

THE SCIENCE OF SPEED



If the sporting aspect is disregarded and racing is viewed solely from the scientific angle, it might then be defined as the severest possible test in the shortest possible time. Every part of the engine unit, the gear-box and the back axle, and every accessory used in or on the car, must stand up to stresses far beyond those that are ever imposed upon an ordinary car in ordinary use.

High speed is the supreme test of quality. This is certainly so in the case of one component—the lubricating oil. The “responsibilities” of the few quarts of oil that pulse furiously time after time through the feedways for hours on end in a race such as the 500 miles are enormous. The oil might, indeed, be likened to the human blood stream, the oil pump to the heart. Failure in either case has consequences that are sudden and serious.

Oil that will stand up to racing tests has a correspondingly greater factor of safety in ordinary use. It is for that reason that the Wakefield Company have always made it a rule to make available to the public the same standard grades supplied for racing. When, for instance, Sir Malcolm Campbell made his new world record of 276 m.p.h. at Daytona, he used supplies, shipped to him in advance, of the same Patent Castrol that was then being delivered to garages in

No. 1 OF A SERIES, EXCLUSIVE TO “SPEED,” DESIGNED TO SHOW WHAT THE PRIVATE MOTORIST OWES TO RACING

LUBRICATION

THE BLOOD-STREAM OF THE ENGINE

By

AN OIL EXPERT

readiness for its announcement to the public a few weeks later.

Oil, whether in the engine of “Blue Bird” or of the most prosaic family saloon, has several functions to perform: it must serve as a buffer between moving parts to prevent friction; it must carry away the immense heat generated; it must protect the engine, particularly the cylinders, from the effects of corrosion, a cause of wear which until recently was little suspected, but is now receiving the attention of the Institution of Automobile Engineers and independent investigators in all branches of the motor industry, and, lastly, it must prevent the formation of sludge.

In the prevention of friction, the essential quality demanded of the oil is that it shall retain its viscosity or “body” at high working temperatures. All oil must vary in viscosity as the temperature rises or falls, but modern high-grade lubricants can be relied upon to resist this natural and general tendency to

“thin out” with an increase in temperature.

The retention of fluidity at low temperatures is not, perhaps, of first concern to the racing motorist, as starting troubles do not loom so large with him as they are liable to do with the ordinary private motorist. Nevertheless, fluidity at low temperatures has to be considered jointly with the need for “body” at high temperatures, and it is a significant fact that the poorer grades of oil, such as are sold cheaply to unwary private owners and are never to be seen on the race track, suffer almost invariably from the fault of low viscosity at high temperatures and unduly high viscosity at low temperatures—the reverse of what is desired.

The question of cooling is one of vital importance to the racing motorist. It is a common occurrence for cars to retire from a race because of big-end trouble, which is, of course, directly due to over-heating. Cooling is not a matter only of how much water is circulating through the cylinder jacket, or the temperature of the air rushing through the radiator honeycomb; to a far greater extent than is generally realised cooling depends on the oil that is circulating on the cylinder walls and on every bearing.

Were it not for this constant flow of comparatively cool oil,

(Continued on page 28)

THE SCIENCE OF SPEED

(Continued from page 27)

no engine designed for ordinary touring, not to speak of racing, could run for more than a few minutes without over-heating and ultimately failing.

Lubrication experts, therefore, look on racing at Brooklands, and elsewhere, not as a sporting event, but as a scientific experiment. Yet, while racing provides a stiff enough test of the cooling properties of the oil, flying provides one that is even more severe. If the 500 Miles Race were to be regarded, so to speak, as a practical "heat test," then high-altitude flights might aptly be described as "hot-and-cold tests," since at heights of 30,000 to 40,000 feet the extremely rarefied state of the atmosphere makes the wildest paradoxes come true.

It is necessary to adjust the machine to conditions which reverse the laws of Nature, as they are understood at sea level.

