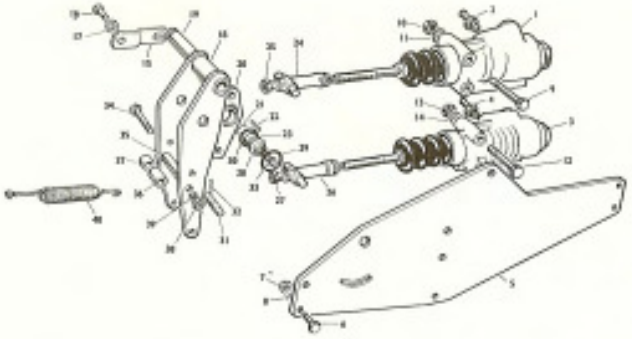


Detailed view of the twin master cylinders. Dis-assembly is easier if you remove item marked 5.

engine, and put the car into gear. (Since there are but a few cars left with "row-your-own" transmissions, we'll assume you have an automatic transmission.) With the lock nut slack, gradually take up the adjustment until the servo just begins to tighten the actuating rods. Stop. Now back off the adjusting nut two flats (one third of a turn), and lock the locking nut. At this point you will have no servo drag, nor will you have servo lag.

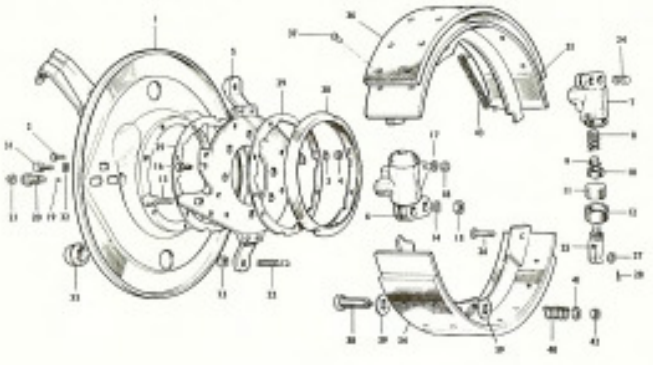
At this point you may decide that your brake troubles are over, having cured the "problem" with the servo. After driving the car you may find that your brakes are hard, and there seems to be no servo-action. Drive back into your garage and do not curse this article on brakes as being worthless and time-wasting. The problem lies in your rear brakes.

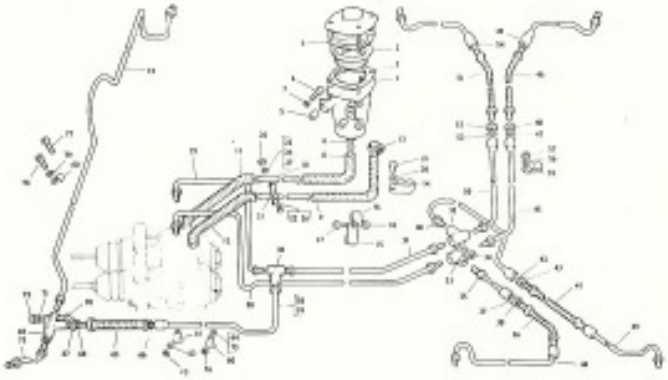
After you have burred over the screws which hold the brake drum to the wheel and had to take them out with a cape chisel, carefully examine the mechanical side of the rear braking system. Each rear wheel has a foot-pedal operated mechanical brake. The design is excellent, but rust has a way of getting into the sliding wedges, causing them to be inoperative. After you get all the rust out and have the wedges quite loose in their respective guides, lubricate freely with a moly grease, wiping off the excess. At this point when you apply the foot brake (without the car running), the wedges should expand the brakes, and, most importantly, the little return springs outside the backing plates (toward the inside of the chassis) should be strong enough to pull the actuating rod back, allowing the wedges to slide back, taking the pressure off the brakes.

Clean up the rear brakes, being careful not to inhale any of the dust commonly found around brake shoes and drum. The dust is very hard on the lungs, gives headaches and may cause asbestosis.

Now when you road-test the car, you more than likely will have good brakes, a soft pedal, and a safer car.

Left-hand front brake as used on the standard cars.





Parts 8, 9, 11, 12, 36, 41, 46, 51 and 65 should be replaced on a regular basis as outlined in the text. Do NOT allow filter (2) to be covered with brake fluid.

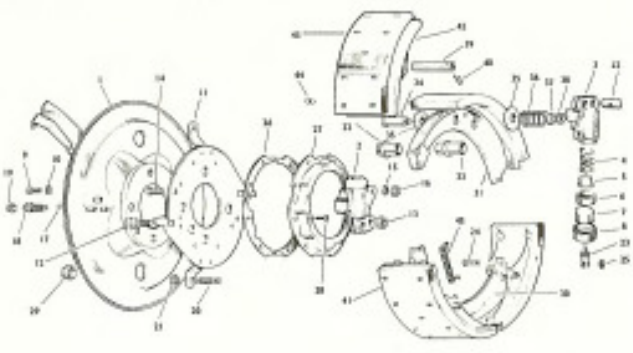
If you reline the brakes, give serious thought to buying new shoes. The expense is small, and the S-series shoes have been known to crack in the holes found in the shoes. Also put in new return springs. Again, the cost is small, and the results are quite worthwhile. If you are a perfectionist, give consideration to "bedding-in" the linings as was done on the earlier cars. They will wear in, but sometimes it takes quite a while.

On the V-8 Bentley Continentals, the front brakes are different. If you can find a wrecked standard car, buy the front braking system, backing plates and all. The Continentals had four-shoe front brakes. They had two problems, one being that they squealed when applied, and the other being that they heated the drums, causing heat cracks to show in the surface of the drum. The squealing can be cured by breaking the glaze on the linings and chamfering the leading (contacting) edge of the lining. A square edge meeting the drum can cause a vibration. The heat-cracking on the drums is not as easy to cure, but a simple "out" is to put the rear drums on the front. Yes, they interchange nicely. A few less panic stops will keep them in good order for years.

A brief word is in order regarding the flexible hoses found on the brakes. These hoses should be replaced at least every four years because they tend to deteriorate internally. The hole in the hose gets smaller and smaller until there is no longer adequate area to pass and return the brake fluid. Also replace the hoses from the reservoirs since they tire with age.

One point which bothers S-series owners is the amount of drag on the front brakes. One can turn the front wheels when the tire is off the ground, but because there is zero clearance between the drum and the lining, the wheel will not spin freely. This slight drag is quite normal and is not a cause for alarm.

The left-hand front brake on the Continental models. Note that there are four brake shoes and other differences.



