THE ROLLS-ROYCE OWNERS' CLUB

REPRINTS FROM

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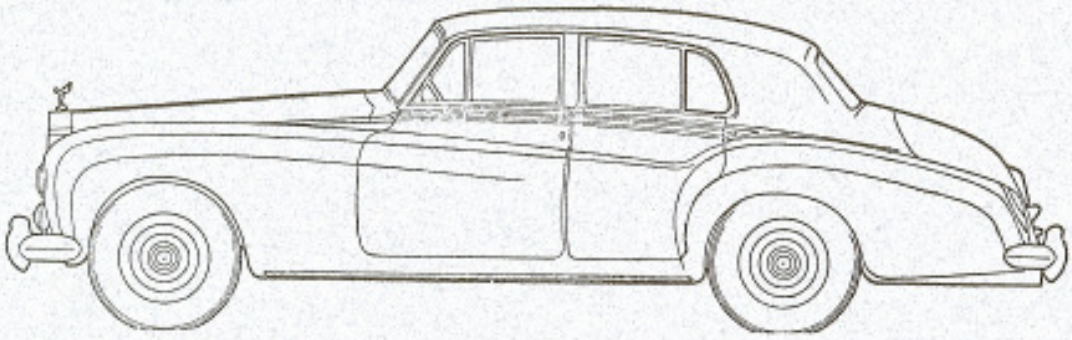
SILVER CLOUD/S: 1955-1966



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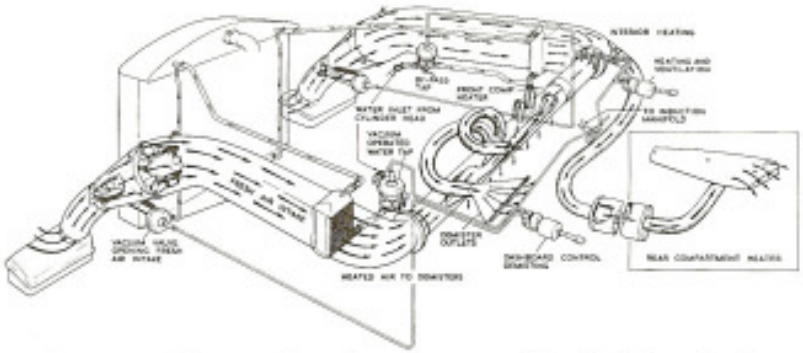

SC-1 or S-1 Heater/Demister System Repair

(Part 1) Bob Mendenhall (CA)

Soon after acquiring my '58 Bentley S-1 saloon, I discovered that the front wings were badly rusted. The outside looked fine, but the inside surface resembled a close-up view of the moon. So I removed the wings to replace them with some "pre-owned" specimens that were in better condition. How I secured them is a long story that will remain untold for now. They are not fibre-glass, they are real rust-collecting steel ! When I removed the phantom (and I mean they were almost gone) front wings from my S-1 (B263FD), I exposed the heater and demister systems which also needed attention. These ductwork arrangements are mainly aluminum and mine had suffered bitterly from salt corrosion, the same condition that devoured the wings.

I have had no previous experience in aluminum repairing, so I hope my explorations will be of value to other restoration novices. Repairing these heating systems requires little technical knowledge, but it takes time.

Description

The heater and demister are similar except for a warm air duct on the heater (right) side to heat the rear seat area. The car's forward motion forces air into each of the small horizontal grilles below the headlamps. The moving air goes through a valve, opened by a switch on the fascia panel; then a fan forces it through a small heat exchanger where it is warmed. The warm air goes into one end of a cross duct that extends across the scuttle. This duct is open at each end but is divided lengthwise by a slanting metal separator.

Warm air from the demister (left) side comes out the top through ducts and slots under the windscreen. Air from the heater side exits through slots in the bottom of the cross duct and warms the driving area. The slanting divider in the duct equalizes warm air distribution across the width of the car.

Parts of the System

The demister (left) ductwork is shown in Figure 1. The heater (right) ductwork is the same except that the mountings are reversed so it can be fastened to the right valance panel. I've assigned numbers to the various sections of the ductwork in order to avoid having to describe each section more than once.

Section 1 is the air intake which is located behind the small horizontal grille under the headlamp. The air intake is wide in front and narrows to the rear. It has a circular outlet opening on the top. The air intake is made of two sheet aluminum sections that are riveted together. The rear is not closed off but has a half-inch slot to allow excess air to exit. A phosphor-bronze screen between the two parts of the assembly stops pebbles and dirt. A three-inch rubber collar is fitted over a flange on the top and this guides the air into the next section. The rubber collar is Section 2.

Section 3 contains a flat disk rotating valve to close off the passage. There are two parts: a cast aluminum housing for the valve (3a), and a sheet aluminum cone-like piece (3b) that increases the duct diameter. The two parts are riveted together but can be separated, if required, by drilling out the rivets.

An aluminum casting is fastened inside the circular joint between Sections 3 and 5. This machined part (Section 4) has a 2-speed electric motor and fan mounted on it. The connecting wires to the motor go through rubber grommets in the motor cover and on top of the duct.

Section 5 extends from the joint at (4) to the heat exchanger. The circular duct bends through an angle, then is formed into a square cross section to match the input shape of the heat exchanger.

The heat exchanger (6) resembles a small radiator. Connecting tubes at the top and bottom extend through matching holes in the valance panel. Water circulating hoses are attached to these tubes to bring in warm water from the engine and return the cooled water to the front radiator. Openings in the exchanger allow the cool air to be warmed as it passes through.

The Section 7 duct is lined with insulating material. The square input matches the back of the heat exchanger but the duct becomes circular and completes a 90-degree bend to meet the inlet of the cross duct. Four studs on the scuttle match the holes in the mounting flange and four nuts are used to secure it. This description of the heating systems will be supplemented with additional details.

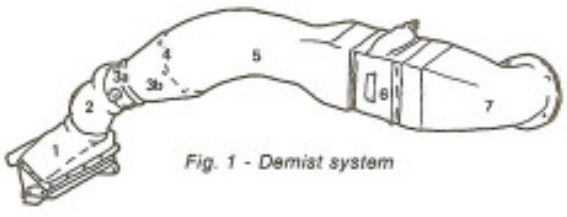

Fig. 1 - Demist system

System Removal

The easiest way to remove the ductwork is with the valance panel still attached to the car. The panel is firmly braced and enough leverage can be applied to remove the rusted screws and bolts. It is also easier to urge the pieces of duct to relinquish their homes when a little

persuasion is necessary! I found persuasion wasn't quite enough with the bronze nuts that held the heat exchanger to the panel, so I left it in place to be removed after I took off the valance panel.

The amount of dirt I found on top of the heater ducts was surprising. The flat top surface of the duct was covered with dirt, stones, sticks, mud, and other debris — all well mulched into place. I transplanted three plants I found growing there, two mangos and a primrose, and they are doing nicely! A putty knife helped clear much of the mess, and a long, thin screwdriver cleared out the debris lodged between the duct and the panel, only about a half-inch away. There was an additional coating of road film and oil, so I used solvent to remove another layer. The weight I've removed will probably force me to remove a couple of shim washers from the front springs to get the car level again!

I've now repaired both the demister (left) and heater (right) systems but I did each one separately so that I could use the other assembled panel as a guide for hardware placement.

The valance panel has many attached pieces of hardware but because of its size (about 3 by 4 feet), it is hard to see all the detail in a photo. I drew a rough sketch as I cleared off the panel, but as several weeks passed between removal and replacement, I'd forgotten what some of my hieroglyphics were supposed to be.

Most motorcars are heavily undercoated around the wheel area. This can make it difficult to remove some of the fasteners. The four nuts holding Section 7 to the scuttle will need the undercoat removed before they can be undone. After they are off, this section can be removed. This must be carefully done to avoid damaging the heat exchanger or the aluminum duct. The duct flange on 7, slides over the outside of the heat exchanger opening. I found a flat rubber loop around this joint with plenty of undercoat and sealant holding it in place. I used a putty knife to pry away this seal from the metal. When the seal was loose, I could pull the scuttle flange away from the studs, then I gently moved the duct up and down to free it from the heat exchanger.

After the top section is out of the way, the lower sections can be removed. Collapse one side of the rubber collar (2) to shorten its length, then slide it off both the lower air intake outlet flange and then off the control valve casting (3a).

The air intake is fastened to the valance panel by two bolts and a bracket. I found it easier to remove the intake from the bracket than the bracket from the panel, because both the bolt and nut were more accessible with wrenches. The air intake assemblies on my S-1 were badly corroded and had to be replaced. If they are not in good condition, be sure to save all the bits and pieces to use for reconstruction patterns.

Before removing Sections 3-4-5, some work must be done on the inside of the panel. The cast aluminum valve control section (3a) has a shoulder extending through a grommeted hole in the panel. Attached by three screws to this shoulder is a horizontal steel bracket. The other end of this bracket has a right-angle bend with a hole for mounting the valve actuator. A wire from the front of the actuator is fastened to a bell crank mounted on the valve shaft inside the shoulder. A spring from the bracket to the other leg of the bell crank keeps the valve closed when not actuated. The other end of the actuator has pneumatic tubing going to the actuator control which, in turn, is connected to a switch on the fascia panel. This actuator bracket, bell crank, and spring must be removed from the panel before the rest of the system can be disassembled.

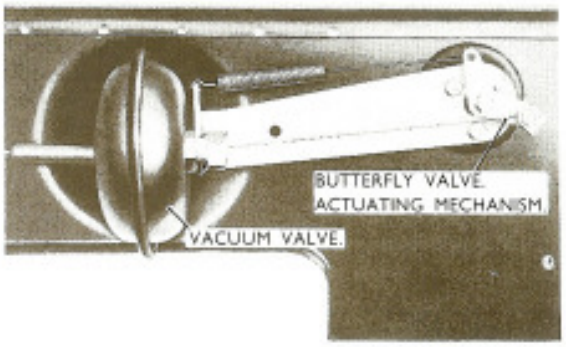

Fig. 2 - Butterfly Control Bracket

The top end of Section 5 is still attached to the heat exchanger (6). Care must be used again to avoid damaging the exchanger. Use the same technique employed when removing 7; a prying, jiggling motion — working the overlapping edges free from the exchanger. Again you may find a flat rubber loop sealing the joint.

Use a putty knife to split the undercoating and free the duct. The two bolts holding the mounting brackets at Section 4 must be removed, then the 3-4-5 section can be taken off and laid aside. It may be fragile, so treat it with care.

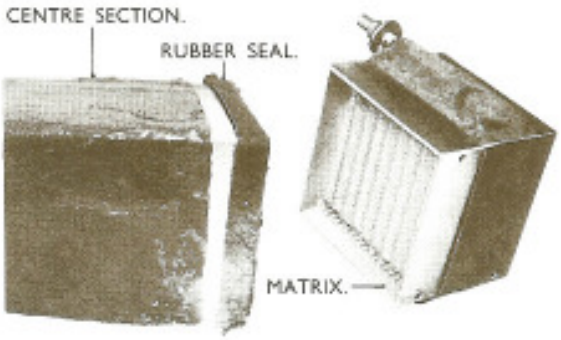

Fig. 3 - Heat Exchanger

The heat exchanger can now be detached. The exchanger has two connecting tubes protruding through the panel, one on top and one on the bottom. On the outside of the panel is a flanged, threaded bushing welded to the tube close to the exchanger. The inside of the panel has a large metal washer and nut threaded onto the bushing of each tube. The bushings pass through two grommets lining the holes in the panel. The bushing is aluminum and the securing nut is brass or bronze. These are often frozen together by corrosion and must be removed with care. A large, adjustable wrench can be used on the inside bronze nut, but if the bushing flange is not held securely, the connecting tube may be twisted off. This happened to me and I had to have a new tube heliarced to my heat exchanger. By using penetrating oil and a thin-jawed water-pump plier on the outside flange, I was able to loosen the bronze nut. I didn't want to destroy the rubber grommet, so I didn't use a torch to heat the joint. After the exchanger is off, remove the rubber grommets and set them aside for reuse.

Fan Housing Disassembly

The final disassembly is to separate the joint that encloses the fan mount casting. This should be done on a flat working surface. Again there may be a problem with frozen screws: the eight steel pan-head machine screws holding the overlapping aluminum ductwork to the circular aluminum casting. These screws were removed after liberal application of Liquid Wrench and heat from a portable propane torch. For some reason, the four screws holding the mounting brackets were very hard to remove and their heads were marred in several places before they came free.

Sections 3 and 5 have open-ended longitudinal slots at the overlapping joint and these allow the ducts to be pulled loose from the casting even when the screws are not completely removed. The top section (5) can thus be pulled free and additional penetrating oil applied to the screw threads. Before this section is fully removed, the fan motor wires should be pulled through the small rubber grommet in the top of the duct.

After both ducts are gone, the circular fan casting is accessible and the motor and fan can be taken off. The fan is held to the motor shaft by a single screw on the front hub. The electric motor is held by three nuts and bolts that are not hard to remove. Make a sketch of which side of the casting carries the body of the motor, it is easy to remount the motor with the casting reversed. The outside circular duct mounting surface is machined with differing diameters to compensate for the thickness of the inside duct and provide a level surface for the overlapping outside duct.

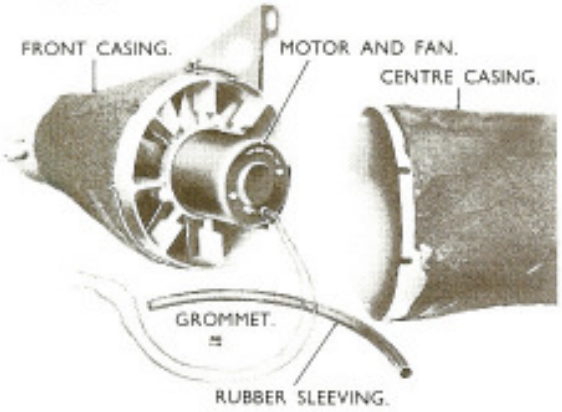

Fig. 4 - Fan, motor and casing

The aluminum fan casting can now be cleaned and the corrosion removed. I discovered much grease and dust on my fan blades. A soak in "Gunk," a wash in water, then a light buffing with a motor-driven wire brush cleaned it quite well.

I next took apart the control valve in the casting (3a). Two screws hold the flat, circular disk in a slotted brass shaft. After the screws are removed, the disk can be forced through the slot and removed. Caution, the edges of the disk are beveled and can cut the unwary. The shaft is removed from the casting by uncapping the outside end (rubber), pulling out the split pin, then pulling the shaft through the shoulder on the other side (don't lose the washer under the split pin).

The brass (or bronze) shaft comes in contact with the aluminum, so there is corrosion. The shaft in my heater (right) control was frozen closed and required considerable persuasion to remove.

Before the ductwork is cleaned, the pieces of insulation should be removed from the inside of Section 7. This insulation pad is about one-quarter inch thick and is lightly cemented to the inside surface. I used a sharp knife to separate the pad from the inside surface. It was very dirty and filled with dust. I kept the pieces to use for patterns when I replaced the insulation with fibreglass batting.

Cleaning the Hardware

I removed all the undercoating from the outside surfaces with solvent and "Gunk" and this takes time. The solvent action is slow, so I used an old, very dull wood chisel to skin chunks of the undercoating away so the solvent could penetrate more surface area, and this speeded up the removal.

Ductwork Repair

After freeing the ductwork sections from dirt and undercoating, I examined them closely. There were many holes and pits in the aluminum caused by the salt. After studying the problem, I found a method for repairing these damaged aluminum ducts.

I decided to use a ready-mixed body putty to fill the holes, but I needed something to anchor the filler. I applied small pieces of glass fibre tape over the holes on the inside of each duct. The holes were easy to find, as a light on the outside made them easily visible. I applied the tape firmly, as I did not intend to remove it. This took some time as there were many holes and some of them took several pieces of tape to cover. From the outside of the duct I applied some "Green Magic" spot putty, using a putty knife to smooth it. I also filled in all the pits that had not eaten all the way through. The spot putty does not require mixing and is squeezed from a large tube. It adhered well and dried in about an hour.

One step I forgot to mention was the use of phosphate jelly on the clean aluminum before I applied the tape and filled the holes. This product is put out by the makers of Naval Jelly and it was used to neutralize any remaining salt and stop further corrosion. I also used a pointed rotary file in my drill and routed out some of the holes and pits so the putty would have a good surface to stick to.

After the putty was dry, I used sandpaper to remove the excess and smooth the surface. The outside was next sprayed with Zinc Chromate aluminum primer using a spray can. This primer insures a good base for other paint or undercoating. The yellow-green color also hides the patches of green putty; unfortunately not exactly British Racing Green!

Air Scoop Restoration

The air scoop (Section 1) on the left side was almost completely destroyed by corrosion. After removing what remained, I found many holes in the top, and the bottom consisted of a slight residue, the center being completely nonexistent. The two sides were still present, which was fortunate, as from them I could determine the angle of the scoop. The top and bottom were riveted together, so I drilled them out and took the scoop apart.

As I mentioned, the bottom was beyond salvage except for the sides. I measured the remains and made a mechanical sketch so it could be formed from sheet aluminum. The top also had several holes and pits, but I decided to repair and reuse it because of the deep drawn shape and the round opening and raised collar, which would be difficult to duplicate.

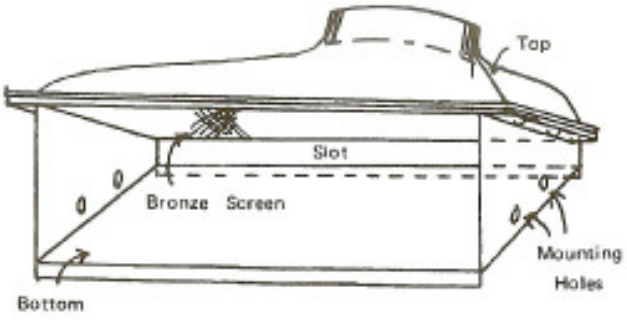

Fig. 5 - Air Scoop

I could find no sheet metal shop interested in making the air scoop, so I became a manufacturer. A replacement, based on my sketch, was cut from 18-gauge aluminum sheet and I used a vise to bend the corners and edges. This sketch is shown in Figure 5. Before using it, check the length dimension, as there have been changes in size; it is a half-inch shorter on the '56 S-1. The corrosion on the flanges used for riveting left the holes very weak, so I made a couple of thin reinforcement strips to strengthen the edges for reassembly. The two sections originally had a fine mesh screen between them, so I purchased a small piece of bronze window screen and cut it to fit. I then used a pop rivet tool to put the air scoop together.

The Valance Panels

After removing the demister system, I discovered that the valance panel was rusty. My radiator shell and grille were already off, so this was an ideal time to remove the panel for cleaning, rust removal, and repainting. With the wing, heating system, and radiator hardware gone, it was not difficult to remove the panel.

Several pieces of hardware must be disconnected before the panel can be removed. The bonnet latch control rod nuts are taken off so the rod can be disengaged from the latches. The vacuum control tubing from the control unit is disconnected. The window washer container comes out after the tubing is slipped from the top nipples. The electrical cable bundle is removed from the clips holding it to the panel. A grounding strap from the frame, held to a small stud by hex nuts, must be disconnected. The bottom support bracket enclosing the exhaust pipe must come off. Remove three bolts.

After these steps are complete, the bolts holding the panel to the radiator and scuttle can be removed and the panel lifted off. This is a cumbersome job and best done by two people. After it is off, it can be placed flat, engine-side up, on an elevated surface. A couple of carpenter's sawhorses are ideal as the panel does not need to be completely supported.

The condition of my panels required me to have complete access, so I removed all the hardware from the panel. I made a sketch of the placement of each piece of hardware so I could replace it correctly. The bonnet latch, rod, and guides are easy to replace, but the cable clip locations should be carefully noted as their mounting direction must be right to hold the cable bundle.

When the heater (right) side panel is removed, there are a couple of differences that should be noted. The two brake fluid reservoirs must be drained and removed. These are glass and difficult to replace, so handle them with care. When the rubber tubing is removed from the bottom nipples, be sure to wire or tape them upright to the engine to keep the master cylinders from being drained. Take care to keep the hoses uncontaminated — seal them with a plug or tape. On my S-1 the armored cable from the emergency brake was routed between some of the rubber vacuum control lines and I had to remove them to free the panel.

Panel Repairing

After all the hardware is off, including the rubber grommets, the panel can be cleaned. I used solvent to remove the undercoating from the wheel-side and it also removed the grease and oil from the engine-side. The size of the panel forced me to stand it upright in a large plastic chemical tray and I used a brush to apply the solvent. After the surfaces were clean, I used a wire brush to remove spots of rust, then a motor-driven disk sander to grind away the remaining spots and expose the rust patches. Following this, I used Naval Jelly to remove the rust pits and other corrosion. I used the disk sander again to grind away the rest of the oxidation and get down to bright steel.

When both sides were clean, I applied a coat of Rustoleum primer to each side. I cleaned up the bottom support bracket in the same way. I next applied a coat of black Rustoleum to the engine-side of the panel and support bracket. Before painting the panel, I straightened out a few bumps on the edges and knocked out a couple of dents. (Any place where metal is bared, it is well to etch the surface with phosphoric acid before priming).

(Part 2, How to Re-assemble, will appear in the Nov. issue)

FRONT LICENSE PLATE BRACKET FOR SILVER CLOUDS

A license plate bracket can be made for the front bumper of the Silver Cloud by using a Fiat 124 ('70-73 convertible--part #905140 @ $1.20 each) and by having your local metals dealer cut you a piece of aluminum (about 25¢-35¢/pound) to a 22" x 4¼" for the exact R-R size, or 19½" x 6¼" to accommodate a standard U.S. license plate. If you use the larger plate backing, the extra space can be further taken advantage of by affixing decals, badges, etc.

In using aluminum, be sure to prime the surface with a chromate primer before painting the desired color.

You will find that this bracket is generally easier to come by than the R-R replacement and considerably less expensive.

J. G. Fuque, Jr., Tenn.

SC-I or S-1 Heater/Demister System Repair

Bob Mendenhall, CA

(Part 2 continued from page 2107)

Ductwork Reassembly

If you separated Section 3 into two parts, put them back together. The control valve in 3a should be reinstalled. The shaft is pushed into the hole in the casting, the end with the raised key goes in the shoulder section. If the shaft does not turn freely, there may be internal corrosion to be removed. I used a fine-cut rat-tail file on the inside surface and was careful not to remove any metal and so enlarge the shaft hole. When the shaft is replaced, be sure to lubricate the surface so that it turns freely. I used light machine oil.

After the shaft turns freely, install a split pin and washer on the keyed end, then push it back into the casting from the shoulder end. This inside washer and pin must be installed first as it is almost impossible to reach down into the shoulder recess after the valve has been installed.

With the shaft in place, the valve disk can be replaced. The beveled disk may require pressure to insert it through the slot in the shaft. Be careful of the edges of the disk as they are sharp. When looking into the casting from the bottom opening, the sharp edge of the disk should be up. When the disk is rotated, the edge should be in contact with the inside surface, both top and bottom. On the demister side (left), the shoulder points right and the heater shoulder extends to the left.

Two brass screws fasten the valve to the shaft. I was unable to measure a difference between the mounting holes and the edge of the disk, but the valve closed off the passage tighter in one position than when it was mounted with the other edge out. This indicates that the shaft hole is not centered.

After the valve is secure, the washer and split pin can be installed on the outside of the shaft to hold the valve securely in position.

Sections 3a and 3b can now be riveted together if they were previously separated. A pop riveter works fine. The rivet length must not be too long as the valve action can be hindered by rivets extending too far on the inside. I had to bend two rivets out of the way and it was awkward to reach past the valve.

Sections 3 and 4 should now be joined. This requires installation of the fan motor in the casting and replacing the fan blade on the motor shaft. Use the sketch made during disassembly to mount the motor on the correct side of the casting. After the motor has been bolted into place, be sure to pull the motor leads through the rubber grommet in the top of the duct. If the grommet is damaged, it should be replaced.

Sheet metal screws (8) are used to hold the two sections together. They are screwed into the holes in the outside surface of the casting. The holes may be corroded, so be sure to try them in the holes before joining the sections. I used self-tapping machine screws to clear the threads before joining the sections.

To reassemble Sections 3 and 5, lay 5 on a flat surface, the curve inside you, and the square section on the right. This helps determine the location of the two mounting brackets which are held in place by the assembly screws. The screws can be inserted through the bracket holes and into the casting. All eight screws can be loosely started because the duct pieces have open slots on their edges and can slide under the screw heads. The outside surface has two levels so that the inside duct surface is level with the casting surface and the outside duct can be pulled down firmly against both surfaces. Be sure that the fan blade is toward the control valve

The valance panel hardware should next be replaced on the panel. Your sketch of the mounting locations should be used to assure that each piece is properly placed. If you have any problems, use the other panel for guidance; it is very similar. (to be continued in Jan. FL)

SC-I or S-1 Heater/Demister System Repair
(Part 3 - Cont'd from page 2121)

Remountlng the Ductwork

I think that it is easier to install the ductwork on the valance panel when the panel is still Iying flat. You won't have to straddle the front wheel and axle, and the duct does not have to be held in position while you fasten it to the panel.

The two rubber grommets lining the holes for the heat exchanger tubes should be replaced. Make sure that their edges are exposed equally on each side of the panel.

The exchanger should now be installed. Be certain to mount it on the correct side of the panel, on the wheel side. The aluminum tubes are inserted through the grommets, the flat washers placed over the tubes on the other side, and the bronze nuts started onto the threaded bushings surrounding the tubes. Before tightening the nuts, put some lubricant on the threads. Be sure to use the same technique in fastening the exchanger that was used in removing it. The bushing on the exchanger must be held in place as the fastening nut is tightened to avoid twisting the tube.

When the heat exchanger is in place, the rest of the system can be installed. The combined Sections 3-4-5 are next to be replaced. The square end of 5 fits over the outside of the exchanger-some edge warping may be necessary to position it, but the metal is soft and creates no problems. Don't force the heat exchanger out of position as the bushings are soft and can be bent.

The valve shaft shoulder will protrude through a large grommeted hole when the duct is correctly placed. This allows the two mounting bracket flanges to touch their mounting holes in the panel. These mounting holes are lined by rubber grommets (to quiet any rattles) but have a short metal sleeve through their centers so their fastening bolts can't be overly tightened.

With the lower ductwork in place, the joint between the exchanger and the duct can be sealed. I used two-inch aluminum self-sticking "duct" tape for this purpose. The clearance between the panel and the joint is about a quarter-inch, so the tape should be started on this inside surface so it doesn't have to be pulled through more than once. After the tape has been threaded through this opening, pull enough more so the end can come around the duct and back to the start. Pull the tape tight, starting with the loose end, so it covers the joint tightly. A long screwdriver may be used to make the inside stick to the duct. Now bring the tape around the outside down to the bottom to give a double layer on all but the inside surface. I did not feel that the inside surface needed a double thickness because it is well protected by the panel.

The air scoop assembly can be mounted at the bottom of the duct, but unless the panel is to be installed immediately, this assembly can be easily damaged. This section can be postponed until the panel is on the car, because the mounting bolts are accessible.

The panel should now be turned over for access to the inside (here's where the sawhorses are valuable). The valve control is now mounted. The control bracket is fastened to the casting shoulder that protrudes through the panel. This steel bracket that holds the actuator is held by three machine screws to the flat edge of the col lar.

The bracket holes are circular slots, which allow some adjustment of the bracket angle; it should be nearly horizontal when the panel is mounted. Next, the bell crank is fastened to the shaft by a single machine screw with the key slot to position it correctly.

The control actuator can now be mounted. The long wire goes through the hole in the bracket towards the shaft. Thread the large nut over the wire and screw it on the threaded sleeve that goes through the bracket. The thin wire is threaded into the rotating bushing on one leg of the bellcrank and the setscrew in the bushing is tightened lo firmly clamp the wire. The return spring should now be installed between the bracket hole near the control and the hole in the open leg of the bellcrank. The spring keeps the valve closed when the control wire is not in operation. Slip the short rubber coupling over the actuator nipple so it is joined to the vacuum line on the panel.

Replacing the Valance Panel

The valance panel should be checked to see that all the hardware is present. On the left panel the windscreen washer container should be mounted, and on the right, the two brake fluid reservoirs.

Panel replacement will generally require two people to position it so the four rear mounting bolts can be replaced. The front mounting bolts are anchored to the radiator and some adjustment may be necessary to line up the holes. If only one panel has been removed, the radiator is stable, but if both panels are off, some readjustment may be necessary.

The demister and heater control lines should now be connected to the tubes mounted on the scuttle. Next, the hoses between the engine and radiator should be connected to the heat exchangers and the jubilee clips tightened.

The top (Section 7) duct can now be installed. This is placed between the rear of the exchanger and the warm air inputs on each side of the scuttle. Remember that the right duct has the additional outlet for the rear seat. After the duct edges have been placed outside the exchanger, the round flange can be seated over the four studs and pressed against the rubber gasket around the air input. Use a thin washer under the nut and tighten down the duct. Now seal the joint at the heater with aluminum tape as was done on the front joint.

Other finishing details are beyond the scope of this article. The question of painting, undercoating, front wing mounting and radiator grille and shell replacement have been covered elsewhere.

I hope that the heater and demister systems in your car do not require the attention that mine did. But if they do, at least you know that someone else with little experience was able to bring these systems back into working condition.

Bob Mendenhall (CA)

S SERIES VACUUM VALVES

All S1 and most S2 and S3 coachbuilt cars use vacuum units to operate coolant taps in the pipes between the engine and heat exchange matrices.

The rubber diaphragms in these taps do fail in time and the result is not a simple heater problem, but a loss of some or all of the engine coolant. Spare diaphragms (part number UD 1233) are probably more important than extra fan belts or radiator hoses.

The procedure for replacing these diaphragms is outlined in the *Workshop Manual*.

Not mentioned is that "unsatisfactory operation of a vacuum unit" can include a weak return spring. The result of this condition is lack of a positive seal and heat when you do not want it. Recently, a unit with a spring pressure of 3¼ pounds was replaced with a new one (part

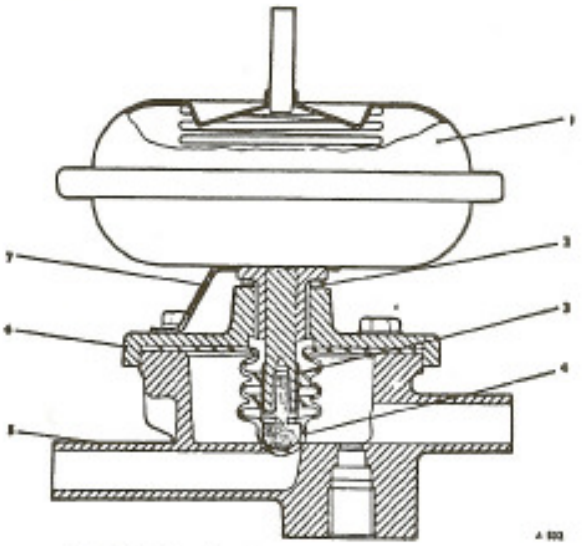

Fig. C11 Section view — vacuum operated tap

1. VACUUM UNIT
2. ADJUSTMENT WASHER
3. DISTANCE PIECE
4. DIAPHRAGM
5. BOTTOM HALF CASING
6. TOP HALF CASING
7. LOCKING PLATE

THROTTLE SUCTIONING VALVE

A part in the air-conditioning which can (and does) go bad in the Shadows is the throttle suctioning valve. The General Motors part number is 5910448 SP and a Chevrolet dealer can get it for you for about $35.00. You may then use the saving (some $295.00) to buy a part for your pre-war Rolls.

Sidney Greenspan, (Wash. D.C.)

TECHNICAL

Air Conditioning on the S.1 Bentley

by Michael Kapp

While I was in the process of searching for a LHD Bentley S.1 to purchase, I kept hearing from sellers that their air conditioning had been factory installed.

Here is a letter from the factory showing that there were only 42 LHD S.1 chassis which had complete air conditioning systems fitted by the factory.

Partial air conditioning from the factory was much more common and, according to Hermann Albers, Dave Clark, and others, consisted of the following:

1. A pressurized cooling system with shrouded radiator.
2. A heavy-duty water pump identifiable by a grease fitting on top.
3. A six belt pulley.
4. A compressor mount on the offisde of the engine in front of the carburetors.
5. Insulation between the headliner and the roof.