At heights of between five and six miles up, the air is so thin that without special supplies of oxygen, human beings would quickly succumb from exhaustion, and without electrically warmed clothing would be incapable of withstanding temperatures of round about 100 degrees below freezing point.

In spite, however, of this bitter cold, the rarefied atmosphere at these enormous heights will not cool aeroplane engines half so effectively as a normal air supply over 100 degrees warmer.

Cooling in any internal combustion engine is a process of heat dissipation. The heat from the piston, for example, passes through the oil to the cylinder wall, and so outwards to the air, either through the water in a water-cooled unit, or direct in the case of one that is air-cooled.

Whatever the preliminary stages, all cooling must end in the dissipation of heat through the air. Obviously, therefore, if there is very little air, very little heat is carried away. As everyone knows, the reason why coffee remains hot in a thermos flask is because the inner and outer walls are separated by a vacuum.

A new function nowadays demanded of the oil is the prevention of cylinder corrosion. Research has proved that cylinder wear is not the simple result of friction, but is very largely due to the actual eating, or "rusting" away, of the metal by the products of combustion. It is with the special object of preventing corrosion that chromium, which is the active constituent of stainless steel, has been added to the new Patent Castrol in the form of a compound perfectly soluble in the oil, which protects the working surfaces of the engine by means of an invisible oil dispersed film.

To overcome the closely allied problem of sludge formation, the new oil contains also traces of a soluble compound of tin. The cause of sludge is oxidation, which means that the oil absorbs oxygen and changes chemically by a process very similar to the rusting away of a piece of iron. The tin compound in the oil serves the purpose of an anti-oxygen agent, or inhibitor, which prevents the oil from combining with the oxygen, and at the same time remains dissolved in it without in any way impairing its lubricating properties.

From the point of view of racing, these special anti-sludge properties are of obvious importance, since they offer an additional safeguard against gummed piston rings and choked filters and oil ways.

Apart from its use in Sir Malcolm Campbell's "Blue Bird," the new patent oil introduced by the Wakefield Company was subjected to searching tests comparable with those imposed on the race track before it was introduced to the public.

In a letter received by the Wakefield Company, the Engineering Laboratory at Cambridge University describes two tests in which a four-cylinder engine of 847 c.c. was lubricated first with untreated Castrol XL as a reference oil, and then with the corresponding patent grade. Each test, consisting of 100 hours' running at 4,000 r.p.m., was the equivalent of a 6,000

mile long-distance record at an average speed of 60 m.p.h. continuously up a gradient of 1 in 39.

In Class G, in which, of course, an engine of this size would rank, 60 m.p.h., were it to be achieved on the race track, would beat the existing international record (for 5,000 miles) by an average of very nearly 10 miles an hour.

Although carried out under relatively easy conditions on the bench, and not on the track, each of these 100-hour tests still represents an unusually severe "caning" of the engine, the oil and other accessories. For the new oil the test was particularly severe, since it involved a comparison under identically the same conditions, not with an inferior oil, but with the famous Castrol XL.

This comparison, nevertheless, revealed a marked improvement in the new oil. Carbon deposit was not only less, and in some places quite negligible, but also differed in character, being softer and more easily removed. Wear on the cylinder bore was "unmeasurable."

Weighing the piston rings before and after the run indicated that the new oil reduced wear by no less than 27 per cent. Lastly, the test revealed a 50 per cent. reduction in oil consumption.

This is but one of the many tests that have been carried out on the bench, on the track and in the air with the new oil. It gives a picture of the practical part which high-speed performance, whether on the race track or in the workshop, has to play in the preliminary stages of an oil's evolution, "from test tube to tin." It is by actual experiment of this type that chemists and engineers can guarantee efficiency and safety.

As speeds grow higher, lubrication will become even more a factor to be reckoned with. Hitherto the engineer has designed his new engine, and the lubrication expert has evolved an oil to suit. But it is possible to conceive of a time when the tables will be turned, and the engineer will come to the chemist with the request: Give us the oil we need and we shall produce the engine.

