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"The aims of the Forum are to promote and foster interest in all Gardner engines"

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Forum Officers

Chairman:
Colin Paillin
Ivy Cottage, 11 The Green, Hose, Melton Mowbray, Leics. LE14 4JP
(Tel: 01949 869004)

Treasurer:
Mike Short
66 Queen Street, Weedon,
Northants. NN7 4RA

Membership Secretary:
Bob Heath,
Corkers Wood Cottage, Forty Green,
Beaconsfield, Bucks. HP

Secretary / Editor
Lucy Short
66 Queen Street, Weedon,
Northants. NN7 4RA

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Cover Picture

ERF C40 with Gardner 8LXCT
Owned by Ken Freeman.

Photograph reproduced with kind permission of the owner.

Chairman's Jottings

Well, here we are again. We're into yet another year and work is progressing nicely on the forthcoming Gardner Engine Rally (our biennial event). If you are planning to attend with an engine I would be very grateful if you could let me have your application forms as soon as possible.

The location of the event moves around the country so as to encourage as many owners as possible to attend. This of course also means that members of the public all around the country get to see the engines.

Castlefields Wharf and basin is next to the Bridgewater Canal in the centre of Manchester. The Science Museum is situated on the other side of the road and the main shopping centre is about 2 minutes walk away. It really is an excellent spot and should satisfy almost everyone's requirements. I look forward to seeing you all in June.

Our AGM is also looming. This will take place on Saturday 2nd April 2005 at 2.30pm at the Anson Museum in Poynton. As space is limited, I really would appreciate if you would let me know if you are planning to attend. I am also looking for new committee members to joint the existing committee - it would be great to have some fresh input. Location should not be an issue as most of our communication is done either by phone or email, with actual meetings occurring approximately twice a year.

I am sure you will agree that the newsletter has definitely improved under the Editorship of Lucy Short, but we are always looking out for new material. Please let us have your comments, stories, anecdotes and pictures to share with the rest of the membership.

I would like to take this time to thank new and existing members for their support of the Forum.

Regards

Colin Paillin

Chairman
Gardner Engine Forum

Continuing our transcript of:
Diesel Maintenance
T. H. Parkinson, AMIAE

Chapter 3
Engine Maintenance
CONNECTING RODS

Similar remarks referring to the first 30,000 miles of piston life apply also to connecting rods which are unlikely to require attention at the first interval, although small-end bushes are likely to need replacement at the second interval.

This particular repair is related to piston assembly. The fitting of oversize gudgeon pins in many instances "ties up" with bush attention and will possibly eliminate the need for replacement. Fitting tolerance of the gudgeon pin and bush is usually defined as an easy push fit, but this definition is apt to be misleading, for while the ideal to aim at is an easy working fit without shake, a tight fitting pink is likely to remain fixed during initial running-in and so leave the piston bosses to act as sole bearing surfaces.

Big-end bearing wear tolerances are stated both as diametrical and side clearances. The former can be maintained to some extent by adjustment, but excess in the latter is only to be rectified by renewal. These clearances are affected by the type of material and are as a rule detailed by the engine manufacturers.

BIG END CLEARANCES

Maker	***Diametrical***	***Side***
AEC	0.004/0.005	0.006/0.008
Crossley	0.003/0.00375	0.004/0.006
Gardner*	0.002	0.004/0.006
Leyland - white metal	0.0015/0.003	-
Leyland – Alloy or lead bronze (shell type	0.003/0.0047	0.0045/0.008
Leyland - lead bronze (strip type)	0.003/0.0047	0.0075/0.011
Perkins	0.0025/0.0035	0.006/0.009

* Not specified by makers, but as these bearings are white metal the accepted standards are quoted.

There is always a danger of confusing the issue in quoting certain wear tolerances, and this applies particularly in regard to big end side clearance. Excessive side clearance on big end bearings increases the bleed of lubricating oil and at one time, when excessive consumption was a bogey on air cell engines, this bleed was reduced to a minimum by keeping side clearances to a safe limit. In the light of present-day knowledge however, this is not considered a factor exercising any marked effect on oil consumption and few bearings are replaced solely because of excessive side clearance. This is also true of main bearings with the exception of those controlling crankshaft end play, the clearance of which as defined by the various manufacturers appears in a table later in this chapter; the other bearings have ample side clearance to allow for crankcase expansion.

Anyone familiar with maintenance work will recognise that to the repairer the important figures on big ends are those dealing with diametrical clearance. In adjusting bearings particularly on *in situ* jobs, there is little that can be done about excessive side clearance, and in practice few bearings are replaced because of it. The need for repairs to bearings (like the need for cylinder regrinds) can be reasonably accurately forecast in a system which has available details of fuel and lubricating oil consumption, coupled with the report of a pre-dock road test. In practice the need for bearing attention is usually apparent on test and the symptoms are readily recognised.