Silver Cloud Brakes

by Colin Black

Photography by the editors

Colin Black was born in the UK, but has lived in Rhodesia and South Africa for most of his 43 years. Apprenticing at British Leyland, he served as liaison from BMC to RR at Hythe Rd., where the B60 engines were installed in Vanden Plas Princess R cars. A very early member of the RREC, he has contributed much technical information to it. In Africa, he rose to the post of General Manager for Cummins Diesel for the whole continent. In 1983, Colin and his family settled in this country where he repairs newer RR's and Bugattis, though he remains strongly involved in the diesel engine business. His other interests include steamboats, sailing, and antique machinery of all types.

The braking system in Clouds is a compromise, consisting of the pre-war mechanical type servo with hydraulics grafted on, replacing the earlier mechanical system. If one started designing with a clean sheet of paper, one probably wouldn't do it this way. Unlike other maker's hydraulics, these have a substantial mechanical back-up system. But they do require servicing if they are to continue operating properly.

Members considering undertaking this work should first equip themselves with the relevant workshop manuals. These are available as reprints from the Club Store, chiefly the Silver Cloud Shop Manual *(covering SCI, SCII, SCIII, the equivalent Bentleys including Continentals), and 6 Cylinder engine only, Store Item No. 19, $50. See also FL1880 (76-3) and FL2277 (80-3).*

The author has generously offered to advise any member who is prepared to have a 'go'—in fact, he is willing to make up brake 'care packages' with the whole lot required (soft parts, springs, duplicate special tool RH417) if there is sufficient interest. Write Colin Black, Rt. 5, Box 707E, Easton, MD 21601 or ring him at (301) 822-9025.

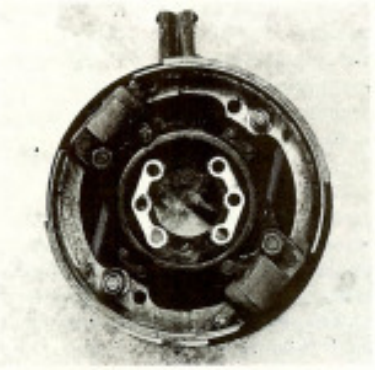


Figure 1: *Complete front brake assembly, shoes and wheel cylinders, immediately after removal from car. When dismantling the front brakes, first undo the cylinder anchor bolts; then unbolt the whole carrier plate from the stub axle, starting inboard, so that the remaining components can be removed on the bench.*

One discernible trend I have seen in the course of working on Silver Cloud and S Series cars is a set of problems with the brakes. The last five I have had in my shop need anything from three to five people to push, even on concrete and with the tires fully inflated. One, the 1961 Paris Show S2 Bentley, tried to nosedive into the pavement the second you took your foot off the accelerator. The owner complained of lack of power, poor fuel consumption, and overheating. Not surprising when one considers the brakes were absorbing about 50 horsepower! It required five people to push it.

The problem is that over about five years, the various rubber seals swell and the wheel cylinders become corroded, causing small areas of friction which are easily overcome by pedal effort/servo, etc., but not so easily overcome by the various return springs. Thus, when the brakes go on, they stay on. This seems to be worse on cars that are infrequently used. One then pulls all the wheel hubs to pieces, re-assembles it all, only to find that the master cylinder rubbers are so swollen that they will not pump a fresh charge of fluid. So out they all come, and then you find that the hoses from the reservoirs are collapsed and internally perished. So out they come as well.

The lessons to be derived seem to be as follows: First, if you can't push your Cloud by yourself on level smooth concrete with the tires fully inflated, you have a brake problem in the course of happening. Two of you should be able to move it easily. Secondly, the rubbers and fluid really need changing at least every five years.

Strangely, we don't seem to see lining problems, but this is perhaps because they don't generally go far enough, fast enough, to wear the shoes out. However, I'm pretty sure that a lot of high fuel consumption and overheating problems are braking system induced.

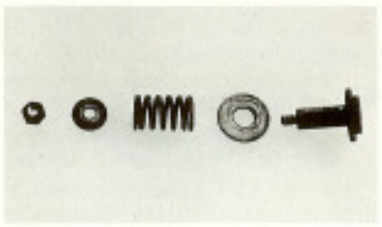


Figure 2: *Front brake shoe and steady post which slips into shake back stop. Adjustment of post squares up shoes to drum.*
Figure 3: *Shake back stop—exploded view. The shake back stop functions chiefly to hold brake shoes just at the interface when the brake pedal is released. It introduces friction into the system. Normally, such a device (in other makes of car) is built right into the shoe and is not adjustable, whereas Messrs. Rolls-Royce make theirs adjustable.*

Figure 4: *Front wheel cylinder, exploded view. The plungers in the cylinder should just pull out—with finger pressure only. If the plunger binds, carefully use compressed air to force the plunger out, say into a towel. If your system of compressed air is not sufficient to push the plunger out, use an hydraulic pump after making a fitting to the hydraulic line. Two hundred to 300 lbs. of hydraulic pressure should be enough for even the worst—or use a separate grease gun. The thread in the fluid pipe hole is the same as an ordinary 3/8 NF bolt. Be sure the plungers are the chromium plated type. A flawlessly smooth surface is what's wanted and needed here. Hone the wheel cylinders smoothish and clean. Surface finish and consistency are the goal for smooth working.* ***Figure 5:*** *Bleed screw with old and new steel balls. Discard the old ball. Do not lose the bleed screw balls in the cylinders. Remove the little ball from the cylinders first.*

Front Brakes

Rolls-Royce use twin trailing shoes on the front brakes where other makers use twin leading shoes. Why? Possibly, with the RR type servo, leading shoes on the front would be too fierce and inconsistent, so the fronts are stabilised deliberately by using trailing shoes. To the best of my knowledge, only RR used twin trailing shoes.

Some points to keep in mind during re-assembly of the front brakes. Note that the small holes on the carrier plate line up only one way with the backing plate. The gasket is important. Replace fan disc lock washers pro forma. Re-assemble the whole carrier unit before refitting it to the car. Hook the bias (return) springs in when fitting the wheel cylinders onto the carrier plate. These springs must be behind the plate in order to pull the shoe in the correct direction. Fit the brake lines onto the carrier assembly before fitting the whole unit to the car, as these lines must go between the carrier plate and the steering arm. The only real mistake possible in re-assembling the brakes is to get the right hand carrier plate onto the left hand stub axle. The result: the steering binds on assembly.