In addition, there also could have been:

6. A condenser installed in front of the radiator.
7. An expansion tank below and behind the front bumper.
8. An on-off switch cut out of the facia directly beneath the ignition switch.

I hope this helps clarify the concept of factory air. The car I purchased (B330LEG) had partial factory air.

Michael Kapp is a member of the Southern California Region and drives B330LEG, a 1956 S.1 saloon.

Rolls-Royce Motor Cars

Rolls-Royce Motor Cars Limited
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Telephone 0270 255155
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Fax 0270 586548

Mr Michael Kapp
President
Warner Special Products
111 North Hollywood Way
Burbank
California 91505
USA

17 March 1987

Dear Mr Kapp

Following on from my letter to you dated 17 February.

We have a total of 462 record cards for S1 Bentley LHD motor cars. Forty-two of this total are recorded as being fitted with air conditioning by the factory; in case it is of any assistance to you, I give below the chassis numbers concerned:

B 263 LCM	B 208 LFA	B 439 LFD
B 75 LEK	B 210 LFA	B 491 LFD
B 77 LEK	B 292 LFA	B 517 LFD
B 97 LEK	B 380 LFA	B 569 LFD
B 191 LEK	B 626 LFA	B 579 LFD
B 311 LEK	B 632 LFA	B 50 LGC
B 313 LEK	B 634 LFA	B 86 LGC
B 413 LEK	B 177 LFD	B 92 LGC
B 415 LEK	B 175 LFD	B 98 LGC
B 423 LEK	B 207 LFD	B 57 LGD
B 599 LEK	B 273 LFD	B 79 LGD
B 625 LEK	B 275 LFD	B 93 LGD
B 146 LFA	B 311 LFD	B 103 LGD
B 180 LFA	B 321 LFD	B 721 LGD

I hope this information will be useful to you.

Yours sincerely

Paddy

Paddy Owens
Parts Distribution Manager
Extension 3428

Wholly owned subsidiary of Vickers PLC
Registered office Crewe Cheshire CW1 3PL England
Registered in England under number 941897

AIR CONDITIONING MODIFICATIONS, S-SERIES CARS

By John McCombe, Ohio

S-I Cars

Some of the late series S-I cars were fitted with factory air conditioning. Numerous modifications to the S-I system were fitted in order to bring these units up to U.S. standards. A thermostat was added in the evaporator to shut down the compressor once the temperature reached freezing to keep the evaporator from icing up and restricting air flow. Main front-to-rear hoses were replaced, the originals had one inside the other and leaked. In some cases evaporator units were replaced completely.

Properly serviced, these units can provide adequate refrigeration. I have encountered a number of cars in which none of this work was ever done and have found that many of these systems are totally unreliable. Our solution is as follows: Replace the original Tecumseh compressor and clutch with current York model fitted with an Eaton Clutch of appropriate diameter and belt width. Buy a compressor with a 10-inch capacity for max. output. (It is possible to purchase a rebuilt Tecumseh compressor, however the old style clutch is generally unavailable. Konner's R-R has several rebuilt clutches for those who insist.) It is, of course, necessary to modify the compressor bracket to accommodate the new-style compressor.

Replace the main hoses running the length of the body if you find the old style hose (appearance of a single hose about 2" O.D. that splits out into two pieces at front and rear). You will need about 14' of 5/8" A/C hose and 12' of the 3/8" size.

Replace the old Danfoss expansion valve (by now probably bad) with a Parker #2002 universal valve or one interchangeable with the Parker model. (We just stumbled on this out of desperation. Original valves are no longer available and cost in the area of $75.) To do all this requires a number of new fittings, we use universal number 719/1144 through 1146, one each.

If there is no thermostat in the evaporator, install some universal model. It is convenient to mount the control knob up on the rear parcel shelf inside the car. This also amounts to installing a manual thermostat for temperature control of the car interior. Wire this into the hot line operating the compressor.

Have the system evacuated and recharged by a competent air-conditioning mechanic.

As a final word, to identify factory installed units in S-I cars, one can find a switch fitted with a knob similar to the heater control knobs located under the ignition key. The cover for the evaporator unit in the boot generally carries a metal tag identifying what is behind as a product of R-R. If a unit doesn't work and is not of R-R make, rely on your A/C man for advice.

S-II Cars

The first S-II cars to come to the U.S. were fitted with air conditioning integral with the heating system. None of these, to my knowledge, were left operable. One may find the evaporator units still under the RF fender as a part of the heating system, but this unit was considered under capacity for use in the U.S. and units of U.S. manufacture were subsequently fitted in the trunk. These early cars are fitted with the Tecumseh compressor, and the above instructions for replacement do apply.

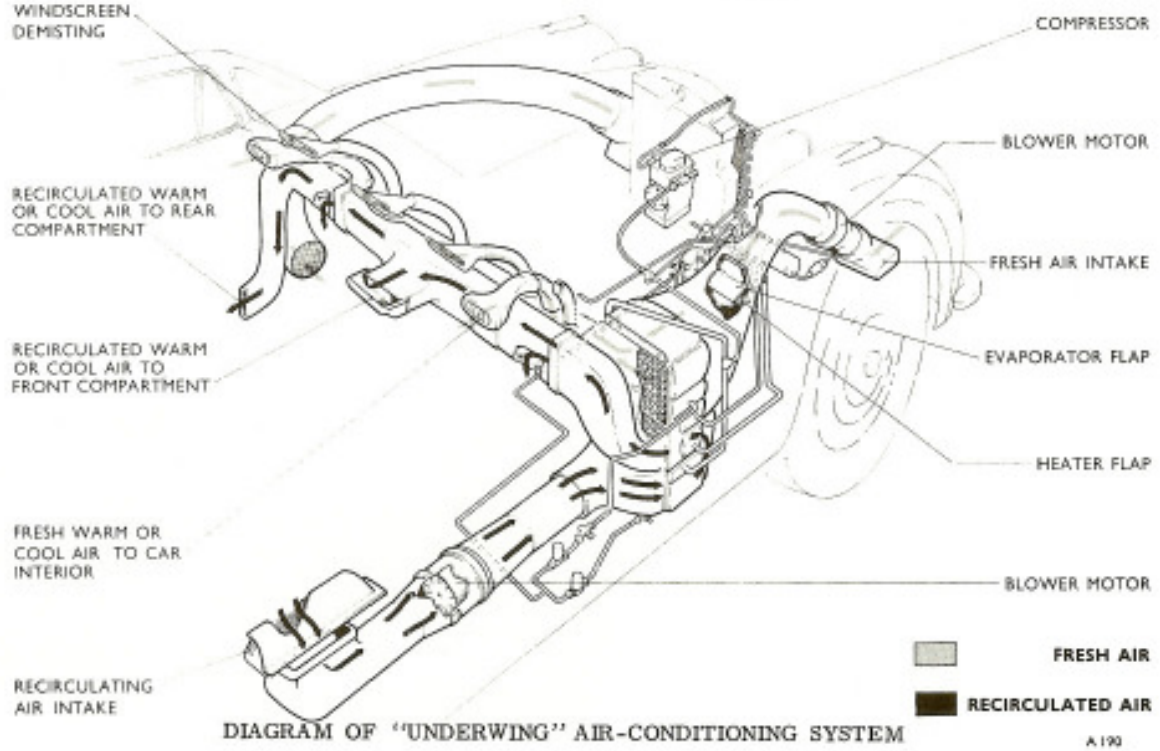


DIAGRAM OF "UNDERWING" AIR-CONDITIONING SYSTEM

1952 SD LSHD58 Park Ward d.h.c. and owners Herbert and Louise Keppler, Atlantic-Yankee Fall Foliage Meet at Avaloch, Mass., Oct. 1969.

The cars fitted with U.S. made equipment can be serviced by any competent specialist, and parts should present no great problem.

Thermostat Notes

The thermostat in the car is now designed to open at 88° F. Current thinking is that it is not necessary to fit a cooler thermostat during hot weather, that once the thermostat opens, it's open, and that during the summer the temperature is going above 88° F in any event, so what difference does it make which thermostat you carry? Of special note is that there are some owners who remove their thermostats altogether during the hot summer months. I have observed that this will keep the temperature down in some cars. Important, however, is that if the thermostat is removed, it is necessary to install a plate drilled with about a 1/8" hole in place of the thermostat bypass gasket. The thermostat works mechanically so that when it is closed the bypass is open, and when it is open the bypass is closed. To preserve proper flow when no thermostat is installed, it is necessary to fit something to block most of the bypass flow.

Editor's Note: R-R Inc. suggests the Amston Co., att. H. Meckl, 2213 Steinway St., Long Island City, N.Y., for installing or changing air-conditioning systems.

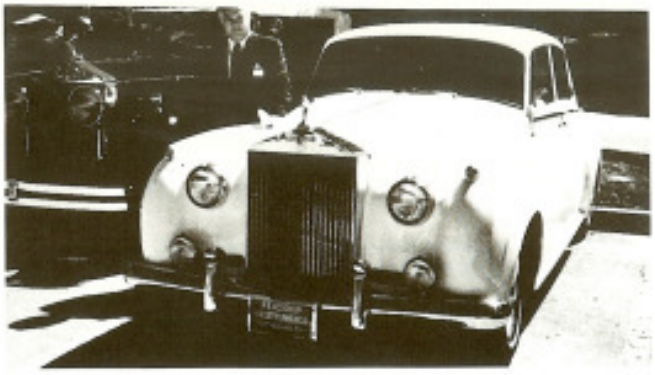
PRECAUTION IN COASTING "S" CARS

Do not coast or be towed long distances with the rear wheels on the ground in an S-type car. The rear oil pump turns causing partial application of the clutches with subsequent damage. Short distance towing or coasting should not cause a problem. John McCombe, Ohio

TRANSMISSION FLUID LOW, "S" CARS

Should an owner ever feel a vibration up through the accelerator pedal, this is a sign of low transmission fluid in the S-type cars. The next symptom is that the car will suddenly downshift to a lower gear, then the fluid level is really low. John McCombe, Ohio

NEW EXCALIBUR SERIES II AUTOMOBILES. These cars, while not R-R related, merit mention here. These classic replicas of Mercedes-Benz SS use Corvette components. A catalog, in design, color, and typography of the period, describes them. Write SS Automobiles, Inc., 4001 North Wilson Dr., Milwaukee, Wis. 53211.



1961 long-wheelbase Silver Cloud II LLCB11 saloon with owner Lionel Beakbane, Treas. of the S.E. Region at their annual meet, Tampa, Fla.

AIR-CONDITIONING CHECKS, S-Series Cars
by Adrian West, Vermont

Early S-series cars apparently came through with either Factory Air (not too satisfactory in the U.S.) or Partial Air. Partial air means the factory has done the dirty work, put in most of the plumbing and the condenser in front of the radiator.

After a few years, the fittings may work loose, then the system will not hold a charge. The places to look are all fittings in the engine compartment, the seals on the compressor motor, the fittings under the radiator, and the fittings in the trunk. These are checked by ANY competent air-conditioning man with a special torch. Obviously, all should be tight and not leaking. Another point where a Freon leak may be found is a little capped-off fitting on the right side of the car, just to the immediate rear of the radiator and against the wheel-well. This fitting is found on the Partial Air cars and does nothing with U.S. air systems.

To check if the system needs recharging, look to the sight glass. This is found in the line generally between the silica gel water trap and the receiver (RR-built receivers are rugged, made of boiler plate). Slide the protecting cover back, and when the system is running, if you can see bubbles in the glass, you need more Freon. The water trap and receiver are under the right front of the car in many Partial Air installations.

Above all, don't get talked into an expensive overhaul. The air conditioning is simple and can be repaired by any good refrigeration man. The Silver Shadows have GM compressors, so can be recharged and parts fitted in any appropriate GM repair shop.

1965 SC III LSEV277, owned by J. C. Armstrong, Texas, who drove to the '69 Vancouver Meet, winning the longest-distance trophy, post-war cars.

1959 Silver Cloud I sedan LSLG36 in the garden of its owner, Edgar F. Maurer, M.D., Calif.

G. Changstrom's '56 B. S1 Hooper saloon at So. Calif. Palm Springs Meet. From Allan Tweddle

S1 VACUUM WATER TAP LEAKS
by John S. McCombe

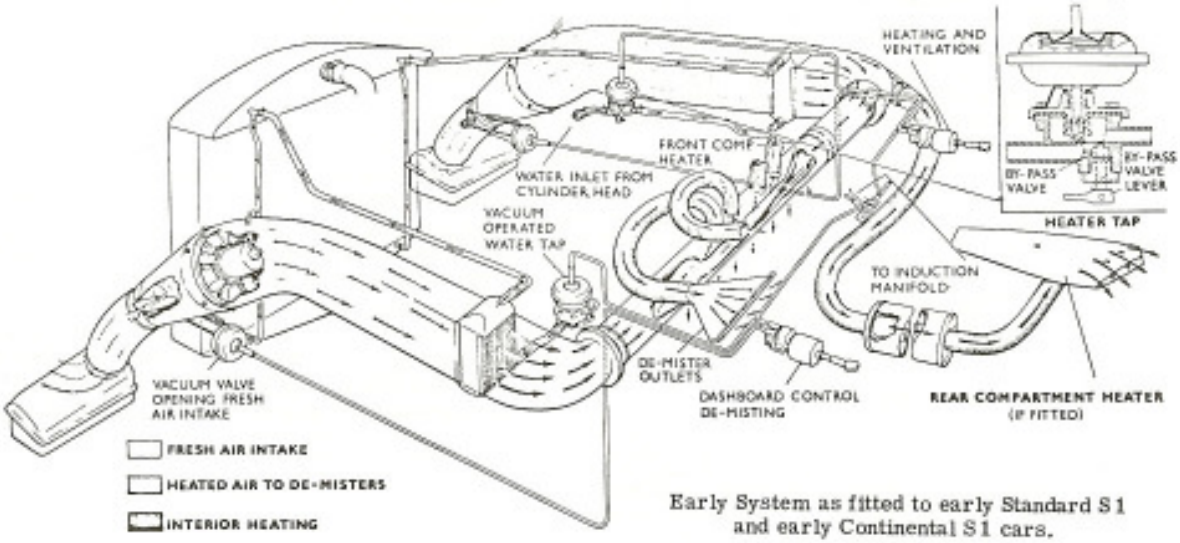
A source of water loss in S1 series cars and some later coachbuilt models is from the heater and defroster water tap units. This is due to the deterioration of a rubber diaphragm which is a part of the tapassembly. To detail the function of the system:

The control knob in the car when pulled out to the first position "opens a vacuum" to the fresh air flap vacuum unit. This overcomes a return spring tension that normally keeps the flap in the shut position. This permits outside air to enter the car. If the heating system is set for summer use, air enters the car at outside ambient temperature for ventilation. If the system is set for winter, there is always a flow of coolant through the heating matrix, and so the outside air coming into the car and passing through the matrix enters the car heated. Details for setting heater and defroster for seasonal use are found in the owner's manual.

Pulled to the second position, the knob continues to "supply vacuum" to open the fresh air flap. It additionally "supplies vacuum" to a vacuum unit which mechanically raises a water tap diaphragm nipple permitting an additional flow of water in the heating matrix if the system is set for winter and is already getting some water flow. At the summer setting, it establishes a water flow to warm the car interior.

The water tap diaphragm is a source of water leak and can be replaced as a unit rather than replacing the whole tapassembly. A recommendation to all owners with this system is that this diaphragm be kept among one's spares.

To Replace: 1. Drain cooling system. 2. Disconnect associated hoses. 3. Remove unit from car (obvious). 4. Observe for reassembly position of lock plate. 5. Remove six cover screws and split assembly. 6. Unscrew diaphragm from vacuum unit shaft removing distance piece from recess in top of diaphragm. 7. Clean crud and sediment from body, etc. In the event of early cars

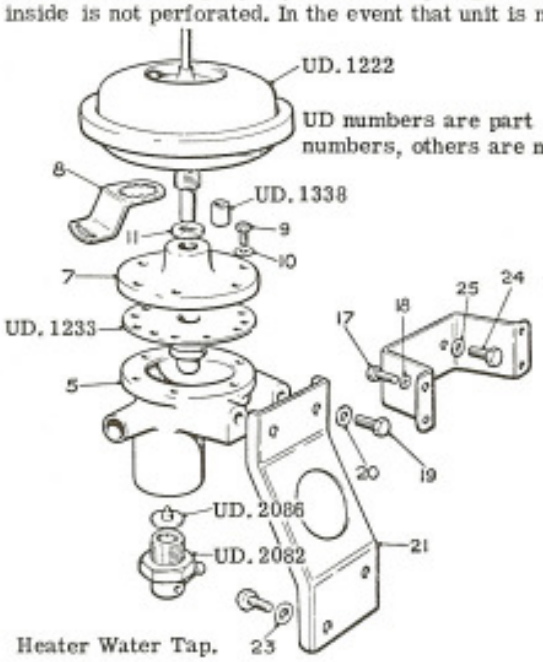


Early System as fitted to early Standard S1 and early Continental S1 cars.

The only two Bentleys of this Mulliner design in the U.S. Left, 1957 B332LEG, owned by C. S. Shoup, Tenn., and right, 1957 B214LEG owned by member Dominic Cappelli, North Carolina. Photo from the meet of the Mid-South Region, Abingdon, Virginia, May 9-10, 1970. Photo by Patterson, Abingdon. From C. S. Shoup

1958 Silver Cloud I SED179 Freestone and Webb special drophead coupe built for the 1957 Earls-court Show, owned by Monty Thomas, at Tampa.

with seasonal water flow valve on bottom of water tap (the type shown in diagram) this can be removed for cleaning, however, extreme care should be exercised here as body casting is brittle and can be easily broken. This is a good time to free this valve, which often can become frozen in position and is less accessible when mounted in the car. 8. Fit distance piece to new diaphragm and screw into shaft. 9. While unit is apart, draw vacuum on hose fitting on top of vacuum unit to assure shaft rises properly and that diaphragm sealed inside is not perforated. In the event that unit is non-functional, that entire unit must be replaced, as there is no way to fit a new diaphragm here. 10. Rest nipple of newly installed diaphragm on water opening in base of tap body. It should be necessary to compress top cover about 1/10" to close gap between it and the body. This assures proper positioning of diaphragm, and this gap can be adjusted if necessary (and it probably won't be) by fitting proper thickness adjusting washer as shown in diagram.



Heater Water Tap.

Note that there are separate similar systems for the heater and the defroster, employing separate air intakes and heating matrices, one coming up under each front fender.

As a final word, let's go back to the fresh air flaps, these are a source of trouble. The steel shaft that holds the flap binds in the aluminum housing through which it passes. The flap vacuum valve is located on the inside of the fender valance under the bonnet at the front of the car. This valve opens the flap through a bell-crank arrangement. A return spring closes the flap. If the flaps are not opening or possibly not closing fully, be sure that the vacuum valve is operating and that the flap spindle is free. This can usually be done in place by putting oil on the spindle under the hood and under the rubber boot on the outside of the air duct under the fender. In many cases, however, it is necessary to remove the entire unit for freeing up and lubrication. Again, CAUTION, these break, too. . .

SILVER CLOUD BRAKE FLUID LEAKS

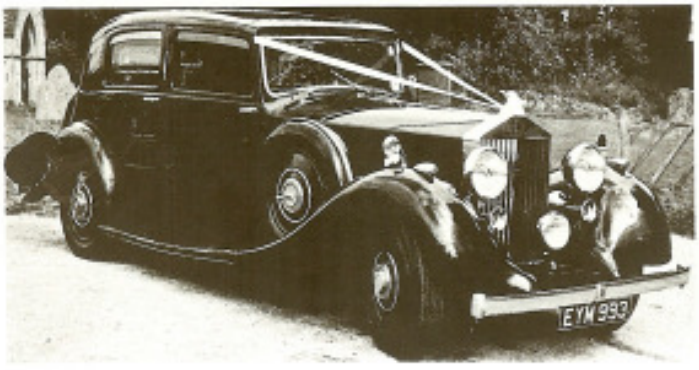
Brake fluid leaks around the bottom hose connections on the reservoirs can be cured easily with a pair of gaskets cut from an old bicycle inner-tube. I have found this beats cork or anything else on several Clouds I - III. H. C. Snyder, Neb.

S2 AND S3 AIR FILTERS, PAPER VS. MESH

Paper air filters are available from R-R for Clouds II and III, and we have found several paper types that would very nicely replace the Cloud I screen type. At least out this way, with our great plains dust, these are far more efficient. H. C. Snyder, Neb.

Comment by John S. McCombe: Yes, and all original S2 cars were fitted with the paper filter. In general, it has been recommended that these paper filters be disposed of in favor of a washable mesh type and, in general, this has been done. However, in areas of high dust problem, the paper filter is considered superior.

1938 25/30 GGR68 Hooper sedan owned by Capt. G. Wasserzieher of Texas. He bought it in 1963 while stationed in England and used it for his wedding. The picture was taken then.



SILVER CLOUD II and III "UPPER AIR" CONTROLS
by John S. McCombe

Air Control Flaps

A common complaint of drivers of S II and S III cars is failure of "upper air" system. It may not produce air temperatures called for by the switch or may not fully close in the "off" position, allowing air to leak into the car at all times.

Before going further, I have encountered owners who don't understand their heating systems, so let's begin with some instruction. In S II cars prior to chassis under number SYD138 in the D series of cars (LSYD, LSZD), there is a single water tap providing water to both the "upper" and "lower" systems. The water temperature is controlled by the "lower" system, warm in its first "on" position and hot in its second and third "on" positions. So in order to obtain the highest temperature from the "upper" system, the "lower" system must be in its second or third position. It should also be noted that when the "lower" switch is in the "off" position, only the warm water flow can be had. There is no way to beat the system as it exists.

(The drawing which we wrongly included on p. 1263 does apply to this early system. Glad we found a use for it! . . . Ed.)

As a further note, to turn off the water flow altogether in the "early" cars it is necessary to turn either the upper or lower switch to the "off" position and the other fully anticlockwise for a period of some 30 seconds, when it also can be turned "off." Simply shutting both switches "off" does not shut off the water tap. This information is worth nothing for summer use of the car, when one does not want any flow of hot water.

Cars of later chassis numbers have two heater matrices fitted, and so the above directions do not apply. These systems work independently of each other. There is a matrix for the upper system as well as one for the lower system, with water control through separate water taps. When either system is shut off the water flow is as well fully shut off, so is not necessary to go anticlockwise with either switch to be sure all water flow has ceased.

Now, for the "upper" system: Air is controlled by positioning two air flaps, one leading directly into the car from outside, the other directing air through the heater matrix (core). The mixture created by these flaps controls air temperature to the "upper" system. These flaps are located in the ducting coming from the air intake in the front of the RF fender. The motors controlling the flaps can be observed under the hood on the fender valance near the firewall.

Common Failures

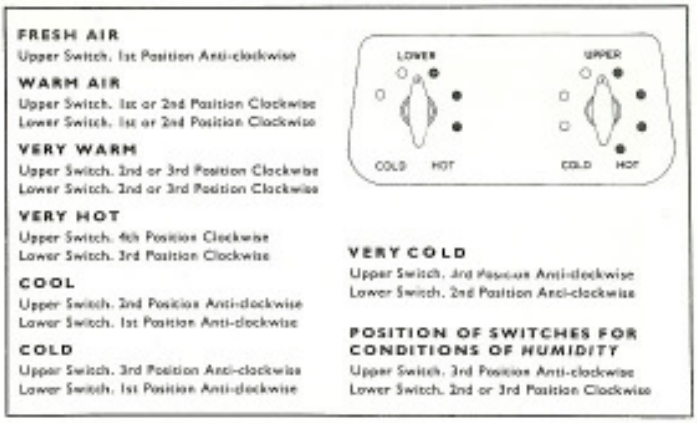
Corroded Spindles: Flap spindles corrode and freeze in position. It is generally necessary to disconnect them from motor linkage, to apply a penetrating oil and to free them by applying external force with vise-grips or what have you. The outer end of the flap spindle is reached under the fender and is covered by a small rubber cap (part number UD6038, Cover, dust).

Actuator Motor Failure: No spares are available for reconditioning motors. In some cases it is possible to take motor apart, clean, and re-assemble. An enthusiast can handle this without difficulty. (Replacement part number is UD6089, Actuator.)

Misalignment of actuator motor linkage to flaps also creates a problem. If this is the case and all else is operating, the symptom is generally an air leak through the system in the "off" position, when no air should enter the car. If an "amateur" has been tinkering with the mechanism, you may look here. More on proper alignment below.

An uncommon but possible failure would be that the lower flap has parted from its spindle, creating a situation in which air constantly enters the car, generally hot air if the rest of the system (water tap) is turned on. Repair here requires an incision through the bottom of the air ducting forward of the spindle location. Sometimes the old flap can be used. Sometimes it is necessary to replace the flap (part number UD8111). The incision is best covered with a new piece, aluminum, or sometimes the old flap, cut larger than the incision, screwed down with sheet metal screws and covered with an undercoating material. This makes a neat and invisible finish.

Switch Failure, Upper System: I have encountered a failure of the switch in which a screw securing the knob shaft comes loose, permitting the shaft to pull right out. In the event of this failure, never try to turn the knob while it is part way out. The interior of this switch contains a series of discs which must be turned together, otherwise it is nearly impossible to figure out their original positions relative to one another. This switch costs over $70. In the early cars the upper blower operates in its "low" blower speed any time the system is turned on. Pulling out on the knob bypasses the blower resistance and operates the blower in its high speed. Later on "ram" air effect is used to obtain interior air flow with the switch having two "pull" positions for low and high blower speeds. Sometimes the knob shaft sieizes. In some cases it is possible to remove and free it, sometimes we find that nothing will free the shaft up, which requires either a new switch or an external switch to cover this function (depending on how pure you want to be).



Switch positions, heating and cooling. From SC II Handbook, 1st Ed.

A possible but uncommon complaint with regard to the dual water tap system is that the positioning of the water hose from the left-handhead to the water tap places the hose in such a way that power steering oil can weep down on the hose. We have had complaints of an apparent sluggishness in water flow and have found this hose to have been so affected as to swell inside, restricting the water flow and causing poor heating. This hose number is UR5567, rather an odd shape that should be replaced with original equipment.

Setting Flap Linkages

Now, for proper setting of flap linkages, critical to proper function of the system:

1. Turn ignition on, turn "upper" switch to off position and wait a full 30 seconds for all motor functions to cease.

2. Observe fresh air duct actuator motor, upper of the two on the valance. The "crank" secured to the gearshaft protruding from the motor should point roughly at the number "1" stamped on the side of the motor. The link going to the flap spindle should parallel the crank. Loosen the pinch bolt attaching to the spindle. Looking through the fender at the spindle, turn spindle fully anticlockwise. This shuts the fresh-air flap. Secure pinch bolt tightly.

3. Crank on motor controlling hot air flap should point at the number "3" stamped on motor, and the linkage going to the lower flap should parallel the crank on its way to the flap spindle. Loosen pinch bolt at flap spindle. Again, looking through the fender at the spindle, turn this spindle clockwise to its fully closed position and then secure pinch bolt.

4. If you find that the cranks on the motor gear shafts are not pointing at the numbers noted above, we assume you have made this correction.

5. Assuming that all else is in working order and that no one has switched any of the wires to the actuator motors, the flap system should be properly functioning. Going through the various positions on the switch will be observed to permit mostly outside air to enter in the 1st positions, only air through the bottom flap in the hottest position.

6. Finally, check the control of water flow. Dealing with the early S II models again, one water tap controls all water for the upper and lower systems. It will be found on the front of the right-hand fender valance, under the hood, down low. And it consists of a mechanical water tap operated by an actuator motor, the same as operates the flaps, and again through linkage. It is possible this linkage is improperly adjusted. With both the upper and lower systems fully off (see above), having turned one of the switches fully counter-clockwise, etc., remove the water tap to be sure that it is in actuality shut fully off and reconnect to the actuator in that position. Assure that the actuator is operating. Sometimes the fan belts develop enough slack so they can swing out and damage the motor unit. (It pays to keep belts properly tensioned.)

Identifying the System: "Early" or "Late"

The second water tap, one that controls the water to the "upper" system only, is located on the LH valance, opposite the one previously described. The tap on the RH valance now controls only water to the "lower" recirculating heater system. To readily identify which system one may have, the early cars have a heater inlet in the kickpad, just forward of the driver door. These cars do not have a sliding door over the cubby box in the front doors. The later cars have the sliding door and a grillwork under and on the outside of the front passenger seat.

It should be noted that these instructions apply to standard cars. Many of the coachbuilt cars have a different, vacuum operated system, and some of the late S III coachbuilt models employ variations on the electrical system. Special cases require special instructions.

Service and Parts

Available through authorized R-R dealers. The actuator motor is a Lucas produced item, their part number 78329. Larry Davidson, Konner's Rolls-Royce, Columbus, Ohio 43213, has had experience with "upper" system switches that have had the knob pulled out and can possibly bail you out. Try to find the screw and a little insulator that falls off the end of the knob shaft at the back of the switch, mail all to him for an estimate.

Leland Short's (Va) LWB Cloud, LLCC95 at Dearborn

THERMOSTATS FOR POST-WAR CARS

With the advent of the SC-III the company also introduced a 190° F thermostat, part number UE 30193. UE30193 is wax-filled and "cracks" open at the actual temperature stated on the thermostat.

The early thermostat (tall type) was gas-filled. There was some delay in the opening (over the temperature stated on the thermostat (154° F, 162° F, 172° F, 185° F) because the pressure in the cooling system retarded the action of the thermostat.

S-I cars *without factory air-conditioning* did not have a pressurized radiator unless ordered with the future intention of air being installed. S-I cars with factory air did have a pressurized cooling system in two stages. The first type has a metal cap with the relief valve built into the cap. Later cars had the relief valve under the metal cover on top of the radiator.

Rolls-Royce does in fact say that the UE 30193 190° F thermostat *can* be used in all S series cars. Here are two arguments against such use: 1. When cars get their cooling systems rusted up they tend to run hotter than when they were new. This problem we all know about. 2. Why put in a thermostat which does not open until 190° F in a non-pressurized cooling system. It does not make sense to run 22° F below boiling. For these reasons, install the earlier-type thermostats in older cars, i.e., early S-I's, Dawns, Silver Wraiths and Bentley counterparts. They are available as 162° F and 172° F.

Now the V-8 cars. The V-8 does tend to run quite warm, and some state that the installation of a lower temperature thermostat is actually a waste since the car is always running warmer than the thermostat. This is true as far as it goes, but about 50% of the V-8's do not hold pressure, and the use of a 190° F thermostat is asking for trouble. Lack of pressure generally comes from bad seal under radiator cap, bad relief valve or valve gasket, solder around relief valve housing assembly leaking, head gasket leak, hose clamp loose, leaking core and leaking heater core to mention only a few.

Use the earlier thermostat in the sixes where there is any question, and use the UE 30193 thermostat in the V-8s only when the system will hold pressure.

Hermann Albers (Indiana)

Something's wrong. from D.G.M. Scott, B.C.

MORE ON HEATING AND DEMISTING SYSTEMS IN S II/S III CARS:

This seems to be the winter for problems, and in spite of best efforts to set up heating and demisting water tap and flap electrical actuators according to factory original specs, we have found additional problems, mainly lack of adequate heat temperature coming into the cars. With everything else in proper order we must suspect a water flow restriction of one kind or another. Here are some of the places to look: *Hoses* —old hoses can appear to be healthy but can in fact deteriorate on their interiors. *Heater cores*—we have found restriction here. Due the extreme difficulty in removing heater cores (start by removing wing and door) is best to have these cleaned in place by competant radiator shops. We circulated via a small pump a cleaning solution through plugged cores and emptied out a lot of accumulation with excellent result. Finally, we found one S-II with the *head gaskets* on backwards, blocking four water passages into each head. Detected by gasket protruding into pushrod passage from the rear on the RH of the engine and to the front on the LH of the engine. It is possible to fit gaskets to cover water passages, so caution must be exercised here.

Stop-leak Anti-Freeze: R-R recommends not to mix with other types but to drain and flush cooling system before a change to this material.

John McCombe, O.

Cool Comfort

Rolls-Royce High-capacity Car Refrigeration

WHEN you are living in a climate of comfortable temperature and humidity, it is almost impossible realistically to imagine the miseries of excessive heat—or cold. The fact that you have spent time in the Tropics or Polar regions brings little more reality to the recollections of temperature extremes.

