ENGINE

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E7

SB/VA.5/PR

Subject : Duaflex Piston Rings for 20/25 H.P, 25/30 H.P, Wraith, Phantom II & Phantom III

Date of Issue 14th May, 1956.

IMPORTANT

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It has been the practice of the London Service Station for sometime now to fit Wellworthy Duaflex Oil Control Rings to engines where heavy oil consumption has been reported.

As this type of ring has proved very satisfactory, it has now been decided to discontinue the use of the Standard Slotted Oil Control Ring, and all oversize pistons will now be supplied with a Duaflex Oil Control Ring.

A complete list of the Duaflex Rings, which are to supersede the original scraper ring, is given below.

It will be noted that one size Duaflex Ring is suitable for a small range of oversize bores. The actual size is as follows :-

Standard ring is suitable for:- Standard to .019" o/size bores.
.020" o/size ring is suitable for:- .020" o/size to .039"o/size bores.
.040" o/size ring is suitable for:- .040" o/size to .059"o/size bores.

The sizes quoted above are those to which the respective rings are capable of expanding i.e. .019" in each case.

The ring gaps are pre-sized and must therefore not be altered.

TO ASSEMBLE TO A PISTON

NOTE: On existing pistons all grooves and oil drain holes must be thoroughly clean and free from carbon. Where piston ring stops are fitted to the lower groove they must of course be removed.

(i) Place the expander in the groove first, and then SPIRAL the rails on one by one, taking care to arrange the gaps all round the piston. The top rail will need a little pressure to enter the groove, as the assembled ring is slightly wider than the groove.

(ii) Check that the assembled ring, lightly oiled, can be moved round in the groove.

(iii) Oil with light oil and install with fitting clamp.

NOTE: The three side rails are identical and may therefore be installed either way round. The assembled order on a piston is :-

Expander, two side rails uppermost, centre spring and one side rail at bottom.

MODEL	PART NO. OF ORIGINAL OIL CONTROL RING.	SIZE.	SUPERSEDED BY.
20/25 HP 3¼ bore.	E.55562.	Std.	R.5390.
	E.56009.	.005 o/s.	R.5390.
	E.56010.	.010 o/s.	R.5390.
	E.56011.	.015 o/s.	R.5390.
	E.56012.	.020 o/s.	R.5391.
	E.56013.	.025 o/s.	R.5391.
	E.56014.	.030 o/s.	R.5391.
	E.56015.	.035 o/s.	R.5391.
	E.56016.	.040 o/s.	R.5392.

Contd/

MODEL.	PART NO. OF ORIGINAL OIL CONTROL RING.	SIZE.	SUPERSEDED BY.
20/25 HP	E.56017.	.045 o/s.	R.5392.
3¼ bore	E.56018.	.050 o/s.	R.5392.
Contd.			
25/30 HP	E.60821.	Std.	RE.21327.
3½ bore.	E.61162.	.005 o/s.	RE.21327.
	E.61163.	.010 o/s.	RE.21327.
	E.61164.	.015 o/s.	RE.21327.
	E.61165.	.020 o/s.	RE.21329.
	E.61166.	.025 o/s.	RE.21329.
	E.61167.	.030 o/s.	RE.21329.
	E.61168.	.035 o/s.	RE.21329.
	E.61169.	.040 o/s.	RE.22039.
	E.61170.	.045 o/s.	RE.22039.
	E.61171.	.050 o/s.	RE.22039.
Wraith	E.60821.	Std.	RE.21327.
3½ bore.	E.61162.	.005 o/s.	RE.21327.
	E.61163.	.010 o/s.	RE.21327.
	E.61164.	.015 o/s.	RE.21327.
	E.61165.	.020 o/s.	RE.21329.
	E.61166.	.025 o/s.	RE.21329.
	E.61167.	.030 o/s.	RE.21329.
	E.61168.	.035 o/s.	RE.21329.
	E.61169.	.040 o/s.	RE.22039.
	E.61170.	.045 o/s.	RE.22039.
	E.61171.	.050 o/s.	RE.22039.
Phantom II	E.76680.	Std.	R.5308.
4¼ bore.	E.79474.	.005 o/s.	R.5308.
	E.79475.	.010 o/s.	R.5308.
	E.79476.	.015 o/s.	R.5308.
	E.79477.	.020 o/s.	R.5396.
	E.79478.	.025 o/s.	R.5396.
	E.79479.	.030 o/s.	R.5396.
	E.79480.	.035 o/s.	R.5396.
	E.79481.	.040 o/s.	R.5397.
	E.79482.	.045 o/s.	R.5397.
	E.79483.	.050 o/s.	R.5397.
	E.79484.	.055 o/s.	R.5397.
Phantom III	EB.2686.	Std.	R.5264.
3¾ bore.	EB.3450.	.005 o/s.	R.5264.
	EB.3451.	.010 o/s.	R.5264.
	EB.3452.	.015 o/s.	R.5264.
	EB.3453.	.020 o/s.	R.5382.
	EB.3454.	.025 o/s.	R.5382.
	EB.3455.	.030 o/s.	R.5382.
	EB.3456.	.035 o/s.	R.5382.
	EB.3457.	.040 o/s.	R.5398.
	EB.3458.	.045 o/s.	R.5398.
	EB.3459.	.050 o/s.	R.5398.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E6.

SB/GF.2/IB

Subject : RECONDITIONING MAIN & CONNECTING ROD BEARINGS ALL ROLLS-ROYCE ENGINES WITH THE EXCEPTION OF THE PHANTOM 111

Date of Issue 21st June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

It is thought desirable that a general policy should be laid down before entering into technical detail.

Selective assembly and fitting represented the accepted procedure in the production of these engines, thus a high degree of interchangeability of parts was not an essential factor, with the result that minor variations occurred in units nominally of the same type. This, however, did not present undue difficulties at the time, since it was customary for all chassis to undergo repairs at the Company's Service Depot, but in the light of post-war policy, under which our Retailers now operate, this practice now leads to certain difficulties with the supply of suitable spare parts.

Our stocks of spare parts, relatively large by comparison with those held by Retailers, enable us to provide for selective assembly in replacements, but it would be impracticable to apply this procedure to individual requirements outside the organization. Therefore, although the Retailer may be fully equipped to undertake engine overhauls, there still remains the difficulty of obtaining suitable spare parts, and this leads us to recommend that engines requiring an extensive overhaul be returned to this Service Depot whenever possible.

Realising, however, that in certain cases, this course may be both difficult and undesirable, it has been decided that this leaflet, containing the necessary technical information, should be issued for the guidance of all who are connected with the fitting of replacement main and connecting rod bearings.

In view of the fundamental differences in design, it has been decided to issue a further leaflet, dealing exclusively with the Phantom 111.

RECONDITIONING PERIODS:

Providing that no mechanical or lubrication failure has occurred, and also that normal usage has been observed, reconditioning periods for the various Rolls-Royce engines should be governed by the rate of oil consumption, which, when it reaches such proportions as to indicate the necessity for re-bore, should determine the decision for a complete engine overhaul.

Satisfactory lubrication of the connecting rod bearings, is largely dependent upon the condition of the main bearings, and this especially is the case when Hall's Metal bearings, with their increased running clearance, are used.

When an engine, incorporating White Metal bearings throughout, has been sufficiently dismantled for examination, inspection of the actual condition of the White Metal should be made. In cases of undue disintegration, or separation from the steel shell, a complete renewal should be carried out.

In the case of an engine fitted with Hall's Metal bearings, such examination should take the form of dimensional clearance check.

GENERAL SPECIFICATION:

LUBRICATION:

A pressure oil pump, situated externally on the lower half of the crankcase on all models with the exception of the Phantom 1, on which the oil pump is housed internally, feeds oil at a pressure controlled by the relief valve to a connection on the crankcase, whence it is taken to each of the seven main bearings by an internal gallery.

The crankshaft journals and crankpins are bored to act as oil conduits and the ends of the holes are plugged with caps. Communication between the crank journal and crankpin conduits is effected through smaller holes, drilled in the webs.

A proportion of the oil to the main bearings passes into the conduits through holes drilled radially in the journals, and lubricates the connecting rod bearings through further holes drilled radially in the crankpins. The upper halves of the connecting rod bearings are drilled, and oil is fed to the gudgeon pins by either of the two following methods:-

1. An external oil pipe, running longitudinally and clipped to the connecting rod beam. This method of communication between the big end and gudgeon pin bearings was incorporated on:-

20-HP.	All chassis.
20/25-HP.	Up to chassis number GFE-41.
Phantom 1.	All chassis.
Phantom 11.	All chassis.

2. Hole drilled longitudinally in the connecting rod beam. Found incorporated on:-

20/25-HP	Chassis number GAF-1 onwards.
25/30-HP	All chassis.
Wraith	All chassis.

Thus all crankshaft, connecting rod and gudgeon pin bearings will be seen to be pressure fed.

DETAILED SPECIFICATIONS:

BEARINGS: CONNECTING ROD:

From the earliest 20HP chassis, the progressive increase in power output has produced a corresponding increase in bearing stresses. Thus, to obviate the possibility of mechanical failure, the question of the most suitable bearing material has received constant consideration, resulting in the following modifications:-

Chassis Type:

20-HP	(G-1 to GYK-81	) White Metal run directly on to connecting rod & cap.
20-HP	(GMK-1 to GXO-10	) White Metal on steel shells.
20/25-HP	(All chassis	) White Metal on steel shells.
25/30-HP	(GUL-1 to GGM-41	) Hall's Metal AC-7.
25/30-HP	(GAN-1 to GZR-41	) Hall's Metal AC-9.
Wraith	(All chassis	) Hall's Metal AC-9, without shims.
Phantom 1	(1-MC to 70-TC	) White Metal run directly on to connecting rod & cap.
Phantom 1	(71-TC to 90-OR	) White Metal on steel shells.
Phantom 11	(All chassis	) White Metal on steel shells.

BEARINGS:MAIN BEARINGS:

White Metal is used for all Rolls-Royce crankshaft main bearings, but the incorporation of shims between the butt faces of the housings is omitted in the following:-

Phantom 11. All chassis between 1-WJ and 206-PY inclusive.
Wraith. All chassis between WRB-1 and WEC-74 inclusive.

CRANKSHAFTS:

All the crankshafts fitted to the early chassis types in both ranges were of Nickel Chromium steel, and were not subjected to any form of case hardening.

Increasing engine efficiency, however, necessitated the development of Nitralloy steel, with its greater resistance to wear on crankshaft journals and crankpins.

Nitralloy steel crankshafts were incorporated in the two ranges at the following chassis numbers:-

20/25-HP. GLZ-28 onwards.
Phantom 11. 14-PY orwards.

All Nitralloy crankshafts are "nitride" hardened, and, while it is unlikely that penetration of the hard surface will occur in the first regrind, we recommend that the hardness should be checked where grinding is in excess of 0.010" (0.25mm) below normal size. All crankshafts should be "re-nitrided" when ground to 0.015" (0.38mm) below normal size.

The minimum hardness figure is 600 V.P.N. but, in the absence of a Vickers machine, a test may be carried out with a smooth file. There should be no tendency for the file to make any impression on the crankshaft, but as this method is less accurate then the use of a Vickers machine, any shaft which appears doubtful should be returned to this Service Depot for "re-nitriding."

DIMENSIONS AND MAXIMUM WEAR.

CRANKSHAFTS:

For purposes of ascertaining the depths to which crankshafts may have already been ground, the original crankshaft dimensions are given in the following table:-

Model	Journals	Crankpins	Radii on Journal & Crankpin:
20-HP (All chassis)	1.9995"-1 (50.79mm-0.03)	1.499"-$\frac{1}{2}$ (38.07mm-0.013)	
20/25-HP (GXO-11 to GKT-21)	2.1245"-1 (53.96mm-0.03)	1.749"-$\frac{1}{2}$ (44.42mm-0.013)	
20/25-HP (GKT-22 to GXB-26)	2.1245"-1 (53.96mm-0.03)	1.999"-$\frac{1}{2}$ (50.77mm-0.013	0.125"-10
20/25-HP (GXB-27 to GTK-53)	2.2495"-1 (57.14mm-0.03)	1.999"-$\frac{1}{2}$ (50.77mm-0.013)	3.17mm-0.25
25/30-HP (All chassis)	2.2459"-1 (57.14mm-0.03)	1.99"-$\frac{1}{2}$ (50.77mm-0.013)	
Wraith (All chassis)	2.498"-$\frac{1}{2}$ (63.45mm-0.013)	1.999"-$\frac{1}{2}$ (50.77mm-0.013)	0.093"-10 2.36mm-0.25
Phantom 1(All chassis)	2.6245"-1 (66.66mm-0.03)	2.1235"-$\frac{1}{2}$ (53.94mm-0.013)	

Phantom 11 (1-WJ to 12-PY)	2.6245"-1	2.1235"-½	0.125"-10
	(66.66mm-0.03)	(53.94mm-0.013)	3.27mm-0.25
Phantom 11 (14-PY to 82-UK	2.7995"-1	2.3735"-½	
	(71.11mm-0.03)	(60.29mm-0.013)	

The data for maximum permissible wear on main journals and crankpins, regrind limits and maximum permissible crankshaft end float is given below, and is common to all Rolls-Royce crankshafts:-

Maximum wear: journal and crankpin:-	0.003"	0.076mm.
Maximum ovality and taper:-	0.001"	0.025mm.
+Maximum regrind: journal and crankpin:-	0.040" U/S	1.016mm. U/S
Maximum permissible crankshaft end float:-	0.007"	0.178mm.

+NOTE: This is based solely upon the minimum physical safety factor of the crankshaft itself, and should not, in any way, affect the observations on "nitride" depth.

RUNNING CLEARANCES AND "NIP" FOR MAIN AND BIG END BEARINGS.

a) White Metal:

Running clearance for main and big end bearings:- 0.002"+½ (0.05mm+0.0127)

Final "nip":- 0.002" (0.05mm)

b) Hall's Metal:

Running clearance for main and big end bearings:- 0.003"+½ (0.076mm+0.0127)

Initial "nip", i.e., Pre-crushing:- 0.016" (0.41mm)

Final "nip":- 0.004" (0.10mm)

BEARING NIP:

The figures quoted for "nip" represent the amount by which the bearing shell is larger in diameter than its appropriate housing, converted into a feeler gauge measurement between the housing butt faces.

