



THE LAGONDA CLUB

THE MAGAZINE OF THE  
LAGONDA CLUB

Number 180

Spring 1999







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of a fast getaway!**

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In this instance all went smoothly, but AXX 757 does have a 200 BHP engine thus ensuring that the bride and groom could make a rapid departure!

Simon Bull's Invicta has semi-retired from racing and is being used as a "Q car" for everyday use in London and long distance touring, surprising many a modern with its 230 BHP and 125 MPH top speed.

A 1904 Martini is currently being fully rebuilt. This is a fascinating project, because we are having to re-manufacture a vast number of new parts. We are tempted to wave the magic wand over the engine and see if we can double its original power, as we have with the Meadows engine, but the owner feels it might not be in keeping for the London to Brighton.

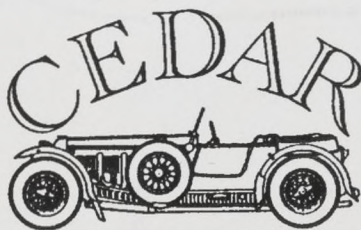
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Issue No. 180 • Spring 1999

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Clive Dalton holds up the large flag for the start of the celebrations at Great Fosters.

*Photo courtesy 'Motoring Memories'.*

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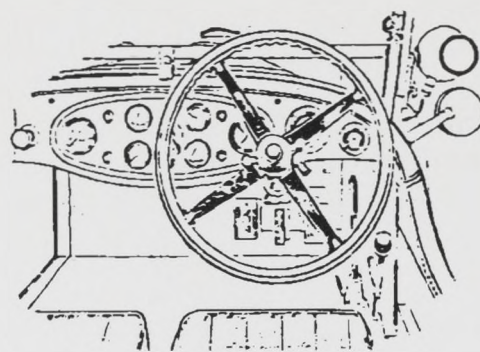
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# From the Driving Seat

*by Ken Painter*



THE CENTENNIAL Year is upon us, with the first two events of the season reported in these pages. It promises to be an exciting and interesting year for us and if an event hasn't been included which will attract you, then you had better write to the Committee straight away and tell us exactly what would!

Sadly, it will take a miracle to see the Painter family attending any of the happenings in a Lagonda of their own. I think it was Harold MacMillan who, when asked what stopped political parties delivering what they promised in their manifestos, replied "Events, dear boy, events". I won't bore you with the events (excuses?) which have slowed down the work on my car yet again, but far too little progress has been made. Must try harder, as my school reports always said.

We have had lots of technical articles submitted recently. This is splendid, because it means that we can all learn even more about what makes our favourite cars work properly, but it doesn't mean that there is any change in the long-standing editorial policy of trying to offer a wide range of topics, covering every aspect of Lagonda life. So, if you feel that the magazine is becoming a little too technical, write a different sort of article for us!

Although most of us want to keep our cars as original as possible, there will be a small series of articles on modifying them. The first is a fascinating and exciting experiment in incorporating modern styles of hand controls for a

driver who has lost the use of his legs. This represents a very real "first", in that no-one has ever converted a pre-war car with "state of the art" and very high tech manual controls in this way before. If it encourages even one other driver who can no longer manage the physical side of driving his - or her - Lagonda to think about a similar conversion, then the author will be a very happy man!

This will be followed by an article on modifications of a slightly different kind, bringing modern refinements to our kind of car, but enabling the car to be returned to original at any time. Not, perhaps, the kind of thing every owner will want to copy, but certainly food for thought.

The simple question, what causes, and what cures, axle tramp on the low chassis cars has certainly sparked a lively response and it could go on for some time. Like the arguments over leaded versus unleaded fuels, I suspect that we are still some way from the definitive answers, so watch this space!

As you will have read in the Newsletter and elsewhere, four petrol additives have been "approved" by the Federation of British Historic Vehicle Clubs and these will be suitable for comparatively gentle use on ordinary roads. They are not suitable for sustained high speed driving on motorways, nor for racing. I suspect that they will meet the needs of many of our members, but for those who race there are still many problems to face. The additives should not be mixed with leaded fuel - which



may still be available at race circuits. As not all of the circuits sell leaded fuel at present, I have my doubts about the viability of this. My pre-war racing engine revs to 6,500 rpm and has a fixed

head, it also has **very** little metal around the valve seats, to allow the highest level of cooling. Racing could become a very expensive luxury in the future.



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## One of W. O. Bentley's Lagondas

"BRITISH CARS SWEEP THE BOARD AT LE MANS" - so read the headlines in "The Motor" on 18 June 1935. It was not another Bentley victory, but nevertheless a significant event in W.O.Bentley's life. The race had been won by a 4½ Litre Lagonda against strong competition from Alfa Romeo. W.O. admits in his autobiography that this unexpected victory prompted his decision to leave the security of Rolls-Royce and to join Lagonda as Technical Director.

At the time of the 1935 race, Lagonda were in the hands of a receiver and subject to sale by tender. A consortium headed by a young London solicitor, Alan Good, was successful and also secured the services of W.O.. The new owners announced to a rather rundown workforce that "we are going to build the 'best car in the world' and have just two years to do it in". Perhaps they were 'thumbing their noses' at R-R who were known to have been interested in bidding for the ailing company, but it would have been a challenge to W.O.. It is not surprising then, with his proven ability to 'get on with it', that within three months revised and greatly refined 4½ Litre Model (the LG45) was announced; that the prototype V12 was

displayed at the London Motor Show in October 1936; and that by the end of 1937/early 1938 the V12 was in production together with a 6 cylinder version - the LG6. The latter used the proven 4½ litre engine in a slightly extended (to accommodate the longer in-line engine) V12 chassis.

The first production LG6 car was a drophead Coupe on the shorter of the two available chassis lengths, Car Number 12310, it was delivered in December 1937. It lives on in Adelaide - Wes Southgate's much admired car. It had three owners in the U.K. before being brought to Australia by well-known Melbourne enthusiast, Tim Hewison in the 1950s. Wes became the third owner in Australia when he bought the car in 1966 and he and Jill brought it to Adelaide. It is a much loved member of the family where it will stay. The only DHC in Australia, the body is by Lagonda Motors and some would say it is the epitome of 1930s elegance!

*Reprinted from the March 1999 Newsletter of the Bentley Drivers Club South Australian Region - see "Letters" for more details.*



# The Evolution of the Meadows Engine

## *David Hine Unravels the Complexities of the 4½ litre Engines*

IN 1933 when the Lagonda Company started to use Meadows engines in the M45 model it would appear they simply engraved "LAGONDA" on the rocker box cover and popped them into the chassis. Not that this implies any criticism because Henry Meadows Ltd were a very well respected engine maker and had supplied the same unit to the Invicta Car Company prior to its financial demise earlier that year. A glance at the catalogue from Meadows shows the various options available and Lagonda picked the same specification as Invicta with the addition of a crankshaft damper on the front but with the exclusion of the external oil filter for some unknown reason (perhaps cost!). The oil relief valve was at the front near side of the engine, connected to the front of the internal oil gallery.

### **M45R Engine**

Late in 1934 a new model was launched, the M45 Rapide. It was based on the shorter 10'3" chassis with the excellent Girling brakes. Many modifications were made to the engine to enable it to generate and stand more power. This exercise was a great success and this was the basis of the famous Fox and Nicholls cars, which achieved victories on the track, including the win at Le Mans in 1935.

The engines are stamped "M45R" and were the only ones supplied with "LAGONDA RAPIDE" engraved on the rocker box cover.

The **crankcase** was cast of an improved alloy, RR50, and the front three **main bearings** were fitted with larger four bolt caps to increase their strength. The **crankshaft** was increased in diameter and it was claimed that it

was balanced, although modern techniques make the dynamic rebalancing of a Meadows crankshaft a very worthwhile exercise. The **connecting rods** were increased in section to a fully machined, much stronger item, in order to stand the higher compression, as the **pistons** were now flush with the top of the bores, compared to the domed M45 pistons, where only the top of the dome came to the top. This increased the compression ratio from 6.5:1 to 7.5:1.

The **lubrication system** of the engine was improved with the fitting of a full flow oil filter. This extra casting was attached to the side of the crankcase off-side, where there was already a flange with four bolts and a blanking plate on the M45 engine. This required two internal oil pipes inside the sump, one from the oil pump to the new filter and another from the new filter to the old filter housing in the centre of the near side. The strainer was no longer fitted in this old housing, so the words "clean often" were ground off the lid.

The new filter casing allowed the use of a replaceable paper or felt filter (same size as XK Jaguar engines) and it was quite a complicated casting, as it also contained two **relief valves**. The main one on top controlled the oil pressure of the whole system and blew off excess oil directly back into the sump through the top "half moon" hole. To the right of the main relief valve is a smaller one, which allows oil to bypass the filter if it is blocked with sludge. The addition of this filter and relief valve set-up meant that the relief valve at the front of the engine was redundant and it was turned into a junction box brass casting and inserts with pin holes were fitted into the



block, to control oil flow to the rocker shafts and timing chains. The **magneto** was changed from a B.T.H. to a horizontal Scintilla type, which also had built-in ignition advance. The **distributor** also had automatic ignition, however the manual advance and retard lever on the steering column was retained. The position of the **oil filler** was moved to the top of the rocker box, because the old filler, with the lovely words "CLEAN OIL ONLY" was near to the timing chains and allowed a lot of oil spray to be emitted. A taller casting, with the **oil breather** on top was introduced and this carried the fan assembly as well.

Some M45 engines had one **block holding stud** made larger, i.e. the one at the front, which had a tendency to come loose. On the M45R engines they were all enlarged.

The tops of the **valve stems** were grooved instead of slotted and collets were fitted.