Thus to observers in Crewe, Cheshire, on a cool, wet morning, blazing sun, red baked sand and temperatures of 110 deg F—even 120, as endured in parts of Texas—seemed as remote as the Hollywood lenses through which most of us have alone seen them. Yet Texas is aware of Rolls-Royce, if not of Crewe, where the cars are made, and Texans, together with the inhabitants of other hot, prosperous areas of the world now order their cars with full air conditioning equipment installed; that is, with refrigeration as well as heat and fresh air.

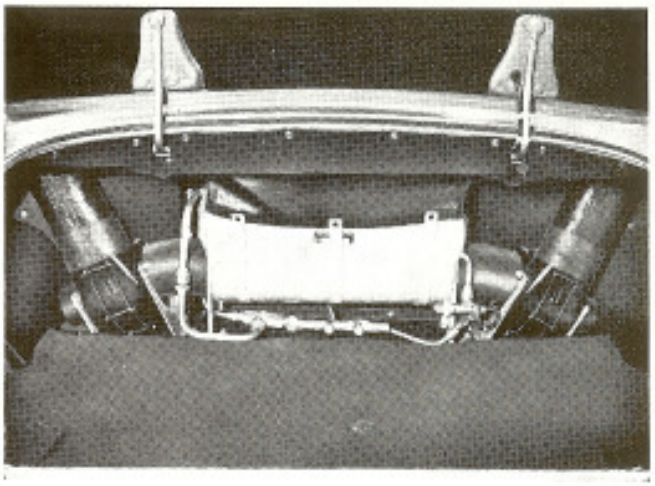
Eighteen months ago Rolls-Royce and Bentley announced the availability of refrigeration for their export cars; in the interim, continued study has been made of the requirements. Existing American systems, except for certain examples made in Texas, were found to be inadequate in capacity. Either they produced insufficient temperature drop, or took much too long about it—mainly both.

Sensing that most motorists are more interested in results than technicalities and theory, Rolls-Royce describe their new system which has an airflow capacity of 400 cu ft min, as being equivalent in cooling to about 50 ordinary domestic-type refrigerators. Everyone is familiar with the size and weight of the "works" in a home refrigerator.

To achieve 50 times the cooling in a small space, with a reasonable weight and acceptable power demands, has been a major and expensive task. Two to three tons of ice per day would be needed to provide a car with the same amount of internal cooling. This refrigeration system has the added advantage of removing excess moisture, and so avoiding misting up.

Quite apart from the need to cater for extreme heat, the time has come when car windows need to be kept shut at high cruising speeds if draughts, buffetting, noise and dust are to be excluded. Full air conditioning is then necessary to keep the car interior fresh and comfortable.

The extreme conditions to be catered for are found when a car has been parked in the sun through midday—at an airport perhaps—and the owner wishes to drive off at once. Interior temperatures of 127 deg F were recorded during tests of such occasions by Rolls-Royce engineers. A worthwhile cooling blast is required at once, and a tolerable interior temperature within a minute or two. The comfortable steady temperature in hot sunshine is judged to be 20 to 30 deg F below the outside shade temperature.



Compact assembly in the boot comprises: evaporator, expansion valve and the two electric blower units. The covering panel has been removed

In parts of America, it seems, the law permits a car to be left parked with the engine running. To drive the refrigeration unit, Rolls-Royce and Bentley cars are provided with a fast idling speed of 900-1,000 r.p.m. The cars can be left safely without fear of overheating for a shopping session or business call, and the car interior is then cool on the owner's return.

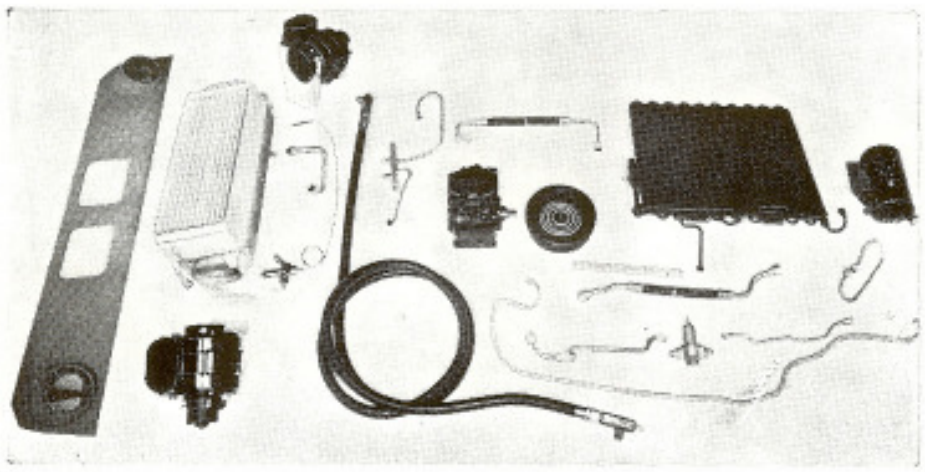
Installation and Units

The paragraphs which follow will best be read in conjunction with the perspective diagram. The refrigeration system is known as the vapour compression cycle, and uses Freon as the gaseous (and liquid) refrigerant.

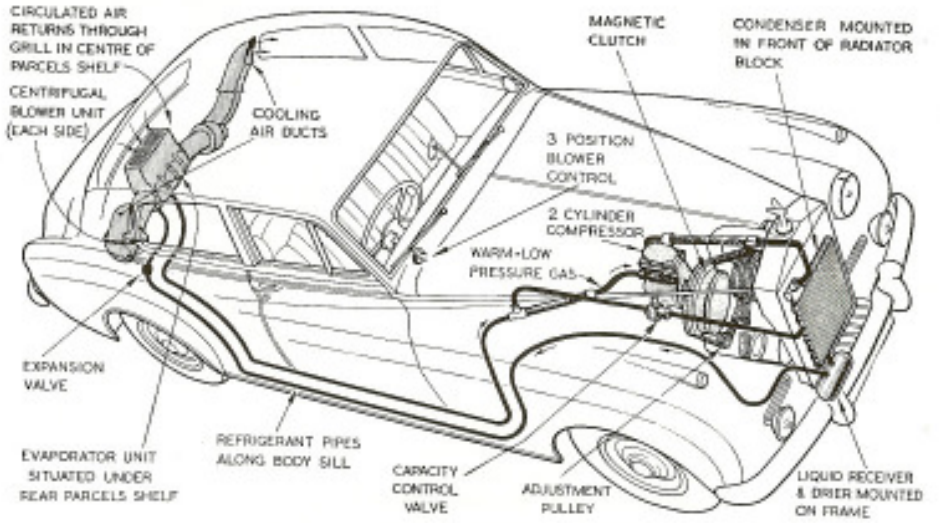
The two-cylinder compressor, driven through a magnetic clutch by belts from a bank of pulleys behind the fan, pumps the Freon gas to a high pressure, raising its temperature. The gas under pressure passes into the condenser, mounted ahead of the radiator block, which brings the temperature down to somewhere near that of the outside air, at the same time changing the refrigerant gas into liquid form, after which it collects in a reservoir beneath the condenser. This is, of course, the stage when the heat from the interior of the car is finally dispelled to atmosphere.

Next the cool, compressed liquid is led back to an expansion valve mounted beneath the evaporator in the boot of the car. As the liquid passes through the expansion valve its pressure is reduced and, consequently, its temperature also. As, cold, it flows through the evaporator tubes it again picks up heat from the air drawn from the car interior and this changes it back into its gaseous form. From here it is pumped back to the compressor and the cycle starts over again. The high pressure side of the system operates at 150-130 lb sq in and the low pressure at about a quarter that figure.

Two Smiths electric centrifugal blowers draw the warm air through a central grille, behind the back seat, directly into the evaporator and expel it again through two circular jets at the ex-



Units of the system, left to right, include: rear shelf with ports, evaporator, electric blowers, piping, valves, pump, clutch and condenser



Layout of the latest refrigeration system. The outlets of the cooling ducts have been modified as seen in the photograph at the foot of the facing page

treme edges of the shelf behind the back seat. In its passage through the evaporator the air loses heat to the refrigerant which, as explained, is changed back into the gaseous form.

High and low pressure pipes between the front and rear group of units in the system are of particularly interesting construction. They are, in fact, concentric, the high-pressure copper tube being inside and the Neoprene-lined, natural rubber pipe surrounding it. Thus the pipe takes the form of a heat exchanger. It has been specially developed by Dunlop. The evaporator is compact, and beautifully made in aluminium with brazed joints by Marston Excelsior, Ltd.

The big cooling capacity needed to reduce temperature in a hot car quickly is excessive for normal demands, and so part of the capacity may be dispensed with in cruising conditions. Therefore in addition to the driver's control on the instrument panel, which simply gives three fan speeds, there is an automatic device. This takes the form of a capacity control valve which allows some of the partially condensed gas taken from a point half-way down the condenser, to be fed back into the return pipeline just before the entry to the compressor. In this way the compressor draws part of its charge from the evaporator and part from the condenser via the capacity control valve. The control valve opens when the suction side of the compressor reaches a predetermined minimum depression; thus the evaporator is never allowed to become too cool and it also looks after the dispelling of ice, should it form in the evaporator fins.

To assist the refrigerator in its work, the underneath of the car is more extensively heat insulated from the exhaust system than on standard models, specially tinted glass is fitted in the windows, and the car roof is insulated to reduce absorption of heat from the sun. A sun vizor can also be supplied.

Because the condenser has to be mounted in front of the normal radiator block, the car's cooling system has to be modified. These changes take the form of pressurizing the system, and fitting a cowl round the fan.

Owners will naturally ask about the effect of the refrigerant in the event of an accident or fire. Freon is not toxic and is non-inflammable. Any liquid heated in a confined space can expand and blow up, and to take care of this possibility a plug, inserted in the system, fuses at 175 deg F and squirts the liquid along the underneath of the car to assist in damping down any fire, by releasing a cloud of non-inflammable gas.

Very great care indeed is taken in assembling and testing the system. The refrigerant has a remarkable propensity for finding leak points, particularly in welds where normal compression testing procedures have failed to reveal a hole. In addition, all moisture must be excluded from the system, because water might form ice and choke the expansion valve and, by reacting with Freon, could form hydrochloric acid, which would result in severe corrosion.

DATA

Power absorption: 3 to 4 B.H.P. Weight of complete equipment: 150 lb. Air flow capacity: 400 cu ft per min. Refrigerant: Dichlorodifluoromethane (Freon). Engine idling speed: 900 to 1,000 r.p.m. Compressor: 2-cylinder piston type, driven by magnetic clutch. Cost: R-R Silver Cloud and S Series Bentley £385 plus £192 10s P.T., total £577 10s, special coachbuilt bodies £550 plus £275 P.T., total £825.

Air ducting for the standard Silver Cloud and Bentley S Series cars is relatively simple, but on the larger models and the coachbuilt cars a much more elaborate system is required to take the cooling air to the front of the car. This accounts for the considerable difference in price for this installation.

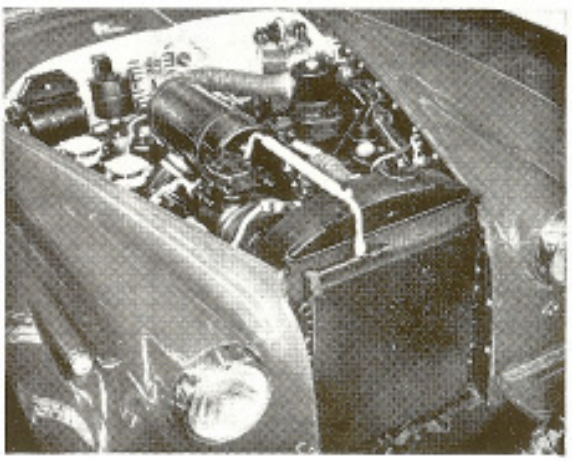
This Rolls-Royce refrigeration unit is now available on the home market as well as overseas and, from our own experience on the road and during simulated tropical conditions indoors, we can confirm that it appears to be most effective. There is quite considerable whistle and whirr when the fans are working at maximum speed, but this is reduced progressively at the lower speed settings.

The jet of cold air at each side is quite powerful. The occupants of the front seats scarcely hear the fans and cannot feel the jets; back seat occupants can detect the air jets on neck and hair if they lean back in a corner of the car.

It was surprising how little change occurred in the inside temperature of the car when the doors were opened briefly in the experimental hot room to allow people to get in and out. Yet the temperature difference inside the car and out was more than 30 deg F. Naturally the unit in the boot between the wheel arches takes up a proportion of the luggage space, but there is still a fair amount of accommodation by European standards.

Rolls-Royce development of car refrigeration will continue with the aims of improving efficiency, reducing the cost and size of the units and eventually, perhaps, dispersing the components into unused corners of the car—for example in the wings behind the front wheels—so that no boot space is lost.

The compressor-pump is belt driven and has a magnetic clutch. Incidentally, note the reservoirs for the car's two independent hydraulic systems



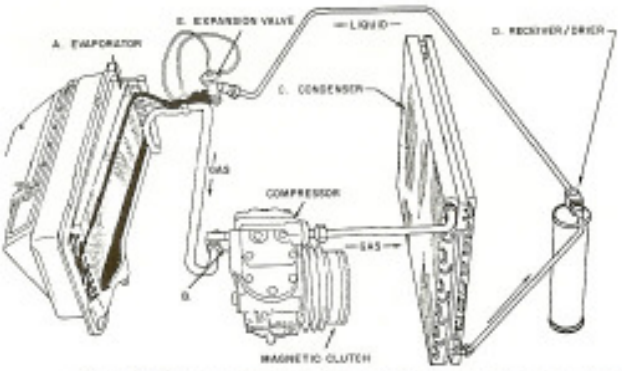


Figure I Basic components and flows in an automotive air-conditioning system.

AIR-CONDITIONING AN S1 OR SILVER CLOUD I

John W. de Campi

Want to air-condition your S1 or Silver Cloud I? It's really not all that difficult but it is time consuming if you do the job right. I reckon it cost me $448.04 to cool BC67AF with an attractive and high capacity unit with trunk-mounted evaporator. Had I taken it to a competent installer whom I could trust to do the job right he would have charged well over $1000, and he would have earned every penny—remember, I said it was time consuming. Instead, it was my spare-time project during the past winter.

Before getting into the details of unit selection and installation, it seems worthwhile to discuss the principles of automotive air-conditioning (see Fig. I). In its simplest form, an auto air-conditioner consists of six major components: compressor, clutch, condenser, receiver-drier, expansion valve, and evaporator, plus the necessary hoses to conduct refrigerant. When the thermostat senses that the car's interior is too warm, it energizes the clutch circuit; the clutch engages; and the compressor turns, thereby compressing the refrigerant gas (DuPont "Freon" 12). The hot gas from the compressor enters the condenser which is in front of the radiator. Here the ambient air-flow carries off some of the heat, and the pressurized gas condenses into a liquid. The liquid flows to the receiver-drier which performs two basic functions: it acts as a reservoir for the liquid and removes any traces of moisture (which would render the system inoperative by freezing in the expansion valve). The receiver-drier usually has a sight-glass on top; and when bubbles show in the liquid refrigerant, the system is under-charged and needs more Freon 12. The liquid Freon now flows to the expansion valve at the inlet to the evaporator. The expansion valve senses the tempera-

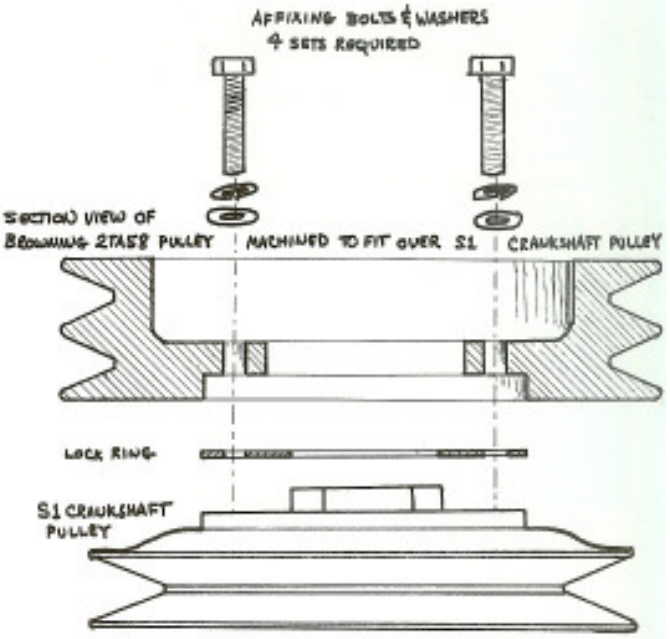


FIGURE II SCHEME FOR FITTING COMPRESSOR DRIVE PULLEY TO EXISTING S1 CRANKSHAFT PULLEY

Figure IV The completed compressor bracket.

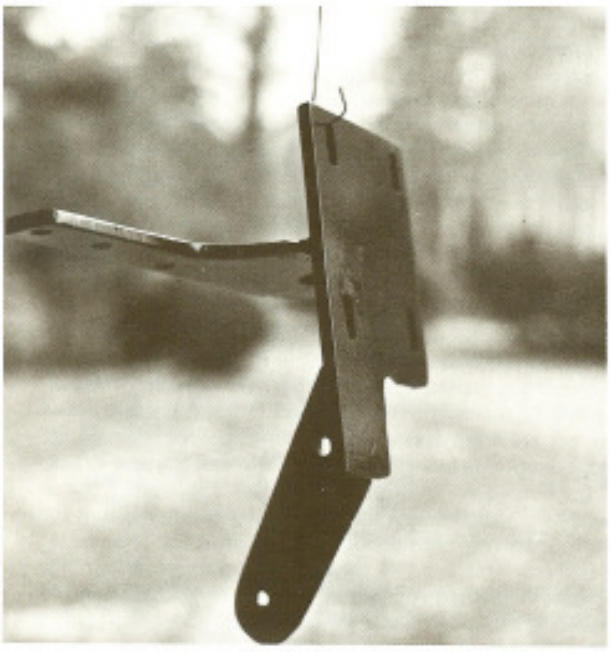
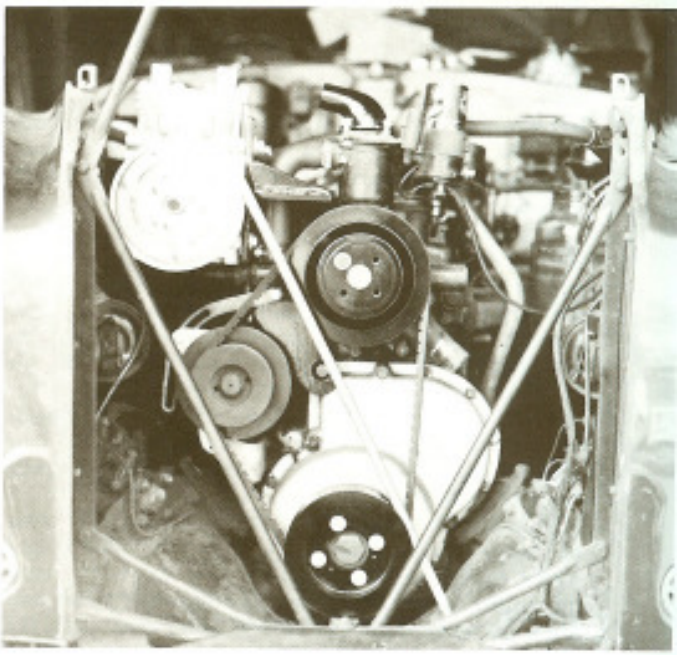


Figure V Before cutting the holes (7-10 on Fig III) in the bracket to mount the compressor, the pulleys must be aligned so the belts will run true. Place the compressor in approximately the correct position and have someone hold it (or wedge it in place with scrap lumber) while you carefully align the pulleys with a ½" round bar. When the location is exactly right, mark the location of the compressor on the bracket. Then you can locate and cut the elongated holes.



ture on the surface of the evaporator and maintains it at just above freezing. Should the surface temperature fall below freezing, ice would form on the surface of the evaporator and block the air-flow. As the liquid Freon passes through the expansion valve into the evaporator, the pressure drops and the liquid boils. When any liquid boils, it absorbs heat in the process. That heat comes from the air surrounding the evaporator and yields the cooling effect we want. Finally, the refrigerant, which is now a gas again, flows back to the compressor for the cycle to repeat itself.

If you decide to cool your pride-and-joy the first task is to select a unit from the many that are on the market. You have two basic choices: a trunk-mounted evaporator or an under-dash unit. The under-dash unit has the advantages of not consuming any trunk space and of blowing the cool air from the front rather than the back. It has the disadvantages of looking out of place in a R-R product, taking up leg room, and getting in the way of your chassis lubrication pedal. A trunk-mounted unit will normally provide more cooling capacity because it will generally have a much larger evaporator. Almost any unit will keep a car cool: the difference is how quickly the car will cool down after sitting in the hot sun for an hour or so. All things considered, I would certainly recommend a trunk unit, but you will find the following generally applicable to either.

The unit I chose was the Frigiquip "Hallmark" trunk unit and the cost was $255. plus $20. freight. It has been satisfactory in all respects and if you decide to purchase one you can write: Mr. M. Katen, Sales Manager, Frigiquip Corp., 3805 N. W. 36th, Box 12279, Oklahoma City, Okla. 73112 and ask for the same components supplied to me. An alternative trunk unit would be the ARA "President" (ARA Manufacturing Co., 602 Fountain Parkway, Box 870, Grand Prairie, Tex. 75050). If you have a Frigiquip or ARA dealer nearby, you should probably deal with him. Should you choose some other unit or buy components and build-up your own unit, there are several things to keep in mind: Select a condenser that is no larger than 19" high (or it won't fit). Use a York compressor because it is aluminum and about 10 pounds lighter that the Tecumseh, Frigidaire, or Chrysler compressor. Lightness is important because sagging front springs are a chronic problem on air-conditioned S1 cars. Avoid clutches that are over 6 inches in diameter—there is barely room for a 6 inch. Finally, select a unit where the receiver-drier is mounted separately from the condenser, if it is attached to the condenser, you cannot see the sight glass when the grill shell is back in place.

Now we come to the problem of installing the unit on the car. The following describes a scheme that worked well on my S1 Continental, and it should work equally well on any S1 or Silver Cloud I (Note: cars with power steering will require some modifications to the system described here). It will *not* work on a Silver Wraith, Silver Dawn, R type or Mark VI, although many of the concepts may be applicable. There are three basic engineering problems to be overcome: devising a pulley system to drive the compressor, mounting the compressor, and getting the fan to clear the compressor.

Rolls-Royce solved the pulley problem in a most complex way—they installed a heavy-duty water pump fitted with a multi-sheave pulley. Then they drove the pump pulley with several belts from the crankshaft pulley and drove the compressor with several more belts using the

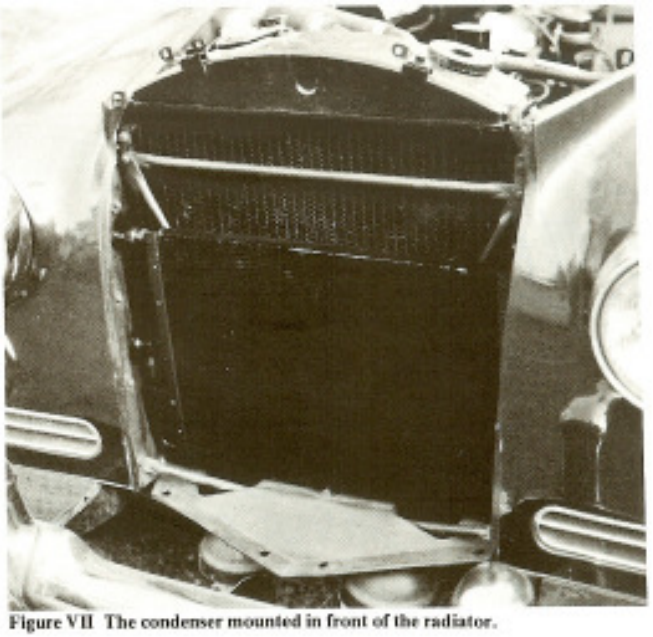


Figure VII The condenser mounted in front of the radiator.

pump pulley as an idler. I am sure that system worked well enough, but it seems inordinately complicated and costly. The cost to convert the pump and pulleys would be over $400. Don't even consider trying this system without the heavy-duty pump, because you will destroy a regular pump in short order with the added load. I decided on a simpler system whereby you attach a two sheave pulley to the existing crankshaft pulley and drive the compressor directly from the new pulley (see Fig. II). Start by removing the grill and radiator and buying a Browning 2TA58 pulley (Browning Corp., Maysville, Ky.; your local Browning dealer will be listed in the yellow pages under "Power Transmission Equipment"). Measure the protruding center of your existing crankshaft pulley with a micrometer or dial caliper—it will measure about 3¼". Alternatively, you can remove the crank pulley and take it to your machinist who can measure it for you. You will find a lock ring bolted to the crank pulley and you may have to file it down so it is the same size or slightly smaller than the raised hub of the pulley. Machine out a cavity, from one side of the new pulley, ¼" deep and just large enough around to be a snug fit on the hub of the crank pulley. Then from the other side of the pulley remove as much metal as possible so as to lighten the weight, leaving about ⅜" thickness in the center (fig. II shows a cross-section view of the finished pulley). Drill two ¼" holes in the new pulley to align with the threaded holes in the crank pulley (used to hold the lock ring). Since two bolts would not be enough to hold the new pulley, drill and tap (¼ NF) two more holes in the crank pulley and corresponding ¼" holes in the new pulley. Now you can bolt the new pulley in place with four ¼" NF x 1" bolts. (Note: throughout this discussion, I am leaving out obvious tasks like painting the pulley.)

Now that the pulley is finished, you can turn your attention to the compressor bracket. Figure III is a drawing of the templates used to make the bracket. Take these templates to a good welder who can make a bracket for you. It is essential to align the compressor clutch pulley with the new crankshaft pulley before drilling the compressor mounting holes in the bracket. Use a ½" round bar (see Fig. V) to align the pulleys. When the bracket is finished you can mount the compressor and fit a pair of matched (*must* be matched) A53 belts (Gates

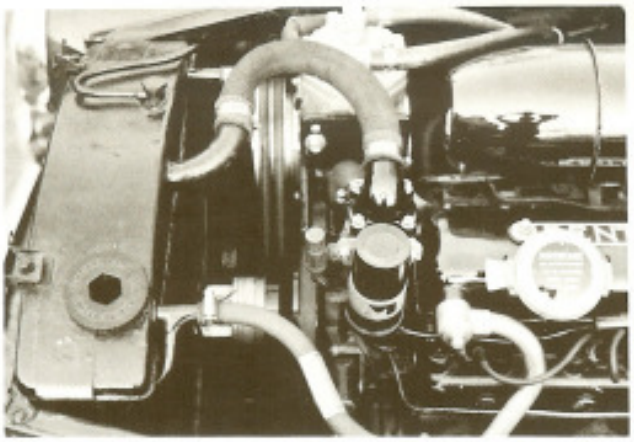


Figure VIII The final underhood view (exhaust side) with the hood and radiator shell not yet re-fitted. It's crowded but it all fits.

8257, Goodyear 4055-17T551, Dayco 453 or Modac 316H).

Your final problem is to get the fan out of the way of the new belts. Fortunately, you can buy standard off-the-shelf components to do this job. Your local Mark IV Auto Air-Conditioning dealer (or John E. Mitchell Co., 3800 Commerce, Dallas, Tex.) can supply the following: One fan spacer #30804 ($3.70), one fan spacer #30797 ($3.15), and one 16" fiberglass fan #30781 ($22.95). The only modification you will have to make is to file about ⅛" from the fan pilot on the water pump shaft. Then you can bolt the new fan and spacers to the old pump and pulley with four 5/16 NF x 3½" bolts, which you can buy at a good machine shop. The purpose of the fiberglass fan is twofold: first, it is lighter than a steel fan and thereby gentler on the water pump bearings since the fan is now spaced out 2½ inches. Secondly, it is only 16" in diameter and the 17½" original would hit the radiator when spaced forward.

A few other precautionary measures would be wise. Overhaul the generator because it is almost impossible to reach after the compressor installation is complete. Install a new water-pump-fan-generator belt because if

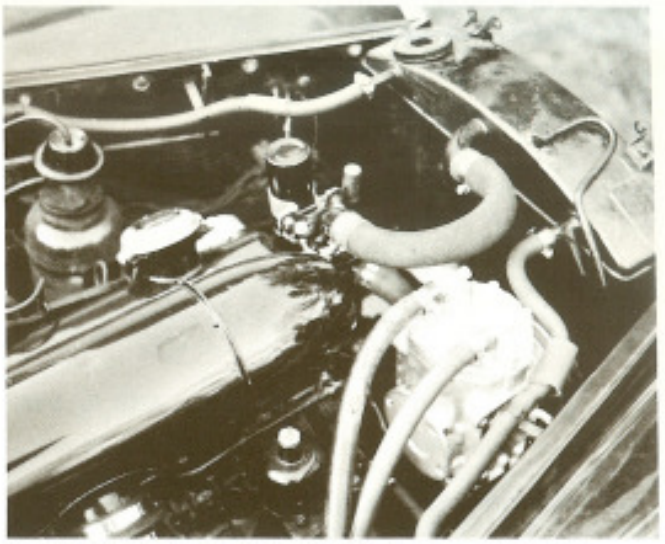


Figure IX The view from the intake side. Note the heater return hose that bends around the compressor on its way to the radiator. A piece of larger hose (shown) was fitted over the return hose as a chafe-guard but it proved unnecessary and was later removed.

the old one were to break later, you would have to remove the air conditioning belts to install a new one. Fit a new low-temperature thermostat and have your radiator boiled out as added insurance against over-heating. The parts necessary to accomplish the above and all the other parts required to complete the installation are included in Table I which is a bill of materials.

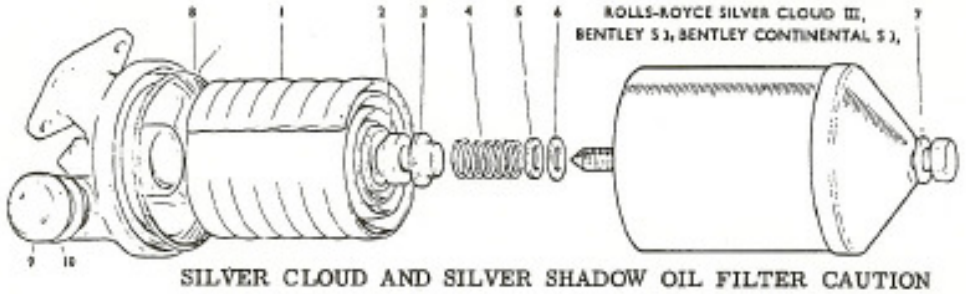
The rest of the job consists of fitting the other components, such as the condenser, receiver-drier, evaporator, controls, hoses, etc. In the interest of brevity, I will not go into those details here. Besides, with care and average mechanical skill you can figure it out. If you run into problems and need help, you are welcome to write me (Sprucehaven Farm, Chester Heights, Penna., 19017) explaining the problems and including your phone number. As soon as I can develop the information to answer your questions, I will call collect.

Best of luck and as they say, "stay cool."

TABLE I BILL OF MATERIALS

Quantity	Item	Source	Total Price*
1	Trunk Mounted Air-Cond Unit, Complete	Frigiquip or other, see text	$275.00
1	Compressor bracket	A good welder	50.00
1	Browning 2TA58 Pulley	Browning dealer, see text	9.54
	Machining pulley to fit	A good machinist	10.00
1	New Thermostat 162° (precaution)	R-R Dealer	23.00
1	Set of New Generator Brushes (precaution)	R-R Dealer	4.00
1	New Fan Belt, Goodyear 22T480 (precaution)	Auto Parts Store	7.00
1	Matched Pair Compressor Belts A53	Auto Parts Store	13.00
1	Fan Spacer, Mark IV part #30804	Mark IV Dealer, see text	3.70
1	Fan Spacer, Mark IV part #30797	Mark IV Dealer, see text	3.15
1	16" Fiberglass Fan, Mark IV part #30781	Mark IV Dealer, see text	22.95
1	Longer Bolt of Gen Arm, 5/16NFx1½" with nut	Machine Shop	.10
4	Bolts for Attaching New Fan 5/16NFx3½" with washers	Machine Shop	.60
4	Bolts to Attach New Crank Pulley ¼NFx1" with Washers	Machine Shop	.50
4	Bolts to Attach Compressor to Bracket	Machine Shop	.50
	Boil Out Radiator (precaution)	Local Radiator Shop	15.00
	Charging Unit With DuPont Freon 12	Local Garage	10.00
		Total	$448.04

*Note: These are the prices I paid but they may vary with location and source.