This causes the bearing to be squeezed when the housing is tightened down, thus ensuring against fretting and loss of oil pressure between the back of the shell and the housing.

Where Hall's Metal is used for the bearing material, a "pre-crushing" operation is necessary before fitting with the correct amount of "nip". This results in the "Settling down" of the material, and the satisfactory maintenance of the final "nip". Should this operation be omitted, the shells will rapidly become loose in the housings, causing bearings failure to occur.

On the other hand, White Metal does not require the "pre-crushing" operation, though the application of the specified "nip" is of the same importance with steel backed White Metal bearings as with Hall's Metal bearings.

The procedure for applying and checking "nip" is as follows:-

Both main and connecting rod bearings are supplied in pairs, partly milled through the axial centre-line. The pairs should be divided, using a hacksaw with as narrow a kerf as possible, and all burrs removed and butt faces cleaned up.

Each shell should then be checked for parallelism of the butt faces in relation to the bore centre-line by placing it on a surface table face downwards, and "clocking" each side of the back adjacent to the flanges at the highest point. Inequalities should be corrected by lightly filing the butt faces, removing as little of the metal as possible. There should be no perceptible "rock", (see fig.1).

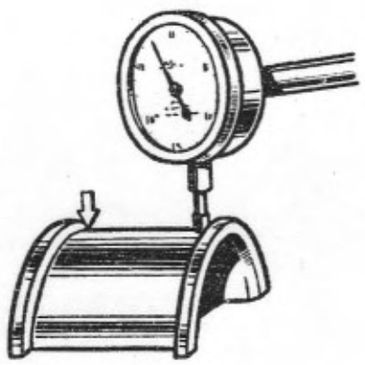


Fig.1.

The shells may then be assembled in pairs, in their respective housings, together, where applicable, with the appropriate shims.

Hall's Metal:-

Tighten down on both sides in normal manner. Slacken off one side completely, and re-tighten to a finger tightness. A gap will now be apparent between each side of the shim, and the housing butt faces, the shim being held centrally by the shell on its inner edge, (see fig.2.).

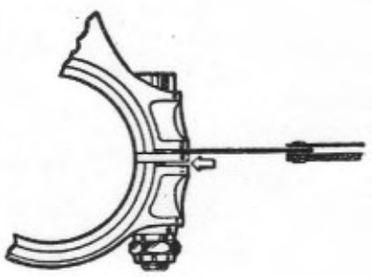


Fig.2.

For the"pre-crushing" operation, these gaps should now be adjusted to 0.008" (0.203mm) for each gap by filing the butt faces of each shell equally, taking care to maintain parallelism and truth.

The assembly should be re-tightened on both sides on completion of this operation, and left for a few hours, or overnight, during which time the "settling down" takes place.

When this period has elapsed, undo one side, re-check the gaps, and adjust to 0.002" (0.05mm) for each gap, and then re-tighten for boring. The main bearing shell locating dowel may interfere to some extent with the measurement of the "nip" if it is too tight a fit in the hole, therefore slight radial clearance should be given. No lateral movement is permissible

In those cases where shims are not used, it is the complete gap which appears between the housing butt faces which should be adjusted to give the necessary "pre-crushing" and final measurement.

White Metal:-

The procedure is precisely the same as for Hall's Metal, with the exception of the "pre-crushing" operation, which is omitted.

BOLT TIGHTNESS:

The tommy bar length recommended for tightening both big end and main bearings is 6" (15cms), and this should be centrally placed in the spanner. On the connecting rods, the correct condition can be obtained by measuring the free length of the bolt, both before and after tightening, when the stretch should be 0.005" to 0.007" (0.127mm to 0.0178mm). The nut must be tightened to the next split pin hole if the castellations do not register, and bolts and nuts should be approximately marked to ensure correct re-assembly.

Direct measurement of the main bearing end stretch is impracticable, but using the connecting rod as a basis for comparison, the nut should be slightly tighter.

We append the torsion spanner figures for those who prefer to use this method, but our view is that this type of spanner is no substitute for an experienced fitter, by whom we would naturally prefer the job to be done.

Big Ends.	225-lbs/ins. +50. 2.51 Kilos/Metre + 0.58
Main Bearings.	300-lbs/ins. +50. 3.61 Kilos/Metre + 0.58

BORING FOR ASSEMBLY:

When the "nip" and bolt tightness are correct, main and connecting rod bearings may be line-bored to journal and crankpin diameters, plus the respective running clearances.

In this operation, particular attention must be given to the concentricity of the main bearing bore in relation to the bore in the housing, as this will ensure that the engine gear centre will be the same as originally fitted. Discrepancies in this respect will give rise to excessive gear noise, and, at the rear, will affect the alignment of the gearbox.

To obtain the requisite degree of accuracy in the alignment of the boring bar, it is recommended that two steel bushes be used, these being identical in external diameter and overall length to the existing bearing shells, but bored to the diameter of the bar itself.

The procedure for line-boring the main bearings is as follows:-

a) Fit the boring bar into Nos.1 and 7 main bearing housings, and tighten down the caps sufficiently to prevent movement of the bushes. (shims to be omitted).

b) Secure the front and rear boring bar carrier plates to the engine crankcase.

c) Insert the boring bar, slide into position, and adjust the carrier plates until the bar is absolutely free both axially and radially.

d) Pull out the bar, and remove the bushes from the housings.

e) Fit the new bearing shells in No.1 housing, and tighten down the cap normally, using shims where applicable.

f) Slide in the boring bar, fit and adjust the cutters, and bore out to journal diameter, plus the recommended running clearance.

g) Remove the cutters, withdraw the bar sufficiently to permit the fitting of No.2 bearing shells. Slide the bar back into position, fit and adjust the cutters, and bore to required size.

Continue in this manner until all the main journal bearings have been bored. If the bearings are to be machine bored, the bore may be centred by similar methods.

The connecting rods, after being bored, should be given the correct alignment of big to small end.

CONNECTING ROD ALIGNMENT.

The following information refers to the maximum permissible mal-alignment in three directions of the small end bore in relation to the big end bore. The re-aligning operation is carried out after boring the big ends.

a) Horizontal Alignment: (See fig.3).

0.0005" per inch (.0127mm per cm.) from the gudgeon pin bush centre line measured along the axis of the mandrel.

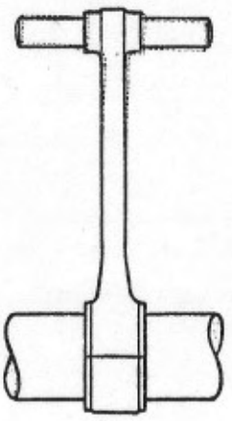


Fig.3.

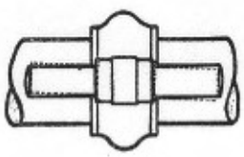


Fig.4.

b) Axial Alignment: (Twist) (See fig.4):-

.001"per inch (.025mm per cm.) from the gudgeon pin bush centre line.

c) Vertical Alignment: (See fig.5):-

0.010" (0.254mm) is allowed as between the vertical centre line of the gudgeon pin bush and that of the big end. This is available for use in centralising the big end on the crankpin during engine assembly.

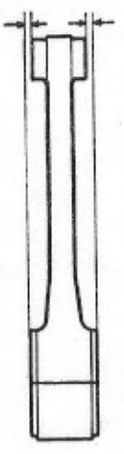


Fig.5.

Small End Side Clearance 0.005" to 0.015" (0.127-0.38mm).

Big End Side Clearance 0.040" to 0.050" (1.016-1.27mm).
(Connecting rod end float is controlled at the Small End).

CRANKSHAFT END FLOAT:

Face off the rear thrust face of No.7 main bearing sufficiently to produce a good surface, and cut the forward face to obtain the required end float of 0.0025" ±.0005"(or 0.07mm.± 0.01 mm).

OIL PRESSURE TEST:

An oil pressure test should be carried out after the crankshaft and connecting rods have been assembled in the engine. The purpose of this operation is to prove the oil tightness of the crankshaft conduit blanking caps and the oil gallery connections to each main bearing, and to ensure that there is a free flow of oil to all the bearings.

It may be necessary to rotate the crankshaft to check the oil flow, as all the conduit holes will not coincide simultaneously with the feed holes.

It is more convenient if the test is carried out with the cylinder block and pistons assembled, as this simplifies the rotation of the engine, and controls the small end oil flow.

An oil pump capable of maintaining a pressure of 30-lbs per sq. inch (2 Kilos per sq. cm) should be connected to the main oil supply point of the crankshaft, and an inspection made with the pressure maintained.

It is, of course, assumed that the crankshaft will be correctly cleaned during the overhaul, but particular attention must be given to the removal of all "sludge" from the crankpin conduits. This will be found to collect on the outer portion of the bore, where it is deposited by centrifugal force, and may obstruct the feed holes if not cleaned out.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E5A.

SB/GF.1/SF.

Subject : ADDENDUM TO SERVICE INSTRUCTION LEAFLET RR/E5

Date of Issue 6th December, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

Subsequent to the publication of RR/E5, it is felt that a certain degree of amplification of the existing information is necessary to obviate uncertainty arising over the dismantling and overhaul of the dampers fitted to Rolls-Royce engines.

With this in mind, it has been decided that such additional information as is considered necessary should be included in this addendum, to be used in conjunction with the existing leaflet.

Commencing with the procedures covering "The Removal and Dismantling of Dampers", it is felt that certain of the interim operations necessary between the removal of the radiator and that of the timing gear cover could, with advantage, be given in detail. This accordingly, has been done, and these essential operations will be found detailed below under their respective headings.

A. EARLY TYPE SLIPPER DRIVE: 20-HP; 20/25-HP, up to GKT-21; Phantom I; Phantom II, up to 172-XJ.

a) Lower the front engine undershield, support the engine at its forward end upon a suitable trestle and remove the engine front suspension cross-member.
NOTE: This operation only applies to those chassis with the Flexible Engine Suspension.

b) In order to facilitate the subsequent removal of the timing cover, it is recommended that the fan bracket and fan is removed.

c) Unscrew the five fan pulley securing nuts and remove the locking plate. This will expose the large serrated locking nut and the starting dog nut. Remove these, (the serrated nut having a left-hand and the starting dog nut a right-hand thread), and then pull off the pulley.

d) Remove the dynamo drive brake blocks, (Phantom II chassis DO NOT have these fitted), disconnect and remove the external oil pipe leading from the oil pump to the union on the timing cover, disconnect the leads from the ignition coil, and remove the timing cover. The remainder of the removal and dismantling of the damper to be carried out as already set down in RR/E5.

B. Phantom III - All Chassis:

a) Remove the fan bracket and fan.

b) Disconnect the control rod running across the top of the timing cover from each distributor. Remove the retaining nuts and separate the two metal H.T. lead carriers from either side of the fan bracket support on top of the timing cover.

c) Remove the large serrated nut, (right-hand thread), using the Special Box Spanner R-3163. Draw off the fan pulley, using Extractor Tool R-3168.

d) Remove all the timing cover retaining nuts and tap back the two topmost bolts until these are clear of the cover itself. It is also recommended that the sump retaining nuts are slackened off just sufficiently to enable the seal at the base of the timing cover to be broken, thus facilitating the removal of the cover. Remove the cover.

The remainder of the removal and dismantling of the damper to be carried out as already set down in RR/E5.

C. LOW INERTIA SPRING DRIVE: 20/25-HP. GKT-22 onwards. 25/30-HP. Phantom 11, 72-XJ onwards. Wraith.

a) Lower the front engine undershield, support the engine at its forward end upon a suitable trestle and remove the engine front suspension cross-member.
NOTE: On the Wraith chassis, the complete triangular engine front suspension plate should be removed.

b) To facilitate the removal of the timing cover, it is recommended that the fan bracket and the fan is removed.

c) Remove the locking plate and draw off the fan pulley by unscrewing the large hexagonal nut in the centre.
NOTE: The serrated locking ring seen round this nut should NOT be removed.

d) Remove the dynamo drive brake blocks, (NOT fitted to Phantom 11 or Wraith chassis), disconnect and remove the oil pipe leading from the pump to the union on the timing cover, disconnect the leads from the ignition coil, and remove the cover.

The remainder of the removal and dismantling of the damper to be carried out as already set down in RR/E5.

The procedure governing the examination of the damper components should also include the following essential test:-

> "When a Low Inertia Spring Drive damper has been completely dismantled for overhaul, it is recommended that the centre friction drum is checked for any signs of movement between the friction plate and hub of the drum. This is of the utmost importance, as any such movement detected indicates that the rivets which secure this plate to the hub have worked loose, and if this is not rectified, will result in the rapid deterioration in damper efficiency, with possibly a structural breakage occurring at the point of riveting.
>
> In all cases of loose rivets, the assembly must be re-riveted, using replacement rivets for the purpose, but before this is done, it is recommended that the friction plate is examined, and if the rivet holes in its webs are unduly elongated, or the webs cracked, then a replacement friction plate must also be fitted."

In conclusion, an important feature in the re-assembly of the timing cover is to ensure that the radial clearance between the oil thrower and the timing cover is not closer than 0.008", (0.20 m/m), for chassis with the Early Type Slipper Drive, or 0.004", (0.10 m/m), in the case of later chassis incorporating the Low Inertia Spring Drive. These measurements represent the minimum recommended limits of clearance and have been found by experience to provide the clearance necessary to prevent any contact between the oil thrower and the timing cover under normal conditions.

While the measurement of this radial clearance with the oil thrower in position presents no undue difficulties on the chassis where this is integral with the damper itself, namely, those chassis fitted with the Early Type Slipper Drive with the exception of the Phantom 111, this will prove impossible on the later chassis where the oil thrower is integral with the fan pulley. In these latter cases, therefore, it is suggested that a special sleeve or bush of the identical external and internal measurements of the existing oil thrower is locally produced and is used as a gauge in the assembly of the timing cover relative to the oil thrower. In this manner, the radial clearance can be accurately checked and the timing cover correctly assembled to ensure the concentricity of the oil thrower relative to the bore of the hole through which it passes.

Should however, the machining of such a sleeve prove impracticable, a process of trial and error will be necessary using "Prussian Blue" on the barrel of the oil thrower to determine whether a definite radial clearance between the oil thrower and the timing cover exists or not. As however, an accurate measurement of the actual radial clearance is unobtainable, it may be necessary to re-locate the timing cover one way or the other several times before a satisfactory setting relative to the oil thrower is obtained.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E5.