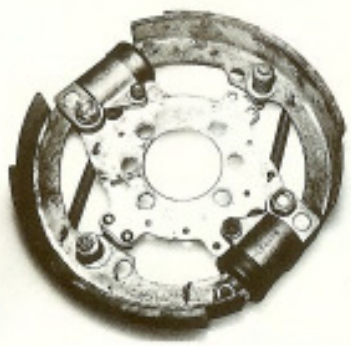
To ensure equal application of the shoes, you must centralise the brake shoes and cylinders within the drum. The cylinder has a slotted hole self-seating arrangement to allow the cylinders and brakes, as an entire unit, to shift to a centralised position. The procedure is as follows: nip up the cylinder anchor bolts; put brake drum on; operate the master cylinder with special tool RH417 and expand the shoes against the periphery of the drum and thus seat the cylinders; carefully remove the drum again; then tighten up the cylinder anchor bolts at the correct position in the slotted hole. If this unit is not centralised—i.e., not concentric with the drum, every time the brakes are applied, the mechanism will be unfairly stressed in addition to giving poor braking.

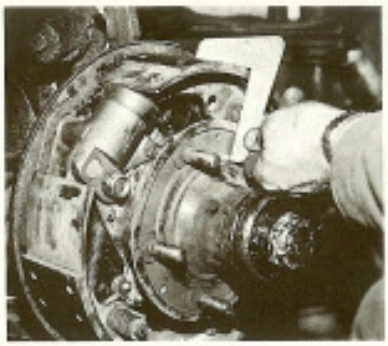
If you have access to a window drum (figure 10), making these adjustments is easier, quicker, and more accurate. The window drum is a necessity when setting up the 4-shoe brakes on the Continentals. With the window drum, you apply hydraulic pressure until the shoes bind hard, then complete the tightening through the window, as per the shop manual. This method guarantees centering and evenness.

Rear Brakes

All brakes on this car were clearly stuck on. On the rears, we tried to slacken off on the adjuster to release it, also backing off on the mechanical

Figure 6: *Water and dirt excluder for rear brake expander. Deterioration allows water and dirt into unit, which in turn corrode plunger and expander cylinder and damage rubber seals. Then brakes don't release.* ***Figure 7:*** *Rubber seals, front wheel cylinder. Left: new one; note sharp edges. Right: old and swollen, thereby binding brakes. Deterioration results from old age and soaking in brake fluid. You'll feel the difference between the old and new rubber parts. The old seals have expanded 3/16", are softer, and will bind in the cylinder. Replace all soft parts on overhaul. Don't argue. Just do it.*





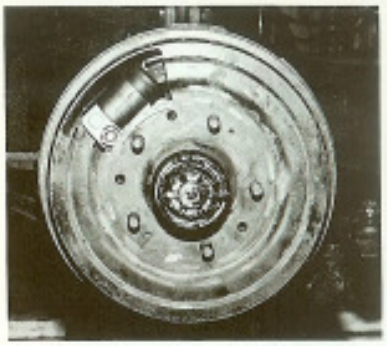


Figure 8: *Front brake assembly after overhaul, but prior to refitting. Observe correct placement of bias springs—behind carrier plate.* ***Figure 9:*** *Brake shoes must be aligned square to the drum for maximum braking. Adjust the steady post: first screw it out part way, then adjust in with your square (made to size out of alloy) and a screwdriver.* ***Figure 10:*** *Brake drum with window cut out: this drum allows tightening of cylinder anchor bolts while brakes are on, thus centralized within drum. Handy here, it is a necessity for 4-shoe front brakes on Continentals. Be very careful when handling a brake drum. The cooling ribs are fragile and can be easily chipped—never hammer them.*

expander. Unless you do this, it will be very difficult to remove the brake drum. Though the hydraulic expander was still frozen on, backing off the adjuster gave sufficient clearance to remove the drum. The rear lining was like new. In fact, the linings on this car were typical of what one finds: fronts half worn, rears like new; these indicate that the car had not been driven all that much since the braking problems occurred.

Since the backing plate requires removal of the half shaft to come free, you will have to remove all components and assemblies from the backing plate, the latter remaining attached to the car.

Pay real attention to the brake rod return springs on the rear backplates: they are important and many times will be either missing or overstretched. Also often missing are the rubber water/dust excluders on the back of the carrier assemblies.

When removing the rear wheel cylinder, be aware of the 2BA setscrew and lock washer at the back. They are likely to be hidden by dirt and rust.

When you remove the rear brake shoes and cylinder from the car, leave the linkage between the shoes connected to both shoes.

Master Cylinder and Balance Lever

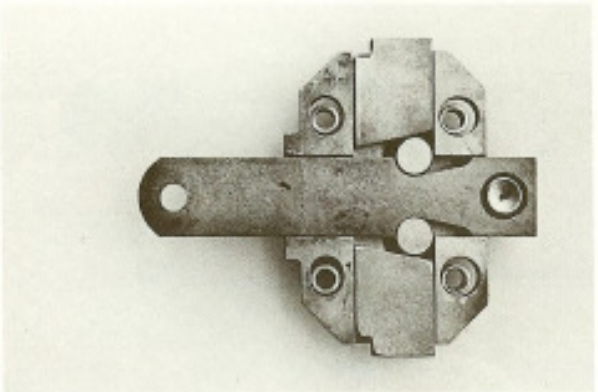
Because Rolls-Royce use a servo assist mechanism, the master cylinders are located amidships on the chassis frame in line with the servo, rather than being connected directly to the brake pedal as other car makers do. Moreover, because there are two master cylinders of different sizes and function, they require a means of being carefully balanced, one to the other, hence the balance lever within the operating lever.

One cause of problems with these brakes occurs as the result of water entering the hydraulic fluid. That combination causes rubber to perish and hastens corrosion of metal parts in contact with it. In addition, the traditional brake fluid (as opposed to the silicone type) is hydroscopic by nature, that is, it tends to draw water or moisture to it, exacerbating the problem. To keep things alive and working longer, change the brake fluid every two years (this is absolutely crucial in Silver Shadow cars), and so get rid of the water that the fluid has attracted.

Massive corrosion had taken place in both master cylinders. Rather than replace them, I resleeved them in stainless.

A real problem in this car was the top anchor pin in the operating lever which was rusted solid and would not come out of the chassis bracket, nor the lever off the pin. It made removal of the master cylinders especially trying, and interfered substantially with correct operation of the brakes. After the master cylinders were removed, heat (the so-called 'gas axe') was applied to the operating lever pivot pin to remove it from the chassis frame.