CYLINDER WEAR

Cylinder wear is a subject which best illustrates the wide variations in vehicle repair life, and it is of some interest to review briefly the variations that have arisen, using city bus conditions as a standard of comparison. The accepted method in the industry of quoting cylinder wear is based on the mileage run per 0.001 in. of wear measured at the point of greatest wear in the cylinder block. Thus a reading of 0.001 in. wear at a mileage of 3,000 is described as 3,000 miles per 0.001 in. or "per thou."

A summary of passenger vehicle operation covering running periods up to 1936 produced an average wear factor equivalent to 2,000 miles per 0.001in. of wear on air cell engines and approximately 3,000 miles per 0.001in. on direct injection units. Averages today have improved to 3,700 miles and 5,000 miles per 0.001 in. respectively. It will be apparent therefore, that the improved wear figures have extended the oil engine cylinder life. These results by no means represent finality and are assessed from vehicles with standard sleeves or cylinder material. Cylinder bore wear figures are regularly used to define overhaul life of the complete unit, particularly where the unit change system is used for major repairs. It will be obvious that total wear figures in the region of 0.015-0.020 in. indicate plus readings in the bore and this condition affects piston clearance with consequent poor oil consumption. It is also certain that this degree of wear will be accompanied by the need for bearing attention in spite of any *in situ* bearing adjustments that have been carried out at the mileage intervals for repair attention.

In assessing a wear standard on cylinder boards beyond which it is not considered advisable to operate, a number of vehicle manufacturers give the figure of maximum permissible wear as 0.015in. This can be regard in practice as generally accepted, but at the same time, and particularly as a result of war-time operation, the figure has been increased to 0.020 in. as the accepted limit. In transposing these figures to mileage under the particular conditions under review, direct injection units were normally operating up to 100,000 miles and air cell engines to 70,000-80,000 between cylinder reconditioning periods.

In dealing, therefore, with items likely to require examination with a view to checking repair tolerances, the importance of having cylinder wear records available for estimating likely future replacements is apparent. At the same time the small operator's position in this respect has limitations. Cylinder wear measurements can only be recorded if accurate instruments are available. The purchase of these for occasional use could be questioned, but since he is a potential prospect for repairs and cylinder work, the small man seldom finds difficultly in utilising the specialist's services for the compilation of records. Large fleet organisations do not as a rule make a check at intermediate stages. Usually, based on experience of a particular type, a fairly accurate knowledge of wear factors is available. Checks are taken at the intermediate stages only if a new type has been introduced, or as an occasional check against the accepted average of the standard fleet figures.

CRANKSHAFTS AND BEARINGS

The foregoing can be taken as a summary of the type of work necessary on the first major dock. It also indicates the class of work which follows in subsequent cycles if *in situ* overhauls are practised. So far as bearings are concerned, and particularly when alloy bearings are fitted to connecting rods, 60,000 miles is regularly covered without adjustment being necessary. This is not always true of main bearings and if extended running without unit removal is adopted, some form of main bearing adjustment is necessary, a road test being a fairly accurate guide to the need. Adjustment implies the reduction of diametral clearances and in certain cases reduction of crankshaft end-play also. The latter adjustment means as a rule the replacement of a half bearing carrying thrust and, therefore, is not a particularly desirable repair, being mainly associated with *in situ* procedure. Bearing replacement operations are outlined at a later stage in this chapter, and as the checking of crankshaft wear tolerances on main bearings can only be carried out after complete dismantling, crankshaft wear factors will be dealt with under that section.

The closing of main bearings either *in situ* or with a removed until under normal workshop conditions can only be done by a person with the necessary fitting skill. The difficulties of doing this work really well *in situ* need not be laboured. The vehicle manufacturers' attitude toward the process varies, some advise against it, others proffer a word of caution, and the remainder are silent. Nevertheless the procedure is recognised in repair circles, and the operator himself is able to judge whether the filing of bearing halves, thus limiting their ultimate reconditioning possibilities, is off-set by the time saved in complete dismantling. This method is also followed in certain cases to extract an additional few thousand miles from a unit in order to extend the repair cycle. In any case, circumstances have apparently justified its adoption, and the following suggestions will probably help in improving the final result. It is obvious, when bearing load are considered, that correct main bearing clearances are important. Further, the use of special materials requires difference clearances from those of white metal. Manufacturers' clearances recommendations must be used as a basis, if a sound repair is to be effected.