SB/GF.4/SF.

Subject: THE OVERHAUL AND ADJUSTMENT OF ROLLS-ROYCE CRANKSHAFT VIBRATION DAMPERS.

Date of Issue: 2nd September, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

The information contained in this leaflet is intended to provide the necessary assistance in connection with the overhaul and adjustment of the early type Slipper Drive and Low Inertia Spring Drive crankshaft vibration dampers fitted to Rolls-Royce engines.

DESCRIPTION.

Although both these components perform the same function in damping out crankshaft oscillation, certain differences in technical design will be noted, and it is for this purpose that the following brief descriptions are given.

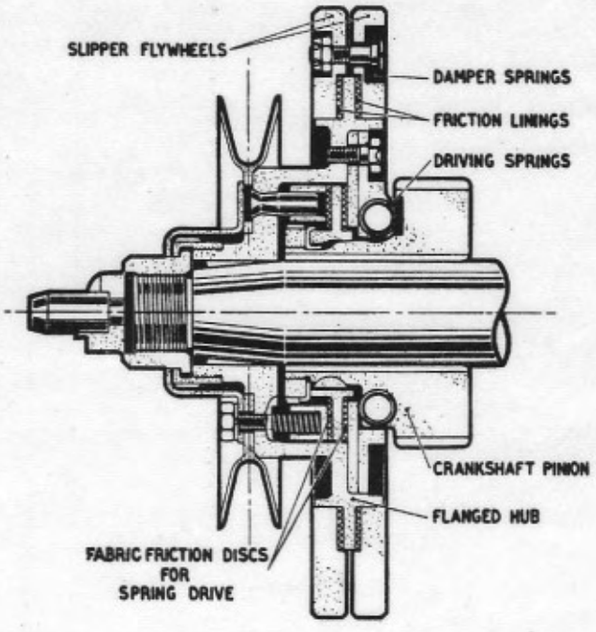


Fig. 1.

EARLY TYPE SLIPPER DRIVE.

Incorporated in the following Rolls-Royce cars.

20-HP. All chassis.
20/25-HP. Up to chassis GKT-21.
Phantom 1. All chassis.
Phantom 11. Up to chassis 172-XJ.
Phantom 111. All chassis.

'A'.

In this design, the slipper flywheels, mounted on either side of a flanged hub driven by the crankshaft, are made to rotate by friction.

Crankshaft vibration produces minute variations in angular velocity, and under these conditions there is relative movement between the flanged hub and the flywheels.

This movement is controlled by friction linings between the flywheels and the flanged hub, the actual slipping torque being set at a specific figure by means of the damper springs. This section of the component neutralizes crankshaft vibration.

The crankshaft pinion, which is an independent assembly, is driven through a spring drive set radially within the main body of the central hub, and such torsional oscillation as might otherwise be transmitted to the attendant timing gears, is damped out by the incorporation within the spring drive, of a secondary damping device.

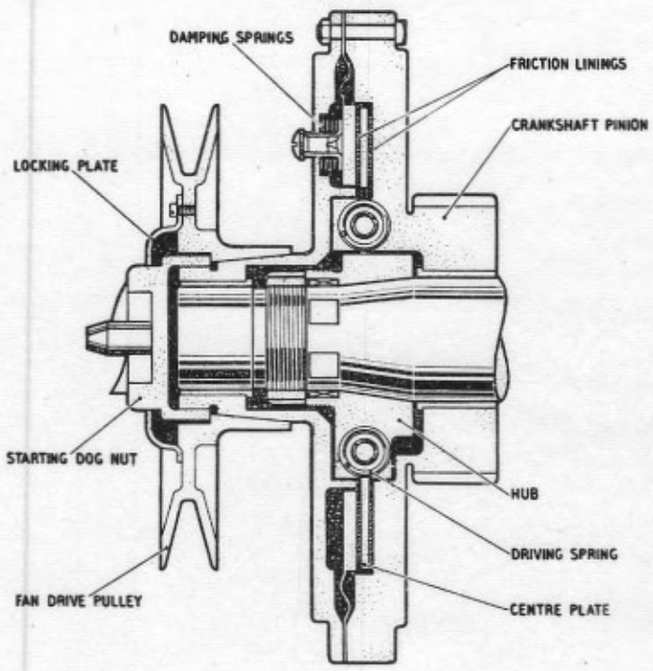


Fig. 2.

LOW INERTIA SPRING DRIVE.

Incorporated in the following Rolls-Royce cars.

20/25-HP. From GKT-22 onwards.
25/30-HP. All chassis.
Phantom 11. From 173-XJ onwards.
Wraith. All chassis.

'B'.

As its name implies, this design has been developed to reduce, as far as possible, the inertia of the parts rigidly attached to the crankshaft so as to increase the natural frequency of oscillation, and to reduce the amplitude of movement. Thus, the only part directly attached to the crankshaft is the central driving hub of the spring drive, which carries a light friction disc. The so-called fly-wheel is attached rigidly to the crankshaft pinion, and is driven through the medium of the radial driving springs. Between these two components is interposed the damping device, which thus serves the same purpose as the two separate damping units in the original slipper drive.

DERANGEMENT OF THE DAMPER - REASONS AND SYMPTOMS.

Apart from such mechanical reasons as structural breakages, inefficiency of the damper will, in the main, be found attributable to an alteration in the pre-determined slipper drive poundage.

Lengthy periods of idleness, such as car storage, may result in the cotton duck washers adhering to the damper friction plates, thus preventing the movement between the friction faces so necessary for the absorption of the minute variations in crankshaft angular movement.

This tendency for the cotton duck washers to adhere to the friction plates during a period of idleness makes it essential, should some considerable time elapse between assembly and actual fitting to the engine, for all assembled dampers to undergo a final poundage test.

Loss of movement between the damper friction faces results in the accentuation, rather than the absorption, of the torsional vibration movement, thus causing the introduction of engine vibration periods.

The commencement of these periods, closely resembling transmission vibration, will be experienced at engine speeds approximately to 18/20 m.p.h. road speed in top gear, and will increase in intensity until reaching a climax at an engine speed corresponding to 45 m.p.h. road speed in top gear, after which intermittent periods will continue to be experienced at intervals of every 10 m.p.h. increase in engine speed.

An additional symptom, closely associated with crankshaft periods, and frequently in evidence when these periods are being experienced, consists of a distinct rattle in the timing gears. This, however, should not be confused with the fast clicking sound associated with a faulty cam balance assembly.

SPECIAL TOOL SCHEDULE FOR REMOVAL.

The removal and dismantling for overhaul of the various types of damper necessitates the use of special tools.

These are obtainable from this Service Depot, and are as follows:-

Model	Chassis Series.	Spanner for Damper Retaining Nut.	Damper Extractor.
20-HP.	All chassis.	R.2855	None required
20/25-HP.	GXO-11 to GKT-21.	do.	do.
Phantom 1.	All chassis.	do.	do.
Phantom 11.	1-WJ to 172-XJ.	do.	do.
20/25-HP.	GKT-22 onwards.	R.2883	R.2879.
25/30-HP.	All chassis.	do.	do.
Wraith.	All chassis.	R.2886	R.2860.
Phantom 11.	173-XJ to 68-GX.	R.2889	R.2930.
Phantom 11.	1-JS onwards.	R.2892	R.2931.
Phantom 111.	All chassis.	R.2883	R.2879.

PROCEDURE FOR REMOVAL AND DISMANTLING OF DAMPERS.

A. Early Type Slipper Drive: 20-HP. 20/25-HP. (All chassis up to GKT-21) Phantom 1, (All chassis), Phantom 11, (All chassis up to 172-XJ).

1. Remove the radiator.
2. Unscrew the serrated nut, (left-hand thread), then remove the starting dog nut.
3. Remove the fan pulley securing nuts, and pull off the pulley.
4. Remove the timing gear cover.
5. Bring the engine up to T.D.C. on No.1 cylinder.
6. Replace the starting dog and serrated nuts and tighten both.
7. Draw off the damper by unscrewing the starting dog nut ONLY.
8. Separate the two flywheels by undoing the ring of nuts round outer diameter.
9. Remove the eight setscrews securing the crankshaft pinion to the central hub and knock out the pinion, spring drive, driving dog, presser plate, friction washers, presser springs and presser spring cage.

NOTE: All the dampers on Phantom 1 chassis between 72-KR and 90-U require to be tilted so as to enable the assembly to pass the front cross-member. To achieve this, it is necessary for the eight setscrews located in front round the central boss to be removed.

B. Phantom 111 (All chassis). Early Type Slipper Drive:

1. Remove the radiator.
2. Remove the fan pulley by removing the five securing nuts round the centre boss and pulling off.
3. Remove the timing gear cover.
4. Drain the engine crankcase and remove the sump.
5. Remove the fan pulley spigot, (4x$\frac{1}{2}$" nuts).
6. Turn back the tab washer and remove the serrated retaining nut.
7. Bring the engine up to T.D.C. on No. 1 cylinder on the left-hand bank, i.e. looking towards the front of the car from the driver's seat.
8. Using the extractor, pull the damper off the crankshaft nose. (It is recommended that the mating teeth between the crankshaft pinion and the camshaft pinions are suitably marked prior to complete removal).
9. Carry out further dismantling in the manner already described above.

C. Low Inertia Spring Drive: 20/25-HP, (Chassis GKT-22 onwards), 25/30-HP. Phantom 11, (Chassis 72-AJ onwards), Wraith.

1. Remove the radiator.
2. Remove the locking plate, and draw off the fan pulley by unscrewing the large hexagonal nut in the centre. (The serrated locking ring located round this hexagonal nut should not be removed).
3. Remove the timing gear cover.
4. Bend back the tab washers, remove the 4 x $\frac{1}{2}$" nuts in the centre of the spring drive together with the 12 x No.2 B.A. nuts round the outer circumference of the damper flywheels, and pull off the front damper plate, spring plate and the first cotton duck washer.
5. Bend back the lockwasher and remove the serrated retaining nut securing the damper rear plate.
6. Bring the engine up to T.D.C. on No. 1 cylinder.
7. Using the extractor, draw off the rear damper plate. (It is recommended that the mating teeth between the crankshaft and camshaft pinions be suitably marked prior to complete removal).
8. Remove the centre friction drum, second cotton duck washer and the driving springs (It should be noted that these driving springs are retained in position at one end only, and thus require to be compressed before they can be extracted. To effect this, the blade of a suitable screwdriver should be inserted into the spring at the end adjacent to the driving dog on the hub side, and the spring compressed until this end is clear of the retaining lip or dowel, after which it can be easily prized out).

After the damper has been completely dismantled, the following procedure should be carried out:-

1. Examine all the friction faces for scoring and regrind where necessary.
2. Discard all used cotton duck washers.
3. Face up the friction washers incorporated in the early type Slipper Drive spring drive section, using emery paper for this purpose.

All Friction Faces:

The diagrammatic sketches appended below, illustrate the limits to which the various friction faces may safely be ground.

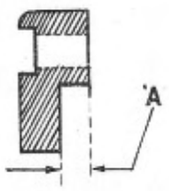


FIG. 3.

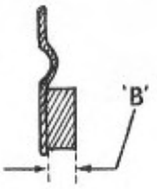


FIG. 4.

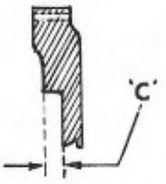


FIG. 5.

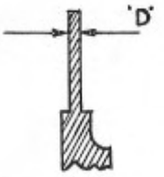


FIG. 6.

Early Type Slipper Drive:-

Depth to which the front and rear damper wheel friction faces may be ground, (See Fig. 3 Dimension 'A')

20-HP)	0.140"	3.56 mm.
20/25-HP.)	do.	do.
Phantom 111.)	do.	do.
Phantom 1.)	0.177"	4.5 mm.
Phantom 11.)	do.	do.

Low Inertia Spring Drive:

	Minimum Permissible Working Thickness for Presser Plate. (See Fig.4 Dimension 'B').		Depth to which the Rear Damper Friction Face may be ground. (See Fig.5 Dimension 'C').	
20/25-HP.)	0.107"	(2.72 mm)	0.388"	(9.86 mm)
25/30-HP.)	do.	do.	do.	
Phantom 11.)	0.12"	(3.05 mm)	0.388"	(9.86 mm)
Wraith.)	0.145"	(3.68 mm)	0.465"	(11.81 mm)

NOTE: The Presser Plate is the friction ring which is riveted to the corrugated spring plate located between the front damper wheel and the centre friction drum.

Centre Friction Flanges:

The centre friction flanges on all models must not be ground below a working thickness of 0.062" (1.57 mm). (See Fig. 6 Dimension 'D').

FRICTION LININGS.

Cotton Duck Washers:

In view of the fact that friction represents the main principal used in all dampers for the absorption of torsional oscillation, it is obvious that the maintenance of the requisite amount of friction for the efficient functioning of the damper depends upon the condition of the friction linings.

The tendency for these to become hard, ingrained with carbon and superficially glazed, thus losing their original properties, makes it essential for all existing linings to be replaced by new ones at each overhaul period.

Before assembly, all replacement friction linings must be reduced to a state approximating to that in which they will operate when actually assembled, and, as this entails a reduction in material thickness, care should be taken to ensure uniformity in all round working thickness, particularly at the scarf joint. This is of the utmost importance, as the fitting of unevenly ironed friction linings will result in the rapid deterioration in damper efficiency.

In order to prepare these friction linings for assembly, the following procedure should be carried out.-

1. Soak in oil for approximately 24 hours.
2. Place the linings between their respective damper flywheels, and bolt up tightly. (All damping springs should be left in position).
3. Fit the hub of the assembly on to an appropriate mandrel, secure firmly in a vice, and using the poundage bar as a means of leverage, rock or rotate the damper flywheels until the linings are uniform in working thickness all round. Carefully trim off all superfluous fringes which may have formed round the joints.

NOTE: On all Low Inertia Spring Drive dampers, the driving springs must be omitted for operation No.3.

RECOMMENDED SLIPPER POUNDAGES.

Each crankshaft damper has a recommended slipper spring poundage for operational purposes.

These figures quoted in the following table, represent the force necessary to overcome the friction between the flywheels and central flange and have been found by experience to produce the correct damping effect for each individual engine in normal circumstances.