The hydraulic lines at the master cylinders are very difficult—nearly impossible—to reach without a hoist or



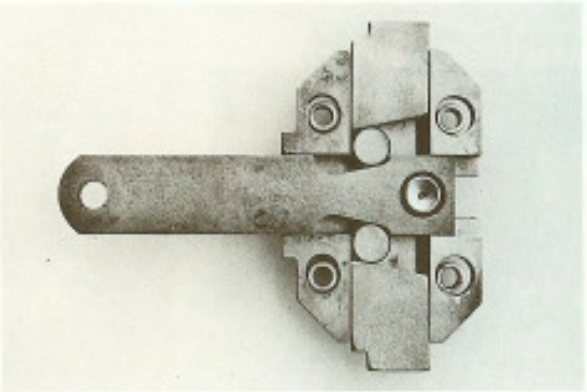
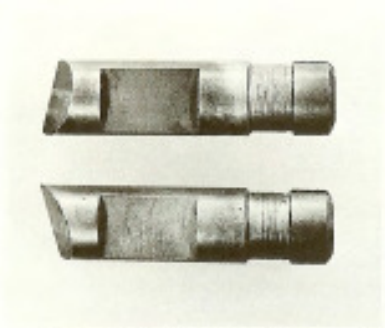


Figure 11: *Rear brake mechanical expander—brakes off. Note distance pieces with loose fit in 4 holes to allow tappet guide to centralize itself when fully reassembled.* ***Figure 12:*** *Rear brake mechanical expander—brakes on. Note tappets pushed out to apply brakes. When you overhaul the mechanical brake expander, use a glass beader to remove corrosion, etc., bearing in mind that glass beading will tend to remove cadmium plating as well, something that is hard to have replaced nowadays. There is no need to polish the expander, though such polishing does no harm. It must work smoothly. If it is really pitted, change it.*



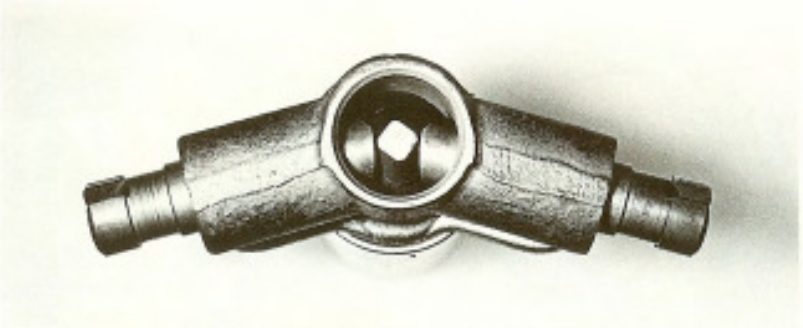


Figure 13: *Rear brake adjuster unit plungers. They really are right and left handed. The notches fit locating pegs machined on the two bolts holding the adjuster to the backplate.* ***Figure 14:*** *Rear brake adjuster unit. If handed plungers are interchanged, the shoes will not contract enough to allow the drum to be refitted. When assembled correctly, turning the adjusting screw will produce an audible click.*

pit. You must replace the master cylinders and their attachments in precisely correct order or it's back to square one.

The larger (1") master cylinder is on top and operates the rear brake shoes and the upper front wheel cylinder (thus the upper shoes). The smaller (3/4") master cylinder is on the bottom and operates the lower front wheel cylinder (thus the lower front shoes only).

The roller bearings in the balance lever seldom go bad. Here's how you replace them. Use any wheel bearing grease to hold them in place. Apply grease to the inside of both balance lever pivot holes. Put 23 needle bearings in the pivot hole (figure 18). Fit the balance levers together with the longer collars facing one another, fitting the appropriate distance piece and rubber o-ring between. Then fit the pushrod holders to the balance lever, the larger (3/8") one going to the top. Now push the pivot pin through the central hole, keeping the roller bearings in place.

Reservoirs

Empty out the reservoirs, removing the sludge and accumulated filth. Then clean up the tops and filter, and have the top place re-cadmium plated.

Don't remove the metal hydraulic tubes from the chassis. Just disconnect the other end from the master cylinders and blow them out with air.

When you replace the flexible reservoir hoses on V-8 cars (they will almost certainly be cracked—examine them carefully), it is advisable to use heat resistant rubber tubing.

The top of the reservoir bracket is supposed to be the mark for filling the reservoir, but with the engine in place you won't be able to see what you are doing, and with dirt inside and out, you never see it anyway.

Said in Passing

There should be nothing mystical about overhauling Cloud brakes. Use the shop manual as your primary guide, and follow the advice in this and in preceding articles, and you will tackle successfully the brake overhaul on your car.

Beware of the terrific multiplier effect in this braking system. Even a minute amount of unwanted friction where it doesn't belong can, by the time it is multiplied and transmitted, have an unintended and undesirable effect on braking.

From Harry Grylls, designer of the Shadow: If a component fastener is designed properly, then the bolt/nut has no need for a washer. If it isn't, then even a lock washer won't help and may, in fact, hinder the intent as the washer crushes. This is why RR deleted big end bolt lock washers when the V-8 was designed. Neither mains nor rods use any kind of lock washer.

Are customers interested in prizes? They start to take an interest when things start to look clean.

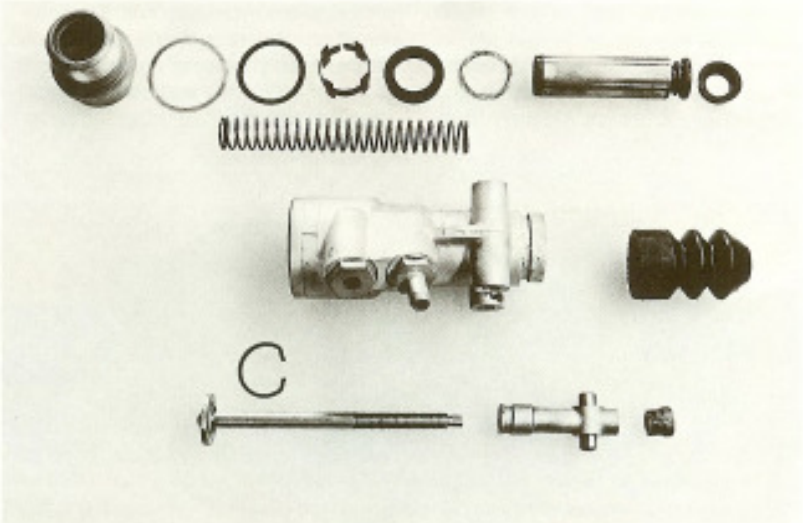
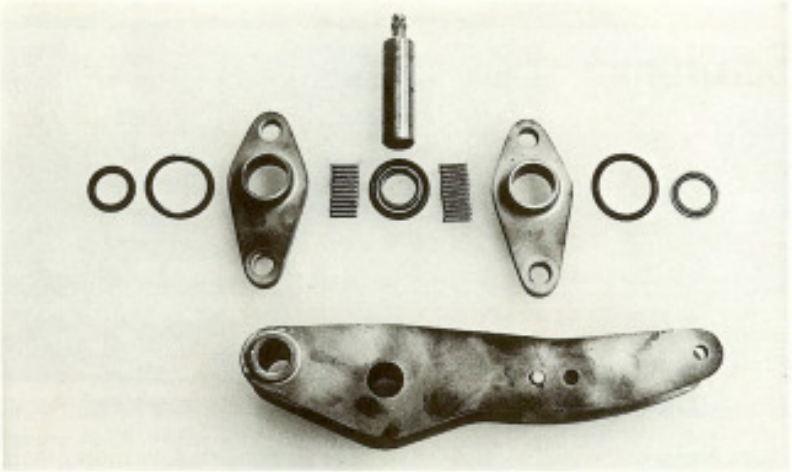