THE INTERNATIONAL TROPHY RACE

BROOKLANDS JUBILEE DAY



Luis Fontes, 1st



Freddie Dixon, 2nd



E. R. Hall, 3rd



Gino Rovere—in the 1100 cc Maserati approaches his channel.

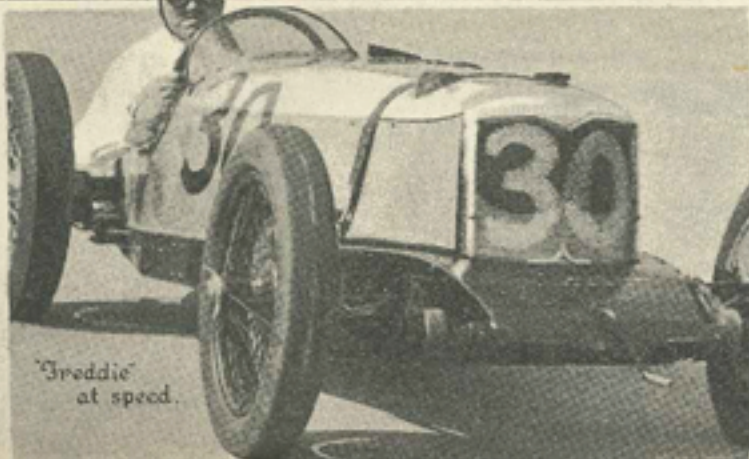


A fine view of the ever-spectacular massed start.....

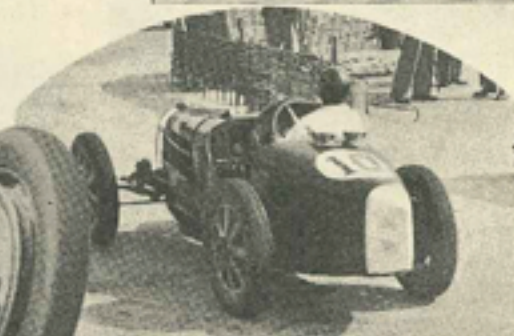
RESULTS :

	m.p.h.
1st—L. Fontes (Alfa Romeo) ...	86.96
2nd—F. W. Dixon (Riley) ...	85.76
3rd—E. R. Hall (M.G. Magnette) ...	85.37
4th—Mrs. E. M. Wisdom (Riley) ...	84.15
5th—R. O. Shuttleworth (Alfa Romeo) ...	83.91
6th—Sir Malcolm Campbell (M.G.) ...	82.96
7th—Miss D. Evans (M.G.) ...	80.63
8th—G. Manby Colegrave (M.G. Magnette) ...	80.04
9th—H. G. Dobbs (Riley) ...	79.87
10th—H. W. Cook (E.R.A.) ...	79.79
11th—D. Letts (M.G. Magnette) ...	79.63
12th—H. W. Cook (E.R.A.) ...	75.76

Team Award : M.G. Team (Donald Letts, K. D. Evans and Miss D. B. Evans)



'Freddie' at speed.



Austin Dobson (1010) who was so unlucky to be put out of the running with Gear-Box trouble when lying third, three laps from the finish.

THE



SOME OF THE DRIVERS WHO WILL COMPETE ON JULY 6th



G. S. Siston.



E. R. Hall.



E. K. Rayson.



W. L. Handley.



Norman Black



P. G. Fairfield.



D. G. Evans.



K. D. Evans.

BRITISH EMPIRE

THIS year's British Empire Trophy Race, which the British Racing Drivers' Club is to run at Brooklands on Saturday, July 6th, should prove to be the most thrilling series of races ever run at the Track.