SILVER CLOUD AND SILVER SHADOW OIL FILTER CAUTION

Horton Schoellkopf points out that oil filters for Silver Cloud I and II are washable and therefore reusable. However, John McCombe recommends that this be done only in emergency. Filters list at $10.99, a low price to protect a $3500 engine. He goes on to give some important precautions in changing filters as follows:

The current R-R part number for oil filters for both S type and SY (Shadow) cars is RH2383. Included in the filter package is a new rubber seal. Actually there are two seals; one can be called wide, the other narrow. The wide seal is used in fitting a filter to a 6-cylinder car. The narrow seal is used in fitting a filter to any of the 8-cylinder cars. The diagram shows the arrangement for the 8-cylinder car. Directions for changing a filter are in the owner manual with the car.

There are a few notes of importance that bear emphasis: Be sure all seals and washers are installed correctly. The Dowty seal (item 7) is in place between the securing bolt and the canister. On the inside of the canister is a seal and above that is a washer which separates the seal from the spring. Sitting on the spring is a cup (item 3, part number CD256). Into this cup is fitted a conical gasket of cork (item 2, part number CD255). The top of this cork gasket is shaped to fit into the bottom of the oil filter.

Caution: An inexperienced mechanic could (and many times does) throw away the cork gasket and cup. These items stick to the bottom of the filter when it is removed and can be overlooked due to all the accumulated gum and sludge in this area. It is essential that the cork and cut be in place. Strongly suggest purchase of a new CD255 gasket to install with each filter change.

Note the differences between the 8-cylinder arrangement (illustrated) and the 6-cylinder arrangement: The 6-cylinder cars unbolt from the top, and so the seal and washer at the bottom of the 8-cylinder canister are unnecessary. The securing spring merely fits down over a fixed bolt coming up from the bottom of the canister.

John McCombe, Ohio

Cloud Automatic Gearbox Service

A brief test drive of LSFU 349 indicated that the transmission was in dire need of repair. Starting in "drive", a change from first to third speed was accomplished, but second and fourth were nowhere to be found. Having had some experience with automatic transmissions, and having access to the necessary equipment, I decided to have a go at it. As it is common knowledge that the Rolls-Royce automatics prior to the Shadow bear a great likeness to the earlier 4-speed domestic General Motors Hydramatic, I concluded that the problem must exist in the rear clutch unit. The fluid was well topped up, but smelled of burnt cork and had a blackish tinge.

Removal of the transmission is not significantly different from that of your Detroit monster, other than the servo linkages which must be disturbed. Also take note of F.L. page 1568, concerning the propellor shaft center bearing pre-load.

As to the internals of the gearbox, I see no reason why any mechanic familiar with the old 4-speed Hydramatic should have any difficulty in performing a satisfactory overhaul. Parts used in this SC III were off the shelf GM components and from all indications most any part in the unit which is apt to require replacement may be serviced thusly. (Clutches, seals, bushings, etc.) However; these parts are becoming quite hard to find as the GM unit in question was discontinued in the mid 1950's as far as automotive use (Pontiac, Oldsmobile, Cadillac, Kaiser, and Nash) and certain truck applications into the early 1960's. Our local NAPA parts jobber was able to supply everything we needed with parts marketed under the "Microtest" brand which are of good quality, and very reasonable in price. You might, of course, strike paydirt at the parts department of an older GM dealer.

In performing surgery on this unit, cleanliness is *mandatory*. Remove every trace of swarf or you've had it! Also, use a good quality fluid. In our case GM Dexron produced good results.

Ronnie Collins
2045 Christmasville Rd.
Jackson, Tenn. 38301

Six-Cylinder Technical Seminar November 8-9, 1986

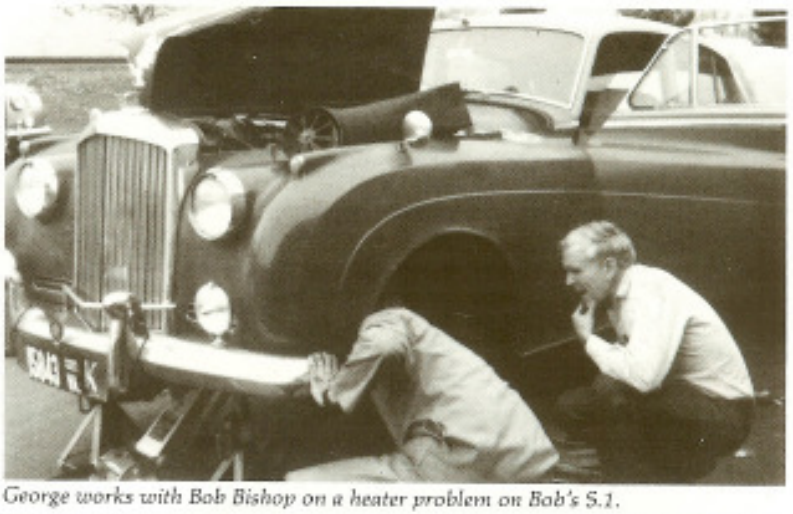
by Richard S. Dosik

While some members are swept away in the search for rare parts, and others become caught up by the need to learn all about their cars' histories, our most common obsession is surely the thirst for authoritative technical information on maintenance and repair. This was most evident in the ranks of those attending the Six-Cylinder Technical Seminar held at Club Headquarters November 8-9. The Seminar attracted truth seekers from as far away as California (father and son team James and Ernest Riffenbaugh), Nebraska (Dr. Robert Moore), and Georgia (Ann Rhea), as well as members from Pennsylvania and adjacent states. While distance prevented some members from arriving by PMC, and the threat of a very wet week-end put off others from travelling in accustomed style, we nevertheless had on hand a good selection of the R-Types, Silver Wraiths, and Silver Clouds that were the subject of the Seminar.

The fountain of knowledge to which we had come to quench our thirst was George Colgett, proprietor of Acme Motor Service (really) of Hayward, CA. George distributed as his text a binder full of useful spec sheets and schematics and used for pedagogical purposes a mixture of lecture, demonstration, and hands-on techniques. However, as in most good schools, it was teacher—not text or technique—that counted most, and it was George's great experience and encyclopediac knowledge that made the Seminar the successful learning experience that it was. The value of experience was also evident in the skillful manner in which Executive Director John Blair organized and facilitated the proceedings.

Saturday morning began with a review of the clues to car condition that should be investigated when, for example, awakening sleeping beauty from its winter hibernation, or when reconnoitering a prospective purchase. George went over what can be learned by carefully eyeballing the dipstick, radiator, and exhaust for color and content, before turning to more scientific subjects such as the conduct and interpretation of compression tests. This back to basics approach was particularly welcome to those of us whose knowlege on arrival was...well...basic, as it encouraged us to raise questions about such nagging matters as the presence of water in the exhaust pipe when starting. Answer: relax, it's perfectly normal when the choke is on and the engine is warming.

As might be expected, George's experience came to the fore when the discussion turned from basics to the peculiarities of the breed, about which he provided much valuable, if not always comforting, information. Mark VI owners, for example, were warned that their engines had an



George works with Bob Bishop on a heater problem on Bob's S.1.

Dr. Brod's striking SW, which has twin sidemounts—very unusual for a post-war car.

achilles heel in the form of a proclivity for piston ring breakage resulting from the bi-chrome cylinder liner construction. They were also cautioned that overheating problems could sometimes be traced to electrolytic "plating-out" on the radiator engendered by the positive ground system, and that corrosion of the aluminium crankshaft blanking caps on pre-war cars was a frequent cause of low oil pressure.

While little can be done to forestall such problems, proper lube and maintenance is effective in preventing many other ailments, and this was our next subject. Among the many tips dispensed for our guidance were:

—not to use water with a high mineral content in the radiator; use distilled water when in doubt.
—rust inhibitor should be added when changing coolant; it's best to avoid using anti-freeze in pre-war cars.
—oil should be changed as frequently as every 1000 miles on early cars with bypass filters, and even more frequently on pre-war cars lacking even such filters.
—20W-50 detergent oils are now recommended for all cars; graphite based oils are not recommended.

Many other tips were provided during the subsequent hands-on servicing session. Like a chess master playing several games at once, George moved from car to car in response to appeals for help, trailed by a gaggle of "observers" consisting of those whose cars were at home and, when the intermittant rain showers came, of those whose cars were outside.

Working on Dr. Robert Brod's 1948 Freestone and Webb SW limousine (WYA16).

George Colgett and Gary Popkins work on Gary's S.1 Hooper saloon (B238BA), the 1955 Earl's Court show car.

Filters, gaskets and other service necessaries were available for purchase from a special stock sent for the Seminar by H. Albers. The Pep Boys were our suppliers for oil and other non-proprietary items.

Sunday's devotions were divided between the mysteries of the Bijur lube system and tune-up theory and practice. As regards the former, George demonstrated that, contrary to what is stated in the official literature, Bijur fittings *can* be repaired. He did this through the painstaking, step-by-step dissection of such a fitting, laying bare its intricate little innards before our very eyes. The functions of the various filters, seals and valving devices were explained, trouble spots where varnish could build up were pin-pointed, and cleaning instructions were given.

Tune-up was another subject addressed through a combination of exposition, demonstration and assistance to members attempting to put theory into practice. The construction and operation of the distributor was explained and practical procedures set out for changing points, setting gaps and adjusting timing. Useful tips were provided on matters ranging from the availability of points that are not only cheaper but easier to install than RR ones, to how to locate TDC, and how to rotate the flywheel by hand (do not use the crank).

After the intricacies of timing, valve adjustment (our final assignment) promised to be a more manageable subject, especially for those of us who find the mechanical more comprehensible than the electrical. Alas, this provided to be only half-true. With help from George's usual tips (e.g., about how to be sure that you are on the "back of the camshaft" before adjusting each valve), tackling the inlet valves seemed relatively straightforward. However, even George could not make adjusting the exhaust valves seem other than what it is—a process that goes far to explain why these engines are called F-heads.

Dick and June Dosik, incoming editors of The Chesapeake Lady, *both work for the World Bank. They have a 4¼ Gurney Nutting coupe and a Mark VI saloon.*

Post-War Six Cylinder Tuning and Service Seminar

May 11-12, 1990 Mechanicsburg, PA

Seminar Leaders: Ralph Curzon, Ontario
Doug Seibert, NY

by Bob Leonard, PA
Photography © 1990 K. & M. Karger

Ralph Curzon, Ont., bends the forked lever which adjusts the carburetter float level while Matt Sysak, PA, observes and absorbs.

Bob Leonard has run a Silver Dawn for the past five years. He is an environmental engineer, loves to work around his house, enjoys woodworking and gardening, and wishes he had more time for his hobbies. We are grateful for these excellent notes.

One general reflection from Ralph Curzon summarizes reasons for careful maintenance: When parts are no longer available, it becomes important financially and ethically to keep what you have in good condition, and easy to take apart. The maintenance schedule is useful in telling you when to expect something that can't be seen may be dirty, rusty, pitted, and thus in need of attention.

Upon arrival and introductions all around, the seminar began with an examination of the undersides of a Silver Cloud on the lift.

• Rear shocks: bolt on top; fluid should be checked every six months as shock can absorb water.

• Differential: with car level, open back plug, feel with finger. If oil, OK. Otherwise add 90 wt. hypoid oil. Don't overfill!

• Rear springs: spray with WD-40 if dry. Gaiters should be in good shape. Springs can be re-arched if necessary. Will improve ride and handling. Don't add helper spring. Measure before removal and tell shop what you want. Distance between spring and frame about 6.75 in.

• Z-bar (SC on): check bushings.

• Fuel tank: Remove plug every six months to keep free. Aluminum plug in aluminum tank - must use properly fitting tool. Check straps for rust.

• Fuel filter: near tank, some accessed from trunk, dirty. Unscrew, open up, clean two screens inside at least yearly.

• Drive shaft: grease all fittings, including slide fitting. Check spring tension of middle hanger. Should bounce back to middle. Keeps drive shaft in line. Possible '57 Chevy universals fit.

Members who bring an appropriate car to a tech seminar leave with a car in better condition.
W5G28 (1951 SW) James Young limousine Owner: A. Pomponio

• Fuel pumps (2): cross wires to make sure each side is working. If not, rebuild both.

• Brakes: excellent design when working. Check for drips under master cylinder. Rebuild if leaking. Change fluid every two years no matter what. Minimizes rust, therefore pitting. Thus seals last longer. RR363 fluid only one to use - high lubrication. DO NOT MIX. Need three people to bleed brakes: one to keep reservoir filled, one to pump master cylinder (NOT brake pedal), one to go around and collect fluid. When fluid runs clean, you are OK. Bleed order:- right rear, left rear, right front, left front. Remember front on SC has two bleeds each.

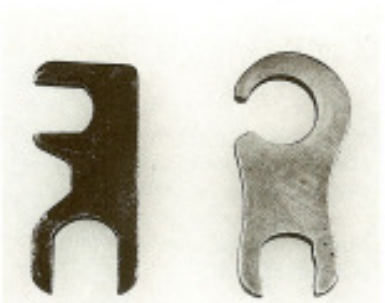
• Transmission: Change fluid in transmission and torque converter. Soak gaskets before installing to get close to right size. Bottom pan of transmission is usually warped a little. Can flatten the pan by rubbing it on emery paper. Will fix some leaks.

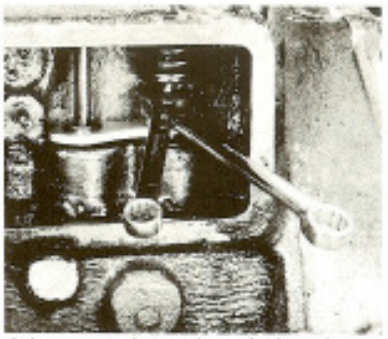
• Bijur drip plugs: if any dry or no oil showing, pull plug and clean. If lines blocked, use compressed air to blow out. Easy to do, vital to car! Careful! If you bend the lines, misaligned parts make it easy to cross-thread fittings.

• Front springs: should get finger between coils, standing height adjusted by shims on top. Height determined by top of tire in wheel well. Use spring compressor.

Under the Bonnet

Time to give our necks a break, lower car, and look under the hood.





Left: Jim Shelly, NY, adjusts the exhaust valves on the RROC Foundation's R Type engine. Center: Even with the correct exhaust valve tool to keep the cam follower from turning as you adjust the valves (left, early post-war cars; right, R Type and Silver Cloud), access is extremely difficult when the engine is in the car. Right: Tool and wrenches in place for adjusting exhaust valves.

• Distributor: lubricate lightly under rotor. Use wheel grease in grease cup. Quarter turn every six months lubes the shaft.

• Manual steering box: check fluid level, use 90 wt. oil.

• Belts and hoses: replace every 2-3 years. Belts harden and become noisy.

• Bijur pump: use 30 wt. if blocked lines, 90 wt. if loose.

• SU carbs: oil level in tops, filters.

• Brake fluid reservoir: fill. Can remove and clean without bleeding system. Glass, so be careful. After cleaning, wash with alcohol to remove residue from cleaner.

• Generator: bushings in back - lube when you change the oil filter, only time bushings accessible.

• Flexible fuel line: from chassis to engine. Watch for fuel leaks, especially onto starter which does spark.

Front Brakes

Discussion shifted from an overview to more specific topics, such as brake assemblies. First, the front brakes.

• Drums: two holes are there to insert two hardened bolts. Tighten equally. If drum doesn't release, tap on bolts, not on the drum.

• Asbestos dust: Do not use air to clean out drums. Use water in spray bottle to wet the dust. Then wipe it out. Use particle mask.

• Linings: if shoes are cracked around the self adjusting screw, replace. Repair changes the arc. Otherwise, replace lining when 1/16" left above rivets.

• Springs for shake back washers: replace if brakes have been hot. Brakes will not go off if these fail to operate.

• Hoses: replace every 10 years no matter what.

(Front shocks are easier to get at while wheel is off. Remove 3/8" nut and fill with transmission fluid or 30 wt. oil if manual calls for it. If fluid light pink, there is water in it. Check wheel cylinders for leaks also.)

• Reassembly: when putting new shoes on, use square to get within 1/32" of square to the hub. Adjustment nut on back of assembly.

Rear Brakes

• Drum removal: similar to front wheel. Shoes are hooked together besides springs. Twist the pair outward from car to remove as unit.

• Compensator rod: check system for free moving balls and wedges. Important since this is the first feel of brakes before servo system takes over. Rear brakes should go on immediately when reversing.

• Shoes: same as front criteria.

• Reassembly: lots of springs, slots, and clips that must be in place. Just reverse removal.

Exhaust Valves

• 12 thousandths clearance. Must be measured 'on the rock' (the exhaust just closed, the intake just opening).

• Adjust 6 when 1 on the rock (1 is front), and the others similarly per list below:

5	2
4	3
3	4
2	5
1	6

• Can save time by following the firing order: 142635.

• Can do hot or cold, your choice.

• Small wrenches and holders in tool kit. Feeler gauge to be snug, not tight.

• Inlet valves are more likely to need adjustment and are easier to adjust.

Steering Box

• Should be zero play when the wheels straight. This is the last step! Do ALL other suspension work first.

• Loosen four dome nuts (the larger ones). Do not loosen the steering column nuts (the smaller ones).

• Housing around bearing can now be turned to bring worm closer to the rocking arm. Two tabs either side - tap gently. Towards engine, tighten. Towards fender, loosen.

• Want tight feel in wheel from 10 o'clock to 2 o'clock. Trial and error. Need to tighten up steering box nuts and check feel at steering wheel each time.

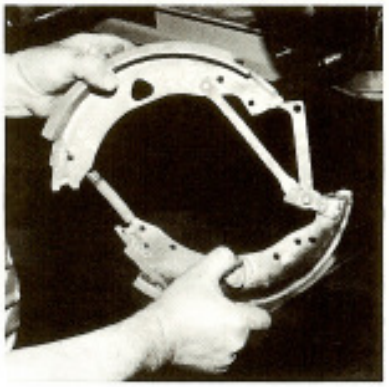
Whew! Lunch. Time to digest all this info (and some other goodies).

Servos

Back to work. Servos - a dry clutch system used from the thirties up to 1966. Simple, yet effective. Just remember, outer links to brake pedal; inner links to master cylinder.

• Removal: remove cotter and pin from emergency brake - WATCH for

Rear brake shoes come off as a unit.



Above: To correct uneven wear, Ralph Curzon files the servo lining in a circular pattern, always touching two sides of the plate at once. Left: Ken Collier, FL, gives it a try.

arm to kick. Unscrew linkages by master cylinder (~18" back). Unscrew cross linkages (both sides). Unscrew two nuts off plate in front of servo on frame. Unscrew stop plate, also on frame. Remove two lower rods from servo (2BA). Remove two upper rods from servo. Unscrew long bolt holding servo to car.

So far so good. No parts went flying. Now we can get the bends out of our necks and work on a bench with a vice.

• Disassembly: remove tape (helps keep oil out). Open up and check asbestos lining - if oily, replace. If worn down (and it should never wear out), replace. If OK, sand flat on emery cloth on a glass. Take plate and turn over. Remove two 15/16" nuts and pull all bearings off for cleaning and inspection. Note sequence of parts. Check plate for uneven wear. File in a circular pattern always hitting two sides of the plate at once until flat.

Relining the servo doesn't look bad.

• Pop back plate with sharp blow to center of back.

• Swivel plate over three rivets and tighten up.

• Drill out rivet heads. Punch rest of rivet out.

• Install new gasket and re-rivet. Don't over-tighten or you may crack new gasket. Repeat with rest of rivets.

Now the fun part - putting it back together. Use wheel bearing grease in bearings.

• Start with outside of plate: in sequence replace felt seal, bearing surface tapped into collar, thrust bearing properly greased, short linkage post, spring, second linkage post, long linkage with three ramps on it, spring, second long linkage with three balls in it, washer, and nuts. Lock up the nuts at the end of the shaft (sloppy feel).

• Turn assembly over: in sequence replace the cleaned plate, clutch, cover, tape, hose clamp (snug, not crushingly tight), gasket cemented to cover. Leave the assembly loose enough for next step.

• Reinstallation: as unit is put in place, you can see the first set of three holes. Using both hands, one pushing towards transmission, and the other turning the unit, feel the second set of three holes align. Start center bolt. Make sure the two outer locked nuts are still free. Tighten center bolt (takes forever).

• Replace rods, starting at the top (pedal). Next one is reverse to the master cylinder (one with clip, clip facing center of servo). Next rod goes inside previous one.

• Master cylinder end: connect rods back here, remembering spacers. Tighten snugly. Remount rubber stop pad. Continue to back of car to tee at axle. Want NO movement there. Undo locknut, turn fastener, and retighten very tight (rear compensator).

• Servo, again: loosen locking nut, tighten up until servo starts pulling rods, BACK OFF two flats, and lock up. Check rods - they should lay towards rear of car, with back of rod against the rubber bumper. There should be NO movement in rod system.

• Emergency brake cable: reattach and adjust from front if needed (brake off of course). Replace splash plate.

Finish the Brakes

Back to rear brakes, again.

• Undo linkage by gas tank.

• Visually check to see if shoes are in properly.

• Check shoe squareness to hub center.

• Check drum for heat cracks - small OK. Can be ground out.

• Install drum, put screws in, tap drum, retighten screws.

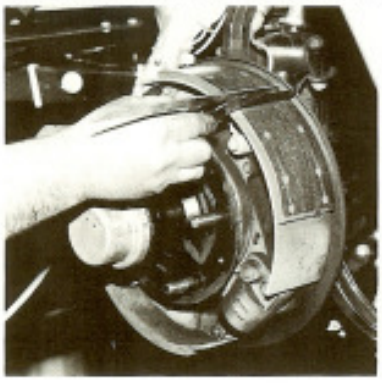
• Check shoe adjustment: tighten shoes to stop drum, then back off a little. Nut rear of axle, tighten towards front.

• Adjust main adjuster: same as above, except nut in front of axle, tighten towards rear.

Surprise on front brakes - no adjustment on SC other than shoe square.

Back to benches. Looking over junkpile, most of the problems occur from lack of lubrication, NOT high mileage. One MUST see oil everywhere.

Two of the adjustments necessary for proper braking: left, measure the squareness of the brake shoe to the hub (within 1/32"); right, check the rear brake compensator for slop: no movement here!



Front Suspension

Suspension check. Take weight off wheels, staying off A arms. Wiggle wheels for play. Underneath, install spring compressor and squash until top shock rubber grows. Now take large screwdriver and wiggle everything. Nothing should be loose. Everything should be oily. Always look for rust. If play found, it may be easier to remove entire suspension system from car and rebuild on bench. Not that much to undo. Springs shouldn't be bound, but

height should depend on how tire looks in wheel well. You can put up to 17 shims on top of the spring before you really have to replace the spring.

End of Friday. My head hurts. But Saturday will start with nicer weather.

Further Inspection

Differences between an R Type and a SC. Went from back to front underneath. Everything recognizable. Differences include drive shaft center suspension, cast iron master cylinder, engine mountings to check, Bijur system goes to clutch so watch overuse, and front suspension. Don't use pitchfork on tie-rod ends to separate ball joints since springs are inside.

Another S1 provided an additional look at what we have talked about. General thoughts that front springs are shot. Must watch parking if car has power steering - cylinder right up front close to ground.

Distributor

A third S1 came in for tuning.

- Plugs: pull and check front three against back three for SU carburetted engine. Should be .025 gap on N12Y plugs.
- Prepare to pull distributor: set distributor to No.1 by jogging engine. Remove small cover under front of flywheel. Rotate flywheel (clockwise from front of car) to get to Top Dead Center. Will see series of timing marks 20-10-5-TDC. Don't want to go past and back up because of any slop in gears. Cover up flywheel.
- Remove distributor: two sets of points in 3- and 4-lobe distributor. Can file points, never use emery cloth. Condensers almost always OK. High set of points goes on stationary plate. Points are a friction fit on posts. Do NOT overtighten screws. Oil felts with one or two drops. Washer goes on outside of arm. Want faces of points to hit squarely, thus may need a little bending. Set gap at .020 for Delco, and .015 for Lucas points. Use same lobe to set both sets of points - the lobes might have worn differently.
- Reinstall distributor: tighten pinch bolt, but not other one. Set 'octane adjuster' to 0 (knurled nut on side). Make sure nut on backside is tight. Up through SCI, time car on solid set of points. From on SCII on, time car on movable set of points.
- Hold rotor to a full retard position (fully counterclockwise). Use static light to set points. Just before light goes on (ignition switch on, car not running), tighten up. As points open, plugs fire. Do not use timing light. Setting points at TDC gives smoothest idle and running.
- Repeat process on No. 6 cylinder: go under car, rotate flywheel to TDC, go back up and set other set of points (remember those two little black screws you were told never to touch? Now is your chance).

Carburetters

Car should now run like a champ. Well, almost. Still have SU's to work on. Pull the pots, clean them, and be very careful of the needle valves. Replace if bent. Clean fast idle cam for free movement. Fast idle cam should be adjusted so that car will come off fast idle when driver blips throttle.

Adjust carbs when warm. Set air screws at 2½ or 2¼ turns out for large and small carbs respectively. Shut off engine and set dial gauges on both carbs, and zero each. Separate two butterfly shafts. One is pulled closed by a spring. Manually bring other one closed and reconnect shafts. Turn engine on and make sure air draw is the same. Set mixture individually to get max speed from the engine. Push up on auxiliary fuel button, and engine should speed up slightly if set right. You can check float level with a ½" rod under the two tabs. Watch out for dirt.

Another great lunchtime to absorb this info.

Doug Seibert, NY, compresses an SCI front spring to relieve pressure from the front suspension while he checks components for wear.

Fuel Pumps

Fuel pumps: remember, if one side is bad, rebuild both. Make sure pumps are grounded, or they won't work.

- Once off car, remove caps (tall caps cover inside condenser, which is better, short caps don't).
- Remove screws from valve body.
- Loosen diaphragm and unscrew body from the diaphragm shaft.
- Pull points off other end. Pin should be free.
- Don't pull brass post out (electrical connection to points).
- Unscrew cover off valve body to reveal inlet (bottom) and outlet (top) valves.
- Pry off screen and pull out gasket. These are good items to keep as spares, along with valves.
- Install new diaphragm and spring (small end of spring towards diaphragm). Screw back into body, watching points.
- Screw in until points don't open any more. Back off one hole. Now back off 6 holes if older style, 8 holes if brass.

The original Kismet tire pressure gauge is very cleverly arranged. The knurled knob unscrews, revealing a spare valve, and the inside end of the knob is the tool that unscrews the valve.

Mounting for u-joint holds driveshaft horizontal. Check for spring tension and rust. If the springs do not pull the shaft back, remove, clean, and refit, or replace springs as necessary.

• Note: newer style has brass clip which goes inside lip of pump housing.

• Older style has two vent tubes to vent fumes from the non-fuel side of the diaphragm. This should point upward. Newer style has single drain hole which should point downward.

• Stick screwdriver under diaphragm shaft to stretch it before tightening housing all the way. Can energize unit also to stretch before tightening.

• Tighten points, keeping surfaces parallel (no gap measurement).

• Hook up to battery to test. Should click away. Put fingers over inlets and unit should slow down.

Session wound down with brief description of water pumps, and a reminder to change oil (20-50 wt. detergent) once a year whether it needs it or not. Change filter whenever you change oil! Lots to remember. Sorry to leave, but eager to investigate.

Overoll Impressions

My general impressions of the seminar? Great! For a novice like myself, there is nothing better than crawling around several vehicles with expert guidance. Maintaining these vehicles does not seem difficult when broken down into logical steps. And after all, isn't that really the purpose of the Club? Being one of the passive owners/members of the club, I'll continue my education in post-war RR/B's.

Meeting people with similar interests always makes life enjoyable. The care that some people have already invested in their vehicles is an inspiration to those of us who are just starting. Should we be discouraged at the work ahead? No. One just has to set one's own level of acceptance and work towards that goal. My thanks again to the organizers of these seminars, the Club, and the members who attended. I appreciate the help.

Use Detergent Oil

by Don Weber, Texas

I always find the articles pertaining to the various Club Tech Seminars to be very interesting and informative, the one on the Phantom I, FL4174 *et seq.*, being no exception.

However, the comments regarding the use of detergent or non-detergent oils reflect a general and continuing misunderstanding of the properties of detergent oil, especially the effects of introducing a detergent oil in an engine that previously had used only a non-detergent oil.

Mobil Lab Tests

Please allow me to quote from portions of a report by Mobil Oil Laboratories:

"An oil with detergent ability is intended to prevent or retard harmful deposit formation. Nothing has been advanced regarding ability to clean an engine previously dirtied while using a non-detergent or only nominally detergent oil. This statement may be hard to accept in view of the many thousands of words used since the late 1930's to popularize the benefits of detergency. Reasonable proof that detergent oils prevent or retard deposits, rather than remove them, is furnished by experiment and observation. The Mobil Laboratories have deliberately run engines under accelerated fouling conditions with non-detergent oils, causing heavy deposits to be laid down. These engines, when subsequently operated on effective detergent oil without prior deposit removal, exhibited no pronounced or sudden removal of deposits. Rather, periodic inspection revealed only a gradual removal of deposits, principally from the areas subject to rubbing action.

"When detergent oils were first introduced, the universal lack of knowledge concerning the actual mechanism of detergency led oil marketers generally to warn against the possibility of sudden and heavy removal of accumulated deposits. It was feared that the freed deposits would load oil filters, cause large increases in running clearances, and clog oil-pump strainers and oil lines, thereby leading to engine failure from lack of lubrication. It is unfortunate that these fears have persisted, because they have proved to be without foundation.

"The simple facts of the case are that there are no known laboratory or field data, either in Mobil or in the oil industry, which show that the more active heavy-duty oils such as Mobil Special, Super Mobil, and the several Delvac commercial engine oils have a cathartic action which can lead to lubricating failure or high oil consumption. Available experience shows the reverse to be true. Heavy-duty detergent oils are not effective cleansers in the real sense of the word, and the cleaning away or removal of existing deposits depends on abrasion due to rubbing and hydraulic action occurring at a faster rate than the engine accumulates new deposits."

SAE Experiment

Furthermore, in the Society of Automotive Engineers *Transactions*, Vol. 61, p. 237-243, Palmer's paper compares the internal engine wear of crankcase detergent oils with an engine run on non-detergent. The investigation had two groups of 15 new cars that were tested over a 15 month period (6 detergent and 9 non-detergent). These hundreds of internal parts were compared for wear between the two groups. It was a well-designed experiment that appears valid statistically. The non-detergent oil was a solvent-refined Mid-Continent type that was 100% additive free. A brief summary of the test can be listed as follows:

1. The detergent additive oil had 37% less piston wear than the non-detergent.

2. Cylinder bore wear was reduced 40% in engines run on the detergent oil.

3. Using an engine cleanliness test, the detergent engine parts appeared 70% cleaner than the non-detergent.

4. Oil consumption was equal in the two groups.

My apologies for the verbal overkill, but the perpetuation of the myth of detergent oils does a serious disservice to our members and their cars.

V-8 Seminar: April 26 & 27, 1985

Some Personal Observations

by Addison Yeaman, Jr.

Ad Yeaman is a government tax attorney with the Department of Justice in Washington. He has been a member of the RROC for four years and takes an active role in Chesapeake Region. He currently runs B20LJ, a 1951 Mark VI with Park Ward drophead coupe body and a very early Bentley T Type, SBX1428, which brought him from his home in Virginia to Mechanicsburg.

Would you laugh if your Rolls-Royce or Bentley dropped in the drink, particularly with your chauffeur at the wheel? The titled lady owner of that particular car was so delighted at the antics of her usually unflappable employee that she told the chagrined Captain of the Cunard liner at fault that the sight of her dunked driver was worth the short period of inconvenience while her motor-car was being repaired.

A "bench racing story"? Not this time. The story was told by Eric Ashton-Irvine, the retired Captain of the Caronia, Queen Elizabeth, and Queen Mary, who attended the V-8 Technical Seminar in Mechanicsburg in April. And he was just one of many there whose talents and interests ranged from racing Merlin engine powered hydroplanes to welding atomic powered submarines, to just loving fine automobiles.

Some thirty of us came from up and down the east coast and as far away as Palm Springs, California, because we all knew the reputation of Cal West, Product Support Manager at Rolls-Royce Motors, our instructor and mentor for the weekend.