MAIN BEARING CLEARANCES

		Diametral Clearance		End Play on Thrust Bearing	
Make	**Material**	**Normal**	**Max.Permis.**	**Normal**	**Max.Permis.**
AEC	White metal	0.002	0.003	0.006	-
AEC	Lead-bronze	0.005	0.007	0.008	0.010
Crossley	White metal	0.0015	0.0035	0.015	0.020
Gardner	White metal	0.002	0.003	0.006	-
Leyland	White metal	0.002/0.003	0.008	0.0035/0.007	0.014
Perkins	White metal	0.0025/0.0035	-	0.0025/0.0035	-

It will be apparent in examining the recommended clearances that simply closing bearings without regard to final running clearance is not likely to produce a sound repair. Dimensional check is, of course, possible on bench operation but if the *in situ* method is followed the inserting between bearing and journal of shim brass simplifies the measurement. This method of clearance check does not require more than partial crank rotation to "feel" the bearing, thus the danger of trapping the shim is avoided. As an illustration, if the normal running clearance of 0.003 in. has increased to 0.006 in. this can be measured by inserting shim between the journal and bearing. By inserting shims to the thickness of 0.004 in. the amount to establish 0.003 in. clearance can be judged by crank "feel" and the subsequent bearing closing carried out with some degree of accuracy.

In unit overhaul, which involves complete dismantling, the following is a brief summary of general repair practice.

CYLINDER HEADS AND MANIFOLDS

Valve re-conditioning is a comparatively straight forward operation with modern plant. Seat facing either by cutter or stoning still requires for best results a certain amount of valve grinding by hand. Head and manifold facing corrections may also be necessary, and after thoroughly cleaning the joint surfaces a straight edge and feeler gauges will provide the means of obtaining a fairly accurate idea of the amount of distortion that may be present. A further check on a surface plate with a not too liberal application of marking blue, and the subsequent removal of high spots by file and flat scraper is a practical method for the correction of inaccuracies up to 0.010in, distortion beyond which amount requires treatment on a surface grinder. The quality of work produced by the grinder must be of the highest, and it should not be taken for granted that any class of grinding work (or machine) will produce the desired results.

PISTONS AND CYLINDER BLOCKS

Piston issue for unit re-assembly is usually covered by a complete set along with the reconditioned (i.e., rebored and re-sleeved) cylinder block. The appropriate clearance and ring fitting in the case of new material in the larger organisations is usually checked by the stores inspection section. Where reconditioned material is issued with oversize pins this follows similar procedure to new equipment. Time is saved in linking inspections with the control of the issue of correct equipment, thereby making the work of the piston section a job of assembly only. In the small shop checking of ring gaps and piston clearance is necessary, but the clearances are established standards, details of which are readily available.

Piston assembly to connecting rods is carried out after the big end bearing fitting has been completed. The procedure is either to reamer the small end bush to suit an oversize gudgeon pin or to fit a replacement bush for a standard pin. This is followed by rod alignment and final piston assembly, the finished components being transferred on special racks to the final erection section. Dust is not a help to a well-built unit and particularly with connecting rod bearings of special metal it must be avoided if scoring is to be prevented.

The general adoption of dry liners in oil engine cylinder block limits to some extent the amount of oversizing that can be undertaken; it is general practice to confine it to a maximum of one millimetre. In view of this limitation certain operators do not, in normal times, extend their running to the limit of cylinder wear, so that advantage can be taken of two steps of 0.020in. oversize between re-sleeving.

Camshaft fitting, where embodied in the cylinder block, does not call for any special comment.

CRANKSHAFT BEARINGS

Connecting rod bearings, particularly those of special metal such as the dual type or the full lead-bronze variety put up mileage life considerably in excess of that prevailing on petrol units; the same applies to white metal big ends in the case of direct injection engines, although in the latter case it is not general practice to extend the running of the connecting rod bearings beyond the 100,000 miles overhaul. Lead-bronze is usually associated with air cell engines in conjunction with hardened crankpins, and no difficulty has arisen in achieving the double overhaul period, i.e., approximately 140-150,000 miles.

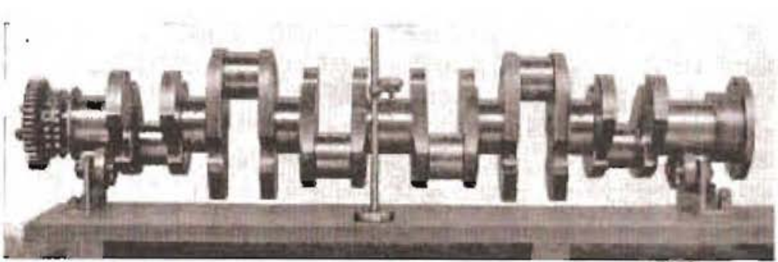
In the dual type occasional replacement of the white metal half is necessary, but when the 80,000 overhaul period was in operation 160,000 was accomplished without renewal of the alloy half. On petrol engine maintenance, failure of white metal big ends and also the limit of crankshaft journal wear tolerance controlled the intervals for attention. On oil engines, particularly those with hardened shafts, crank journal wear necessitating regrinding occurs at much less frequent intervals. Big end journal wear standards are constant and the engine manufacturers all recognise the same limit of 0.003 in. ovality before regrinding is required. An operator could, if he wished, extend beyond this figure, but experience has indicated the more frequent need for taking up clearances if this is done. In closing connecting rod bearings to reduce clearances, previous remarks regarding accurate knowledge and use of manufacturers' standards apply. The fitting of new bearings to big ends calls for little comment other than emphasising the importance of shell bedding and interference fit.

