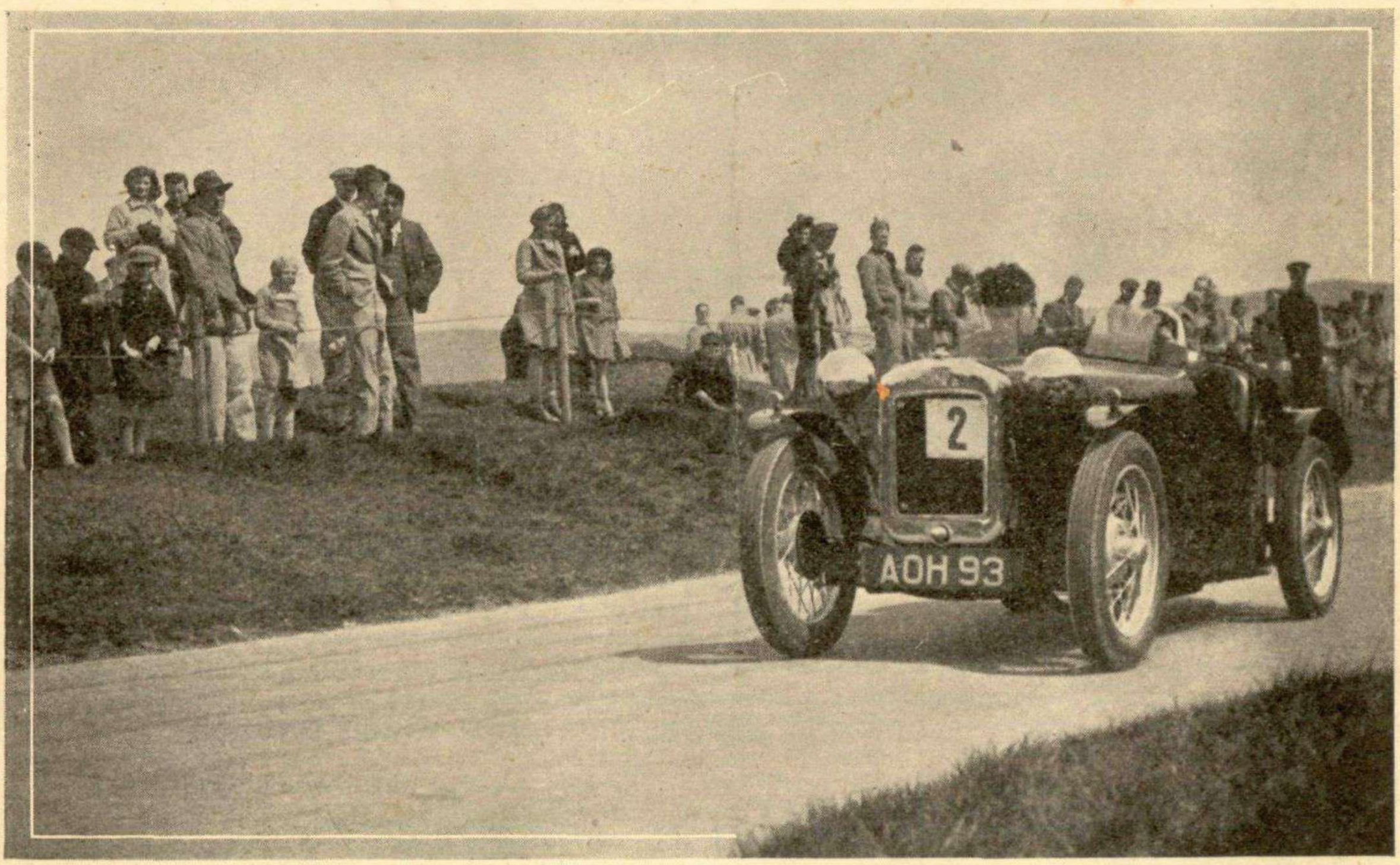
Vol. XXI No. 4 AUSTIN SEVEN OBSERVATIONS April, 1945

MOTOR SPORT

INCORPORATING Speed

ONE SHILLING MONTHLY

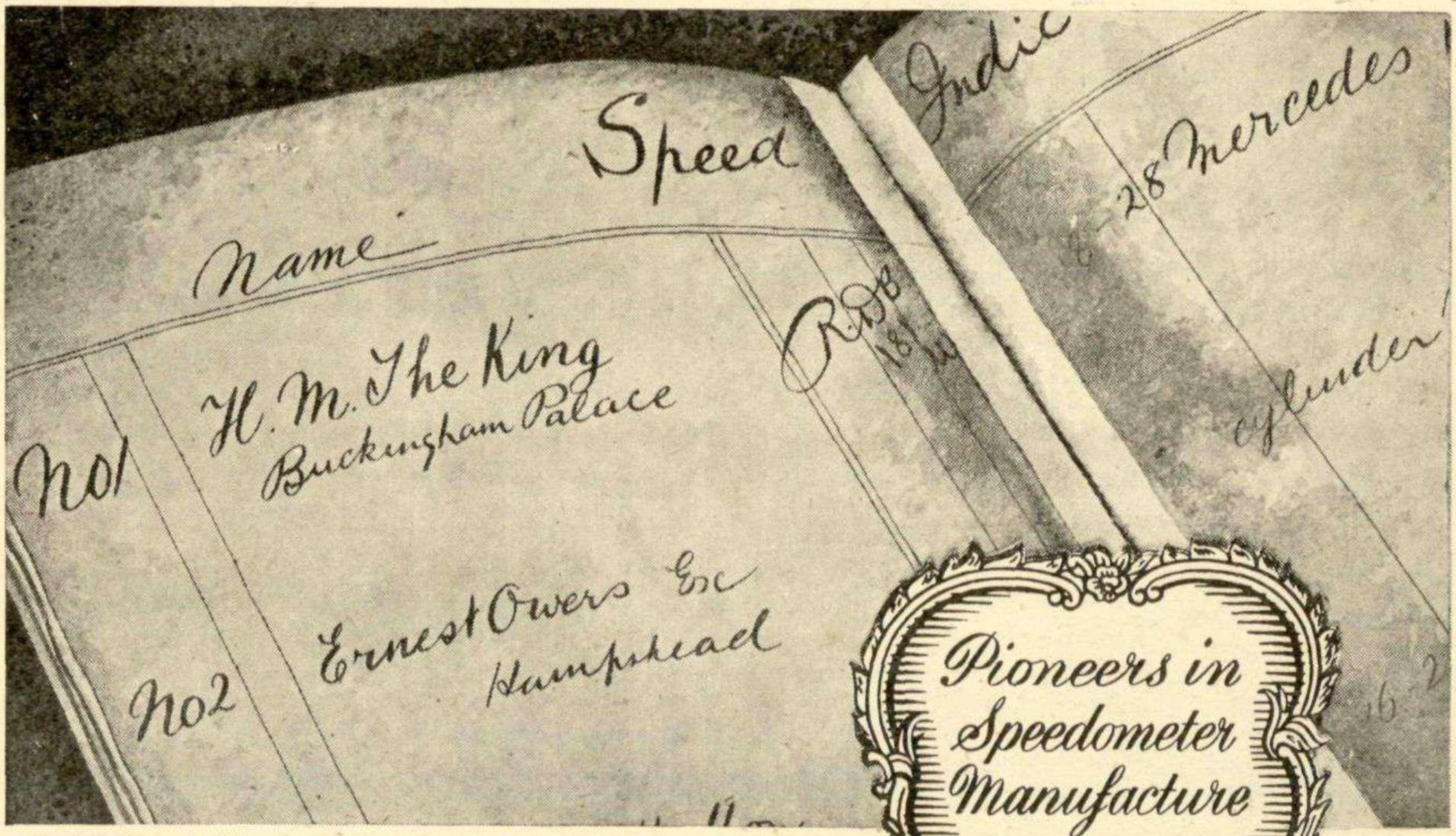


CONTENTS

Observations on the Austin Seven "Nippy" ... 67
Converting the Braking System on Frazer-Nash Cars 70
Pipe Dreams 71
News from India 72
Cars I Have Owned 73
Rolls-Royce Reflections... 75
Some Speculations on Fast-Car Suspension 76
Rumblings... 81
Club News 83
Letters from Readers 84

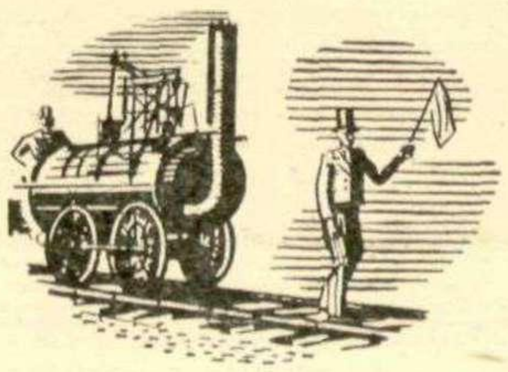
Smiths of England

MILESTONES SERIES No. 2



Ledger Record of Speedometer Sale to King Edward VII.

A Smith has played midwife at the birth of many a great invention. The urge to create, experiment and explore seems to be innate in the Smith family, of which Sir Allan Gordon-Smith has, by his enterprise, proved himself a worthy scion. The repeal, in 1896, of the preposterous law which had made it compulsory for a mechanically propelled vehicle to be preceded by a man walking with a red flag, encouraged the development of the petrol motor. Sir Allan, who had served his time with the Swiss clock making industry and joined his father's firm, clearly foresaw the significance of this progress, and in 1904, after many months of work and research, introduced a speed indicator specially for motor car use. So successful was this instrument that Sir Allan himself had the honour of selling the first to His late Majesty King Edward VII. Since then the Royal family, almost without exception, has used "Smith" instruments, and Royal Warrants have accordingly been held.



S. SMITH & SONS (ENGLAND) LTD

MOTOR : Smiths Motor Accessories Ltd., K.L.G. Sparking Plugs Ltd., British Jaeger Instruments Ltd., Smiths Jacking Systems Ltd. CLOCKS & WATCHES : Smiths English Clocks Ltd., Enfield Clock Co. (London) Ltd., English Clock Systems Ltd., A.B.E.C. Ltd., British Precision Springs Ltd. AIRCRAFT & MARINE : Smiths Aircraft Instruments Ltd., Henry Hughes & Sons Ltd., Marine Instruments Ltd., Furzehill Laboratories Ltd. INDUSTRIAL : Smiths Industrial Instruments Ltd., A.T. Instruments Ltd.

Scientific S.E.21

VOL. XXI. No. 4 APRIL, 1945 PRICE ONE SHILLING

SUBSCRIPTION RATE 13/6 PER ANN. POST PAID

MOTOR SPORT

OFFICIAL JOURNAL OF THE BRITISH RACING DRIVERS' CLUB

INCORPORATING **SPEED** AND
THE BROOKLANDS GAZETTE

EDITORIAL OFFICES
15-17, CITY ROAD, LONDON, E.C.1
Telephone: MONarch 8944

ADVERTISEMENT OFFICES
54, BLOOMSBURY STREET, BEDFORD SQUARE, W.C.1
Telephone: MUSeum 0522

OBSERVATIONS ON THE AUSTIN SEVEN "NIPPY"

Capt. John Moon, a very capable student of design, as "Motor Sport" readers know, and a keen member of the 750 Club, writes of his experiences with, and modifications made to, a 1935 model—the size of sports car many people will run after the war.

THE "Nippy" Austin Seven seems to be a rather humble motor car about which to write in the pages of MOTOR SPORT, but the following few notes are inspired by the recent sight of my faithful BXE 603 standing, fortunately undamaged, amid the remains of a fly-bombed garage.

The "Nippy" was bought in the spring of 1938 to replace a "12/40" Lea-Francis which was getting rather long in the tooth to provide reliable daily transport to my place of employment, without an extensive overhaul. As I was at that time quite a firm supporter of the vintage-type of car, I viewed the newcomer with a certain amount of suspicion, which was in no way alleviated by the loss, after some weeks of ownership, of two big-ends on the way home one evening, and the consequential ignominious end of that run on a tow rope. Since then, however, the "Nippy" has endeared herself to me and has been responsible for converting me into a very keen Austin Seven enthusiast.

For those readers who are not familiar with the "Nippy's" specification, it generally follows well-tried Austin Seven lines, but quite a large proportion of the parts are different from the standard type of that time. The front axle beam is dropped as in the "Ulster" model, and a reverse-camber front spring is used, with rear springs that are flat, to lower the car. At the time that the "Nippy" was designed, vintage ideas as to the functions of road springs were still ruling at Longbridge, as the springs have the same number and thicknesses of leaves as the 5-cwt. vans. The steering gear is lowered by using the same steering-box as was used on the "Ulster," which rakes the column and drops the wheel into the driver's lap to give a very comfortable driving position. Brakes are exactly as on the standard car, and so is the rear axle, except for a crown wheel and pinion giving a final drive ratio of 5.625 to 1 instead of the usual 5.25 to 1. The gearbox is known as a close-ratio box, but as the box ratios are 1, 1.49, 2.37 and 3.79 to 1, it must be taken that this is meant as a relative term only. The gearboxes fitted to the "Nippy" models varied from year to year in the same way as they did for the standard cars. In 1933, towards the end of which season the "Nippy" started life as the Austin "65," the boxes had no synchro-mesh, but constant-mesh third gears only. For 1934 there is synchro-mesh engagement for third and top, and second gear is in constant mesh, but is engaged by plain dogs. In 1935 and onwards, the top three ratios are all constant-mesh and are synchro-mesh engaged. Ratios are swapped by means of a long, cranked gear-lever, which is not very satisfactory, as its knob is still some way from the steering wheel, and quick movement with one's arm outstretched is not an easy matter. This point I have now attended to by fitting an enclosed type remote control of my own design and construction.

The engine follows the design of that of the standard car quite closely, but, nevertheless, it manages to differ from the standard engine in all its component parts except the timing case, the flywheel, and sundry minor parts. The crankshaft is a very massive affair, machined all over and with 1½-in. big-ends, but oil feed to these big-ends is still by means of two jets in the side of the crankcase, which squirt oil into rather shallow pockets milled out of the webs of the shaft and which lead into the journals *via* drilled oilways. This lubrication system is, to my mind, the chief snag with the "Nippy" and has been the cause of nearly all the trouble which I have had with my car; but more of this later. A few "Nippies" of '36 and '37 vintage are fitted with the "Speedy" engine, which has pressure feed to the big-ends, through the front end of the crankshaft, which is more reliable. This engine cost an extra £25 when fitted to the "Nippy." The connecting rods are also machined all over and have fully-floating gudgeon pins which bear in an unbushed little-end in the rods. The connecting-rod caps are retained by two $\frac{5}{16}$-in. bolts, whose nuts are locked by locking plates and not by the usual split pins. The cylinder block is cast in Chromidium, but in other respects does not differ from that of the standard Seven. The head is the same as that fitted to the earlier "Ulster" models, and, I believe, gives a compression ratio of about 7 to 1 with a normal-thickness gasket and a bit more with the correct "Nippy" gasket, which is somewhat thinner than the standard one. The valve gear is the same in design and layout as that of the standard Seven, though all parts are different, starting with the camshaft, which gives a lift of about $\frac{3}{8}$-in. and an overlap of 20°. The tappets are adjustable, which I always feel is rather a mistake, as valve bounce is generally the limiting factor on the "Nippy" due, I think, to the short valve springs which the adjustable tappets necessitate, and also to the not inconsiderable reciprocating weight of the tappets themselves. The light, hollow tappets with hardened buttons and the longer springs of the "Ulster" never give trouble in this direction. The camshaft is driven by a pair of steel gears, whereas the normal Seven has cast-iron timing wheels. The induction manifold is an aluminium casting carrying the 30-mm. downdraught carburetter, which feeds down into a bored horizontal passage and thence down into the two siamised inlet ports in the block. The inlet manifold bolts to the exhaust manifold to give a hot spot directly below the carburetter. This exhaust manifold is of a somewhat peculiar shape, but the negligible improvement resulting from the substitution of an "Ulster" outside manifold suggests that it must be of fairly efficient layout. The

carburetter is a Zenith VEI, which differs from those Zeniths fitted to larger Austins and most other cars in having a rather larger selection of holes and jets drilled in it. The "Nippy" generally takes a 21 choke, and I have used quite a variety of jet combinations at different times, with, curiously enough, different results!

The crankcase has grooves cast in it to accommodate the large big-ends. The sump is quite a deep affair, cast in aluminium, with ribs on the bottom. The instruction book and all other sources of information give the oil capacity as four quarts, but I have never been able to persuade mine to take more than three.

As I am one of those who dislike the Le Mans style of body with a flat tank at the rear, I approve of the "Nippy" body for a car of its type. There is very comfortable accommodation for two, with reasonable luggage space at the back of the seats under cover. If more space is required, quite a lot can be piled on the opened cover of the spare wheel compartment of the tail, though, as this is really abuse, a certain amount of discretion is needed. I have once even gone as far as to carry a complete wheelbarrow in this position, though not without having a very guilty conscience. Very early "Nippies" had aluminium-panelled bodies, which are very liable to split in various places, but the steel panelled bodies, as fitted to the 1935 and later cars, are quite free from this trouble, and last remarkably well considering that the chassis frame stops short in front of the rear axle and that the body supports itself and the petrol tank from there back.

The hood gives quite good weather protection in spite of the absence of side-screens on 1935 models. Like all small-car hoods, it is complicated to erect, and possesses an astonishing propensity for tying itself into knots when being erected during a thunderstorm. It stows away quite neatly on top of the folded hood-sticks behind the seats when eventually it is dismantled. The windscreen is quite a solid affair, some 1½ in. higher on 1936 models than on the earlier cars. Unfortunately, it only opens upward, but I have in mind a simple conversion to enable it to fold flat, which I shall probably effect after the war. The single screen wiper had advantageously been replaced by a dual one, with the motor on the near side, so improving visibility over the near-side wing with the screen open for blackout driving.

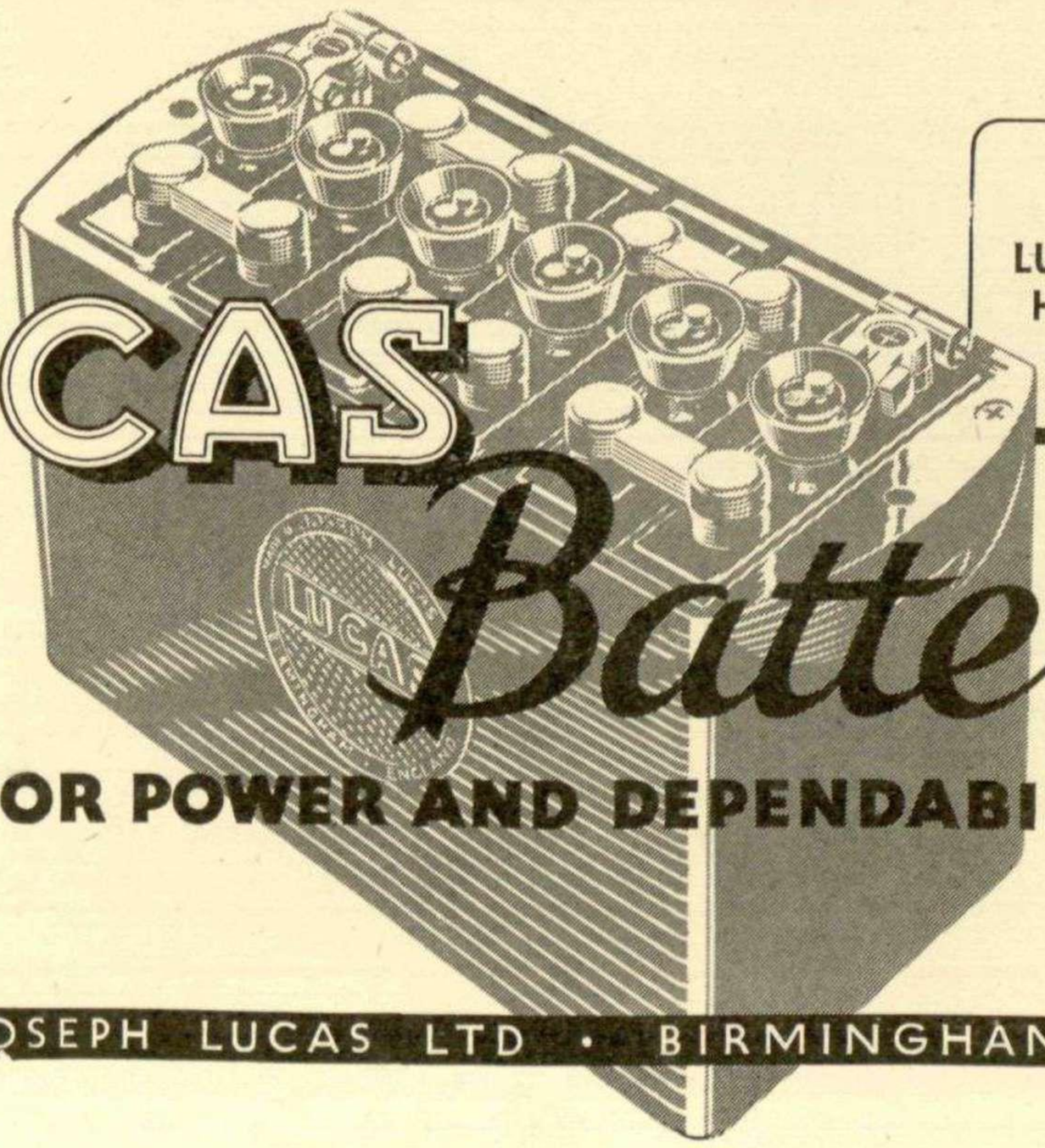
The dashboard instruments are rather meagre and not too good, no rev.-counter being fitted, while the speedometer is of the horrible ribbon-type which were being produced by Smith's at that time. I have added a thermometer and a second oil pressure gauge, which does not have such a depressing tendency to read zero as the original one has, and also lets me know what the oil pressure actually is when the car is being warmed-up.