Figure 15: *Master cylinder immediately on removal from car. Grit and muck indicate seepage and leakage—clearly time for overhaul. The muck is the result of a mixture of brake fluid and water attacking die-cast aluminum. Despite all the corrosion, these brakes worked, though they did not retract. You can inspect for corrosion without removal or disassembly: just look under the rubber covers.* ***Figure 16:*** *Master cylinder, exploded view. Notice corrosion on plunger at top right. Either fit replacement cylinders or bore and sleeve the old ones: cost considerations may dictate the method of repair.*



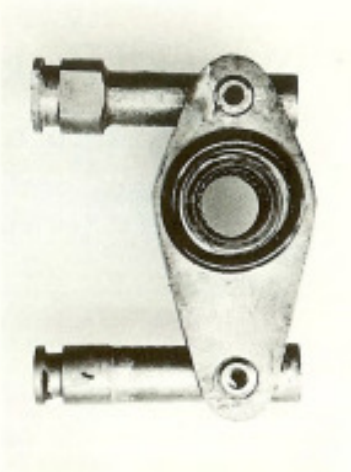
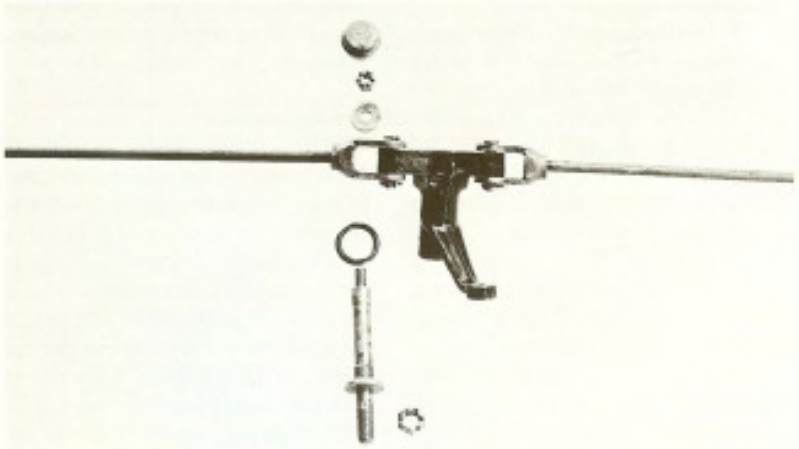


Figure 17: *Master cylinder balance lever, exploded view, with operating lever and one of the two sets of needle bearings. The balance lever balances the effects of the two master cylinders. It pivots in a needle roller bearing which is well protected and seldom causes trouble. At overhaul, replace the 3 rubber o-rings.* ***Figure 18:*** *Balance lever partially assembled: needle roller bearings are held in by heavy grease.*

Replacement Brake Parts: Silver Cloud II/III

Name	Quantity	Part No.
Reservoir Hoses (top)	2	UR4988/9
Reservoir Hoses (bottom)	2	UR3234/5
Reservoir Hoses (clips)		UR8054
Brake Hoses (front)	4	UR4807
Brake Hoses (rear)		UR4804
Master Cylinder Kit (1")		CD1206
Master Cylinder Kit (3/4")		CD1207
Balance Lever O-Ring	2	LC280
Balance Lever O-Ring		LC212
Off Stop Buffer		UR1234
Rear Brake Equalizer Seal		FB3940
Rear Brake Equalizer Bushes	4	RG5085
Cap		UG898
Rear Brakes		
Adjuster Excluder	2	GB4327
Seal Kit		CD1607

Name	Quantity	Part No.
Bleedscrew Ball	2	UG1181
2BA Lockwasher	2	KB7104/2
Brake Rod Boot	2	UG1174
Brake Rod Spring	2	RE17032
Brake Rod S-Hook	2	RG6025
Dust Cap	2	UG1169
Front Brakes		
Bleedscrew Ball	4	UG1181
Dust Cap	4	UG1169
Joint	2	UG3761
Cylinder Kit	4	CD1608
5/16 Shakeproof Washers	2	CS32060
Assorted 3/32 Split Pins		
3/16 Split Pins	2	K4628/2
Lockplates	2	UR4912



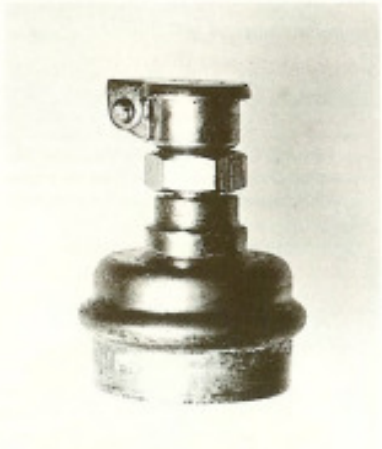


Figure 19: *Rear brake equalizer and linkage. The pivot pin and bushes here were rusty, an indicator that the whole system, hydraulic and mechanical, requires attention. It is not enough to clean up this easily accessible unit and then stop.* ***Figure 20:*** *Author's modification: since there is no way to lubricate the pivot pin, I add an oil fitting to the cap over the pin. Then it's easy to put in a few drops of oil every time your car is serviced.*

National Brake Seminar

Post-War to 1980

October 16-17, 1992
Mechanicsburg, PA

This seminar, led by George Colgett, CA, RROC Vice President, Post-War Tech, and Guy Williams, was based on Guy's teaching tool in which he has adapted the Shadow concept of three braking systems retrospectively to pre-Shadow post-war cars. Photography © 1992 K. & M. Karger.

Guy Williams makes his point – note the cutaway Shadow accumulator.

Understanding Brakes

As Easy as 1-2-3

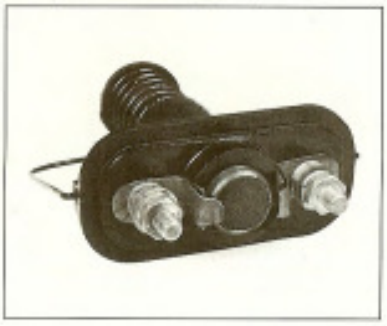
by Guy Williams

The point and emphasis of this article is the concept that the brakes on post-war cars through 1980 all have the same power flow chart or logic pattern or algorithm, with some variations. Once this power flow path is understood and combined with the details of how it is implemented on a car, the symptoms which that car is exhibiting will tell you what needs to be fixed.

To emphasize clearly and teach the basic concept, I will deal with the variations only at the end.