Chassis Series	Damper Type.	Spring Loading British Measure.	Spring Loading Continental Measure.
20-HP. All chassis)		3½ - 4 lbs.	1.59 - 1.81 Kilos.
20/25-HP. Up to GKT-21.)	Early Type	12 - 14 lbs.	5.44 - 6.35 do.
Phantom 1. All chassis)	Slipper	do.	do.
Phantom 11. Up to 71-XJ.)	Drive.	do.	do.
Phantom 111. All chassis.)		20 - 22 lbs.	9.07 - 9.98 do.
Phantom 1. 72-XJ onwards)	Low Inertia	12 - 14 lbs.	5.44 - 6.35 Kilos.
20/25-HP. GKT-22 onwards)	Spring	do.	do.
25/30-HP. All chassis)	Drive.	do.	do.
Wraith. All chassis)		11 - 12 lbs.	4.99 - 5.44 Kilos.

NOTE: Although the figures quoted above represent sufficiently accurate limits to ensure normally efficient damping, variations are permissible to suit individual cases. In the event of a vibrational period developing at low engine speeds, reduction of the recommended damping spring loading is permissible as a counteracting measure. Conversely, an increase in the recommended spring loading is permissible to counteract a vibration period at high engine speeds. It should, however, be noted that in no case should these variations be in excess of 1-lb.(0.45 Kilo) above or below the recommended loading figures already established for each damper type.

SLIPPER POUNDAGE TEST.

The effort required to overcome the frictional drag exerted by the damper springs is measured on a spring balance, and is obtained in the following manner. (See Fig.7 below)

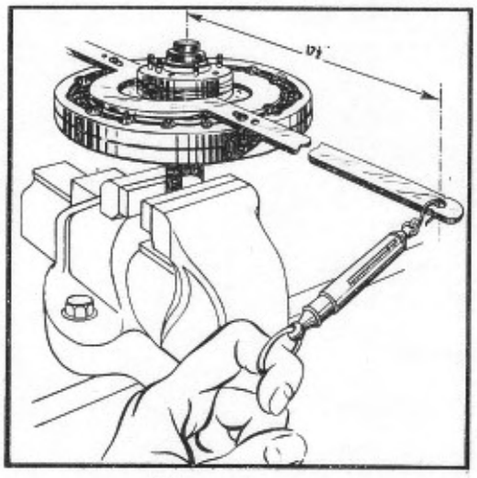


Fig. 7.

1. Place the damper assembly in position on an appropriate mandrel and secure in a vice.
2. Attach the testing bar to the damper fly-wheels.
3. Secure the spring balance to the bar at a radial distance of $17\frac{1}{2}$". (44.45 cms).
4. Pull on the free end of the balance and read the poundage required to cause the two fly-wheels to move relative to the central hub.

NOTE: In all cases the damper driving springs must be omitted while this test is being carried out.

SPECIAL TOOL SCHEDULE FOR ASSEMBLY AND TESTING.

These are as quoted in the following table and are obtainable from this Service Depot upon application:-

Tool Piece No:	Description:	Models to which applicable:
R.2985	Mandrel	(20-HP. All chassis (20/25-HP. Up to GKT-22.
R.2986	do.	(20/25-HP. GKT-22 onwards. (25/30-HP. All chassis.
R.2987	do.	(Phantom 1 All chassis. (Phantom 11. Up to 172-XJ.
R.2988	do.	Phantom 11. 173-XJ onwards.
R.2989	do.	Phantom 111. All chassis.
R.2990	do	Wraith. All chassis.
R.3138	Poundage Test Bar.	(20/25-HP. GKT-22 onwards. (25/30-HP. All chassis.
R.3157	do.	Phantom 11. 173-XJ onwards.
R.3160	do.	Phantom 111. All chassis.
R.3446	do.	Wraith. All chassis.

NOTE: Poundage test bars for both the 20-HP and Phantom 1 Early Type Slipper Drives are not included in the above schedule, but can be locally produced, if and when required from 1" x $\frac{1}{4}$" steel strip to the shape and measurements shown in Fig. 7 above.

PROCEDURE FOR THE RE-ASSEMBLY OF DAMPERS.

A. Early Type Slipper Drive:

1. Fit the replacement friction linings on to the flanged hub, taking particular care to see that these lie perfectly flat upon their respective friction faces and are free to rotate round the boss of the hub.

2. Assemble the slipper flywheels into position on the central flanged hub.

3. Secure both the flywheels by screwing up the outer ring of nuts as far as they will go.

4. Slacken back each nut $1\frac{1}{4}$ full turns in the case of the 20-HP damper, and $1\frac{1}{2}$ full turns for both the Phantom 1 and Phantom 111. The clearance which shows between the flywheel faces, should not be less than 0.010" (0.25 mm) when measured with a set of feelers. If, however, this gap is less than the recommended minimum given above, then the two flywheel faces should be machined off sufficiently to make up the difference.

5. Carry out the poundage test as previously described. If the effort required to move the two flywheels relatively to the central hub exceeds the maximum recommended pre-loading figure, further ironing of the friction linings should be carried out. Should however, this not prove sufficient, reduction in the spring loading can be effected by the removal of damper springs in pairs, i.e. springs diametrically opposite to each other, but at no time must more than two pairs, i.e. 4 springs, be so removed.

6. Upon the recommended spring loading being obtained, refit the damper assembly to the crankshaft and secure in position.

7. Check the timing. (When carrying out this check, always turn the engine by means of the flywheel.

B. Low Inertia Spring Drive:

1. Fit the first replacement lining to the rear damper plate, ensuring that it lies perfectly flat upon the friction face and is free to rotate. The scarf joint of the lining should be in line with the '0' which will be seen etched on the face of the rear damper plate.

2. Line up the '0' on the centre plate with the '0' seen on one of the rear plate centre pins, and fit.

3. Position the second friction lining, ensuring that its scarf joint is diametrically opposite to that of the first lining.

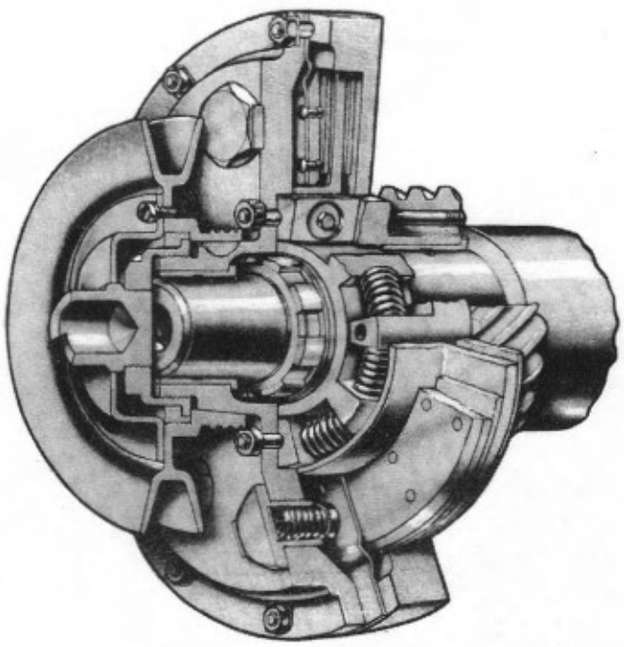
4. Locate the '0' on the spring plate with those already assembled, and fit.

5. Fit the packing plate, again making sure that the marks are lined up.

6. Having removed all the packing washers from behind the damping springs carried by the front damper plate, fit this plate to the rear plate and secure.

7. Apply the poundage test. (As previously stated, all the driving springs must be omitted for this operation).

8. If necessary, reduce the damper spring pre-loading by removing the springs in pairs. As already mentioned, not more than two pairs should be so removed. (This method of reducing the damper spring pre-loading is applicable to all dampers with the exception of the one which is fitted to the Wraith engine).



The Wraith damper, (see Fig. 8) having only eight damper springs, requires the insertion of packing washers for increased pre-loading, and vice-versa.

Should, however, these methods of adjustment prove insufficient, further grinding of the rear damper plate friction face will be necessary, but it is emphasised that this should only be resorted to in the unlikely event of the more conventional methods, detailed above, failing to produce the desired effect.

Fig. 8. (Wraith Damper).

9. Upon the recommended spring loading being obtained, remove the front damper plate and spring plate and re-insert the driving springs into position. This latter operation may be simplified by leaving the rear damper plate on the mandrel, and after locating certain of the springs alternatively, compressing these by means of the testing bar, thus widening the remaining spaces sufficiently for the easy insertion of the remainder of the springs.

10. Having re-positioned the driving springs, remove the rear damper plate from the mandrel and refit to the crankshaft nose, ensuring that the marks on the mating teeth of the crankshaft and camshaft pinions are coincident.

11. Thread on the lockwasher and centre retaining nut, and using the special serrated box spanner, tighten up and lock in position.

12. Replace the front friction lining, spring plate and front damper plate, and secure.

13. Check the engine timing. (When carrying out this check, always turn the engine by means of the flywheel).

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR / E4.
PHANTOM III

SB/GF.8/SF.

Subject : Pistons and Rings for Phantom III (3¼" Bore) Engine.

Date of Issue 15th June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

All Phantom III engines were fitted with three ring type pistons, and replacements are as quoted in the following schedule.

The additional ring sizes are included to cover those cases where suitable replacement rings are required for use with existing piston assemblies fitted prior to the current system of rationalization.

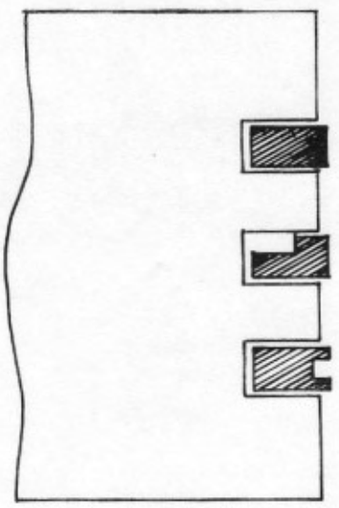
FOR ALL PHANTOM III CHASSIS.

Size:	Piston	A Top Ring 1 Off	B Inter Ring 1 Off	C Btm.Ring 1 Off	Gudgeon Pin 1 Off
Std.	E.89438	EB.2377	EB.3077	EB.2686	E.86706A
.005 O/S	-	EB.3078	EB.3088	EB.3450	
.010 "	-	EB.3079	EB.3089	EB.3451	
.015 "	E.88715	EB.3080	EB.3090	EB.3452	
.020 "	-	EB.3081	EB.3091	EB.3453	
.025 "	E.88717	EB.3082	EB.3092	EB.3454	
.030 "	-	EB.3083	EB.3093	EB.3455	
.035 "	E.88719	EB.3084	EB.3094	EB.3456	
.040 "	-	EB.3085	EB.3095	EB.3457	
.045 "	E.88721	EB.3086	EB.3096	EB.3458	
.050 "	-	EB.3087	EB.3097	EB.3459	

All quantities are expressed in terms of one piston.

Ring Assembly:

The following diagram illustrates the correct ring assembly.



A Rectangular.

B "L" Section.

C Channelled.

Ring Gaps:

Top Ring	.008" - .010"	No stops fitted.
Inter Ring	.006" - .008"	
Bottom Ring	.006" - .008"	

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E 4
PHANTOM II

RS/JW/DBI

Subject : Pistons and Rings for the Phantom II (4.250 in. Bore) Engine

Date of Issue 4th November 1960

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

All Phantom II engines were fitted with five ring type pistons, and replacements are as quoted in the following schedule.

The additional ring sizes are included to cover those cases where suitable replacement rings are required for use with the existing piston assemblies fitted prior to the current system of rationalization.

For All Phantom II Chassis

	A Piston	A Top Ring 1 off	B Inter. Rings 3 off	C Btm. Ring 1 off	Gudgeon Pin 1 off
Standard	E.82041	E.76485	E.77531	R.5308	E.76882
0.005 in. O/S	-	E 79462	E.79450	"	"
0.010 in "	-	E.79463	E.79451	R.5470	"
0.015 in "	E.82046	E.79464	E.79452	"	"
0.020 in. "	-	E.79465	E.79453	R.5471	"
0.025 in. "	E.82048	E.79466	E.79454	"	"
0.030 in. "	-	E.79467	E.79455	R.5472	"
0.035 in. "	E.82050	E.79468	E.79456	"	"
0.040 in. "	-	E.79469	E.79457	R.5473	
0.045 in. "	E.82052	E.79470	E.79458	"	"
0.050 in. "	-	E.79471	E.79459	R.5474	"

Note: Pistons are now only supplied in the following sizes:

Standard, + 0.015 in., + 0.025 in., +0.035 in., + 0.045 in.

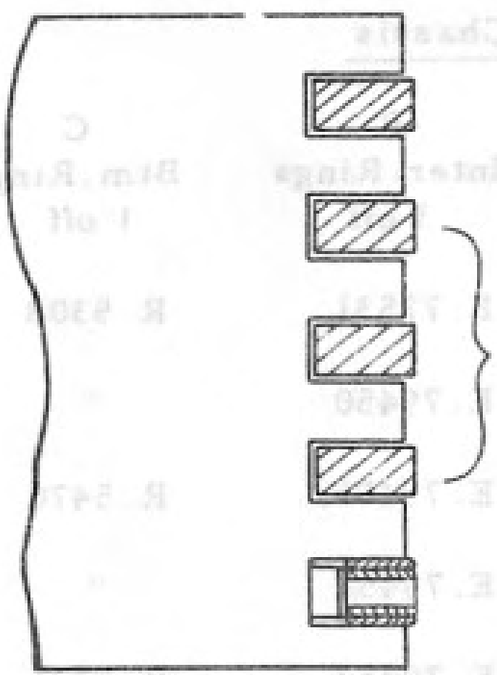
All quantities are expressed in terms of one piston.

The 'Channelled' Type Oil Control Ring originally fitted is no longer stocked and has been superseded by the 'Duaflex' Piston Ring.

'Duaflex' Rings should be fitted to ALL Pistons on the same engine.

Ring Assembly:

The following diagram illustrates the correct ring assembly.



A RECTANGULAR.

B RECTANGULAR.

C DUAFLEX.

B.271

Ring Gaps.

Top and Bottom Rings (no stops fitted).	0.004 in. - 0.006 in.
Centre Rings (stops fitted).	0.004 in. - 0.006 in.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E4.
PHANTOM I

SB/GF.4/SF.