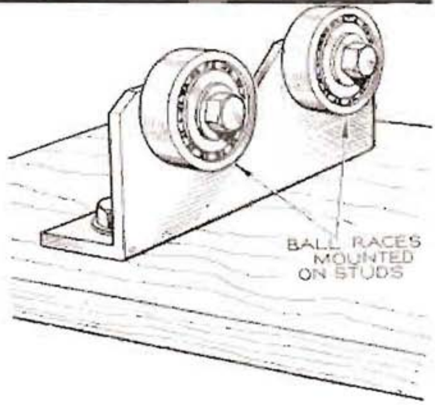
Interference fit or nip is a fairly well known term in bearing work. A satisfactory result is not possible unless the fit of the shell in the connecting rod or main bearing housing is good. It is necessary to establish this fit by a check with some light-marking medium such as Prussian blue. After lightly coating the bearing housing the assembly should be bolted to normal working position. Examination of the shell marking on dismantling will determine the need for further capping. With correctly capped bearing and accurate shell butting, interference fit is defined as the gap between the cap and connecting rod or bearing housing faces, which can be measured by feeler gauge with the securing bolts tightened just beyond find tight; on average this should be 0.002 in. Greater clearance that this must be avoided or the cap will be distorted when the bolts are pulled tight.

The boring of lead bronze bearings does not present any difficulty if the usual boring equipment is available. Tool edge and feed are items demanding care in producing the desired finish in lead-bronze and alloy bearings. Crankshaft main bearing wear tolerances follow identically those applying to big end journals, i.e., maximum wear tolerances of 0.003 in. ovality.

As a rule the greatest wear is present in the centre main journal, although the wear on the intermediate journals may approach it very closely. But as grinding is obviously necessary if only a single journal is affected, the rate of wear is assessed on this, and described similarly to that of cylinder wear, i.e., in terms of miles per 0.001 in.

The lower pressures prevailing on direct injection engines are reflected in the main crankshaft journal wear figures, and 60,000 per 0.001 in is common. On the other hand 30,000 per 0.001 in. is an average for the air cell type. Crank pin wear is similar in both types, showing mileages as high as 200,000 per 0.001 in. Main bearing replacement or renewals calls for careful shell bedding, recognition of standards of interference fit, and some appreciate of the type of material used in crankcase manufacture. Distortion and the alignment of crankcase bearings naturally varies between Elektron, aluminium and cast iron, all three of which are used in crankcase construction. It is general practice, therefore, on main bearing work (and particularly in the case of light alloy castings) to machine and fit bearings with the cylinder block bolted in position.





To test crankshafts by dial gauge a true picture of wear or distortion is not certain if the shaft is rotated between centres. In this simple shop-made equipment the shaft is rotated by resting its outer journals on ball races mounted on pieces of angle steel bolted to a baseboard.

Line boring equipment is an essential to successful bearing replacement; the choice of equipment is wide, ranging from simple boring bars to elaborate and costly machine tools. Successful results, however, are produced with the type of boring bar with adjustable steadies in the bearings and hand operated feed. In any case, the principles are identical with all equipment for this work. The title "line-boring" defines the operation and if qualified by accurate alignment in relation to bearing houses with correct clearances in relation to journal sizes the application can be followed even by those who are not familiar with this type of work.

Finally, in this section, with present established design, replacement of main bearing bolts is not considered as likely to be required during unit life. Big end bolt replacement, however, must be provided for. Thread stretch at one time was a fairly accurate guide, but present-day materials and design rarely show defects. Replacement is, therefore, to some extent governed by safety-first policy and a general rule is to replace the big end bolts at the 100,000-mile interval.

ASSEMBLY

Final erection of the sub-component assemblies does not offer any great difficulties but requires a certain amount of organisation if flow is to be maintained. The method of assembly, for instance, must follow a definite sequence.

Experience indicates the desirability of making the erector responsible for the cleaning of crankcase oil ways and crankshaft oil passages even when bearing work is carried out in a separate section. The importance of simple but time-saving engine stands must be recognised, and the advantage of being able to rotate the unit on its axis during assembly is considerable. The sequence of assembly is based upon common sense and is applicable to all types.

1. Crankcase. Clean oil ways, assemble crankshaft and bearings.
2. Cylinder block fitted to crankcase, piston and connecting rod attached to crankshaft, final check on alignment followed by insertion of split pins and securing of cylinder block.
3. Head assembly, tappets and valve timing
4. Assembly and alignment of auxiliaries, manifolds and sump

The use of running-in compound during assembly is strongly recommended, and liberal application should be made before the sump is finally attached. Time and thought in designing and making lifting equipment is well spent and in order to facilitate the handling of the finished unit when transferring it to stores or to the vehicle to which it is to be fitted.