The first step in understanding RR post-war brakes is to abandon the idea that things happen simultaneously. You must accept and work from the awareness that the application of your brakes is the result of a chain of events. Your task, or your mechanic's, is first to identify and then to rectify the weak link(s) in your chain.

The broken contact in this brake lamp switch allows the stop lamps to work only under hard braking – a full stop from speed. If you test it at rest, the lamps will seem to work but not necessarily on the road. The contacts are replaceable and available from RR. You can turn the plunger to a new spot for a better temporary contact



Servo Analogy

The sequence of events with all the pre-Shadow cars involves a dry clutch called a servo. It is easier to understand the servo if you divide it mentally into two sections – primary and secondary – with an analogy between the servo and the more commonly understood ignition distributor.

An ignition distributor has two sections – primary and secondary. It is the primary that controls the function of the ignition. When ignition takes place is vested in the primary components.

The application of the ignition is a function of the secondary components in the distributor – the cap and rotor.

The fact that power is generated by another component (the coil) is triggered by one section of the distributor (the points) and then distributed through another section (the cap and rotor) to be used to perform work somewhere else, makes the distinction between the control as against the application sections of the distributor.

Within the limits of the above analogy think of a servo as having these two analogous sections, the control components and the application components. Like a distributor, it all works together as one unit. But for the purposes of diagnosis and repair, I think it helps to keep them separated mentally.

Remember: This separation is a teaching device used to explain how a servo functions as part of a larger whole. You will not find references to servo "primary arms", etc., in any Rolls-Royce manuals or literature, nor will other knowledgeable RR people know what you are talking about if you use these terms in this context.

What I term the "primary parts" of the servo are the two upright arms that (like distributor points) control the action of the mechanism.

The secondary parts of the servo are the clutch faces and the arms that actually connect with the other brake components and the master cylinder(s). These take power from another place (the driveshaft) and use it to do the work of applying the brakes.

The key to all this action is in the base of the primary arms *and* in the way they are connected in the car.

There are two critical elements of the design:

1. When the two "primary arms" move together, as a unit, the motion from one is transferred to the other. But until they separate, nothing happens to the servo.

2. Once they separate along their linear axis (front to rear in the car) their design forces them apart across their width. This separation activates the rest of the servo components (the secondary) by forcing the servo clutch faces together. Then the rotating servo causes the secondary arms to apply this motor generated power to the brakes.

Braking Sequence

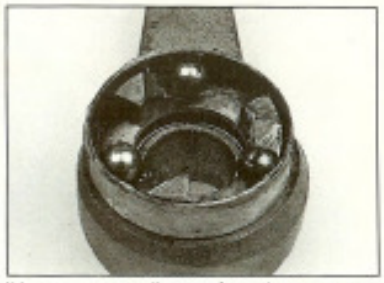
The sequence works as follows:- brake pedal to linkage, to one servo primary arm, to the other primary arm, the two arms move together as a unit, which pulls on the handbrake linkage, which connects to the rod to the rear, to the equalizer pivot, to the side rods, to the mechanical expanders in the rear drums, to the rear shoes, to the drums, which causes sufficient resistance so that your continued pushing with your foot causes the two primary arms to separate and trigger the servo. This is what comprises what I call the No. 3 Braking System.

Rolls-Royce has always used this numbering system with Shadows. I think it is helpful to employ it in understanding all multiple braking systems. This No. 3 System serves three purposes:

1. It is the trigger mechanism for the high pressure brakes (the secondary part of the servo applying the master cylinders).
2. It provides the pedal feel.
3. It provides approximately 10% of the brakes.

The parallel to Shadows is exact: since Shadows have disk brakes, they require much higher operating pressures. So they use two independent high pressure pump and accumulator systems. But all the Shadows until chassis sequence no. 22073 use an unassisted master cylinder plumbed into what are termed the low pressure pistons in the rear calipers.

In a device called a "rat-trap", the resistance from this No. 3 System (RR terminology) is used to trigger the valves which distribute the motor-generated accumulator pressure to the wheels, just as the resistance from the mechanical brakes is used to trigger the servo's application of motor-generated force to the master cylinders.



As the servo arms pivot during brake application, ball bearings on small ramps force the arms apart, engaging the servo which then assists in brake application. These bearings rarely wear. Use chassis grease to keep them from falling out during assembly.

The rest of the algorithm, or flow chart, is also the same between Clouds and Shadows.

The 1 inch master cylinder system (No. 1 System) on Clouds supplies high pressure to all four wheels. The upper (front) wheel cylinders on the front wheels and the high pressure brakes to the rear.

The No. 1 System on Shadows supplies high pressure to all four wheels. The front calipers on the front wheels and the high pressure pistons in the rear calipers.

The ¾ inch master cylinder system (No. 2 System) on Clouds supplies high pressure to the lower (rear) wheel cylinders in the front wheels.

The No. 2 System on Shadows supplies high pressure to the rear calipers on the front wheels only. (Remember, variations later.)

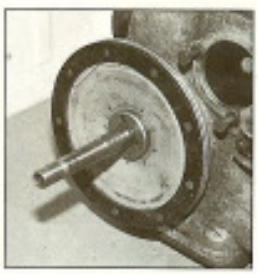
If you are still reading this far, the accompanying chart should now be making sense to you. Note that the numbers represent the decreasing order of the percentage of brake pressure supplied by each system. The sequence of action is No. 3 then No. 1 and No. 2 simultaneously.

An outline of Guy Williams's teaching tool – his adaptation of the Silver Shadow concept of three braking systems back to earlier post-war cars. Seminar participants found that Guy's approach neatly categorized the functions of the braking system and led to their better understanding of it.

Post-War Rolls-Royce and Bentley Brake Systems					
	Pre-Cloud	Silver Clouds & S Series		Silver Shadows & T Series	
	SW, SD MK VI R Type	Until SYB50, B245BC (mid-1956)	All Others SCI, II, III, S1,2,3	'66 through mid-1976	Mid-'76 through 1980
No. 1 System High Pressure Hydraulic to Front of front & to rears		Single Master Cylinder System for 4 wheels	1 inch Master Cylinder for 4 wheels	No. 1 Pump and Accumulator and Distribution System 4 wheels	No. 1 Pump and Accumulator and Distribution System 4 wheels
% of brakes	Zero %	85-90%	60%	60%	55%
No. 2 System High Pressure Hydraulic to Rear of fronts (& to rears in Late Shadow)	Single Master Cylinder Hydraulic to front only		¾ inch Master Cylinder for fronts only rear cylinders	No. 2 Pump and Accumulator and Distribution System High Pressure rear calipers on front	No. 2 Pump and Accumulator and Distribution System 4 wheels small pistons in rear
% of brakes	70-75%	Zero %	30%	30%	45%
No. 3 System Low Pressure Trigger & pedal feel	Mechanical in line through primary side of servo (large arms)	Mechanical in line through primary side of servo (large arms)	Mechanical in line through primary side of servo (large arms)	Hydraulic unassisted master cylinder in rat-trap	Mechanical, compression bushing in rat-trap
% of brakes	25-30%	10-15%	10%	10%	Zero %

Note: All brake percentages are approximate.





