

BRAKES



SERVICE INSTRUCTION LEAFLET

ISSUED BY
ROLLS-ROYCE LIMITED

RR/J2

SB/GS. 3/IP.

Subject :
BRAKES.
ADJUSTMENT, ALL MODELS.

Date
of 6th March, 1946.
Issue

I. GENERAL.

As the linings wear with use the amount of lever movement and pedal travel before the brakes are applied increases, and after a certain point becomes excessive, causing such faults as inefficiency, thump or pulling to one side. Therefore it is important that very careful attention should be paid to the adjustment of the brakes to obtain the best results.

The adjustment of the brakes varies with individual models as described later, and may consist of a simple form of wing nut adjustment on the later models or, on the earlier cars, either a serrated adjustment on the ends of the actuating shafts, or variable length operating rods.

In the case of those cars not fitted with the wing nut adjustment it is necessary to check the travel of the brake actuating levers situated on the front brake carrier plates, which in all cases should be $\frac{1}{2}$ ". The table below shows the correct amount of free travel measured at the ends of the levers on the brake actuating shafts under the rear axle.

MODEL.	FOOT.	HAND.
20. H. P.	$\frac{5}{8}$ "	$\frac{3}{4}$ "
20/25.H.P. PLAIN DRUMS.	$\frac{5}{8}$ "	$\frac{3}{4}$ "
" " RIBBED DRUMS.	1"	$\frac{3}{4}$ "
25/30.H.P.	WING NUT.	$\frac{3}{4}$ "
WRAITH.	WING NUT.	WING NUT.
PHANTOM II.	$\frac{5}{8}$ " - $\frac{3}{4}$ "	$\frac{5}{8}$ " - $\frac{3}{4}$ "
PHANTOM III.	WING NUT.	SERRATED BUSH.

On those models having a serrated adjustment on the cam operating levers there will be found numbers 1,2,3,4, and 5 stamped on one serrated member and an arrow on the corresponding serrated disc. These show clearly how much the lever has been moved. If, on inspection, the arrow is found pointing to number 5 then all adjustment has previously been taken up and the necessity for a re-line is indicated.

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continued:

II. METHOD OF ADJUSTMENT.

FRONT: Phantom I & II. 20 H.P. and 20/25 H.P.

Refer to Fig. 1.

1. Remove the split pin and unscrew the nut (G).
2. Remove the cover (H) and unscrew the nut (M) sufficiently to permit the serrated member (K) to be moved clear of the serrations on the lever (L).
3. Disengage the serrated parts by tapping the lever (L) away from the wheel and while holding the serrated member (K) tap the lever back again.
4. Turn the hexagon (J) in a direction to apply the brakes by an amount equal to one tooth at a time. The correct adjustment is obtained when it is possible to move the

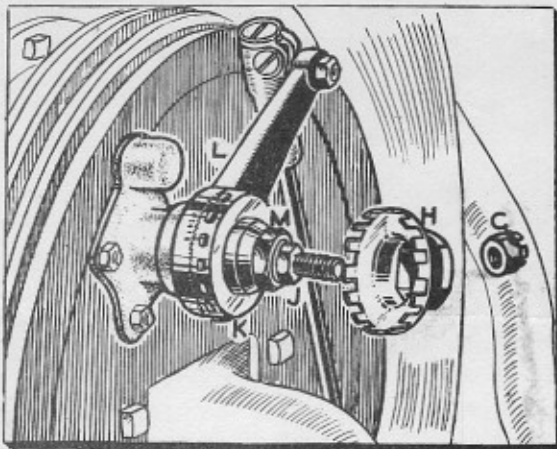


Fig. 1.