#### LG45 Sanction I

1936 saw the formation of a new company, L.G.Motors, as Lagonda Ltd had fallen into receivership. The new LG45 cars used a 10' 9" chassis, the same as the short run M45A model. The engine was denoted as Sanction 1, but was very similar to the M45R, except that the coil was replaced with a single vertical Scintilla magneto on the near side, so that both sets of plugs were run off magnetos and the dashboard switch was changed to "1,2 and 1&2"

An important change was the use of the excellent Borg and Beck **clutch** to drive the G9 gearbox, which now boasted synchromesh on 3rd and top gears. The rear of the crankshaft had a small hole drilled in it to allow oil mist to lubricate the spigot of the cardan shaft, which was now located in a bronze bearing in the flywheel. The **camshaft** third bearing journal was machined and the camshaft drilled to provide positive lubrication to the rear bronze bearing. A huge air silencer was fitted, with a smart aluminium casting to duct the air to the

**carburettors. Centralised chassis lubrication** was worked by a pump fitted to the rear near side of the sump.

The jets in the carburettor were adjustable from inside the car for starting the engine, so the Ki-Gass pump was deleted.

#### LG45 Sanction II

The Sanction II engine looked much better, because the **dynamo** was moved to the offside and driven by the same chain as the water pump. This was also a tiny bit safer, as petrol from an overflowing front carburettor no longer fell on a magneto, but a better protected dynamo.

Twin Scintilla Vertex magnetos were fitted in a drive housing which had its own oil feed and a small sump. They were driven by the smaller chain which now also drove the fan pulley.

Trouble must have been experienced with blocks coming loose, as these engines had an extra stud fitted at the front.

#### LG45 Sanction III

This engine series was launched with quite a fanfare to boost sales. W.O.Bentley had joined the company and they were making the most of this by saying that he had inspired the changes, but there is no mechanical evidence of this. He was probably spending much of his time on the design of the V12 and the G10 gearbox.

The whole difference was a completely new cylinder head and the rest of the engine remained as on the Sanction II.

Prior to this, the engine tended to run out of puff over 3,500 R.P.M. and the new head with its bigger valves facilitated extra power to be developed up to 4,000 R.P.M.

With increased compression, caused by the use of domed pistons in the LG45 Rapide engines, up to 115 B.H.P. was available at the back wheels and with a 3.31 rear axle speeds of 105 M.P.H. were achieved, which was certainly spectacular for 1936.



The head is taller, requiring longer head studs, but the configuration of the studs in the block remained the same.

The most peculiar part of the design is the **inlet manifold**, which was cast internally as a pipe running the full length of the head. A disc was fitted in the middle of this pipe, with a smaller hole in the middle to separate partially the front three inlets from the rear ones, it was secured by a stud from above. The carburettor inlets are closer together and the carburettors bolt onto the side of the head. Some of the head studs pass through this internal pipe and, unless very well sealed, oil from the rocker gallery above, gets sucked into the

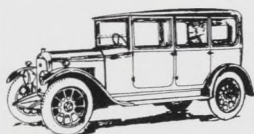
cylinders.

The aluminium castings at either end close off the inlet manifold pipe as well as their water duties, so care with gaskets is required here also. a small **transfer pipe** for water was added to the rear, as well as the three on the side of the engine.

The **larger valve springs** required slight modification to the rockers to accommodate them.

#### **Sanction IV**

The Sanction IV engines are the same as the Sanction III, except that the clutch thrust system is integral with the bell housing, similar to that on the V12 engine.



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“And if I catch either of you joyriding in grandpa’s Lagonda again there’s going to be BIG trouble!”



# To Wink, or not To Wink? That is the Question

*Tim Wadsworth Gets Flashy*

THE young are doing it all the time. On the street corners, in the car park and at every twist and turn. We, of a more mature disposition, have always relied on a firm handshake, but it is conceivable that we could be misunderstood by the object of our attention and receive an unwelcome smack. I have therefore given serious consideration to taking up this modern habit of 'winking'.

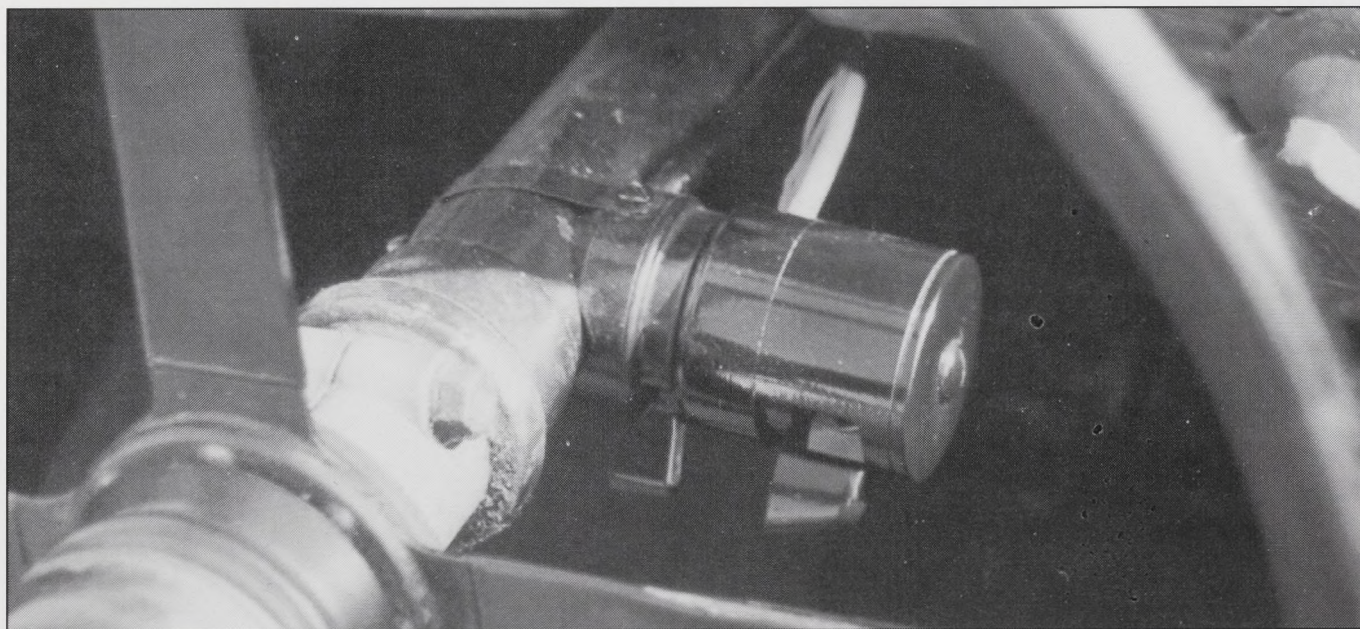
The Lord High Minister of all that moves hath decreed that we can wink in white or amber to the front and in red or amber to the rear, but if we wink to the front, then we must wink to the rear and, furthermore, there must be either an audible or visual indication to the driver.

Now winking in red to the rear could be combined with the stop and tail lights, but it all gets a bit complicated and could send confusing signals. Additional vintage style rear lights with amber glasses are not a problem and can usually be bolted on to most rear ends without looking too much out of place.

It's a different matter on the front. Additional lights will definitely spoil her looks, but for those lucky enough to have those delightful lights on their aerofoil stalks, fitting a double filament bulb is not impossible. The 21/5w bulb is much longer than the standard 5w, but by cutting away a bit of the bulb holder and soldering tails to the bulb itself, it can be made to fit.

Stand-alone flasher units and buzzers are easy to obtain and can be fitted out of sight on the bulkhead, or behind the dashboard, but finding a suitable direction switch is more of a problem. One solution is to modify a '50s dashboard type to fit inside a specially turned aluminium tube, which replaces the cap of the steering column mounted dip switch. You'll need a lathe and a certain amount of patience, but it does avoid defacing the dashboard with a non vintage switch.

Wink away you young bloods - we know your little game!