Perhaps the most valuable modification which I had carried out was a tonneau cover which fits over the hood-sticks but under the furled hood, the latter being enclosed in its original cover held down by additional press-studs. The tonneau cover can also be used when the hood is erected, so preventing the seats from being wetted by rain blowing in at the sides.

The brakes I found to be reasonable, provided that one used the hand and foot controls together and pulled hard. This was rather beyond a girl friend who used to drive at the time, so I forestalled disaster by fitting a set of the longer cam levers which were fitted as standard to the 1936 cars. The 1936 front-type levers fit both back and front on Austins with flattened rear springs, but where the rear springs are not flattened, the 1936 rear-type levers have to be used, together with new brake cables with fork-end instead of ball-joint connection to the levers. By this modification, Austin brakes are improved in power, but the snag of unequal application of the front "stoppers" remains. I do not trust the so-called self-lubricating camshaft bushes, and shall drill mine through for grease-gun lubrication when I get an opportunity. One front brake seized on, once, due to these bushes. External brake-pull-off springs are well worth fitting, as the brake shoe springs easily get tired. The final answer to the brake problem is, however, to my mind, enclosed-cable operation for the front wheels, and this again is a modification which is on the waiting list.

All the steering rod joints require watching and lubricating frequently. Later models have grease nipples for the push-and-pull-rod joints, and these are well worth fitting, as otherwise it is a job for a force-feed oilcan. The springs that load these same joints are very liable to collapse, so causing steering backlash.

The 1935 propeller-shaft (front half) is a Hardy Spicer, but not of the needle-roller variety. Mine developed a certain amount of backlash, and was advantageously replaced by a needle-roller type as fitted to 1936 and later cars. This entails changing the coupling flanges also.



I have had a certain amount of trouble with the engine, and so have all the "Nippy" owners that I know (and that covers quite a large number of cars). The crux of the matter, to my mind, is this. The "spit-and-hope" method of big-end lubrication is perfectly satisfactory for the standard 1 5/16-in. crankshaft, especially with the quite sizeable oil pockets forged in the crank, but the rather small pockets machined in the "Nippy" crank seem to collect only the barest sufficiency of oil for the larger 1½-in. journals. As soon as there is any interruption in the oil supply, such as a partially-blocked jet, the big-ends run short of oil and start to lose their white metal in small fragments. This is a cumulative process, and unless the oil is changed very frequently, one gets pieces large enough to completely block the jets, and then it's all over very shortly. All the "Nippies" that I have known have suffered the loss of one or more big-ends, generally followed by the loss of others shortly afterwards, caused by failure of the repairer to strip the engine completely for cleaning out the white metal. This must be done exceedingly thoroughly, even to the extent of removing all the brass plugs screwed and riveted into the end of the drilled oilways. If this is done and the big-ends are fitted with the correct clearance, the engine run-in carefully, and the oil changed conscientiously every 1,000 miles, I think that a "Nippy" engine will give good service and will be reliable. There are, however, two alternatives.

The first is to use a pressure-fed crankshaft (as used in the "Speedy" or "75" model, and in one or two 1937 "Nippies") in which the oil is fed into the drilled crankshaft through a white-metal-lined bush which runs on a parallel portion of the starting-handle dog.

Unfortunately, to convert an engine in this way takes about £20 worth of new parts—parts that one is not likely to be able to pick from a breaker, either.

The second alternative is to use a tuned standard engine with the 1 5/16-in. crankshaft and spit-and-hope big-end lubrication. I did this during the early part of the war when the main bearing races of the "Nippy" engine worked loose on the crank. (This is another playful little trick that these engines play.) This engine was built up with the crankcase out of an Austin Seven van, and the rebored block, rods and crank of an earlier engine that I had by me, and was absolutely standard except that the "Nippy's" 30-mm. downdraught carburetter and manifolds were used. This engine gave excellent pulling at low speeds, but maximum speed, and acceleration in the higher ranges, were considerably curtailed. It made a very satisfactory war-time hack, however, as it stood up to a terrible caning and never gave any trouble at all. After some months I fitted the high-compression head from the "Nippy" engine (I was advised not to do this as the clamp-type little-ends of the standard rods were said to object). This largely restored the maximum speed, but not the acceleration, to the previous level. The pulling power is still so good that I think she will easily pull a higher gear, and I have a 5.25 to 1 axle ready to use when I get the chance. The reduction in urge at higher speeds is, of course, due to the limited overlap of the standard camshaft compared with a "Nippy" one, which also explains the absence of the usual "Nippy" bark from the exhaust, which led the Editor to describe my car as "fast but silent." I am not at all sure that the extra "bite" at high speeds is worth the bark and wear and clatter from the high-lift cams, but if I do want it, the high-lift camshaft can be conjured into the standard crankcase by grinding small clearances from the centre cams and by using non-standard-diameter rollers for the centre bearings. Alternatively, I have been told that the standard crank can be used in the "Nippy" crankcase, but this needs checking carefully, as the "Nippy" oil jets are slightly differently situated, and may not spit in quite the direction for the standard crank. Actually, I am convinced that an engine built up in this way with all the "Nippy" features except the crankshaft would perform far better than a "Nippy" engine, due to the reduced friction resulting from the smaller crank. If the ultimate performance is required, then a pressure-fed crank is necessary, but I still think that anything larger than the 1 5/16-in. crank is undesirable in an unblown engine.

When I dismantled the standard engine for a top overhaul after some 5,000 miles' bashing, I found everything in good order except the exhaust valves, which needed refacing. As these are only 3 per cent. nickel steel and cost 2s. 2d. each, I think this cannot be considered an expensive item. Incidentally, when using the "Nippy" engine I found that it paid to lift the head and lightly grind-in the exhaust valves about every 1,000 miles.

A further experiment has been to try out an external exhaust manifold of the "Ulster" type, with an outside Brooklands silencer and a rather curly exhaust pipe leading under the near-side door and back underneath the body. The principle advantage gained is a few inches more ground clearance. The increase in power is almost imperceptible, and a larger compensating jet is required to make up for elimination or, rather, considerable cutting down, of the hotspot.

A hand ignition advance has been fitted to supplement the automatic device, but it has not really paid for itself. Incidentally, it is operated by a knob marked "choke," which rather foxes strangers, as the choke itself is not marked. A Lucas high-voltage coil has proved to be well worth fitting.

The gear change, operated by about three feet of gear lever, worried me for a long time. For some reason no satisfactory remote control for the 4-speed Austin box has ever been marketed, but I eventually designed and made up one that has been very satisfactory. I had to use a welded-up steel casing, and it is necessary to use a distance piece some 3/16-in. thick between the remote control casing and the gearbox itself, in order to accommodate the interlock arm, which is mounted above the face of the gearbox casing and which swings sideways into a recess milled in the original gearbox lid, right up to one of the setscrews securing the lid. The only modification required to the box itself is the filing out of the bottom of the slot in the reverse-speed selector, which acts as the reverse stop in normal circumstances. This, unfortunately, means taking the gearbox out of the car. Incidentally, the reverse stop on the remote control was arranged to be operated by pressing the lever downwards, which is very convenient for quick changes into reverse.

A very minor but valuable alteration was the boxing-in of the headlamp brackets, by welding a strip in the hollow of the U, which completely cut out the headlamp dither which became apparent when we had to fit heavy lamp masks.

A pair of fat Michelin RLP wheels and tyres (I think the size is 140 by 40) for the rear wheels have improved steering, roadholding and comfort enormously and make the car look much less spindly. They were fairly well worn when I bought them, and do not seem to be much smoother now, which is a good thing, as the cost of replacing them will be considerable. I think that a lot of the success of the Michelin tyres is due to their thin and flexible sidewalls, which explains why the same advantages do not accrue from the use of normal tyres of large section. I have tried 4.5-in. by 17-in. tyres on the front, but they are rather too large, and 4-in. seems about the best section for the front wheels. In order to stick to the same running radius for all wheels, this indicates 18-in. rims, which I have not got at the present, but which are fitted to some vans. Nothing larger than a 4-in. section tyre can be fitted into the compartment at the back of the body, so that the size of the spare is restricted. Anyway, we are getting to the days at which we can leave our spare tyres at home—a puncture is a very rare occurrence.

So much, then, for the "Nippy," with her snags and little peculiarities. Her performance on paper looks most unimpressive—about 30, and 45-plus on second and third, and about 63 on top, with a pretty steady 40 m.p.g. wherever you go and however you drive; but there are not many cars as handy in thick traffic and for short journeys in built-up areas.

Just before embarking for Service overseas for the second time, I took her out for a short journey. She still performs as faithfully as ever but begins to get somewhat tired, which is not surprising considering that she was laid up for two years with no other preparation than to change the sump oil and then to squirt engine oil into the carburetter while she was running, until one could not see for blue smoke. After that two years she was started and driven off without even a check over. She is now laid up again, but as soon as I return I intend to give her the overhaul that she deserves. A new rear axle will be fitted, the gearbox will get new bearings, and various chassis rivets will be tightened up. If I can see a convenient way in which to extend the front wings, a wider front axle will be fitted to improve the roadholding, and I think that a new dashboard with new instruments is indicated, while if I can afford to risk impairing her reliability, I think that a very moderate boost is an idea to be adopted. All this may sound a waste of money, but I think that after seven years I know all her snags, and that nothing I am likely to be able to buy after the war or, in fact, anything less than a Type 328 B.M.W. or something similar, would tempt me to part with her, and even then I think that she would make a good second string.

A Simple Method of Converting the Braking System on Frazer-Nash Cars from Cable to Hydraulic Operation

P. McCormick describes here a very practical modification to his blown "Nurburg" Frazer-Nash.

DURING the past two years I have effected a conversion of the braking system on my "Nurburg" Frazer-Nash from cable to hydraulic operation which promises to be very satisfactory. The conversion, after a good deal of consideration, trial and error, has proved so simple that I put it forward as a solution to some of the braking problems which exist with the earlier Frazer-Nash models.

On my own car, *circa* 1932, these problems came under three headings :—

(1) The brakes, which were 12-in. diameter in front and 10-in. diameter at the rear, at their best had only been adequate and had never inspired confidence. Bands shrunk over the outside diameter of the drums to prevent distortion had produced a slight improvement, but I remained far from happy behind large American cars, and could never be sure, particularly in the wet, that a sudden application of brakes would produce deceleration in a straight line.

(2) The entire braking system required overhauling.

(3) I intended supercharging the engine, which automatically threw the defects outlined in paragraph (1) into greater prominence.

The system I favoured was the Lockheed, which operates on the principle that "pressure exerted upon any portion of a fluid enclosed in a vessel is transmitted undiminished equally to all surfaces." This type, inherently self-compensating, primarily solves the difficulties of ensuring straight-line braking ; it has the minimum of parts to wear, is light, powerful, easy to maintain, and has the added advantage that the whole 'Nash brake pedal and cross-shaft assembly can be dispensed with and the master cylinder operated by a second pedal mounted on the clutch cross-shaft. From a blitzed Triumph "Gloria" I obtained, for 50s., the entire brake layout, comprising front-brake assemblies with stub axles, splined hubs and Timken taper roller bearings, and the rear-brake assemblies. All drums are 12-in. in diameter.

Front Assembly.—The Triumph front stub axles, in common with the 'Nash's, are covered by Rubery patents and the king-pins and bushes are luckily interchangeable. The taper keyed locations for the track rod arms are identical, but the location for the steering arm is, unfortunately, machined the opposite way round, and this means either fitting the steering arm with the ball end hanging downwards—not a pleasant sight to contemplate—or twisting the straight shank of the arm through 180°, thereby bringing the ball end to the top. The second alternative was chosen, and the arm was twisted hot and afterwards magna-fluxed and normalised to relieve stresses. Thus the entire Triumph front assemblies—stub axles, brakes and hubs—were fitted, and attention turned to the rear.

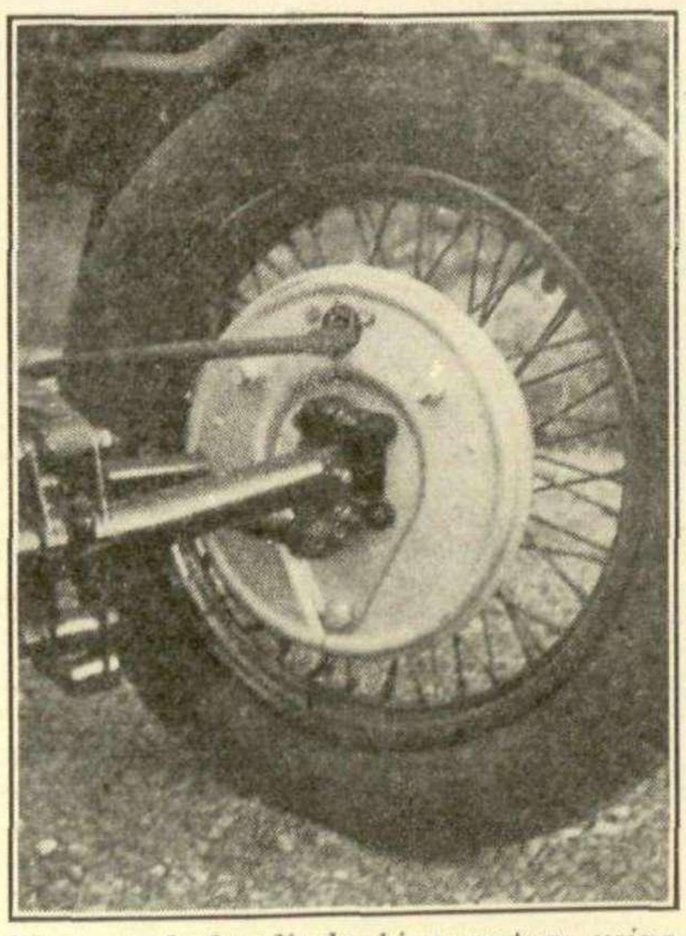
Rear Assembly (Backplates).—The sheet metal backplate rivetted to each of the 'Nash radius arms was removed and the centres of the Triumph backplates were turned out—about $\frac{3}{4}$-in. on diameter being removed—to locate on the spigot formed by the outside diameter of the protruding bearing housing on the outer face of each radius arm. Each backplate was then secured by four conveniently placed bolts, positioned as follows : two were the $\frac{5}{16}$-in. bolts which act as stabilisers and pass through the top and bottom of the radius arms, the third was a $\frac{7}{16}$-in. bolt replacing the 'Nash brake shoe-cum-shock-absorber fulcrum pin, and the fourth a $\frac{5}{8}$-in. bolt replacing the 'Nash brake-operating camshaft.

At this stage it is worth stressing three points :—

(1) Packing pieces may be necessary on the four securing bolts to line up the backplates and prevent fouling by the drums. In the case of this conversion these were made by hand, to suit, each of the eight pieces being shaped differently. The maximum width of any one was $\frac{5}{32}$-in.

(2) It is essential to fit the backplates with the wheel cylinders uppermost to permit of bleeding the lines through the valves in the *top* of the cylinders.

(3) It is necessary, with the single-brake-shoe, fulcrum-type radius arms, to tilt the backplates (taking the centre-line as a vertical line passing through the centres of the plates and the wheel cylinders) backwards through an angle of about 7° in order to provide clearance over the side of the radius arms for the brake-shoe cam adjustment nuts. This clearance can be obtained and a sufficient space left *under* the side of the radius arms through which to pass the cables which provide the auxiliary hand operation of the rear brakes.



The new hydraulic braking system, using Triumph components, of P. McCormick's "Nurburg" Frazer-Nash. The conversion, carried out by himself, he describes in the accompanying article, so that fellow "Chain Gangsters" may go faster, safely.

Rear Assembly (Brake Drums).—The one real snag of the layout is the method of fitting the rear drums. The original rear drums of this car were the old saucer-type with short-reach hubs, and thus it meant packing the flat-faced Triumph drums inwards to meet the backplates. In order to do this, spacers had to be devised which would also act as adaptors between the eight $\frac{5}{16}$-in. bolt holes in the flange of the 'Nash hubs and the $\frac{5}{8}$-in. diameter holes in the Triumph drums. These were duly designed and machined from the solid (M.S.), providing the most expensive item in the whole layout (£3). The drums were secured to the adaptors not by $\frac{5}{8}$-in. bolts, but by $\frac{3}{8}$-in. bolts passing through short $\frac{5}{8}$-in. diameter sleeves. A refinement of this design might have been the fitment of studs in the flanges of the adaptors in place of the bolts described, but in that case the flanges would have to be wider and the saving in weight is problematical. Anyway, the result achieved is most satisfactory in spite of having to remove the hubs in order to inspect the internal brake mechanism ; this should be a rare necessity.

Fitment of Master Cylinder.—Fitting the master cylinder presented no difficulty. A right-angle bracket was fabricated from $\frac{1}{4}$-in. M.S. plate, to carry the master cylinder, and the whole assembly was bolted snugly into the channel section of the side-member at a convenient distance from the brake pedal. This pedal, a second 'Nash clutch pedal, mounted on the same cross-shaft, provides the thrust to the master piston through the normal adjustable-type, ball-ended connecting rod. The reservoir is placed above the master cylinder on the bulkhead. The pipe layout is a matter of taste, and it is not proposed to lay down any hard-and-fast scheme other than to emphasise the necessity of fitting four flexible pipes—one from each wheel cylinder. It was found desirable in this

Continued on page 85

PIPE DREAMS

Soon we shall be furiously planning for peace. In this article Kenneth Neve ventures some suggestions as to things we might do.

"NIGHT, sable goddess, from her ebon throne in rayless majesty stretched forth her leaden sceptre o'er a slumbering world." And I was fire-watching. And round about the witching hour, on my post-prandial patrol (if the term may be applied to a "subsistence" supper) under the very same stars which have lighted long night journeys in days of peace, I fell to thinking of all the things that at various times I had promised myself I would do if I had the space, the equipment and the time in which to do them. Intentionally the all-important clause "wealth" is omitted because it is too easy to dream of presenting Mr. McKenzie with a blank cheque and requiring him to build a Bentley to out-Lycett Lycett. Our dreams therefore are bound by an arbitrary financial horizon which shall keep them within the limits of what most of us can achieve by begging, borrowing, pawning, pinching, or, more usual, selling our worn-out automobiles to those less wary than ourselves.

I am conscious that some of the following ideas are not worth the work involved, that some will not excite you, that some may be too exciting. I disclaim all responsibility for the ideas expressed—blame them on "Night—sable goddess" and the "subsistence" supper.

Whimsey the First.—There are many of us who shrink from running our well-preserved vintage cars through trials because of the possibility of damage attendant thereupon, yet who, if the cost were not too great, would like to compete in various club trials in a motor car of vintage tradition a little out of the ordinary. Peter Clark must have had the idea when he planned his "Blue Label" trials Bentley, but 16 h.p. is a bit high for a second car for most. Could not a cheap trials car, and effective, be made from an early Frazer-Nash or G.N. chassis into which could go a Morris-Cowley engine? Dull, you say; but wait. Retain the gearbox and keep also two chains to give a high and a low final drive; high to give reasonably fast road cruising at low revs., and low to belittle the activities! In short, the amateur's "overdrive." The Morris engine fits the G.N. with no more trouble than the drilling of four holes; it has the dynamotor giving ready-made starting and lighting. Engine spares are legion, and the horse-power, while enough to be interesting with the "overdrive," would not give sufficient torque to do the elderly, and by modern standards somewhat frail, final drive a mischief.

The chassis, if you can find it, will cost between 10s. and £10. Say £5. The Morris engine 50s., plus £5 for "doing up." Allow £5 for putting the two together, and the rest depends on how "pansy" you want the body. I commend a glance at Barbara Marshall's "Annie." To build such a car is much cheaper and infinitely less exacting than the construction of a "sprint special," and the opportunities for using it so many more in number that I marvel that so many people attempt the latter and so few the former.

Whimsey the Second.—This applies particularly to those who live somewhere near a sand-racing centre. Procure a "Speed Six" Bentley, or a "36/220" Mercédès, or a "Black Hawk" Stutz, tear off the body and mount a bucket seat and, if you insist, a very light body, and take it on to the sands for a good blind. If the car is reasonably reliable, you'll finish the race, and even if you do not win, you will have had some healthy entertainment and a satisfying drive. If the motor blows up, give it to the first bloke who offers to buy your beer for the evening. And now, before horrified hands are raised to heaven in protest against this last advice, I had better say that during the last five years I have seen examples of all the cars mentioned, for sale in running order for less than £30 each. (It will save paper and postage if I state categorically that I know of none just now!)

Whimsey the Third.—This idea was born during one of the famous convivial evenings of the Northern Section of the V.S.C.C., but it will bear the sober light of day: to take a Model T Ford through the "Land's End"!