Editor's Note – This extract has been taken directly from the book printed in 1942 and the written word, grammar and punctuation have changed quite significantly over the past 60 years.

Guy Motors & Gardner Engines
by Robin Hannay

Whilst Guy were Gardner's' best customer during the war years, purchasing over 2,000 engines, they had additional competition for Gardner's output when the war ended. Gardner's adopted an allocation system to enable them to meet part of their customer's requirements. This restricted output at Guys, so in 1947 they installed a Meadows 10.35 litre oil engine, and after testing was offered as an alternative. This was popular with coach operators because of its lively performance (390 lb. ft. of torque compared with 348 lb ft) plus 200 extra revs giving another 5 m.p.h. Further help came from customers who supplied their own Gardner engines. Walter Alexander in Scotland replaced the 5LW engines in 54 Utility Guy Arab Mk II double-deckers with 6LWs just after the end of the War. The displaced units were overhauled and fitted into some of the 101 new Guy Arab Mk III single deck chassis that they had ordered. Lancashire United also supplied 5LWs for 10 single-deck Mk III chassis that they purchased in 1948.

In 1948 the Design Office started work on a new double deck chassis. Whilst basing it around the Gardner 6LW engine and Guy 4 speed constant mesh gearbox (with the option of a 4 speed pre-selector), it had a sturdier rear axle, improved braking system and lighter, manual steering. One major improvement was in the driver's cab where the draughts that came through the floor around the pedals were eliminated. A cast aluminium footwell was designed and mounted on the chassis. An inflatable tube surrounded it, in a recess, which allowed for movement of the rest of the frontal structure, which was attached to the body. This had an enclosed radiator with a detachable grille in front of it, to allow access. The wings were incorporated in the design, as were the headlamps, which were fitted in the cowl covering the radiator. Access to the engine was by means of a hinged bonnet with a gas-strut to hold it in the open position. The new design was discussed with many customers and Birmingham liked the design and adopted the styling as standard for their buses, as well as ordering 100 chassis, followed by orders for a further 201. The new design became the Mk IV with the first 10 going to Lancashire United in 1951. The Mk III continued alongside until 1953.

After work had started on the double-decker, thoughts were given to a new single-decker. At the 1948 Commercial Motor Show, M.C.W. and Sentinel had under floor-engined buses on display. These offered about 5 extra seats on a single-decker, so Guy started on a similar design. They approached Gardner to see if they were working on a horizontal engine but were told they were too busy producing upright engines without adding additional models. Guy did not want to buy engines from competitors, so took a used 6LW from the Arab Mk III development chassis, new in 1945 and turned it through 90 degrees, making a new sump to suit and altering certain other items. Two other 6LWs were similarly modified. The new model, the Arab U.F., was shown at the 1950 Commercial Motor Show with a left hand drive show chassis and a complete 40-seat bus with Guy-PRV body. A third chassis had been built for road testing and all had Guy-Gardner horizontal 6LW engines. As many operators and other chassis manufacturers expressed interest in engines to be mounted under the floor, Gardner realised there was a potential market and introduced 4, 5 and 6 cylinder HLW versions in 1951.From the testing done by Guy's, the blocks were turned through 78 degrees to improve lubrication.

Whilst the Arab UF continued in production to the end of the decade, from 1954 they were for export only. With rising operating costs, a new model was designed, entering production in 1953. Keeping the 5 and 6 HLW engines as the power units, it had a new 5 speed overdrive constant mesh gearbox, Kirkstall hypoid bevel rear axle, lighter chassis frame, springs and as a result smaller wheels and tyres. This saved about 15 cwt. and coupled with redesigned lightweight bodies, complete 44 seat buses weighed around 5.5 tons – a saving of about 3 tons compared with an Arab U.F. with the old type of body. It was considered that a reduction of 1 ton of weight, gave another mile per gallon. Many Arab LUF's were used on long distance services, giving returns of 13–14 mpg. Western SMT used a fleet of 10 on their Glasgow to London service where they did 600,000 miles in about 4 years before being relegated to more local routes.

