a body that starts at the nose and ends at the tail, instead of just behind the driver's head. Air to the engine inlet trumpets is taken in through ducts in the leading edge of the engine cover.—D. S. J.

MARCH 711—Aerodynamic special?

BRM P160

FROM the grandstands the new BRM P160 will be hardly discernible from last season's P153 apart, perhaps, from the fact that the legend on the side of the gaily-painted monocoque reads simply "Yardley-BRM" for the word "Team" has been dropped. In fact, the Owen Organisation's young designer Tony Southgate has produced a development of the P153 using very much the same design philosophy but utilising very few of the parts from the older car.

The open bathtub, semi-monocoque-type chassis is retained but this year it is even wider with an increase of 4 in. making the width now 47 in. In an attempt to get the weight further back the wheelbase has been increased by an inch to 97 in. The car has also been flattened slightly; the nose and cockpit are now 1½ in. lower. A new up-and-down-flow aluminium radiator which is more steeply raked than before assists in this process, while the water rails are now mounted under the chassis frame. Also in an attempt to give the car smooth lines the oil tank has been streamlined and fits directly behind the gearbox.

There are also constructional changes to the monocoque which is now built wholely from 18 gauge L72 alloy sheeting rather than the thinner 20 gauge of last season's car. Also the front bulkhead is now box-sectioned sheet rather than the previously used steel tube frame, although tubing is still used in the rear bulkhead.

The same conventional outboard wishbone and link suspension system is employed, although, for this car, different geometry has been used so new uprights front and rear are utilised along with new wishbones, and so on. The uprights retain BRM's idea of using needle-roller bearings in the hub at both the front and rear, while the anti-roll bars are mounted underneath the suspension. The lower radius rod on the rear suspension now picks up on a lug on the engine rather than the monocoque tub.

The suspension both front and rear is no longer "fully" adjustable —a phrase which seems to appear on so many racing car brochures from Formula Ford upwards. Southgate is of the opinion that he has done his sums correctly and that giving adjustment at every joint for an infinitesimal number of combinations of camber, castor and toe-in will only confuse matters. Hence many of the joints, particularly at the chassis end of the wishbones at the front and top link and wishbone at the rear, are non-adjustable. As long as the sums *are* right this is a welcome step giving drivers less to theorise about and more time to get on with racing.

The rear brakes have been moved inboard to come in line with recent thinking and are no longer of the ventilated type but the front brakes are still ventilated and remain outboard.

BRM have retained the lightweight aluminium Koni shock-absorbers, the titanium springs which only weigh 15 oz. each and various other titanium parts which all help to give the car a very low unsprung weight.

One intriguing new idea on the car concerns the rear-mounted aerodynamic wing. The leading edge of the wing has several slots in it through which air can pass. Sandwiched inside the wing are two rows of heat exchanger-type radiators through which the engine oil is passed. Southgate says that this eliminates a lot of the drag produced by tacking on a couple of conventional oil radiators in the air stream while the efficiency of the wing is not impaired. The idea is yet to be tried and provision has been made for more conventional oil cooling if necessary.

A second interesting feature of this car will not be incorporated until a later stage in its development. This is a hydraulic jacking device which works on both the front and rear suspension and maintains the ride height at a constant level as the 50-gallon (340 lb.) fuel load reduces. A similar idea was tried on last year's McLaren Indianapolis car, but this operated on the front suspension only and was supposed to be activated by the drivers who actually found they were too busy with other problems to worry about it and hence the idea was dropped. But the proposed BRM system will be automatic and will be set in action on the grid when Southgate, or one of the mechanics, "lights the blue touch paper".

BRM retain their own V12, 60°, 3-litre engine and during the winter have worked on modifications to improve the reliability and extend the power range. There have been some material and minor design changes while a lot of time has been spent on the exhaust system, which now boasts of four megaphone secondary pipes which should give the engines a very distinctive note. The Mk. II cylinder heads, which were tried briefly towards the end of last year, have undergone various changes in the port and valve areas and should be in use regularly once the season has got under way.

Along with Ferrari, BRM are the only Grand Prix team who build their own gearboxes and retain a gearbox designer—Alex Stokes. For the new car he has redesigned the box utilising a smaller casing which incorporates the lugs to take the inboard rear brakes. The rear cover has also been shortened and the position of the selector arm moved into the rear cover. Thus the three selector shafts are reduced in length but otherwise the internals remain much the same as before, including the recirculating oil system with cast-in oil ways.—A. R. M.

BRM P160—Development of 1970 car.

■ **MARCH MOVEMENTS.**—While visiting the factory of March Engineering Ltd. at Bicester to see the first of the 1971 Grand Prix cars being built we took the opportunity of finding out what has happened to all the March 701 Grand Prix cars built last year. In some of the races the March contingent of works cars and privately-owned ones was very similar to the Lago-Talbot scene in the Grand Prix races of the early post-war years and the 250F Maserati scene in the races of 1954-58. A further similarity to the Maserati days was the facility that March offered to customers in that they could send their own mechanics to the factory to complete the original building or later overhauls. A total of ten March 701 cars was built during 1970, given a simple numbering system from 1 to 10. The factory team used 701/1 and 701/5 for Amon and Siffert, respectively, and had 701/6 with a lighter monocoque as a spare and test car. Ken Tyrrell bought 701/2, 701/4 and 701/7 for his drivers Stewart and Cevert, and Andy Granatelli bought 701/3 for Andretti, 701/8 was driven by Peterson under an arrangement between March and Colin Crabbe, and 701/9 was sold to the Rhodesian Team Gunston for John Love to race in S. Africa; 701/10 was built and sold to Hubert Hahne, but never raced, and the lawyer's pantomime over this car was typical of the 1970 Grand Prix season.

During the season many of the cars were modified or crashed and underwent rebuilds ranging from new wishbones to complete new monocoques, but whatever happened to the car March Engineering insisted that it kept its original works number; 701/1, 701/3 and 701/9 all underwent rebuilds involving new chassis monocoques. During the winter a number of the cars changed hands, one changed its character completely and a brand-new car was built for a private team, this being 701/11. Tom Wheatcroft, the Leicestershire builder and Grand Prix car collector, has bought 701/1, which he displayed at the Racing Car Show in the centre-piece and let Derek Bell drive in the January race in the Argentine. Tyrrell was trying to sell all or any of his three cars, but having said that he got Gardner to design the Tyrrell Grand Prix car because the March was not competitive; he is not likely to find a surfeit of customers at his price. The STP-Oil-Treatment-Special, number 701/3, was rebuilt with a new chassis and a 2½-litre Cosworth V8 engine and Amon and Oxton drove it in the Tasman races for STP. Siffert has bought 701/5, the car he raced last year, which he ran himself in the Argentine and will run in Swiss hill-climbs this year. The thin-gauge chassis car 701/6 has been acquired by Frank Williams for use by Pescarolo until a 711 is ready, and 701/8, which was yellow and maroon last year and is now red, has been rebuilt with a V8 Alfa Romeo engine installed as a test vehicle for the March/Alfa Romeo contract; 701/9 is still in S. Africa and the unraced 701/10 is still in Germany with various people sniffing around it and making offers.

The new March 711, described in detail elsewhere, is being built in five examples, 711/1 having an Alfa Romeo V8 engine for de Adamich to drive, 711/2 will be the first Cosworth-powered works car, and 711/3 the second Cosworth-powered works car, 711/4 will be a similar Cosworth-powered car for the Williams team and 711/5 will be a spare works car.