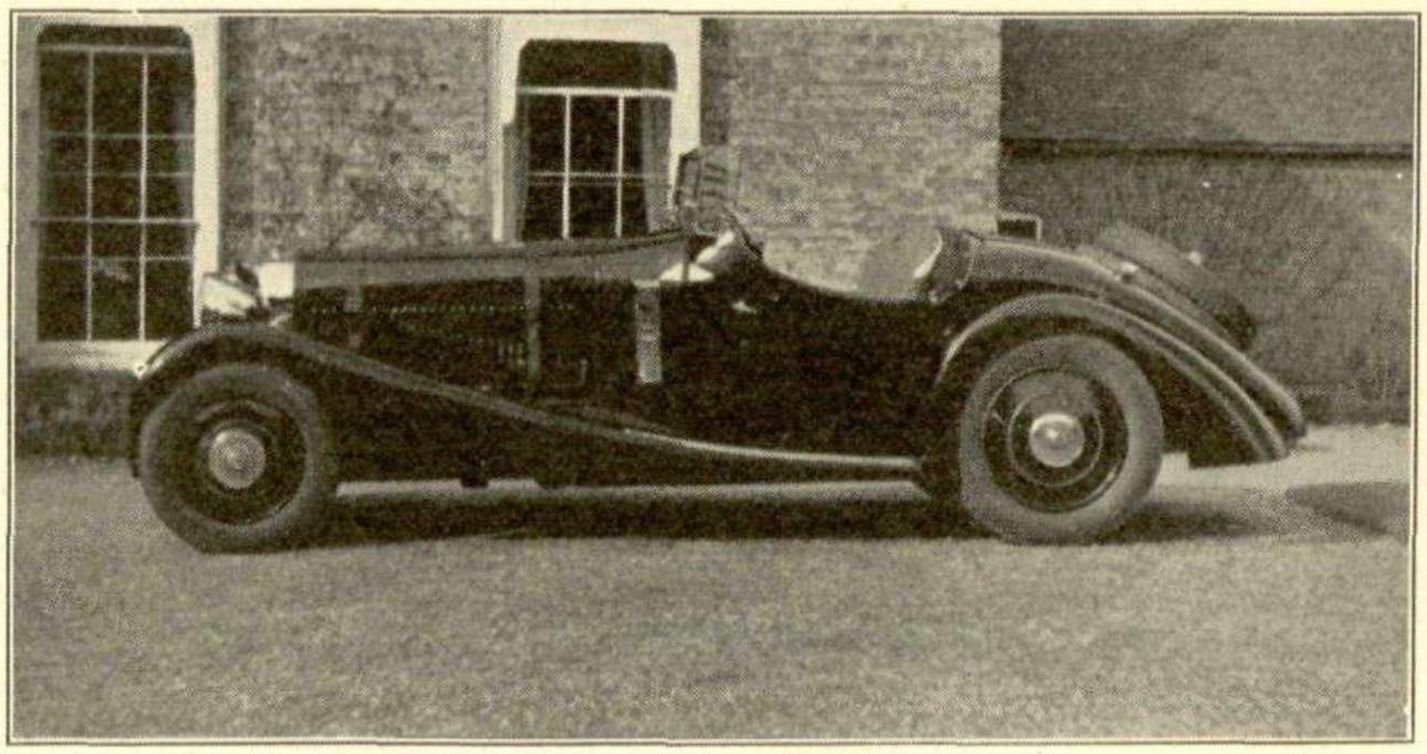
Whimsey the Fourth.—I am doubtful if even the most rabid enthusiast, once he attains years of discretion (if enthusiasts ever do) likes going to parties or the pictures in a stark, hoodless, oily diligence. My personal metamorphosis occurred on the day when I donned a boiled shirt, and, with profanity, achieved a passable tie, and then went out to swing the "30/98." At first I turned the handle awkwardly thinking more of the shirt than the job. With rising ire and all sartorial considerations subordinated, I wound the harder until worked up to a demoniacal fury, the desired result was obtained. The shirt was past redemption, its virgin smoothness now befurrowed and, if somebody whose mother used Persil had stood close by me, his supercilious smirk would have been completely justified.

What I wanted, I decided, was a nice, clean, comfortable coupé with large doors and a docile power unit, and to hell with the pseudo-racer for social occasions. But the sort of car I wanted cost so much to tax, and certainly could not be justified for evening use alone. Why not put a 7-h.p. engine in a Rolls-Royce. At one time there was running about London a Rolls powered by a 600-c.c. Scott engine, and quite recently in Lancashire I drove a short way in a V8 Ford which had nothing larger than a Morris Eight engine to provide the power, and quite nicely it went, too. There is little to be proud of in the appearance of an ungainly American pressing as a body, but in a Rolls one could accept 30 m.p.h. and still look out with haughty dignity on the lesser breed who, in their vulgar haste, go scurrying by. [Or, why not afford an old "Twenty" Royce?—ED.]

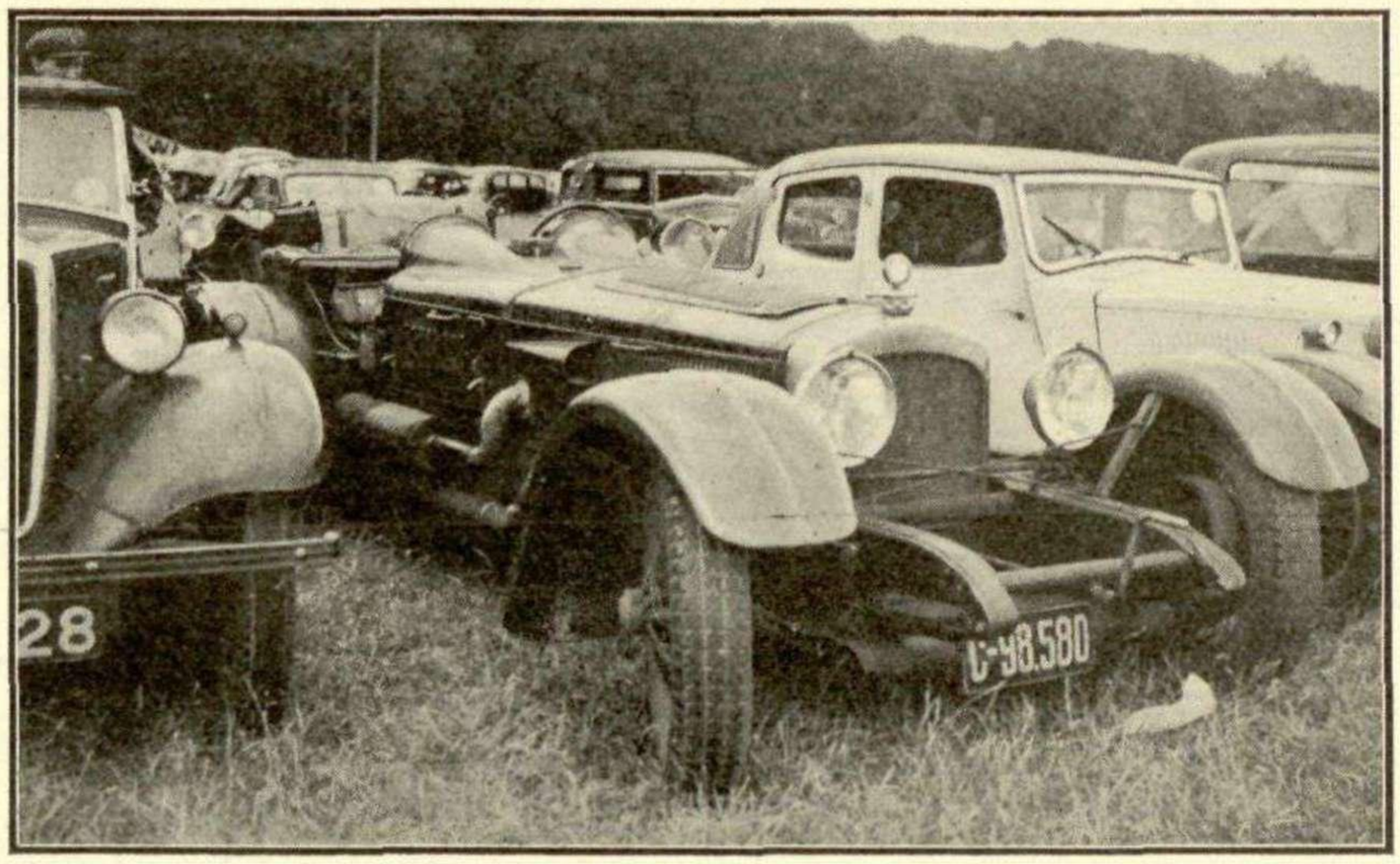
Whimsey the Fifth.—The ill wind of petrol paucity has, true to tradition, blown a bit of good in that it has introduced, or rather reintroduced, to two wheels many who would not otherwise have gone back to motor-bicycling. But for it, I doubt whether Pork Lees, Sam Clutton or I would have ridden a 1,000-c.c. Ariel "Square 4," which being the case, there would not have been born in at least three minds the idea of putting one, two or even four of these amazing power units into a car chassis. How it could be done effectively none of us professes to know, but if it could, what a machine would result! The bicycle is as smooth as a Lincoln, and has the get-away of an E.R.A., and the music of eight (or could it be sixteen?) cylinders would alone make the job worth while.

Whimsey the Sixth.—If you want to go really fast, and really cheaply, you buy a motor-cycle, and if your thoughts turn to sprint racing you get a dirt-track engine which will shoot you off the mark with no mean effort. What a pity that having but two wheels you are barred from the car classes. But stay, two and two make four. Why not ride two bikes?

D.T. Douglas were conveniently low and possessed commendable power, so take two and stand them up about a yard



Neve suggests buying up something like this "Speed Six" Bentley, stripping it, and having fun and games with it in post-war sand-racing.



Another Neve scheme—a race for "specials" at Donington, for example. Here is a Continental road-equipped "special" which appeared in the car park at a British race meeting. Can anyone identify it?

apart and join them together with what an Italian mechanic of my acquaintance called "iron sticks." Sit between the two bicycles or, if you prefer it, ride one and use the other as a kind of power-driven sidecar, but remember to put in a track-rod to marry the two wheels. The cost? Well, about two bottles of whisky to get you fearless enough to ride the thing, and the price of three weeks in a high-class nursing home whither you might be borne by kind friends at the termination of the ride. Or would it work?

Whimsey the Seventh.—Many months ago the Editor was good enough to publish my plea for a post-war Class I in sprint competition, which drew forth the fact that John Bolster, Lowry, Molyneaux in Urmston, and one or two others were all interested enough to start building if somebody else did. As a "30/98" owner I find that three generations of Roget have included in the "Thesaurus" no phrase eloquent enough to express my distaste for the "buzz-box" and the "doodle-bug," and if I thought Class I would encourage either, I would never mention it again. Contrariwise, I still believe that Class I, with its hearty, thumping, man-sized cylinder and its (probable) chain drive, would be in the best vintage tradition. Who will start?

Whimsey the Eighth.—Is it really necessary in a "special," such as one would build for a 500-c.c. engine, to spring the back wheels? Normally we fit springs and then burden the vehicle with shock-absorbers screwed up so tight as to render the springs almost inoperative. Would not a simple rubber buffer do as well?

Whimsey the Ninth.—The Bol d'Or had always interested me intensely until it became the playground of the low horse-power, professionally-built racer. In England the amateur constructor has little chance of prolonged activity other than an occasional run of a few seconds duration on a speed-trial course. In France the builder drove his mechanical progeny single-handed for (if it would keep going) 24 hours. There is the almost inadmissible story of the man who completed the motor-cycle race, washed his face, consumed two oranges, then drove his car for a further 24 hours.

Is it beyond hope that as a curtain-raiser to a more serious afternoon at Donington or Crystal Palace or the Mountain Circuit, a 50-mile race for "specials" could be run? Judging by the reaction of the Shelsley-Walsh crowd, such a race should be as popular a spectacle as a Mays-"Bira" duel any day; and what an encouragement to the amateur builder. Is it too much to hope for a race of the "specials"?

Whimsey the Last.—The financial horizon goes a bit misty here—but it would be worth it. Vintage Bentley enthusiasm is now about at its highest ever; would it be possible in some post-war sports-car race to enter a team consisting of at least one of each size? At Le Mans—could this final "fling of the battleships" possibly happen there?—in 1929 Birkin and Barnato in the "Speed Six" covered 1,767 miles to average 73.62 m.p.h., and in 1930, Barnato and Kidson did 1,821 miles at 75.87 m.p.h. A little earlier (1928) the unblown "4½" covered 1,658 miles. In 1939 Wimille and Veyron (Bugatti), covering just over 2,000 miles, averaged 86.8 m.p.h., the two Lagondas 83.5 and 83.2 respectively, at which speeds they filled third and fourth places, while Gordini and Scarton (Fiat) found that an average of 74 m.p.h. gave them tenth place in the G.P. d'Endurance.

No one expects that a 15-year-old car could *win* the race, but that would be no disgrace. If they could equal their form when new, a blown "4½" or "Speed Six" could still finish within the first dozen, while a good 8-litre could be still higher. There might be one example of each size from 3-litre to 8-litre, each car, still privately owned, of course, and driven by its owner and A. N. Other, would have to be overhauled by one of the well-known Bentley specialists—not necessarily the same firm in each case—and the whole team sponsored by a representative body (who better than the V.S.C.C. [or Bentley Drivers' Club.—Ed.] which might persuade its vice-president, S. C. H. Davis, to control the cars and drivers and ensure a properly serious attitude to the affair).

There would be no lack of competent amateur crews for the pits who would subordinate themselves to "S.C.H.D.," and who, by so doing, would have one of the finest holidays ever. It is difficult to estimate the finances of such a venture, but I am persuaded that this is not an insuperable difficulty. If it could be done, it must be in the first post-war race before a new generation of 50-h.p., 100 m.p.h. animated tear-drops changes the complexion of sports-car racing entirely . . . and if any of the cars—these *voitures demodees* so scathingly dismissed as obsolete by so many who have driven naught but the products of Abingdon—if even one of them finished, would not the sight of it crossing the line at the end of the 24th hour make it all very much worth while?

◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆

NEWS FROM INDIA

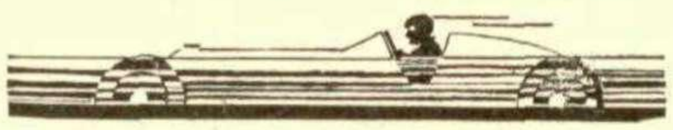
Lt. D. F. Mallalieu, R.E.M.E., former secretary of the M.M.E.C., wrote recently to Graham Dix and suggested that his comments on motoring in India might also be of interest to readers of Motor Sport. In Bombay, American cars of 1930–34 are in use as taxis, Buick, Oldsmobile and Hupmobile being the most popular—many have the beautiful wire wheels the Yank adopted in this era. The 'buses are mostly Daimlers. Interesting cars in Bombay included 7th Series Lancia "Lambda," large Fiats of 1935–36, a Rolls-Royce, a Riley "Lynx," a Wolseley Special, several Morris and Austins, and plenty of D.K.W. and Adler. The last-named are prolific all over India.

In Jubbulpore, Mallalieu noticed a very stark P-type M.G., a Railton, a 1932 Riley Nine, several flat-twin Rover Eights, and some model-T Fords, besides several Standards, Austins and Morris.

During a longer stay in Bangalore a well-preserved Modified Brescia Bugatti, various small Fiat models of 1932–39, some larger Fiats and several f.w.d. 850-c.c. (?) Skodas were seen. Also a Hansa and some more D.K.W.s. There are also some Bantams, possibly Jap productions, smaller than the Fiat 500 but better proportioned. Mallalieu also mentions the American taxis, two Rolls-Royce, a nice "Speed Twenty-five" Alvis saloon, a 3½-litre S.S. Jaguar, and some well-kept, recent model Wolseley, Morris, Hillman, Humber and Standard cars. He has also had fleeting glimpses of an Alfa-Romeo, an L-type and a P-type M.G., and a rear-engined Mercédès. Seeing the last-named, Mallalieu said, "Look, a Merc!" and the fellows he was with thought he meant an aircraft or an Eurasian girl! He reports that the breakers' yards are really methodically laid out, in contrast to ours, but that prices are on the high side—£12, for instance, for a 1918 4-cylinder Indian m/c. engine. Norton, B.M.W., and German Diamond motor-cycles are popular, and an "Ivory" Calthorpe and some very old hub-gear Triumphs have been seen. One breaker has a 1912 Triumph, new even to tyres.

CARS I HAVE OWNED

The series continues, this contribution being by an anonymous R.A.F. officer, with particular reference to an ex-T.T. " Hyper " Lea-Francis.—Ed.



VERY early in life I developed an interest in motoring and well remember first experiments in this direction. In 1919, or maybe it was 1920, my father decided to enter the field of private owners. He purchased, at an exorbitant figure, an ex-W.D. 4-h.p. Douglas Combination, upon which, at the tender age of eleven, I was wont to ride illegally whenever opportunity offered. Recollections of this chain-cum-belt horror centre mainly around broken Bowden cables, flywheels that periodically dropped off and, worst of all, my decision to start up the engine with the oil pump filler cap removed. On this model, the oil sump was situated below the crankcase. The engine started and oil gushed up from down under, the result being one ruined best bib and tucker. It cannot be doubted that at the age of eleven I was provided with good cause for remembering this incident.

The next family purchase was a brand new atrocity in khaki and stripes produced in Detroit by Harley Davidson. This machine was fitted with an enormous sidecar, replete with hood and windscreen, and was thus calculated to influence favourably my mother's somewhat anti-motoring tendencies. This machine really had unlimited power and, believe it or not, it once pulled a 20-seater charabanc (also made in Detroit) for some eight miles along a quite undulating road to the nearest garage at a steady 30 m.p.h. in top gear.

In spite of youthful hopes that my next occasional mount would be in a light shade of apple green (apple green was then used by Harley Davidson to distinguish H.C. " Super Speed " models from hacking versions), my mother won, and a four-wheeled vehicle was chosen in the form of the then newly-introduced Standard 11.4-h.p. tourer, or was it 11.9-h.p. ? This car proved to be a tractable little thing, although it must have been an early and more or less experimental model, for on being tested at the Standard works some months after purchase, several alterations were made, including part removal of the cylinder head. To my then lay mind this appeared to make no appreciable difference although, in deference to the Standard Motor Company, it must be remarked that all the avowed necessary alterations were carried out in a very short space of time, the car being driven home again the same day. Another curious reflection on earlier technical knowledge occurs to me in connection with this car, and would seem worth recounting. A decided heaviness quickly became apparent in the steering, so heavy, indeed, as to tire the driver over long distances. The agent from whom the car was originally bought advised resetting the front springs. This was done and had the effect of lifting the bows of the car until a head-on view offered the suggestion of a long-legged spider about to take off. After this bit of servicing the car became most unstable, and was quickly sold in favour of a 12-h.p. Riley " Chatsworth " saloon, which produced many m.p.g. but few m.p.h. A 10-h.p. Rover was added to the stable in 1931, and later the Riley " Chatsworth " was replaced by a Rover " Pilot," to which my father has continued to give his allegiance.

About this time I decided to experience the pleasures of personal ownership, and was soon the victim of a " large-h.p." salesman and a small h.p. car, to wit, a 1924 Morris-Cowley 2-seater drophead coupé. In spite of this car earning for me the nickname of " Doctor," the thing rattled horribly after the fashion of the time and, as mentioned, horses were exceeding few.

This vehicle was exchanged at the local breaker's for what was known as a " Colonial " Morris-Oxford saloon of some 16 h.p. The breaker assured me I had the better of the bargain, an assurance that seemed to lose value as odd bits began to drop off and get mislaid *en route*. The final indignity was endured whilst rattling majestically up the main thoroughfare of a busy midland town. The radiator was doing its customary boiling act, when suddenly the top hose became a safety valve and dense clouds of steam belched from the bonnet under pressure. A mild observation from the policeman on point duty that it must be on fire drove me to seek sanctuary and a last resting place for the " Colonial " in a quiet side street. Although never again trusted by me, the " Colonial " was patched up and traded out for a Morris-Oxford tourer of early vintage, complete with half-axles of silver steel, I was told. This transaction recurs to me as the only occasion upon which the better of the bargain was really had by me. A considerable mileage was put up in the old lady until she finally gave up the ghost when turning to the right out of Gt. Portland Street into Oxford Street. She died half-way across at midday, and under the cynical gaze of other waiting motorists she was pushed single-handed to the kerb, where a 'bus conductor kindly offered a box of matches from his platform with which, I can only imagine, he intended I should, there and then, make a job of it !

It was then decided that more dependable motoring should be the order of the day, and a very " clean " (I have always liked the word) 16-h.p. Austin fabric saloon was secured at a moderate figure. Everything about this car was exceptionally smooth, including the tyres, this last factor giving rise to some truly miraculous performances on wet roads after applying the cotton-wool brakes. However, the Austin was a good car and most considerate of its owner's pocket with regard to oil and repairs. The fabric and the electrical circuit eventually decided to strike, however, and, funds being low, it was necessary to return to the original and equally famous marque in the guise of a Cowley saloon at knockout price ; and, indeed, it was a knockout ! However, it succeeded in transporting self and newly-acquired wife to a new place of business 150 miles away, where it was unknown and thus more easily disposed of.

The following spring thoughts turned to matters sporting, and the long-awaited first sporting investment was a diminutive M.G. Midget coupé (Model M). Much was expected, but a memory of the scriptures was invoked, but little was obtained. The exhaust note was good, but as jet-propulsion had not then been heard of, that did not help, and although many mysterious things were done to the Midget, it was found that, if anything, even fewer revs. were then there for the asking ; 55 m.p.h. on the " clock " being in the nature of a maximum.

Whilst on a visit to a nearby town, my wife was impressed by a cream-and-powder-blue vision and, as will be readily appreciated, those early days of married life are ofttimes fraught with danger. The cream-and-powder-blue vision eventually found its way into our stable, and many happy hours were spent there admiring the 8-in. dials and the wife's ability to make a car look really worth the money. The Wolseley Daytona Hornet, for such it was, was quite pleasing to handle, and according to one of the 8-in. dials, would travel at some 60 and 85 m.p.h. in third and top gear, respectively, whilst the hand of the other 8-in. dial hovered over a red area. This car seemed to be able to climb any trials hill at which it was put, but it was subsequently discovered that climbing such hills in the leisurely manner of a minor motor trials official was vastly different from actually climbing in " trials proper." Unfortunately, whilst motoring up to a Brooklands meeting one Saturday afternoon, it became quite imperative to ascend the grass bank and drive along it for some little while before returning again to the road. As the needles on the 8-in. dials were undoubtedly well past noon, the grass verge did not do the Hornet a power of good. The car never really recovered from the shock and developed a decided tendency to try to lick its wounds, often giving the impression that the nose-end wanted badly to get around to the rear whilst still being intent on going forward.