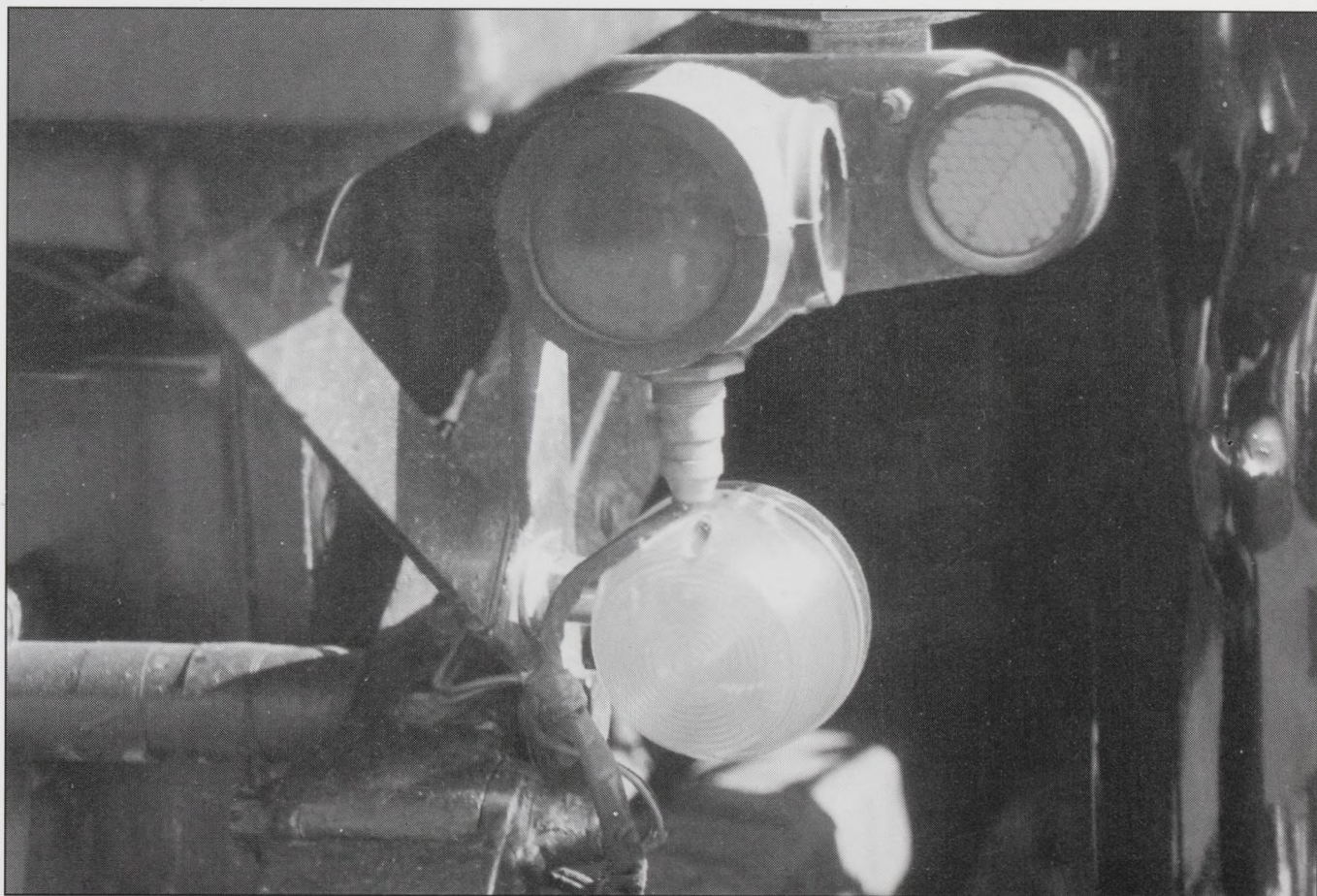


*Tim Wadsworth's direction indicator switch grafted onto the dip switch.*





*The modified sidelight.*



*The extra light at the rear.*





*Above: The line-up of cars at the Old Mill House.*

*Below: the Pointer's LG45 DMC and the Mallett's LG45 Saloon.*

*(These pictures are examples of the current fashion for 'super panoramic' and 'panoramic' pictures. They won't fit the magazine unless they are cropped – in half in the case of the upper photo, so please try to send pictures in the traditional format!)*





# The Suffolk Dinner – 20th March 1999

## *Colin Bugler Eats in East Anglia*

THE 22nd Annual Suffolk Dinner was the first major event of the Lagonda Centennial year and was attended by our President David Hine, Chairman Clive Dalton and past Chairman Jonathan Abson. It was particularly good to see Ted Fuller (the original Rapier spares supremo and a founder member of the Rapier Register) and his wife Eve. Against the usual attendance of about 50, this year the effect of the Centenary was evident by a record attendance of 70 members of the Lagonda Club and Rapier Register.

As usual the dinner was held at the Melton Grange Hotel, Woodbridge and many of us enjoyed the hospitality of local members who, once again, opened their houses to their friends from the UK and abroad. Mike Pilgrim had spent many hours organising this dinner which was graced by a very professional menu devised by Ian Whyte featuring the Centennial Logo. There were 15 Lagondas at the Dinner, the oldest being Frank Tufts' 14/60 saloon and the youngest being Colin Mallett's LG45 saloon, which looked enormous in its coat of very white paint. Among the six Rapiers present was Peter Allen's prototype Eagle two seater, which was on the road for the first time after many years of hard work and restoration. When I started my Eagle replica Rapier project, I visited Peter to take measurements, photographs, etc. and it was a nice touch to see our cars side by side.

One Rapier from Holland, belonging to Gerard and Maria Lansink, had been driven 181 miles and won the Gary Guiver Gong for the longest distance driven by a Rapier to the 1999 Suffolk Dinner.

At the end of the Dinner Mike Pilgrim spoke of the record attendance and welcomed new members Ian and Halina Pointer, who had recently moved to Suffolk. Mike then introduced David Hine, who recommended attendance at other Centennial events and paid tribute to his predecessor, James Crocker. David spoke of various amusing happenings in his Lagonda life, after which we were regaled with one of his inimitable monologues, which had the whole audience joining in at appropriate times, to everyone's enjoyment, casting an altogether new light on the Battle of Hastings!

This concluded the Dinner and everyone then mingled to reminisce about when, who, what and all things Lagonda.

The next day saw 14 Lagondas and about 40 members meeting for lunch at the Old Mill House, Saxtead Green. The occasion was interspersed with various members running frantically to put up side screens when the rain suddenly descended. It was only a heavy shower and then it was back to generally chatting and examining each other's cars, before departing for home after a very enjoyable weekend.

Valerie and I spent the weekend with Margaid and Paul Nickalls, who made us very welcome, along with several other members. As we set off home on the Monday morning, we remembered the 41 years earlier to the day we were setting off in another rapier after our wedding, for a honeymoon in Wales. Little did we think that, so far in the future, we would be even more involved in the Lagonda world, let alone celebrating the centenary of the Lagonda!





*Two of the Rapiers at the Old Mill House.*



*Paul Hartley, Halina Pointer and the Pointer dog – actually it's a Weimaraner.*



# Lagondas in the 21st Century

## *Tony May Reports on the Centennial Celebrations at Great Fosters*

THE BACKDROP of an Elizabethan hunting lodge, converted into a luxury hotel in the 1920s, gave an almost theatrical setting to the thoroughbred Lagondas that gathered there on Easter Sunday, April 4th, to launch the programme of Club events to celebrate the marque's centenary.

Great Fosters' proximity to Staines had attracted the Lagonda Company to use this hotel and its grounds back in July 1934 for vitalising the launch of its Rapier model to the press. Thereafter it was used on a number of similar occasions - those early photographs purposely linking the name Lagonda to what we see now, with hindsight, was the fast disappearing world of gracious living. So it was particularly appropriate for Lagondas to return to their "photographic home" after such a long interval.

Jeff Leeks organised the day with the help of Hilary Leeks, and from early morning Club members were making their various ways to Egham in Surrey - all anticipating a great day ahead. By 10.30 the main display of cars in front of the hotel was complete and provided an interesting form of *deja vu* for those who had been inspecting the excellent display of historical photographs mounted in the Orangery by Bowers Motoring Memories. For there were the photographs of the Rapier launch in 1934, taken on the same forecourt by Charles K. Bowers; Bob Bowers now provided a neat symmetry to the occasion by being the official photographer of the day some 64 years after his grandfather had performed that role. Bob's team were also hard at work filming the occasion on video.

Cameos and contrasts were provided

in the main display area by the fine selection of Lagondas chosen to represent the marque, all polished and well turned out - present were Rapiers, M45s, LG45s, 2 litres (high and low), 3 litres, 12/24, 14/60, 16/80, DB 3 litres, LG6, the ex-Ralph Richardson V12, an AML V8 and an Invicta. For one Rapier, Peter Allen's Warwick Wright Special (340 PA/BPJ 160), it was a happy return to Great Fosters as it had been displayed here at the original press launch. The adjoining Tithe Barn courtyard had a supporting display of yet more Lagondas aided by the muscular presence of the light green Aston Martin Vantage demonstrators - the DB7 Volante 6-litre V12, V8 Le Mans and the V12 Coupe, all capable of producing fearsome amounts of brake horse power. The contrast was provided notably by the 11.1 Lagonda parked nearby.

The AML V8's owner, David Brown, found himself to be the newest Club member shortly after his arrival. Colin Bugler has a persuasive tongue (and also just happened to have an application form in his pocket). Yes, I did say David Brown, but no connection I am sorry to say. Meanwhile, after enjoying breakfast hospitality from Aston Martin Lagonda Ltd., where the Club was welcomed by Kingsley Riding-Feke, AML's Service and Restoration Director, a small cavalcade of Lagondas had arrived from Newport Pagnell with our Chairman, Clive Dalton, bearing the Lagonda flag. With a short speech Clive announced the celebrations well and truly launched and the Club's flag was raised on the hotel forecourt.

By lunchtime the overflow of Lagondas had spread onto various drives around the hotel and into the main car





*Clive Dalton cuts a dash as well as the cake.*



park - a rough count of between 65 and 70 cars was made. The hotel bar was in popular demand with so much talking and there was also the opportunity to see the Brooklands Society's display of motoring memorabilia that accompanied the Bowers' exhibit. Club regalia was also well displayed.

Lunch beckoned and some 130 members and guests adjourned to the hotel's old Tithe Barn restaurant where they enjoyed a very pleasant meal and listened to Clive Dalton who welcomed the gathering and reiterated the aims of this year's celebrations. Clive introduced Bob Dover, Chairman and Chief Executive of Aston Martin Lagonda Ltd., who spoke of the importance of the close ties between AML and the Club and pledged his company's continuing support. Tribute was paid to Harry Calton, Public Relations Officer of AML who was also present, and his staff who with the help of Dave Willoughby had produced the splendid Lagonda Centenary brochure.

Then came the important champagne toast to "Lagondas in the 21st Century" after which the Chairman transformed himself into Errol Flynn (that dates me), by expertly flourishing Col. Stephen Matthews' own ceremonial sword before cutting the Lagonda Club cake. A big "thank you" to Stephen and his Catering Corps colleagues for making such an excellent cake. Jeff Leeks thanked everyone for their support on the day and presented bouquets on behalf of the Club to Tracey Dover and Ros Calton, wives of Bob and Harry. Reference was made to the rest of the celebratory events to be

held during the year and in particular the Brooklands Lagonda Fete on 17-18 July where the finest array of Lagondas will be seen. "Don't miss it" was the clear message!