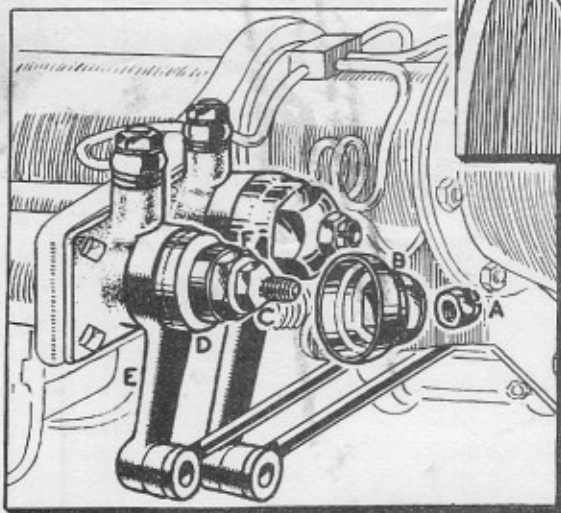


Fig. 2.

REAR: Phantom I & II. (Foot and hand brake).

Refer to Fig. 2.

1. Remove the split pin and unscrew the nut (A).
2. Remove the cover (B) and slacken the nut (F) sufficiently to permit the serrations on the disc (D) to disengage with those on the boss of the lever (E).
3. Rotate the actuating shaft by means of a spanner on the hexagon (C) in a direction to apply the brakes by an amount equal to one tooth at a time until the correct amount of lever travel is obtained. (See table).

end of the lever (L) not less than $\frac{1}{2}$ ". Particular care must be taken to see that each front brake is adjusted until there is an equal amount of travel.

continued:

REAR: 20 H.P. and 20/25 H.P. (Hand and foot brakes).
25/30 H.P. (Hand brake only).

Refer to Fig. 3.

1. Remove the clevis pin or bolt (A) from the jaw (B) and slacken the nut on the pinch bolt (C).
2. The jaw (B) may now be screwed on the rod (D) according to the adjustment required. (See table).

Note:- The adjustment of the handbrake is similar and must be carried out while the foot brake jaw (B) is disconnected.

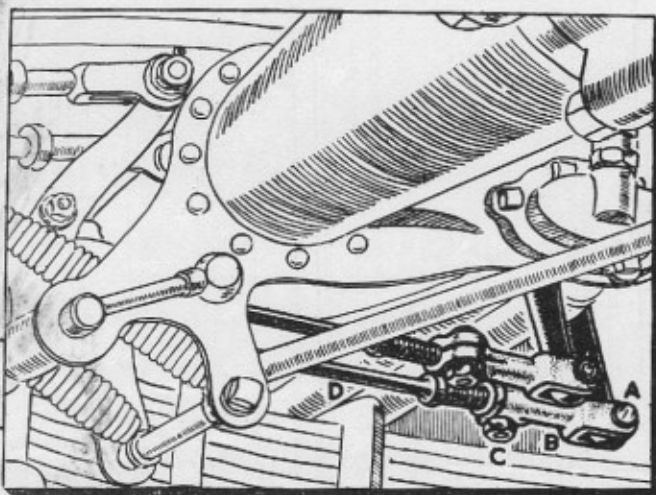


Fig. 3.

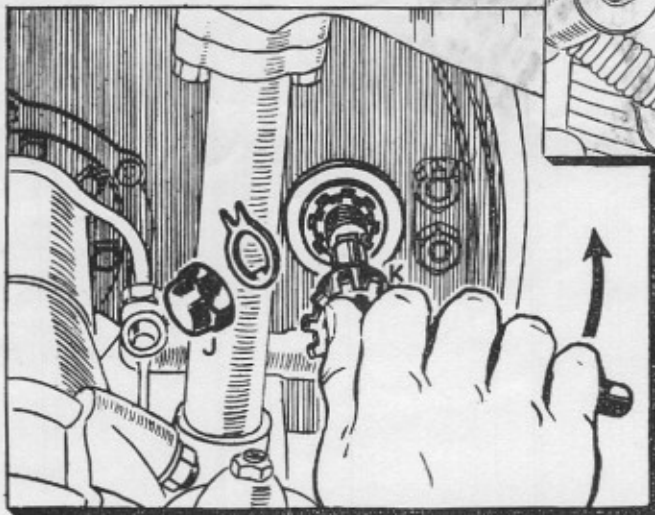


Fig. 4.

REAR: Phantom III. (Hand brake).