Such behaviour convinced my wife and I that the time had come to seek other suitable means of transport, and whilst on a visit to interview a Riley Nine, Mk. IV, a very dusty-looking machine was espied in a far corner of the emporium. The proprietor was eventually prevailed upon to have it wheeled out, my wife proceeding to turn up her nose, an impression which was firmly retained until a trial run convinced her of her folly. This car had originally been bought and raced in the 1928–29 T.T.s by Gordon Hendy, and was a blown T.T. Lea-Francis with o.h.v. roller-bearing Meadows engine and everything that should go with it. In consideration of fuel consumption the No. 9 Cozette supercharger was removed before collection, but the result was so disappointing that a rebore was decided upon and promptly carried out. After careful and extensive running-in, the foot was fully depressed and, literally, nothing of importance happened. Bearing in mind the performance

put up during the initial trial run, it was decided to re-fit the compressor and hope for better things. The result was, indeed, worth while, although petrol consumption increased from 23 m.p.g. to 13 m.p.g.; indeed, it was realised that whilst everyone was obliged to respect "*it*," the car had absolutely no respect for anyone or their pockets. It was understood that the speedometer was reasonably accurate, and the following figures, obtained on the road with full equipment but windscreen removed, speak worlds for this make of car: 1st 30, 2nd 43, 3rd 78, 4th 93 m.p.h. (Higher readings were subsequently obtained on the Track.) The rev.-counter was, unfortunately, never repairable, although I seem to remember the works records telling me that 5,200 r.p.m. represented the absolute maximum, and that 3,000 r.p.m. represented 60 m.p.h. in top gear. The steering and road-holding were extremely good at all speeds, and the car would throttle down to walking pace in top gear, getting away again smoothly and rapidly in the same gear, whilst with the aid of the lower gears, the acceleration was truly breath-taking. Other than for reboring, I do not recall spending a penny-piece on repairs, although rear tyres lasted less than 4,000 miles, due, of course, to use of the phenomenal acceleration. I take no credit for the performance but, whilst this car belonged to me, nothing ever passed it—and customers were quite frequent! It is to be hoped that anyone reading this narrative will pardon undue prolongation of the Lea-Francis tale in deference to a now extinct model that would give all an enthusiast could ever require. This car once pulled a caravan over 600 miles of the most hilly country in England without a murmur of complaint other than a seized clutch thrust race, which necessitated clutchless gear changing after take-off. In spite of the caravan, the "Leaf" insisted on passing vehicles that were in its way up hills and, shameful to relate, many on the level. Without caravan, of course, it once did 126 miles nonstop over poor roads in 2 hrs. 32 mins., during which run it was impossible to exceed 70 m.p.h., and that only for very short periods. The inevitable happened to a somewhat negligent owner, and whilst busily dusting down a customer with 3rd gear engaged (showing-off) a decided shortage of oil became suddenly apparent in the form of expensive noises. Although a partial seizure was the reward, more should have happened with only ½-in. of oil to be read on the stick. The cream was off the milk, as it were, and the "Leaf" eventually gave place to a lorry-like contraption with no brakes, called a Humber. This vehicle also finished up by grazing along the grass verge, a choice between the grass and the rear of a stationary 'bus really leaving no option.

Next in line came another Morris-Cowley, about which the less said the better. This was quickly followed in turn by Buick, Essex "Super Six," 21-h.p. Vauxhall, Austin Ten, Standard Nine, about all of which much could be told.

The next car of note was an S.S.I., to be remembered by its ability to consume copious quantities of oil and its lack of ability to answer the helm.

Next came a Ford Ten that always seemed to like company, preferably in front and connected by a rope, although it did not altogether object to being pushed so long as it did not have to work alone for long periods at a stretch.

After this came a very majestic old Sunbeam saloon that readily assumed the nickname of "Taxi." After a con.-rod had had the better of an argument with No. 4 cylinder, it was decided that we should return to something more compatible with our youth, if not our growing family. M.G.s followed in rapid succession, four in all, starting with a J1 and ending with a P.A. The quest for urge was not rewarded, however, the best of this batch providing only 68 m.p.h., from the J1.

A crimson M.G. "Magna" was also among this series, in consequence of which it is felt that one's full duty would not be done by the discerning reader were a word of warning not added on the subject of buying cars in the dark. Bought unseen, on the recommendation of one who once thought fit to call himself a friend, this horrid vehicle was also collected on a dark and stormy night. On taking over, I was told that the battery was O.K. "Just needs charging, old boy!" Before an opportunity arose of pressing the button another kind friend hastened to oblige with the handle. Truly I had fallen among thieves. The 45 miles-run home was embarked upon with headlights which really were obliging; they automatically dimmed on removing the foot from the throttle. After some cautious miles had been traversed, the rains came down and a prayer of thanksgiving was offered up for the hood. The prayer quickly turned to something else when, on erection, it was found the hood was but a frame. Some more deserving person than I must have required large quantities of canvas for some dark purpose at an earlier date. However, I comforted myself with the consoling thought that men as good as I had used this motor car to, or for, some purpose. Nay, better men than I, for rumour had it that the son of a famous eastern potentate had once owned it. Later my confidence seemed misplaced when no trace of the august name could be discovered among the many previous owners listed in the registration book. I hesitate to speak more of this matter, concerning which we still feel strongly, but it can be added that in addition to a U.S. battery there were few teeth remaining on the starter ring, and the front brakes were applied on full lock.

It was now at long last decided to give away no more Saturday pennies in quest of a second "Leaf," but instead to invest our small savings in a sound proposition which, with luck and care, might be expected to carry us towards middle life. A new Morris Eight was purchased, but after knocking off some 33,000 miles in 14 months, it was decided that this machine could not possibly make the grade and it was replaced by a new 10-h.p. of the same breed. This car promised to compare more nearly with our now settled habits, and might even, in time, have completely reformed its owner, had it not been for the second world upheaval interrupting the experiment, and flannel bags having to give place to something more "uniform."

Perhaps we all look forward to again equipping and acquitting ourselves right well when the *job* is done, but until it is, may we hope that nothing will be allowed to interfere with a favourite pastime, reading MOTOR SPORT.

Should any reader be sufficiently interested in technical data on the above cars, the writer would be happy to correspond through MOTOR SPORT by courtesy of the Editor, but in view of such shameless disclosures as are made above, I must claim privilege to sign in self-styled title only—"A Past Answer to Certain Motor Traders' Prayers." [Or do you mean grace, sir, the one commencing: "For those whom we are about to deceive may the Lord make us truly thankful"?—ED.]

CONTINENTAL CARS LTD.

Directors: R. E. CLARKE, L. POTTER

SPECIALISTS IN THE UNUSUAL

Streamline 1938 Steyr-Daimler
1½-litre M.G. Open 4-seater
Bugatti Type 57 Galibier Saloon 1939

★

Le Mans H.R.G. 1938
1937 Riley Sprite 2-seater Black
1941 Registration D.K.W. Saloon

Tel.: Chobham 131

Full Stock List on application

CENTRAL GARAGE CHOBHAM, nr. WOKING

Rolls-Royce Reflections

Some people expressed surprise when John Bolster went over to a Twenty Royce and enthused over what is quite a slow car. So we asked him how it was. Here is his answer.—Ed.

IN writing this little essay, I feel that a few words of introduction are necessary, to excuse its infliction on customers who are not normally interested in "old gentlemen's mobile drawing-rooms."

To me there is nothing more marvellous than a real "blind," especially on a fast solo motor-cycle, but I cannot stand speed on the public roads in the passenger's seat of a car. Enquiry among my friends has confirmed that, except among the very young, the dislike of being driven fast is universal. Furthermore, for a typical journey on England's inadequate and over-crowded roads, the frenzied driver of the super-sports will hardly have time to order drinks before the sedate luxury-wagon glides noiselessly up. But the greatest recommendation for such machines, now and in the immediate future, is that an ultra-smooth clutch, flexible engine, even and progressive brakes, and correct weight distribution, all result in an incredible tyre mileage.

One can only discuss the various Rolls-Royce models in general terms, because the continuous progress in design which each model has undergone gives a different character and performance from cars of similar type but varying age.

The "Silver Ghost" was introduced in 1906, and was still in production 19 years later. No car produced since that famous model has been more silent, because the "Ghost," as turned out by Rolls-Royce, Ltd., was probably as nearly silent as any reciprocating engine will ever be. I once took a nasty fall in the road through trying to start the engine of my "Ghost" with the handle when it was already running.

It is not generally realised that the "Silver Ghost" is, for its size, a very light car. All the parts are of extremely fine construction, and the big engine is not nearly so heavy as it looks. Most of the poor things are utterly swamped by enormous bodies, of fabulous weight and wind resistance, but with a light body, a modicum of acceleration is available. These are the most delightful cars to drive, the light, high-geared steering being beautifully sensitive, and the engine, having almost the torque of steam, will start the car smoothly from a standstill on top gear. The governor throttle is fascinating to play with, and my car will nearly always start "on the switch," without recourse to handle or starter.

Few enthusiasts are in a position to run a 7½-litre private car, but with a light van body a great deal of use can be found for these everlasting and surprisingly economical chassis. But please be kind to them, because they are still, in their way, the best cars in the world.

Late in 1925 the side-valve 114 by 121 mm. engine of the "Ghost" gave way to a push-rod o.h.v. job of 108 by 140 mm., known originally as the "New Phantom," and, subsequently, as the "Phantom I." This car was appreciably rougher than the "Ghost," and had not a markedly superior performance to the faster versions of the side-valve car. In 1929, however, the "Phantom II" appeared, and this was considerably faster, with an aluminium head having the two plugs per cylinder on opposite sides, instead of all in a row as in the earlier engine, the inlet and exhaust manifolds being separated similarly. Almost every detail of the engine was different, and the gearbox, with closer ratios, was now in unit, and had the mechanical brake servo on the opposite side. (The last few "Phantom Is" had some of the Mk. II features.) An entirely new chassis frame had semi-elliptic springs all round, and Hotchkiss drive. The short-chassis, high-compression model, known as the "Continental Phantom II," is still thought by many to be the world's finest high-speed touring car, and I, personally, feel that no gentleman's collection is complete without one.

Nevertheless, time marches on, and the latest of the 40/50-h.p. models, the "Phantom III," appeared in the middle 1930s. With its vee 12-cylinder engine and independent front suspension, it was faster than its predecessor both on the straight and round the bends. Ridiculously heavy coachwork was often fitted to these cars, but with a reasonable body, the acceleration was magnificent.

The small Rolls-Royce will probably be of more practical interest to the enthusiast. This car was introduced shortly after the Kaiser's war. It was called the "Twenty" (21.6-h.p. R.A.C.), and had a push-rod o.h.v. engine of a little over 3-litres capacity. The earliest cars had a three-speed box and rear brakes only, with an engine giving less power than the subsequent models. They are often dismissed as being inferior to the later "Twenties," but no less an authority than L. C. McKenzie has informed me that the earliest "Twenties," when running with their original pistons, were the smoothest engines ever fitted to any car.

The four-speed "Twenties" had mechanical servo brakes, which were the equal of any present-day brakes. The chassis was a normal-looking affair, with semi-elliptic springing, but for some reason that I am unable to explain, this model is quite the safest car I know on slippery roads. Some good ideas were incorporated, such as the spare magneto, which does not normally rotate, but can be coupled up in a moment by the touch of a finger. The starter, whose ingenious clutch saves the gear teeth from shock, is also found on Rolls-Royce aero engines, and the radiator shutters are a convenience.

The last "Twenty" was delivered late in 1929, and it was then replaced by the "20/25," whose increased bore gave a 3½-litre, 26-h.p. car, though the engine had not altered externally. A 6-in. wheelbase increase gave even more room for coachwork. The "20/25" had those most effective shock-absorbers, whose gearbox-operated pump increased their damping at high speeds, and in 1933 an effective synchro-mesh gearbox was introduced. Eventually, another step-up in the bore took place, and the "25/30," a 30-h.p., 4¼-litre car, added acceleration to the virtues of the smaller Rolls-Royce.

Performance figures are not the attraction of the baby Royce, but, as a matter of interest, the 1921 car would do an honest "sixty," and the 1936 model, when not over-burdened with colossal carosserie, would just about achieve "eighty."

Last of all came the "Wraith." Its 30-h.p. engine has a new head, with inlet and exhaust ports on opposite sides, and a very large frame, with independent front suspension, permitted the mounting of bodies of a size previously associated with the 40/50-h.p. car. There is quite a demand for these motor cars, but they are still to be had if one has about £4,000 to spend!

To revert to poor men's motor cars, the old "Twenty" is about as cheap a car to run as one can imagine. The petrol consumption always averages over 20 m.p.g., even on short runs, and the tyre wear is very slight. The car is made like a watch, and seems absolutely everlasting. I ran an old "Twenty" for several years before having to buy any spare parts, and was then amazed at their cheapness. But, remember, that the delightful running of these cars is due to meticulous workmanship, and if you let Bert, the blacksmith, mess about with your engine, she'll run as roughly as any cheap old junk.

Although these chassis, by their reliability and delicacy of control, still satisfy those of us who do not require a fast car, some of the bodies which have been perpetrated upon them are really horrible. Beauty is but skin deep, but some people are unwilling to drive a car which provokes screams of "Gor blimey! She's an old 'un," from the loungers at every street corner. For this reason, new bodies of modern appearance have been built on these cars, and two firms, the Southern Motor Co. and J. Compton, have specialised in this work. One of my "Twenties" has a Compton body, and quite apart from its very distinguished appearance, it saves me hours in cleaning. Smooth lines and chromium plate certainly make a difference when one has to wash one's own car.

I cannot conclude my remarks without pointing out my inadequacy for the task which I have attempted. An article signed McKenzie or Craner, for instance, would carry some authority, and Mr. Sears, who collects Rolls-Royces as lesser men collect stamps, could tell us a thing or two.

SOME SPECULATIONS O

—with particular reference to tha

by S/Ldr. C. W.

This masterful survey of modern suspension as to future trends and another article which technical matter of the " education

I HAVE used the word " Speculations " in my title deliberately, because many of the categorical statements put forward represent merely my own amateur theories and may be scornfully rejected by the experts.

From late Edwardian days until the early thirties the suspension of sports and racing cars remained substantially unchanged, consisting of stiff ½-elliptic springs on front and rear axles, controlled by friction shock-absorbers, in combination with a fairly flexible channel steel frame. At the rear this was sometimes varied by ¼-elliptic or cantilever springs.

The Lancia " Lambda," though not primarily a sports car, deserves mention as an honourable exception, its front end resembling in many essentials that of a modern G.P. car.

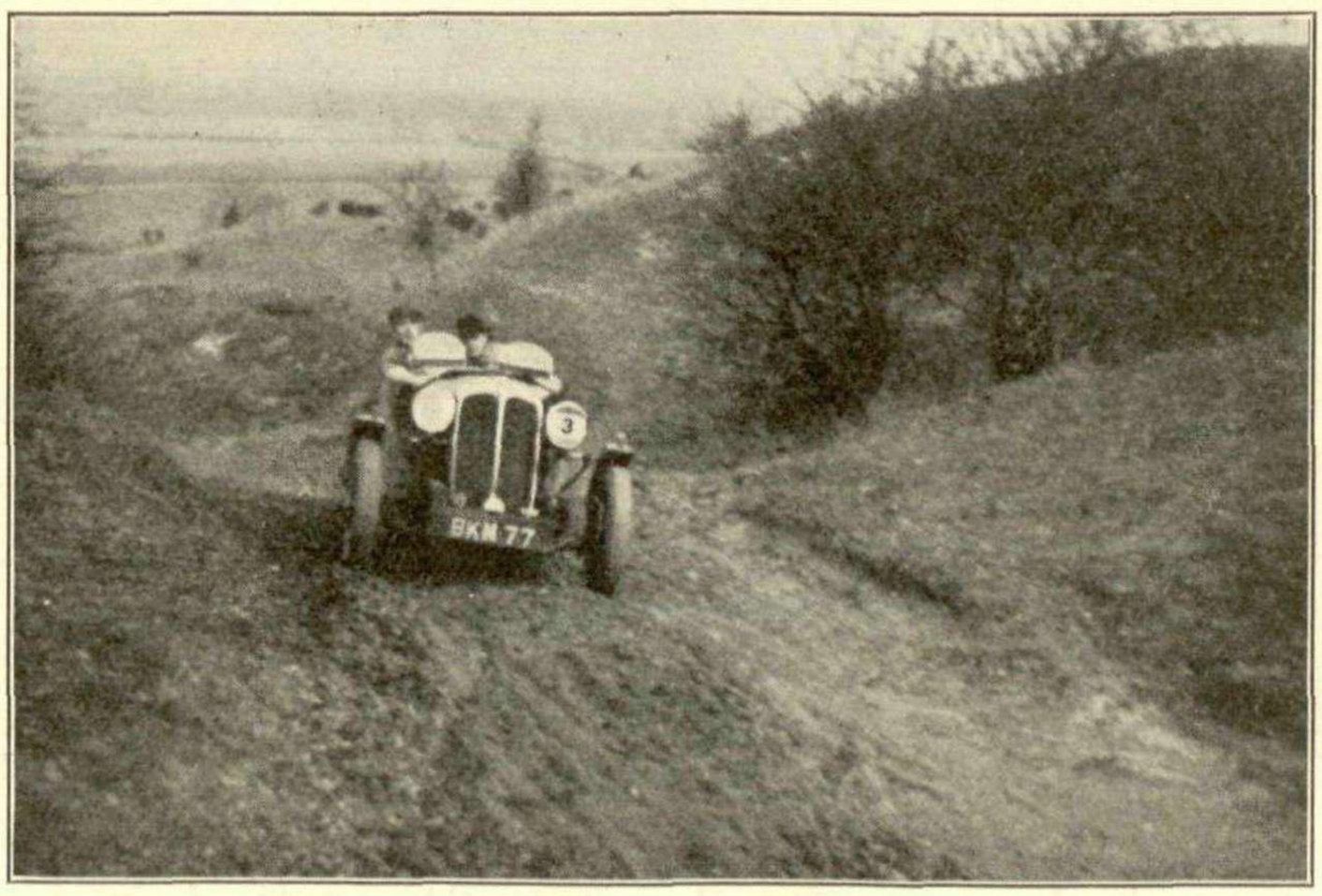
Springs throughout this period were extremely hard, that is, they had high rates and small excursions, and, being backed by large friction shock-absorbers, were extremely unyielding. Road irregularities were to a certain extent accommodated by deflection of the frame, and Bugatti even went so far in the early twenties as to build two or three experimental cars with no front springs at all.

The reasons for using such hard springs were several. At the front hard springs were necessary for two reasons : (1) To limit vertical travel of the axle. With conventional ½-elliptic springing the front axle rises and falls in an arc whose centre is the eye at the unshackled end of the spring. If the travel is large, considerable changes take place in the castor angles of the king-pins, to the detriment of directional stability. (2) To minimise roll. Roll is produced by centrifugal force acting through the c. of g. of the sprung portion of the car with a leverage determined by the vertical distance of that c. of g. above the roll axis, and is opposed by the springs with a leverage determined by the horizontal distance between them (where an axle is used).

With a deeply dropped front axle and flat springs the roll axis at the front was low, and the minimum permissible distance between the springs was limited by the steering lock. To resist roll adequately hard springs were therefore necessary.

At the rear they were necessary in order to maintain good contact between wheels and road in spite of high unsprung weights. The rapidity with which a spring rebounds into its previous position after an impact depends upon its rate, and upon the mass it has to accelerate, that is, the unsprung weight of its particular wheel, etc. The higher the rate and the smaller the unsprung weight, the swifter the rebound, and the sooner the wheel returns to contact with the road. Where the unsprung weight is large, as with the conventional live rear axle, the spring must have a very high rate if the wheel is to rebound swiftly enough to follow faithfully a rapid succession of small bumps. Where the unsprung weight is low a soft spring is perfectly able to maintain good road contact.

The use of stiff springs also relieved designers of the necessity of making special provision for brake reaction at the front and drive and brake reactions at the rear. Many fast cars up to the middle thirties were built without radius rods at the front and with Hotchkiss drive at the rear.



Suspension of the old order—stiff leaf springs, further stiffened by shock-absorbers, and a flexible frame. The car is Richards's special Rover Ten, capable of 85 m.p.h. and a successful participant in trials.

Such stiff springs are undesirable. They give a harsh ride, and impose heavy stresses on the frame, because the stiffer the spring the greater the rate at which it transmits to the frame energy imparted to its road wheel by an impact. Also, the hard spring, with its small range of movement, cannot accommodate large slow excursions of its wheel, such as are demanded by considerable but relatively gradual changes in level of the road surface.

In 1934, Mercédès-Benz and Auto-Union threw their famous bombshell in the racing world by producing cars which showed a startling advance in suspension and roadholding qualities. The principal objects of this article are to examine the methods by which they achieved this advance and to attempt to determine the reasons underlying their departures from conventional practice, and so to hazard a prophecy as to the future trend of sports-car suspension.

Dynamically, the advance was accomplished by closer control of road-wheel movements and by ensuring understeer.

Structurally, it was obtained by using independent front suspension, employing soft springs in conjunction with a stiff frame, mounting the final drive on the frame, and making changes in the disposition of the main masses.

The use of i.f.s. confers a number of advantages. There is some saving of unsprung weight compared with an axle system, but this is not the major advantage, and is not as great as is often supposed. A large proportion of the unsprung weight at the front is formed by the two-wheel, hub, and brake assemblies, together with their steering arms and pivots. These are approximately the same in both systems. Against the saving of the weight of the axle beam must be put the unsprung portion of the suspension links. The biggest saving is achieved by dispensing with ½-elliptic leaf springs. The unsprung weight of a coil is about one-third that of the corresponding leaf spring, whilst the unsprung weight of a torsion bar is virtually nil.