In 1950, Guy started improving their lorry chassis. The first new model was the Otter Diesel for a 6-ton payload. Whilst this was based on the petrol engined 6–tonner, it featured a new coach built cab and under structure which was wider than that used initially with the petrol version. The engine chosen was the 3.8 litres, 58 bhp. 4LK, which was coupled to a 4 speed Guy gearbox and drove a single speed rear axle with the option of an Eaton two-speed. It was possible to fit a 15ft. long alloy platform body and still achieve a taxation weight under 3 tons (3,048kg.) to be allowed to travel at 30 m.p.h. Above this weight, the maximum legal speed was 20 m.p.h. In 1953, the design was altered and a Motor Panel under structure and cab became standard, as was a 5 speed David Brown gearbox. As Gardner could not supply enough 4LK engines, Guy offered the 70 bhp 4.73 litre

Perkins P.6 as an alternative. In 1957, the Mk III version was introduced with a fibreglass grille covering a film-block radiator, which replaced the polished aluminium unit used previously. The B.M.C. 5.1-litre engine became another alternative. The final version of the Otter Diesel featured a min-version of the fibreglass cab introduced on the Warrior/Invincible Mk II's. This was only where cabs were required on right hand drive chassis from around 1962. The majority of Otter Diesels built from 1960 until the last one was built in December 1967, were for export. They were used for buses and coaches, as well as lorries, and were 4LK powered.

With increasing competition from the 'mass-producers' at the beginning of the 1950's, Guy decided to extend their range of lorries. They had a nucleus of regular customers for the 2/3-ton Wolf (Ever Ready and Lyons, etc.), the 4-ton Vixen (Pickfords bought 100 a year during the 1950's), plus export business for use as lorries and buses. The first new design was the Big Otter Diesel. Using the Motor Panels cab but with wider wings, a sturdier chassis was used, with larger wheels and tyres, suspension, etc. The engine chosen was the 75 bhp Gardner 4LW coupled to a David Brown 5-speed gearbox to drive an Eaton two-speed rear axle. The result was an ungainly and heavy vehicle with a maximum payload of 7.5 tons at the legal gvw of 12 tons. A re-design was done resulting in the Warrior in the following year. This used a fibreglass cab built in the Guy body shop. It was based on the Motor Panels design but was 6 inches wider. A film-block unit replaced the polished aluminium radiator of the Big Otter Diesel and a fibreglass access panel had a large polished aluminium outline in roughly a square shape with a broad horizontal bar centrally which was about 6 inches wider than the surround. It looked considerably more attractive and with an 80 bhp. Meadows 4DC330 engine, 5 peed gearbox and two-speed rear axle was lighter. This gave an 8-ton payload, and when the legal limit was increased to 14 tons, an extra 2 tons could be carried. Many chassis were converted to six wheelers, allowing a further payload of up to 5 tons.

The next step was to produce a range to the maximum legal limits. To speed this process, Guy bought 2,3, and 4 axles chassis frames, axles, brakes and steering gear from A.E.C. In the 3 and 4-axled chassis, they fitted the Gardner 6LW engine coupled to a David Brown 5 speed, direct drive gearbox. The all steel cab came from the Willenhall Motor Radiator Company, who supplied B.M.C. with cabs for their 7-tonner. In the two axles chassis, a 5LW was fitted, with the 6LW as an option but 4 chassis were built for the Co-Op with 4LW units. These were introduced at the 1954 Commercial Motor Show and in the following year, an attractive cab with

The Invincible Mk.I was made by Boalloy at Congleton, with a Gardner 6LW engine and a David Brown gearbox.

At the 1958 Commercial Motor Show, Guy introduced the Invincible Mk.II. This Tanker had the new 6LX engine.


The Otter Diesel 6 tonner was introduced in 1950 with a Gardner 4LK engine and continued in production until the end of Guy light vehicles, in 1966.


The Guy Arab U.F was a popular for coach work. This is a Belgium example with a 33 foot long Jonkheere body and powered by a 112 b.h.p. 6HLW engine.

curved windscreens, built by Boalloy became an alternative. With requests for more powerful engines, as Gardner had nothing to offer, the Meadows 6DC630 giving 420 lb ft torque, (compared with 358 lb ft for the 6LW) and 127 bhp at 1,800 rpm became an option. With the extra power, a 5-speed overdrive gearbox was used and it was a lively and economical vehicle. Named originally the Goliath, this was changed to Invincible following protests by a German electrical equipment manufacturer.

The Invincible range gave Guy experience of heavy vehicles whilst they designed their own. When they were exhibited at the 1958 Commercial Motor Show, they attracted a lot of interest, not only from operators, but the ordinary Press. The reason was the new fibreglass cab has wrap round windscreens, twin headlamps (the first lorry to have this feature) and the provision of a socket for a shaver! Surprisingly a cab heater was an extra, as it was in competitor's cabs. Called the Invincible Mk II range, the 6LW engine was joined by the new, 6LX engine, as well as the Meadows 6DC630 as options, followed by Cummins and Rolls Royce units. The Warrior Mk II range was re-designed, using the same cab but with the 112 bhp. AEC AV470 and 100 bhp. Leyland 350 engines joining the Meadows 4DC330 which was uprated to 100 bhp. In addition the 6LW was available. As standard, two, three and four-axled chassis were built on the track. The Warrior Light Eight gave about 1 ton (1,016 kg.) extra payload.