Subject : Pistons and Rings for Phantom I ($4\frac{1}{4}$" Bore) Engine.

Date of Issue 15th June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

All early Phantom I engines incorporated a cast iron cylinder head and were fitted with piston assemblies comprising five rings of 'L' shaped section.

With the introduction of the aluminium cylinder head at Chassis No: 1-CL, however, the ring design was altered, rectangular rings being used in place of the 'L' shaped type.

The pistons and rings to cover all replacement for Phantom I engines are as quoted hereunder, the additional ring sizes being included for those cases where suitable replacement rings are required for use with existing piston assemblies fitted prior to the current system of rationalization.

For All Chassis Between 1-MC and 101-AL inclusive

(Cast Iron Cylinder Head).

Size	Piston.	A Top Ring.	B Lower Rings.	Gudgeon Pin.
		1 Off	4 Off	1 Off
Std.	E.73376	E.73291	E.73287	E.73206A
.005 O/S	-	E.73719	E.73707	
.010 "	-	E.73720	E.73708	
.015 "	E.73733	E.73721	E.73709	
.020 "	-	E.73722	E.73710	
.025 "	E.73735	E.73723	E.73711	
.030 "	-	E.73724	E.73712	
.035 "	E.73737	E.73725	E.73713	
.040 "	-	E.73726	E.73714	
.045 "	E.73739	E.73727	E.73715	
.050 "	-	E.73728	E.73716	
.055 "	-	E.73729	E.73717	
.060 "	-	E.73730	E.73718	

For All Chassis Between 1-CL and 90-OR inclusive

(Aluminium Cylinder Head)

		A Top Ring	B Lower Ring	Circlips.	Gudgeon Pin.
		1 Off	4 Off	2 Off	1 Off
Std.	E.76995	E.77907	E.77906	E.76885	E.76882
.005 O/S	-	E.78931	E.78919		
.010 "	-	E.78932	E.78920		
.015 "	E.77894	E.78933	E.78921		
.020 "	-	E.78934	E.78922		
.025 "	E.77896	E.78935	E.78923		
.030 "	-	E.78936	E.78924		
.035 "	E.77898	E.78937	E.78925		
.040 "	-	E.78938	E.78926		
.045 "	E.77900	E.78939	E.78927		
.050 "	-	E.78940	E.78928		
.055 "	-	E.78941	E.78929		
.060 "	-	E.78942	E.78930		

All quantities are expressed in terms of one piston.

Ring Assembly:

The following diagrams illustrate the correct ring assembly for both types of piston.

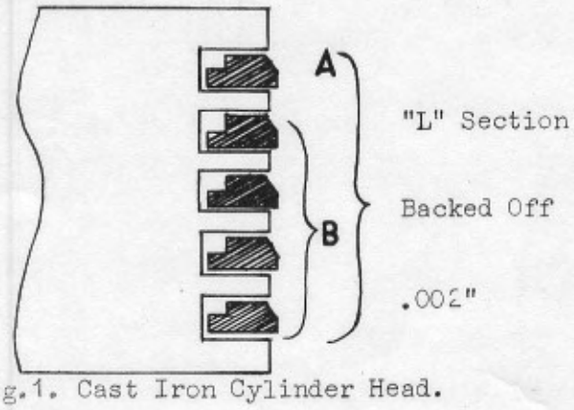


Fig.1. Cast Iron Cylinder Head.

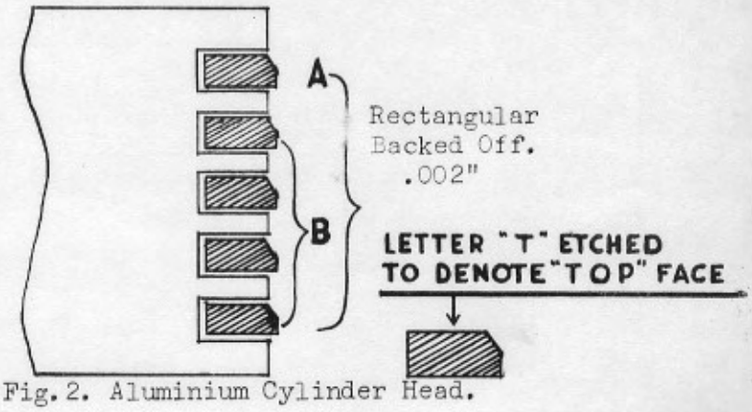


Fig.2. Aluminium Cylinder Head.

Ring Gaps:

Top Ring (Both types of piston) .010" - .012" (No stops fitted).

Lower Rings (Both types of piston) .008" - .010" (Plus .175" for width of stops.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E4.
25/30 H.P.
WRAITH

SB/GF.3/SF.

Subject: Pistons and Rings for 25/30-HP. and Wraith ($3\frac{1}{2}$") Engines.

Date of Issue: 15th June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

All 20/30-H.P. and Wraith engines are fitted with three ring type pistons, and replacements are as quoted in the following schedule. The additional ring sizes are included to cover all cases where suitable replacement rings are required for use with existing piston assemblies fitted prior to the current system of rationalization.

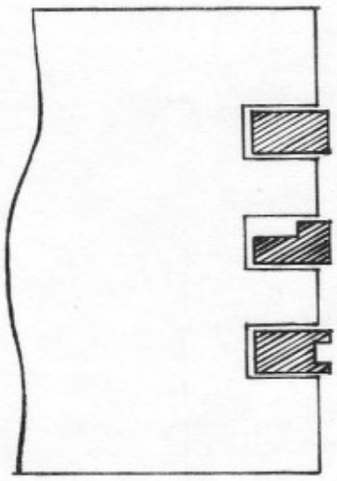
For All 20/25-H.P. and Wraith Chassis.

Size.	Piston.	A Top Ring.	B Inter:Ring.	C Btm.Ring.	Gudgeon Pin.
Std.	E.61463	E.60820	E.61123	E.60821	E.60634A
.005 O/S	-	E.61152	E.61184	E.61162	
.010 "	-	E.61153	E.61185	E.61163	
.015 "	E.61176	E.61154	E.61186	E.61164	
.020 "	-	E.61155	E.61187	E.61165	
.025 "	E.61178	E.61156	E.61188	E.61166	
.030 "	-	E.61157	E.61189	E.61167	
.035 "	E.61180	E.61158	E.61190	E.61168	
.040 "	-	E.61159	E.61191	E.61169	
.045 "	E.61182	E.61160	E.61192	E.61170	
.050 "	-	E.61161	E.61193	E.61171	

All quantities are expressed in terms of one piston.

Ring Assembly:

The following diagram illustrates the correct ring assembly.



A Rectangular.

B "L" Section.

C Channelled.

Ring Gaps:

Top Ring. .008 - .010")
Inter Ring. .006" - .008" } No stops fitted.
Bottom Ring. .006" - .008")

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E4.
20 H.P.

SE/GF.8/SF.

Subject :

PISTONS AND RINGS FOR
20 H.P. (3" BORE) ENGINE.

Date of Issue 15th June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

All engines prior to Chassis No: GXL-42, were originally fitted with a four ring type piston. These are now obsolete, but suitable rings for use with existing four ring piston assemblies are available upon application being made to the Service Depot.

Five ring type pistons, now being manufactured to cover all replacements for 20-H.P. engines, are as stated hereunder, the additional sizes being included for those cases where suitable replacement rings are required for use with existing piston assemblies fitted prior to the current system of rationalization.

ALL 20-H.P. CHASSIS.

SIZE.	PISTON.	A TOP RING.	B INTER RING.	C BOTTOM RING	GUDGEON PIN.
		1 Off	3 Off	1 Off	1 Off
Std.	E.54525	E.50518	E.53625	E.50518	E.54771A
.005 O/S	-	E.53614	E.53806	E.53614	
.010 "	-	E.53615	E.53807	E.53615	
.015 "	E.54705	E.53616	E.53808	E.53616	
.020 "	-	E.53617	E.53809	E.53617	
.025 "	E.54707	E.53618	E.53810	E.53618	
.030 "	-	E.53619	E.53811	E.53619	
.035 "	E.54709	E.53620	E.53812	E.53620	
.040 "	-	E.53621	E.53813	E.53621	
.045 "	E.54711	E.53622	E.53814	E.53622	
.050 "	-	E.53623	E.53815	E.53623	

All Quantities are expressed in terms of one piston.

Ring Assembly:

The following diagrams illustrate the correct ring assembly for both types of piston.

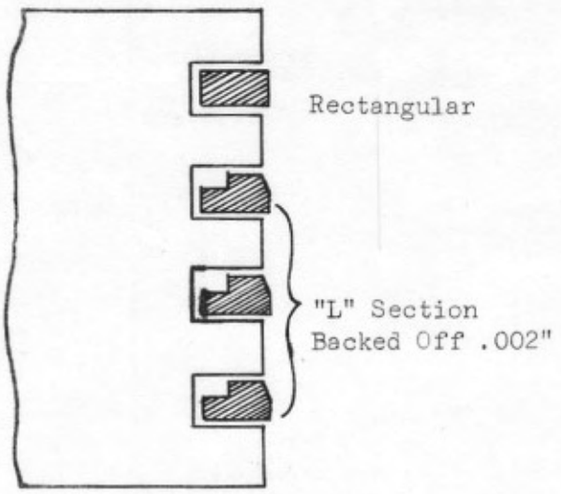


Fig. 1 Four Ring Type Piston.
(Obsolete).

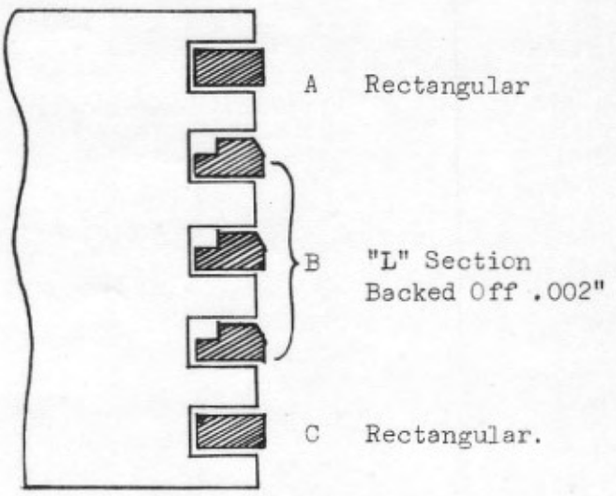


Fig. 2. Five Ring Type Piston.
(Present Replacement).

Rings Gaps: (Obsolete and present Replacement)

Top Ring (No stop fitted)	.006"	-	.008"
Inter Rings (stops fitted)	.004"	-	.006" plus .075" for width of (stop.
Bottom Ring (No stop fitted)	.004"	-	.006"

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E4.
20/25 H.P.

SB/GF.2/SF.

Subject : Pistons and Rings for 20/25-H.P. ($3\frac{1}{4}$" Bore) Engine.

Date of Issue 15th June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

All engines prior to Chassis No: GLR-25 were originally fitted with five ring type pistons. These are now obsolete, but suitable rings for use with existing five ring piston assemblies are available upon application being made to this Service Depot.

Only four ring type pistons are now being manufactured to cover all replacements for 20/25 H.P. engines, and are as stated hereunder, the additional ring sizes being included for those cases where suitable replacement rings are required for use with existing piston assemblies fitted prior to the current system of rationalization.

1. Chassis GXO-11 to GKT-21 inclusive. (5.25 to 1 Compression Ratio.)

Size.	Piston.	A Comp. Rings.	B Btm. Ring	Circlips.	Gudgeon Pin.
		3 Off	1 Off	2 Off	1 Off
Std.	E.56468	E.55561	E.55327	E.55327	E.56469
.005 O/S	-	E.55999	E.56009		
.010 "	-	E.56000	E.56010		
.015 "	E.56698	E.56001	E.56011		
.020 "	-	E.56002	E.56012		
.025 "	E.56500	E.56003	E.56013		
.030 "	-	E.56004	E.56014		
.035 "	E.56502	E.56005	E.56015		
.040 "	-	E.56006	E.56016		
.045 "	E.56504	E.56007	E.56017		
.050 "	-	E.56008	E.56018		

2. Chassis GKT-22 to GTK-53 inclusive. (5.75 to 1 Compression Ratio).

Size.	Piston.	A Comp.Rings.	B Btm.Ring	Circlips.	Gudgeon Pin.
		3 Off	1 Off	2 Off	1 Off
Std.	E.57122				
.015 O/S	E.58495				
.025 "	E.58497	For part numbers covering rings, circlips, and Gudgeon pin, refer to schedule 1.			
.035 "	E.58499				
.045 "	E.58501				

Ring Assembly:

The following diagrams illustrate the correct ring assembly for both the original five ring piston and current four ring type piston.

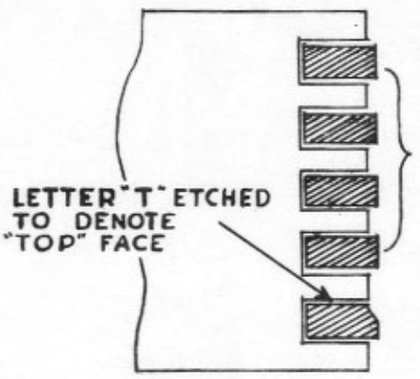


Fig.1. Five Ring Type Piston (Obsolete).

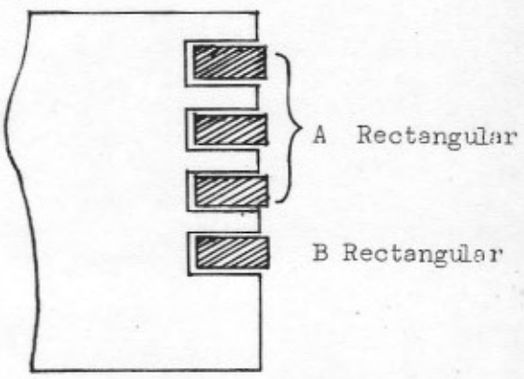


Fig.2. Four Ring Type Piston. (Present Replacement).

Ring Gaps:

1. Five Ring Piston (Obsolete type)

Top Ring (No stops fitted)	.006" - .008"
Intermediate Rings (Stops fitted)	.004" - .006" (plus .075" for width of stop.
Bottom Ring (No stops fitted)	.004" - .006"

2. Four Ring Piston. (Current Replacement).

'A' Top Rings (Stops fitted) .006" - .008"
(plus .075" for width of stop).