The Phantom III although having wing nut adjustment on its foot brakes has a serrated bush adjustment on the hand brake. To carry out an adjustment to the serrated bush situated forward of the axle on the back plate of the brake drum proceed as follows:-

Refer to Fig 4.

1. Remove the hexagon cap nut (J) and lock washer on the outer end of the actuating shaft.
2. Withdraw the serrated bush (K). This may be tight, if so, apply penetrating oil and lever out evenly from both sides.
3. Pull on the hand brake lever two notches.

continued:

4. With the bush threaded on, insert the square ended key, supplied in the toolkit, into the square hole in the end of the actuating shaft. Rotate the key as far as possible in an upward direction i.e. in a direction to apply the brakes, and hold in this position whilst re-inserting the serrated bush. The bush must be rotated until the position is found where both internal and external serrations engage.
5. Replace the lockwasher and hexagon nut.

Note:- To check that the near side and off side hand brakes are equally adjusted measure the distance from the end of the operating lever to the brake back plate on each side.

FRONT AND REAR: Wraith, Phantom III, 25/30 H.P. (Foot brake).
And the later type 20/25 H.P.

Wing Nut Adjustment.

It is most important that only the fingers are used to turn these nuts. They are formed with cam shaped bosses bearing on cylindrical trunnions in such a way that rotation of the nut through 90° causes the brake shoes to be moved towards the drum as the cams ride over the trunnion. This movement is carefully predetermined, and is equal to the normal clearance between shoes and drum when the shoes are in the off position. Screwing on the nut through a further 90° , that is a total of half a turn, allows the shoes to return to an off position which is half a turn of the adjustment nearer to the drum. The adjustment is self-locking.

The nut should be screwed up until the cam action described prevents further rotation with the fingers, owing to the shoes being applied to the drums. The setting will then be correct, and the adjustment locked if the nut be turned back one quarter of a turn.

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ROLLS-ROYCE LIMITED, SERVICE STATION, HYTHE ROAD, WILLESDEN, LONDON, N.W.10



SERVICE INSTRUCTION LEAFLET

ISSUED BY
ROLLS-ROYCE LIMITED

RR/J1.

SB/GS. 2/IP.

Subject :
BRAKES, GENERAL INFORMATION.
ALL MODELS.

Date
of 25th Feb, 1946.
Issue

1. GENERAL DESCRIPTION.

The Rolls-Royce four wheel braking system, incorporates a servo motor of the dry disc clutch type driven through worm gearing from the main-drive shaft in the gear-box. The linkage is so arranged to provide servo assistance in both forward and reverse motion, but a proportion of rear braking is achieved by direct manual pedal pressure entirely independent of the servo.

The illustration below shows a typical layout. This is purely diagrammatic and certain features differ on the various models, as for instance the brakes are operated by direct tension rods on the later models, as opposed to torsion shafts on the early cars.

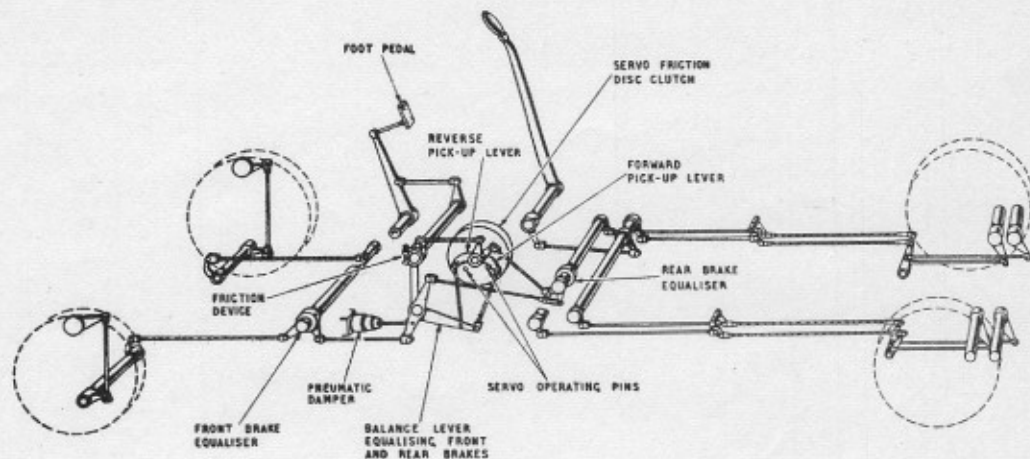


DIAGRAM OF BRAKING SYSTEM

Initial pressure on the brake pedal brings the rear brakes into operation and further pressure engages the servo, which through the medium of a special T shaped balancing lever, augments the direct rear braking effort and at the same time applies the front brakes.