Due to losses made in South Africa from the mid-1950's and slim profits on U.K. sales, Lloyds Bank put in a receiver in 1961 and transferred the assets to a new company; Guy Motors (Europe) Ltd. This was sold shortly afterwards to Jaguar. They had recently acquired the Daimler bus business from B.S.A. and had started to design a commercial vehicle range. Upon acquiring Guy, the project was moved to Fallings Park and the results appeared at the 1964 Commercial Motor Show in the Big J range. Made in two, three and four-axled forms, Gardner, Cummins and Rolls Royce engines were offered in the 'heavy' range and A.E.C. AV505 and Leyland 400-series engines for lighter models. Motor Panels provided the cab, which was a larger square unit than used on the Otter.

Williams Lyons, the owner and founder of Jaguar was nearing retiring age and decided to sell his Empire to B.M.C. in 1966. BMC were losing money on their car range, so in the following year, Harold Wilson, then Prime Minister, persuaded Donald Stokes, the Chairman of the Leyland Motor Corporation, to take over the ailing firm. The new group became the British Leyland Motor Corporation and comprised of BMC, AEC, Albion, Guy, Leyland and Scammell lorries, plus Bristol and Daimler buses. The firms continued separately, but with the reducing sales in the commercial vehicle market in the early 1970's, contraction took place. In August 1975 the Group announced that they were going to discontinue the Guy range in the spring of 1976. This immediately stopped interest in Guy lorries. At that time prices were being increased every three months, but the Group wisely decided not to increase the Big J prices, and eventually they were appreciably cheaper than similarly powered competitors, so sales increased and production continued until the Spring of 1978, when the factory was closed.

The new underfloor-engined buses and coaches from all manufacturers were heavier than front engined vehicles and many weighed more than double-deckers. Passenger traffic began to decline from 1951 and operating costs (including wages) were rising. Thoughts were given to reducing the chassis weight resulting in the Arab Lightweight Under Floor engined chassis appearing in 1953 using 5 and 6 HLW engines. Bodybuilders also produced lighter bodywork resulting in a saving of about 2 tons on the completed bus. The Arab U.F. remained in production for export and was joined in 1956 with the Victory featuring air suspension and disc brakes. A further development occurred in 1959 when an Invincible lorry chassis frame with a 6LX engine and set back front axle was built for Lagos Municipal Transport in Nigeria. Called the Victory Trambus, it was joined by a Warrior version using AEC AVU470 (later AV505) or Leyland 400 series engines. When Jaguar acquired Guy in 1961, development of anew range of lorry chassis that had been started at Daimler, was transferred to Wolverhampton, resulting in the Big J range in 1964 replacing the Guy designs. However, whilst Big J units were now utilised, the Warrior and Victory Trambus models continued and when Fallings Park was closed in 1982, they were transferred to Leyland and remained in production for several more years, most having Gardner 6LX engines. This was also added to the options for the Arab double-decker in 1958.

Developments on double-deckers resulted in Leyland producing in 1956 a rear engined Atlantean allowing about 4 more seats than conventional buses. It also had the advantage of the entrance being alongside the driver, so that he could supervise loading, enabling the conductor to concentrate on collecting fares. When one-man operation was allowed a few years later, it became a real advantage. There was resistance from some operators to having the engine at the rear. One of these was West Riding who had bought a large number of Arab Mk IV's, which were fitted with lowbridge bodies. Their Chief Engineer discussed an idea he had with Guys for a front-engined design with a setback front axle to allow a front entrance. With the experience that Guy had with air suspension, this was included and also disc brakes, although Girling advised them against it, as the gross vehicle weight would be higher than their recommended gvw of 11.5 tons. The resultant chassis appeared in August 1959 and was called the Wulfrunian. Rubery Owen built the complex chassis frame. The 6LX engine was standard, as was independent air suspension, plus a semi-automatic gearbox. West Riding placed an initial order for 23 chassis and over the next 5 years orders a further 103. In service trouble was experienced with the braking system, air suspension and the independent front suspension pillars. The design was too complex and operators were reluctant to commit themselves. The only other customers were Lancashire United, Bury Corporation, and West Wales bought one each and County Motors, Accrington Corporation and Wolverhampton Corporation had two and there were two demonstrators.

The Wulfrunian was a very advanced vehicle. Unfortunately it was too advanced and the only major customer was West Riding from Wakefield.

To force the hand of customers, Guy decided to discontinue the Arab in 1960 after existing orders had been fulfilled. Two years later, they realised their mistake and re-designed the Arab chassis to reduce the floor height by about 3 inches, reducing the step heights, as forward entrance double-deckers were becoming popular. The Mk V continued in production until 1971. With the increased popularity of the rear-engined designs, sales of front engined chassis declined, so most of Mk Vs were exported, mainly to Hong Kong. This was also a major market for the double deck Victory Trambus Mk II. When the Fallings Park factory was closed in 1982, the links between Guy Motors and Gardner ceased.