'B' Bottom Ring (Stop fitted .004" - .006"
(Plus .100" for width of stop).

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E4

SB/GF.7/SF.

Subject : PISTONS AND RINGS FOR USE IN ROLLS-ROYCE ENGINES - TYPES AND SIZES USED.

Date of Issue 15th June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

The information contained in this leaflet is considered necessary, as, owing to the fact that the majority of the earlier engines are now fitted with pistons and rings not originally specified, it is felt that a certain amount of uncertainty exists regarding appropriate replacements.

GENERAL INFORMATION.

PISTON SIZES:

To obviate the necessity of holding large stocks of pistons for which past experience has proved that there is a limited demand, it has been decided to rationalise the oversizes available to the following sizes:- 0.015", 0.025", 0.035", 0.045".

It is recommended that liners be fitted when further re-boring becomes necessary, thereby restoring the cylinder bores to their original sizes.

PISTON RINGS:

A. Certain early types of piston assemblies are now obsolete, but replacement rings for use with existing old type pistons are available from this Service Depot.

When indenting for these, the chassis number should be given, and the size of piston fitted, stated.

B. Rings supplied through this Service Depot, whether separately, or in conjunction with their respective pistons, are not "gapped" to the recommended clearance limits prior to delivery. These should be "gapped" during the actual assembly of the engine, the tightest portion of the respective cylinder bores being chosen for this purpose.

GUDGEON PINS:

Gudgeon pins should be specifically indented for in all cases where replacement pistons are required. It should be noted that in order to fit the gudgeon pin, the piston should be heated to 100°C in boiling water. This applies to all gudgeon pins which are retained by circlips. On other types, assembly is facilitated if the piston is warmed slightly.

BORING:

The cylinder should be bored to the oversize stated. The necessary clearance is provided for in the piston dimensions.

DETAILED INFORMATION.

Detailed part numbers and recommended piston ring gaps for each Rolls-Royce engine, are contained in the following pages.

Further assistance is provided by the inclusion of diagrams illustrating the correct assembly of the rings.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E3A.

SB/VK/JSL/JSK.

Subject : CYLINDER LINERS
DRY LINERS FOR ROLLS-ROYCE ENGINES.
(Except Phantom III)

Date of Issue 6th March, 1953.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

In cases where it is necessary to rebore and fit replacement pistons to an engine which has already been bored to the maximum permissible oversize, a dry liner may be fitted.

This liner may be either:-

(a) A Full-length parallel type to restore the bore diameter to the original size.

(b) A Stepped liner, the lower part of which constitutes a "skirt" or bore extension. This can be used to salvage any block having a broken extension, irrespective of bore size.

MACHINING INSTRUCTIONS FOR BLOCK:

FULL-LENGTH LINER - Each liner must be treated individually, and its external diameter measured, taking a micrometer reading across the diameter at six points; then bore to the mean reading, allowing an interference as shown below.

STEPPED LINER - Machine off the broken skirt flush with the bore of the cylinder. Measure the liner and bore out as above. Chamfer the inside edge of the cylinder bores as shown in the diagram.

LIMITS OF INTERFERENCE:

20 H.P. 20/25 H.P. 25/30 H.P. Wraith	0.002" to 0.0025"
Phantom I Phantom II	0.0025" to 0.003"

FITTING THE LINER:

The load required for pressing in is (approx.) $2\frac{1}{2}$ to $3\frac{1}{2}$ tons.

BORING OUT LINER:

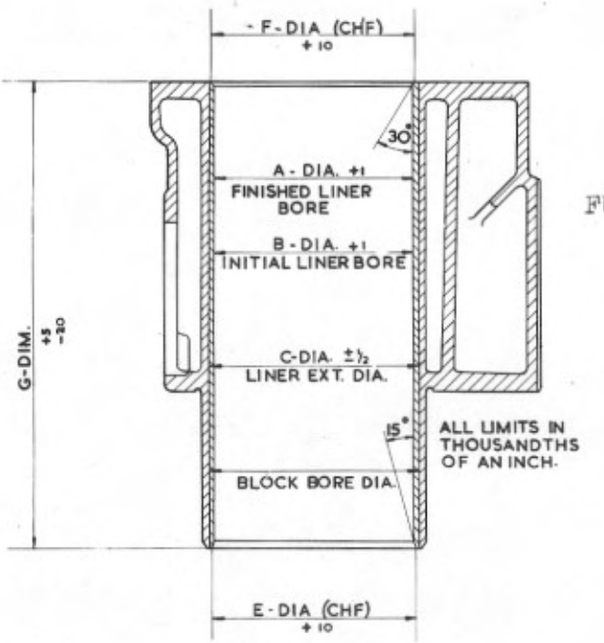
After pressing in the liner, bore it out to 0.002" undersize and hone finish to size, a matt finish being obtained by using FC.320-L-VGN. stones or an equivalent.

LUBRICANT:

The recommended lubricant is "Dixol Soluble Oil", supplied by:-

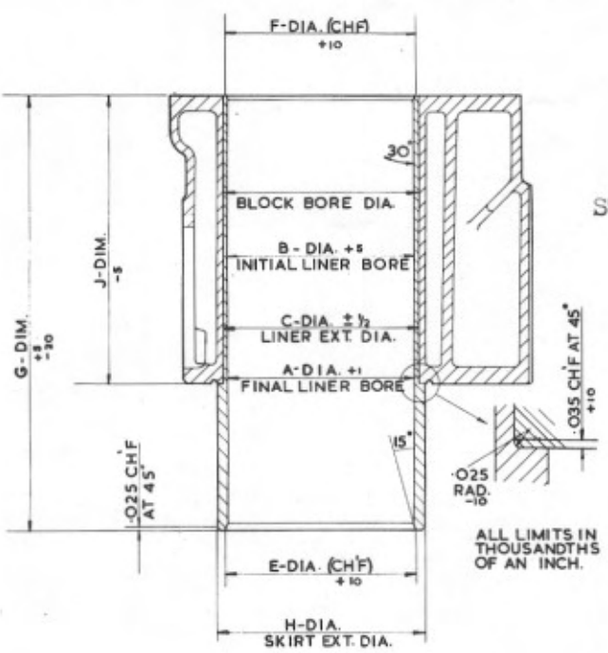
W. B. Dick and Co.,
Rotherhithe,
L O N D O N .

used in proportion 25% Dixol to 75% paraffin.



FULL LENGTH LINER.

MODEL	A-DIA	B-DIA	C-DIA	E-DIA	F-DIA	G-DIA	LINER PIECE No.
20 H.P.	3·000	2·980	3·1275	3·050	3·050	7·625	R.3689
20-25 H.P.	3·250	2·230	3·3775	3·300	3·300	7·625	R.3690
WRAITH & 25-30 H.P.	3·500	3·480	3·6275	3·550	3·550	7·625	R.3691
PHANTOM I	4·250	4·230	4·378	4·300	4·300	9·875	R.3692
PHANTOM II	4·250	4·230	4·378	4·300	4·300	9·450	R.3693



STEPPED LINER.

MODEL	A-DIA	B-DIA	C-DIA	E-DIA	F-DIA	G-DIA	H-DIA	J-DIA	LINER PIECE No.
20 H.P.	3·000	2·980	3·1275	3·050	3·050	7·625	3·350	5·000	R.3697
20-25 H.P.	3·250	3·230	3·3775	3·300	3·300	7·625	3·575	5·000	R.3698
WRAITH & 25-30 H.P.	3·500	3·480	3·6275	3·550	3·550	7·625	3·750	5·000	R.3698
PHANTOM I	4·250	4·230	4·378	4·300	4·300	9·875	4·700	5·875	R.3700
PHANTOM II	4·250	4·230	4·378	4·300	4·300	9·450	4·600	7·000	R.3701

Material: Centrifugally Cast Iron.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E3.

SB/GF.1/IB

Subject: CYLINDER LINERS.
DRY LINERS FOR ROLLS-ROYCE ENGINES.
ALL TYPES EXCEPT PHANTOM III.

Date of Issue 1st June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

In cases where it is necessary to rebore and fit replacement pistons to an engine which already has been bored to the maximum permissible oversize, a dry liner may be fitted.

This liner may take the following two forms:- (a) A Full Length parallel type for the purpose of restoring bore diameter to the original size. (b) A Stepped Liner, the lower part of which constitutes a replacement "Skirt", or bore extension. This can be used to salvage any block having a broken extension, irrespective of bore size.

MACHINING INSTRUCTIONS FOR BLOCK.

The machining procedure for the block depends upon the type of liner to be fitted and is as follows:-

FULL LENGTH LINER: Bore cylinder block skirt extensions to the appropriate dimensions given in the data schedule on page 3 of this leaflet.

STEPPED LINER: Machine off the broken skirt flush with the base of the cylinder, and bore out the block to the appropriate dimensions given in the data schedule on page 4 of this leaflet. Upon completion of this operation, chamfer the inside edge at the base of the cylinder bores as shown in the diagrams.

LIMITS OF INTERFERENCE.

The limits of interference between the liner and the block are as follows:-

20 H.P.
20/25 H.P.
25/30 H P. — 0.002" to 0.0025".
Wraith

Phantom I
Phantom II — 0.0025" to 0.003".

These figures are the maximum and minimum, and there should be no variation above or below.

FITTING INSTRUCTIONS FOR LINERS.

PREPARATION:- Prior to inserting into the block, all liners should be externally coated with a rust promoting compound such as Sal-Ammoniac.

PRESSING IN LOAD:- The load required to press the liner into the block is as follows:- 2 to 3 tons.

INTERNAL BORE FINISH:

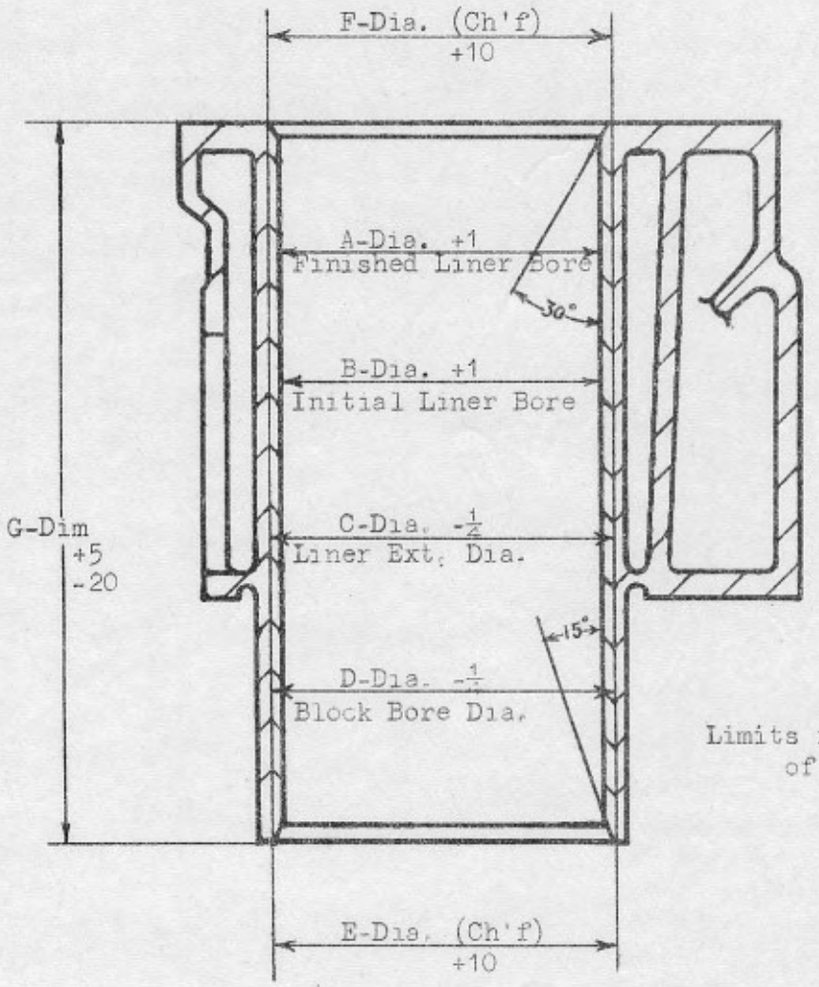
After pressing in, the internal bore of the liner should be ground to approximately .002" undersize, and hone finished to the required size, a matt finish being obtained by using FC 320-L-VGN stones, or nearest equivalent, if this specification is not available.

A recommended lubricant is Dixol Soluble Oil, and is supplied by:-

Messrs. W.B. Dick & Co.,
Rotherhithe,
LONDON.

This should be used with paraffin in the proportion 25% oil to 75% paraffin.

FULL LENGTH LINER.