Amongst the guests we were pleased to see John Scholey and his family. We believe that John was the only representative present of the old Lagonda Company, being an employee between 1935-39. We look forward to seeing him again at Brooklands.

After lunch members and guests circulated amongst the cars, with much reminiscing and renewing of old friendships. Car bonnets were raised for closer inspection and comment. There were numbers of new faces of members, and their cars, whom we had not welcomed previously to Club events. We hope that we shall see them again during the summer's activities.

By late afternoon goodbyes were being said and one by one Lagondas drifted off down the driveway for their homeward runs. Some took the opportunity to drive over much of the original seven mile route used by the factory for testing its cars while others diverted to visit Wilbur Gunn's grave at the Englefield Green cemetery.

Without doubt everyone enjoyed a relaxed, and above all, a great "fun" day. The final total attendance was thought to be nearly 200. Thanks again Jeff and the Centenary Committee for making it happen.

Thanks are due to "Motoring Memories" for the photographs of this event.







*Great Fosters and the main display.*



*The Tithe Barn display, before the crowds arrived.*





*Some interesting contracts.*



*The AML V8's engine bay comes under close scrutiny.*



# Sleight of Hand

## *Michael Bolger describes how a 4½ litre Invicta was converted to hand controls*

I AM a paraplegic and, therefore, unable to use my legs and feet. As a result I am confined permanently to a wheelchair. Since my accident I have driven post-war sportscars fitted with an automatic gearbox and standard hand controls to operate the accelerator and brakes. For me this has been the 'easy option'. Before my accident I drove pre-war sportscars and I have always wanted to enjoy that experience again.

Back in September 1996, I therefore set myself the goal of buying a pre-war classic sportscar; installing hand controls to enable me to use a manual gearbox, as well as to operate the accelerator and brakes; and competing in events arranged by the Vintage Sports Car Club Ltd, under the auspices of the RAC Motor Sports Association.

There were three main requirements:

First, a competition licence issued by the RAC MSA. This would be the first time that such a licence had been issued to a paraplegic driver using a pre-war car in licensed competition events.

Second, special dispensation from the VSCC to use suitable hand controls to operate the clutch, as well as the accelerator and brakes.

Last, but not least, an accessible and drivable car with competition performance and enough low-end torque to suit the hand controls.

### **The Competition Licence**

From the start, the RAC took an encouraging but realistic approach to my licence application. Understandably, they required reassurance regarding my general health and my ability to drive with hand controls in a competition environment. They made it clear that a licence to take part in full, open racing events would not be possible, but

entering speed trials and hill climbs might be possible.

My medical consultant, David Grundy, the head of the Spinal Injuries Treatment Centre at Salisbury Hospital Trust, and his colleagues, gave me tremendous help and support on the medical front, and Tony Reynolds of the British Motor Sports Association for the Disabled was extremely supportive of my application. In December 1997, I was awarded a National (B) Licence - an event well worth celebrating!

### **Special Dispensation**

The VSCC were also very encouraging and extremely helpful with technical advice and information, whilst having to ensure that the pre-war integrity of the vehicle was sustained as far as possible and that the hand controls and gearbox would not give me an unfair competitive advantage. At the end of 1997, I was given special dispensation to use hand controls for operating the clutch, accelerator and brakes.

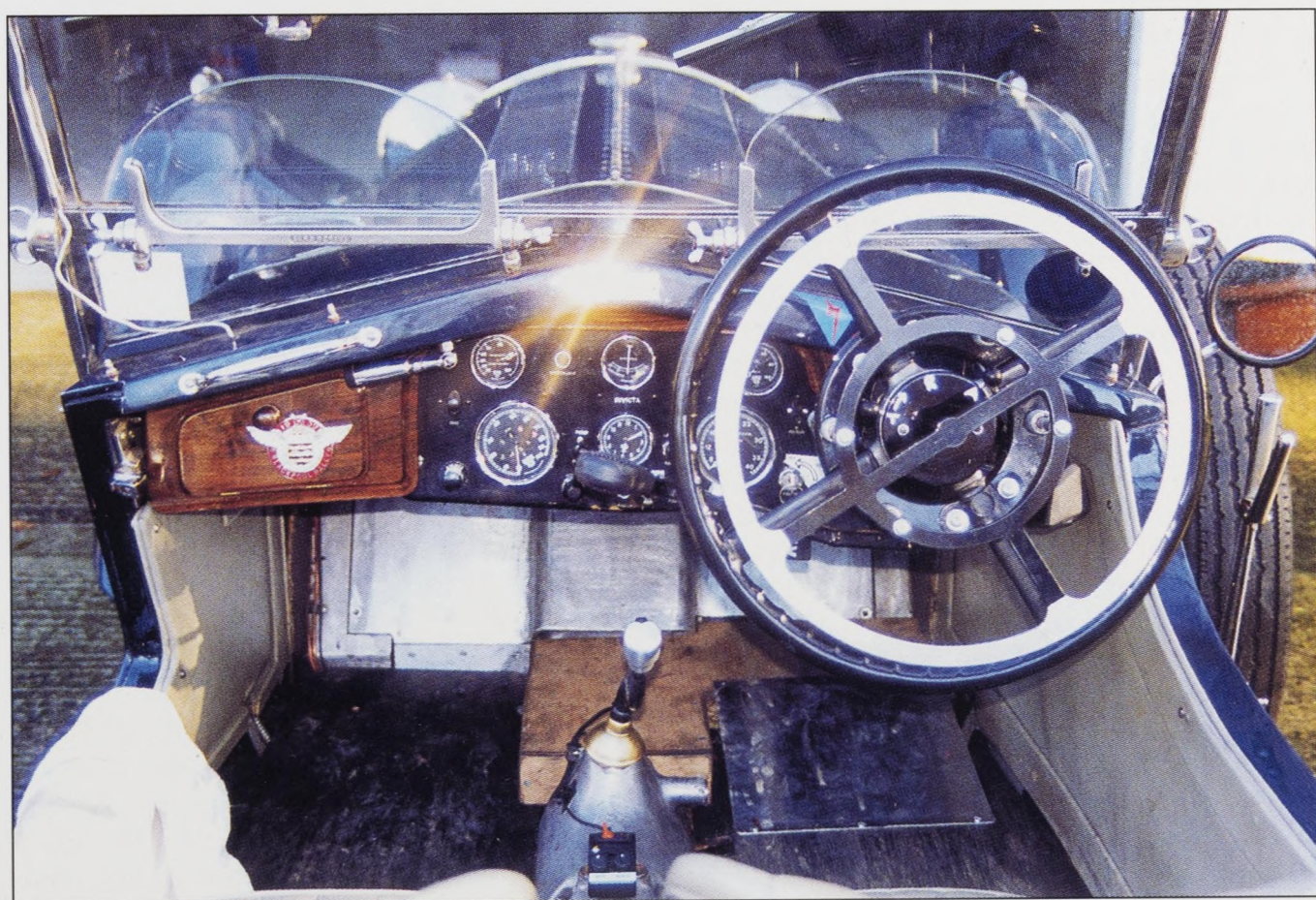
### **Finding the Car**

This proved to be the most difficult and frustrating part of the project. The easy part was identifying the types of car which would be most suitable, with reference to the size of engine and overall performance, particularly the need for considerable low-end torque, which would reduce the need to change gear so much. Lagonda, Invicta, Talbot and Alvis were the most obvious options, particularly Lagonda M45s and Invicta S types, because of the 4½ litre Meadows engine. I therefore joined the Lagonda Club for information and advice, one of the best decisions I took!





*Proud owner beside his modified Invicta . . . . .*



*. . . . . and a view of the modifications, all removable if the car is sold. this was not the final layout, the clutch control was moved to the dashboard.*



It was soon confirmed that the main problem areas would be access, use of gearbox and ease of steering, in that order of difficulty. Access was a major problem because the driver's seat was normally at least 30 inches above ground level and ten inches above my wheelchair seat; the running boards were up to 14 inches wide and, with some cars, particularly Lagondas, the gear lever was positioned to the right of the driver, just inside the bodywork, seriously impairing access from the driver's side. To make matters worse, many of the cars did not, of course, have a driver's door and access therefore had to be obtained through the front passenger's door. Transferring to and from the car for a wheelchair user was, therefore, a major logistics problem.

Once in the car, help with clutch control and changing gear was essential, whichever car I chose. The ability to steer effectively whilst accelerating or braking at the same time is essential with these types of vehicle, particularly, of course, in hill climbs.

Hoping that solutions could be found to the problems of access and drivability, whilst retaining the integrity of the vehicle as much as possible, I began my search for a suitable car. In total, the search lasted from the Autumn of 1996 until the Spring of 1998, in the course of which I travelled over 5,000 miles and looked at over 20 cars, particularly Lagonda M45s. However, an Invicta S Type Low Chassis Sports Tourer, with its 4½ litre Meadows engine, accessible low chassis and the absence of running boards, light steering and servo assisted brakes would have been the car which came closest to meeting my specification, but, given the price, it would have to be a replica and they are very difficult to find.

In search for a suitable car, I had considerable help, advice and plenty of encouragement from members of the Lagonda Club, particularly from Colin Bugler and Arnold Davey; and I kept in touch with the leading hand controls experts, particularly those specialising in automatic clutch control and remote control seat transfer systems.

Eventually, after looking at some fine cars, an Invicta S Type Low Chassis Sports Tourer replica came onto the market. The car had been built by the late Chris Browning and was well known to the VSCC. It had a replica chassis and body, but the 4½ litre Meadows engine, the gearbox, axles, differential, steering column and brakes all came from a 1933 Invicta 4½ litre A Type High Chassis Saloon, together with its brown log book and other relevant paperwork. The only feature of the car which was not standard was that it had three, not two 2" SU carburettors, which have an additional cover on the bonnet.