The Gardner 8L3B
By Wyn Hughes (AMIRTE) – Membership No. 180

During the late sixties I worked at British Rail Locomotive Works in Derby where 8L3Bs were fitted into the small "shunter locomotives" used for shunting carriages and wagons at the shunting yards.

When problems arose, or at service intervals these shunter locomotives were brought into the workshops to be dismantled by semi-skilled labour. All parts were washed thoroughly and the individual components distributed to their relevant departments. After all the components had been serviced, they would go to the "Engine Erection Shop" where one skilled man and one semi-skilled man would build up an entire engine.

Engine erection began by cleaning the main bearings which had been re-metalled with white metal and bored out under-size, with fine wire wool and fitting them onto the 'bedplate'. The caps were fitted and torqued down, one side would be undone and bearing 'nip' checked. All the caps would be removed and a thin smear of engineers blue was applied to the crankshaft main journals. The crankshaft would be lifted by overhead crane and placed into its bearings in the bedplate. The caps would be fitted and the crankshaft rotated by using a large 'Tommy bar'. The main bearing caps would be removed and the crankshaft lifted our and a 'bed' would now appear in the bottom shell bearing halves. Any 'high spots' would be removed by using a hand bearing scraper, one bearing at a time. After having scraped all the bearings, they would be polished using fine wire wool before being replaced into the bedplate. This procedure would be repeated again and again until the shaft would rotate by using a short 'Tommy bar'.

Once this was achieved a special 'Dial Test Indicator' would be fitted between the webs of the crank pins, and the shaft rotated. Four readings would be taken; top, right, bottom and left every 90° of crankshaft rotation. This would check the alignment of the main bearings. If a bearing was out of alignment the top cap would be removed and the shell bearing removed by fitting a 'home-made tool' which was similar in shape to a split pin, in the crank pin journal oil hole. By rotating the shaft, the special tool would push the bottom shell round to the top and then it could be removed and the 'high spot' taken out by means of a bearing scraper. Only when the DTI would register zero in all positions on all crank pins, and the crankshaft could be rotated by using one finger, was it good enough. This procedure could take up to four or five days, whilst utmost cleanliness had to be observed throughout.

The next task was to set the crankshaft end float. There were two sets of thrust bearings, one set on number 8 main bearing and the other set on the rear main. Feeler gauges and the DTI were used and I think the end float was between six and eight thou' but after nearly forty years, I am not too sure on the figures.

Next were the big end bearings. Having been re-metalled and bored under-size, they were cleaned with wire wool and fitted into the con-rods, caps fitted and torqued down on the bench. One side was undone and the bearing 'nip' was measured with a 'feeler gauge'. This was adjusted by either filing the shell halves, or filing the caps. The crank pins would be wiped sparingly with engineers blue and the relevant con-rod was bolted onto the crank pin, the shaft rotated, the con-rod removed and using a hand-bearing scraper the high spots were scraped away until a perfect 'bed' achieved.

Work would then proceed to the upper half of the bedplate, the camshaft bushes would be fitted and then 'line-bored'. The upper half of the bedplate was then bolted onto the lower half, and the cylinder blocks were fitted. (NB the 8L3B was the only engine that Gardner produced that employed 'wet liners'). The pistons would be fitted onto the connecting rods and entered into the cylinder bores, the big end caps fitted, torqued down and split pinned. All the nuts were numbered, four bolts per cap and in the event of the castellated nuts not lining up with the split pin hole, the nut had to be removed, filed down and replaced on the con-rod until the holes lined up.

The fitting of the camshaft, timing chain, injection pump drive shaft, friction damper, fuel injection pump and flywheel followed this. Spill timing was carried out using a 'swan-neck' pipe followed by the separate cylinder heads and push rods and the valve clearances set. At this point the coach painter appeared with his grey enamel paint, and painted the engine. His motto was, "if it doesn't move, paint it". Finally the auxiliaries such as oil filter, injectors, injector pipes, manifolds, etc., were fitted. This engine was fitted with two starter motors, one either side.

After engine erection, the engine would be fitted to a test bed and run on test where fuel leaks, if any, would be remedied, engine temperature and oil pressure would be noted under load, and fuel consumption test and brake horsepower test would be carried out. Only if the engine passed all the tests would it be fitted into the locomotive.

I have now retired to North Wales, where I enjoy using the skills I learnt so many years ago, on my Gardner 1L2, 4L2 and 4LW engines.

This apparatus was used in the Gardner testing laboratory to measure the size of the sprayer holes. A measured amount of fuel was timed to run through the sprayer on test.

A table was devised showing the minimum and maximum amounts of fuel which must be used over a measured period of time. If you can add any further information, please let us know.

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66 Queen Street, Weedon, Northants. NN7 4RA
01327 342457