FRONT BRAKES (LATE TYPE) REBUILDING

R-R Silver Dawn, Silver Wraith, Bentley Mark VI, R type

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The main reason for penning this particular article is the frightening number of these brake assemblies that I see which are either built up absolutely incorrectly or at best way out of adjustment. The normal warning signs being that the brake adjusters are screwed right in, almost to the extent of making one believe there are no linings on the shoes. This problem is very widespread in the USA but it also appears on home territory and is not confined to owners, invoices from professional specialists combined with the obvious faults shows no common ground. What is very obvious is that the proper rebuilding procedure is not widely known or followed. Hopefully more brake assemblies will now meet the objectives of this article as shown below.

To rebuild the later type front brakes so that the correct brake shoe self-wrapping action occurs both in a forward direction and in reverse. Ensuring that the front brakes, when applied, provide the designed retarding power in either direction. To correct the omissions from the parts and workshop manuals. Any mention of the Bentley MKVI brake assemblies includes the relevant Rolls-Royce models.

THE HISTORY OF THE FRONT BRAKE AND INCORRECT BRAKE ASSEMBLY

The early Bentley Mark VI hydraulic front brake was based on the mechanical wedge front brake arrangement that was used on the Bentley Mark V of 1939/40. Fig 1 shows the external linkage of a 1940 Bentley Mark V, note the mechanical link at the top of the king pin with another universal link under the leather cover. Wedge brakes are notoriously difficult to design so that they provide the correct feed back to the driver, and from the driver's point of view can be alarmingly difficult to control. The main reason is that the input effort to output load is not linear along the travel of the wedge, and they can tend to be fierce in action and to stick or release slowly. Try extracting a wedge that has been holding a door ajar under some pressure and you will realise just how efficient a wedge can become, and how difficult to release. Having discussed the down side of wedge brakes, if you are faced with stopping a heavy vehicle with limited input effort they certainly can provide the application efficiency as long as you are not too concerned about controllability. In short if you are travelling on ice, water or have slight brake unbalances…don't ring us!

Fig 1. No, not a Bentley MKVI brake arrangement but a Bentley MkV of 1940

Cost and the practicalities of transmitting the driver's effort to the foundation brake at the road wheel end would have caused the shift from a mechanical operation to hydraulic operation, of at least the front brakes. The fairly new-fangled hydraulic brakes having been around the best part of 10 years and more without killing the masses in their Wolseley and Morris cars. In October 1944 the initial R-R drawings, in this case drawing RF 3127 covering the kingpin and yoke assemblies showed a hydraulic front brake. Fig 2 illustrates this design, still a wedge brake but with hydraulic operation. The parts of the cylinder are made up of out sourced components from Girling and in house produced parts like the cylinder body.

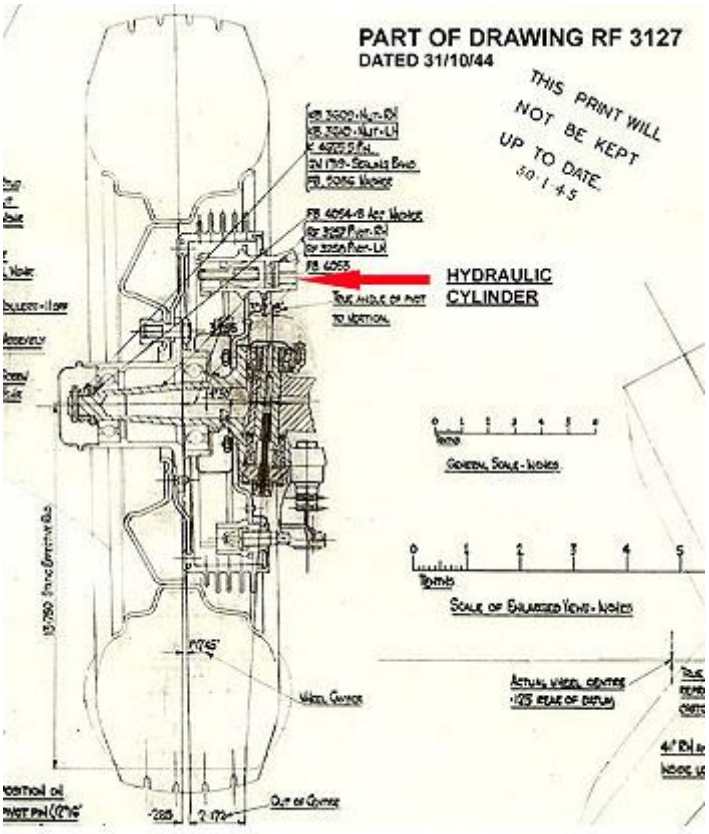

Fig 2. Part of the October 1944 drawing RF 3127 showing a hydraulic cylinder.

This design was to last from the introduction of the Bentley Mark VI in 1946 until approximately June 1950, the hydraulics powered the foundation brake arrangement shown in Fig 3. Viewing the available drawings shows that the original intention was to mount the hydraulic hose to chassis pipe connection off the shock absorber body instead of the chassis. Unfortunately the inter shoe linkage was original attached adjacent to the trailing shoe as shown by the red arrows which tended to pivot the shoes around the link pivots instead of the adjuster tappet. A service bulletin later instructed retrospective reversal of the linkage so that it was fitted at the position of the blue arrow. This service bulletin was indeed needed as the brakes were subject to dragging. Moreover as Fig 3 shows, no one altered the parts manual even up to 1952, and to this day owners are misled by this image. It should be noted that this brake arrangement was also used on the rear brakes right until the "S" series of cars were launched in 1955.