Given the considerable amount of engineering work which would have to be done, most of it entirely new and experimental, to make the car drivable for me, it soon became clear that a replica, rather than an original car, was the more suitable way forward. What was most needed at this stage was an experienced motor engineer, familiar with this type of vehicle, to work in partnership with a progressive hand controls specialist who was prepared to design and install a full set of hand controls in a pre-war car, thereby breaking entirely new ground, at the same time as retaining the integrity of the car as much as possible.

Paul Kitcher, helped by Jo Moss, has done the engineering work required on the car itself, including, amongst many things, a partial engine rebuild, fitting additional brake servos, installing a more useable, central position Alvis all-synchromesh gearbox and generally making the car more comfortable for me to sit in and drive. Paul restores vintage sports and historic racing cars, including Alvis, Cooper Bristol, 4½ litre Bentleys, Vauxhall 30/98s, as well as Invictas.

Jo Moss, who is a Lagonda Club member, also helped with the car search. She is enthusiastic about vintage sports cars, particularly those with 4½ litre Meadows engines and, most of all, the Invicta S Type. Jo races a 4½ Invicta Sports in VSCC events.





*Michael demonstrates the accelerator ring, operated with the right hand and the control for the brakes with the left hand.*



*Ready to go!*



I asked Owen Briggs of Brig-Ayd Controls to design and install the hand controls required to operate the accelerator, brake and clutch, because he has a proven track record of doing such work very successfully, albeit with modern cars, particularly in the automatic clutch field. Also, he has an intuitive empathy for cars such as the Invicta and is stonily committed to helping disabled drivers to test their limits. In addition, he was prepared to enter into a long-term partnership with Paul Kitcher and me on developing the car to its full competitive potential.

The objective was to install the most effective, versatile and, preferably, the latest, hand control technology, whilst changing the car as little as possible. For example, this included retaining the original steering wheel with its advance/retard and hand throttle controls as well as the original Alvis gear lever.

In order to drive the car effectively, I needed to operate the accelerator without taking my hands, or as a minimum, the base of my thumbs, off the steering wheel. Although the steering is much lighter than, say, a Lagonda M45, it is still heavy enough to need steering with both hands, particularly in confined spaces.

For the same reason, the hand-operated lever used for braking the car had to be positioned as close to the steering wheel as possible, so that I did not need to remove my hand from the steering wheel for a significant length of time to apply the brakes.

As a result, the car has been fitted with an accelerator ring which sits just inside and proud of the rim of the steering wheel so that I can accelerate with the base of my thumbs and steer with the rest of my hands. The brake lever is positioned just to the left of the steering wheel so I can operate it with the back of my left hand for light braking whilst still steering with that hand, or only have to move my left hand a very short distance away from the steering wheel for heavy braking. An additional feature, which is very helpful, is that a ratchet on the brake

lever will allow me to apply the brakes for a sustained period, whilst freeing up my left hand completely in order to steer the car.

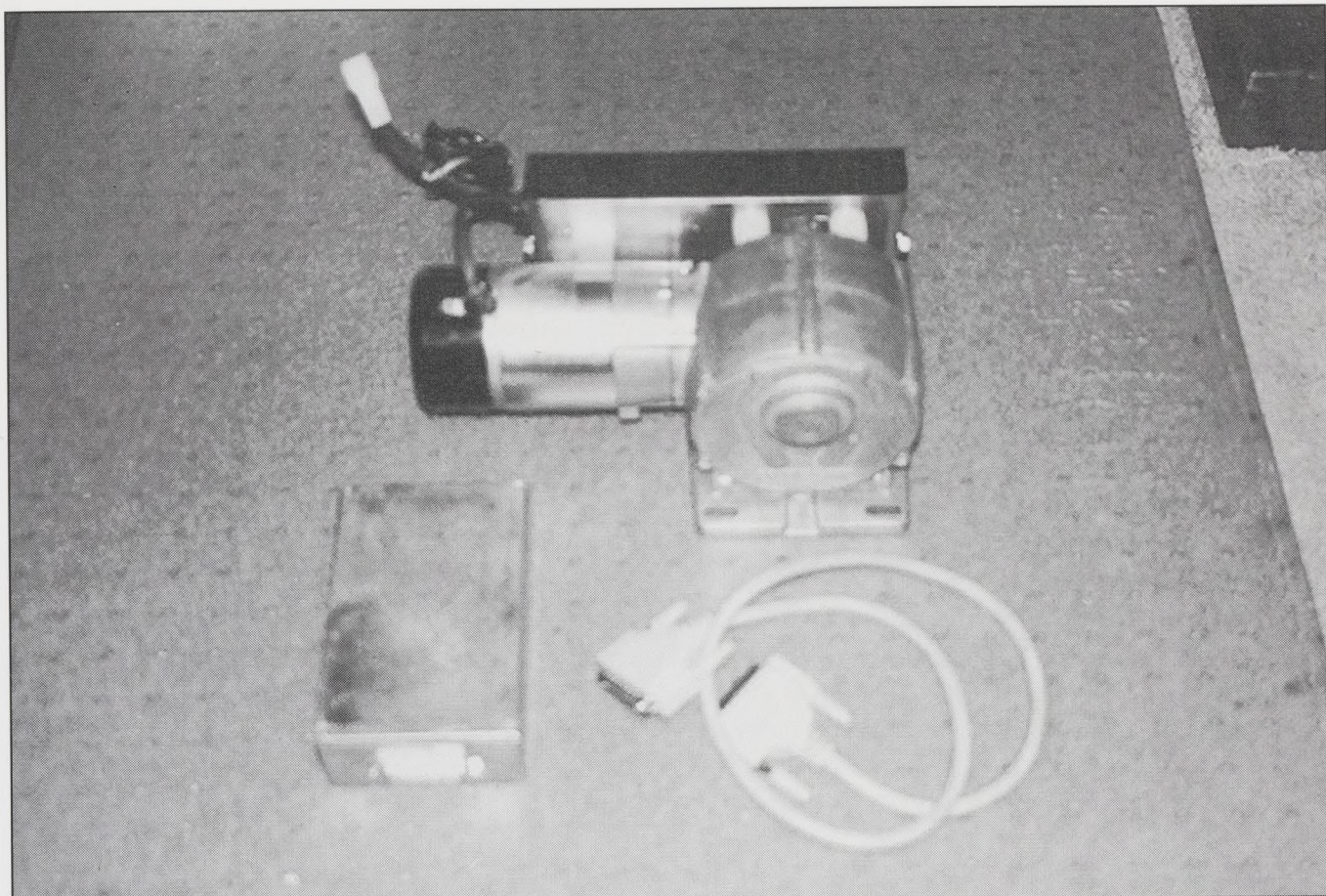
The "jewel in the crown", so far as I am concerned, is the recently-developed electronic semi-automatic clutch system which allows someone like me, unable to use my legs and feet, to use a manual gearbox. Unlike alternative systems which are vacuum or hydraulically-powered, an electronically powered system is most suitable for a car like the Invicta, which does not have the means to power a vacuum or hydraulic system.

The actual operation requires the driver to change gear manually by pressing a button on the top of the gear lever and selecting the appropriate gear. With increased movement of the accelerator, which reflects engine rpm, the clutch is progressively engaged. At a speed of 10 mph, the clutch is fully engaged and, to change up or down through the gears, the driver has to press the button on the gear lever, change into the required gear and then release the button. Electronic control of the system will also disengage the clutch at a speed below 5 mph when stopping, thereby avoiding stalling. When reverse is selected, a signal is sent to the controller which will then moderate the rate at which the clutch is engaged, giving a more easily controlled speed for reversing into confined spaces.