By far the most important advantage of i.f.s. is its contribution to understeer. When a tyre is exposed to a lateral force, as when cornering, it tends to drift (without skidding) in the direction of that force. The angle which its new course makes with the straight-ahead is called the " slip-angle." The slip-angle for a given lateral force depends upon various factors —inflation pressure, loading, and the angle of the wheel to the vertical. Under-inflation, over- and under-loading, and increase in the angle to the vertical all

N FAST-CAR SUSPENSION

t used on the German G.P. Cars

S. MARRIS, R.A.F.

systems represents both an interesting prophecy will satisfy those readers who have asked for more " sort in their " Motor Sport."—Ed.

increase the slip-angle. Now the directional stability of a car depends mainly upon the relative slip-angles, front and rear. (Steering and suspension geometry may also affect it.) If the slip-angle at the rear is the greater, the car will tend to turn *towards* any lateral force. Centrifugal force will then be added to the lateral force, the car will turn still more, and a vicious circle will be established. This is oversteer. If the slip-angle at the front is the greater, the car will tend to turn *away* from any lateral force. Centrifugal force will then oppose the lateral force, a balance will be reached and the car will be directionally stable. This is understeer.

Since centrifugal force increases as the square of the speed, oversteer increases in the same way, and an oversteering car becomes rapidly more directionally unstable the faster it travels. Consequently, understeer is a property essential in very fast cars.

A potent method of obtaining understeer is to arrange for a large transfer of weight between the front wheels under the influence of lateral forces, with resultant overloading of the outer tyre and underloading of the inner, so producing a large slip-angle at the front.

When centrifugal force acts on a car it transfers weight from the inner to the outer wheels to a total extent which depends upon the magnitude of that force, upon the height of the c. of g. and upon the track of the car. The weight transfer between each *pair* of wheels (front or rear) is made up of two components, namely, a share of the moment compelling the sprung portion of the car to roll, and a share of the moment tending to upset the unsprung portions of the car. The magnitude of the moment causing roll depends upon the magnitude of centrifugal force and the distance of the c. of g. of the sprung portion above the roll axis (that is, the line joining the roll centres of the front and rear suspensions). This moment is transmitted to the wheels through the springs as weight transfer, and the share transmitted front or rear depends upon the relative roll resistances of the front and rear suspensions—the greater the roll resistance at the front the greater the weight transfer due to this component, provided always that the frame is torsionally rigid. The share, front or rear, of the moment tending to upset the unsprung portions of the car depends directly upon the static loading and the height of the roll centre at that particular end. The total weight transfer at each end depends on the sum of these two components.

By far the most important advantage of i.f.s. is its contribution to understeer. I.f.s. gives increased resistance to roll for the same hardness of spring, compared with an axle system, and therefore tends to increase weight transfer at the front and produce understeer.

A front-axle system offers less resistance to roll than to bump, whilst an independent system offers equal resistance to both. This may be a little difficult to appreciate at first because it is the conventional system which behaves in a complicated dual way and the newer independent system which acts more simply.

With a conventional axle, for a given level of a front wheel relative to the frame, the spring on the same side may be in any one of a series of different degrees of compression, depending upon the level of the other end of the axle. In roll, owing to " lowering " of the opposite end of the axle relative to the frame, an outer front spring is less compressed for a given " rise " of its wheel than it is in " bump," since in the latter case the inner end of the axle remains at its normal level relative to the frame.

With independent suspension, for a given level of a wheel relative to the frame the spring on the same side can only be in one particular degree of compression. Consequently, the resistance to a given amount of deflection of that wheel is always the same whether the motion is roll or bump. This increased resistance to roll is slightly offset by the lowering of the roll axis at the front with most types of i.f.s., as will be discussed later, but there is always a considerable net gain in resistance to roll and in weight transfer. A third advantage is that in all independent systems the path of the steering pivot is positively controlled and the caster angle (except on the Cord) remains constant under spring deflection and brake torque, however soft the spring, so that directional stability is not affected.

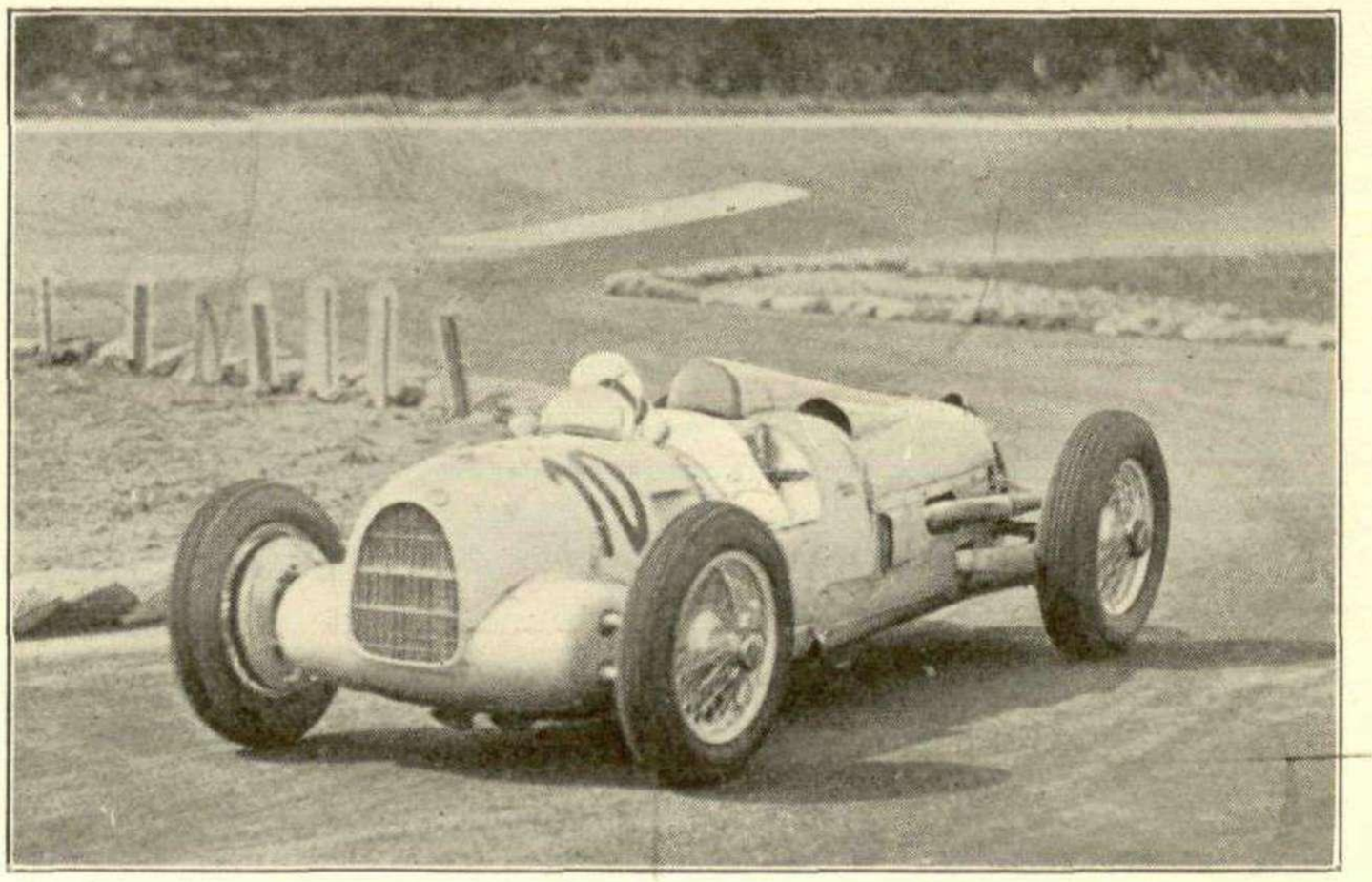
These three points—decreased unsprung weight, positive control of the path of the steering pivot, and increased resistance to roll—as well as being advantageous in themselves, allow softer springs to be employed without the disadvantages which attend their use on a conventional front axle.

A further advantage of i.f.s. is that there is no tendency for front axle " tramp " to occur, with the axle oscillating violently in a see-saw manner across the front springs. (Provided the front end of the frame is torsionally stiff. If it isn't, the whole independent suspension assembly may oscillate.)

There are a very large number of different types of i.f.s. They may be classified broadly into three groups, according to the type of wheel movement which they show when viewed from the front.

The first is the " vertical," in which the wheels remain vertical to the road in bump, but lean with the car in roll, *e.g.*, front suspensions of Lancia, Cord, Porsche, Vauxhall, G.P. Mercédès, and D.K.W. types. In the first three examples the track remains constant in bump, but in the last two there is a certain amount of side scrub of the tyres.

The second group comprises the " wish-bone " systems, in which the wheels are carried on transverse links, usually of wish-bone form, the upper shorter than the lower, so that the lower parts



An Auto-Union on a course calling for good suspension. Like all modern G.P. cars, it has soft suspension, a rigid chassis, and a low c.g.

of the wheels tilt outwards in bump to maintain constant track. In roll the outer wheel remains almost at right angles to the road, only leaning outwards slightly. Examples of this type are Rolls-Royce and all cars of the General Motors and Chrysler groups, with coil springs; Lagonda and Citroen, with *torsion bars; and Humber*, earlier B.M.W., and Delage, with leaf springs, a transverse spring replacing the lower links.

The third group comprises the "swing-axle" systems, in which the wheels are carried on half-axles pivoted close to the centre line of the car, and swing in arcs whose radius is nearly half the track. The wheels tilt *inwards considerably in bump*, and slightly inwards in roll to a degree depending upon the distance apart of their pivots. This is the least popular group. Examples are the f.w.d. Derby and the L.M.B. The majority of independent rear suspensions are "swing-axle," notably the original G.P. Auto-Unions.

The three groups all attain in only slightly varying measures the basic advantages of i.f.s. explained above, but they differ considerably in their secondary properties. It was, therefore, the secondary properties which determined the German designers' choices.

In all secondary properties the "vertical" group represents one extreme, the "swing-axle" the other, and the "wish-bone" a compromise which can be modified in either direction by adjusting the proportions of the upper and lower links.

(1) The attitude to the road surface which the front wheels assume in cornering greatly affects their lateral drift ("slip-angle") and therefore the over- or under-steering properties of the car as a whole. In the "vertical" group the wheels lean outwards with the car to the full extent of the roll. Drift is at a maximum, and there is a marked understeering tendency. In the "swing-axle" *group the position is completely reversed.* The "wish-bone" group is intermediate.

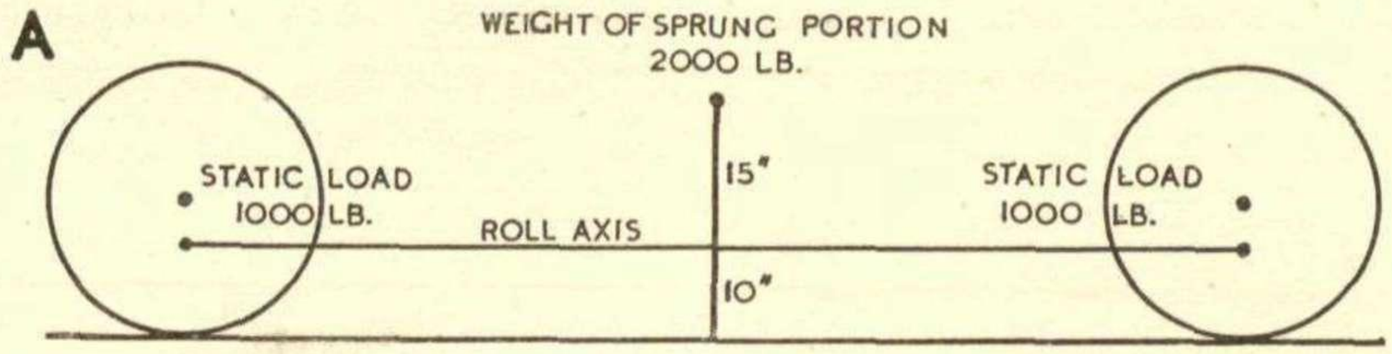
(2) The height above the road of the centre about which the front end of the car rolls, and consequently the liability of the system to roll and its tendency to transfer weight, also vary in the three groups. Other things being constant, the higher the roll centre at the front the *greater the weight transfer between the* front wheels (and therefore the greater the understeering tendency). This is because lowering the roll centre at the front increases the leverage of the force tending to upset the sprung portion of the car by only about half the amount by which the leverage of the force tending to upset the unsprung portion of the front end is diminished, since the c. of g. of the sprung portion of the car is about half-way along the wheelbase.

This is most readily illustrated by rough diagrams and crude numerical examples.

Assuming front and rear spring periodicities to be approximately the same, in accordance with current practice, then load/rate ratios must be the same, and therefore the ratio of resistance to roll front/rear will be as the ratio of static loading front/rear. Assuming—

Track ... ... = 50″
Weight of car ... ... = 2,000 lb.
Ratio of loading front/rear ... ... = 50/50
Height of roll centre at rear ... ... = 10″
Height of roll centre at front ... ... = 10″
Height of c. of g. of sprung portion ... = 25″

Then, if $u=0.5$, and the car is cornered on the point of skidding (see A in the accompanying fig.)—



Overturning moment on front wheels is—

$$\frac{2{,}000 \text{ lb.} \times 0.5 \times 15''}{2} + 1{,}000 \text{ lb.} \times 0.5 \times 10''$$

$$= 12{,}500 \text{ lb/in.}$$

Weight transfer at front is—

$$\frac{12{,}500 \text{ lb./in.}}{50''} = 250 \text{ lb./wheel.}$$

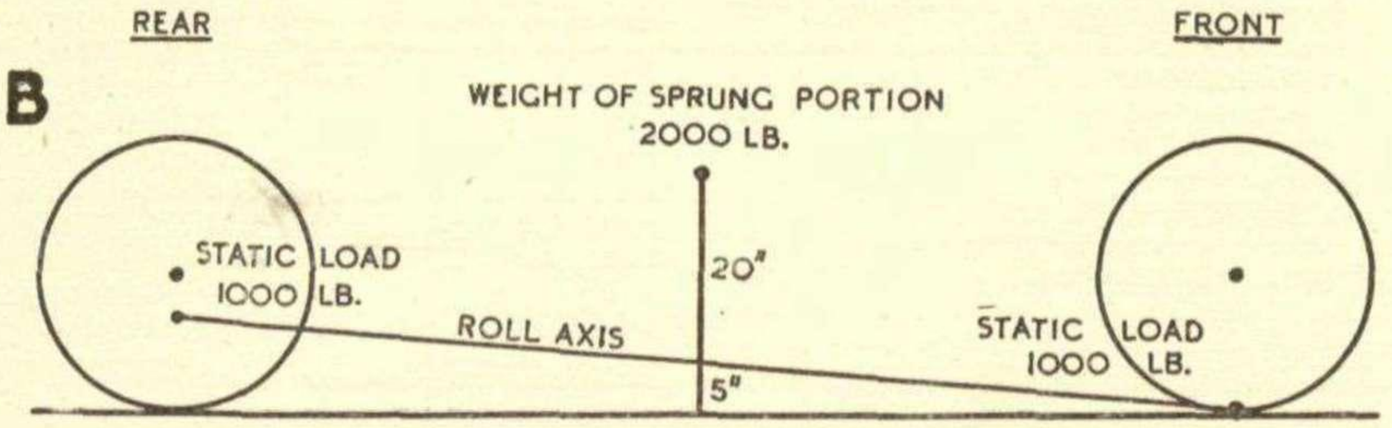
$$= 50\% \text{ transfer.}$$

Overturning moment on rear wheels is exactly the same.

But if

Height of roll centre at front ... ... = 0″

Overturning moment on front wheels is (see B in the accompanying fig.)—



$$\frac{2{,}000 \text{ lb.} \times 0.5 \times 20''}{2} + 1{,}000 \text{ lb.} \times 0.5 \times 0''$$

$$= 10{,}000 \text{ lb/in.}$$

Weight transfer at front is—

$$\frac{10{,}000 \text{ lb/in.}}{50''} = 200 \text{ lb./wheel}$$

$$= 40\% \text{ transfer.}$$

Overturning moment on rear wheels is—

$$\frac{2{,}000 \text{ lb.} \times 0.5 \times 20''}{2} + 1{,}000 \text{ lb.} \times 0.5 \times 10''$$

$$= 15{,}000 \text{ lb/in.}$$

Weight transfer at rear is—

$$\frac{15{,}000 \text{ lb./in.}}{50''} = 300 \text{ lb./wheel}$$

$$= 60\% \text{ transfer.}$$

For understeer it is, therefore, desirable to have as small a difference as possible in the heights of the roll centres, front and rear. (In this example the unsprung masses have been assumed to be nil, but the error introduced is small, and the principle is not affected.)

The position of the roll centre for any system can be determined by superimposing drawings of it in varying degrees of roll. (In many systems the motion of the frame in roll is not pure rotation *about a point, but includes some bodily* lateral movement, and the roll centre is then not a true point but a small zone.) In the "vertical" group the centre is approximately at road level, its exact position being determined by the type of linkage and the rate characteristics of the springs, but these differences affect its position surprisingly little. Even in the "wish-bone" group it is almost exactly at road level if constant track is maintained. *In the "swing-axle" group,* however, it is at the intersection of the lines which join the bottoms of the tyres to their half-axle pivots, *i.e.*, high—usually above hub level.

(3) Side-scrub of the tyres in bump takes place to a considerable extent in the "swing-axle" group, but is absent in the "wish-bone" group, and usually absent in the "vertical."

Note that these last two properties are intimately connected, and that any expedient which decreases lateral tyre scrub lowers the roll centre and *vice versa.*

(4) *When a rapidly rotating wheel is* tilted, gyroscopic action introduces a force which tends to oppose tilting. Therefore, in suspension systems where *the wheels are tilted in bump, the inertia* of the mass of the wheel to acceleration upwards is reinforced by the gyroscopic resistance to tilt, and, in effect, the unsprung weight is increased. In addition, gyroscopic action in bump tends to produce a movement of the wheel about the king-pin axis, which affects steering. (These effects are obviously greatest in the "swing-axle" group.)

The G.P., Mercédès and Auto-Unions from 1934 to 1939 all used "vertical" types of i.f.s., each marque adhering to, and developing, its own system. Mercédès *used pairs of short transverse links* of equal length, working against coil springs, which were disposed horizontally in the earlier examples, and vertically in the later. The shortness of the links must have given rise to considerable lateral tyre scrub, but, according to Peter Berthon, wear from this action was negligible in comparison with the rapid

wear from other causes. This tyre scrub may have been embodied in order to provide some frictional spring damping in addition to the hydraulic damping of the shock-absorbers.

Auto-Union used the Porsche system, with pairs of fore and aft arms of equal length working against transverse torsion bars. In the later examples the arms were shortened, as some trouble had been experienced with distortion under cornering loads—presumably twisting, since, with a co-efficient of friction less than unity, the horizontal load would always be less than the vertical.

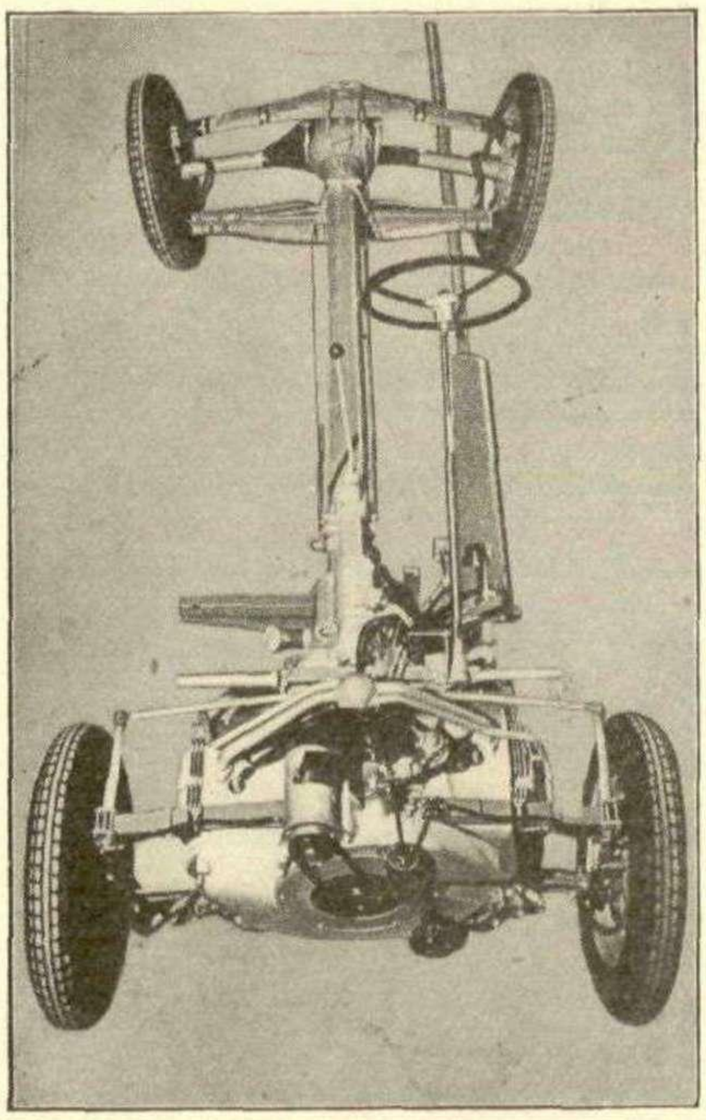
Since the considerable gyroscopic effects to which it is prone at high speeds ruled out the " swing-axle " system, Mercédès and Auto-Union were compelled to use either " wish-bone " or " vertical " systems at the front. But, as will be apparent from the preceding numerical examples, when the front roll centre is nearly at road level, as it is in both these systems, weight transfer at the front is almost entirely due to roll. Since both these cars were laid out with wide track, very low build, and rear suspensions having good roll resistance, their tendency to roll and to transfer weight at the front was inevitably small. It was, therefore, necessary to increase the drift angles at the front by some other means. Adopting " vertical " systems and so allowing the front wheels to lean with the car in roll achieved this. The " wish-bone " layout here had all the disadvantages, tilting the wheels on bump, having a roll centre on road level, and holding the outer front wheel (the more heavily loaded) vertical *in roll*.