We weren't disappointed, either, whether we knew only enough to drive the automobile in reasonably competent fashion or were already expert at its maintenance and repair. I'm one of the former, and I met at least five of the latter. Judging from the depth of the questions and the quality of the discussions with Cal, there were a lot more than these five.

What do *you* do on a weekend? Read about cars? Dine with friends and swap stories about things you love in common? Motor through beautiful countryside? At Mechanicsburg, you didn't have to choose—it was all there at the same time.

If you don't read another word in this issue, take this for gospel: It was marvelous and *you* should attend a seminar in your area—whatever your skill level. If you're a beginner, you'll learn. If you're an expert, your knowledge will be appreciated, and you'll learn, too.

These seminars are just about the ideal size and duration to get a good insight into the car and, perhaps even more important, a marvelous way to meet others with similar interests.

On our arrival, Headquarters sparkled, the teaching and work areas were neat, clean, some parts just painted. Even the chairs brought in for the occasion and which we occupied for hours were reasonably comfortable. Accommodations, hearty sandwiches for lunch, nightly informal group dinners, and a Pennsylvania gourmet final banquet at a nearby mountaintop inn were outstanding. Many thanks are due John Blair, the Club's Executive Director.

What did we learn at Mechanicsburg? We learned that Cal West loves Rolls-Royce and Bentley V-8 powered automobiles, honors the engineers, designers, and the Company that manufactures them for us, and respects our own trials and tribulations when a problem does, alas, occasionally arise.

We learned that we, in turn, should honor the Rolls-Royce tradition and respect the responsibilities ownership of these cars imposes on us. Our cars and their engines were, after all, designed with aeronautical principles in mind, and they were constructed to aircraft-close tolerances—all devolv-

SAF-12100 (1985 SSp) saloon — Owner: Rolls-Royce Motors

Cal West is about to fit a cylinder liner in the demonstration V-8 engine block.

Ed Shaffer, Chuck Byrne, Sid Greenspan, and Jim Steiner examine a cutaway carburetter.

ing from the water-cooled Merlin engine that powered the legendary Spitfire. If the engine is not abused, its life is 'almost forever'.

We learned how to keep from abusing it: keep it clean, and change the oil as per the maintenance schedule: oil and coolant are very cheap. We already knew that Rolls-Royce parts are not.

The most fundamental advice is: keep it cool, for heat is the worst enemy of the aluminum V-8. Unspeakable calamities befall your wallet should you fail to switch off *immediately* if your temperature warning lamp lights or the buzzer sounds. Cal's instruction is: stop now, or court possible seizure of pistons (and the owner's heart).

Cal taught us all how to tune and maintain the various S.U. carburetters (if you drop it, you've bought another), how to rebuild the brake servo, how to overhaul the many components of the Shadow hydraulic system (including an intensive session on its theory), and, for the majority of the seminar, how to rebuild our V-8 engines, all interspersed with pointed remarks on proper spark plugs, coolant, gasoline, oil, chassis maintenance, as well as precise techniques for those who will carry out the work Cal made sound so easy.

We left Mechanicsburg with enhanced knowledge, heightened respect for our cars, gratitude to our instructor and new friend, Cal, and with deepest thanks to Rolls-Royce Motors for supporting our Club and for letting Cal explain the how and why of these cars.

One final personal bit of advice: sign up for a technical seminar. You'll learn, you'll enjoy, and—most of all—you'll meet some very fine people, your fellow Club members. I did.

S2's at the Seminar

by S.B. Purdy

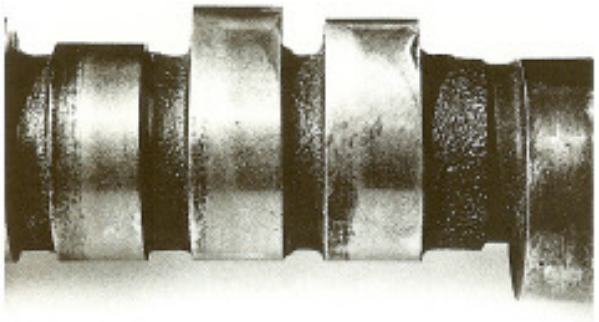
Strother Purdy, an RROC member since 1969, lives in Bridgewater, Connecticut, surrounded by a collection of wheeled and track vehicles which includes such weighty names as Lorain, Caterpillar, and Rolls-Royce. He is late professor of English at Marquette, and writes literary and film criticism. He maintains Silver Cloud II, LSAE365, for the little old lady (his mother) who bought it new in 1962.

Cal West's V-8 seminar of April 26 and 27, 1985, included a great deal of interest to the S2 (Silver Cloud II or Bentley S2) owner or mechanic. Considering the rapidity with which the company replaced the S2 with the S3 engine, and the need to cover the much larger time period of S3's, Shadows and Spirits, this shows how well organized a session it was. Your reporter, part time S2 mechanic (LSAE365), came away inspired, if not altogether mollified *in re* some of the factory decisions in the design of the S2. Lack of mollification was somewhat offset by hearing that the later V-8's have had their share of inbuilt goofs, too. I confess this is not a very generous attitude. What follows is a summary of Cal West's remarks, with my own comments put in parentheses if not otherwise indicated.

Engine

The opening review of the engine itself applies to the S2 generally as follows: this is a big, powerful, understressed unit, that will run practically forever if cared for, just like the classic engines. Proper care means no tears in the air cleaner flex hose to let in dirt, and replacement of the original wire mesh air cleaner element with a Shadow type paper filter (or UE5801, original equipment for S2's sent to the dustier third world). Being a wet sleeve design, with cast iron sleeves pressed into an aluminum block where they are bathed by coolant, the engine has neoprene o-rings in its very heart, just like Ferrari, to keep the bath water from mixing with the oil wetting the sleeve on the inside, and pulsing about below its lower edge. How long can neoprene last? Cal couldn't say—can anyone?—but could testify that it lasts longer in the engine than on the shelf, and no one has yet taken out his sleeves just to replace the o-rings.

When these engines are torn down, it is because they have been overheated. Overheating them isn't easy, for they run cool—(too cool, really, as originally set up, and the current factory advice of fitting an 88° C. thermostat is worth following, giving you better heater action and less crud in the oil on short runs). Even running with the heat gauge against the stop is not dangerous; the gauge is calibrated conservatively (on the other hand, once you know the gauge cries wolf it becomes dangerous!). To put the engine in peril you must do something really gross, like pressing on regardless after losing a radiator hose. If the heat has been great enough to warp the block, you might consider endowing the club with a new display engine (it could use a nice complete V-8 display, too; the early Shadow used in the seminar was little more than a short block). Otherwise use it as a boat anchor, for while scored sleeves can be replaced with new (a very nice feature



Typically worn cam lobes.

Cylinder liner o-rings: flat for coolant, round for oil.

of a wet sleeve engine—new bores out of the box), there is no way to get the crankshaft back in a straight line. Line boring of the block could do it, in an engine with a timing chain. In an engine with timing gears, like the S2, the gear fit is destroyed when the crank is moved to a new position by boring metal out of the block. Gear howl would be more or less inevitable. In a case of less than disastrous overheating, the block may nevertheless grow sufficiently around the sleeves to cause the o-rings to stop sealing out coolant. If the coolant is full of electrolytically removed aluminum and mineral deposits—they are thickest at the rear cylinders where the water current carries them—some of them will be caught between the o-ring and its grooved seat when the block shrinks on cooling. The o-ring can then no longer do its job: water will get past it and come out of the weep holes in the side of the block. There are eight of these, one per cylinder, set between the lower of the two coolant sealing o-ring grooves and the bottom o-ring, which keeps oil from coming up out of the crankcase. You will see the good news on the garage floor. Engine disassembly and sleeve removal is the only cure; plugging up the weep holes will not do!

Sleeve removal requires considerable application of force, even after warming the block and cooling the sleeve with sprayed freon. This force can distort the thin aluminum webbing that separates cylinders if it is unsupported, so each pulled sleeve should be dropped back in as its neighbor is pulled. Without its o-rings, it goes in and out quite easily. The factory sleeve puller (liner extraction tool RH7095) can be assisted in its operation by molybdenum disulfide on its threads, to cut friction. Member Roy Wilson also suggested the fitting of a radial thrust bearing, such as a PII throwout bearing, between the top two washers on the tool, again to reduce friction. Sleeves should be marked, along with everything else coming out of the engine, to show their original position.

On insertion, the block should again be warmed, and cleaned, particularly around the top groove where the locating collar on the sleeve comes home. The distance the sleeve protrudes above the deck (.002 plus or minus .001) is critical, since it gives the sealing "nip" on the head gasket, and is obtained by selective fitting at the factory. Replacement sleeves come .006-.008 tall on the collar, and must be machined down. A reused sleeve should go in the same hole, turned 90 degrees so as to present an unworn surface to piston thrust. Hesitation is not advisable as you insert the oiled and o-ringed sleeve; the cooling block and warming sleeve are tightening up on each other as you dither. A firm push with the heel of your hand is sufficient; real resistance indicates something is wrong. Lubriplate/white lithium grease on the o-rings helps. When you fit the pistons, remember that until the heads are on, the sleeves can move and possibly be moved by piston ring drag, so use a wrist pin or other hollow cylinder of the right length on a head stud to bear on the sleeve collar and hold it down while doing this work.

As for the crankshaft, wear is unusual: if the oil is clear, standard bearings should go back in. When the crank is out of the engine, stand it on end: it can take a set if allowed to lie flat. If the crank does not turn free on disassembly, block warpage may be the cause (see boat anchor above). It should turn free on assembly, too. Check it after torquing up each of the mains, working out from the center. Note that on the center main there are thrust washers which can be put back wrong side out—there is a bronze side, and a bearing side—with disastrous results. Wear can be dealt out by the crank: the small bronze driven gear on the oil pump suffers from the big steel driving gear on the front of the crank. If you must replace the oil pump gear, don't get a steel one—it is meant to go with the bronze driving gear used on the crank of later V-8's. On the other end of the crankshaft there can be oil control problems; the horseshoe fitting (UE7488) that bolts into the block rear face over the crankshaft oil flinger incorporates a clever reverse thread that "winds back" escaping oil into the engine. On shutdown winding stops, and the "last drop" lands on the garage floor. This is a built-in feature, and not to be taken as a sign of trouble. You want trouble, try this: there are locating pins in the horseshoe fitting cover, which go into holes in the block. On some S2 engines these holes go right through the block wall, and on some early S2's the pins are not staked into the horseshoe fitting. Get the picture? Pin falls out, leaving direct passage from crankcase oil supply to out-of-doors.

Dave Scott looks on as Bob Bishop attempts the 'quick press fit' of the wrist pin into the piston.

Servo mechanism exploded.

Oil can also be helped past the rear main, oddly enough, by a tear in the air cleaner hose. The air it allows in, besides delivering dirt to the piston rings, as mentioned earlier, is sucked in by the crankcase vapor recirculation (proto-PCV) tube, down the oil filler neck, and into the crankcase. Crankcase pressure goes from negative to positive, and out goes the oil. The existence of this tube (UE9459), standard on cars sent to the U.S., and the need for cleaning the wire mesh flame trap therein, can be forgotten by owners (there being no mention of it in the Owner's Handbook). The purpose of the flame trap is to prevent a carburetor backfire from igniting the oil in the crankcase (something only made possible by the existence of the tube in the first place!). But, Cal assures us, recirculation of the crankcase vapors into the engine is good for it. European S2's allow outside air to pull crankcase vapors out a "road draught tube" exiting below the engine. This system can cause unwanted oil discharge too, if the baffle plate bolted above the mouth of the tube inside the engine comes loose, or is forgotten on reassembly. Rocker oil is then squirted more or less straight into the tube, and straight out of the engine.

S2 rods have a wrist pin on the small side, which can wear out its bushing. S3 engines beefed up the pin, but fitted it tight, causing a heavy piston slap, or "thump," in those engines when cold. Rod bolts should be replaced, not refitted. Throughout the engine, in fact, use the aircraft engine mechanic's approach to threaded parts: fit new. RR is after all mainly an aircraft engine company. (Honoring an engine's aircraft heritage is all very well, but this advice has that carefree attitude towards expense that sometimes characterizes the factory viewpoint. The question "would you risk the destruction of an engine for a few dollars" is as unanswerable as "Have you stopped beating your wife?" but many a mickle makes a muckle, and yours truly intends to continue in his old ways of replacing only bolts that have been stretched or otherwise deformed in service. Time enough to change when S2's take to the air.)

Camshaft bearings, which don't exist on the later V-8's, can be line bored (tool RH7109). Cam failures do occur (Rolls-Royce not being the only make to have had problems with camshaft manufacture in recent years), but generally early in the life of the engine (the cause of LSAE365's complete engine overhaul at 40,000 miles?), so it's not something any present day S2 has to fear. At about 70,000, pitting on the lobes is generally found, but there is no certainty it will get worse. The camshaft can be conveniently inspected by removing the tappet cover (the carbs must come off first, but then they have to anyway for that real engine cleaning and repainting you have been promising yourself for so long). The camshaft gear is unmarked: theoretically offset bolt holes ensure it goes on only one way. Mark it. The camshaft could be drawn out the front of the engine *in situ* were it not for the necessity of pulling the transmission to get at the bolts that hold the distributor drive gear to the rear of the camshaft. The timing gears are enclosed in a two piece cover; the rubber strip that acts as a seal between the two can be held in place on the upper cover with a speck of trim adhesive until the lower cover is fitted over it; otherwise it should be dry. It should also be "too long", so it sticks out both sides. Don't trim these protruding ends; that would leave no allowance for shrinkage in use, and let the ends be drawn in past the cover edge. Result: one big leak.

Larry Paquette shows Ed Collins, Chuck Byrne, Dave Brokaw, and others how to fit the friction plate in the servo mechanism, keeping all fingerprints off.

Valve gear displays some frailties: pushrod collapse on some engines, along with a blockage of rocker shaft oil caused by worn bearings closing up the oil holes. Any engine running

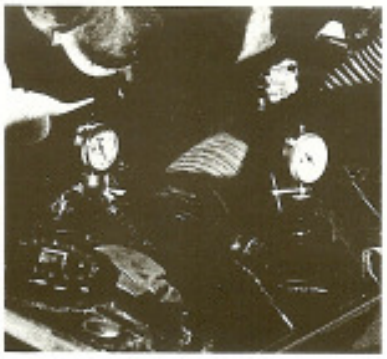
today will have had that fixed; oil getting down the valve guides remains to be dealt with, however. A Ford-type cup over the guide helps, as does cutting a groove on the guide and clipping into it the Perfect Circle seal used by Chevrolets. (As to the oil burner reputation of S2 engines, a question Cal West fielded politely if with not altogether concealed exasperation, being tired of having oilfree Detroit V-8's held up to him, there is a factory expectation that oil use = 1% of fuel use, which at 14 mpg works out to one gallon of oil every 1400 miles, at 18 mpg, a gallon every 1800 miles—say an average of 400 miles a quart. Only when you do worse than that should you diagnose trouble (though of course smoke out the tail pipe on deceleration points to valve guide leaks in any case).

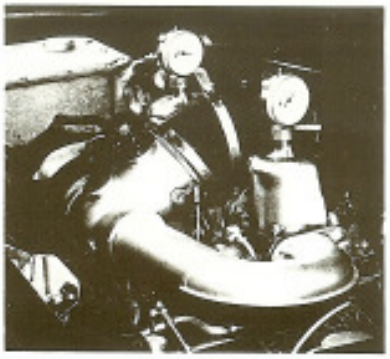
Carburetion

The twin SU HD6's are marvellously simple and reliable devices (the discussion didn't include automatic choke and its linkage), requiring little maintenance beside getting them to work in unison. This is done by adjusting the throttles at idle so as to give identical piston height in the two suction chambers. A pair of dial indicators set up for the job, with extension legs that reach down in the suction chambers to ride on the pistons, is going to be made available from Rolls-Royce, Inc. The operation was demonstrated on LSAE365, and is far more accurate and convenient than the manual's "listen to the hiss" method. On carb reassembly, watch the two washers for the banjo fitting on top of the float bowl: aluminum goes on top, fiber below.

Running Gear

The protective boot over the driveshaft trunnion joint must be replaced if perished, and that requires pulling the shaft. If the boot goes, the trunnion joint will follow. A shudder in the driveline on acceleration lets you know this. The driveshaft grease points must be approached delicately; power grease guns or muscular application of the lever type will blow the seals. Rear spring gaiters should be renewed if torn, and the dirt exposed, the spring disassembled and relubed—very sticky business. Shock absorber oil supply must be kept topped up; if it leaks out, the shock self-destructs. Don't try to slow a leak by using heavier oil than the recommended 20 weight; you will just lock up the suspension. Brake system (shares with the classic cars





The dial indicators measure piston height in the carburetter suction chambers. Left, LSAE365, carbs are quite even, while, right, the Shadow needs some adjustment—one carburetter is doing most of the work.

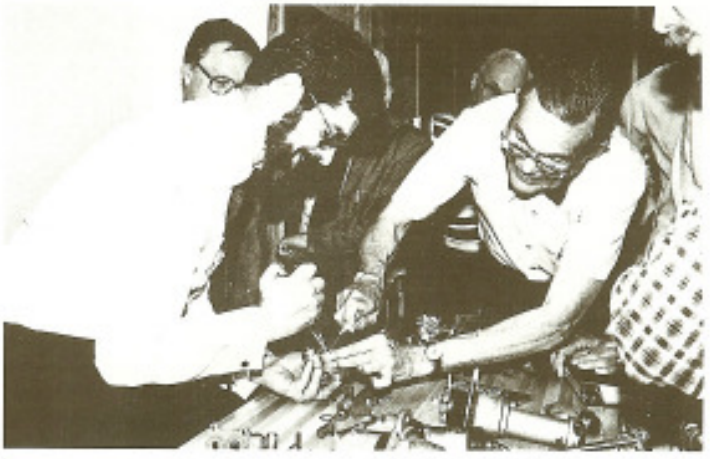
the transmission driven) servo: is it wet? ATF leaking out of the transmission puts it out of action, and shows up as a chatter in the brake pedal as you slow to a stop. To replace the offending seal and soaked friction plate (I'd plan on spending more than the hour Cal West said it took him) you must remove the actuating levers and more than a dozen other parts, keeping them all in order, and putting them back clean, especially the friction plate. Not even fingerprints there. Hold in the shaft on which the servo is mounted as you pull it off, for it can be drawn out of the transmission, dropping off its shims in the process. It should be turned back and forth to check for slop in the gear that drives it, though, and if there is slop it must come out.

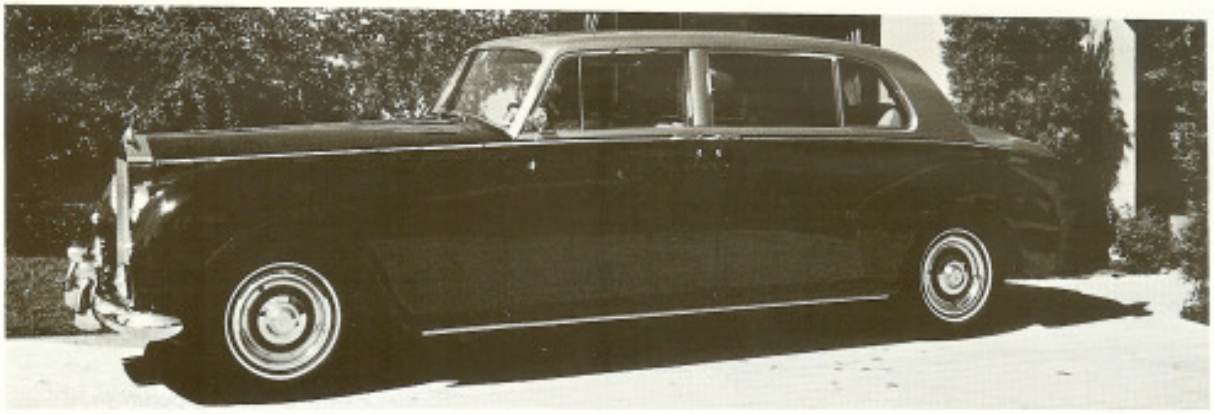
Final Notes

S2's in the modern world. Regular gas or unleaded works fine in these 8 to 1 compression ratio engines, for they need neither super high octane to avoid knock nor lead for valve lubrication. There is plenty of oil around the valves anyway (see above), and the engine is understressed to begin with. If there is carbon buildup in the combustion chambers, however, CR goes up, and higher octane fuel is needed to avoid pinging under load. The cure is not octane additives in the fuel (treating symptoms), but getting rid of the carbon—by carbon treatment additives or, better, a change in driving habits. Don't just pussyfoot around town, get out on the highway . . . drive the car to the V-8 seminar! Tires: (current love affair in the media with) radials not for us: radials transmit road shock through the suspension and make the steering heavy and constantly pulling, the S2 having little caster to resist their directionality. Use 8.20x15 bias ply as originally fitted.

One hopes we may do more of this in the future, perhaps even have a session just for the S2. As pleasant as a visit to RROC Headquarters is, a classroom with a garage style lift would be preferable. Very little on the S2 is visible from above! Or is there a club member out there with a bare chassis?

Cal West and Roy Wilson wrestle with a snap ring—the proper tool was not at hand—while dismantling a Shadow hydraulic leveler unit.





SILVER CLOUD II AND BENTLEY S2 ENGINE MODS
by John S. McCombe

On the earlier engines, there was no valve stem packing at all. The sealing arrangement was through rubber pads fitted to the sides of the collets (keepers or wedges) used to secure the valve springs at the top of the valve stems. Earliest type collets were found to loosen these pads in use, and a later type collet was introduced with a rubber pad that was bonded by a better method to extend life. Rolls-Royce now supplies as standard equipment and for replacement parts for all 8-cylinder engines incorporating a valve stem sealing grommet (see page 1025), a neoprene "O" ring under the part number RH7909. This replaces the packing originally fitted to these engines and should be used in the event of replacement.

Let us deal with these earlier models. In the event of oil consumption (it gets to a quart in 100/150 miles), you can follow one of several alternatives. Remove tappet cover, rocker arms and shafts, exposing valve stems and springs. Inject air through spark plug holes, one at a time, and with valves closed and held shut by air pressure, fit new collets with bonded-on seals. This can make some difference but probably is not a cure.

In the event the heads are being removed for decarb or valve grinding, there are two other alternatives: First, you can modify the heads to fit later equipment that incorporates the valve stem grommet. This requires replacement of the valve guides. (It is possible to machine the guides to accommodate later equipment, but at the mileages on most early S2 cars it would be well worth the small additional expense to fit new guides, selectively reaming each guide to the existing valve stem diameters.) The top of the new valve guide is chamfered to provide adequate seating for the grommet. An improved valve can be fitted, providing a valve stem that has been modified to prevent damage to the new grommet. We are told however, that the old-style valve can be reused as an alternative to replacing 16 relatively expensive valves. With new or machined guides in place it is then necessary to fit new valves (if you wish), grommets, grommet housings, bottom washers, and springs for retaining the grommet housings.

A second route to pursue is one with which we have had success, and I suppose this depends to some extent on your local machinist. I have used Perfect Circle equipment as follows: Using a Perfect Circle tool for this job, machine the tops of the existing intake valve guides to accommodate a Perfect Circle Teflon seal of appropriate size. If guides are worn, have guide bores knurled to appropriate valve stem sizes. Fit Perfect Circle seals to intake guides and use new collets to seal exhaust valve stems (the guides on the exhaust valves do not stand adequately proud of the heads to accommodate the Teflon seals in this situation), and reassemble using existing valves, springs, etc. This is a middle choice to follow in the event one does not wish to do the full modification.

Some questions have arisen concerning additional changes that have taken place since the introduction of the original 8-cylinder engine.

Head Gaskets: Original head gaskets, extending into S3 cars, were entirely metal gaskets. A modified gasket is now supplied under part number UE31004. This is a composition gasket with sealing rings around critical areas such as the cylinder bores and water

1961 Phantom V 5LAT82 H. J. Mulliner touring limousine owned by Fred H. Kenfield, Fla. It is one inch lower and six inches shorter than the seven-passenger car. The interior is shown below. The car is complete, with Waterford glassware in the bar.

At 45,000 miles, valve guides, rocker shafts, etc. were replaced in this S2 engine, for reasons explained herewith. Some machining was done to fit a heavy-duty Cadillac clutch fan, and side panels were louvered. The car will now idle with air conditioning on in Florida summer without overheating. The thermostat is out in summer. An alternator was fitted.

"Gathering Clouds" at the San Diego Meet, So. Calif. Region, Nov. '69. From Allan Tweddle

passages. We have found a number of S2 cars that leak oil down the sides of the block between the heads and the block. These oil leaks don't seem to be internal, and they don't appear to be critical to the running of the machine. However, they must be corrected in time and the use of this new-type gasket is important. If you have an old top gasket set, be sure to procure the new head gaskets before carrying out the repair. This is a good time to assure you are fitting proper valve stem seals so that you don't have to duplicate head removal at a later time.

Rocker Arms and Shafts: In early S2 engines rocker arms and shafts were fitted with detachable bearings. Sometimes excessive wear occurred, and a new-style rocker arm and shaft set was introduced in which the bush was deleted and the arm was hardened, including the bore. Flats were cut on the shafts to provide improved oil flow, and these provide a means of identifying whether your engine is fitted with later-type arms and shafts. A further modification was introduced to the arms at a later date in which a lubricating hole was drilled the full length of the arm. Current part numbers are: UE9695 Rocker, exhaust; UE9696 Rocker, inlet; and Shaft UE8767.

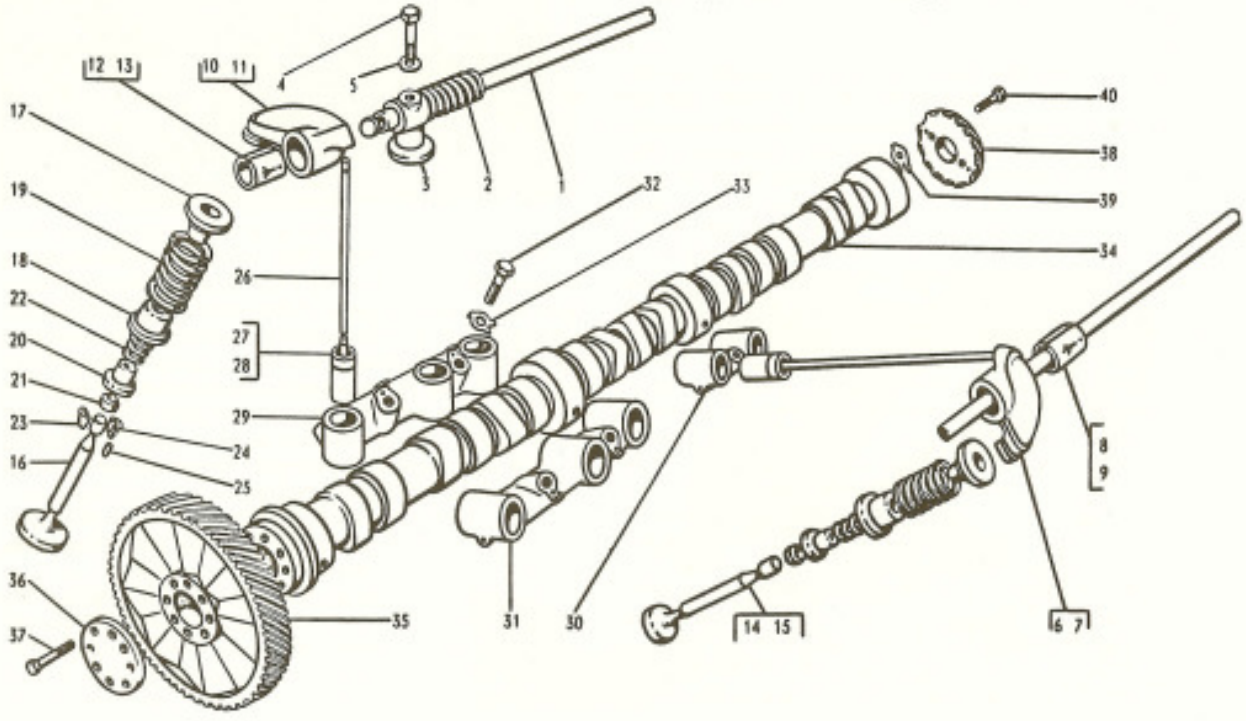
Spark Plug Adaptors: Original production cars did not incorporate waterproof plug adaptors. In heavy weather the ignition systems tended to drown out. There are many types of these available in the U.S. market, in the event you experience such breakdowns.

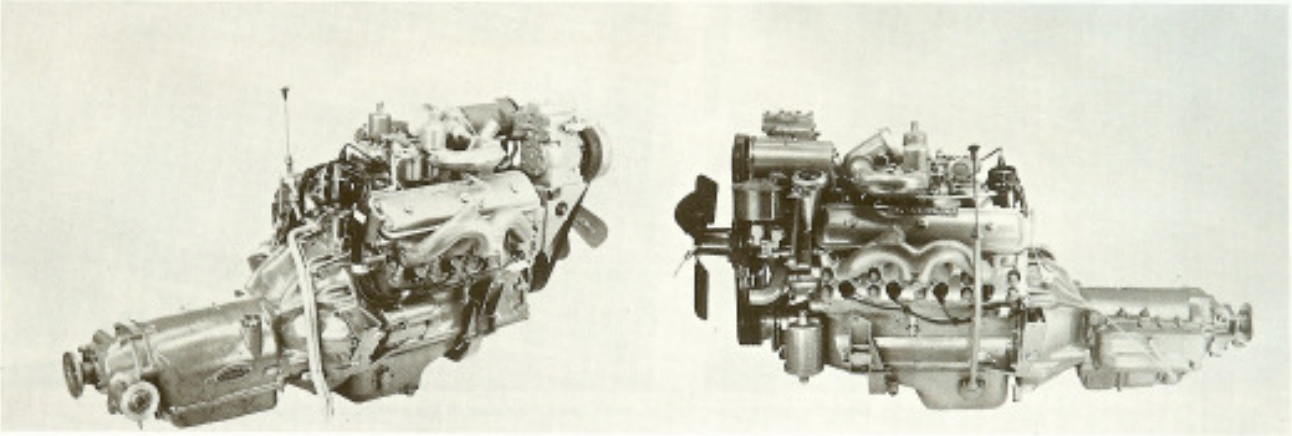
Intake Manifold Gaskets: Initial supplies of this part did not prove entirely satisfactory and generally were replaced with joints of improved composition. Indications were rough idle, inability to adjust carburetter mixtures routinely, and poor vacuum readings.

Parts Required to Convert to Later Valve Stem Seal

Ref.	Part No.	Part	No. off	U.S. Retail Each
	UE7431	Guide, exh. valve	8	$ 1.70
	UE7432	Guide, inlet valve	8	.84
14	UE9629	Valve, inlet	8	7.64
16	UE9690	Valve, exh.	8	28.66
21	RH7906	Grommet	16	.58
20	UE7427	Housing	16	.55
18	UE9603	Washer	16	1.39
22	UE391	Spring	16	.67

Drawing which shows the replacement valve stem seal.





Right rear quarter view of the V-8 engine.

Left side view of the V-8 engine.

OVERHAULING A MODERN V-8 ENGINE

PART 1

The V-8 cars are now up to 12 years old and many of the earlier ones are getting to the point where they are within the financial range of more and more of us. Unfortunately these cars come to us needing considerable work, primarily engine and transmission. Buying an RR or B with a shot engine is risky business unless you have lined up a replacement engine before you buy. A NEW engine costs about $3,200 from RR, with a core value of about $1,000 on your old engine, provided nothing is B-R-O-K-E-N. If it has broken parts, no core value allowed, AND, holes through the block DO count.

Before you rush right out and buy a modern car with a shot engine, keep in mind that this is no job for a novice, that parts are not cheap and that you will end up with one of the most delightful cars made when you are done. The removal is time-consuming and can be somewhat tedious. Reading this article you will think it is a two hour job. It definitely is not a two hour job, although an experienced person should be able to get an engine out with one evening's hard work. While part 1 does not deal with the actual rebuilding, keep in mind that the rebuilding is definitely NOT for the novice.