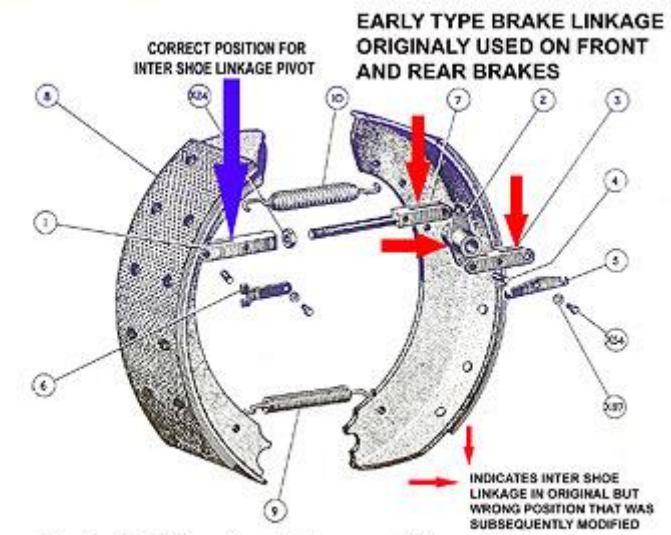

Fig 3. This intershoe linkage on this earlier brake needs fitting correctly.

At Bentley Mark VI chassis B-1-GT, Silver Wraith WME –1 and Silver Dawn SCA-1 the front brakes were altered completely, including the brake drum. Fig 4 illustrates the foundation arrangement of this later front brake, particularly important on this parts list view is the position of the off stop pin, which is correct. This brake was designed to produce maximum retardation without the disadvantages of a wedge operation, and it achieves those objectives extremely well.

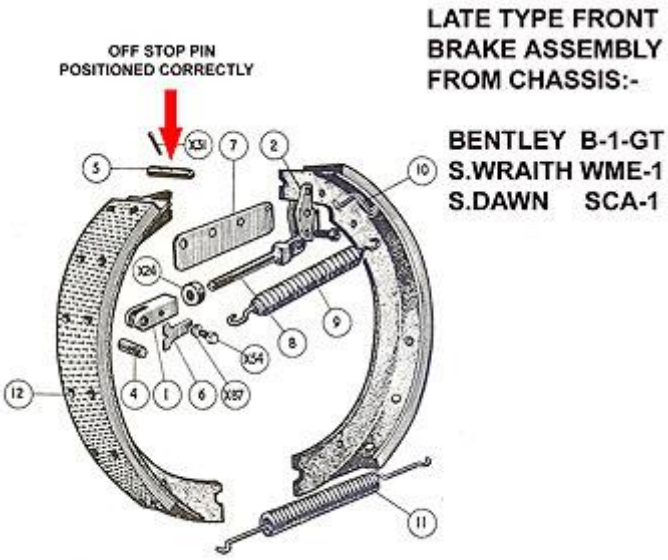

Fig 4. The intershoe linkage of the later front brake

Unfortunately neither the parts nor the workshop / service manuals are very helpful in rebuilding this late type brake correctly. The former shows the position of the clevis link Fig 5 in the place of the off stop pin and the latter are missing a number of vital paragraphs and fail to explain the importance of the cylinder positioning.

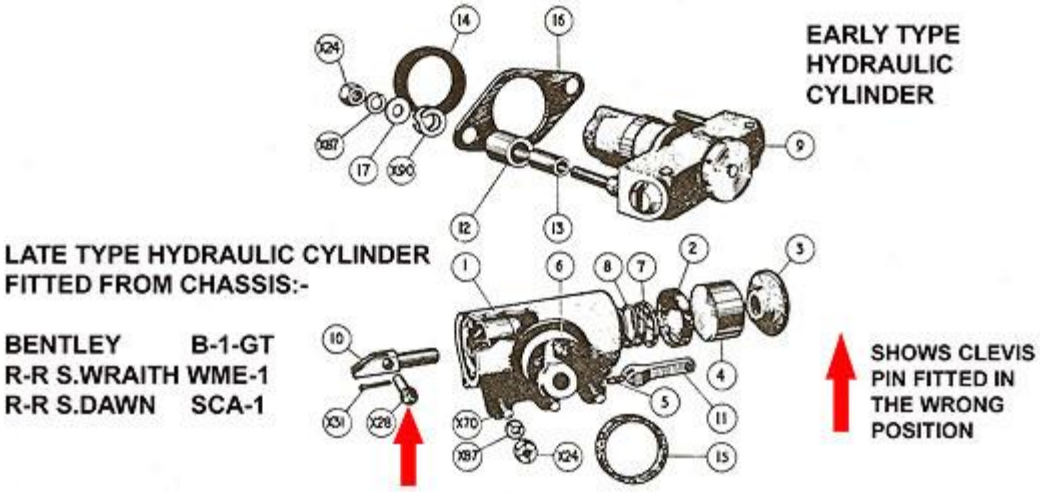

Fig 5. The early and late type hydraulic cylinders, from the parts manual

The only known complete drawing of this front brake that shows the correct assembly is contained in scheme number PL 5693, which was the original design scheme. Fig 6 shows part of the drawing for this scheme in which the red arrow clearly depicts the off stop position at the front end of the cylinder.

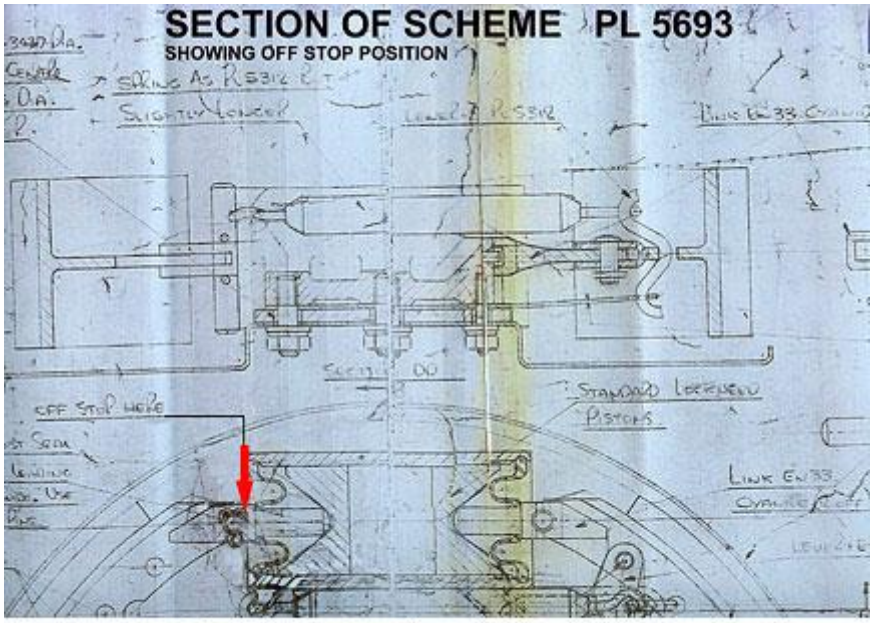

Fig 6. Part of scheme PL 5693, the only printed matter to show the correct layout

Fig 7 shows the writer's correction of the assembly of the late type cylinder previously shown in Fig 5, note the correct positioning of the 'clevis pin' and '(off) stop pin". The latter always being at the front of the wheel cylinder.