The net result is that between 35% and 55% of the total braking effect is applied to the front wheels, the actual proportion varying on different models, dependent upon the leverage arrangement. During braking, however, the forward momentum of the car imposes a greater weight on the front wheels thereby rendering it highly improbable that they will ever become locked.

A point worthy of note is that in the event of both rear wheels locking during violent braking, the servo ceases to assist the manual effort, and imposes no more loading on either front or rear brakes, thus assisting the driver to maintain control of the car.

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continued:

Both front and rear brakes are provided with a separate equalising mechanism to ensure even braking on each side, and there is also a compensating device between front and rear brakes.

As the front brakes are solely servo operated, a frictional damping device is provided to prevent their sudden or violent application. Noisy release of the servo levers is prevented by a pneumatic damper, which acts in one direction only, a non-return valve eliminating any damping effect during the application of the brakes. The Wraith, however, is fitted with a hydraulic damper in the front brake linkage.

The hand brake lever operates an entirely independent set of shoes within the rear brake drums of all models excepting the Wraith, on which the same shoes are used for both hand and foot operation.

The actual brake shoes are of the two shoe direct cam operated type, the majority being of cast aluminium. On most later models, an auxiliary tipping shoe is pivoted on each main shoe, the object being to eliminate the tendency to squeaks by maintaining a damping effect on the brake drums by virtue of the relatively heavy bedding at the toe of each shoe.

II. POSSIBLE COMPLAINTS.

The various complaints likely to be met with are set out in the following table together with the cause and remedy. In diagnosing troubles, it is well to remember the following points:-

- (a) The bodies on Rolls-Royce cars vary considerably in weight and this may account for certain complaints of inefficiency of the brakes due to the additional weight of the vehicle.
- (b) Brake squeaks have been found to be aggravated by the conditions of use. For instance, in certain cases the brakes may be used continually in town and this constant light application produces a glazed surface on the liners which causes groans on pulling up. On the other hand, continual and heavy application of the brakes during hard driving in the open country may overheat and burn the liners and this subsequently causes a pre-disposition to squeaks.
- (c) Water in the brakes temporarily destroys the frictional properties, and in cases of complaint the owner or driver should be advised to exercise restraint when washing down the inside of the wheels and brakes with the hose.
- (d) Wartime restrictions have resulted in certain well tried and approved liner material being rendered unobtainable, and substitutes have perforce had to be resorted to which may not have the characteristics necessary to ensure freedom from squeaks etc.

Complaint.	Cause.	Due to.	Remedy.
Brakes inefficient.	I. Brake liners glazed or worn out.	Wear & tear.	Reline.
	II. Oil on brakes.	(a) Too much oil in axle box. (b) Excessive use of one shot.	Clean out drums and reline.
	III. Servo inefficient.	(a) Servo liners glazed, worn or oily. (b) Incorrect adjustment.	Reline servo. Re-adjust.
	IV. Water on brakes.	Ingress of water during washing.	Dry off by application of brakes.
	V. Incorrect adjustment.	Wear or Neglect.	Re-adjust.
Brakes squeak or groan.	I. Liners glazed.	Constant light application only.	Rough up and re-bed liners or reline.
	II. Liners overheated.	Violent use of brakes.	Reline.
	III. Brake drums rusted	Condensation.	Brakes require using.
	IV. Drums distorted.	Overheating due to prolonged use.	Regrind drums.
Brakes grab or thump.	I. Excessive travel.	Incorrect adjustment.	Re-adjust.
	II. Front brakes come on first.	(a) Insufficient damping. (b) Excessive travel rear brakes.	Tighten up swinging arm on servo. Adjust rear brakes.
	III. Fierce brakes.	Incorrect bedding of brakes.	Re-bed.
Brakes pull to one side.	I. Oil on brakes.	Excessive use of one shot.	Clean out brakes or reline.
	II. Unequal bedding.		Re-bed.
	III. Uneven adjustment.		Re-adjust.
Brakes fade.	Overheated liners.	Prolonged or violent application of brakes.	Reline.
Heavy pedal pressure.	Servo inefficient.	Servo liners glazed or oily.	Reline servo.