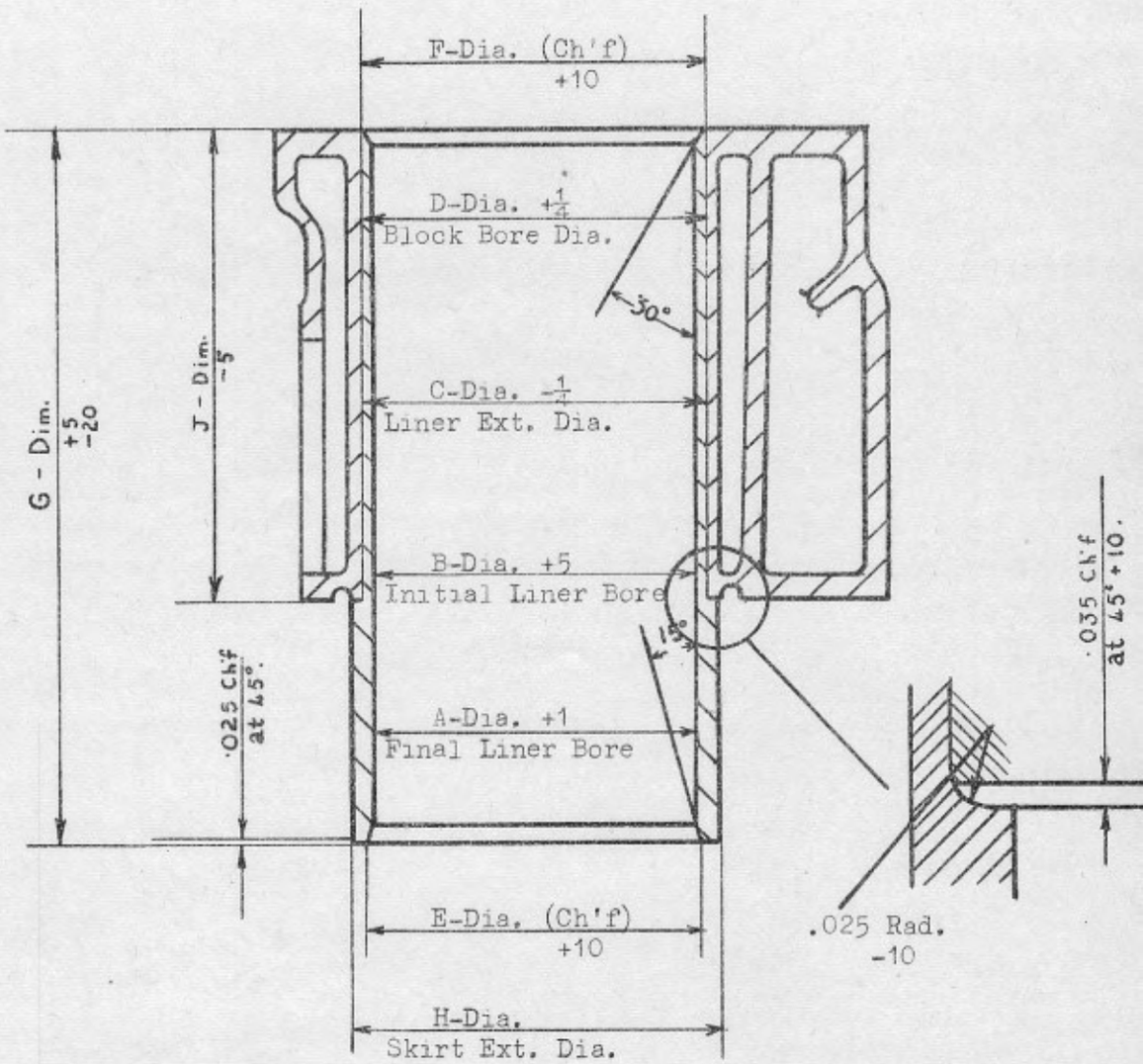


Limits in Thousandths of an inch.

Material: Centrifugally Cast Iron.

MODEL	A-Dia.	B-Dia.	C-Dia.	D-Dia.	E-Dia.	F-Dia.	G-Dia.	Liner Piece N
20 H.P.	3.000	2.980	3.1275	3.125	3.050	3.050	7.625	R.3689
20-25 H.P.	3.250	2.230	3.3775	3.375	3.300	3.300	7.625	R.3690
Wraith & 25-30 H.P.	3.500	3.480	3.6275	3.625	3.550	3.550	7.625	R.3691
PHANTOM I.	4.250	4.230	4.378	4.375	4.300	4.300	9.875	R.3692
PHANTOM II.	4.250	4.230	4.378	4.375	4.300	4.300	9.450	R.3693

STEPPED LINERS.



Limits in thousandths of an inch.

Material: Centrifugally Cast-Iron.

MODEL	A-Dia.	B-Dia.	C-Dia.	D-Dia.	E-Dia.	F-Dia.	G-Dia.	H-Dia.	J-Dia.	LINER PIECE N
20 H.P.	3.000	2.980	3.1275	3.125	3.050	3.050	7.625	3.350	5.000	R3697
20-25 H.P.	3.250	3.230	3.3775	3.375	3.300	3.300	7.625	3.575	5.000	R3698
25-30 H.P. & WRAITH	3.500	3.480	3.6275	3.625	3.550	3.550	7.625	3.750	5.000	R3699
PHANTOM I	4.250	4.230	4.378	4.375	4.300	4.300	9.875	4.700	5.875	R3700
PHANTOM II	4.250	4.230	4.378	4.375	4.300	4.300	9.450	4.600	7.000	R3701

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E2

S3/GS. 1/JM.

Subject :

DISTRIBUTOR DRIVE.
20 H.P. 20/25 H.P. & 25/30 H.P.

Date of Issue: 2nd Dec. 194

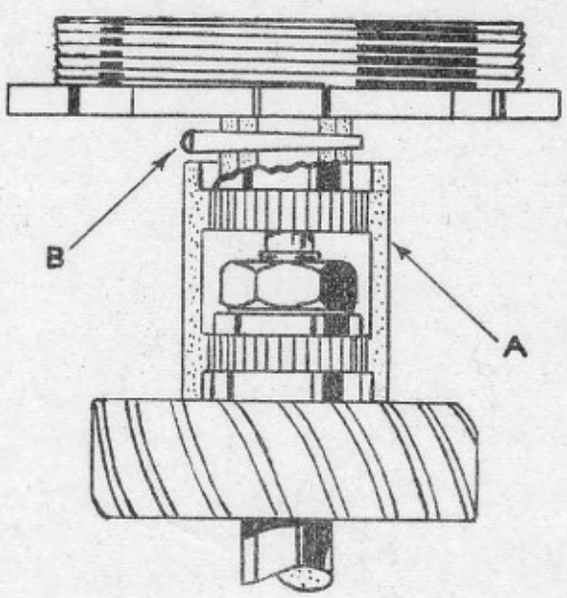
IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

It is necessary to draw attention to the following point in connection with the distributor drive on the above models. The splined sleeve shown at "A" in the sketch is free to move vertically on the splines, but complete dis-engagement is prevented by the taper pin "B" on which the sleeve butts after a limited amount of vertical travel.

If the pin is short, the condition may arise in which the sleeve ceases to engage the splines and complete ignition failure will occur on the road.

It is therefore essential, when a distributor is removed or dismantled to make sure that the head of the pin projects to an effective extent. A new pin must be used if the existing one does not project sufficiently when driven into position.



SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E 1.

SB/CM.1/IP.

Subject : CONNECTING ROD BIG END BEARINGS. 20/25 H.P.

Date of Issue 12th August, 1946.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

The original 2.000" bore connecting rod big end bearing shells (Part No.E.55613) carried an external oil groove in the upper half which conveyed oil through the shells to the connecting rod for the feed to the gudgeon pin.

In order to avoid cracking of the white metal which might occur due to local distortion in the vicinity of the groove, the original type shells will be no longer manufactured, and for replacement purposes, shell EB.3463* will be used.

This shell has no external groove and it is most important to machine the connecting rod so as to incorporate the necessary oilway as shown in Fig 1.

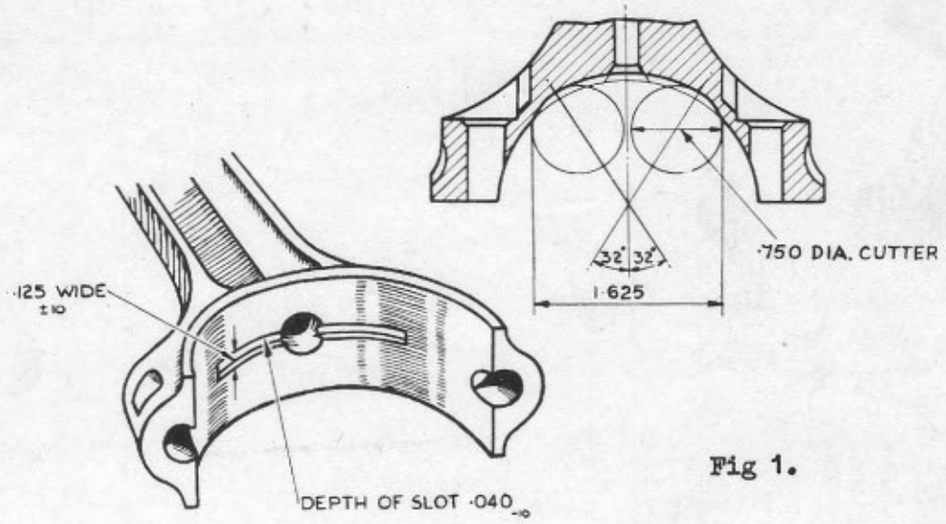


Fig 1.

On connecting rods fitted with an external oil pipe, an additional counterboring operation is necessary to connect the groove with the oil hole. This is shown in Fig 2.

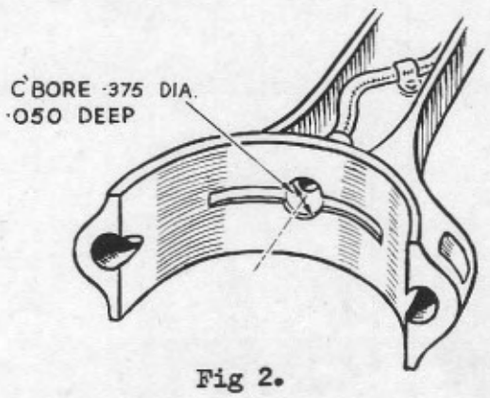


Fig 2.

* An alternative shell, Part No. R.3231, may be used. This is sufficiently small in the bore for use with undersize crankpins up to a maximum of .040 on diameter.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E2

S3/GS. 1/JM.

Subject :

DISTRIBUTOR DRIVE.
20 H.P. 20/25 H.P. & 25/30 H.P.

Date of Issue: 2nd Dec. 194

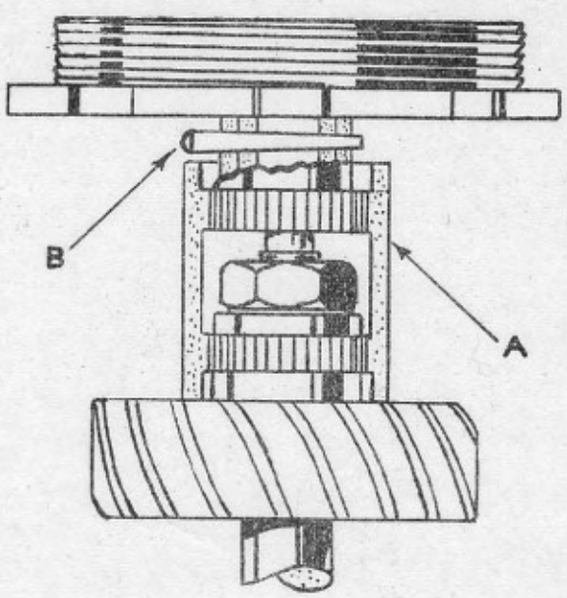
IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

It is necessary to draw attention to the following point in connection with the distributor drive on the above models. The splined sleeve shown at "A" in the sketch is free to move vertically on the splines, but complete dis-engagement is prevented by the taper pin "B" on which the sleeve butts after a limited amount of vertical travel.

If the pin is short, the condition may arise in which the sleeve ceases to engage the splines and complete ignition failure will occur on the road.

It is therefore essential, when a distributor is removed or dismantled to make sure that the head of the pin projects to an effective extent. A new pin must be used if the existing one does not project sufficiently when driven into position.



SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E3.

SB/GF.1/IB

Subject: CYLINDER LINERS.
DRY LINERS FOR ROLLS-ROYCE ENGINES.
ALL TYPES EXCEPT PHANTOM III.

Date of Issue 1st June, 1948.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

In cases where it is necessary to rebore and fit replacement pistons to an engine which already has been bored to the maximum permissible oversize, a dry liner may be fitted.

This liner may take the following two forms:- (a) A Full Length parallel type for the purpose of restoring bore diameter to the original size. (b) A Stepped Liner, the lower part of which constitutes a replacement "Skirt", or bore extension. This can be used to salvage any block having a broken extension, irrespective of bore size.

MACHINING INSTRUCTIONS FOR BLOCK.

The machining procedure for the block depends upon the type of liner to be fitted and is as follows:-

FULL LENGTH LINER: Bore cylinder block skirt extensions to the appropriate dimensions given in the data schedule on page 3 of this leaflet.

STEPPED LINER: Machine off the broken skirt flush with the base of the cylinder, and bore out the block to the appropriate dimensions given in the data schedule on page 4 of this leaflet. Upon completion of this operation, chamfer the inside edge at the base of the cylinder bores as shown in the diagrams.

LIMITS OF INTERFERENCE.

The limits of interference between the liner and the block are as follows:-

20 H.P.
20/25 H.P.
25/30 H P. — 0.002" to 0.0025".
Wraith

Phantom I
Phantom II — 0.0025" to 0.003".

These figures are the maximum and minimum, and there should be no variation above or below.

FITTING INSTRUCTIONS FOR LINERS.

PREPARATION:- Prior to inserting into the block, all liners should be externally coated with a rust promoting compound such as Sal-Ammoniac.

PRESSING IN LOAD:- The load required to press the liner into the block is as follows:- 2 to 3 tons.

INTERNAL BORE FINISH:

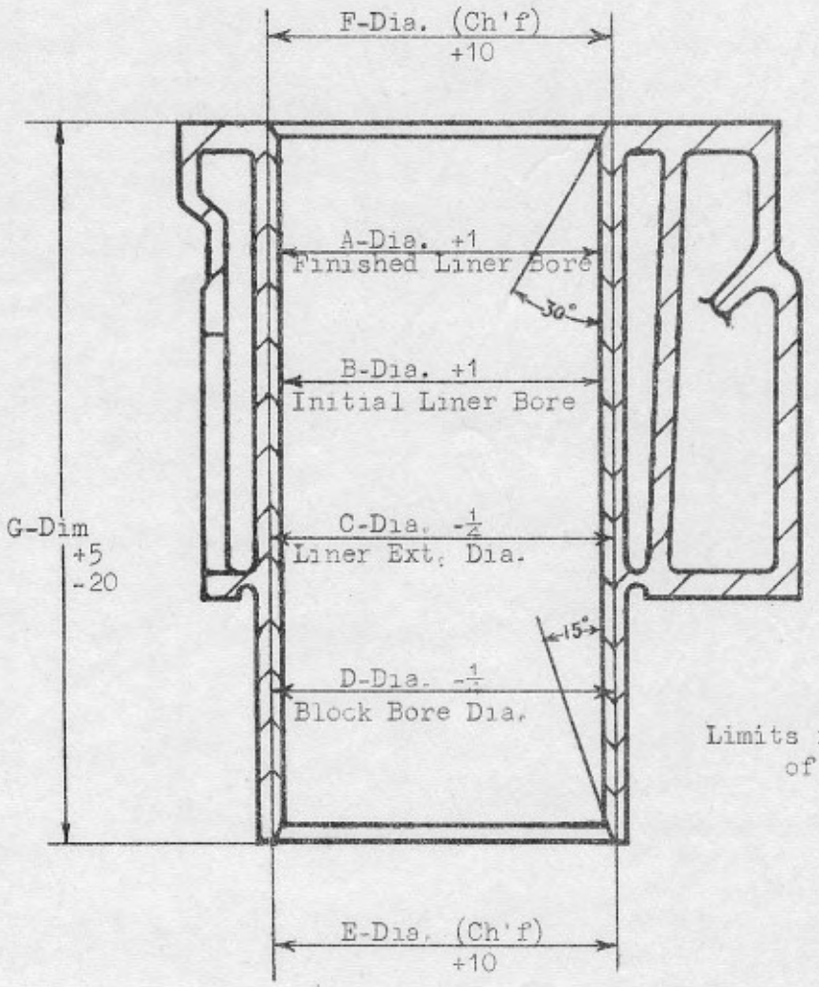
After pressing in, the internal bore of the liner should be ground to approximately .002" undersize, and hone finished to the required size, a matt finish being obtained by using FC 320-L-VGN stones, or nearest equivalent, if this specification is not available.