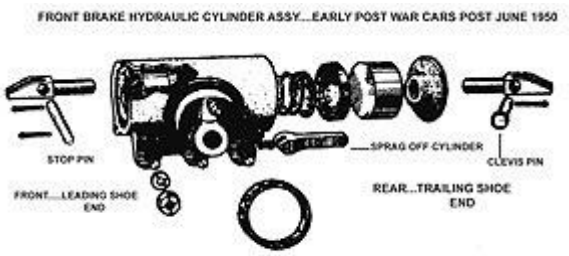

Fig 7. The corrected late type hydraulic cylinder assembly

Comparison of Fig1 with Fig 8 shows how the changes affected the exterior of the brake from 1940 to 1950.

There are at least five different ways of assembling this late brake assembly, only one is correct. The three most frequent errors are to position the "off stop pin" at the rear of the hydraulic cylinder instead of at the front, see Fig 9. Having the "W" link hooked onto the trailing shoe only instead of passing through the shoe and engaging in the anchor plate. Finally, in the extreme, failure to engage the sprag link into the recess at the rear end of the hydraulic cylinder.

Fig 8. The back of road wheel view of the later brake, compare this with Fig 1

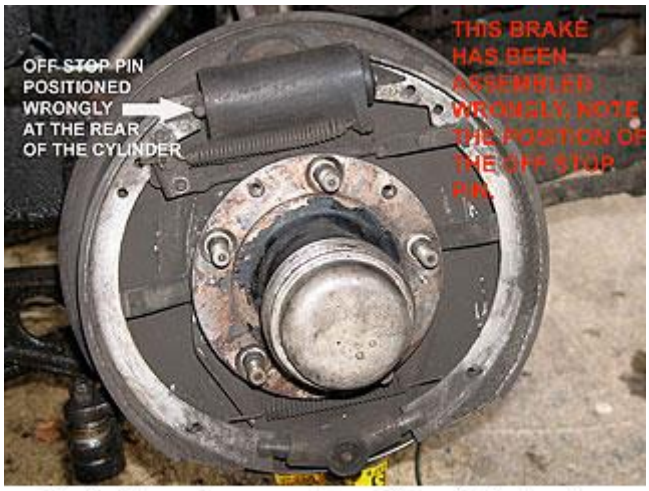

Fig 9. Yet another wrongly positioned off stop pin, even the professionals get it wrong!

LATER TYPE FRONT BRAKE

The following is intended to correct the omissions of the parts and workshop manuals in respect of the later type front brake only.

IMPORTANCE OF THE POSITION OF THE HYDRAULIC CYLINDER AND THE CORRECT BRAKE SHOE ACTION

Although the brake hydraulics will provide an equal hydraulic pressure column of fluid across the ends of the brake shoes this will not provide true equalisation or centralisation of the brake shoes as might be normally expected. With this brake design it is necessary to set the actual position of the hydraulic cylinder in relation to the brake drum before any other components are assembled.

Failure to achieve the correct initial positioning of the cylinder will result in the brake adjuster being positioned too far inwards when the brake is assembled. In addition the leading shoe off stop pin will not be resting on the cylinder, and this in turn will allow the leading shoe to tilt and foul the brake drum. This is caused by incorrect internal geometry of the intershoe linkage that in this instance is mounted off the cylinder on this unique design. The incorrect geometry in turn will result in the brake shoe contact point with the drum being wrong and not providing the most efficient self-wrapping action. When the car is braked in reverse any incorrect shoe wrapping is particularly noticeable as this causes the brakes to be extremely inefficient.

FREEDOM OF FRONT BRAKE CYLINDER HYDRAULIC PISTONS

Unfortunately it is not as simple as pressing the brake pedal to check the action of the front brake cylinders because the front brakes are operated directly by the transmission driven servo, and not under the direct action of the driver.

All is not lost however. If the car is raised and blocked safely such that the front wheels can be revolved by hand, forward pressure on the end of the balance lever to which the servo rods are connected will operate the master cylinder. The end of this balance lever is immediately behind and below the battery location, the lever should only need moving forward by 0.125 inch (3 mm) or so, to start operating the front brakes. If movement more than this is encountered it is a sign that the brake linkages are not set correctly. It is preferable if the brake drum can actually be removed and then with the aid of a helper moving the balance

lever, see that both cylinder pistons can be seen to be moving. It is imperative that both wheel cylinder pistons are completely free and not seized or sluggish.