It is interesting to note that E.R.A. borrowed the Porsche suspension complete, and that the 1½-litre, 8-cylinder Alfa-Romeo used a somewhat similar " vertical " system with fore and aft links.

The same considerations will apply to the selection of the front suspension layout of any low-built sports car, and will strongly favour a " vertical " i.f.s. system. With semi-sporting cars of higher build and lower maximum speed, " wish-bone " systems have an advantage. The greater susceptibility of such cars to roll would give unduly large front slip-angles with " vertical " types of i.f.s., owing to the combination of greater weight transfer due to roll, with excessive lean of the front wheels. "Wish-bone " systems correct this by removing the second factor (as far as the more heavily loaded outer wheel is concerned). The gyroscopic effects of the corresponding tilt of the wheels in bump is unimportant at moderate speeds. But as the constant tendencies in automobile evolution are towards lowering the centre of gravity, cutting down roll by expedients such as anti-roll bars, and increasing the maximum speed (*e.g.*, 1941–42 American cars), " wish-bone " systems are likely to decrease in popularity amongst fast cars in favour of " vertical," probably of the Porsche type.

The considerations which affected the layouts of the rear suspension of the G.P. Mercédès and Auto-Unions were very different from those operating at the front. The major considerations were the elimination of the shift of weight from one rear wheel to the other under drive torque (with loss of adhesion of the lightened wheel), and the reduction of unsprung weight. It is difficult to say which was the more important. Happily, both considerations were satisfied by mounting the final drive on the frame.

The 1934 G.P. Mercédès-Benz used a De Dion rear axle acting against a transverse leaf spring, the beam being a forging located against lateral movement by some suitable device, possibly a pair of triangular links meeting at a ball joint, as on the " Grosser " Mercédès. On later models the forging was replaced by a tubular axle acting against longitudinally placed torsion bars, and located laterally in a slotted projection from the back of the differential housing. The axle was located longitudinally by radius arms running forward from the brake back plates to the sides of the frame.



The 1934 Auto-Union used tubular half-axles, swinging on the differential housing, acting against a transverse leaf spring and stayed by longitudinal radius arms as on the Mercédès. By 1937 this system had been replaced by a De Dion layout with torsion bars, very similar to the Mercédès of the same date.

The choice between axle *versus* independent suspension at the rear was on a different basis from the same choice for the front in important respects. As regards saving of unsprung weight the positions were closely comparable, front and rear, the independent system showing little gain. (Comparison of the De Dion axles of the later Auto-Unions with the swing-axles of their predecessors shows that unsprung weight was increased only by half the weight of the tubular axle plus the weight of the two outer universals. Radius arms were necessary in each case. This increase was, in practice, offset by the substitution of torsion bars for the leaf spring.)

Positive control of the path of the steering pivot, of course, did not enter into the question, nor, owing to the point of action of the springs close to the wheels, was there any danger of "tramp" at the rear axle. Increased resistance to roll was not an advantage of i.r.s. Roll resistance at the rear is *not* automatically increased by the use of an independent system, as on a rear axle it is easy to arrange the point of action of the spring so close to the wheel that the degree of spring compression for a given amount of wheel deflection is virtually unaffected by the slope of the axle and is, therefore, equal in roll and bump, as with independent suspension. The roll resistance of a rear suspension system, axle or independent, is normally determined by the height of its roll centre.

The roll centre of an axle layout is at the point at which the axle is anchored to the frame against lateral movement. Obviously, since the corresponding point on the frame does not move laterally in roll, it must be the centre about which the frame rolls. (Where the axle is anchored to the frame not at a point but through some linkage—*e.g.*, a Panhard rod—the latter is laid out so that some particular point on the centre line of the axle is always in the centre line of the frame. This point on the axle is then the roll centre. If, as is often the case, the condition at which the locating device aims is only approximately fulfilled, the roll centre will not be a true point.) With an axle, therefore, the designer can readily fix his roll centre as high or as low as he likes.

The choice between suspension systems at the rear turned mainly on height of roll centre and on attitude of wheels to road. The roll centre had to be neither so low as to cause excessive roll, nor so high as to produce oversteer by increasing weight transfer at the rear at the expense of the front. The attitude of the wheels to the road had to be vertical in roll to avoid a large slip-angle, and as nearly vertical as possible in bump to avoid gyroscopic effects.

" Vertical " systems were ruled out on both counts, their roll centres being at road level and their wheels leaning with the car in roll, the combination producing gross oversteer. " Wish-bone " systems also suffered from having their roll centres at road level, and although the attitude of their wheels in roll is better, they are subject to gyroscopic effects in bump. This left only the " swing-axle " and De Dion systems for consideration.

The roll centre of a system with half-axles pivoted at the level of the differential axis tends to be too high (it is above the level of the pivots), but the resultant excessive weight transfer at the rear is partly offset by the reversed camber of the wheels on roll, which reduces their slip-angle for a given deviation from normal load. Reduced weight transfer at the front, however, still occurs. In addition, such a system suffers from severe tyre scrub and gyroscopic effects. The latter are said to have caused its abandonment by Auto-Union.

(The roll centre of a " swing-axle " system can be lowered by pivoting the half-axles below the level of the differential axis, but this entails the use of two universals each side, so sacrificing the

simplicity of the layout. It also gives poor ground clearance under the pivots. Even if by this expedient the roll centre is brought down almost to road level, tyre scrub and gyroscopic effects, though reduced, remain always greater than with an axle, since each wheel swings in an arc whose radius is only about half the track, whereas with an axle the radius of the arc described in bump is the full track.)

Since a De Dion axle can have its roll centre at any desired height and maintains its wheels vertical in roll and nearly vertical in bump (a 6-in. bump with 56-in. track means an inclination of only 5°), it fulfils most closely the desiderata for a rear suspension system stated above. It was, for these reasons, the final choice of both Mercédès and Auto-Union.

The considerations which dictated the rear suspension layouts of the German G.P. cars also operate with sports cars, but with slightly different relative values owing to much lower power/weight ratios. Elimination of loss of adhesion of the offside rear wheel at high torques is less important than reduction of unsprung weight, although the former is a considerable advantage under slippery conditions and will probably obviate, even on the fastest sports cars, the necessity for a limited-slip differential—a device which is not an unmixed blessing. The final drive must for both these reasons be mounted on the frame.

The height of the roll centre and the attitude of the wheels in roll and bump are again the determining factors in choosing the type of rear suspension, although, with a higher centre of gravity, roll tends to be greater, and a fairly high roll centre can be employed without too great a disparity between weight shifts, front and rear, in roll, since, as shown in the numerical example given previously, weight transfer at the front, when the front roll centre is at road level, depends on the rolling moment. Gyroscopic effects, too, are less important on sports cars, since speeds are lower. The "swing-axle" is therefore not entirely ruled out, but as with "wish-bone" at the front, lower centres of gravity and higher speeds will tend to make it progressively more disadvantageous. In addition, its severe tyre scrub, if soft springs are used, is a considerable drawback for normal use.

Within five years of the resumption of car production the majority of expensive cars will have De Dion rear axles. The Americans are likely to be early in this field—as they were with i.f.s. (The use of coil springs at the back on Buick, Oldsmobile and certain Chrysler models suggests that they feel the time is ripe for radical changes in rear suspension.)

In passing, it is worth noting that if fore-and-aft radius arms, rigidly attached, are used to locate a rear axle, one arm will be twisted when one wheel rises relative to the frame, making the suspension stiffer than when both wheels rise together. If a torsionally stiff axle beam is used, this effect will be severe. It is undesirable, as the springing will be either too hard in the first case, or too soft in the second. The effect is exaggerated in roll, when the axle will act as an anti-roll bar, with increased transfer of weight outwards between the rear wheels, tending to produce oversteer. The remedy is to make one radius arm free to rotate on the axle, or to use an axle section which, though stiff in bending, is weak in torsion. Citroen tried the first solution on the rear axles of his earlier front-drive models, but quickly discarded it in favour of the second, using a cruciform axle section.

If it is necessary to increase the resistance to roll of a suspension system, it is better to put the anti-roll bar at the front, when there will be increased transfer of weight outwards between the front wheels, with correspondingly decreased transfer between the rear, so assisting in obtaining understeer. The front suspension is likely, in any case, to be softer, and its resistance to roll therefore less, than the rear, as by such an arrangement fore and aft pitch is automatically damped out quickly. For these reasons the use of anti-roll bars at the front on touring and semi-sporting cars is likely to increase. The Americans have already made a start.

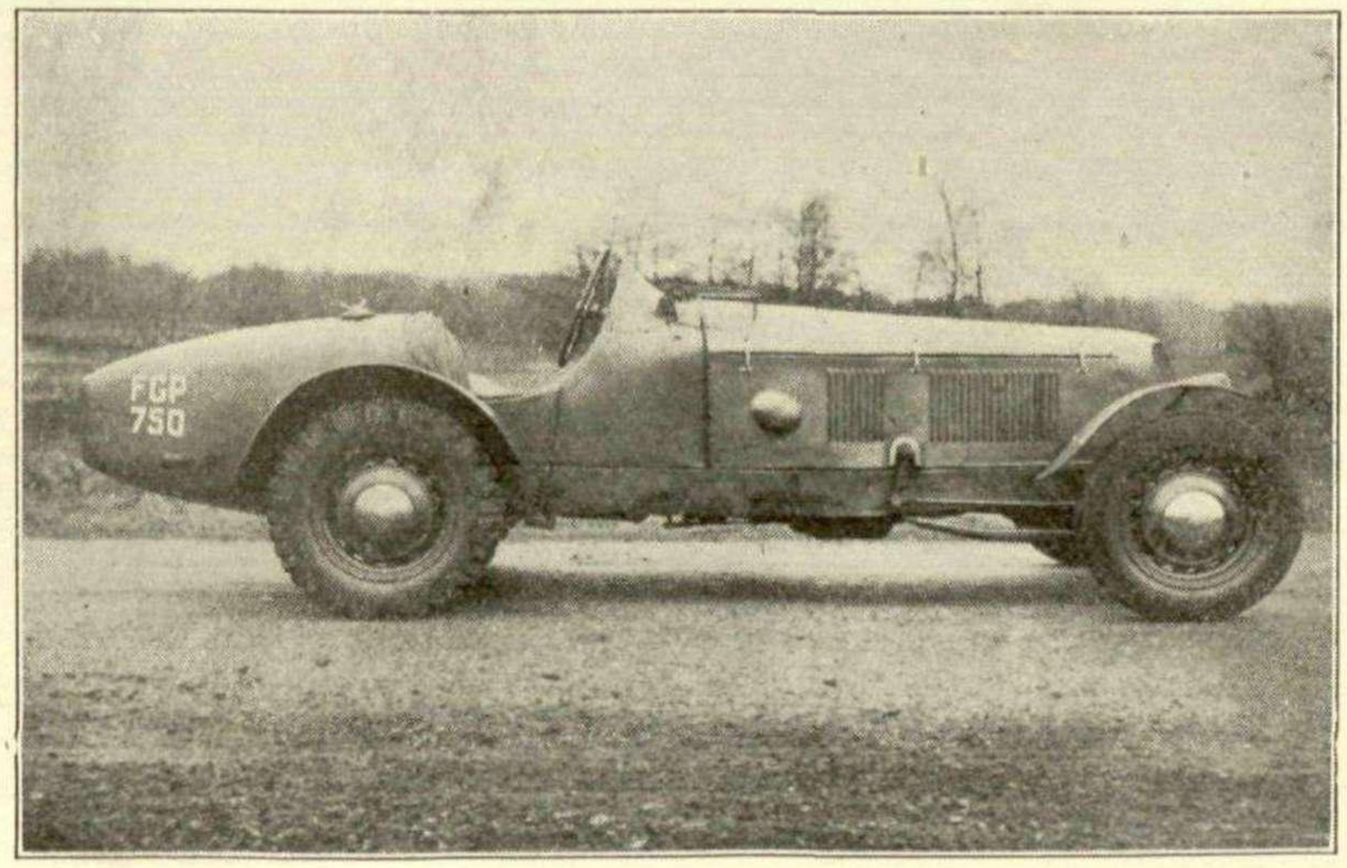
The last innovation introduced by the German G.P. cars to improve suspension and roadholding was redistribution along the chassis of the main masses, which were pushed towards the ends. This was quite evident on the Mercédès, but it is doubtful

Continued on page 86

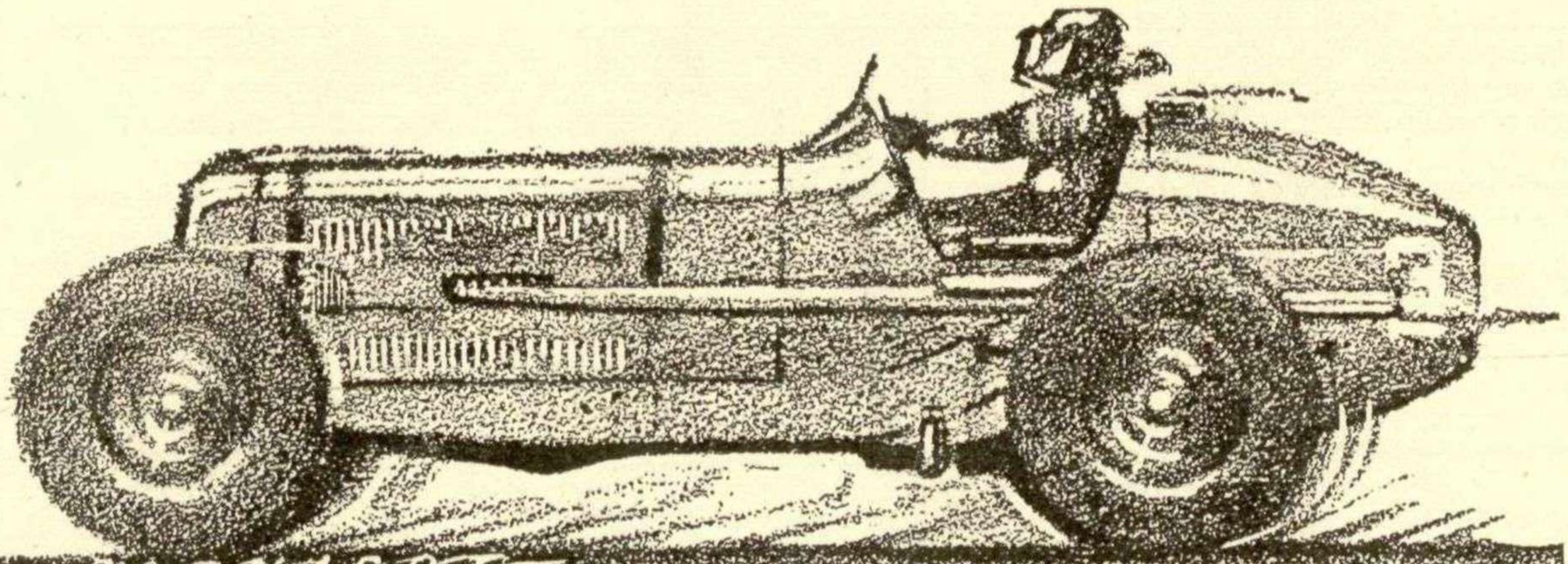
NOW as victory takes shape before our eyes, so does the design of our post-war ALLARD car.

ADLARDS MOTORS LTD.

Manufacturers of Allard Cars



Branches at
PUTNEY, BRIXTON *and* **FULHAM**



RUMBLINGS

In a leading article in MOTOR SPORT for October, 1943, Cecil Clutton referred to an experimental 6-cylinder, 2-stroke Scott engine which gave 50 b.h.p. per litre at 4,500 r.p.m., pointing out that this represented a b.m.e.p. of 145, which considerably exceeded that attained, for instance, by the Type 57S Bugatti. This led Dr. Ronald Wood, of Leeds, to send us a photograph of this engine installed in his Aston-Martin, and subsequently he sent us technical details of the 6-cylinder unit, which we published in February last year. Being now exiled in Yorkshire we recently decided to visit Scott Motors, Ltd., at the pleasant Bradford suburb of Saltaire and see these things for ourselves. Mr. W. Cull, the chief engineer, kindly said we would be very welcome, and off we went. Scotts, of course, achieved their first flush of fame in the 1906 Newnham hill climb, in which event Alfred Scott gained a victory in all three classes for which he had entered his new 2-stroke bicycle. Thereafter this enthusiastic firm occupied a position in the motor-cycle firmament equivalent to that held by Frazer-Nash in our world. To proceed to present times, the 6-cylinder Scott engine was an experimental effort, and a 3-cylinder engine followed. This went into a motor-cycle and became better known than the "six." As a further experiment it was installed in various cars, notably an M.G. and a Morgan 4/4. This latter car was run 10,000 miles before the war on test, Solex, Amal and S.U. carburetters being made to like it during this period, and since then it has performed the unenviable service of works hack. We hadn't been in Mr. Cull's office long before he said: "Take the Morgan out and get some fresh air. The chassis is worn out, but the engine still goes!" The car, we should explain, had done just about 20,000 miles, but the engine had never been overhauled or even de-coked. This unit, known as the 3SM., sits on rubber in the Morgan chassis, drives through the standard gearbox, and is cooled by a normal "4/4" radiator. The 4.5 to 1 top gear is a trifle on the low side, but, nevertheless, we understand that 90 m.p.h. has been seen on the clock. The capacity is just under a litre and, while fuel consumption varies considerably with driving methods, generally it has been rather better than with a normal engine. We soon discovered the sheer fascination of the thing. Here is an engine which asks for plenty of revs., as the clutch is engaged, and thereafter revels in revs. It can be pushed along hard in 3rd gear, and feels as if it will stand abuse for ever. The revs. flick up to facilitate gear-changing as they would with a blown, twin-o.h.c. unit. Above the power roar there is that unmistakable Scott purr, just sufficiently audible to please, while at low speeds the tail pipe gives a hint that a 2-stroke cycle engine is in action. The essence of the thing is "life," and a feeling that it is unburstable. Some of the original urge is probably lacking, but the acceleration is excellent, and the car settles down very nicely at 50 m.p.h. The steering being stiff and devoid of castor action, the chassis generally soggy, and the clutch inclined to slip, we did not take liberties with the car on brief acquaintance, but there is no question but that the Morgan possesses exceptional roadholding qualities and adequate brakes, so that we can well believe that Mr. Cull puts up some exceptional averages about the place when he forsakes his 2-litre M.G. saloon for the works hack. Lubrication is looked after by means of a clever diaphragm pump on the crankcase, which draws oil from the sump and mixes it with the petrol. This overcomes the inconvenience of having to add lubricant to the fuel and obviates bearing corrosion, which is said to occur on certain crankcase-compression 2-strokes which employ the old-fashioned "petroil" method. Ignition is by coil, using a distributor adapted from a motor-cycle conveniently located on the off side. An S.U. carburetter is recommended for power, but the car we tried had a 30-mm. Solex, which gives easy starting and economy.

Two-Stroke

Mr. Cull told us that the 6-cylinder engine will not be available after the war as it, and other forms of 2-stroke, are earmarked for other purposes. But the 3-cylinder unit will be offered to the public, although it has not yet been decided whether it will be put into

a chassis. It would seem to offer considerable possibilities to the "special" builder. It has a bore and stroke of 78 by 78 mm. (1,108 c.c.) and in normal form gives nearly 42 b.h.p. at 4,000 r.p.m. and weighs 256 lb. inclusive of Borg and Beck clutch, dynamo, engine mountings, manifolds and one gallon of oil, etc. Its maximum torque occurs at 2,800 r.p.m. Although he is not especially concerned to develop it for racing, Mr. Cull says he does not see why a 500-c.c. version should not be made to give 100 b.h.p.; the 6-cylinder could give some 170 b.h.p. in unblown guise. Moreover, he reminded us that considerable weight could be saved by substituting an alloy sump for the pressed steel one now used and replacing various steel cover plates with something lighter. All of which should interest those seeking an engine for a post-war "special." The 3-cylinder Scott is a proven job, having seen the light of day eight years before the war. It would seem to offer greater power than an equivalent size 4-stroke with the same, or slightly better, fuel consumption. Moreover, it is a real engineering job and, as such, is a pleasure to own, while it holds its tune for very long periods, there being no valves to grind-in, or tappets to adjust. Much has been said against the 2-stroke, particularly on the score of fuel wastage, but one is apt to forget this lack of need for frequent maintenance, and the 3-cylinder Scott appears to give this in full measure, together with foolproof lubrication, excellent torque and a useful power output. Indeed, we hope to have more to say about it at some future date. At present, Mr. Cull is devoted to certain very technical matters closely connected with ridding the world of Germans, but he did let slip that he considers the Lowrey Formula of controlled air-inlet dimensions the most satisfactory for future Grand Prix racing. We can expect some very interesting developments from this old-established, specialist Yorkshire firm with the advent of peace.