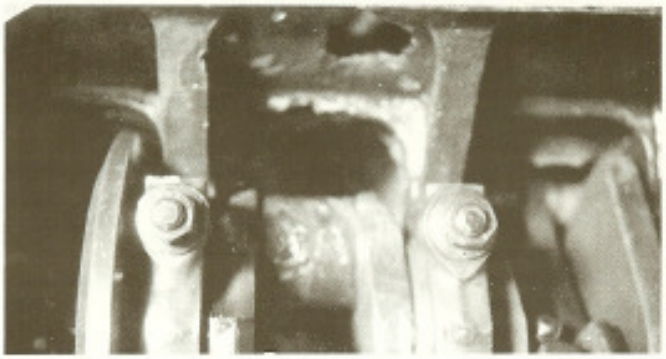
First drain the coolant from the radiator and both sides of the engine block, drain the pan and the transmission, remove the undersheets, unhook the engine pipes from the exhaust manifolds, undo the radiator shell and the painted extension at the bottom. Take off the hood, remove the radiator shell, open the air-conditioning system (if fitted), tape up each joint as you open them to keep out the moisture. Take off the a/c condenser and remove the bracing in front of the radiator (one large bolt at the very bottom). Remove the fan and the 4 fan-belts and remove the radiator. Now remove the exhaust manifolding, the air-cleaner (if not removed with the hood), the carburettors (one bolt in the center) and unhook all the wires, paying particular attention to the wire going to the oil level indicator in the pan. It also helps to remove the distributor, folding the cap forward onto the engine (you may have to wire it into place).

Now crawl underneath and undo the four bolts holding the front engine support upper section to the sides of the engine. You can just take the nuts & cap screws off the rubber support itself, but it's easier to leave the cross-member in place. Take the nuts and cap screws off the rear engine supports, leaving the supports in place. Don't worry about the engine falling down, it's been there for some time and can't fall more than an inch or two if the rubber mount should come out. Remove the throttle linkage, kick-down linkage, shift linkage, speedo cable and the four heavy bolts holding the rear flange of the transmission to the propellor shaft.

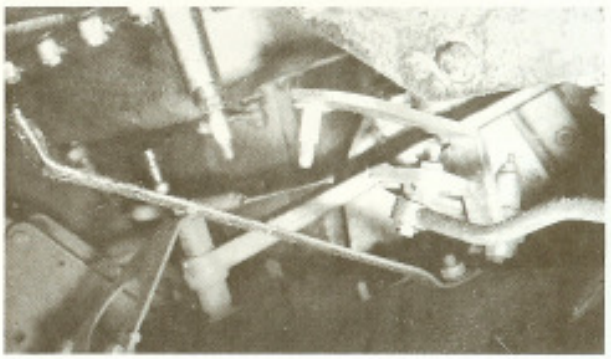
Remove the gas line and plug same with a cork. Unhook the power steering hoses at the pump. Remove the generator, power steering pump, water line under the a/c compressor (miserable job) and the compressor.

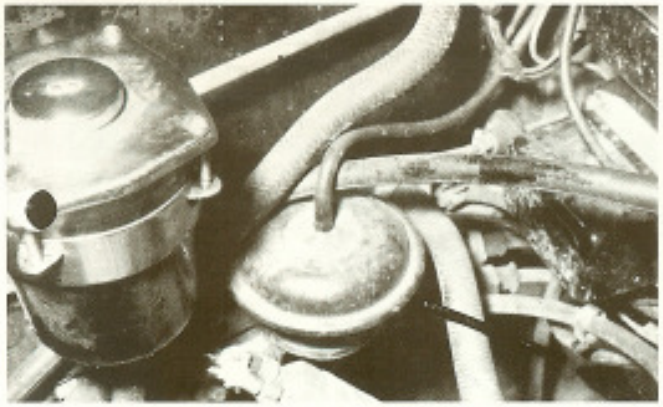
You ain't half done yet. Put the car down off the jackstands.

This engine was over-revved, throwing 2 rods, one through the block . . . see hole.



This confusion is the Hydra-Matic linkages which must be disconnected from the frame.





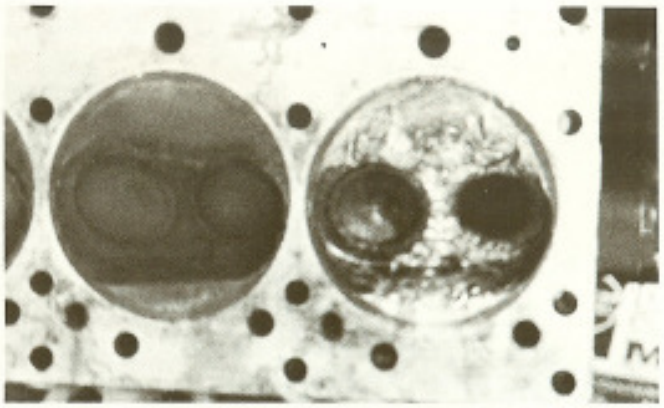
On the Continentals, this heater tap must be removed before the manifold can come off.

Slip a covered cable under the rear of the engine so that it passes between the flywheel cover and the pan. Check to be certain you have drained all the oil out of the pan and the transmission . . . if you don't, you'll wish you had later on. Have your chain falls so the hook is directly over cylinders 2A & 2B. Gripe the cable about 4 inches above the valve-lifter chamber, insert the hook and gently lift. It also helps to run a steadying rope down from the loop in your ceiling, hooking the rope into the generator support.

The engine should lift off its rubber motor mounts and start forward. As you raise the engine, try to keep it at a 30 degree up-angle raising it until clear of the car. Pull the car back from under and you will have a free-swinging engine & transmission.

While the engine is up where you can work on it, remove the bottom flywheel cover, put a large bucket under the flywheel and remove the ring of 1/2" cap

Out the engine comes. Removal of the heads is not mandatory, may only be the result of your exploration.



A valve head bounding in the combustion chamber did this damage to a head . . . also broke the piston.

screws. Knock the ring back and lower the unit to the floor. I rested the engine pan on my creeper and the transmission pan on the pad of my floor jack. Now remove the starter and all the bolts around the bellhousing. Pull the transmission back from the engine.

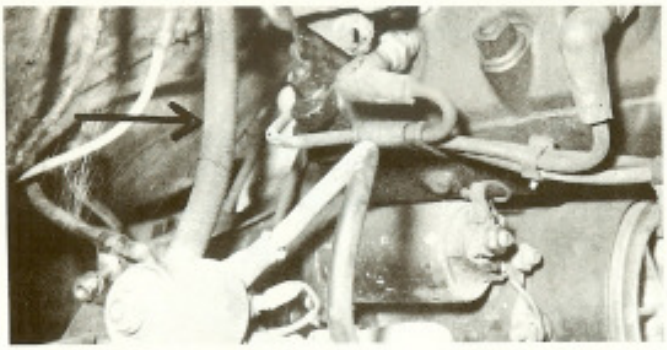
I have long regarded automatic transmissions with fear and distrust, although I know they are mechanical and with some study I could figure out how they work. I still feel, however, that it is best to get someone who knows how to fix one when you have one which is at all questionable. Don't take it to the local Pontiac garage. They'll just have kittens when you tell them it came from a Rolls-Royce/Bentley/Phantom V. I have been more than pleased with the services of Albers Rolls-Royce (360 S. 1st Ave., Zionsville, Indiana, 46077), and since Hermann Albers is the Club's Cloud expert, it goes without saying that he knows what he is doing and deserves our support. He also maintains a very substantial inventory of parts, particularly the faster-moving items. Obviously I sent the Hydra-matic in question to him.

Now back to the engine:

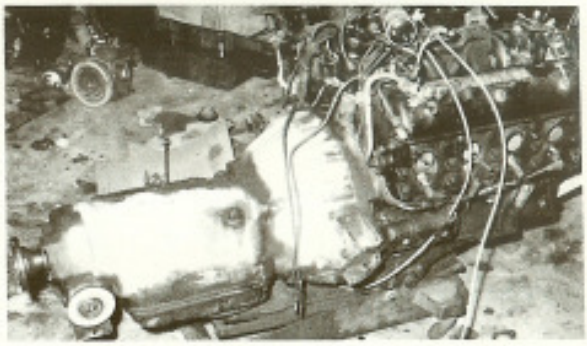
Take off the intake manifolding, and pull off both heads. Remove the flywheel and stand the unit up on its end.

I assume that if you have gone this far you are no novice. I shall not insult you by telling how to grind in the valves. I would caution, however, that exhaust valves are $31.53 each, so use some care in disassembling. Throw away the old valve keepers. If you have one of the early V-8's (which you doubtless have) go to your friendly Ford dealer when you get ready to reassemble the heads, buy eight (one for each intake valve) valve shields to stop the oil from running down the intake valve stems. Remove all the end plates

The exhaust manifolds are not strong. This one cracked from twisting engine pipes to get holes to line up. About $40 each.



Be certain to remove the metal fuel line leading from the frame to engine (see arrow).



The engine removed. Note that easily broken stuff is gone prior to lifting the engine. A covered cable does less damage than a chain.

from the two heads and have the heads machined perfectly flat. Take off an equal amount from both heads, and take off the minimum possible. (End plates are removed because the machines can grip these heads only at the ends).

Now remove the pan, the oil filter and the piping to the oil pump. Take off the vibration damper on the flywheel and get a puller to remove the piece which sticks out. This piece is on a keyed taper and comes off darned mean. Be certain to take the nut off from the inside first. (To prevent the puller from going down into the crankshaft, I took a bolt whose thread body would just fit inside the crankshaft and turned a recess in the bolt head to receive the pin from the puller). Now take off the water pump and the lower plate. Pull off the skew gear which drives the oil pump, checking first that the pump has not more than 0.0033 backlash. The bronze gear will doubtless be shot and you'll have something in the order of 0.090 or worse. Buy a new *set* of gears. Take off the oil pump.

If your engine is virgin or properly overhauled at an earlier time, all the rods and caps will be marked A1, B1, etc., so if they are, push out the pistons. Flip the engine over on top of a sawhorse to prevent bending the headstuds, lift off the five mainbearing caps, lift out the crank and go get your micrometers.

Rather than go into the measurements of the engine (which will appear in table form in a later issue of the Flying Lady), buy an S-2/S-3 engine overhaul manual. Remember that each throw carries two rods, so you'll have to check each journal a minimum of four times to determine if the throws are round or not.

Take off the valve chamber cover, remove the 6 lifter holders and place them in such an order as to insure their going back where they came from. Check that the bottom of each lifter is square, not cupped. If they are cupped, plan to check the cam carefully for wear.

Pull off the cover to the back of the camshaft on the flywheel end, remove the skew gear, lift out the distributor drive. Remove the gear from the front of the camshaft, take off the spacing plate, and pull the cam out.

You now have close to a bare block. Check the cylinder liners for taper and ovality. Be sure to check the liners at their bottoms for you will likely find that they are badly worn, even out of round at the bottom as much as 0.018". Cry (or gently swear) for you are now thoroughly and completely in the soup.

You might as well order the following parts:

One full set of gaskets
8 pistons, rings and pins fitted
8 cylinder liners
All necessary seals and "O" rings
1 Set rod and main bearings. (Undersizes available only in GB. Check with Albers should you feel undersizes are necessary)
1 full set motor mounts
4 new fan belts
8 little end bushes
Spark Plugs, points, coolant hoses, etc.

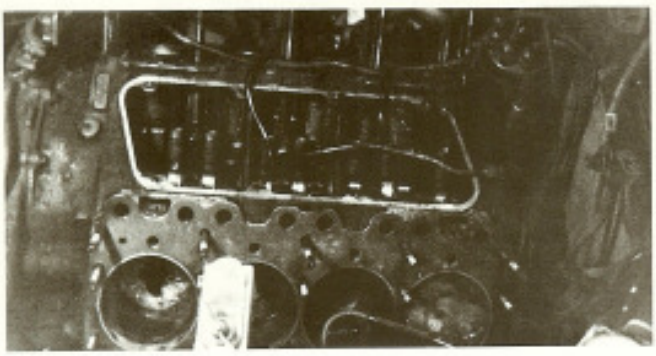
The above parts will run somewhere in the neighborhood of $500, which is a nice neighborhood, but one in which there are few Fords, Chevvies, or even Cadillacs.

While things are apart, now is a good time (and a very easy time) to check the working of the heater flaps and their little motors, the water tap which controls your heat in the winter (hopefully) and do refill the front universal joint with Mobilgrease #2 (no other). (Unhook the wire to the fuel pump while checking these items, just easier). A thorough cleaning is generally in order, too.

You are now going to have a few days rest. Clean up those parts you wish to, or go back to working on your Ghost, P-1, what-have-you, which you have neglected for this modern iron. Review the family fortune, or lack thereof.

O. Shoe

Note the hole caused by the bounding valve head. Damage to this front bore was quite extensive, requiring a new sleeve.



Sometimes it seems the parts will never come. This car sat outside during four snowstorms.

Dr. Sam Scher's SC-II conversion as seen at the Annual Meeting in Palm Beach.

Clean cooking on the stove. Heat the piston until the pin enters. Unit will be quite warm at completion.

OVERHAULING THE MODERN V-8

PART 2

After breaking the engine and transmission apart, you have three courses of action open: (1) Quit, let someone else do the work; (2) put back together what you have taken apart; and (3) continue with the overhaul. Assuming you to be a brave soul, able to finish what you undertake, we shall continue with the instructions for overhaul.

Remove the water-pump and front lower engine plate, the flywheel, and the cover to the rear of the camshaft and then flip the engine over on top of a sawhorse. Remove the pan, take off the oil-pickup and piping, then the oil pump and the oil filter. Undo the rods and push them out; undo the mains and then lift out the shaft. Remove the camshaft gear and the retaining plate behind it and pull out the cam . . . gently, please. There is no need to remove the studs, either head or main, since they will cause no trouble.

Do NOT attempt to drive out the liners for they no doubt are really stuck in place. Send the bare block to an automotive machine shop and have the liners pulled. They have the proper tools. Should a liner refuse to come out, do not despair; anoint it liberally through the bleed hole and around the top with vinegar, allow to stand overnight, then pull out. Throw away the old "O" rings, three to each cylinder.

At this point you should decide whether or not you are going to replace the camshaft bearings. The tolerances call for 2.000 to 2.0005. Since the shaft itself is 2.000 this is pretty tight. However, aluminum expands and you should have good oil clearance immediately on starting the engine. Replacement bearings are not precision fit and must be line-bored (any shop which line-bores model A Ford shafts can do this simple job for you).

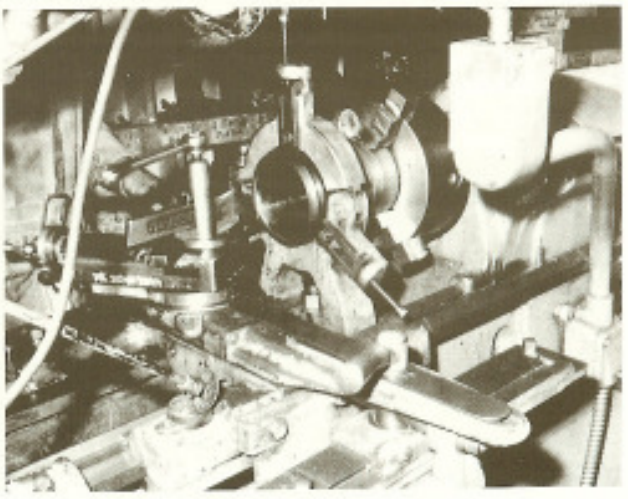
At this point your engine is quite empty or should be. There is no excuse whatsoever for overhauling a filthy engine. Start cleaning. Most large truck shops have a carb. tank which can handle this engine in two passes by standing the engine straight up and immersing it in the solution. Stay away from hot tanks. They will eat aluminum rapidly.

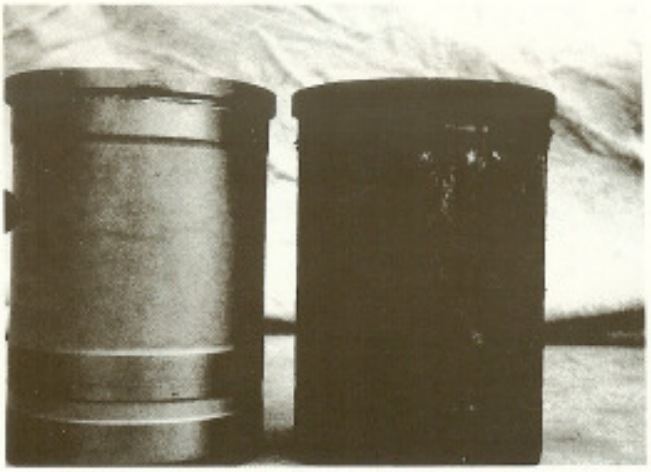
Remaining cleaning is a night's work for the interior of each hole must be cleaned or scraped to remove the cooling system corrosion. I used a bearing scraper to get mine clean. I thought about sand-blasting but wasn't willing to take the chance that there might be a bit left in an oil line when I got through. I also found dry-cleaning fluid to be helpful (my fluid was "Perk," not a petroleum solvent). Dry-cleaning fluid is slightly corrosive so do not leave parts in it overnight.

By this time you have received several packages of parts. Take the time to examine each part, particularly the sleeves. Check with your micrometers to be sure each sleeve is the correct size and visually to insure there are no heavy machine marks on the sleeves. It is also well to insure that you have all the correct hoses, pipes, gaskets,

If you try to install the engine this way, you should read the directions again.

Cylinder barrel being machined to stand 0.002" to 0.003" proud the face of block.





The old sleeve shows why the sleeves are often well-secured to the block. The build-up is basically aluminum corrosion.

etc. Nothing is more frustrating than to be missing a vital part during an assembly.

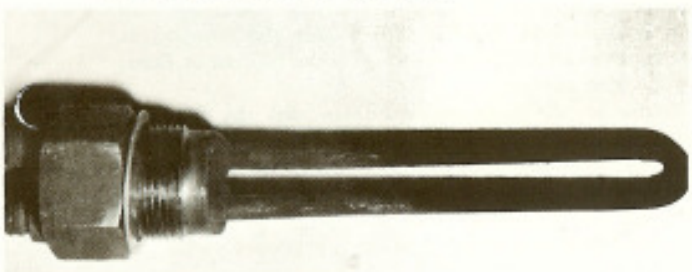
Starting with the bare block, fit each sleeve to a bore. They should be just able to turn in the hole, that is, just short of binding. Use sandpaper on the aluminum walls until you have the sleeves fitted properly. . . . 80 grit works best. Now take the block and sleeves in place to a good machine shop to have the sleeves cut off so that there is 0.002" to 0.003" of the sleeve standing proud of the face of the block. A good shop can do the whole job in less than an hour. It is most important at this point that the sleeves be put into the proper holes and not mixed up.

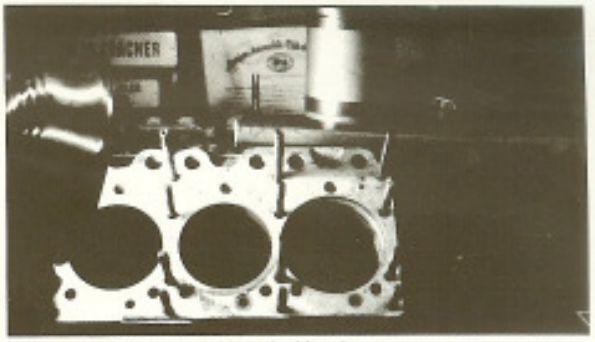
Next fit the three "O" rings to the interior of the sleeve holes, making certain that the grooves which hold the rings are very clean. Do not get involved with any type of stickum at this point. Clean the sleeve, oil lightly all over, and work the sleeve into the hole. Toward the end you'll have to put a wooden block on top of the sleeve and drive the sleeve home. Check that you stand proud the correct amount. If a sleeve really refuses to enter the bottom of the hole, check that you have not tipped over a ring.

With the sleeves in place you are home free. The rest is straight assembly work. Be certain your new oil-pump gears (driving) have 0.0033 or less lash. You might give some thought to replacing the relief spring in the pump (this is a miserable job, sorry I mentioned it). The spring is found under the core plug on the body of the oil pump. It takes a special tool to get the plug out.

Do NOT mix up the piston pins. They are selectively fitted to the piston. Mark them carefully (A1, A2, . . . B1, B2, etc) and put them in the proper piston. You may get wrist-pin knock if you don't watch this point.

This item is the choke stove which is found in the right exhaust manifold. For some reason R-R saw fit to extend the threads down into the manifold. The resulting build-up of carbon makes the unit very hard to extract. Turn off the first 0.250" of threads and make life easier for the next man. (He might be you.)





Block with one sleeve removed. Sign in background cautions rebuilder to use oil for a lubricant.

When making up a joint, I have found Ford's Perfect seal (Part #B5A-19554-A) to be an ideal sealer; it is soluble in lacquer thinner but forms a nice neat joint. Cost is small. . . . 75¢ a can, complete with brush.

As you put the engine together you may elect to rebuild the waterpump. An article on this will appear in a future Flying Lady but do be careful in removing the cast iron front housing from the aluminum back housing. This breaks very easily.

To set up the skew gear on the back of the camshaft, turn the engine until cylinder A1 is at firing TDC. The axis of the flat distributor driving shaft will be parallel with the axis of the engine. The flywheel is foolproofed and use all the bolts to line up the flywheel on the crankshaft when picking up the timing marks. You don't have to tighten them down, however.

BEFORE you put the engine back into the chassis check the following items while you still have room:

Grease in the front universal joint.

All vacuum operating chambers work (LWB & Coachbuilt cars).

All heater tap and flap motors working properly (standard cars).

No bare wiring showing.

Most of the dirt cleaned out.

The rear motor supports have special blocks to keep the engine from running through the fan on a sudden (or otherwise violent) stop or crash. The part *without* the rubber goes on the engine, lip to the front. The rubber piece goes on the frame, lip to front. Keep about 0.250" of space between the two lips. Change the front motor support before installing the engine or you'll wish you had later on.

Put the engine back into the chassis. It will take you either a full day or about three evenings of hard work to get it hooked up and running. There is nothing easy about putting the engine back. Reinstallation is hard, drudge-type, work.

Radiators can generally be recored by a competent shop with costs about $50. Put in a new pressure relief valve if you go this route. Also be careful not to twist off any of the short small studs which hold the wind-sucker to the radiator. They are not too strong.

Put the power-steering pump on before the generator. It's not easy to work on anyhow and the generator is right in the way.

There isn't much of anything too serious about rebuilding these engines. Make up with accuracy what you lack in knowledge and, above all, clean everything most completely before starting the assembly. Our British cousins use a preservative on everything. "Perk" takes it off very quickly. Do not be dismayed and do not mix things up. When in doubt, ask or call, it's cheaper in the long run.

OVERHAULING THE V-8 ENGINE, MORE

A local SC-II, Member Jim Deisenroth's LSWC150, had developed a definite miss on idle which tended to disappear with increased RPM. Tentative diagnosis of a burned valve was confirmed by a compression test showing cylinder A-2 to have a reading about 90 psi lower than the average of the other 7. We followed the procedure given in the Engine Manual for the SC-II for removal of the heads, but discovered a couple of unmentioned items which deserve to be noted. One was that removal of the dipstick tube made access to the manifold and other bits on the left side of the engine easier. Access to the mounting screws for the dipstick tube is much improved by removing the splash-pan on the underside of the frame at the left of the sump. Otherwise, to quote an old McFarlane-ism, you need spaghetti fingers and curved eyesight.

The directions call for disconnection of 4 electrical units from the loom which is clipped to the induction manifold and runs across the front of it, as well as the right side. A 5th connection should be undone: the one to the oil pressure sender at the left front of the engine block, low down.

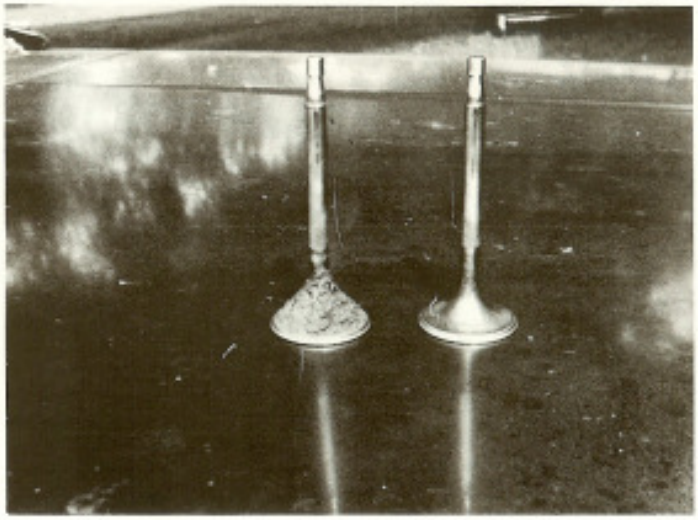
After disconnecting petrol feed pipes according to the recommended procedure the manifold fuel overflow pipe should be uncoupled at its rear. We found this out by trying to lift off the manifold and being brought up short by the unanticipated ligature. Another item that must be removed before trying to lift off the manifold is the water pump bypass hose.

Another unmentioned obstacle is the high-tension plug wire guides mounted on the rear of both cylinder heads. Since these are close to the firewall, it's easy to ignore them until you try to lift a head off and get frustrated by the clinging tentacles. For removal of the cylinder head nuts, the manual specifies use of tool RH7126. We wondered for a moment what this tool could be like and then tried an ordinary 11/16" deep socket. It worked just fine!

The accompanying picture shows what can happen when flow of oil down the valve stems is not properly controlled. Part of the operation on LSWC150, as long as the heads were off for a valve grind, was to update the oil seals to later specifications as described by John McCombe on page 1278 of the July, 1970 F.L. We had our automotive machine shop remove the old valve guides and press in the new ones before reseating the valves. Incidentally, the culprit causing the low compression was an exhaust valve with a gap in the edge you could throw a cat through. The valves shown here are intakes, one with the accumulated carbon of 137,000 miles, the other after about 15 minutes of treatment with scraper and wire brush.

It might be well to mention inflation here. An exhaust valve which cost $28.66 in 1970 was $67.27 in August, 1974. Valve guides had gone from $1.70 to $4.44 and from $.84 to $1.59 for exhaust and intake respectively. We don't have the price of a top overhaul gasket then, but now it comes to $188.67. For a '56 Cadillac, the J.C. Whitney Co. in Chicago will sell you valve grind gasket kit for $13.98. The '68-'72 cars command only a paltry $9.35.

John Utz, N.Y.



BURGLAR ALARMS ON MASCOTS?

Len Goldfarb (Conn.) sent the following article, found by him in the Sunday Telegraph while flying with the Red Baron over Dusseldorf.

Rolls-Royce is considering fitting burglar alarms to all "Flying Lady" radiator mascots because so many are being stolen for sale to collectors.

They are becoming increasingly popular among teenagers who fit them on to old bangers and families who use them as ornaments.

A sudden spate of thefts, estimated at about 20 a month throughout Britain, is causing Rolls-Royce mascot casting foundry in Crewe to fall short of demand.

A spokesman for Rolls-Royce said: "The mascots are in short supply because we cannot keep pace with the standard of morality of people with bolt cutters.

"We are seriously considering fitting mascot alarms to every new car rather than just offer them as optional extras."

Previously, the mascot, a young woman with flying robes depicting "The Spirit of Ecstasy," could be unscrewed. Rolls-Royce owners would carry out a "removal ritual" every time they left their vehicles unattended.

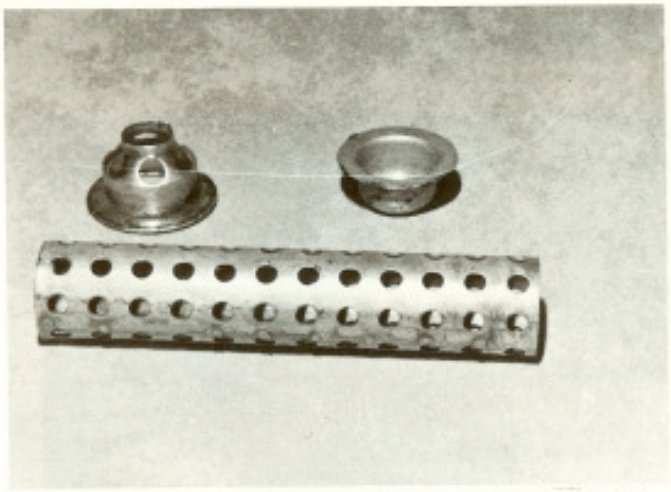
STAINLESS STEEL EXHAUST SYSTEMS

Road Motors (Leeds) Ltd., Victoria Mills, 511 Bradford Rd., BATLEY, Yorks., England are now prepared to ship ex stock complete systems for the S1 and S2 cars only. The Technical Secretary of the RREC advises that they are extremely well made and that they fit without bending and adjusting. At present production is limited to only the S1 and S2.

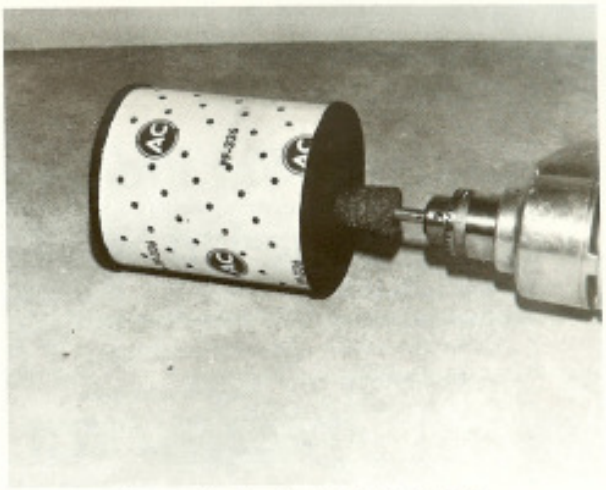
OIL FILTERS, MORE

On page 1686 an article appears on making a filter for a modern engine using a Hastings Filter number 121. While this conversion will fit, the filter described is not of the full-flow variety, but is a by-pass type filter. The filter is made of somewhat denser materials than the conventional full-flow filter and the component being removed by the screwdriver is the by-pass as fitted by the manufacturer.

While we do make suggestions to ease the financial pain some experience in owning a Rolls-Royce or Bentley, generally speaking it is better to fit original equipment parts where possible. (In other words, crossing a desert you use what you can get your hands on . . . next door to a dealer, you buy the proper parts).



1478 **Here are the bits you must take from an original "British" filter. S/SC II & III take the same filter.**



One way to enlarge the hole in the U.S. filter.

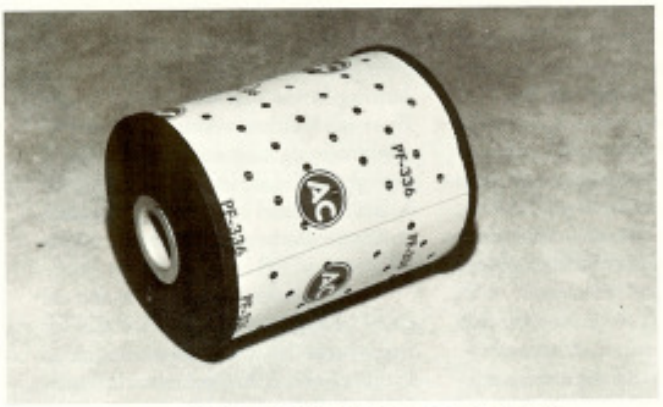
OIL FILTER FOR SC1 AND S1 CARS

In order to use a conventional filter cartridge in place of the R-R element on a SC-I or S-1 engine, strip the felt socks and supporting metalwork from the core. This is done easily with a pair of side-cutting pliers; tack-weld deposit should be ground off the center core.

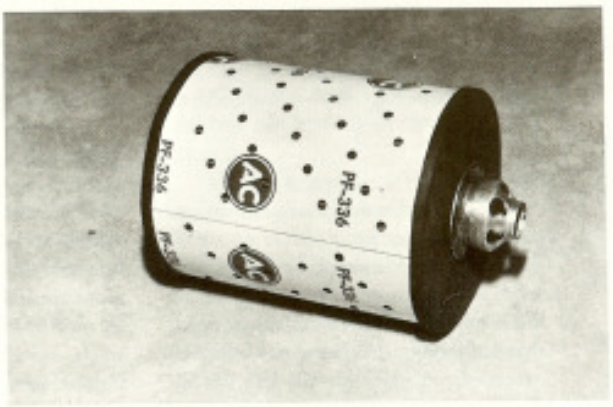
Get a Purelator P-76-1 or A-C PF-336 from your neighborhood discount house and grind the end holes to slip over the core, about 15/16 in. dia. Slip the end pieces on and it is ready.