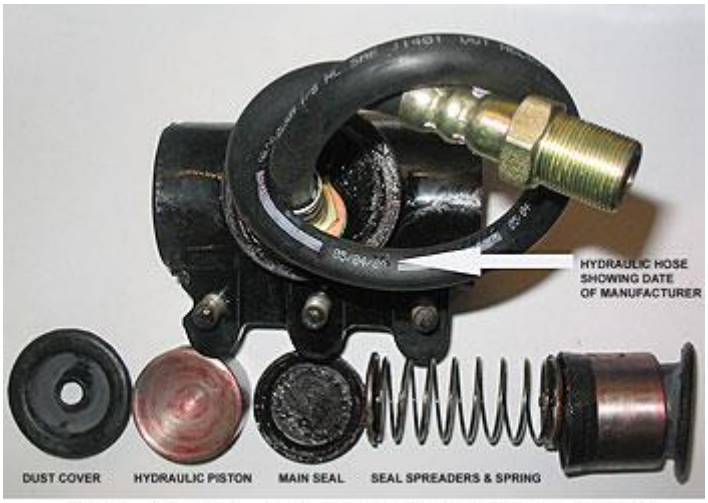

Fig 11. Hydraulic parts of one front brake cylinder, in which cleanliness is essential

SOME PARTS DESCRIPTIONS AND SPECIAL CONSIDERATIONS

Fig 10 shows a new lined shoe of the latest type. Although it is not shown on this image, the leading lining edge that is at the left top should be ground down fully across the lining for approx. one inch from the edge. This provides a gently lead to the leading lining edge and can help prevent brake grabbing.

The actual lining thickness on both early and late type brake shoes, front or rear, is 0.322 inch + 0.015, most suppliers will provide 0.312 inch linings, which will suffice. The correct thickness is however listed for the record. Each lining covers 102 degrees of the drum surface at an inner lining radius of 5.800 inch and the width is 2.250 inch (+/- 0.015 inch). A number of different lining part numbers have been used, differing only in the material used, these part numbers include GB 3760, GB 4685, RG 3305 and RG 7146.


Fig 12. Hydraulic cylinder after having bronze inserts fitted and stainless steel pistons

Fig 11 and Fig 12 show the hydraulic components of a cylinder; in this case both images show a left hand side cylinder, each side being handed. Fig 12 shows bronze inserts in this cylinder, these half inserts are fitted only half way down from each end of the cylinder so that any insert movement does not cut off the hydraulic fluid supply. Currently it is possible to source replacement cylinders of better quality material than the originals, so the viability of inserts might be questioned. The bronze inserts, or indeed stainless ones do prevent seizures especially if the cylinder is also fitted with stainless pistons as shown in these views. The red coloured material on the pistons and rubbers is special rubber grease.

The shortest hydraulic hose that can be fitted is 13.5 inches from end to end; a slightly longer hose of around 15.5 inch is also available. The former tends to keep pressure expansion to a minimum whilst the latter allows the brake assembly to be passed over the end of the stub axle without dismantling the brakes. This is handy during any suspension or kingpin work when any extra disassembly and brake bleeding may be avoided. Owners with cars having right-hand side under wing fresh air intakes or Continental type under wing hot water demister matrix should be aware of the longer brake hoses fouling these parts when the suspension is on “bump”. Note that it is necessary to couple the hose, with interspaced copper washer, to the wheel cylinder before attaching the steel chassis pipe.


Fig 10. Late type front brake shoe, compare this with the earlier types in Fig 3

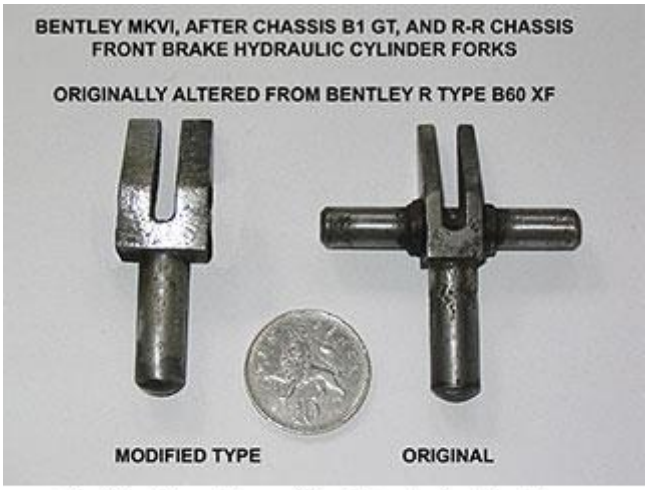

Fig 14. Strengthened front brake fork for the late type front brake

Fig 13 shows the special brake bleeder used on these late cylinders. This brake bleeder part no RG 5253 is 0.312 inch diameter and threaded 24 T.P.I to WHITWORTH form. This is not a normal TPI for 0.312 inch Whit, and the equivalent size in UNF will not do the job and is dangerous. Beware your local brake specialist is unlikely to stock this bleeder screw and because they are frequently seized it is advisable to purchase new genuine ones from a Crewe Parts source before undertaking the work.

For the record the brake bleeder fitted to the earlier Bentley Mark VI, with the different brake cylinder, before June 1950, is a standard BSF thread and part no RG 7050.

Reverting back to Fig 7 note the position of the "sprag" and how it jacks, or mounts off, the cylinder. The positioning of this sprag is difficult to illustrate on a fully assembled brake. This illustration also shows the forks through which the clevis pin and off stop pin are fitted. Later heavy duty forks were standardised on R types after chassis B 60 XF, and were intended to be retrofitted to Bentley MKVI after chassis B1 GT, see Fig 14. Unfortunately it is not well known that these forks should be fitted, along with a different stop pin and clevis pins. One of these pins, the clevis, is not available but can be obtained commercially. Modified part numbers were, Fork RG 8490, off stop pin RG 8489, and Clevis K 4561 / Z .

Fig 15 shows the white guideline along the front brake hose, so placed to ensure the hose is not twisted during the tightening process. Note that hoses are now marked with their date of manufacture.

Fig 15. Front brake hose alignment, notice the white dashed line exhibits no twisting

Fig 13. Late type front brake bleeder with Whitworth form thread, these are none standard!

REBUILDING FROM THE BRAKE BACK PLATE

Fig 16 this is the start of the assembly and to aid recognition the sequence has been confined to describing the rebuild of the right hand brake. To assist

this situation certain images of the opposite brake have been used in a mirror image fashion, it is therefore important to ignore any incorrect background aspects.

At this point the adjuster is fitted loosely, not forgetting the rubber seal that fits between the back plate and adjuster.