A recommended lubricant is Dixol Soluble Oil, and is supplied by:-

Messrs. W.B. Dick & Co.,
Rotherhithe,
LONDON.

This should be used with paraffin in the proportion 25% oil to 75% paraffin.

FULL LENGTH LINER.

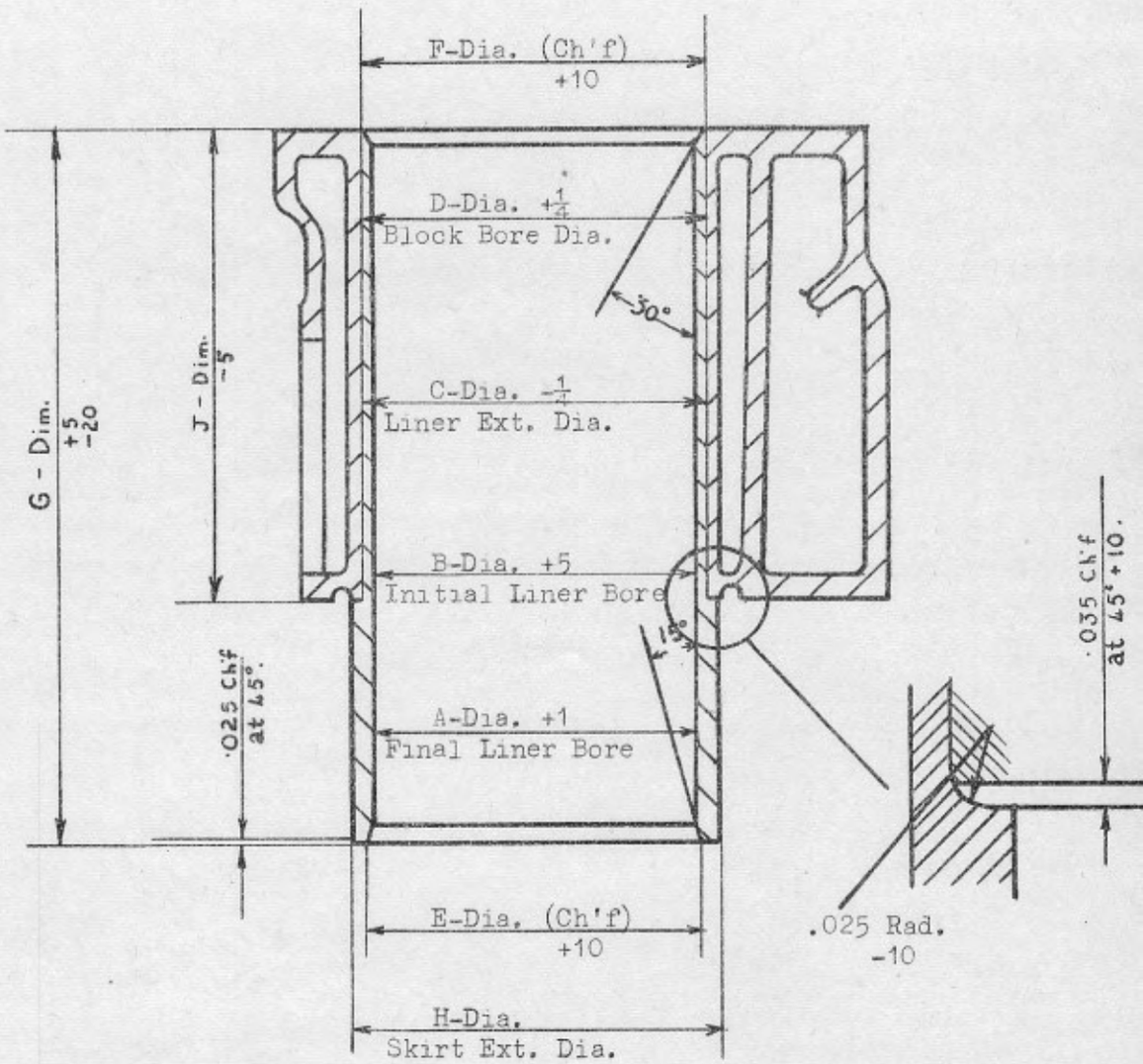


Limits in Thousandths of an inch.

Material: Centrifugally Cast Iron.

MODEL	A-Dia.	B-Dia.	C-Dia.	D-Dia.	E-Dia.	F-Dia.	G-Dia.	Liner Piece N
20 H.P.	3.000	2.980	3.1275	3.125	3.050	3.050	7.625	R.3689
20-25 H.P.	3.250	2.230	3.3775	3.375	3.300	3.300	7.625	R.3690
Wraith & 25-30 H.P.	3.500	3.480	3.6275	3.625	3.550	3.550	7.625	R.3691
PHANTOM I.	4.250	4.230	4.378	4.375	4.300	4.300	9.875	R.3692
PHANTOM II.	4.250	4.230	4.378	4.375	4.300	4.300	9.450	R.3693

STEPPED LINERS.



Limits in thousandths of an inch.

Material: Centrifugally Cast-Iron.

MODEL	A-Dia.	B-Dia.	C-Dia.	D-Dia.	E-Dia.	F-Dia.	G-Dia.	H-Dia.	J-Dia.	LINER PIECE N
20 H.P.	3.000	2.980	3.1275	3.125	3.050	3.050	7.625	3.350	5.000	R3697
20-25 H.P.	3.250	3.230	3.3775	3.375	3.300	3.300	7.625	3.575	5.000	R3698
25-30 H.P. & WRAITH	3.500	3.480	3.6275	3.625	3.550	3.550	7.625	3.750	5.000	R3699
PHANTOM I	4.250	4.230	4.378	4.375	4.300	4.300	9.875	4.700	5.875	R3700
PHANTOM II	4.250	4.230	4.378	4.375	4.300	4.300	9.450	4.600	7.000	R3701

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E3A.

SB/VK/JSL/JSK.

Subject : CYLINDER LINERS
DRY LINERS FOR ROLLS-ROYCE ENGINES.
(Except Phantom III)

Date of Issue 6th March, 1953.

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

In cases where it is necessary to rebore and fit replacement pistons to an engine which has already been bored to the maximum permissible oversize, a dry liner may be fitted.

This liner may be either:-

(a) A Full-length parallel type to restore the bore diameter to the original size.

(b) A Stepped liner, the lower part of which constitutes a "skirt" or bore extension. This can be used to salvage any block having a broken extension, irrespective of bore size.

MACHINING INSTRUCTIONS FOR BLOCK:

FULL-LENGTH LINER - Each liner must be treated individually, and its external diameter measured, taking a micrometer reading across the diameter at six points; then bore to the mean reading, allowing an interference as shown below.

STEPPED LINER - Machine off the broken skirt flush with the bore of the cylinder. Measure the liner and bore out as above. Chamfer the inside edge of the cylinder bores as shown in the diagram.

LIMITS OF INTERFERENCE:

20 H.P. 20/25 H.P. 25/30 H.P. Wraith	0.002" to 0.0025"
Phantom I Phantom II	0.0025" to 0.003"

FITTING THE LINER:

The load required for pressing in is (approx.) $2\frac{1}{2}$ to $3\frac{1}{2}$ tons.

BORING OUT LINER:

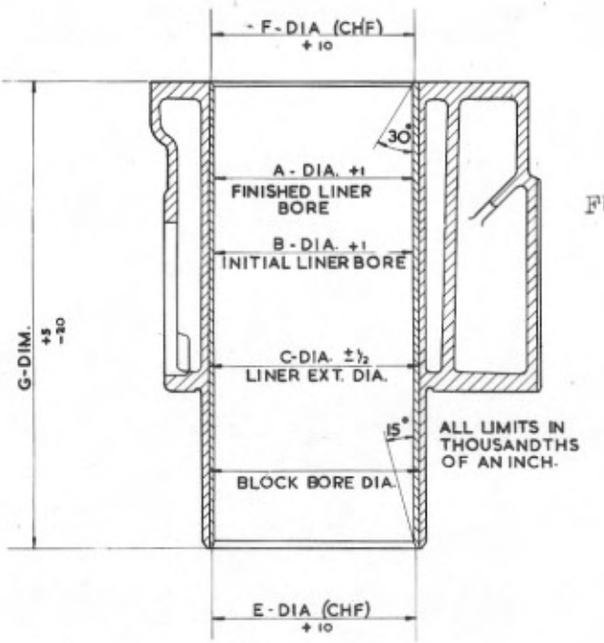
After pressing in the liner, bore it out to 0.002" undersize and hone finish to size, a matt finish being obtained by using FC.320-L-VGN. stones or an equivalent.

LUBRICANT:

The recommended lubricant is "Dixol Soluble Oil", supplied by:-

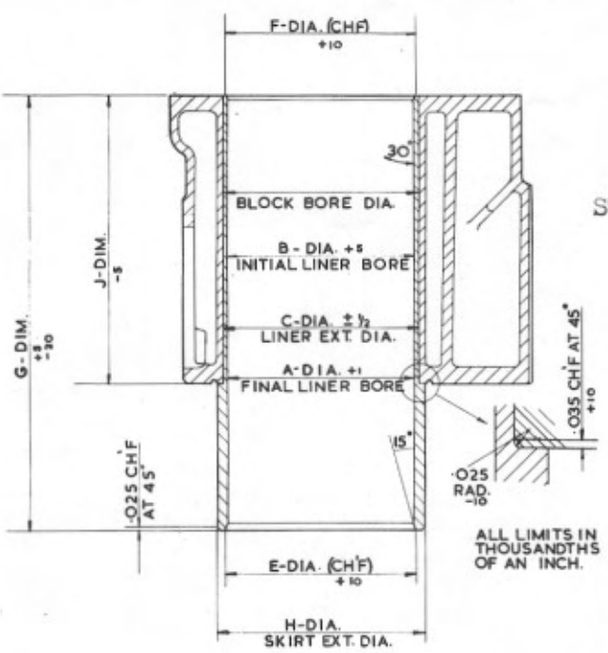
W. B. Dick and Co.,
Rotherhithe,
L O N D O N .

used in proportion 25% Dixol to 75% paraffin.



FULL LENGTH LINER.

MODEL	A-DIA	B-DIA	C-DIA	E-DIA	F-DIA	G-DIA	LINER PIECE No.
20 H.P.	3·000	2·980	3·1275	3·050	3·050	7·625	R.3689
20-25 H.P.	3·250	2·230	3·3775	3·300	3·300	7·625	R.3690
WRAITH & 25-30 H.P.	3·500	3·480	3·6275	3·550	3·550	7·625	R.3691
PHANTOM I	4·250	4·230	4·378	4·300	4·300	9·875	R.3692
PHANTOM II	4·250	4·230	4·378	4·300	4·300	9·450	R.3693



STEPPED LINER.

MODEL	A-DIA	B-DIA	C-DIA	E-DIA	F-DIA	G-DIA	H-DIA	J-DIA	LINER PIECE No.
20 H.P.	3·000	2·980	3·1275	3·050	3·050	7·625	3·350	5·000	R.3697
20-25 H.P.	3·250	3·230	3·3775	3·300	3·300	7·625	3·575	5·000	R.3698
WRAITH & 25-30 H.P.	3·500	3·480	3·6275	3·550	3·550	7·625	3·750	5·000	R.3698
PHANTOM I	4·250	4·230	4·378	4·300	4·300	9·875	4·700	5·875	R.3700
PHANTOM II	4·250	4·230	4·378	4·300	4·300	9·450	4·600	7·000	R.3701

Material: Centrifugally Cast Iron.

SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/E 8

SB/TJ/FH.1PR

Subject : Standard and Oversize oil control rings fitted to 20/25 H.P. 25/30 H.P. Wraith, Phantom II & Phantom III cars

Date of Issue 12th June, 1957

IMPORTANT

THE CONTENTS OF THIS DOCUMENT ARE STRICTLY CONFIDENTIAL AND ARE NOT TO BE TRANSMITTED TO ANY UNAUTHORIZED PERSON.

It has been decided to standardize the fitting of Duaflex oil control rings on the above mentioned cars. These will be available in the Standard and oversize ranges as specified below.

Gap setting of these rings is not required when fitting. Full fitting instructions will be included with each order, and should be closely followed.

Duaflex Part Nos.

Rolls-Royce 20/25

Standard size	-	R.5390
.010" oversize	-	R.5460
.020" "	-	R.5461
.030" "	-	R.5462
.040" "	-	R.5463
.050" "	-	R.5464

25/30 and Wraith

Standard size	-	RE.21327
.010" oversize	-	R.5465
.020" "	-	R.5466
.030" "	-	R.5467
.040" "	-	R.5468
.050" "	-	R.5469

Phantom II

Standard size	-	R.5308
.010" oversize	-	R.5470
.020" "	-	R.5471
.030" "	-	R.5472
.040" "	-	R.5473
.050" "	-	R.5474

Phantom III

Standard size	-	R.5264
.010" oversize	-	R.5475
.020" "	-	R.5476
.030" "	-	R.5477
.040" "	-	R.5478
.050" "	-	R.5479