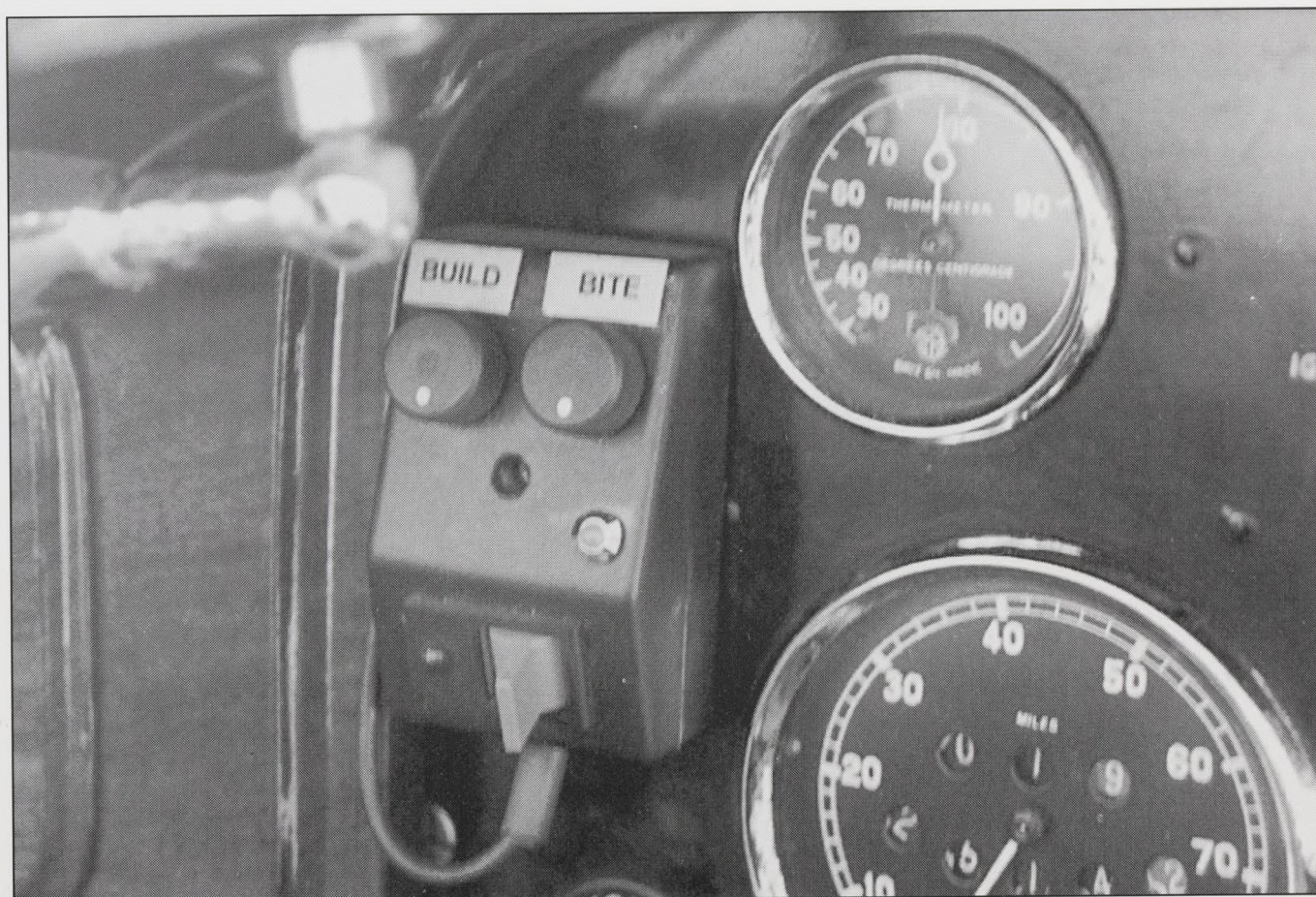
The system can be switched easily to Sport mode, which works to much faster parameters and is therefore much more suitable for both speed trial and hill climb events. These features give this system a flexibility and versatility which gives it a competitive edge over other automatic clutch systems currently on the market.

The principal components of this electronic clutch system are a heavy duty 12v motor and gearbox, with built-in driver circuit board, all of which is mounted out of sight within the engine compartment; an electronic control panel, installed on the dashboard for ease





*The magic which works the clutch! Drive motor, electronic 'black box' and the connecting lead.*



*The clutch control panel: 'bite' controls the speed of engagement, 'build' controls the rate of take-up and how progressive it is.*



of access; a clutch cable which is connected to the clutch pedal or directly onto the arm at the gearbox; an engine rpm sensor, a speed sensor and reversing sensor, an accelerator pedal potentiometer; a button on the top of the gear lever for engaging and disengaging the clutch itself and a full system on/off switch. All of these components can be removed from the car easily, with no legacy of damage to the car itself.

One of the major advantages of this total set of hand controls, which Owen Briggs is right to emphasise, is that both the brake lever and the gear lever are on the same, left, side. This means that the driver's right hand always can be on the steering wheel, leaving the left hand to operate both the brake and gear levers.

The electronic clutch system was designed by Eamon O'Connor of OC Mobility in conjunction with Owen Briggs. This is the first time that an electronically-powered automatic clutch system has been installed in a pre-war car and it is also the first time that a pre-war car, fitted with hand controls to operate the accelerator, brakes and clutch, has been driven in competition events. It really is a case of marrying hand controls technology of the Millennium era to a car

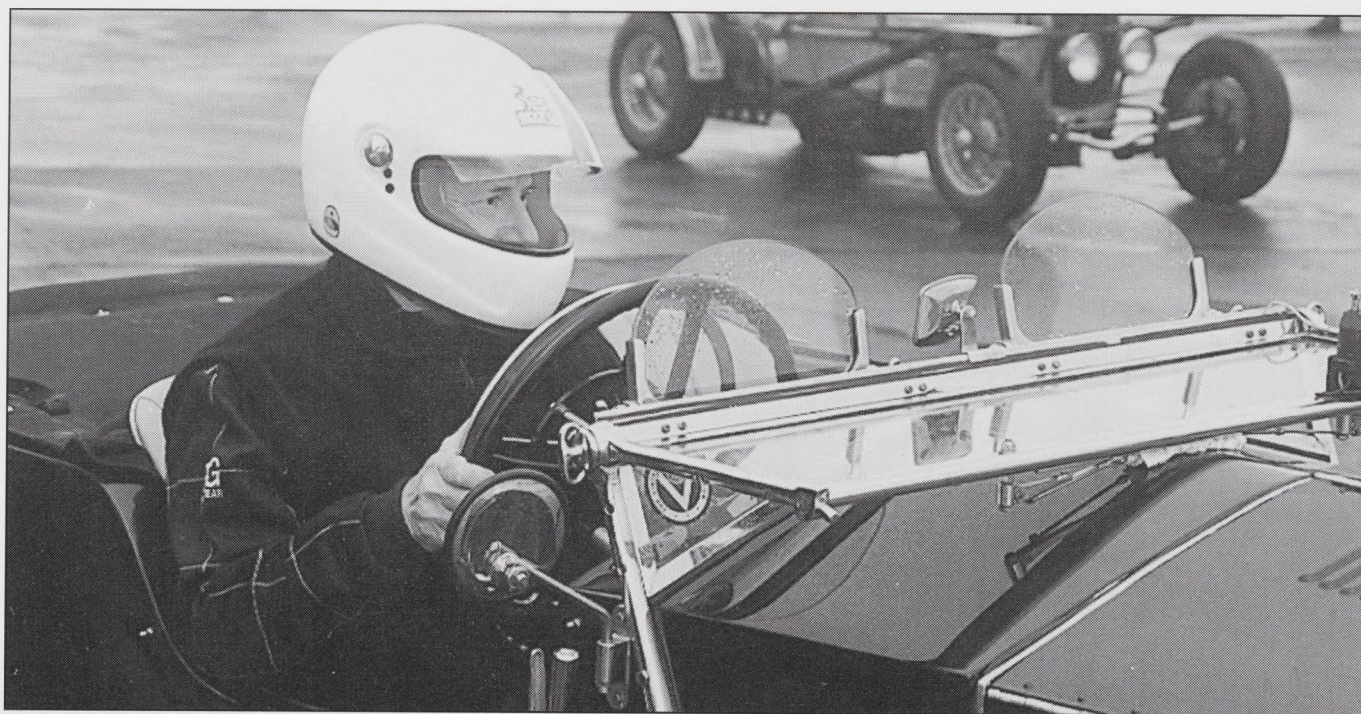
of the type designed sixty-five years ago. Even better, the electronic clutch system itself can be fitted to any vehicle, irrespective of the type of engine, including diesel.

### **My First Speed Trial Event**

I enter my first competitive event, the VSCC Speed trial, to be held at Colerne, on 10th April 1999.

### **Overall Objective**

My overall objective has been to show people, able-bodied as well as disabled, that it can be done - that it is possible to obtain both a licence and special dispensation to drive competitively with hand controls installed in a pre-war sportscar. With the groundwork completed and the price thereby reduced, my hope is that increased sales will make it even more affordable for other disabled drivers to share this experience. Given my circumstances, it is impossible to describe just how satisfying it is to be able to transfer in and out of this car on my own, without any assistance, and how exhilarating and rewarding it is to be able to drive it so spontaneously in all conditions.



*Michael at the Colerne Sprint, where he made an encouraging debut. We will report his progress with great interest.*



# Who is Taking the Lead Now?

## *Dennis Clarke muses on the fuel situation*

TEN years have elapsed since two star petrol was withdrawn from filling station forecourts, leaving the likes of me to ponder over the choice between unleaded and four star. Unleaded petrol at the time was the closest in characteristics to the two star petrol I had been using since the star rating was adopted to signify the knock rating of the various grades of motor spirit available to the average motorist. I opted for the unleaded, after all it was cheaper and experience had shown that more expensive grades had not reciprocated with more miles per gallon, or any noticeable increase in power.

This choice of unleaded petrol for my two litre was not made without careful aforethought. The Lagonda engine must have been designed to run on unleaded petrol. Put another way, it was certainly not designed to run on leaded petrol. petrol doped with tetraethyl was patented in the early 1920s on account of its property to reduce the knock or pinking experienced in spark ignition engines, so allowing higher compression ratios and earlier ignition to be used with the accompanying increase in power. only the holders of the patent, or those paying a premium to them could take advantage of this, forcing other suppliers of motor fuel to scratch their heads and search for other means to increase the knock rating of their brands of petrol. The name "petrol" was also the subject of a trade name, but the word has caught on too well in English usage that this has been forgotten about, like some other trade names. Cleveland Discol contained ethyl alcohol to raise the knock rating, about ten percent at one time and gasoline in the USA is following this line today.

Benzole Mixture contained additional benzene from the coal tar industry, which would not be allowed now. Methyl iso-butyl ether is one of the oxygenated substances added in this country today.

Overall, the proportion of petrol sales containing lead in the early 1930s might have been one quarter of the petrol sold to motorists. Thus the driver of a car in those days would not have been sure of obtaining petrol doped with lead in many parts of the country, even if he had been aware of such a thing. The handbook makes no mention of particular brands of petrol recommended for the car and a car maker would not have produced an engine for general use which relied on a fuel not widely available. Even up to the outbreak of the Second World War, quite a high proportion of petrol sales would have been lead free. the patent had expired and fighter aircraft engines such as the Merlin needed 120 octane to power them. Even at this time the presence of lead as a lubricant for valve seats was never mentioned and probably not thought of. Octane rating, ever higher compression and the suppression of knock or pre-ignition was foremost. Valve recession probably only came to light when the lead was reduced or omitted as an environmental issue.