Fig 16. Initial stage of rebuilding, the brake adjuster is fitted loose

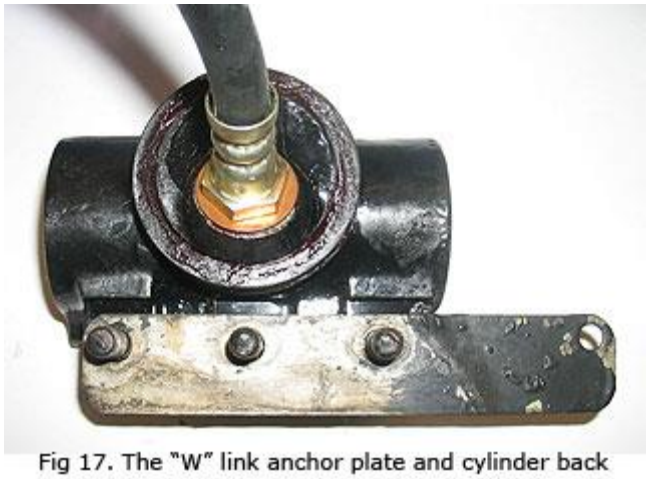

Fig 17. The "W" link anchor plate and cylinder back plate seal, don't forget to position both before refitting the hydraulic cylinder

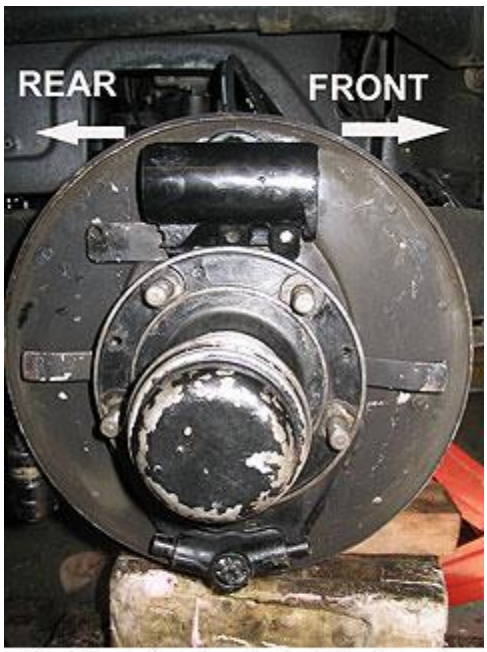

Fig 18. Hydraulic cylinder fitted loosely with the spring anchor plate offset towards the rear

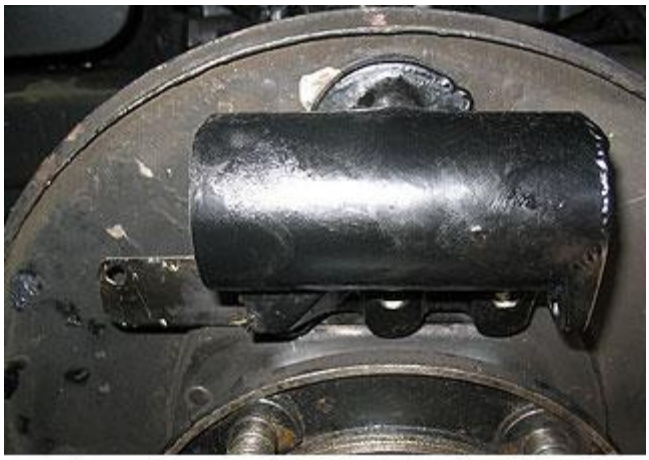

Fig 19. Close up view of the hydraulic cylinder, note the link anchorage hole

Fig 17 Shows how the "W" link anchor plate is sandwiched between the cylinder and brake back plate. It should be noted that a very similar but shorter strengthening plate, with three holes, is positioned on the

studs at the rear of the cylinder when it is mounted. This strengthening plate takes the place of flat washers. In this image the circular rubber seal that fits between the cylinder and back plate is also shown.

Fig 18 the hydraulic cylinder, complete with anchor plate, is loosely mounted on the back plate.

Fig 19 A close up view of the cylinder, note the position of the hole in the top left corner of the anchor plate. This hole will eventually accept the inner end of the “W” link, after it passes through the web of the trailing shoe.

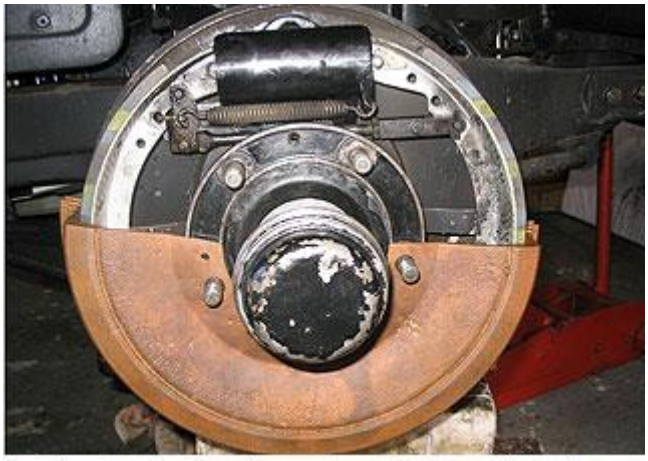

Fig 22. Viewing the results using a test drum if you are lucky enough to possess one!

Fig 20. Close up view, showing p

Fig 21 Showing the objective, fit far forward as possible with against the cylinde

Fig 20 this view shows how the rubber dust seal is trapped between the cylinder and the back plate. The cylinders are fitted with a dust / water seal at each end in the position illustrated at the end of this cylinder, the red appendage is rubber grease.

Fig 21 before proceeding further it should be pointed out that the process of setting the position of the hydraulic cylinder, which is described below, can be accomplished in a number of ways. The method explained is aimed at the owner who may have limited tools, in fact if the build sequence is followed it will be realised that the complete front brake is rebuild using very few tools except for wrenches and pliers or similar to attach the brake return spring. All these items should be in the car tool kit.