By making up two sets, one will be ready to go at each change. I ran premium multi-grade oil for just under 5,000 miles when my Cloud had some 70,000 miles on the odometer, then drained the sump and had a sample tested at the motor research laboratory of a major oil company. They reported that the oil looked good for at least 3/4,000 miles more and that the filter was doing a fine job.

C. C. Wuth, Mo.



Here is the bottom installed in the U.S. filter.



The top of the U.S. filter. Metal center supports the pressure.

Post-War Pre-Shadow Tune-Up Seminar

February 21-22, 1992
Mechanicsburg, PA

Based on notes from
Roger Hadfield, Ont. & Bob Leonard, PA
Photography © 1992 M. Karger

Roger Ford, seminar leader

Equip yourself with the appropriate shop manual for your car. It contains enormous and valuable step by step procedures and information and was prepared by Messrs. Rolls-Royce who built these cars. Many manuals (including that for the S3) are available from Club Stores. Roger Ford was a mine of information and experience, bright and cheerful and equally willing to tackle small as well as large problems. This seminar focused on techniques, running commentary, and demonstrations. References to Bentley S1, S2, and S3 can be presumed to refer equally to the Rolls-Royce Silver Cloud, Silver Cloud II, and Silver Cloud III. A number of cars were put on the lift, and Roger took them on the road afterwards, with a number of seminar participants going along for the informed ride.

Preliminary

Prior to adjustment of ignition and carburetter, set your valves to .006" inlet and .012" exhaust for 6 cylinder cars. Do a compression check. Should be even within 5 or 10 psi when engine warm. Expect compression of 90-110 psi for 6 cyl., 125 for S2, 135 for S3. Write down the compression test numbers on paper so you can compare them when you test again next year. Be sure the battery is well charged, so it's still able to turn the engine at last cylinder tested. V-8: if no compression on one cylinder, possible lock in hydraulic lifters – try again later. Remove the spark plugs from all cylinders but the one whose compression you are testing.

Fuel & Carburetion

Check carbs (S.U.'s): Pull apart & clean. Use carb cleaner, but away from car. It will cause paint to drop off.

Auto transmission fluid can be used in S.U. carb piston dampers in most climates, winter and summer. In warm climates such as Southern California, the piston will come up too quickly and cause a flat spot so use 30 wt. oil.

Carb synchronization: A Uni-SYN gauge indicates the flow into each carburetter, making comparisons of them easy. Use only when the engine is warm. Roger Ford doesn't use Uni-SYN gauge on an RR/B car because the linkages are good enough to synchronize the carbs by zeroing them. You can use the carb tickler to check each carb separately. Press on one tickler; if the engine revs, then dies, the second carb is too rich. If the engine dies immediately, the second is too lean. Then check first carb with the tickler on the second.

Volume screws on S1/S2/S3 carb: Tighten lightly and then back off 2½ turns. Do not back off below two or above three turns. If you find you have to, then your carb has a problem.

S.U. carb rebuild: Watch washers. Some are serrated on inside. Do not replace with standard washer. You will create a vacuum and cause engine to run very lean.

Idle speed:. 6 cylinder, 500 rpm; standard V-8, 600 rpm; V-8 with air, 700-800 rpm; V-8 with Sanyo compressor, 600 rpm. You need to know your engine to set idle speed right.

There is a small valve with a ball bearing in the fuel line right near the flywheel housing. This prevents fuel from running back out of the carbs. If you get a puddle in the morning, the ball is not seated or is missing. Replace it. On 6 cylinder cars it is down near the oil pan.

One participant mentioned the use of 100 octane low-lead aviation fuel for use in his SCIII. It seems paradoxical to me (Roger Hadfield) as I use auto fuel in my aircraft – to each his own!

The cost of overhaul parts for S.U. fuel pumps is such that the purchase of a new Shadow pump and fitting of pump units to the old brass center valve body is cheaper ($220) and better with *new* actuators. Don't put one on a 'show car' or an experienced judge will notice (Doug Seibert). Be cautious of after-market pumps as the pressure can be too high: 2½ - 3 psi is standard S.U. pressure, but you want 2- 2½ psi at the carburetter. If in an emergency you must use an American fuel pump, put a regulator in the line near the pump and set at 1 pound. It will end up at 2½ psi at the carb.

There are excellent manuals available for S.U. carbs. *S.U. Carburetters,*

Frank Sedey, PA, enjoys SLVC37, his 1964 Phantom V Mulliner, Park Ward limousine, for its comfort and prestige. It should last for a very long time.

Post-War Spark Plugs		
Model	Champion No.	Gap
6 cyl.	N8*	.025"
S2	N12Y, N14Y	.025"
S3	N14Y	.030"
PV	N14Y	.030"

* Roger Ford recommends using N12Y. N8's are now difficult to obtain.

Haynes Publications Inc., 861 Lawrence Dr., Newbury Park, CA 91320, and *S.U. Carburetters*, Motor Racing Publications Ltd., Unit 6, The Pilton Estate, 46 Pitlake, Croydon, Surrey CR0 3RY England.

Automatic Choke

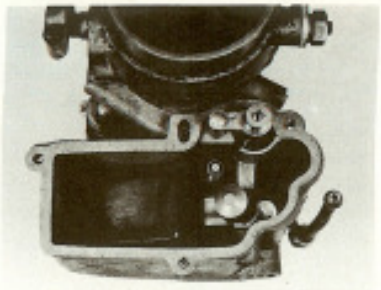
The automatic choke responds to the inter-related workings of the vacuum diaphragm, a bimetallic spring, and an electromagnetic switch which keep the engine on fast idle until certain conditions of vacuum, oil pressure, engine temperature, and under bonnet temperature are met. Examination of the various mechanisms involved fascinated seminar participants.

Depress accelerator pedal only once to set choke. The engine should start in ½ to one full revolution. The choke is then pulled open ⅛" for fast idle at 1,800 rpm. At normal operating conditions, the butterfly is flat open. Make certain it has not been bent.

On S Series cars, a flapping choke after start denotes a failed diaphragm, where the vacuum line connects up. Be very careful of the fragile pin when aligning and tightening nut on new diaphragm.

Don't adjust the bimetallic spring more than two notches either direction from the factory mark. If it needs more, you may require a new bimetallic spring.

Do not lube the fast idle cam – even WD40 will leave a residue, and a sticky cam will keep the engine on fast idle.



The gasket on the Zenith carb float bowl must not cover the low speed jet, center top.

Ignition

Points: Lightly use 600 grit paper on block to remove carbon and re-mate. Set to .020", except Lucas in S3 series – set to .016", and change condenser with points. Condenser not normally replaced when using Delco-Remy points. 6 cylinder – two sets of points, set at .020", Delco-Remy D110 (one set per box, buy two boxes). Always go back and recheck gap and condition. Watch base thickness. May have to bend Delco-Remy arm to align the points. You can work on the points with the distributor on or off the engine, but if you take the distributor out, make careful note of pointer direction (it will go in more than one way).

Pitting of points is often due to condenser failure – can be tested (e.g., Radio Shack type tester) or replaced. Dale Powers, FL, source for condensers (close but not exact).

Static resistor on the ignition rotor can cause high rpm – 95 mph & up – breakdown (ignition failure).

If Lucas points are to be installed, assure the protective coating is removed first. (Probably a good idea with any make.) Also, make sure the small screw in the baseplate is not too long – it could interfere with the advance weights underneath.

Spark plug wire: Use only solid copper core wire in ignition harness rather than carbon or silicon which break down with the heat of the V-8 and also from oil penetration. Replace wire when it's hard or cracked. Remember the end fittings are not molded on and will thread onto the new wire and thus be reused. At least twelve feet of wire is needed for a new ignition harness.

An excellent, practical hands-on demonstration of ignition timing was carried out by Roger Ford – the procedure is as detailed in the relevant RR/B Shop Manuals. Note: Set the octane selector fully advanced when setting points.

Timing marks on the flywheel vary from model to model.

Road test for best setting to eliminate pinging: on a reasonably straight stretch of road, accelerate so in 4th at 25 mph, then step on it. If no ping, advance timing until it does ping, then take it back a little until it just doesn't. Get as much power from early advance, without ping. If retarding spark/ignition gets rid of ping, but you don't like the power, use octane booster. Roger Ford has seen timing range from 5° late to 15° early and still ping. How you set up your car depends on how *you* like to drive it.

Shade tree repairs: If the distributor cap is cracked, and you need to 'get home', a visible crack can be scratched across to break the carbon contact which allows the flow to ground (very temporary measure!). If the arcing is across the coil lead, it's possible that the shorting is in the cap cover, especially if the felt washers around the screws are missing. The cover can be removed, and you can still run normally to 'get home'.

Worn distributor drive bushings are a common problem and must be replaced prior to proper adjustment. Worn bushings will affect the idling more than the high speed on these engines. Play of .005" to .006" in the distributor shaft is too much. Bushings are available. Most distributors at this session needed new bushings. When the bushings are replaced, assure that there is a grease hole in the bushing and that it aligns with the grease cup for grease passage.

The drive pin on the distributor shaft can be replaced by drilling and installing a rolled pin.

New Rolls-Royce Part Numbers for Post-War Distributor Points			
Item & Qty.	6 cyl	S2	S3
Spring Arms (2)	RF5093	RF5093	–
Fixed base (1)	RH8889	RH8882	–
Movable base (1)	RH8891	RH8887	–
Kit	–	–	CD3047
Gap	.020"	.020"	.016"

Engine

Marvel Mystery Oil!! Roger Hadfield: 'I'd never heard of it. It appears that it will do anything.'

An engine in storage for a long period will develop fungus on an open exhaust valve which will come off and score a cylinder wall when the engine is started. Before starting a stored engine, put Marvel Mystery Oil into the bores.

Through flooding or too rich a mixture, excess fuel can cause wear or erosion of the top piston ring through wash and resultant lack of lubrication. This all happens when recommissioning a stored car. Again, Marvel Mystery Oil to the rescue. It also helps lube exhaust valves.

Piston slap was mentioned as being common to the S2 – less so with the S3 – also common with the earlier post-war sixes, but not with the big bore and S Series due to offset piston pins.

An excellent set of intake valve adjusting tools for 6 cylinder cars is available through John Decker, 8726 Remmet, Canoga Park, CA 91304. $45 each.

Thermostat: RR thermostat has throttle valve where American units do not. Must have it or else little water will be cooled. S3 thermostat will fit into Silver Wraith (long neck) if rotated 90°.

Water pumps will wiggle. As long as it doesn't whine or leak, don't worry about it.

To check oil pump gear, you have to pull the water pump, both sets of pulleys, camshaft cover top & bottom. It is an essential part of a major rebuild.

The S2 has dished pistons and the S3's are flat-topped, but neither is now available in oversizes from RR. Liners take about 5 tons to extract. You can hone the liner to even it out. From RR, pistons cost $290, liners $120, and a set of rings $210. If you hone the liners, you can buy silicone impregnated pistons to the exact size you want.

If the webs between cylinders are cracked, repair them or replace the block. $2,500 to reweld block. $1,700 for oversize bearings if you have to grind the crankshaft. You can polish without going to oversize and get standard bearings for about $400. Don't rebore the crankshaft holes as this will prevent correct meshing of gears between crank and camshafts.

Slight weep at rear main seal – do not use American replacement. Use RR part to get a good seal.

Dave Rogers, VA, had just purchased this 1957 SCI, LSDD198. Below: its handsome picnic tray.

Exhaust Systems

Stainless steel may not be the answer due to its higher heat retention and the associated crackling and snapping in the cooling process, as well as an uncomfortable whistle. Possibly, the answer is to replace only the tailpipe in stainless, for the sake of appearance.

Exhaust system must be grounded in three or four places to prevent arcing damage.

The front muffler only is lagged; the others are bare. George McVey, 5040 Antioch, Merriam, KS 66203 913-722-0707, sells an effective modern alternative to asbestos.

The upper silencer, above the axle, contains baffles, but some aftermarket replacements are empty, with the resultant increase in exhaust report. Flanges on RR replacement exhaust systems are welded on wrong and have to be undone and redone (Doug Seibert).

Brakes

Shake back stops operate dry – no lubrication! Tighten to 22 lbs. torque. Their only purpose is to align the brake shoes square to the drum. Do not use stops to adjust brakes in any other way.

To do a proper brake overhaul, always replace the five hoses available from RR at $120 total.

Low speed judder when brakes applied: Springs weak, allowing the small coil spring to brake drum to float free.

RR says 'Do not use silicone brake fluid.' See FL4207. Also, it will void any warranty from several of the shops that resleeve brake cylinders. The resleeved cylinders also have some problems with regular brake fluid leaking. Use RR363.

Automatic Transmission

Jumping out of reverse is commonly caused by a worn selector. During transmission rebuild, tell the shop to examine the corner of the mandrel for wear and to file it to rebuild the edge if warranted.

Just prior to engine shut off, select reverse, then switch off the engine. This relieves pressure on the front pump and will help prevent leakage. Then select neutral, and finally select reverse for locking.

Transmission fluid should be changed completely every 20,000 miles, the filter cleaned, and the bands readjusted. The lubricating properties of ATF are important. Be sure to drain the torus also. Watch the torus plug – it's very sensitive and fragile. If it strips out, use a tapered plug. A spread aluminum washer prevents this plug from coming out easily.

Transmission adjusting tools: The

front band tool is in the toolkit. It looks like a plumb bob. The rear band tool is not in the kit. See pic in *Automatic Transmission Service Manual*, Section 6, pp. 8-9, TSD2042, Club Store Item No. 3204.

Tires and Wheels

Radial tires may not be the answer. They are noisier than bias tires, especially over road cracks. The car will sit lower. When radials are changed, always keep them on the same side of the car for constant rotation in the same direction or failure is likely; i.e., rotation of radials means exchanging front with back on the same side. Remember, the Cloud suspension was not designed for radials so they also require realignment. Castor 1½ - 2° positive; camber 0-½° positive; toe-in 1/16". Adjusting camber on Clouds is difficult even for a good front end shop until they know how to do it. Maximum size for radials is 215 x 70R – larger will scrape the wheel well.

RR recommends tire pressures for bias ply of 22 lbs. front, 27 rear; Roger Ford recommends for bias ply 27-30 lbs. front, 30 rear; for radials, 30 lbs. front, 35 rear. Testing of tires on your own car is strongly recommended.

Do not use quick-fix plug for flat tires. They will be outlawed soon; they are very dangerous, especially in radials. Patch tire only. The tire people will know the limits to patching.

Beware of servo drag when balancing the wheels on the car: It will blow the balancing machine's fuse. The paint rings on the wheel discs can shift and cause a slight shudder here or there. Pin them down.

Overtightening of wheel bolts (with an impact wrench) will distort the wheels and make them impossible to balance satisfactorily. Remember: Left side, left thread; right side, right thread. (Old rule for tightening: 'Down in front'.)

Louise Newman, NH, investigates the workings of the automatic choke which she expects to repair on her own Silver Cloud II.

This exceptionally clean and well-kept 1964 SCII, LSFU721, belongs to Rick Parker, NJ.

Chassis

Low speed vibration, say 5 mph, is often caused by wear in the Detroit coupling. Vibration at 18-20 mph denotes problems with the center support mount. If you pull the mount down by hand, and it doesn't spring back, then remove the mount, dismantle, and clean it, replace the rubber, check the springs, refit the unit, and align it.

If you need to remove the drive shaft, make sure two knuckles are aligned when you put it back.

The steering idler arm is often a prime cause of wander. The pin and bush set is available from John Decker, address above, at $25 each.

The tapered wheel bearings should be just tightened and then backed off one or two holes. Make sure the split pin is bent to clear the ground strap in the hub cap.

Rear spring re-arching, although not totally successful long term, is being done satisfactorily in California and Toronto. Do *not* retemper the springs – it does not last.

Teflon tape is being tried between the leaves to allow proper slip, but there is a problem getting split pin back into the bolt. Spring Menders in Norfolk, VA, was mentioned as a possible source for new leaf springs.

As front springs grow weary and weaken, the front end starts to sag. Springs have five shims on top from the factory. You can go up to 16 shims before the spring will fall out of its socket. Shims are in a canvas pack at the top of the spring. Coil springs are available from a California supplier at $150 per pair.

Standing height must be correct before any other repairs to the suspension can be carried out correctly. Consult the workshop manual. You have to pull the spring out with an RR tool and with much experience. An important fix, but do not undertake it lightly. Springs uncompressing without control have been known to kill people.

A Cloud with air conditioning requires heavier duty front springs. Home market cars have thicker springs; export cars have thinner (softer) springs.

Body mounts are rubber with a bolt through into box, located in front of each door and under the center of the radiator. Usually, the left hand front mount goes first. If the mounts are rotted away, the car will sag in the middle or else the body will move on the chassis, and cause problems opening and closing the doors. The body wobbles – if you attempt to correct it by steering, it looks like a drunk going down the road.

Export cars were undersealed (sheet metal only), a good point to bear in mind for judging. If you underseal your chassis, scrape all rust off first. Trapped rust simply continues to develop.

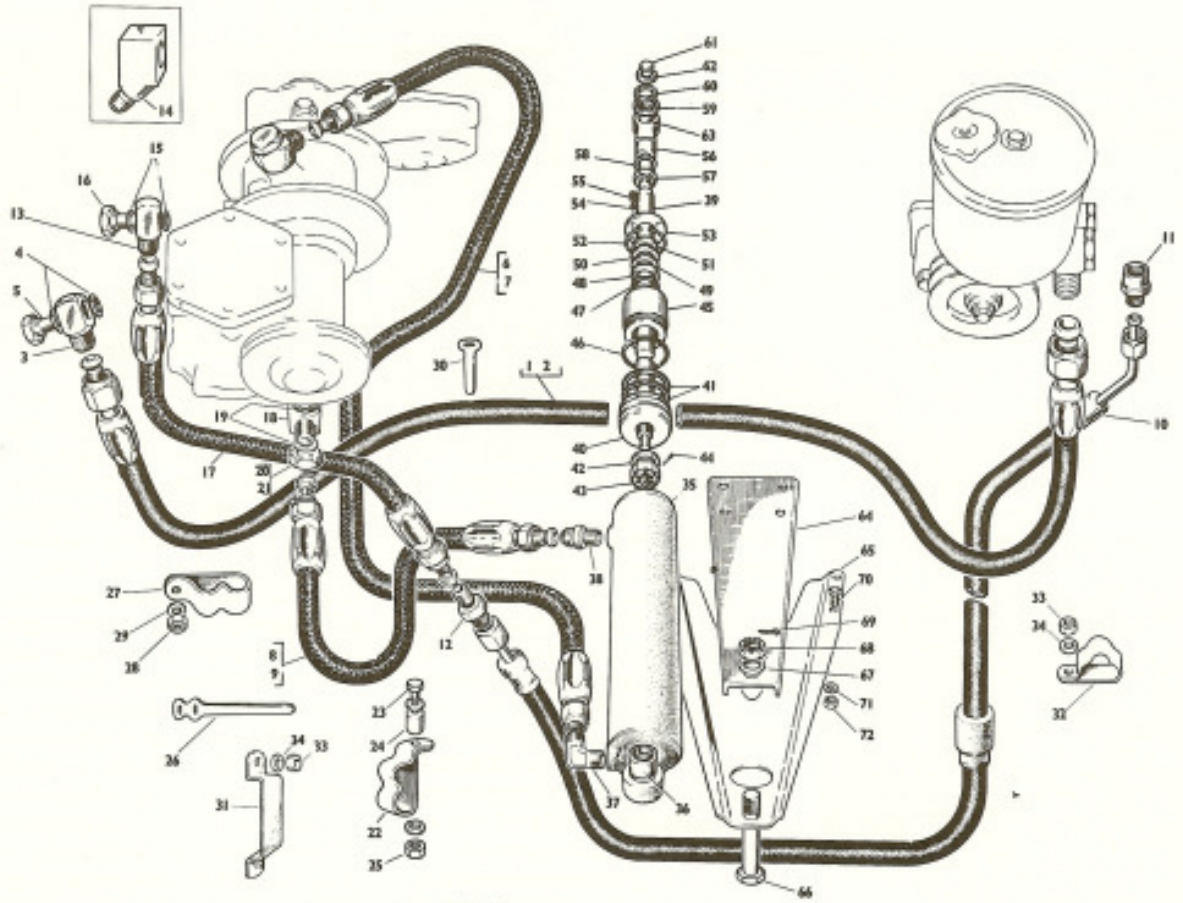
Lamps

Brake lamps can be improved on Clouds by removing the horizontal baffle, allowing light to the total area.

Cloud instrument board lamps can be upgraded by using Archer 1487 bulbs, E10 base, 14v. 2 amp. You will need seven or eight.

•

Leak equals big puddle; seep equals small puddle; weep equals few drops.



Herewith the entire power-steering assist system. Part #39 is the ram shaft.

POWER-STEERING REPAIR, S-SERIES AND SILVER WRAITH

Recently encountered was a power-steering ram with a severely pitted ram shaft. After examination it was found that each end of the shaft has the same thread and taper, making reversal somewhat less complicated.

To accomplish this modification, proceed as follows: you may or may not elect to grind off the extra 1/16" on the opposite end. Indeed, you may elect to grind a wrench flat there. Drill a split-pin hole in the opposite end and refit.

You will need the following parts:

1 CD666 seal
1 CD667 paper back-up washer
1 CD671 Scraper
1 CD702 O ring
1 CD3814 seal expander as fitted to the last series of S-3's

You may also need the following:

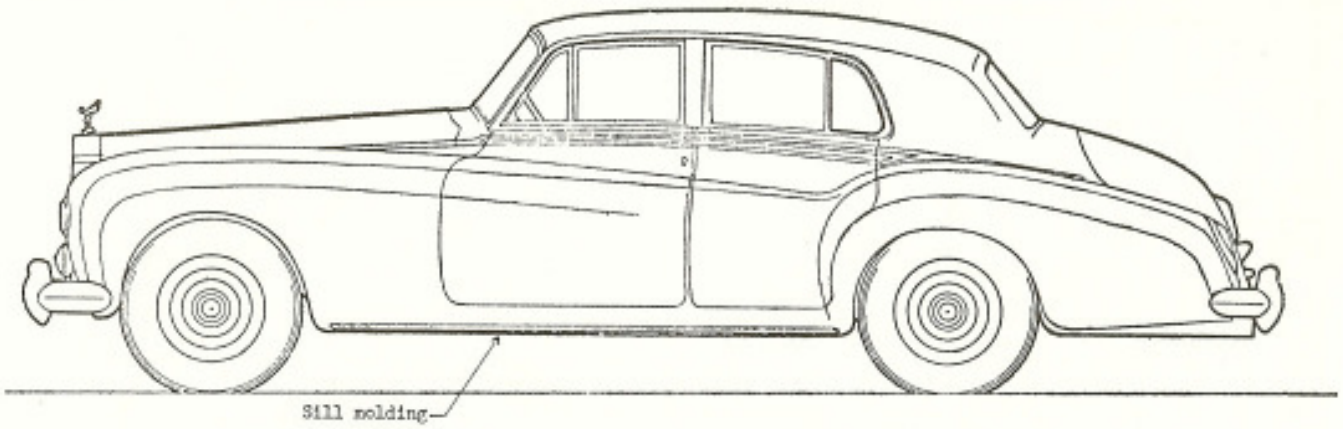
2 CD697 Ring
1 CD698 Ring

Total cost of parts should run somewhat less than $50 at present-day prices.

This modification applies to all early and late S-series cars and to E and later series Silver Wraiths with power-steering.

The saving on the ram is $81.99.

John McCombe, Ohio



SILVER CLOUD III SALOON

STANDING HEIGHT – SILVER CLOUD AND S SERIES BENTLEY

Owners should know that SC and S series cars develop front spring sag in normal service. Left uncorrected, this condition spoils the handling and appearance of the car. It can be the cause of a serious scoring penalty at RROC concours; resale value may also become impaired. The problem is corrected by installing new front springs.

The above side view drawing has been reproduced from an original sales brochure for the R-R SCIII. Side views of the SCI and II plus SI, II, and III Bentley would be similar. The points on this drawing to note particularly are the relationship of bumper centerlines to centers of the hubcaps and the clearance between the top of the front wheel and the wheel opening in the front fender. Also the sill molding along the bottom of the body is parallel to the road surface, i.e., the front end of the molding is not visibly lower than the rear end. In short, the drawing depicts an unloaded new car with correct standing height.

A comparison of this drawing with an actual car will usually reveal a noticeable front end de-elevation. In particular the sill molding will not be parallel to the ground and no space will be visible above the tops of the front wheels. This condition is caused by front spring sag. All R-R SC and Bentley S models are notorious for this weakness. It tends to become evident after about five years' service regardless of mileage. Air conditioned cars suffer more noticeably due to the added weight carried in front.

As a maintenance procedure, provision was made for the periodic addition of shims to the tops of the springs to compensate for sag. The total number of shims that may be added is 18. Each shim is .050" thick and by leverage raises the car .100". However shimming a sagged spring is a short-term remedy because once sag commences the rate of continuing sag becomes progressive to the failure point. To properly restore front standing height, new coil springs must be installed.

Of course when rear leaf springs sag, they may be re-arched to standard specification and returned to service. With leaf springs this is a common procedure and is usually more economical than installing new ones.

The reason why coil springs cannot be rejuvenated is rather interesting. First of all a coil spring subjects the spring material to a twisting force or torsion load. Torsion is a form of tension, i.e., the twisting force tends to stretch the spring material. A leaf spring is subject to a bending or sheer force. A sagged coil spring has experienced sufficient service for the outer fibers of the spring material to become stretched away from the inner core. This process does not occur dramatically as a result of running over rough roads; instead the spring material "creeps" as it accumulates service through operation near to but not actually in excess of the design yield point. In other words the material gradually becomes tired. A leaf spring on the other hand does not experience a stretching condition in service. It merely loses its bend or camber. Camber can be restored by re-arching the spring and retempering the spring material. In contrast the torsion stretch in an old coil spring is not removable as a practical matter.

Although the visual check mentioned previously is usually effective in detecting spring sag for the practiced eye, there are a few measurements that can be made for a more conclusive determination. A simple test for an unloaded car with properly inflated tires is to measure the ground clearance under each end of the sill molding on both sides of the car. These measurements should be about equal within a range of 3/8". Also the clearance under a front overrider should be about 12" or about the same clearance as under a rear one. These measurements are not precise because friction in the springs and other suspension parts prevents a car from coming to rest at exactly the same standing height after each trip. Of course the R-R shop manual discusses a more elaborate procedure for measuring standing height, but that method will not be described here.

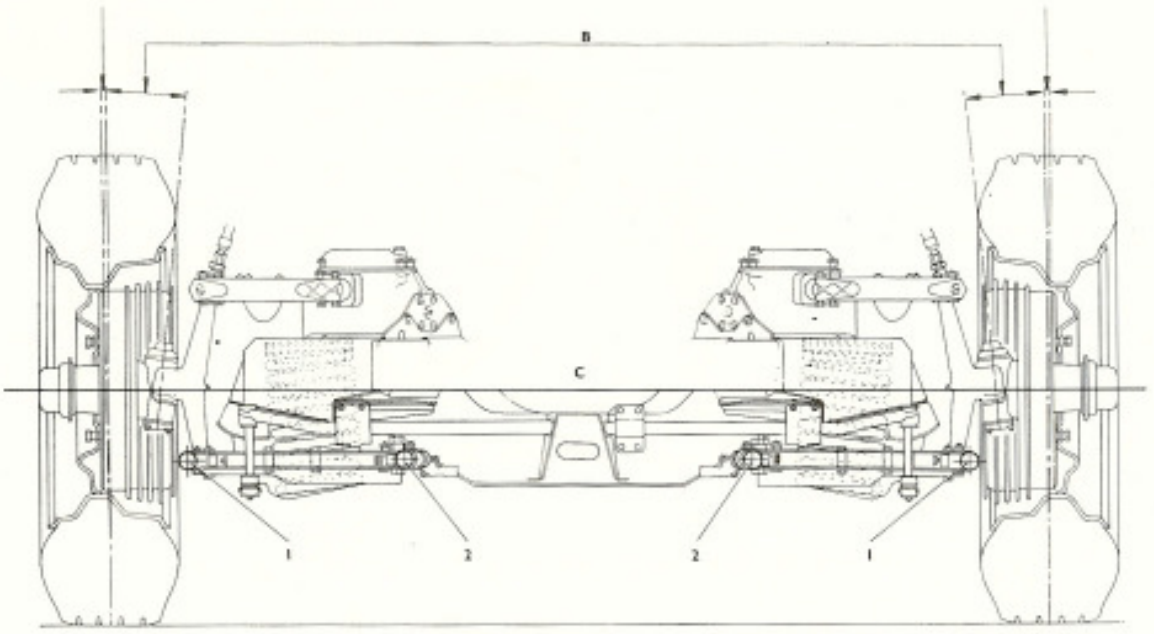
Improper standing height can be a problem for participants at RROC national meets. Judging classes for these cars are always crowded; the judges are keenly aware of spring sag and score accordingly. For instance a car otherwise able to score in the mid-nineties can lose two points for spring sag – enough usually to put it out of award contention.

Aside from concours scoring disappointment, spring

TIRES – CLOUDS AND SHADOWS

Silver Shadow models seem to consume tires at a greater rate than the Cloud series cars. Consensus of dealers seems to favor Michelin X radial cord models in the 205 x 15 size. Latest models provide more comfortable ride than formerly experienced with this steel cord tire. We've heard of but not experienced mileages of up to 50,000. A bit harder ride than some other types and perhaps a little road hum on certain types of road surfaces, a hum we understand diminishes at around 5000 miles.

Konner's Rolls-Royce, Columbus



A. CAMBER ANGLE B. ANGLE OF PIVOT PIN INCLINATION C. LEVEL LINE OF CHASSIS

The standing height is the vertical height of point "2" above point "1". The car must be unladen and tires properly inflated when checking this measurement. Tolerances for Standard Car are 0.800" to 1.400". For the Colonial Car, 1.300" to 1.900". Also see page H2 in the Silver Cloud workshop manual for more explicit details.

sag also alters the front suspension geometry thus affecting the general handling of the car. Too, a nose-down attitude mars appearance obviously.

Every one of these cars is a potential collector's piece. Most owners of good examples know that resale values have been trending upward for some time. To encourage this circumstance it is logical to maintain a high standard of condition from both a mechanical and appearance standpoint. Restoring standing height with new front coil springs contributes measurably to that program.

Bruce Hill, Washington

ALIGNMENT SPECS – CLOUDS AND SHADOWS

SI CARS

Camber – Vertical 0° to ½° positive
Castor – 1° negative (manual steering)
0° (power-assisted steering)
Toe-in – 1/16 in. to 5/32 in.

SII CARS

Camber – Vertical 0° to ½° positive
Castor – 0°
Toe-in – 1/16 in. to 1/8 in.

SIII CARS

Camber – Vertical 0° to ½° positive
Castor – 1° (SCX-1 onwards)
Toe-in – 1/16 in. to 1/8 in.

SILVER SHADOW

Before SRH 3349 – CRH 3449

Camber 1° negative plus-or-minus ¼°
Castor – 1½° positive plus-or-minus ¼°
Toe-in – .062 in. to .141 in.

After SRH 3349 – CRH 3449

Camber – 1° negative plus-or-minus ¼°
Castor – 3° positive plus-or-minus ¼°
Toe-in – .062 in. to .141 in.

Hermann Albers, Ind.

A SUGGESTED CHASSIS PAINT

duPont has recently come out with a new poly enamel which they sell under the trade name of IMRON. This paint seems to be ideal for painting chassis and running gear. It has exceptionally high chip-resistance, and needs only to be washed once in a while to be kept at maximum brilliance.

It is so new that it has been released only to selected shops. Your duPont paint dealer should have a way to get it by now.

CAUTION: When mixed with the activator, the paint has a pot life of only 3 hours, so plan your work accordingly. A complete cleaning of spray materials in lacquer retarder is a must or you'll need to blast to get the dry paint out of your spray gun. Use more than adequate ventilation.