ADJUSTMENT OF SERVO MOTOR - ALL MODELS.

The adjustment of the servo motor is effected through the larger hexagonal nut, located at the extreme end of the servo shaft.

This nut is locked by 25 radial serrations which engage similar serrations formed on the face of a washer which is secured against rotation relative to the shaft. Each of these serrations are carefully proportioned to give the correct clearance of the servo, and care should be taken to see that these are in proper engagement at all times. On all occasions when screwing up the adjusting nut, force should not be used, as this will only result in defeating the object of the teeth, namely, to ensure the correct amount of clearance with the minimum amount of trouble.

There are two methods of adjustment. The first is that already laid down in the various handbooks. This consists of screwing up the adjusting nut one serration at a time until the correct amount of free pedal travel is obtained. Owing to the fact that a certain amount of wear may have taken place in the linkage joints and the pedal fulcrum, this method may result in a servo clearance which is slightly too close. Should it be decided that this method will be used, however, the free pedal travel recommended for the various chassis types is as follows:-

20 H.P.)	1/4"
Phantom I)	
20/25 H.P.)	1/2"
25/30 H.P)	
Wraith)	
Phantom II)	
Phantom III)	

The alternative method is by checking of the servo clearance itself.

This is effected by pushing the servo drum towards the gearbox as far as it will go, and applying the foot brake, noting the amount of movement of the servo drum. The correct clearance for all models is 1/32" end float. The adjusting nut should be screwed up one serration at a time only, until this clearance is obtained.

Should the adjusting nut be screwed up beyond the recommended amount, there will be a tendency for the servo to drag, thereby causing rapid deterioration in braking efficiency.

OVERHAUL OF SERVO MOTOR - ALL MODELS.

REMOVAL AND DISMANTLING:

a) 20 H.P. 20/25 H.P; 25/30 H.P.: Phantom I & II:

1. Disconnect all the centralised lubrication pipes to the servo, where fitted. *Clean*
2. Remove all the clevis pins and collars from the following points:-
Servo shaft cam levers.
Pneumatic damper connecting arm. (Where applicable).
Upper and lower arms of 'T' shaped balance lever.
3. Remove pinch bolt securing lever on to the servo end of the foot pedal cross shaft, and pull off the lever.
4. Slacken off the adjusting nut on the suspension link adjustment.

Remove

5. Remove the pneumatic damper, where applicable.
 6. Bend back the tab washer, and remove the large hexagonal nut securing the front end of the supporting plate on the pedal cross shaft.
- NOTE: On certain models a metal distance piece or washer will be found.
7. Remove the suspension link adjusting nut, coil spring, top and bottom collars, and the bolt.
 8. Remove the nut which secures the rear end of the supporting plate.
 9. Jack up one of the rear wheels, rotate the servo and remove the nuts securing the drum to the driving plate.
 10. Separate the drum from the driving plate, and remove the servo unit complete with suspension link and balance lever.

NOTE: Particular care should be taken to ^{see} that the driving plate is not pulled away from the gearbox, as this may result in the distance piece on the end of the shaft dropping into the gearbox. **IMPORTANT**

11. Remove the circlip from the end of the servo shaft, unscrew the large adjusting nut, and pull off the serrated washer and buffer springs.
12. Remove both cam levers, taking care not to lose the balls.