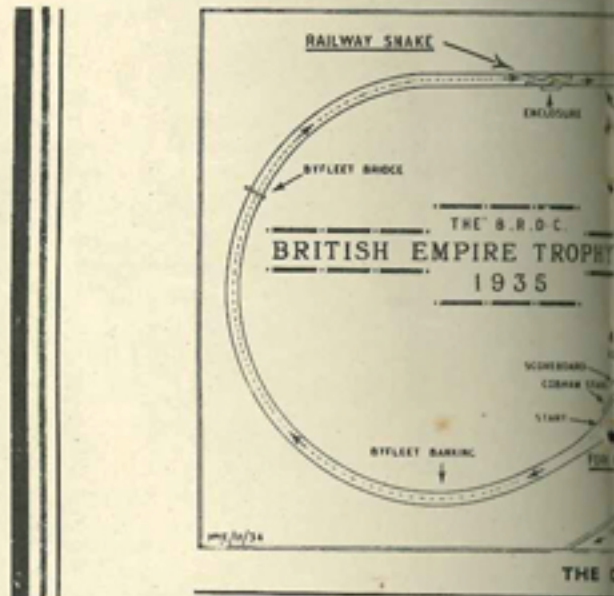
The course has been considerably stiffened, as will be seen from the plan which accompanies these particulars.

The whole of the outer circuit will be utilised as in the past, there being a snake turn half-way down the Railway Straight, while the corner which last year was met at the point where the old Finishing Straight joins the main track, has this year been considerably modified, and cars will turn right, into the old Finishing Straight, proceeding down very nearly to the main entrance to the Paddock, where they will round an acute left-hand hairpin bend which will be followed by the clockwise turn under the Members' Bridge on to the Home Banking.

After the fast stretch off the banking down to the fork, the cars will have to negotiate the same double bend as that which was planned for them last year, proceeding thence by way of the Byfleet Banking, to the Railway Straight Bends to which reference has already been made.

The start and finish will take place on the short stretch between the Fork Hairpins and the Byfleet Banking, and the race consists of 80 laps which totals a distance of 240 miles.

The first car will be despatched



THE HANDICAP ON HORSE-POWER

Capacity.				Non
Up	to			M.
Up	to	750 c.c.	...	36
"	"	1,100 c.c.	...	36
"	"	1,500 c.c.	...	29
"	"	2,000 c.c.	...	26
"	"	2,500 c.c.	...	24
"	"	3,000 c.c.	...	24
"	"	3,500 c.c.	...	20
"	"	5,000 c.c.	...	20
Over		5,000 c.c.	...	20

at 2.30 p.m., the remainder of the field following at the intervals provided for by their respective handicaps.

The entries will be divided into the following classes: Class "A," cars with engines exceeding 8,000 c.c.; Class "B," cars with engines exceeding 5,000 c.c. and under 8,000 c.c.; Class "C," cars with engines exceeding 3,000 c.c. and under 5,000 c.c.; Class "D," cars with engines exceeding 2,000 c.c. and under 3,000 c.c.;

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G. E

RE TROPHY RACE



shown in the centre panel, beneath the plan of this year's course.

The handicap for next month's race provides that the 1,100 c.c. unsupercharged cars and both the blown and unblown 750 c.c. classes, all have to average 77.14 m.p.h., while the unblown 1,500 c.c. cars have to average exactly 80 m.p.h. against a speed of 81.20 for the supercharged 1,100 c.c. and unsupercharged 2,000 c.c. cars. The supercharged one-and-a-half litres and the unsupercharged 2,500 c.c. and 3,000 c.c. cars have all been set a speed of 82.44 m.p.h., while the unsupercharged cars in all the remaining classes share with the supercharged 2,000 c.c. class, a set speed of 84.37 m.p.h.

BROOKLANDS

SATURDAY - JULY 6th - 1935
Starting at 2.30 p.m.