With these thoughts in mind I happily filled the tank of my low chassis with unleaded petrol in 1988 and, ten years later, continue to do so. I watched the behaviour of the engine, particularly for signs of rocker clearance reducing. Over this ten year period I have adjusted the rockers only once and that was so minor as to be not really necessary. Over this time the car has done some 50,000



miles, often covering two hundred miles or more without stopping, though the engine has not been run at high speeds. The car, originally supercharged, though not in my ownership, is fitted with the OH differential and the gearing is such that at 2,000 rpm it is bowling along at a merry 50 mph, a speed I seldom exceed these days, not because it is incapable of higher speeds, but my preference for a more relaxed way of life.

Furthermore, there seem to be some advantages in using unleaded petrol, though it could be other improvements in fuel for cars. Whereas when using two star I had to close the spark plug gaps two or three times each year, they would burn from 15 thou to nearly 30 thou, making it difficult to start on a damp morning, this has not been necessary since using unleaded. The head has not been off for six years, so I have no idea if serious coking has developed, but the engine still throbs merrily and there seems no reason to delve into such depths. When things are working satisfactorily I tend to leave well alone.

Most pre-war cars are probably driven at moderate speeds these days, with a little grace and decorum, as befits their stature. In such circumstances there is perhaps no need to worry about running on unleaded petrol of 95 RON or low octane rating. I cannot vouch for those who want to push their cars to the limit, but it would be interesting if

someone were to delve into the annals of history and find out what petrol was used by Lagonda in the 1935 Le Mans race and whether it was doped with lead. I would be very surprised if it was.

**Editorial comment:** *Your attention is drawn to the caveat at the foot of page three! I am no technical or historical expert and I am as puzzled by the arguments for and against unleaded as the next man. Ten years' experience of unleaded is not to be ignored completely, but expert opinion is clear that, up to around 3,000 rpm, there will be little valve seat wear with unleaded, but over that speed it increases rapidly. Perhaps that explains why Dennis has experienced no problems.*

*My copy of "Motor Racing" was published in 1939 and seems to suggest that leaded fuels had been generally available for some time - as the "Ethylised" mixtures offered by various (un-named) petrol companies. It does state that the authorities at Le Mans allowed an unlimited proportion of benzole in the fuel "of late", whatever timescale that might imply. It also specifies a leaded and an unleaded aviation fuel.*

*Personally, I intend to fit hardened valve seats in my 2 litre head, then I won't have to worry about enthusiastic use of the right foot!*

**K.P.P.**





# The Second Time Around

## *John Anderson Plays With His Dirty Bits*

THE above heading recalls that splendid T.V. series starring Judi Dench - good story, well acted and cultured voices - jewels amongst so much junk! Discovering I had a blowing silencer on the 2 litre I thought, "That's ridiculous, I only fitted a new one a short time ago". How wrong can one be? On reference to the records, it was 12 years! It now looks as though I'm on the second time around. When I started the four year rebuild I could push my fist through the bottom of the footwell tool box, so I cut out the rot, fabricated another and riveted the new to the old. I took the opportunity to make it a little deeper. This, of course, was on the offside, but I thought I'd make another for the other side, only shallower, to provide room for the silencer, which I knew I would have to fit a long time hence. I also had much the same to do to the battery boxes under the seat, but as 2 x 6 volt batteries were more expensive and heavier than 1 x 12 volt, I converted one box as a spares container and made the other a little bigger to accept the larger battery.

Come the time to fit the silencer I hadn't really left enough space! Of all the 2 litres I've seen, I don't think any two had the same shape/size, but this is usually the norm with Lagondas. By having the expansion chamber oval and the inlet/outlet stub pipes off-set from the centre and setting the whole at a slight angle the problem was solved. I had tried and failed to find something, from one of the many exhaust system suppliers, which I could modify, but eventually found a very co-operative firm in Birmingham to whom I gave details over the telephone as to what was wanted and the result was a beautifully made unit at a very reasonable price.

Sadly, when I tried to approach them again, they were no longer in business, so I decided to have a go myself and contacted a local sheet metal worker for help.

He wasn't prepared to do the whole job himself when I explained the requirements. I bought from him a 3' length of 2" tube and picked up a bit of ¼m.s. plate from the local scrap merchant, from which I cut out the two oval end plates, in which I drilled and bored out holes to accept the tube. I then made up a jig for my pillar drill and drilled eight rows of 5/16" holes at 1" intervals over a 24" length of tube. Each alternate row was interspaced. Back to the sheet metal worker, who was to form and weld up the expansion chamber to the end plates and the plates to the tube. I suggested, simply with ease of construction in mind, making the job with a twin layer of thinner gauge sheet, rather than one thicker one, but, no he would do it in one. In the event, he had problems in bending and ended up with two pieces of the thicker sheet and a pair of overlapped welded joints.

When fitted there was a distinctive vintage bark, with a slight excess of decibels and a tendency to resonate at certain revs, particularly on the over-run. However, a 12' length of 2" asbestos tape, neatly bound round the expansion chamber and held securely in place by three mega length Jubilee clips successfully solved the problem and will, at the same time, give a certain amount of weather protection to the silencer.

To be honest, I had expected the original unit to have lasted longer and thought I would have a go at repairing it for a spare. I had to use a heavy



persuader at the leaky end of the box to part it from the down-pipe and caused quite a bit of damage. so I cut out the end 6", made another end plate and got another bit of sheet welded in to close the gap. Two things came to light. The skin of the expansion chamber had no welding at all, the ends and the horizontal seam had all been formed on a folding machine, the only welds being where the pipe passed through the end plates. These plates were of the same thin sheet metal because, obviously, the folder could not have coped with something like  $\frac{1}{4}$ ". Thus, this was the weakest spot and a recipe for weld failure. The other thing was the discovery that the box was double skinned! The outer layer protected the inner from weather and the inner protected the outer from gaseous erosion and, I reckon, eliminated the resonance problem.

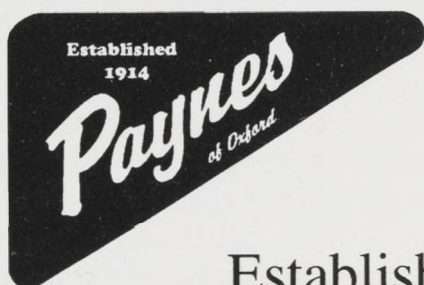
Another case of second time around was the relining of the front brakes. When first fitted I had no trouble at all and had got a local firm to do the job and supply the linings. This time I bought from the Club and the result was appalling squealing, which persisted even after rasping the leading edges, etc. Eventually I got the nearside one quiet and Adrian Lead, another 2 litre owner and the local Renault dealer, came up with a very long tension spring, rather like the springs swinging settees in the garden are suspended from. Having added three old bed springs to increase the length, I levered it on around the offending brake drum. Complete silence! A few weeks later the n/s drum again started to squeak and has similarly been treated. A local garage owner friend, on hearing the noise, said "You want to send those linings back to the suppliers!" Any ideas? Possibly lack of asbestos content?

Lastly, I have had recurring trouble with keeping the drive section of the mag vernier coupling secure on its shaft. The slot to allow the sliding of the coupling to and from the mag, when replacing the latter, was not a good idea in the first place. I've solved the problem by fitting a

tapered cotter pin, removing the lugs from the base of the mag and can now slide the mag up to the coupling. To do this I had to borrow a  $\frac{5}{16}$ " taper reamer from a friend who, amongst other things, makes instruments for hospital theatres. I showed him my handiwork and explained the care I had to take in getting the correct amount of taper to allow room, on a pin of given length, for a couple of flats to be ground on the thick end and for the last  $\frac{1}{2}$ " to be turned parallel to accept a  $\frac{1}{4}$ " thread. His reply was to show me a batch of tapered pipe unions of silver steel he was making for the administration of anaesthetics, where a difference of 2 thou between the diameters of the two parts of the union would alter the length of the assembled unit by  $\frac{1}{4}$ ", which would then not fit!

This encounter was to have a sequel. He noticed a slight oil leak down the side of the block from just above the camshaft tunnel, adjacent to the thrust bearing of the o/s camshaft. I had been trying to find the cause for ages and I renewed the thrust bearing gasket and the drain plug washer to no avail. I explained the valve gear lubricating system to him, mentioning the neoprene washers between the camshaft tunnel and the head and he produced an endoscope! Another item of equipment that he manufactures for the medical profession. For the uninitiated, this is an instrument for inserting cutters, telescopes and floodlights into all sorts of embarrassing apertures in one's person. We start the engine, he inserts the tube into the minute gap between head and block and we see a misplaced neoprene washer and an illuminated and magnified picture of a tappet rocker doing its job! And the oil leak! Here, he mentions that the equipment used would cost a hospital £1800. Remove the No 4 exhaust rocker, apply a packing made from plumber's thread sealing tape, plus some silicone sealant and we don't have to remove the head.



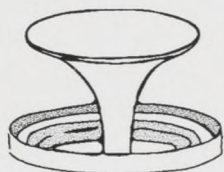


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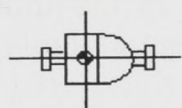
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# Letters

Dear Ken,

The following brief note, which appeared in the March 1999 Newsletter of the Bentley Drivers' Club South Australian Region (of which I am an associate member by virtue of WO's involvement with Lagonda) may be of interest. The photos no doubt would not reproduce well, but there was an article, with photographs in "The Automobile" Vol 10 No 12 (Feb 1992 - their 10th Anniversary issue), which featured my LG6 on the front cover. However this apparently passed unnoticed as it was not mentioned in the Lagonda Newsletter or Magazine!