NOTE: Certain models do not use steel balls between cam levers.

b) Phantom III & Wraith:

1. Disconnect the centralised chassis lubrication pipes.
2. Remove all clevis pins and collars from the following points:-
Both the servo shaft cam levers.
Upper and lower arms of the 'T' shaped balance lever.
3. Remove the nuts securing the front and rear ends of the supporting plate.
4. Disconnect the rod connecting the friction damper device with the suspension link.
5. Jack up one of the rear wheels, rotate the servo and remove the nuts securing the drum to the driving plate.
6. Separate the drum from the driving plate. (See Note 10 above).
7. Having removed the servo drum from the chassis, screw up the adjusting nut at the end of the servo shaft until the two castellated nuts project through the holes in the inner pressure plate. Remove these nuts and separate the pressure plates.
8. Remove the circlip from the end of the servo shaft, unscrew the adjusting nut, pull off the serrated washer and buffer springs.
9. Remove the cam levers, taking care not to loose the steel balls.

NOTE: In relation to the "Wraith", Item 4, this form of damping will only be found on models prior to chassis WHC-1.

Thoroughly clean the unit with petrol to remove all traces of oil and dirt, and examine the liners for oiliness or superficial hardness and gloss.

Inspect the clevis pins and connecting link yokes for wear and ovality, renewing where necessary. Failure to do so may result in noisy and delayed action of the servo.



SERVICE INSTRUCTION LEAFLET

ISSUED BY

ROLLS-ROYCE LIMITED

RR/J3

SB/GS. 1/IP.

Subject :

BRAKES.
Re-bedding and Relining, All Models.

Date

of 25th March, 1946.

Issue

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GENERAL.

In the event of it being necessary to examine the brakes, the hubs and brake drums must first be removed as described in RR/V1. It should then be obvious whether the complaint is due to the brakes requiring relining, i.e. worn out or oil soaked, or whether roughening up and re-bedding will be adequate.

It must be emphasized that in all cases where the external adjustment has been used up a reline is essential, in spite of the fact that the liners may appear to be capable of a second life by internal adjustment.

It should be noted here that Rolls-Royce liners are somewhat thicker than the general standard, and this is an essential feature in the design of the brakes to obviate the possibility of the rivet heads ever coming into contact with the brake drums, thereby scoring the drums, and probably causing overheating and distortion of the aluminium shoes by heat transference from the drums.

Any attempt to secure further service from worn liners by lengthening the brake toggles is therefore discouraged, and for this reason our early models had the brake toggle jaws drilled and pinned to the toggles after their correct initial setting. The only circumstances under which the toggles should be lengthened is after the brake drums have been re-ground and new liners fitted. Nevertheless there may be cases where unauthorised adjustment has been carried out as a means of obtaining extra life out of the liner. In all such instances the toggles must be reset when relining.

The various operations which may be necessary are set out in the following order.

- I. Brake drums.
- II. Re-bedding of liners.
- III. Setting of auxiliary shoes.
- IV. Removal of brake shoes.
- V. Relining of shoes.
- VI. Cutting and bedding of new liners.

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continued:

I. BRAKE DRUMS.

Clean the brake drums and examine surface for ribbing, scoring, distortion, or overheating. If it is intended to reline the brakes, in all cases the drums should be re-ground. Do not remove the drum from the hub for this operation, but grind as a complete assembly, thus making sure that the drum is concentric with the hub bearings. The best finish is a ground finish free from chatter marks, although the drums may be bored if preferred. The recommended details for grinding are :-

Wheel.	Norton.
Grade.	45N to 60N.
Diameter.	3 $\frac{1}{2}$ "
Speed of wheel.	5500 R.P.M.
Speed of drum.	50 R.P.M. (in opposite direction)

Take as little material out of the drum as possible to obtain a true diameter, otherwise the drums may become too thin, causing distortion and squeaks on application of the brakes. A safe minimum thickness of the drum may be taken as $\frac{1}{8}$ ".

II. RE-BEDDING OF LINERS.

Re-bedding may be effective in the following instances if the linings are otherwise in good condition.

1. Complaints of fierce brakes due to uneven bedding.
2. Brake squeaks or groans.
3. Brakes pull to one side due to unequal bedding.