THE BRITISH EMPIRE TROPHY



Handicap.	Starting Time.								
	S/c.		Non-s/c.		S/c.				
	M.	S.	H.	M.	S.	H.	M.	S.	
36 0	2	30	0	2	30	0	2	30	0
26 40	2	30	0	2	39	20	2	39	20
24 0	2	36	40	2	42	0	2	42	0
20 0	2	39	20	2	46	0	2	46	0
16 0	2	42	0	2	50	0	2	50	0
10 40	2	42	0	2	55	20	2	55	20
6 40	2	46	0	2	59	20	2	59	20
0 0	2	46	0	3	6	0	3	6	0
0 0	2	46	0	3	6	0	3	6	0

The blown 2,500 c.c. cars are required to average 86.40 m.p.h. The 3,000 c.c. supercharged entries 89.26 m.p.h. The 3,500 c.c. cars with superchargers 91.52 m.p.h., and the two bigger classes of blown cars are both set a speed of 95.57 m.p.h.

It is rather interesting to note that the difference between the 77.14 m.p.h. at one end of the scale, and 95.57 at the other end amounts to only 27 secs. per lap.

In view of the fact that the final closing date for entries is not until June 19th, with an intermediate closing date on June 8th, obviously it is impossible to foretell what last minute entries will be received, but up to the time of going to press an extremely interesting collection of entries has responded.

Class "E," cars with engines exceeding 1,500 c.c. and under 2,000 c.c.; Class "F," cars with engines exceeding 1,100 c.c. and under 1,500 c.c.; Class "G," cars with engines exceeding 750 c.c. and under 1,100 c.c.; Class "H," cars with engines not exceeding 750 c.c.

This year for the first time, the handicap provides for 2½-litre and 3½-litre classes, the handicaps as a whole being as



Light:
British
Trophy Race
— Capt.
T. Eyston



MY enthusiasm for motor cars started when I was only ten years old, and I frequently used to drive at this early age. About this time my father owned a 40-h.p. Napier, and a 20-h.p. Vauxhall, and in these two cars he used to compete in various speed trials and hill climbs. In those days cars were not sent back to the works to be tuned, but it was customary for the firms in question to send one or two of their most expert mechanics to the various owners who competed. It was when these mechanics came down to Bourne that I first had the opportunity of going out with them when they were testing and tuning the cars.

Competitions ceased as a result of the outbreak of war, and I, at this time, went to school at Oundle. Towards the end of the War I joined the Grenadier Guards, and after that went to Christ's College, Cambridge, where I renewed my enthusiasm for motor racing by purchasing a 1½-litre Speed Model Hillman. A friend of mine who was at school with me, Amherst Villiers, also entered Cambridge just about the same time, and with his help, together

with the very valuable advice and assistance of Kensington Moir, who was then the Zenith Carburetter expert, and with W. M.W. Thomas, now General Manager of Wolseleys, we increased the performance

by

Raymond Mays:

of the Hillman quite considerably. After various troubles and much super-tuning, and after many midnight trials on the Cambridge-Huntingdon road, the Hillman became quite a fast car for those days, and I was successful in

winning several of the inter-Varsity events.

It was in 1922 when I purchased one of the famous Brescia Bugatti cars for competition work. At first I ran in several hill climbs with the car in the same condition as delivered to me, and I was fortunate enough in making fastest time of the day at South Harting, and several other events.

However, I soon realised that the car was not fast enough to beat cars of all capacities at all the hill climbs, and I was determined, with the help of my friend, Amherst Villiers, to be in a position to make the much coveted fastest time of