* * *

Wheel Spin

"Wheelspin" is the title of C. A. N. May's new book, published by Foulis & Co., Ltd. Although there are books on racing, rallies and trans-continental record runs, up to now no one has written a book on trials, if we except a long-ago, out-of-print little work by Major Montague Johnson. So May's book is very welcome, and it does capture, very effectively, the spirit of this branch of the Sport. He deals with the period from 1933 up to the outbreak of war, from the viewpoint of one who drove M.G. cars in most of the well-known trials, did a certain amount of organising into the bargain, and also attended various club social functions, and who consequently knew his fellow competitors very well indeed. This books brings back nostalgic memories with every page. Technicalities are not shirked and the would-be trials competitor will gain much useful knowledge by following the author's increasingly successful career with J2, P-type, N Magnette and, finally, one of the "Cream Cracker" blown PB M.G.s (he also used two T-type M.G.s). Trials exponents are apt to regard a car's showing over a course as more important than the car itself, as it were, but once one has appreciated their rather especial approach to the Sport, a history of their exploits, related by one of their number, makes most acceptable reading. Indeed, May's book has such an important function to fulfil that it is a pity the MSS. was not edited more thoroughly before it went to press. The composition of many sentences could be improved, and it seems unnecessary to go into quite as much detail as the author does on page 66, as to how wet one becomes in a hoodless car in heavy rain, while the over-dramatic bit about the backs of H. K. Crawford's hands being "now raw and bleeding" as he made engine adjustments on Porlock when his Wolseley-Hornet Special stopped during the 1933 "Land's End" could have been omitted. It is debatable whether "20–25 m.p.h. up Widlake is every bit as thrilling as 120 m.p.h. on Brooklands," and we are puzzled to know why May has to operate "all the right *knobs*, pedals and levers" in a stop-go test. But we can forgive him these things for the pleasure of reading of all the hills, all the cars and all the competitors that made pre-war trials so very worth while. Gypsy Lane, Kineton, Mill Lane, Cloutsham, Bamford Clough. . . . Toulmin, Macdermid, Alf. Langley, Allard, Flower, Welsh, Bastock, J. E. S. Jones. . . . You meet them again in "Wheelspin," as the author recounts his experiences in the Cotswolds, the Chilterns, Wales, the Derbyshire dales, Exmoor, N. Devon, by the Cornish coasts, in Kent, Surrey, the Lake District, parts of the Mendips, the Clee Hills, and parts of Worcestershire. It is a book that all trials competitors, officials and spectators will read with avidity. It would have benefited, as we have said, by careful editing, and a detailed index would have been particularly suited to a work of this kind. That is something to bear in mind if a second edition is contemplated. The present volume is well illustrated with 19 good photographs, runs to 174 pages, and costs 8s. 6d. It is excellent entertainment and a very worth-while record.

CLUB NEWS—continued from next page

"M.S." LIBRARY

Since the announcement recently, requests for the loan of Instruction Books have come in fast, suggesting that many people are working on their cars. Apart from the books listed at that time those covering the following cars have since been added: Riley Nine, "16/95" Alvis, 3-litre Lagonda, straight-eight Minerva, R21 and R21a (*gearbox-in-axle*) A.C. Six, Lanchester 21, "9.5" Rhode, Singer Nine, Talbot "18/55," Lagonda Rapier and Rapier, Ford Ten, R5 B.M.W. motor-cycle, and Cozette superchargers and carburetters. In the previous index, for Alvis "Firebird" read "Firefly Twelve." This comprehensive library is a credit to readers' generosity and helps in no small way towards the more efficient operation of sports-type cars. Further contributions will be appreciated, and duplicates are of value, as single books are often on loan for the full three weeks. Address to W.B., 123, Bilton Lane, Harrogate, Yorks.

★

THE "GEN"

Those whose wives or girl-friends wish to learn how a motor car propels itself could hardly do better than commend a study of one of Pitman's latest books, "The Internal Combustion Engine," by A. H. Franks. This book, which the buyer will doubtless first read himself, covers the transmission, brakes, steering, etc., as well as the engine, and has a chapter on diesel engines. It costs 7s. 6d.

★

Foulis, Ltd., have published yet another motoring book, "Spinning Wheels,,' by C. A. N. May, in which the author describes his trials exploit at the wheel of M.G. cars.

Club News

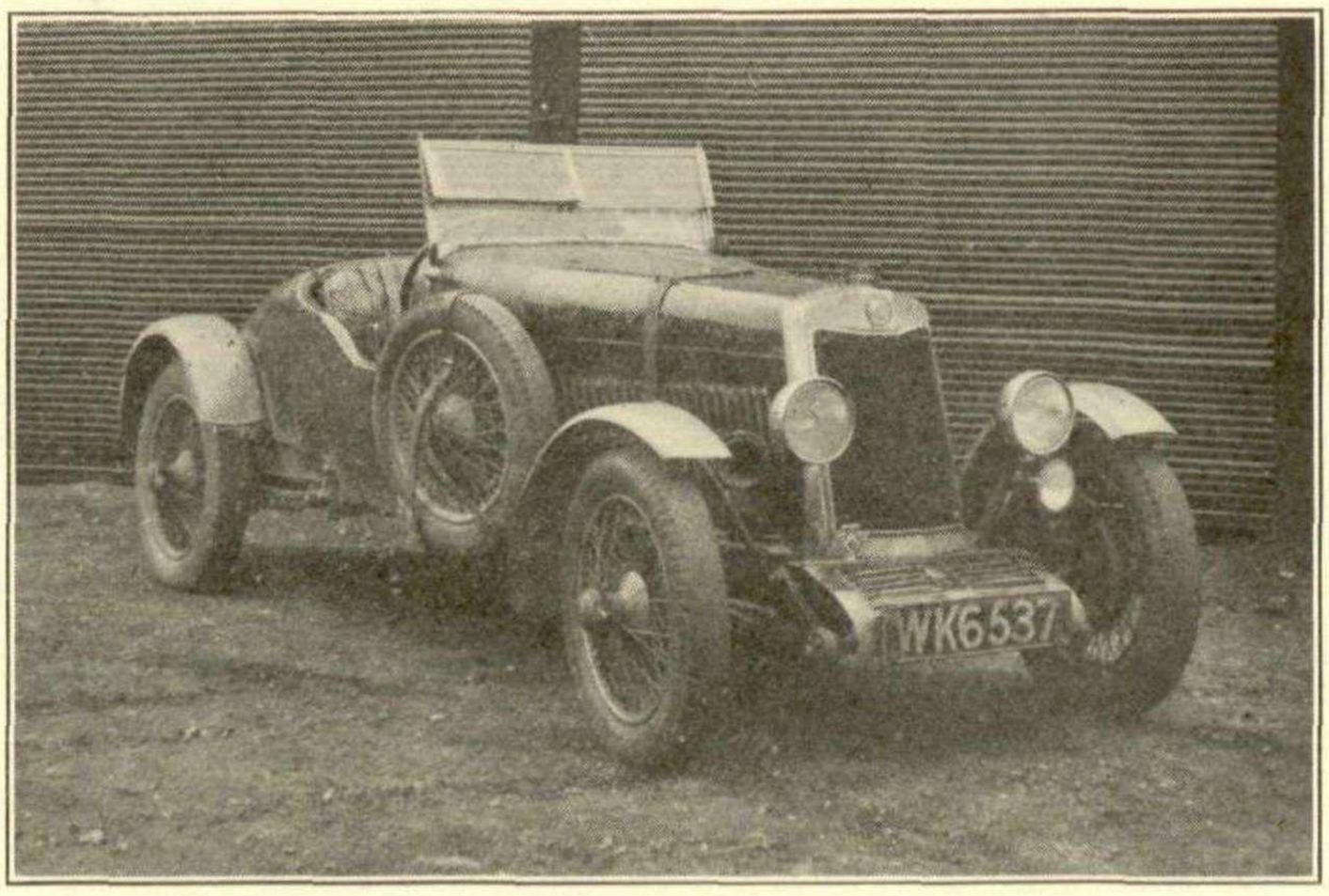
WE HEAR

E. D. Saddington has recently acquired two very potent cars and would be delighted to hear from anyone who knows anything of their histories. One of these cars is a blown 2.3-litre Alfa-Romeo with open 2/4-seater body, having a Wilson gearbox, the whole car, now red, obviously having at one time been French blue, even to the upholstery. The registration number is GN6076, engine number 2,111,005. The other car is a 2.9-litre Maserati, road equipped, with 2/3-seater body. It has a Centric supercharger drawing from a large S.U. carburetter, and an outside Brooklands exhaust system—registration number ELM 510. If any reader can help Mr. Saddington, please write to him at "Old Straddles," Cross Oak Lane, Salfords, Redhill, Surrey (Hooley 628).

Geoffrey Frank's fleet now consists of an Alvis "Speed Twenty" coupé, an Alvis "Speed Twenty" tourer, a 2-litre A.C. coupé, an L-type M.G. Magna, a T-type M.G. and a late 1932 Alvis "Speed Twenty" chassis. He would dispose of the last-named to a "special" builder for £45, as, having recently bought David Morgan's 1910 Leon Bollee and Hutchison's 1912 Daimler, his stable is rather cramped for space. The 1905 Rover, early Argyll, 1903 Rex fore-car and Humber fore-car, mentioned previously as being at a garage in East Yorkshire, have come into the market again and could be bought for £100 for the four—a bargain "Brighton" anticipators shouldn't overlook. P/O. M. Hutchinson has acquired a 1922 "Blue Label" 3-litre Bentley. V. L. Parry, present owner of the "Spook," would like to hear from any Frazer-Nash enthusiasts in the Midlands. His telephone number is Midland 3385.

Batten is using a Type 40 B.M.W., and Lomas was recently rung up by an Indian Army captain, who saw his name in MOTOR SPORT, and who was home on leave from Burma, and asked if he could find a sports car. He was able to put the enquirer on to a 1937 2½-litre S.S. "100," which is reputed to have been raced and to be capable of 110 m.p.h. F/Lt. R. de Yarburgh-Bateson is home after three years overseas' service, and says that one of the joys of his return has been to get MOTOR SPORT again. Lord Ridley, who normally uses a Lancia "Aprilia" and has the ex-Hampton 1922 1½-litre Mercédès-Benz, has, of late, been running a Halford-Special.

Hampton is willing to dispose of the other 1½-litre Mercédès, which he bought for spares. John Haining has his rebuilt "12/50" Alvis running, and is designing a special body for a "Speed Six" Bentley. Ian Craig has sold all his Bugattis, but has the ex-Hutchison Allard, now with Type 40 V8 engine. Craig is a film cameraman these days and runs a Fiat. Interest in Allards is considerable, a lieut.-colonel wants to import one to India, and an enquiry has been received by the makers from Montevideo. D. S. Jenkinson is amongst the latest of three-wheeler recruits, having bought a 1929 o.h.v. J.A.P. 2-speed Morgan Super Sports, although he is at present riding a 1929 "T.T. Replica" 600-c.c. Scott. The Minerva and Graham Paige which Baker drove in B.A.R.C. races are for disposal, together with the trials V8 Ford. Further voluntary contributions will be greatly appreciated by the Editor.



"Hyper Leaf." This particular Cozette-supercharged T.T. Lea-Francis was raced in the T.T. by Gordon Hendy. It was afterwards used by the author of the "Cars I Have Owned" article in this issue, who obtained some 78 m.p.h. in third, and 93 m.p.h. in top gear in road trim.

★

N.L.E.C.C.

The second journal of the N. London Enthusiasts' Car Club is in print and contains a report of Peter Monkhouse's talk to the club on "Preparing Cars for Sporting Events," together with a summary of his answers to some intelligent questions which were put to him afterwards. The club emphasises that it exists as much to foster enthusiasm as to cater for existing enthusiasts, and hopes to receive support from the sort of person whose "imagination can be fired by the sight of an Aston on a bend, by the steady 'popple-popple' of an old Lagonda, by the absence of 'floating power' at the wheel of a Riley, or by the exquisite fragrance of a wheezing '12/50' . . ." We would softly whisper that mobile policemen have had their imaginations fired by fast cars on corners, that it would probably have been fatal to have mentioned the Riley matter to Freddie Dixon after the 1932 T.T., and that our "12/50" may *rattle* but it does not wheeze or smell! However, best wishes to this newest of clubs.

The next meeting of the N. London Enthusiasts' Car Club will be held on April 20th, at 7.30 p.m., at John Keble Small Hall, Deans Lane, Edgware. Rivers-Fletcher is Chairman. Hon. Secretary: G. Bance, 13, Hazlemere Road, Crouch Hill, N.8.

★

E.C.C.

The Enthusiasts' Car Club has asked us to state that it has no connection with the recently-formed N.L.E.C.C. Raymond Mays was due to give a lecture on March 13th.

★

COVER PICTURE

This month's cover picture is of an Austin Seven "Speedy" competing in the Lewes speed trials, and is topical, in view of Capt. John Moon's article on his experiences with a "Nippy"—which the "Speedy" generally resembled—elsewhere in this issue. We believe the Lewes venue is no more, but certainly speed trials will constitute a very popular form of competition after the war. Alas, there is, as yet, no sports model in the post-war Austin range.

Continued on previous page

Letters from Readers

Sir,

I have read with great interest your article on "Sprint Events 20 Years Ago." I see, in your description of the Caerphilly Hill Climb, 1924, you mention me as a class winner, and ask, "Does anyone know where Sully is now?" Well, here I am, very much alive and kicking! My peace-time address is "Top Cross Cottage," Chew Stoke, near Bristol, where I should be only too pleased to see any of my friends if they happen to be in Bristol and care to look me up after the war.

A short description of my run up Caerphilly Hill in 1924 might interest your readers.

The car used was a special 2-litre H.E. (72 by 120), with four valves per cylinder, push-rod operated. One only of this model was made, specially for hill climbs and sprint events. The car had a 4 ft. 2 in. track, 8 ft. wheelbase and no differential. On the way down to Wales from Reading I had bad misfiring. On examination, to ascertain the cause, I found that water was entering one of the two inlet ports from the water jacket of the cylinder head owing to a blow hole in the casting. The blow hole happened to be in a place that could not be got at for welding. As I particularly wished to win my class on the hill, I decided to do the climb with a dry engine, *i.e.*, with no water. To avoid overheating at the start, the late dear old Ebby, after consulting other competitors in the class who sportingly agreed, allowed me to have a push start, which naturally cost me a second or two, and I proceeded up the hill. The engine stuck it without blowing up. I had to stop the engine at the top of the hill by putting it in gear and letting in the clutch with the brakes hard on, as everything seemed to be red hot. However, the class was won; that is all that mattered.

Below are a few successes won by me on H.E.s in the good old days:—

Porthcawl Speed Trials.—Open Class, from 2,100 to 2,500 c.c.

Caerphilly Hill Climb, 1921.—The Nian Stuart Cup for 2-litre; Open Class from 2,100 to 2,500 c.c.—Wakeley Cup. Five medals in various classes.

Holme Moss Open Hill Climb, 1921.—Second fastest time for cars up to 2,300 c.c.

Sutton Coldfield, 1921.—Highest figure of merit on formula.

Newport, Catsash Hill, 1921.—Highest figure of merit for the day on formula.

Brooklands, 1921.—First, Senior Long Handicap; second, Senior Short Handicap.

Worcester Speed Trials, 1921, *Madresfield Park.*—Fastest time in unlimited class.

Shelsley, 1921.—Worcester Team Cup, with Raymond Mays and Frazer Nash as joint members of the team.

Brooklands, 1921.—Second in 90 m.p.h. Short Handicap; third in 75 m.p.h. Long Handicap; Class C. Records, ½-mile, kilometre and mile.

Sutton Coldfield, 1922.—Second place on time; highest figure of merit in unlimited class on formula.

Essex Motor Club, Cop Hill, 1922.—Second on formula in Classes 29 and 30.

London–Holyhead, 1922.—Gold Medal.

Caerphilly Hill Climb, 1922.—For cars from 2,100 to 2,500 c.c.: Three H.E.s entered, winning first, second and third. Also winning one Challenge Cup, Gold Medal, Silver Medal, two Bronze Medals.

Porthcawl Speed Trials, 1922.—For cars with engines of 2,100 to 2,500 c.c.: Three H.E.s entered, winning first, second and third.

Basingstoke Hill Climb, 1922.—Fastest time of the day.

My first car was a 1901 3½-h.p. De Dion.

I am, Yours, etc.,

H.M. Forces. R. J. Sully (Major).

* * *

Sir,

I read with interest the columns entitled "Enthusiastus Extinctus" in the February issue, and it was with much regret that I had to make myself realise the truth in every line.

Perhaps men are much too gentlemanly; the days when "knights were bold," etc., and they drank beer before breakfast, are long since gone, A woman's position in this world was perhaps ably defined (?) by a writer in the 15th century when he said: "Woman should be an angel in the street, a saint in the church, beautiful in the window, honest in the house, and a demon . . ." somewhere else.

When I first met the person who was to escort me down the aisle she was a "Chrysler-type" of enthusiast, but after much "shop talk" and hard convincing, she became the regular ballast on the bracket of my racing 350-c.c. motor-cycle. Many a stocking was ruined with "Castrol R" from the racer, or mud from my comp.-tyred, scantily mudguarded trials iron. This sound education more than proved its worth and developed a lover of all stark, unclothed, and uncomfortable motor cars, which may prove a mill-stone around my own neck in years to come when, getting a little grey and staid, I feel the folly of it all—a woman never gets old.

J. A. Masters's announcement *re* the Land's End has gladdened her heart, as we may then introduce our not yet two-year-old to my Magnette and her first trial.

Blow, trumpet—blow!

I am, Yours, etc.,

Tucker Peake.

Stevenage.

* * *

Sir,

Under the heading "Australian News" the bore and stroke of Lyndon Duckett's Mercédès are given as 6⅞-in. (175 mm.) by 7 1/16-in. (180 mm.). Are these figures quoted correctly? I could believe either, but not both together. The 1907 cars were 175 by 150, and one of the 1908 cars measured 155 by 180. There is reason for thinking Duckett's car to be a 1907 G.P. job, but the dimensions quoted leave the matter still in doubt.

I am, Yours, etc.,

Anthony S. Heal.

Denham.

* * *

Sir,

Almost three years ago, while I was in course of a sea voyage for service in a distant clime, I heard, *via* the B.B.C. news service, that the basic ration of petrol was to be drastically reduced and finally completely cut at the end of June, 1942. I was profoundly thankful that I had not been called upon to endure the miseries of a motorless existence in England. After two years abroad I returned home and have endured twelve months of service in basicless England. Looking back across several thousand miles at those twelve months (I am overseas again), I realise that far from being miserable from the motoring point of view, they have contained some incidents which are quite highlights in my motoring career.

Firstly, a beneficent government allowed me coupons for ten gallons of petrol and the privilege of licensing my Austin "Nippy" for a month for 10s. during my disembarkation leave. I found that my method of laying up the "Nippy" by changing the sump oil and then pouring oil into the carburetter choke (with the engine running) until the surrounding neighbourhood was covered with a pall of thick blue smoke, had been fully effective, and she started with a very short tow although the petrol in the tank was two years old. The "Nippy" was used quite a bit during my two weeks' leave, and I found that I still got a lot of pleasure out of driving her—I was afraid that experience with high-powered Yanks might have spoilt her for me, but this was not so.

During my leave I visited my good friend Harold Biggs at Adlards Motors, and with his connivance and Sydney Allard's blessing I was able to make a short (essential) journey in South London in the Mercury-engined 4-seater Allard Special. To one new to the modern Anglicised Yank, the Allard Special was a revelation in brilliant accleration and effortless performance, combined with excellent roadholding and good brakes, although I still remain a small-car enthusiast. This particular car was fitted with the Columbia 2-speed axle which gives a pre-selectable, vacuum-engaged alternative higher ratio in the rear axle by means of a planetary gear fitted alongside the crown wheel. The extent to which the very high top gear—2.9 to 1, I think—can be used even in London traffic is, indeed, remarkable, though the gap between the two ratios is rather wider

than one would desire in a sports car. However, the power and flexibility of the Mercury engine, whose ⅛-in. larger ports give about 10 b.h.p. more than the 30-h.p. Ford V8 at the expense of a very few pounds weight, render this quite a minor snag. One other point that impressed me was the way in which a trans-Atlantic gear-change can be improved by fitting a decent remote control.

The next high spot was the collection of the blue W-Special Austin Seven from Kew and its delivery to its new home in Surrey, but as this has already been dealt with at length in the August, 1944, MOTOR SPORT, I will say no more about it now. I am, however, reminded of a shocking trip up from Norfolk to London (by the alternative means of transport) to introduce the future owner of the blue Austin to Williams, of groping our way out to Kew by District in the thickest of London pea-soupers, laden with a supply of petrol lighter fuel in countless bottles for the purpose of trying the Austin out (it was much too thick to try out the car and, anyway, it already had plenty of fuel in the tank) and, finally, of an even more nightmarish return to my station in Norfolk.

Due to the incidence of Christmas during my disembarkation leave, and the accompanying jollifications, I still had a tankful of fuel when I had to return, so that on my next leave I went gaily along (very honestly) to the local county council and took out a licence and used up the petrol.

The event of that leave was a short trip on a 500-c.c. Type R51 B.M.W. motor-cycle. This is the twin-carburetter transverse H.O. twin job with shaft drive. To one whose motor-cycling is of limited extent and more or less confined to orthodox W.D. types, this again was an experience describable only in superlatives that I hesitate to re-inflict. This machine now has as a stable companion another sports B.M.W., this time the "600," which is almost a replica of the "500" except for its larger tank and sprung rear frame. I have not yet seen this, but it must be about the last word in motor-cycling.

My next leave was a motorless one, but my embarkation leave which followed was livened by one decent journey in the "Nippy" undertaken for the purpose of using up the last of a stock of Cleveland Discol which was purchased on September 2nd, 1939, and which had been stored in a pressure-tight tank ever since. This treatment was not very effective (perhaps because I had been in the habit of opening it up quite often to remind myself what Discol smelt like) as the unfortunate Austin literally stank of paraffin when running on it, and considerable carburetter tuning was required to produce any semblance of decent running. The Austin performed as faithfully as ever, but she is getting a little tired—her garage had been buzz-bombed over her in the meantime, which, I have no doubt, did no good at all, and my first job on my return home will be to give her a thorough overhaul, as I cannot at present see much hope of buying another motor that would do all that she does in the same way.