I have just received the lovely publication "A Century of Lagonda" and I only wish I could be there to share in the Centennial Year, which promises to be so memorable. I have been a member since 1966, when I purchased the LG6, car no 12310.

Yours sincerely

**Wes Southgate**

*The article Wes sent is featured on page 5 - and he is right about the photographs not reproducing well enough for publication! We are very fortunate in Britain to have a very large number of magazines about, or which feature, our sort of car. None of us could possibly take every magazine and Lagondas feature so regularly in them I have given up even trying to keep track.*

**K.P.P.**

Dear Ken,

I have recently purchased yet another book on the Zenith triple Diffuser Carburettor and under the section "If popping back takes place in the carburettor after running at high

speed for example etc. etc....." It advises you "Clean the cylinders with an Oxygen Blow Pipe."

Can anyone please enlighten me regarding this advice?

Yours sincerely

**Roger Firth**

Dear Sir,

Recently reading a borrowed copy of your club magazine, I came across the letters written in comment about a previous article on axle tramp. I found all of the opinions of interest. I have some interest on this subject myself. I have owned a 20/25 Rolls Royce for a number of years and have experienced the problem at low speeds after **ONE** front wheel is disturbed by a bump.

Rolls Royce experienced this problem on beam axled, front wheel braked cars. I do not believe that king pin inclination or castor angle affect this problem. The cure on my 20/25 was the very careful setting up of the steering joints.

Royce designed a quite elaborate joint for the rear of the drag link. This joint uses opposing springs and pads, each side of the drop arm ball and is set up with a small clearance between pads and ball when the steering wheel is at rest. There is no friction present in this joint.

The joint at the forward end of the drag link and the two on the tie rod are all adjustable. R.R. specified a torque figure for the drag link and tie rod. The figure is read by clamping a bar to the tubes and noting the poundage on a spring balance.

As previously stated, close attention to these settings and maintaining tyre pressures at 35 p.s.i. has completely



cured the problem. However, I should qualify this statement. When I drive the car now and hit a pothole with a front wheel, the oscillations start, but stop within a second or so.

To sum up, I think the oscillations act in the horizontal plane and can be damped by steering friction. Hence the Bentley fix using a steering damper. However, the only correct fix is I.F.S., therefore I can appreciate that V12 owners may find this very boring!

Before tramp-free motoring can be achieved, all the suspension needs to be in sound condition and tyre pressures correct.

A final aside - the Rolls does not have heavy steering, it is light for an un-assisted system, with two turns lock to lock.

Hope someone may find this of interest.

Yours sincerely

**Clive Doyle**

Dear Ken,

May I add an amateur word on axle tramp?

In the 50's when I was up at Cambridge, I had a low chassis 2 litre speed model (GO 5840, still in the club and owned by the man I sold it to) which used to suffer from this disconcerting ailment, usually at a certain speed, somewhere between 30 and 40 if I remember aright. My solution, though aesthetically not very pleasing, worked perfectly and cured the problem completely. I took the Andre Hartfords off and fitted large double acting telescopic shock absorbers. I seem to remember part of the problem was the great length of the back part of the front springs, combined with the large moment of the drop axles just allowing the whole assembly to wind up. I never encountered this problem with a high chassis 2 litre, or with a 14/60 and my 3 litre ZMBS has never done it in earnest.

However, with the 3 litre, I have encountered rear axle tramp and this is how it happened. On an MoT test down

here about six years ago, we took the car out on the road with a Tapley Meter to do the brake test and I couldn't resist showing off the power of the hand brake to my friend Dave. The rear axle tramped stones and dust everywhere, but the car stopped as though it had gone into a stone wall. Dave was impressed. When driving on, I had the greatest difficulty keeping from Dave the stress I was under trying to keep the car straight. Nevertheless I passed the test and went home to inspect the damage. The tramping had broken a spring and allowed the axle to drop back an inch or two, at which point the diff hit the petrol tank and broke the aluminium level casting, which was still balanced in place. The resulting serious rear wheel steering had been the obvious reason for the car's drunken gait and was cured by fitting a new set of springs all round. The tramp was banished by showing more respect for the hand brake.

Three years later at another MoT, with the same Dave, he noticed that there were no brakes on the rear driver's side, as it happens, where the spring had broken. There had been brakes earlier in the day, so I said "Let's wind up the adjuster and try again". Which we did and, once again, passed with flying colours.

On my return home I investigated further and found that the Woodruff key on the brake lever had, three years earlier when the axle had tramped, been sheared, as if by a guillotine and the roughness in the joint had kept the brakes going perfectly until that day. A new Woodruff key and, because the thing was in bits anyway, a complete re-do of the rear mechanism cured the problem and all is well again in that department.

Very strange things, old cars. Oh, and long may their agricultural simplicity continue to baffle MoT testers.

Yours ever

**Neale Edwards**

Dear Ken.,

My sincere thanks to all those kind people who have written to me, pointing



out that I do not have a problem with the Old Tramp, it is his daughter, Chimmy, who is the real culprit.

Regards

**Peter Towers**

Dear Ken,

What a feast of pseudo-science we have been treated to in the last magazine regarding axle tramp.

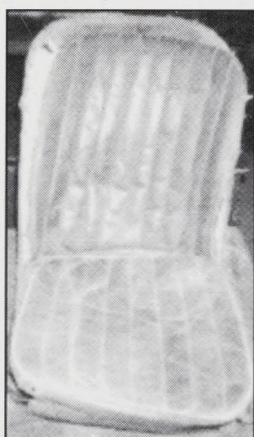
Now, as every school boy knows, if S equals the forward speed, H the height of the bump, I the king pin inclination, M the unsprung mass and Y the angle of yaw, then what we have is S - H - I - M -

M - Y. A violent side-to-side oscillation of the front wheels, largely due to the size of the wheel and those attractive, but unwieldy, cycle mudguards attached to the backplates.

It may well be set off by a bit of tramp, which could be prevented by one of these elaborate bracket and rod affairs, but anyone who has had first hand experience will know that it's the **side to side** movement that shakes the car to pieces and terrifies the occupants. So, away you tramps - let's do the shimmy.

Kind regards

**Tim Wadsworth**



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**AFTER**

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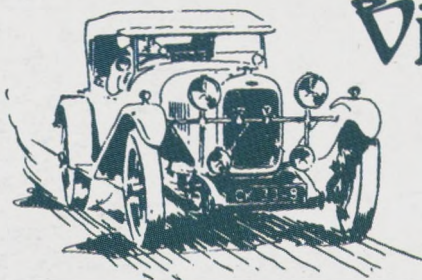
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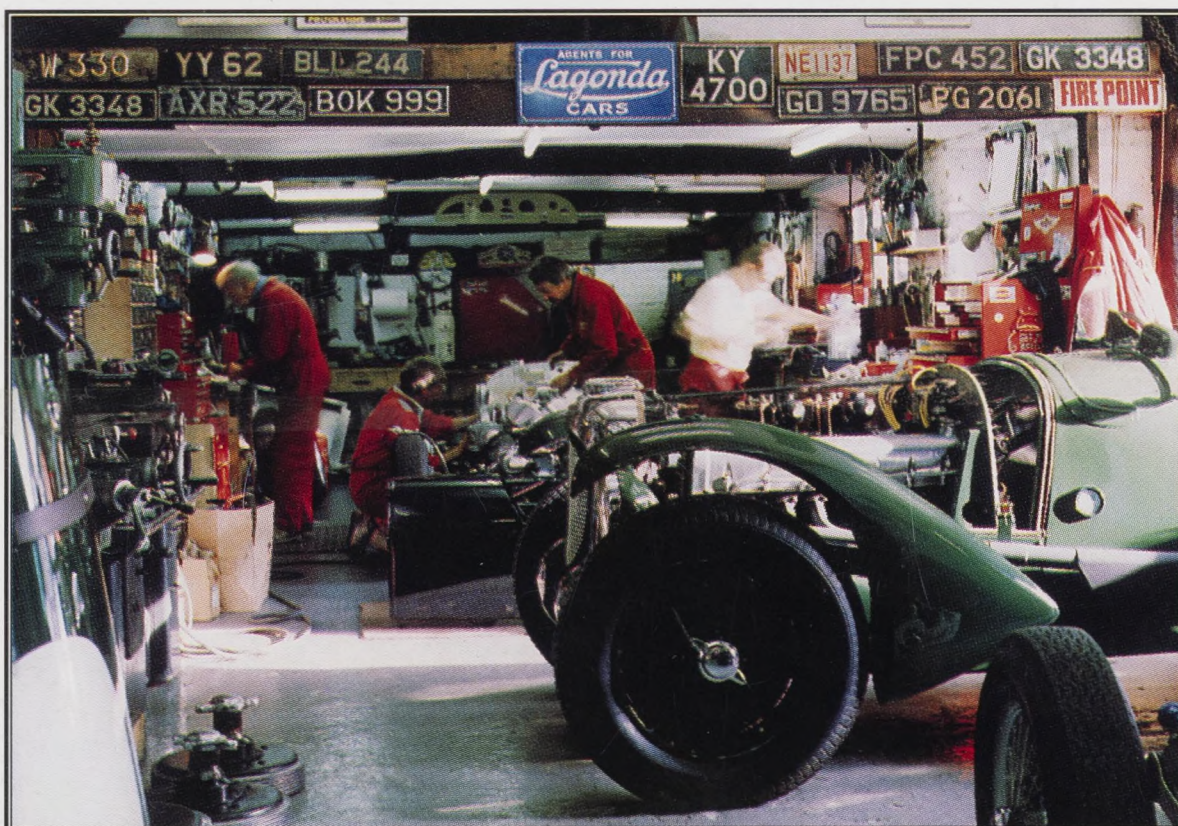


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