In some cases it may be found that re-bedding will improve the general efficiency of the brakes.

The drums should be blued and a marking taken on the liners. The liners must then be filed until full length bedding is obtained. If the bedding is satisfactory but glazed, rough up with a coarse file.

In order to avoid the necessity for laborious filing, Rolls-Royce have developed special hand operated cutters which automatically produce 100% bedding.

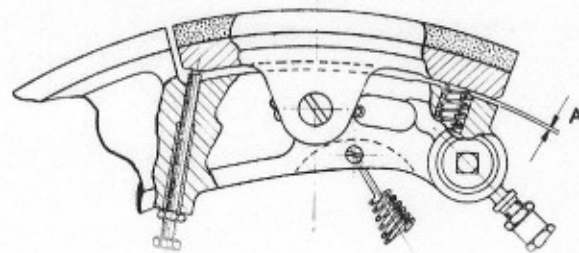
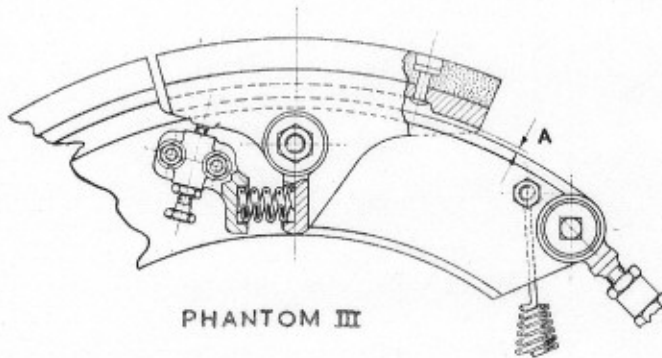
It is important to note that where auxiliary shoes are fitted, they must be reset before bedding as described in the next section. In the event of no bedding being found on the auxiliary liners, due to wear, which will naturally have taken place by reason of the spring loading, it may be more profitable to reline the auxiliary shoes only, rather than take off an unnecessary amount of material from the main shoes.

III. SETTING OF AUXILIARY SHOES.

It must be remembered that on normal application of the brakes, the auxiliary shoes are compressed against the spring, therefore any check on the bedding under hand application must be taken with the springs fully compressed by means of the adjusting screws provided.

continued:

The auxiliary shoe must then be reset after bedding so that a .012" feeler can be inserted between the main shoe and auxiliary shoe. The illustration shows the arrangement of the Phantom III and 25/30 auxiliary shoes, and indicates the clearance referred to as "A".



25/30 H.P.

Unlike the other models which have only one central adjusting screw, the Phantom II and III auxiliary shoes have two adjusting screws, one on either side of the centre web. After relining, the inner one must be set before replacing the complete shoes on the back plate. The clearance of .012" should be set and the locknut tightened. The outer screw must then be screwed in to eliminate the gap until the brakes have been bedded.

The clearance "A" does not vary with running and after the locknut on the adjusting screw has been tightened the auxiliary shoe requires no more attention until subsequent relining or re-bedding of the shoes.

IV. BRAKE SHOE REMOVAL.

Although there are several differences in the assembly of the brake shoes and mechanism of the Rolls-Royce models, these variations are so slight as to make a detailed description of the method of removing a set of front brake shoes on each model unnecessary. The following series of operations therefore, may be applied to all models with the exceptions mentioned.

continued:

(A) Front: All Models.

On all models except the Wraith and Phantom III the outer brake shoe carrier plate must be removed before it is possible to remove the brake shoes.

1. Remove the brake shoe pivot bolts by bending back the tab washer and unscrewing the two nuts to be found behind the back plate. In some cases a castellated nut and split pin is fitted.
2. Remove the nuts holding the brake shoe carrier plate and remove the plate.
3. Remove the guides from the slots in the brake shoes by extracting the split pins and unscrewing the nuts on the back of the dust cover.
4. Withdraw the spring eye pin after extracting the split pin in one brake shoe. Note:- The Phantom III has two brake return springs. Remove the spring eye pins in one shoe only.
5. Extract the split pin and withdraw the toggle lever pin connections to the brake shoes. Note:- The Phantom III toggle levers are connected to the brake shoes by means of a bolt, castellated nut and split pin.
6. Remove the brake shoes.