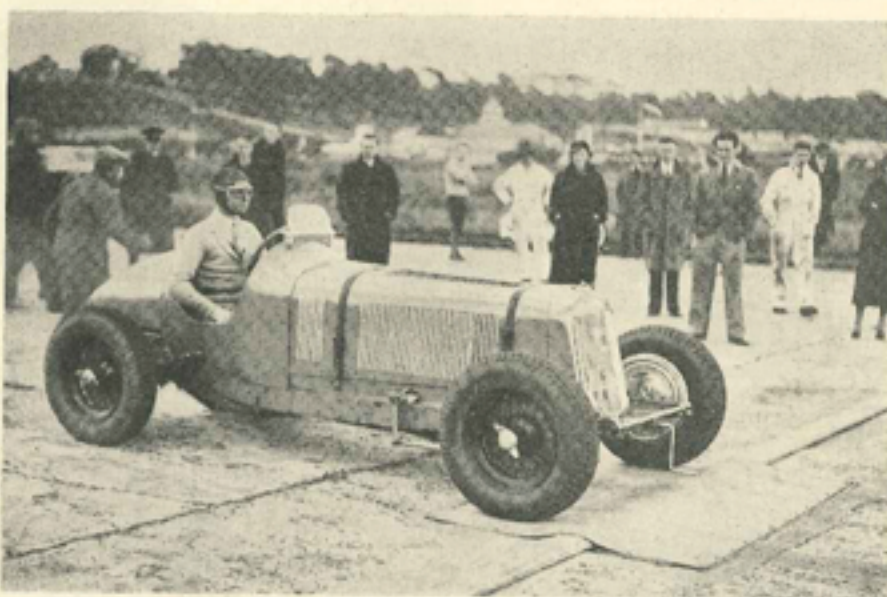
the day at all the important events. To attain this ambition meant months of experimental work, because I realised the necessity of increasing the engine revs, and in those days even on a racing engine it was a very great risk to alter the existing r.p.m. of the engine. During this experimental time, we had numerous "blow ups." In fact, not only the engine, but the transmission and rear axle gave trouble during this



The historic photograph of Raymond Mays shedding a wheel from his Bugatti, "Cordon Bleu," at the Caerphilly Mountain Hill Climb

period. We used the old Bugatti for all the experimental work, and when we thought we had obtained what we wanted, we rebuilt these modifications into a second car, and these two cars became the "Cordon Rouge" and "Cordon Bleu." For the next two years these cars were almost unbeatable on hills, and my ambitions were realised

when I obtained all the 1½-litre hill climb records, and most of the unlimited ones as well. Whilst talking on the subject of hill climbs, to my mind it is an absolute tragedy that Shelsley Walsh is the only remaining event of this kind, as there is no question of doubt that a speed hill climb is more thrilling from a spectator's point of view than any other speed event in this country. Of course, Shelsley has always been the star turn of the hill climbs, and from the time when I first competed there in 1921, right up to now, it has increased in popularity every year. I first made fastest time of the day and broke the record for the hill at Shelsley Walsh in 1923, on a 1½-litre Bugatti. The surface was then very loose, and clouds of dust followed the wake of the car up the hill. The time of my record run was 51.9 seconds, and from 1923 up to now I have broken the record of the hill three times, and have made fastest time of the day six times. For several years the surface remained rough, but was gradually improved, until, in 1930, the whole hill was redone previous to Von Stuck's record run. During the earlier years of Shelsley, all the star drivers and all the best known cars competed—I think it is more difficult to make fastest time of the day at Shelsley Walsh than anywhere else. The driver has no chance to make one



On the line in the 2-litre E.R.A. prior to the start of the successful attempt on the World's Standing Start Kilometre Record at Brooklands

single mistake, nor must the engine misfire for a fraction of a second. Approaching the corners, rounding the corners and going out of the corners are more important than one can possibly imagine, as the wheels of the car must be placed almost to an inch to keep those precious fifths of a second down. It is interesting to note that the times at Shelsley show a reduction of just about one second per year during the last twelve years. Of course, if the surface was now rough, and similar to the earlier days, the modern high-power weight-ratio cars would find still more difficulty in obtaining grip.