These periods of leave without or with very limited motoring have given me plenty of time to get on with the building of the special which I commenced in September, 1939, and have been building on and off ever since. This time I was very reluctant to leave it, as the end begins to appear in sight, so that it should be motoring within a few months of my next return home.

This letter would be incomplete without mention of my Service motoring, which has been by no means inconsiderable. Several thousand miles were covered on motor-cycles, B.S.A.s and Nortons, and latterly some thousands more in a Jeep. Of the Jeep I am not going to write now except to say that although it is certainly not a sports car (though one correspondent to a motoring weekly described it as such), and has certain well-defined snags, it is a very enjoyable car to drive and has made my duty journeys a pleasure. Incidentally, the Jeep was assaulted by an L.P.T.B. bus in Oxford Street one day and drove off the victor, leaving the bus derelict by the roadside. This worthy end was reached by knocking the valve off the bus's nearside front tyre!

To my regret, two "Rembrandt" meetings have coincided with military engagements, so that I have not been able to get along, but two headline occasions have been two meetings of the London graduates' section of the I.A.E., at which John Bolster read his paper on racing cars (subsequently printed in MOTOR SPORT), and the late Cecil Kimber's exposition on the past and future of the sports car.

I also recall with much pleasure many casual conversations with various enthusiasts who have seen me reading MOTOR SPORT and other magazines during tedious railway journeys and have made themselves known to me.

And now my participation in motoring Sport has again to be largely through the pages of MOTOR SPORT. Don't you let me down, sir!

I am, Yours, etc.,
J. S. MOON (Capt, R.E.M.E.).
India Command.

◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆◆

CONVERTING THE BRAKING SYSTEM—continued from page 70

particular case to fit a fifth flexible pipe from the master cylinder to the main transverse gallery pipe which feeds all four wheel cylinders separately. After all, 'Nash chassis do flex a little! Any Morris, Wolseley or Triumph handbook devotes a chapter to the care and maintenance of Lockheed brakes, so any notes on this subject would be redundant. For a total expenditure of about £6 the whole conversion may easily be effected, and this sum, viewed as 30s. per wheel, compares very favourably with the alternative cost of relining shoes and probably fitting liners to the old drums. The only essential concomitant of the conversion other than those already mentioned is a wife who will sit for hours on end patiently operating the brake pedal, while you, with the aid of box spanners, sticky fingers, and horrible language, lie on your back underneath and bleed the wheel cylinders one by one!

READERS' SALES AND WANTS

To meet the repeated demands for something on the lines of the old Spare Parts Announcements, we have instituted a system of inexpensive advertisements. Each announcement must be limited to twelve words, plus the advertiser's sufficient postal address, and the charge will be 1s. 6d. per announcement, payable at time of posting.

FOR SALE

GRAND PRIX BUGATTI
SPARES AND SERVICE
F. O. CLEVELAND HARMER
Bugatti Specialist
83, Old Oak Road, Acton, W.3
Shepherds Bush 5022

SET Riley Nine pistons + .0025 C/R 7 to 1, Quick release rad.-cap chrome. New. Offers. C. Brooks, 15, Lonsdale Avenue, Romford.

1933 M.G. "L" type 12-h.p. open 4-seater, good order. Licensed Sept., 1944. £100. Muncer, 2, Lidgett Park View, Leeds, 8.

1926 Salmson engine No. 94. Thoroughly overhauled. Price £10, for quick sale. Cameron, 53, Norbury Road, Thornton Heath. 'Phone Livingstone 3523.

16 by 6.50 42 mm. wheel and tyre suitable M.G., etc. Monckton, 11, Royal York Crescent, Bristol 8.

1936 A.C. 16/70 engine in pieces, body rough. £25 or offer. J. P. Humphreys, 89, Old Penkridge Road, Cannock, Staffs.

19-in. Whitworth racing wheel and new Dunlop cover and tube. Offers to Stuart Wilton, 40, Brent Street, London, N.W.4.

TALBOT "65" frame, axles, "knock-on" hub, 16-in. brakes, good tyres, steering. Offers. D. Manning, "Far End," Heathervale Road, Woodham, Weybridge, Surrey.

1927 Raleigh 248-c.c. motor-cycle. 1931 Wolseley "Hornet Special" spares. Any offer considered. D. Manning, "Far End," Heathervale Road, Woodham, Weybridge, Surrey.

COZETTE Supercharger, as new. Suitable for 3 to 4½ litres. Fairman, 71, Tetley Road, Birmingham, 11.

1928 Hillman 12-h.p. saloon. Unused since 1938. Offers nearest £18. T. Wagner, 73, Addiscombe Road, Croydon.

WANTED

BUGATTI, 1½, 2 or 2.3-litre Grand Prix, complete, or parts for same. F. O. Cleveland Harmer, 83, Old Oak Road, Acton, W.3.

WANTED, International Aston-Martin. Good condition essential. State price and full particulars. D. Trowbridge, 412, Ley Street, Ilford.

WANTED, supercharger installation, also tyres, for Fiat "500." M. Wells, 54, London Road, Sleaford, Lincs.

LANCIA "Lambda," coach work must be reasonably good. Bacon, 39, Park Hill Court, Addiscombe Road, Croydon; or during business hours, Bishopsgate 8133.

BRIAN LYTH, of Darlington. I want J2 engine. Please write, Leir, Caravan, Old Shrubland Farm, Leamington Spa.

STRAKER-SQUIRE spares and data required. Little, 91, Whiteladies Road, Bristol, 8.

WANTED, Riley "Imp" or K M.G., condition unimportant. Full details, Clayton, 11, Redburn Road, Northenden, Manchester.

Spares Section, MOTOR SPORT, 15/17, City Road, London, E.C.1

Blakes BOOK

FRIENDS OF OURS

To some a motor car is merely a way of getting there quickly; to others, it's a passport to fresh air and a change of scene. But we like to think of the readers of this journal as belonging to another class altogether — those to whom motoring is a joy in itself. Any motoring, anywhere, in almost any car. These are the people who love cars as other people love dogs, who are interested in everything about them, and who know "what goes on under the bonnet". We confess a special affection for this type of motorist. We enjoy talking technicalities with them; we understand their urge for the "little bit more"—*not* necessarily in sheer speed; and there's nothing we like better than collaborating with them in making that sweet music—the smooth sound of a perfectly-running engine . . . To get back on this job again is one of the chief reasons why we long for an end of the war soon.

110 BOLD STREET, LIVERPOOL 1: Royal 6622

SOME SPECULATIONS

—*continued from page* 80

to what extent it was done on the Auto-Union. It was the manifestation of a tendency which was already apparent on touring cars, where it had produced the forward engine mounting, but it had not at that date been seen on racing cars. On the Mercédès the radiator was mounted forward of the front hubs, and the engine came immediately behind it, in marked contrast to contemporary racing practice. In spite of this, 60 per cent. of the loaded weight of the vehicle was carried on the rear axle, showing that the remainder of the main masses were mounted well towards the back of the chassis, notably the gearbox, which was moved from its conventional position amidships and combined with the final drive. Moving the main masses to the ends of the chassis increased its moment of inertia, and thereby its resistance to disturbances in both the vertical and horizontal planes, thus giving a "flatter" ride and greater directional stability. This distribution of masses is now almost universal on touring cars and is steadily increasing in popularity on sports cars. [Pushing forward the engine on normal cars was first done, of course, to give increased passenger space.—ED.]

From this examination of the German G.P. racing cars the pattern of the post-war sports car clearly appears. In the larger and more expensive classes it will closely resemble in suspension arrangements and in general layout the G.P. Mercédès, with stiff frame, soft springs, "vertical" independent front suspension, De Dion rear axle, forward engine mounting and gearbox in unit with the final drive. The fast touring car may differ in having "wish-bone" i.f.s., and "swing-axle" rear suspension.

The smaller sports car has to scale down its suspension movements to suit its narrower track and shorter wheelbase. Consequently, its necessity to use i.f.s. to control king-pin attitude is less pressing, though still essential if a comfortable ride is to be combined with understeer. For this, and economic reasons (technical advances usually spread down from the more expensive models), the smaller cars will prove slower to change over to i.f.s. At the rear stiffer springs, which permit them to profit less from reduced unsprung weight, lower torques, and considerations of cost, will conspire to delay for at least ten years their adoption of the De Dion axle, and, therefore, of gearbox in unit with the differential. In the meantime, many of them will have gone over to front drive.

★ ★ ★

WANTED

The Editor will be pleased to hear from anyone who has for disposal copies of "Monte Carlo Rally" and "Motor Cycle Reminiscences," by "Ixion," and a model P2 Alfa-Romeo car or other car models.

"1½-LITRE"

85 m.p.h., and with same carburetter setting - 32 m.p.g.
0-50 m.p.h. - - - 11.0 secs.
Standing Start, ¼-mile - 19.2 secs.

H·R·G

"1,100 C.C."

75 m.p.h., and with same carburetter setting - 37 m.p.g.
0-50 m.p.h. - - - 11.3 secs.
Standing Start, ¼-mile - 21.8 secs.

★ **The above figures have been proved many times in events by amateur owners** ★

Private competitor on a 1½-litre H.R.G. in the Paris-Nice Trial, 1938, writes:

"On the Sunday following arrival the car was motored slowly to Montlhery and a few practice laps put in to see whether everything was in order. One timed lap of 1 min. 7secs., about 86 m.p.h. suggested all was well (Montlhery Speed Test, one flying start lap: 1 min. 9 secs. 1st in class F)."

H.R.G. ENGINEERING CO., LTD., SURBITON, SURREY - - Telephone: Elmbridge 4489

CLASSIFIED ADVERTISEMENT SECTION

Advertisement Offices :

54, BLOOMSBURY STREET, BEDFORD SQUARE, W.C.1

Telephone : MUSeum 0522

RATES (prepaid) 1/3 per line
Minimum 3 lines
6 Words to line
Copy required by 20th of the month

FOR SALE

CAR Maintenance (1937). Re-boring, engine reconditioning, tuning, etc. 4, Bryanston Mews, W.1.

BUGATTI 3.3-litre, Type 57, twin o.h.c. Fitted Corsica open 4/5-seater sports tourer. Mechanically perfect, 14 mm. plugs, etc. Immaculate, opalescent blue. £1,950. Also Mercédes-Benz, "38/250," 1931 model fitted Corsica 4/5-seater drophead coupé. Immaculate, opalescent blue. Smart 1938 body. Mechanically 100 per cent. 100 m.p.h. £975. Box No. 162, MOTOR SPORT, 15, City Road, E.C.1.

FOR disposal for any reasonable offer 1924 long-chassis 3-litre Bentley saloon, less engine. Coachwork poor, differential damaged, otherwise complete and good condition. B-type gearbox, 6 wheels, 20-in. well-base rims with tyres, new battery. Box No. 163, MOTOR SPORT, 15, City Road, E.C.1.

MONOMARK Service. Permanent London address. Letters redirected. Confidential. 5s. p.a. Royal patronage. Keytag 9d. Write Monomark, BM/MONO6V, W.C.1.

BUGATTI Type 40 "Grand Sport" engine, dismantled but complete, includes KE 965 valves and Hoyt big-ends, etc. £60. Also Lancia Astura, 1935. Closed 4-seater saloon. Fast, comfortable, smart, and with superb roadholding. £250. Birkett, 3, Pondtail Road, Fleet, Hants. Fleet 588.

1932 3-litre Lagonda Selector Special. Close coupled sports saloon. Unused since war, and overhauled regardless of cost, tele-control shockers, Maylock vacuum gearbox. Good tyres, and complete with two new batteries. Exceptionally fast car. First offer over £200 secures. 17, Wickham Road, Shirley, Surrey.

SUPERCHARGED M.G. "Cream Cracker" for sale. May, 1939. Mileage 18,000, counterbalanced crankshaft and con.-rods by Laystall, Marshall blower, 2-ton half-shafts, aluminium bonnet and cycle-type wings, seven tyres and wheels, including two extra low pressure and two comps.; five almost new. Marchal headlights, many other extras, finished in cream with black upholstery, in perfect condition throughout. Has been carefully run and maintained by an enthusiast. Ideal for post-war competitions. Price £500, or near offer. C. H. Ross, Niddry Mains, Winchburgh, West Lothian.

ALLARD V8 competition 2-seater in the same condition as used in hillclimbs, trials and rallies, with almost unequalled success by Guy Warburton. A rare opportunity for someone to acquire a very potent and almost unbeatable car at the low price of £700. G. Warburton, Spinney End, Worsley, Lancashire.

BENTLEY 1926 chassis, 1928 "Red Label" engine, 1936 Corsica body, Marchal lamps, £140, or exchange smaller car, cash adjustment. H. Ashwood, 20, Lancaster Mews, W.2.

FIAT "500" 1936, good used spares. Starter and dynamo (reconditioned and unused since), manifold, flywheel, clutch plate, cylinder head, road wheel, two connecting rods, swing arms and hubs. £25. Biggs, 16, Fyfield Road, Enfield, Middlesex. Ren. 1121.

M.G. racing 750-c.c. engine, including new cylinder block and head. Write, Rowan Tree Cottage, Hillside Avenue, Worthing.

1932 Lagonda 2-litre supercharged open 4-seater, black, green leather upholstery. Unused since 1939, this car has now been overhauled, wings resprayed, etc., and is in exceptionally fine condition. £195. Daniel, Ashburnham, Virginia Water.

1931 "Silver Eagle" Alvis, less body, otherwise complete. Dual ignition, spring wheel. £17. Haining, Wimbolds-Trafford, near Chester.

TAILWAGGER No. 1 Special light V8 competitions Allard, with Bugatti-type body, Scintilla Vertex and mountings for alternative V12 unit, tyres practically unworn, terrific performance, and winner of many awards in the hands of K. N. Hutchison. Seen by appointment at 3, Valonia Gardens, West Hill, Putney, S.W.18. 'Phone Put. 4367.

LAYSTALL

for

CRANKSHAFTS

CHARLES FOLLETT

LIMITED

Will always pay top cash prices for really first-class low-mileage second-hand cars of all types.

★

Showroom : **18 BERKELEY STREET W. 1**

Mayfair 6266

Service, Works & Stores : **124 King Street, Hammersmith, W.6.** **Riverside 1413.**

FOR SALE—*continued*

RILEY Nine, modified March, special 2/4-seater, completely rebuilt, all worn parts replaced. Springs reset, polished, taped. New parts to steering brakes, gearbox, transmission overhauled. Engine rebored, liners fitted. H.C. pistons, crank reground, new bearings, two S.U. carburetters, Hartford shockers. New 10-in. Marchal headlights, Brooklands remote control. Large rear tank, twin quick-action fillers, short rad. Folding screen, new glass, aluminium bulkhead, walnut facia. Instruments include 6-in. rev. counter. Rewired, new batteries, rad. stoneguard. Two spares, all parts rechromed, including track rod, etc. Re-cellulosed Bugatti blue. Silver wheels. Black leather upholstery. Good tyres, hood. Over £140 spent on rebuild. Many spares. Accept reasonable offer, or consider Riley Nine Lincock coupé or early fabric saloon part exchange. 2, Swinnow Drive, Pudsey, Yorkshire.

RILEY Nine. Counterbalanced crankshaft, £20. Large journal racing crankshaft, £30. Unused linered cylinder block, £10. Rockers. Standard connecting rods. New radiator. Roots-type blower. Needs overhauling, £15. Chambers, 12, Holland Park Avenue, London, W.11.

WRIST Stop Watch. Perfect condition. Offers to Box 170, MOTOR SPORT, 15, City Road, E.C.1.

WANTED

SPORTS CARS. T. & T. interested in purchase of good sports cars. Thomson & Taylor (Brooklands) Ltd., Portsmouth Road, Cobham, Surrey.

SUMP for 16-h.p. Triumph, 1938–9. 6-cylinder. 412, Cottingham Road, Hull.

TYPE 30 Bugatti, with original specification and coachwork preferred. Also Type 37a Bugatti with large brakes and aluminium wheels. Also illustrated literature and press cuttings of Bugatti cars from 1910 to 1925. Also pair early Marchal headlamps, old nickel or brass side and tail lamps, and speedometers. Hampton, Spronketts, Bolney, Sussex.

M.G. cylinder block, P-type. Would consider complete engine, if necessary. Write, Rowan Tree Cottage, Hillside Avenue, Worthing.

WANTED Lagonda Rapier fixed-head coupé, any condition. C. L. Cottam, 25, Palace Road, Llandaff, Glam.

WANTED. "Wheels at Speed," "Road-racing, 1936." In good condition. State price required. G. Siddons, Warren House, Loxley, Sheffield 6.

ALVIS Speed 20 Saloon, preferably Charlesworth, about 1933–4. Give full particulars and price. Good condition not essential. Box 167, MOTOR SPORT, 15, City Road, E.C.1.

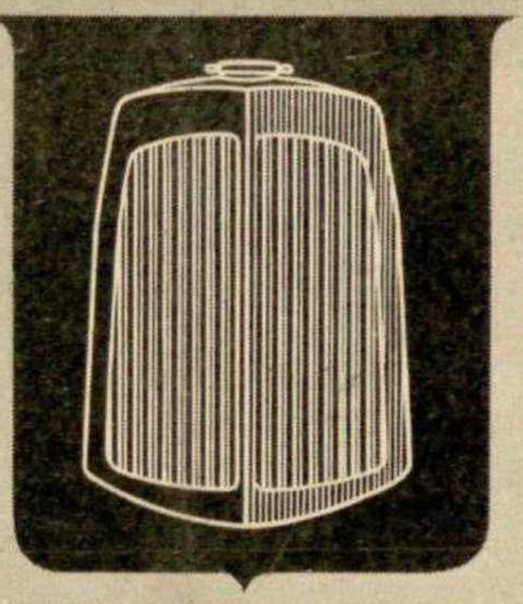
BUGATTI G.P., Brescia, Type 30 or Type 55 gearbox, 8-cylinder Scintilla Vertex, pair Zeiss bulb holders and pin for rim fastener, radius arms, rear springs and axle bearing housings and hubs for early Frazer-Nash. Austin Seven crankcase, 1933–36. 30 mm. Zenith triple-diffuser carburetter. Birkett, 3, Pondtail Road, Fleet, Hants. Fleet 588.

1½-litre open 4-seater with full road equipment, Bugatti preferred. Full particulars. Eve. 5a, Aboyne Drive, Raynes Park, S.W.20.

WANTED MOTOR SPORT January, 1940 to December, 1941; also November, 1927, March, 1930, January, 1932, October, 1935. State price. Major Cliff McCulloch, Stoke Mandeville Hospital, Aylesbury, Bucks.

VINTAGE 4-seater sports car, Big Port Alvis, "12/60" Alvis, "Red Label" Bentley, or any vintage sports in good condition. State price and give full particulars. Would-be owner at present serving in B.L.A. Box 168, MOTOR SPORT, 15, City Road, E.C.1.

ENGINE and gearbox, engine alone, or wrecked car with serviceable engine and gearbox, of the following types: M.G. 1½-litre Type UA, 69.5 by 102, 4-cyl. Morris 12/4 Series III, Aug., 1937, or later. Wolseley Forty-Eight Series II, 1936, 37 or 38. Box No. 169, MOTOR SPORT, 15, City Road, E.C.1.



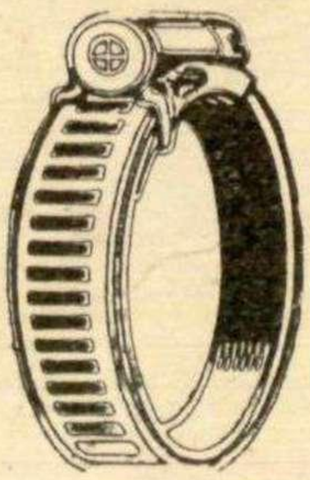
ASTON MARTIN

ASTON MARTIN LTD · FELTHAM · MIDDX

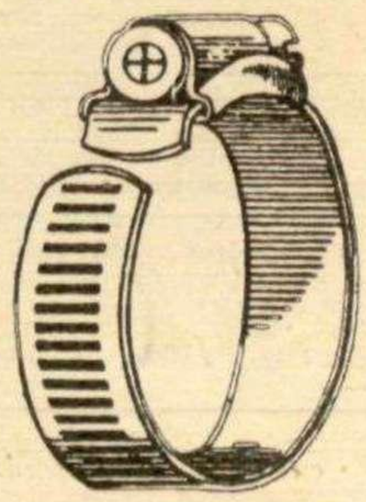
RP-188E

JUBILEE WORM-DRIVE CLIPS

THE BEST POSSIBLE TO GET



MAKE SURE YOU HAVE THEM FITTED ON YOUR RADIATOR JOINTS, LEATHER COVERS, ON UNIVERSAL JOINTS, AIR, OIL & WATER HOSE JOINTS.



ALL IN ONE PIECE.
EASY TO FIT.

NO PARTS TO LOSE.
GUARANTEED NEVER TO LEAK.

A KEEN MOTORIST WRITES : *"I cannot understand anyone using any other pattern, as yours are the last word in satisfaction and efficiency."*

STOCKED BY ALL GARAGES & ACCESSORY DEALERS

MANUFACTURERS
L. ROBINSON & Co.,
2, London Chambers
GILLINGHAM, KENT.

Printed by Tee & Whiten and J. Mead, Ltd., 21, City Road, London, E.C.1, and Published by the Teesdale Publishing Co., Ltd., 15/17, City Road, London, E.C.1. Trade Agents for the United Kingdom : Horace Marshall & Son, Ltd., Temple House, Tallis St., London, E.C.4. Agents for Australasia : Gordon & Gotch (Australasia) Ltd.