Left: Three prongs on the side of this early post-war manual gearbox help locate the servo mechanism. Removing the plate surrounding the prongs (remove 4 screws) exposes a replaceable seal. Center and right: The servo clutch plate and shaft fit onto the prongs after the whole servo unit is assembled. You must blindly twiddle the shaft to make it snap onto the prongs.

I think that the best way to cover the variations is chronologically, which is left to right across the top of the chart.

Variations

The post-war pre-Silver Cloud cars had mechanical brakes only to the rear wheels. Therefore they did not have a No. 1 System as it has been defined here. What they had instead were the No. 2 and No. 3 Systems with the variation of an extra secondary rod on the servo. This extra secondary rod supplied servo assist to the rear mechanical brakes once the servo was engaged by the primary rods.

The early Clouds had the No. 1 and No. 3 Systems only. These are the single master cylinder Clouds. As the chart shows, they went to the dual master cylinders early in the production run, then to No. 1, No. 2, and No. 3 Systems.

There is one significant change to the pattern during the production run of the Silver Shadows. They eliminated the No. 3 System. They replaced the resistance of the master cylinder with a rubber cone shaped progressive resistance bushing.

The small pistons in the rear calipers that were supplied by the master cylinder are supplied by the No. 2 accumulator in the late model production run cars. This is the change shown on the chart.

Symptoms and Design

Even with these variations the basic concepts still apply.

First, you must realize that you are dealing with a sequential system that has both triggering and applications sections.

This is important because it means you can have a very high pedal and almost no brakes or vice versa, a pedal that goes almost all the way to the floor then gives you hard firm brakes when the linkage runs out of free play. These symptoms are possible because there is a trigger system that is separate from the high pressure brake systems.

On Clouds it is possible for the linkages to be misadjusted, the pivots to be worn, etc., which will give you a poor pedal until you manage to trigger the servo, at which time a good servo and hydraulic systems will do an excellent job of stopping the car. On Shadows, the exact same thing can happen with a poor master cylinder.

The opposite symptoms can also appear in both cars: a high firm solid brake pedal with a good "feel" that has a reduced or in extreme cases, little or no affect on actually stopping the car.

In Clouds this would be because the secondary side of the servo and/or the hydraulics were malfunctioning. In Shadows it would be because the pump and accumulator systems were below standard.

•

In all cases I remind you that you must be aware of the basic system and how it is implemented in whatever car you are working on. This knowledge combined with the precise symptoms will tell you what needs to be repaired. And remember, whatever you are fixing – from automobiles to zithers – it is the design that dictates the proper repair sequence.

Brake Seminar Notes *by Bob Leonard, PA, and others*

George Colgett and Guy Williams led us through an inspection of the braking systems of several participants' cars. This served primarily to reinforce our understanding of how brakes work, assisted by Guy's teaching model as described in his article.

Brake rods are high quality steel, but can be bent by master cylinder failure. They should *never* have adjustable nuts in the middle of them, and they should *never* be straightened. Replace them instead with RR parts only.

When relining servo, buy extra rivets; you will need them. Head of rivet goes on the plate side; peen on the cover side just hard enough to keep rivet from rotating, or you could crack the back plate.

Adjusting the servo: Book says turn adjusting nut in until servo starts rotating with transmission, then back off 2 flats. George Colgett says back off 6 flats (one complete turn) and run for 500 miles, then reset according to book. The servo disc will expand with heat, especially in stop/start traffic, and the brakes will come on by themselves.

The cover plate on the servo is more than a dust cover – it is actually a spring plate which helps separate the dry clutch assembly. If it gets damaged, don't straighten it, replace it.

You never want a bonded shoe – only a riveted one. Bonding will come loose if brake fluid leaks on it. Use RR parts.

Take shoes and drums to an OSHA approved brake shop so shoes can be relined and arced to the face of their drum. The face of the shoe should hit the drum first. Brakes will chatter if heel or toe hit first. Check shoes for cracks – RR recommends replacement of whole shoe with liners.

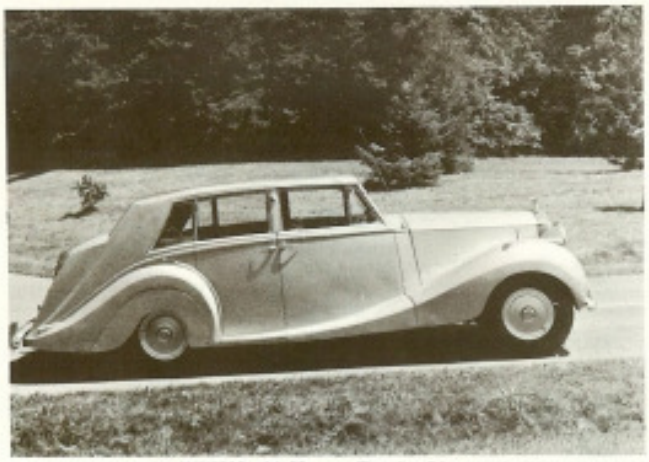
In examining brake linkages for play, don't forget to check the pivot at the base of the pedal arm (not at pedal itself) for undue wear.

If you have to work on the Shadow braking system, remember the unrelieved hydraulic pressures cause bodily injury and major repair jobs if the pressures are not first bled out. The accumulators are right above the exhaust pipes, a clear fire potential. Hint:- Keep a bucket of water handy when working on this system. A stream of brake fluid at 2,000 psi will go right through your hand, and may splatter all over the vehicle's finish. This stuff makes a nice paint remover. (Obviously, before you start this work, study the Shop Manuals – available from Club Stores – as well as Cal West's superb series of articles.)

To remove wheel covers from Clouds & Shadows, put the valve stem at 11 o'clock, then slide a flat bar behind the wheel cover as far in as it will go at either 12, 4, or 8 o'clock to catch the clips holding the cover. The deeper you can get your pry bar, the less likely to dent or bend the wheel cover.

If buying a car with hydraulic brakes, check the color of brake fluid in the reservoirs. It should be clear amber (straw color). If contaminated fluid is or has been in the car, expect to replace every perishable item in the braking system.

A tool that is useful in several places on Shadows is made for Mack Trucks: a 7/16" swivel socket on a ¼" drive which has Allen screws so it can be tightened in position.