Although in the past I have more or less concentrated on Shelsley Walsh and Brooklands meetings—owing to not being able to get away—the E.R.A.'s were not built for these particular events. E.R.A., Ltd., came into

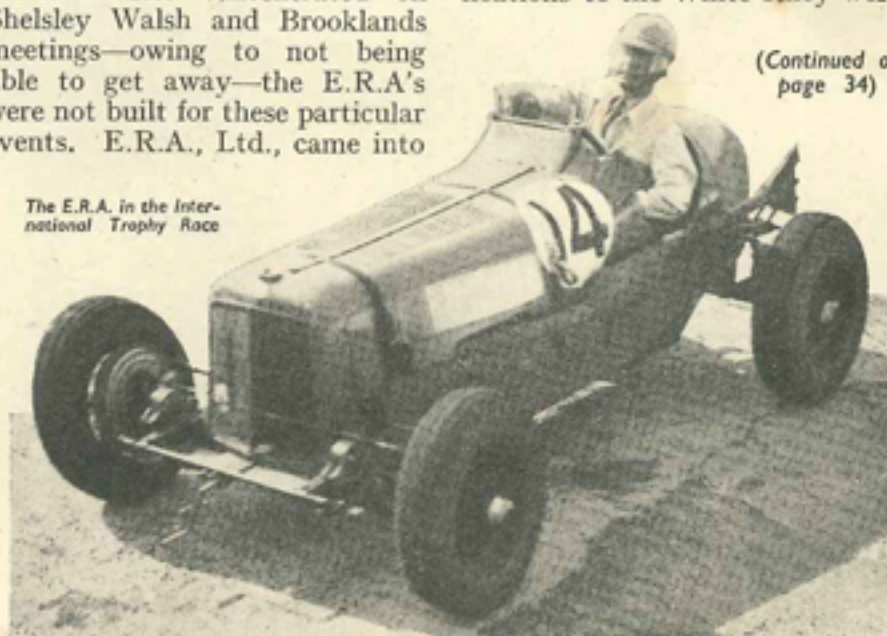
being * through the great sportsmanship of my friend, Humphrey Cook, who is himself an enthusiast with considerable racing experience with Vauxhalls and Bentleys. The object of the concern was to construct and race a team of cars in first-class events, but although at the time the Company was formed the existing formula

was known, it was decided not to start to construct cars suitable for the formula, but to choose a capacity that would give plenty of events both at home and on the Continent with the idea of gaining experience, and if we were at all successful to construct cars to the new international formula when it became known.

The chassis of the present model was designed by Reid A. Railton, and the engine, which is basically similar in the three capacities 2,000, 1,500, and 1,100, was evolved from my Supercharged White Riley which we then considered had the makings of a very efficient and reliable power unit. The original modifications to the White Riley were

(Continued on
page 34)

The E.R.A. in the International Trophy Race



THIS E.R.A.

(Continued from page 33)

the work of Peter Berthon, who later produced the revised layout which now constitutes our E.R.A. power unit. The first car was rushed through in May, 1934, and was entered in the Mannin Moar—the production was so late that the first real run this car had was during the practice for this event. We were openly criticised for going into this event with an untried car, but we considered that the minor "snags" with the motor car would be brought to light more quickly than if the car was tried out before entering into competitions. Actually the car never ran in the race, but the practice showed us that although it had the makings in the field of a thoroughbred racing car, its suspension and steering were not quite right, and other minor troubles were also brought to light. The suspension was

altered and other modifications made, and this car started in the British Empire Trophy Race. During practice we had considerable trouble with fuel feed and carburation, and when the car started in the race we knew it was not going to perform as it should. Apart from the Brook-