(B) Rear.

(a). Phantom III.

This model differs from others in the arrangement of the rear brake shoes as it has the hand brake shoes fitted outside the foot brake shoes and although the former seldom require relining they must be removed before the foot brake shoes are accessible.

1. Bend back the tab washers on the nuts of the four pivot bolts, remove the nuts and tap out the pivot bolts.
2. Withdraw the split pins and spring eye pins from the two return spring connections to the top hand brake shoe, and lift off the hand brake shoes.
3. Withdraw the split pins and spring eye pins from the two return spring connections to the top foot brake shoe.
4. Extract the split pins, unscrew the castellated nuts, tap back the toggle lever pivot bolts through each brake shoe, and pull both brake shoes forward off the pivots.

(b) 20 H.P. 20/25 H.P. 25/30 H.P. and Phantom II.

continued:

(b) 20 H.P. 20/25 H.P. 25/30 H.P. and Phantom II.

1. Remove the brake shoe carrier plate.
2. Withdraw the split pins and spring eye pins from one foot brake shoe.
3. Withdraw the split pins and toggle lever pivot pins from the brake shoes, and pull off the two foot brake shoes.

Note:- The hand brake shoes are removed in the same manner as the foot brake shoes.

(c) Wraith.

There is only one set of shoes on this model for both hand and foot brake.

1. Bend back the tab washer on the two fulcrum bolt nuts. Unscrew the nuts and tap the bolts back through the shoes.
2. Withdraw the split pins and return spring eye pins in one shoe.
3. Withdraw the split pins and toggle lever pivot pins in both shoes and pull off both shoes together.

V. RELINING.

Too much importance cannot be attached to the rivetting of the liners to the shoes. The effectiveness of the brakes can be impaired by spongy liners. Any burrs which might be on the faces of the shoes must be removed, and the two central rivets fitted first. After rivetting the liner must be clamped to the shoe and a reamer passed through the adjacent holes before fitting the rivets. Proceed in a similar manner outwards from the centre until all rivets are fitted.

In order to reline the auxiliary shoes it is necessary to remove them from the main shoes, but before this is done mark each auxiliary shoe and its corresponding position on the main shoe, then proceed as follows :-

1. Release the locknut and turn back the adjusting screw as far as it will go in order to relieve the tension in the spring.
2. Remove the split pin locating the pivot in the shoe, and tap out the pivot.

The Phantom III auxiliary shoes are pivoted on a bolt and can be removed after the castellated nut has been unscrewed and the bolt withdrawn.

continued:

VI. CUTTING AND BEDDING OF NEW LINERS.

Before commencing cutting or hand bedding of new liners, all external adjustment must be set back to zero and auxiliary shoes adjusted to eliminate the clearance referred to in Section III. Then, by sliding the brake drum up to the liners, or by rotating the liner cutter, it will be possible to determine whether the toggles require resetting in order to equalise the amount of material to be removed over the length of the liners, and avoid unnecessary waste of material.

The liners should then be carefully filed or cut until the brake drum can just be passed over them. If the cutter has been used, the setting of the cutting tool should not be disturbed when this point is reached.

The correct clearances (See RR/J2) have now to be obtained, by further filing or cutting. The shoes should therefore be expanded gradually by the external adjusters and cuts taken with the cutting tool in the same position, until the wing nuts are turned in six half turns or the operating levers have the correct initial free travel with the drums in position. By this method 100% bedding is obtained when the brakes are in the on position. Similar bedding by filing can only be obtained by trial and error.

Finally, the .012" clearance between the auxiliary and main shoes must be restored by means of the adjusting screws, after which the drums may be replaced.

On those cars having wing nut adjustment, the nuts should be turned back three half turns from the fully screwed up position. This is to allow for "growth" of the liners which may take place during the initial heating up period. After a short period of use, the setting should again be checked to ensure that the brakes are not binding.