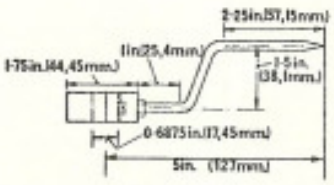


Silver Wraith WVH32 with Hooper Touring Limo body. Happy owner is R. W. Richards, W.Va.

SERVO DRIVE GEARS—POST WAR CARS EXCLUDING SHADOW AND T SERIES

Service Bulletin No. AG20 of 14 Mar 66 advises a possibility of undue wear of the bronze gear in the gearbox which drives the brake servo. The bulletin refers specifically to automatic boxes up to SC III/S Series and suggests a check of the gear after a mileage of 50,000. The wear in the early stages may be felt as a slight delay in servo action on braking and in bad cases, would presumably promote stripping of the gear. Hence, a check of all post-war boxes would seem worthwhile.

The bulletin suggests the tool shown below be made up to check the backlash.



The tool is attached to the head of the bolt securing the servo to the gearbox which can be reached from beneath the car. The pointer is then rocked to and fro to the extent of its travel. If this travel exceeds 0.250 in at the tip of the pointer (i.e. at a 5 in radius), the servo gear should be replaced.

On automatic boxes, this is comparatively simple as the servo mechanism can be removed as a unit from the rear of the box.

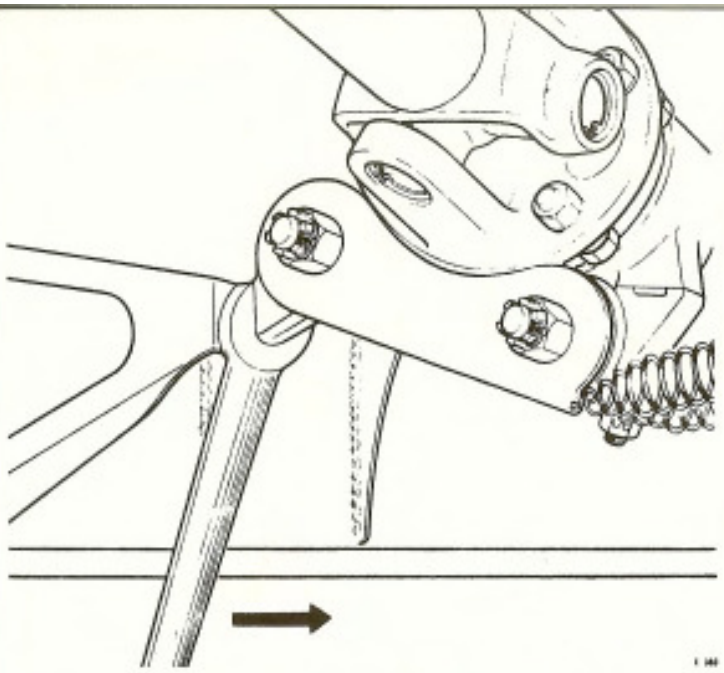
On manual boxes more is involved. The bronze gear is 'hourglass' in shape with the "waist" of the gear snugly fitted into the driving gear on the third motion shaft. It is therefore impossible to draw the bronze gear over the third motion shaft with the latter in position. If it is not desired to remove the gearbox, the following procedure may be practical:

a. Remove the floor board and toe board, leaving the pedal surround in place.
b. Disconnect tail shaft, rear shock absorber pressure line, rear stabilizer rod from gear box and chassis, and servo. It may be possible to remove the servo from the box without disconnecting any of the brake rods and wire it to the chassis clear of the box.
c. Disconnect the rear gearbox mount on the top side leaving shims and rubber mount in place.
d. Screw out both rubber tongue fittings and collect rubbers.
e. Jack up engine to raise rear of transmission until servo shaft is clear of chassis side member.
f. Remove rear coupling, transmission cross stabilizer mount, rear cover plate, speedometer drive and rear shock absorber pressure pump.
g. Withdraw servo locating piece from rear of box, four screws retaining servo oil seal and servo shaft can be persuaded out of the box.

Renewal of the gear is straightforward. Suggest replace the smaller race on the end of the servo shaft being the first to wear, and readily available locally. It may also be worthwhile to renew the servo oil seal which appears to be a factory special.

Read in conjunction with the maintenance handbook, the above should be little trauma to the most unmechanical. Good luck!

Bill Coburn, Va.



PROPELLER SHAFT CENTER BEARING SQUEAL – S-SERIES CARS

During the winter months the propeller shaft center bearing can emit a loud squealing noise soon after starting from rest when the bearing is still cold. The bearing is very lightly loaded and it is almost certain that this noise is caused by the balls skidding instead of rolling in the tracks. One simple way of ensuring that the balls do roll, is to load them lightly in an axial direction against the tracks by twisting the bearing as described below.

The noise can be cured with the least delay and inconvenience by applying a small pre-load to this bearing. It should be stressed, that the application of a small pre-load does not in any way have a detrimental effect on the bearing.

To begin the procedure place the car on a ramp or over a pit. Remove the split pin which locks the nut securing the center bearing mount to the chassis frame. Slacken the nut sufficiently to allow the mount to twist about its retaining bolt.

Using a 3/4 in. A/F open ended spanner, twist the center bearing mount about its retaining bolt (see Fig. 1) until all the clearance has been taken up in the bearing. This is a very *delicate* operation, and can be carried out as follows:

Hold the spanner between the forefinger and thumb and gently rock the mount to and fro, watching the gap between the forward end of the center bearing housing and the flange on the propeller shaft. When the spanner is at one end of this rocking motion, all the bearing clearance will have been taken up. Increase the forefinger pressure on the spanner to apply a very light pre-load to the bearing, and retighten the nut to lock the mount in this position. The mount can be twisted forwards or backwards; either way effectively loads the balls against the race tracks. Using a new split pin, secure the nut.

Alternatively a known amount of pre-load can be applied using a spring balance. With the split pin removed and the nut slackened as before, apply a spanner to the mount as shown in Figure 1. A torque of not more than 4 lb. ft. will impart the correct pre-load to the bearing. Therefore a load of 4 lb. should be applied through the spring balance at a distance of 12 in. from the base of the spanner jaw (or 5 lb. at 9 in. or 8 lb. at 6 in. and so on).

When the bearing has been pre-loaded, both spring plates of the mounting assembly should be marked with a yellow paint stripe to indicate that this action has been carried out.

STAINLESS STEEL EXHAUST SYSTEM FOR S.I. BENTLEYS

Replacement exhaust systems in stainless steel are now being manufactured for the S.I. by P. Wainwright, Road Motors Ltd., 511 Bradford Road, Batley, Yorks.

Prices are,

Front downpipe & box	£57.50
Intermediate pipe & box	£26.50
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Factory photo of an S-2 Continental with Park Ward coachwork. An example of rising prices . . . a tattered and torn one went at auction recently for $13,000.00.

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