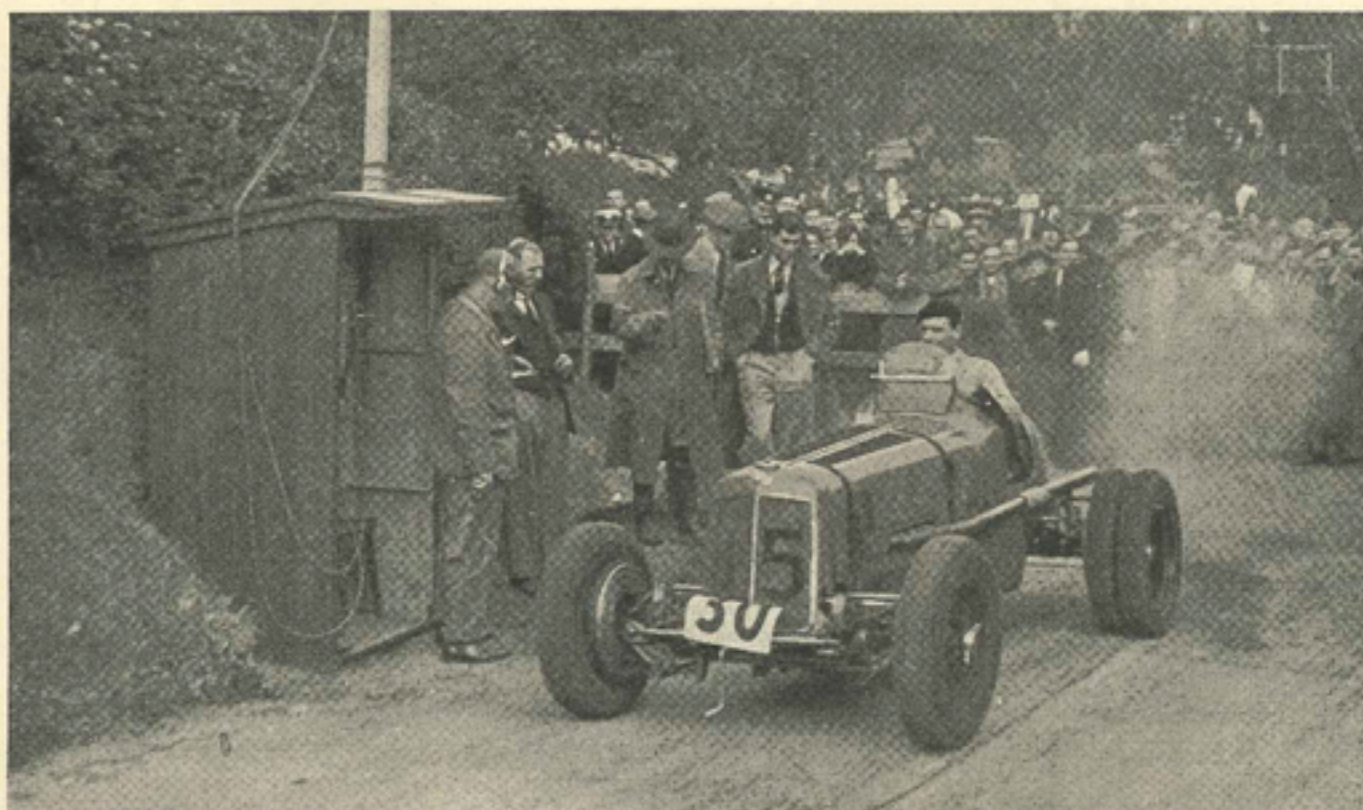


Raymond Mays in the E.R.A. workshops

lands silencer bursting on two or three occasions, the car ran through this 300 miles very reliably. Meanwhile, our first 1,100 and 2,000 c.c. cars were

being constructed, and with these three cars we managed to collect the Mountain Course and International Standing Class Records. For a short while the 2-litre held the World's Standing Kilo., which was then retaken by Von Stuck's Auto-Union. Unfortunately the September Shelsley was wet, but I managed with the 2-litre to beat Whitney Straight for fastest time of the day. Also the 1,500 and 1,100 cars ran through the Nuffield Trophy Race successfully, which race I won on the 1½-litre.

Our plans for this year are rather ambitious, as we hope to compete in quite a number of events both at home and on the Continent, and the necessary preparations, together with the maintenance of cars that have been purchased from us, keep the works at Bourne fully occupied. Our further plans depend entirely on the success we meet with this season.



CONGRATULATIONS!

Raymond Mays in the 1½-litre E.R.A. in which he set up a new record for Shelsley, on May 18th, in 39 4/5 secs. The scene at the start of the climb