It is important to check the positioning of the brake shoes to ensure they are square to the brake drum before tempting any permanent rebuilding. Temporarily build up the assembly so that the shoes can be checked that they are square to the drum. The gauging can be completed with a trammel or square positioned or clamped across the face of the front hub. Onto this arrangement a piece of metal can be attached at a right angle so that it sweeps across the face of the lining when the hub is turned. Fig 22 shows the principle using an old brake drum as a testing trammel. Bending the shoe web stops, seen here just above the horizontal edge of the drum, will alter the position of the shoes. On no account attempt to remove these shoe web stops from the brake back plate assembly as their retaining nuts and bolts are riveted into position. It will be found that an adjustable ‘F’ spanner, bigger than the one in the tool kit, is an ideal tool for bending these stops

Initially the object is to achieve a position shown in Fig 21, where the off stop pin is hard up against the front end of the cylinder at “A”, the lining is touching the drum at “D” and the brake adjuster is screwed up

between 8 and 11 clicks. In this image the intershoe linkage is fitted but in this setting up process it may be found easier to complete without the intershoe linkage, and indeed the trailing shoe not fitted. A study of the brake will show that in the simplest instance the leading shoe can be arranged to trap the off stop pin and shoe fork against the cylinder by the expedient of fastening an elastic band or similar between the shoe and hydraulic wheel cylinder. Either procedure will work, it is just a matter of preference.

Firstly loosen off all three nuts that hold the cylinder and the two set screws that retain the adjuster. The brake shoe is going to be used as a gauge between the drum and cylinder to set the cylinder position. Hold the two adjuster tappets together so that resistance can be felt when the adjuster is turned, back off the adjuster fully and then screw it up until resistance can be felt on the tappets and the first adjuster click can be felt. At that point screw the adjuster up a further 8 to 11 clicks. The reason for the setting, in this instance, is that eventually the shoes can be backed off to clear the drum if required, after the brakes have been completely assembled.

Move the adjuster and cylinder to a central position so that the drum can be fitted with the leading shoe in position. Position the leading shoe onto the hydraulic cylinder and adjuster tappet with the off stop pin and fork in their correct position. If the brake is completely built up to hold the leading shoe, instead of using a heavy elastic band, the inter shoe linkage does not require the locking plate to be fitted. Once the drum is in position, ensure all the drum retaining screws are in position and tightened and then from the rear of the back plate push the hydraulic cylinder as far forward as is possible. Holding the cylinder firmly in the forward position nip up the centre nut only of the three retaining studs. Then remove the brake drum, off stop and fork, and the leading shoe.

Fig 22 this shows how useful an old front brake drum can be, and it is even more desirable when working on the rear brakes. This later type drum can be used on the very early Bentley Mark VI brake assemblies, but the earlier Mark VI drum will not fit the later front brake.

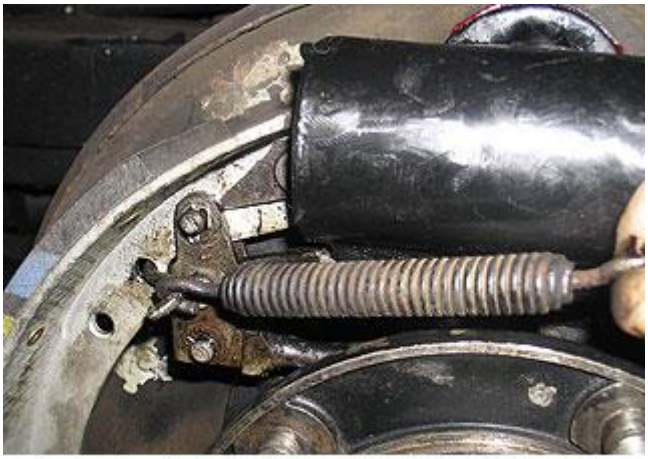

Fig 23 Showing how the retaining spring is fitted onto the "W" link. Use pliers or side cutters to position the spring end into the hydraulic cylinder anchorage

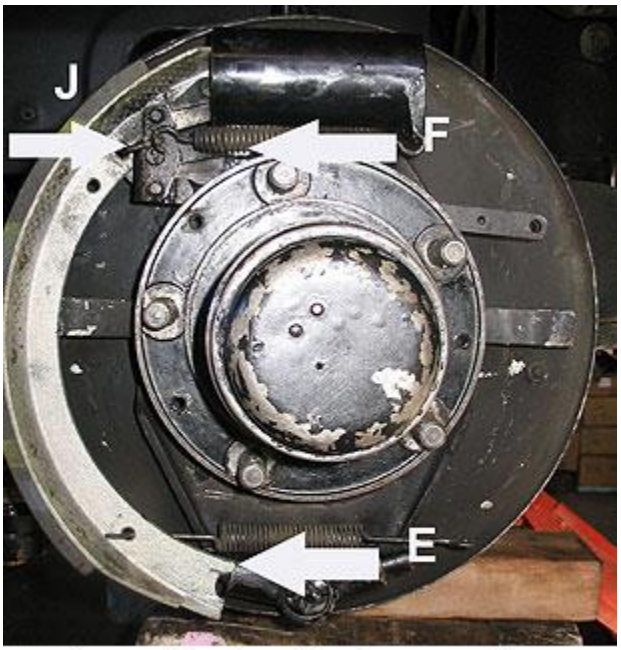

Fig 24. Fitting the trailing shoe assembly at the top end only

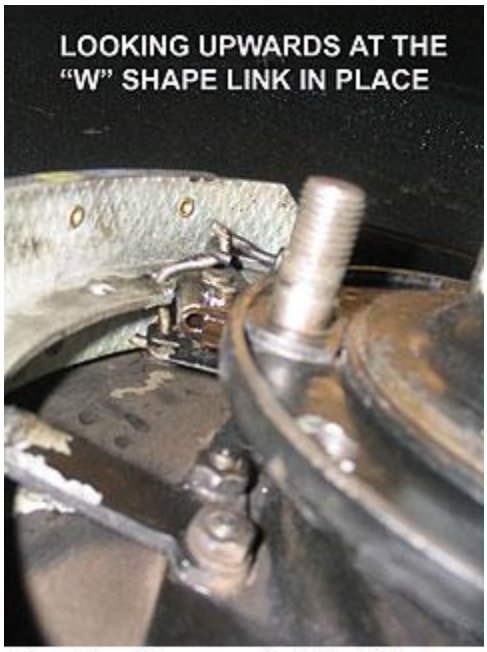

Fig 25 Looking upwards at the "W" shape link in place, owners sometimes find it difficult to latch the link into the anchorage and then fit the return spring

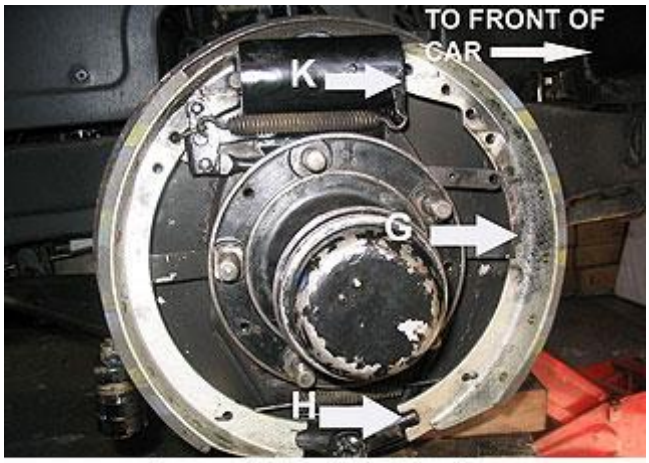

Fig 26. Fitting the leading shoe

Fig 23, Fig 24 and Fig 25 Assemble the trailing shoe, return spring and the intershoe linkage as shown in these images. Fig 23 shows how the return spring hooks onto the end of the "W" link. It is important to check that the opposite end of this link, after passing through the trailing shoe at point "J" in Fig 24, has engaged with the anchor plate as shown in Fig 25. The forward end of the return spring hooks onto the hole cast into the underneath of the hydraulic cylinder, seen more clearly in Fig 26

Also of importance is to ensure that the sprag that was previously shown in Fig 7 has actually engaged into the cylinder recess at point " F" in Fig 24. Note, at this stage, that the adjuster end of the trailing shoe at point "E" has not been engaged with the adjuster tappet, although the shoe assembly is held firmly under the influence of the return spring. The intershoe bottom return spring can now be fitted to the trailing shoe and it is engaged from the rear side of the shoe web.

Fig 26 Hook the opposite end of the intershoe spring into the leading shoe then, by hand, lift the end of the leading shoe into the adjuster tappet at point "H". Note that the adjuster end of the trailing shoe has still not been engaged. Point "G" is merely showing the point of shoe contact with the shoe web stop, while at point "K" the off stop has yet to be fitted.

Fig 27 Pull the leading shoe top edge forward and insert the off stop and the fork.

Fig 28 Now, by hand, lift the adjuster end of the trailing shoe at point "N" into the tappet.

Fig 29 At this stage adjust the length of the intershoe linkage by slackening the locking nut and turning the fork end, in or out, so that the brake drum can just be fitted. The object is to reach a situation where the drum is dragging or touching the trailing shoe equal to the drag of the leading shoe. It may prove necessary to slacken off the brake adjuster a few clicks in order to position the drum with the trailing shoe fitted. However, it is wise to keep account of the number of adjuster backing off clicks and adjust the brake up each time to the original starting point.

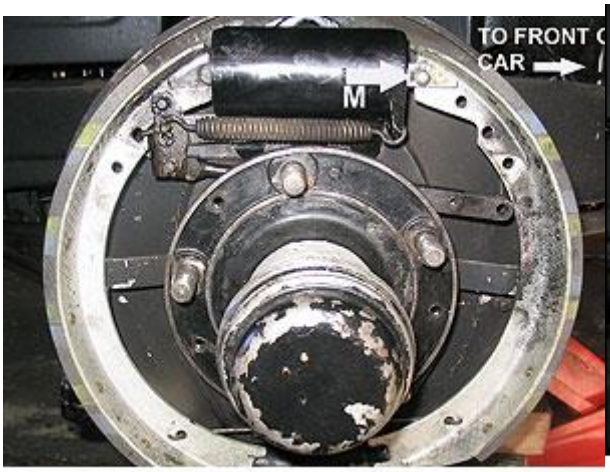

Fig 27. Adding the offstop pin and link

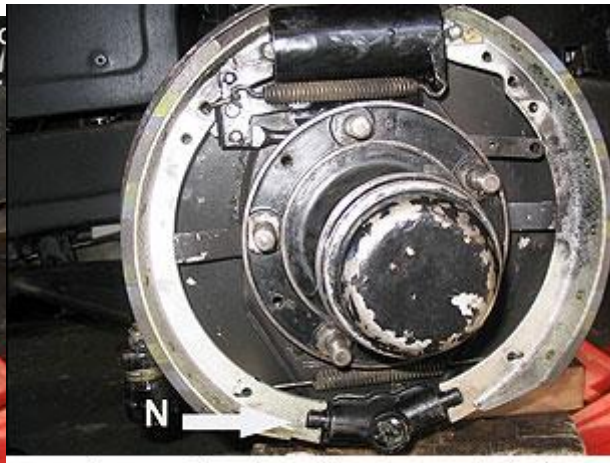

Fig 28. Fitting the trailing shoe at the brake adjuster end

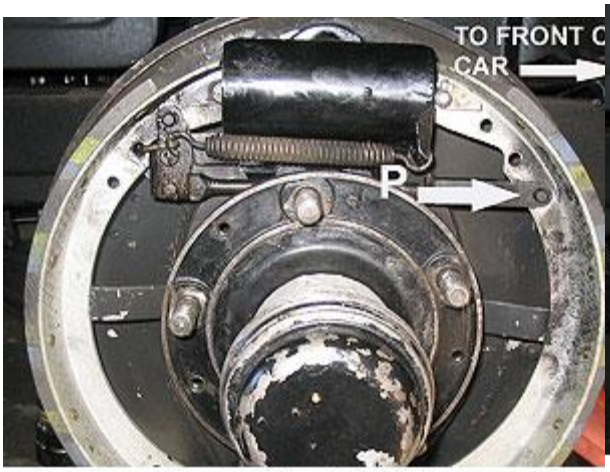

Fig 29. Fitting the link pin

Fig 30. Fitting the locking screw when the intershoe linkage has been set

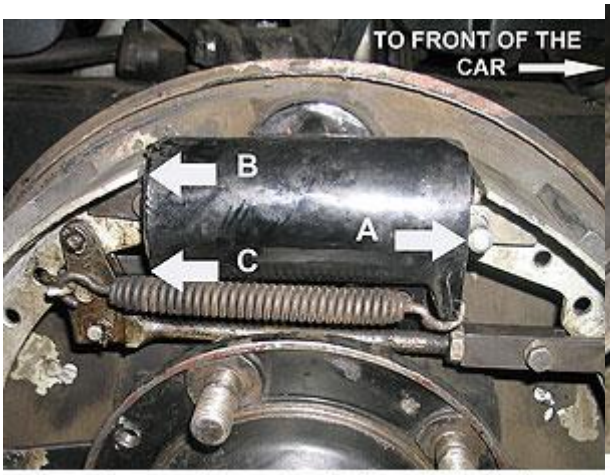

Fig 31. Points to check when the brake has been assembled

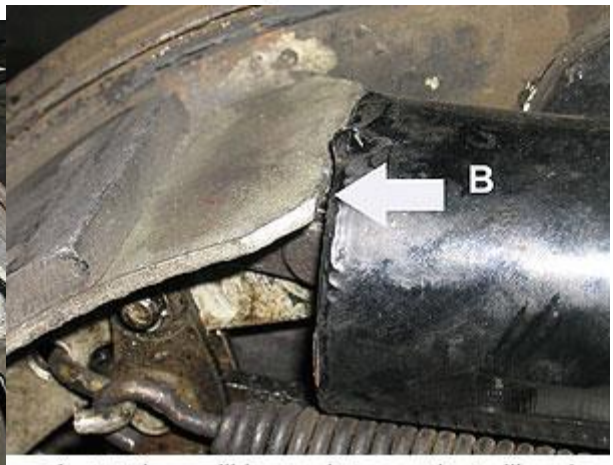

Fig 32. There will be gap between the trailing shoe and the wheel cylinder, and it could be larger than the gap that is shown

Once an equal drag or touching situation has been reached, fit the pin shown at point “P”, tighten up the rod lock nut and then fit and secure the pin lock plate as shown in “R” in Fig 30.

Fig 30 when all the brake setting is finished ensure this locking pin is tight and secure.

Fig 31 now fit the brake drum and retaining screws and just nip up the adjuster until the drum is dragging. Loosen the centre retaining nut at the rear of the hydraulic cylinder, this should be the only securing nut that is currently nipped up.

At this stage tighten up the brake adjuster hard to centralise the complete brake assembly and follow this by tightening the two brake adjuster retaining set screws and the three nuts holding the hydraulic cylinder. If the brake adjuster is slackened off to clear the linings and the brake drum is now removed the following should be noted.

- At point “A” the off stop pin should be held so firmly against the front of the cylinder that it cannot be moved by finger pressure.
- At point “B” the trailing shoe top web will not touch the hydraulic cylinder, but there will be a distinct gap between the cylinder and web. The shoe end will obviously still engage the fork end.
- At point “C” the sprag will be firmly in engagement with the cylinder body.

Fig 32. This shows in close up the gap between the trailing shoe and cylinder when the brake is assembled correctly.

Fig 33. This view shows the adjuster slackened back, the threads on the adjuster can be seen. When the brake is assembled correctly, the square end of the adjuster will be in full view providing new brake linings are fitted. If the linings are worn the adjuster will be inwards slightly, but at no point will the end of the adjuster just about disappear.

The brake drum can now be replaced permanently and the brakes adjusted. If the adjustment to the intershoe linkage has been completed with due care it will be found that the shoes will clear and then touch the drum with one, or at most two, adjuster clicks. As expected this will depend upon the shoe lining profiles already having been bedded to the drum radius, and no undo slackness in the wheel bearing.

A finer setting can now be achieved if really desired by again temporarily slackening off both the adjuster and cylinder holding fixtures at the rear of the back plate. Then applying the brakes by moving the master cylinder balance lever forward hard or by driving the car and applying the brakes. Do not forget to securely tighten all the fixings when adjustments have been completed.

Some of these cars have a reinforced road wheel, which when fitted to combine with this later front brake drum can result in a slight foul between the reinforcement sections and the drum. This occurs just outside of the radius of the wheel stud pitch and shows up as a localised marking on the drum. When the road wheel nuts are tightened any such localised distortion of the drum can result in the shoe linings lightly rubbing.

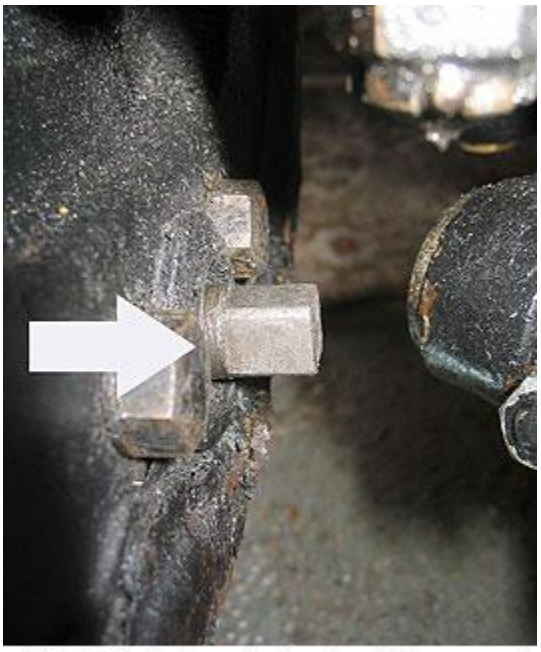

Fig 33. The brake adjuster should be screwed in only a little more than this when the brake has been assembled correctly