Body Beautiful

SERVICE NOTES – CLOUDS AND SHADOWS

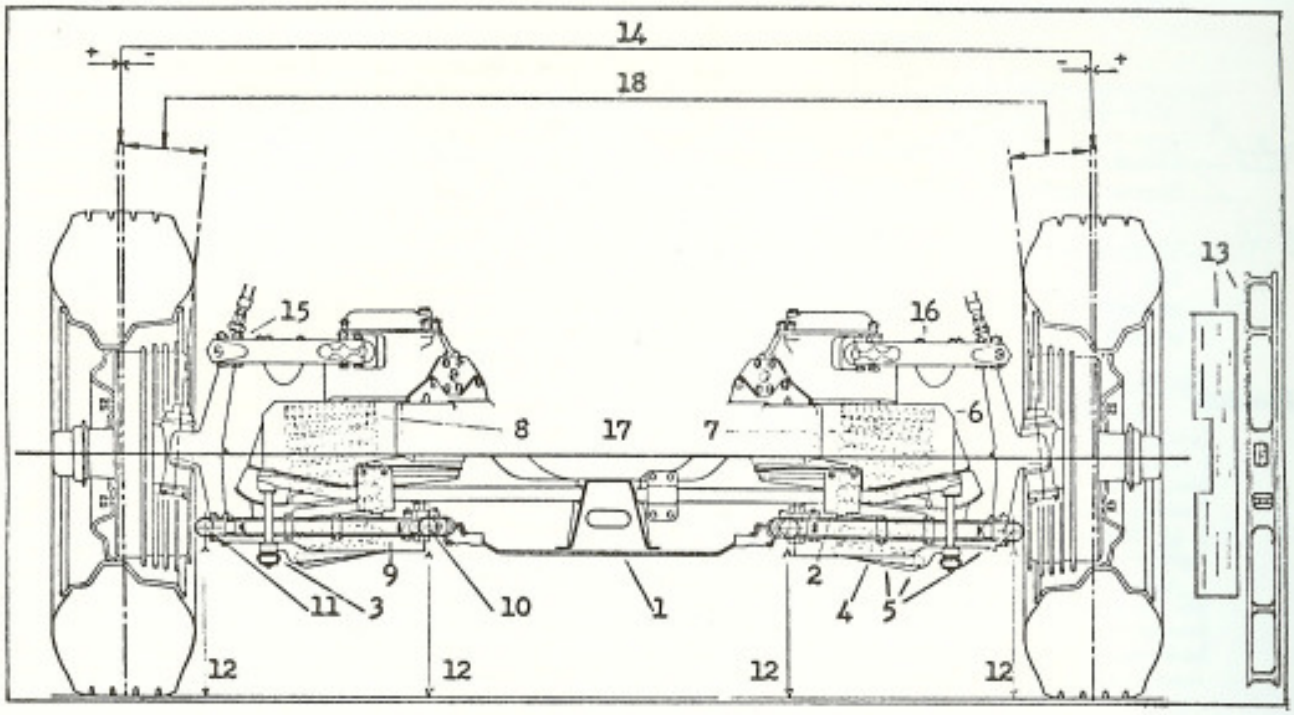
Recommended "life" for thermostats is 24 months, using 88° thermostat year-round. Do not mix stop-leak antifreeze with other types. If a change to this type is felt desirable, drain and flush the cooling system before filling.

BRAKE FLUID – CLOUDS AND SHADOWS

For brake fluid Konner's Rolls-Royce of Columbus, Ohio urges that only *Girling Fluid* be obtained and used. "Amber" is recommended for Silver Shadow models and "Amber" or "Crimson" for Cloud models. Generally-available U.S.-made fluids can damage seals and can produce expensive service problems.

OVERHEATING – CLOUDS AND SHADOWS

May we again emphasize that should your coolant boil out, STOP your car; shut down your engine! That "short" mile to the next gas station could result in an extensive engine repair. And, again, some R-R temperature gauges "indicate" quite hot. This generally does not indicate a problem. If you are *using* coolant, then is the time to diagnose for a problem. If your car is not boiling, is not consuming coolant, even though the gauge may read *hot*, you likely have a normal running situation.



FRONT SUSPENSION SYSTEM - S SERIES CARS

1 Front cross-member
2 Stabilizer bar chassis mount
3 Stabilizer bar link
4 Lower spring seat
5 Lower spring seat retaining bolts
6 Spring housing
7 Eye for compressor hook
8 Upper spring seat and shims
9 Lower A frame
(Lower triangle lever)
10 Inner fulcrum bearing
11 Outer fulcrum bearing
12 Official standing height
13 Wood block and carpenter's level
14 Camber angle
15 Upper fulcrum bushing
16 Upper A frame
(Upper triangle lever)
17 Level line of chassis
18 Angle of pivot pin inclination

STANDING HEIGHT RESTORATION ON SILVER CLOUD AND S-SERIES BENTLEY

By Bruce Hill, Wash.

Installation of new front coil springs to restore stand-height on S-series cars is a feasible project for an experienced, enthusiast owner. There are a few hazards to avoid, and a special tool is necessary to compress the springs. Formulation of a plan to replace all worn-out front suspension parts at the same time springs are changed is advisable. New R-R springs are expensive; custom made replacement springs may be an economical alternative.

While replacement of front springs is in the contemplation stage, examine all parts of the front suspension and steering system for evidence of excessive wear. Particularly note the condition of inner, outer, and upper fulcrum bushings. Many suspension parts cannot be replaced unless the springs are removed; there is no point to doing the job twice.

The R-R shop manual recommends a special tool, RH-195 I.F.S. Coil Spring Compressor, to compress the springs. This tool seems to be a scarce item.

If the RH-195 cannot be bought or borrowed, an improvisation will be necessary. Fortunately there are other tools available for compressing suspension springs. At least one is an EY-6800 internal type compressor. This tool is handled by Cornwell Tool Co., 924 E. Pike, Seattle, Wa. 98122; it is quite rugged and intended for use with an impact wrench. Comparative cost of the two tools is as follows:

RH-195	$65.00 (old quotation)
EY-6800	27.50 (November 1972)

As a first step toward spring removal, measure the stand-height by the sill molding method described in my previous article. These measurements can be used as a standard of comparison when the job is finished.

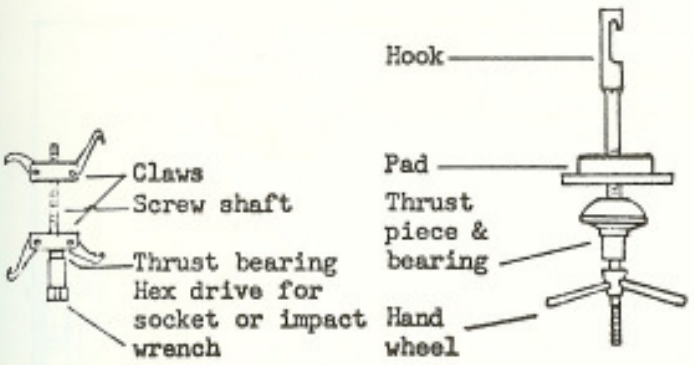
Next, lift the front of the car with a regular 1-1/2 ton garage jack. Place the jack under the center of the front cross-member for this operation. The jack saddle should have a diameter of about 7" to properly distribute the load. Be careful that the jack does not foul the power steering cylinder.

Once the car is elevated, place heavy-duty jack stands under the front stabilizer bar chassis mounts. The stands must be at least 22" tall and resting on level pavement.

After removing the strain from the jack, gently try to shake the car as a test for solid support. Disconnect and remove the stabilizer bar links to the lower spring seats.

If an RH-195 compressor is available for spring removal, the hook must engage the eye attached to the frame at the top of the spring housing. Be absolutely sure the engagement is correct and won't slip.

From the drawing, note that the spring compressor pad has a different shape on either side. Select the side that fits the lower seat best, and run up the hand wheel until the compressor takes the strain from the spring. The A frame



EY-6800 SPRING COMPRESSORS RH-195

will lift a bit at this point.

Loosen the retaining bolts on the lower seat with a 1/2" drive socket and 17" el bar. There are eight bolts on SIs and four on SIIs and SIIIs. These bolts will be very tight; a foot may be required to move the wrench. Check the car again for solid support before performing this gymnastic.

After the retaining bolts have been removed, run down the compressor hand wheel to within an inch or so of the bottom. Lift the compressor, lower seat, and spring slightly to disengage the frame eye. Withdraw the spring and tool from the spring housing. All of the shims must be removed, too. If they do not come out easily, let them stand for a few hours or overnight. They tend to stick to the rubber composition spring pad at the top of the spring housing.

If an EY-6800 compressor is used, it should grip the spring in the manner described by the instructions furnished with the tool. Compress the spring until it is loose on the spring seat. Remove the spring seat and withdraw the spring. When the spring is out of the car, carefully note the position of the compressor claws and the length of the compressed spring; these conditions must be duplicated when the new spring is installed. As a safety measure, relax the compressor as soon as possible.

While the springs seats are off the car, examine them for evidence of fatigue cracking. An SI owner here in Seattle has reported his experience with these parts giving way under the springs.

If new R-R springs are being installed, examine the attached tags for poundage ratings. These ratings must be equalized in the following manner: Divide the difference in poundage ratings between the two springs by 14. The resultant indicates the number of shims required to equalize the weaker spring i.e., each .050" shim increases the poundage rating by 14 lbs.

When the springs are installed the stronger spring will use two shims (the minimum), and the weaker spring will use two shims plus the equalizing pack for the initial trial.

To install the springs, place the lower spring seat, spring, shims, and upper spring pad over the RH-195 compressor and lift the entire assembly into the spring housing. Engage compressor hook in frame eye as before and check for solid connection. Run up compressor hand wheel a bit to steady parts; be sure shims and upper spring pad are seating properly.

Place two 12" x 1/2" diameter alignment rods through adjacent fore and aft retaining bolt holes on SI cars. On SII and SIII cars use the two outer spring seat retaining bolt holes (the inner ones are threaded). Stretch a large rubber band between the alignment rods to hold them in place.

Run up the hand wheel on the compressor until the lower spring seat settles against the A frame. My experience suggests that engagement will occur at the outer end of the A frame first. If further manipulation of the hand wheel does not effect a suitable contact for the inner retaining bolts, use a large "C" clamp to grip the A frame and spring seat at one of the retaining bolt locations. Adjust the "C" clamp, alignment rods, and compressor hand wheel until a good contact is effected. Be careful that the "C" clamp does not slip off unexpectedly.

When alignment is correct, insert the retaining bolts and tighten moderately. Remove the "C" clamp and alignment rods. Insert and moderately tighten all other retaining bolts. After all bolts are in place they may be fully tightened. The R-R shop manual recommends 65 lbs. ft. torque on 3/4" A.F. bolts. Finally, remove the spring compressor.

If an EY-6800 compressor is used, the procedure is similar except that the spring is compressed before being placed in the spring housing. I believe the lower spring seat could be bolted on directly without the alignment difficulty discussed under RH-195 procedure. The compressor would be relaxed and removed after the seat was secure.

Following installation of both springs, connect the stabilizer links and lower the car to the ground.

After the car is on the ground, gently rock it from side to side to seat the springs. It might be advisable to drive the car a few miles before checking the standing height to insure a thorough shakedown of all parts.

If the standing height does not check out properly, determine alterations necessary to effect an acceptable trim condition. Remember, one .050" shim raises the car .100".

For desired results, all or part of the job may have to be done again. I had the springs on my car in and out three times before I was satisfied.

Incidentally, Hermann Albers recommends installing eight shims over each new spring. Although my experience showed this method raised the car a little too high, it is a practical technique that obviously saves time. I must mention, too, that Hermann is the author of the sill molding method of standing height measurement. This is another time-saving professional wrinkle.

When I had finished installing the springs on LSCX 729 I had used five shims over the weak spring and two over the strong one.

As an alternative to the sill molding measurement or as a final flourish, there may be some interest in taking the front standing height measurements according to the official R-R method. To do this, park the unloaded car on a level surface with the tires properly inflated and only five gallons in the tank.

Lift the front bumper a bit by hand and gently release it. Crawl under the front of the car and measure the distance to the ground from the center of the inner and outer fulcrum bearing caps for each side of the car. Record all clearances.

Next, depress the bumper by hand and gently release it. Take the measurements again and record them with those taken previously.

Average the clearances for each location and subtract the outer average measurement from the inner average measurement for each side of the car. The resulting values will be the average amount by which the inner fulcrum center stands above the outer fulcrum center.

The R-R shop manual indicates the following amounts for standing height obtained by this method:

	SI	SII & SIII
Standard car	.600" to 1.200"	.800" to 1.400"
Colonial car	1.100" to 1.700"	1.300" to 1.900"

Immediately after changing the springs on my car the "official" standing height was 2 3/16" on both sides. After driving the car 500 miles, however, standing height settled down to 1 5/8" on both sides. The sill molding method indicated a level condition within acceptable tolerances at all times. Subsidence in new springs is due to normal stress relieving.

Due to the natural function of the suspension geometry, spring sag increases positive camber. When standing height is restored, the camber angle returns to normal. By comparison, an impression of negative camber is created.

To insure that the camber angle is nearly correct a simple

test can be made by placing a carpenter's level vertically across the wheel rim. A wood block cut to the shape shown in the diagram is helpful when making this test.

The level should indicate a vertical or very slightly positive condition since standard camber is 0 to 1/2 degree positive. If the camber has been altered to compensate for sagged springs, a new camber adjustment will be required.

To make a temporary adjustment until the car can be set up professionally, raise the front and remove the wheels. On SI cars loosen the four bolts anchoring the upper fulcrum bushing blocks to the upper A frame. Slide the blocks outward for more positive camber or inward for negative.

On SII and SIII cars, bend back the locking washer on the upper fulcrum bushing pinch bolt and loosen the bolt. Turn the bushing nut clockwise slightly to gain positive camber and counter-clockwise to gain negative camber.

In either case only a small adjustment should be necessary. The shop manual describes a number of esoteric problems that can be associated with the need for a large camber adjustment. These problems will not be examined here.

After the adjustment has been completed, the camber angle should be rechecked with the car on the ground. Before checking the camber, always depress the bumper slightly and gently release.

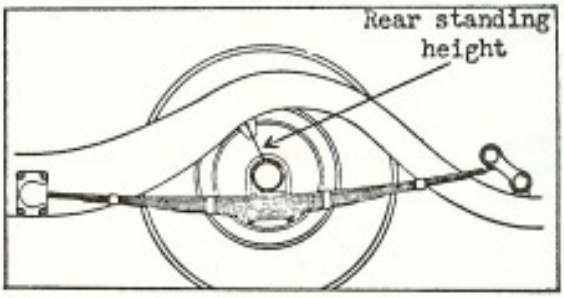
Although front standing height is a chronic problem with S-series cars, rear standing height may become a difficulty on cars with advanced mileages. To complete the discussion of standing height as such, the following values are quoted from the R-R shop manual for the rear standing height:

	SI	
	Height Tolerance	Height Tolerance
Standard car	6.00" +.600"	6.000" +.600"
Colonial car	6.500" −.350"	6.900" −.300"

These measurements are taken from the center of the rear axle rebound pad mount to the nearest point on the axle housing. The difference between these measurements for each side of the car should not exceed 3/8". If the car has been elevated with rear wheels hanging, the measurements should be postponed until the car has been driven at least 30 miles.

If the measurements indicate need for re-arching the rear springs, pertinent data for spring camber, etc., is recorded on small brass tags fastened to the top of each gaiter about 4" behind the axle mounting.

There are several alternate replacement springs supplied by R-R for S-series cars. The retail price ranges from $89.76 to $141.79 *each* as of March 26, 1973.



REAR SUSPENSION SYSTEM

Although I installed genuine R-R springs in my SCIII, I became curious afterward regarding the cost of a custom made set. My investigation revealed a meaningful economy providing a batch of several identical sets is made at one time.

A *pair* of very high quality, fully guaranteed, custom springs would sell for approximately $115.00.

If any owners are interested in pursuing this opportunity, I can furnish additional details to any who care to write to me at 8249 16th Avenue North East, Seattle, Wa. 98115.

S-Type Automatic Transmissions

The transmission used in the Silver Cloud/Bently S type cars is the old GM dual-range design built by Rolls-Royce. This is a very durable unit despite being a little on the rough side at shift points when compared to later designs. To extend service life as far as possible use the following procedure:

1. Check the fluid level every 3,000 miles. The dipstick is located under a large round rubber plug on the right hand floorboard (refer to the owner's manual) and should be checked in "neutral" with engine warm and at idle speed.
2. Drain the transmission pan and torque converter fluid every 12,000 miles. Remove the pan, clean the sump screen, check the front and rear band adjustments, fit a new sump gasket (part no. UG809), remove the torus inspection cover, remove the drain plug (it may be necessary to rotate the crankshaft in order to have the plug downwards to drain), replace the sump and torus drain plugs and refill the transmission with new fluid. The correct type is the GM approved *Dexron*, generally available from oil companies and parts suppliers. *Caution*: Band adjustment should be attempted only by an experienced person with the proper tools.
3. Never operate the car if a high pitched vibration can be felt through the accelerator at 10-40 mph. This is a strong indication that the fluid level is low (usually 2 quarts) and must be topped up at once. Failure to do this will result in total transmission failure in a few short miles.

S. Roach

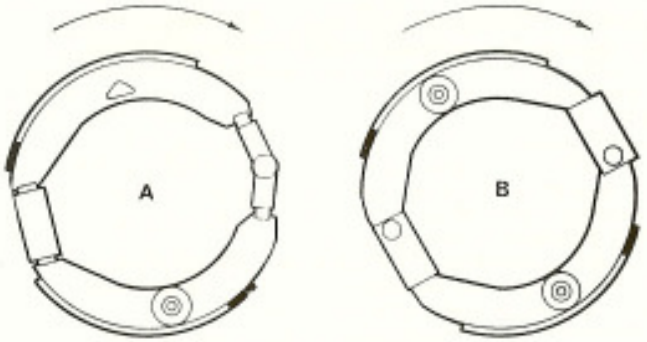


FIG. 1 SHORTENED BRAKE LININGS
A. Rear B. Front

SHORTENED BRAKE LININGS— S3 CARS

APPLICABLE TO: All cars built prior to the following chassis numbers.

Silver Cloud III	SEV.471
Silver Cloud III L.W.B.	CCL.79
Bentley S3	B.92.EC
Bentley S3 L.W.B.	BAL.18
Bentley Continental S3	BC.90.LXC
Phantom V	5.LVB.41

DESCRIPTION

Since October 1963 all new S3 series cars have been fitted with shortened brake linings in an effort to alleviate brake squeal problems which arise in service. The brake linings have been shortened by approximately 0.650 in. on all the leading edges of both front and rear brake assemblies, with the exception of the four shoe Continentals where only the rear assemblies have shortened liners. This shortening has the effect of increasing the unit loading on the liner and consequently reduces the tendency to squeal.

This Service Bulletin is issued to advise Retailers and Service Personnel that since supplies of linings UG.2071 and UG.1523 have now run out, all brake linings and brake shoe/lining assemblies supplied in the future by the Spares Central Stores will be of the shortened type. The part numbers of the various assemblies are listed in Spares Information Sheet 3.G.4.

It should be noted that complete brake shoe/lining assemblies are interchangeable, but if shortened linings are to be fitted to existing shoes, then two new rivet holes need to be drilled in the brake shoe to allow the shortened lining to fit. This can be done in the following manner.

PROCEDURE

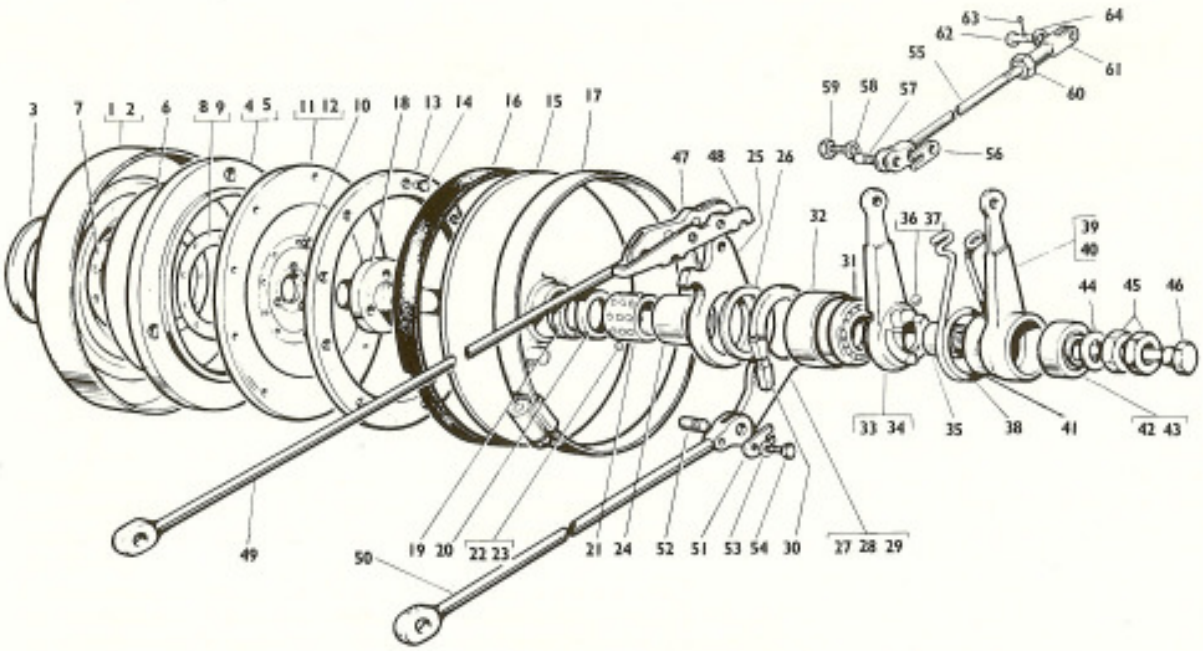
Identify the shortened end of the lining. This can be done by comparing the angular distance between the pairs of rivet holes. The end of the lining which has the two adjacent pairs of rivet holes closest together is the shortened end. Place the lining on the brake shoe in the correct position. As described earlier, the linings have been shortened at the leading edge, this being seen more clearly in Figure 1. The shaded parts of the lining denoting the portions which have been cut off.

Mark the position of the two new holes.

Remove the lining and drill two holes in the brake shoe to 0.187 in. dia.

Rivet the brake lining to the shoe in the normal manner.

from Herman Albers, Ind.



An exploded view of the servo. Lined disc is shown as number 11 and 12. Be certain ball bearings 36/37 are clean and lubricated.

REPAIRS TO S-SERIES BRAKES

While the very early S-series cars only had one master cylinder, the S-series was Rolls-Royce's first attempt at a dual hydraulic braking system. Prior to the S-series, a combination of mechanical rear and hydraulic front systems was used. The accent has always been on having a car which would stop well and under all but the most impossible of conditions (all four wheels off the ground).

The S-series is not without its troubles, but fortunately, they are of a minor nature, requiring little other than patience and small fingers with lots of extra skin on them.

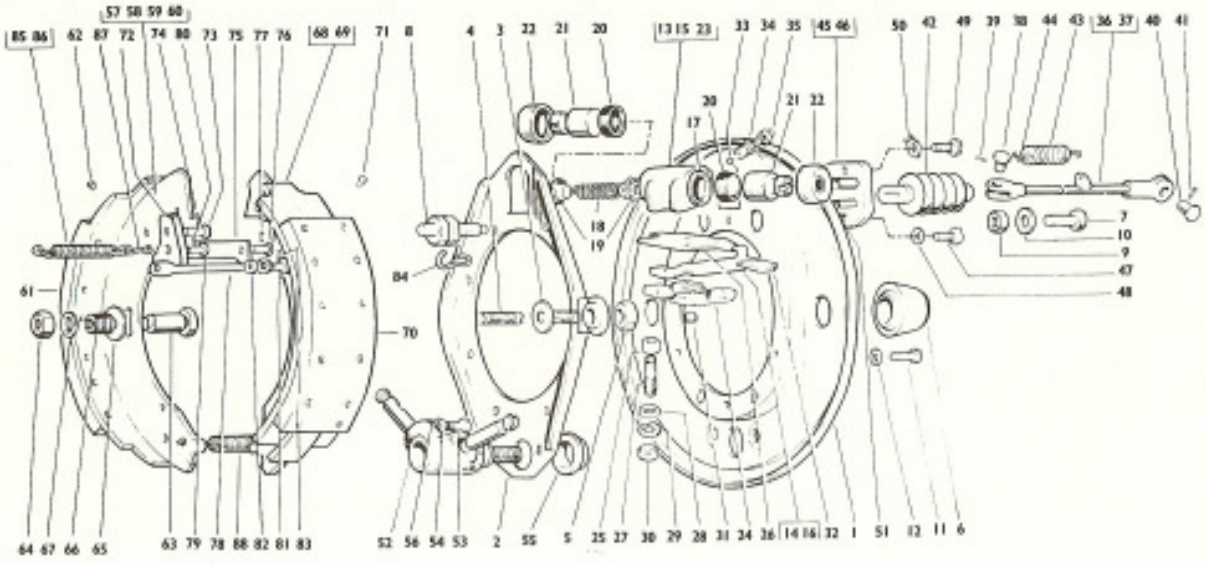
By far the worst job is to remove the dual master cylinders on the later cars. By this time, everything seems to be a mass of rust. Once removed, however, they can be rebuilt in the normal way. The same ease of repair also applies to the slave cylinders. A good brake hone can do wonders to getting the leaks to stop in the system.

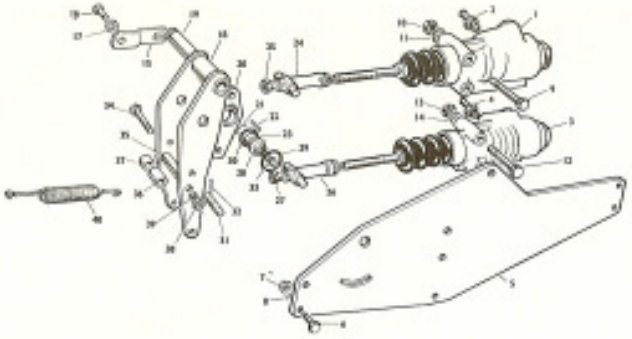
One of the most common features on the Rolls-Royce braking systems is the servo. While its operation is quite basic, it is always considered to be "out of adjustment" and one hears comments about "servo-lag," "slipping servo," etc. All the servo on the S-series needs is to be (a) clean, and (b) properly adjusted. Once the above two criteria are met, it can almost be forgotten, for it is not a source of trouble.

To clean the servo, remove it from the car. This is no serious undertaking and should be accomplished in about an hour (all figures for time are taking into consideration the Rolls-Royce Rule of Three . . . simply multiply by three the amount of time you think a project should take). Once removed, take it apart, and break the glaze on the surface of the linings. I like a piece of 100 grit paper glued to a sheet of plate glass to get everything in one plane to accomplish this "glaze-busting." Replace the seal in the transmission, check the ball bearings, and reassemble, using a new seal for the tin covers. Reinstall the unit.

To set the servo, get the car on jack stands, start the

Parts 24, 26, 14 and 16 are the offenders when you have a hard brake pedal. Lubricate completely and wipe off the excess.





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.

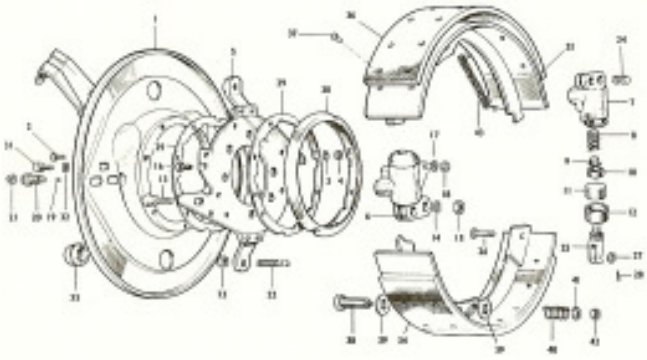
At this point you may decide that your brake troubles are over, having cured the "problem" with the servo. After driving the car you may find that your brakes are hard, and there seems to be no servo-action. Drive back into your garage and do not curse this article on brakes as being worthless and time-wasting.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

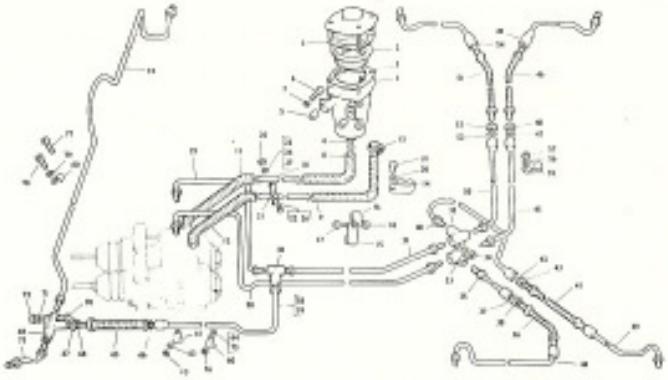
After you have burred over the screws which hold the brake drum to the wheel and had to take them out with a cape chisel, carefully examine the mechanical side of the rear braking system. Each rear wheel has a foot-pedal operated mechanical brake. The design is excellent, but rust has a way of getting 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, 56, 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.

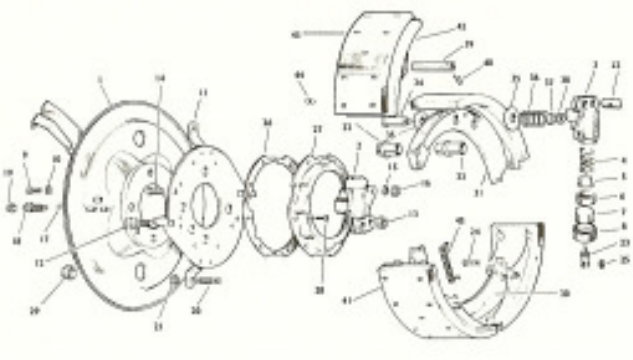
If you reline the brakes, give serious thought to buying new shoes. The expense is small, and the S-series shoes have been known to crack in the holes found in the shoes. Also put in new return springs. Again, the cost is small, and the results are quite worthwhile. If you are a perfectionist, give consideration 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.

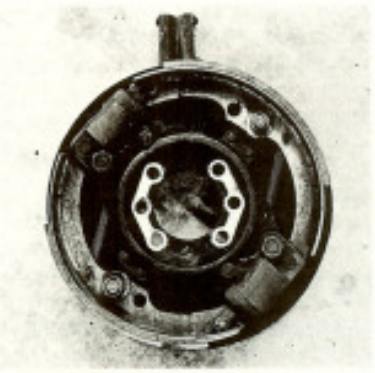


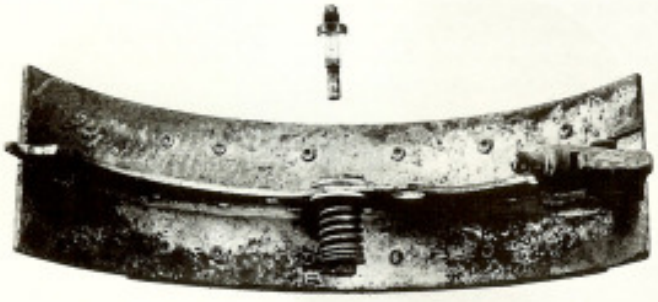
Figure 1: *Complete front brake assembly, shoes and wheel cylinders, immediately after removal from car. When dismantling the front brakes, first undo the cylinder anchor bolts; then unbolt the whole carrier plate from the stub axle, starting inboard, so that the remaining components can be removed on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



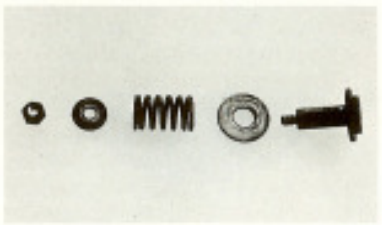


Figure 2: *Front brake shoe and steady post which slips into shake back stop. Adjustment of post squares up shoes to drum.*
Figure 3: *Shake back stop—exploded view. The shake back stop functions chiefly to hold brake shoes just at the interface when the brake pedal is released. It introduces friction 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.

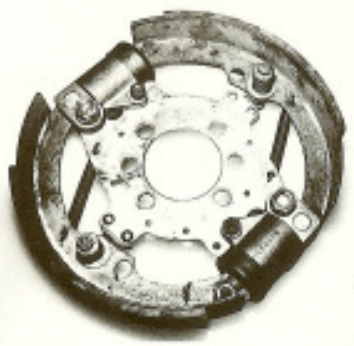
To ensure equal application of the shoes, you must centralise the brake shoes and cylinders within the drum. The cylinder has a slotted hole self-seating arrangement to allow the cylinders and brakes, as an entire unit, to shift to a centralised position. The procedure is as follows: nip up the cylinder 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.

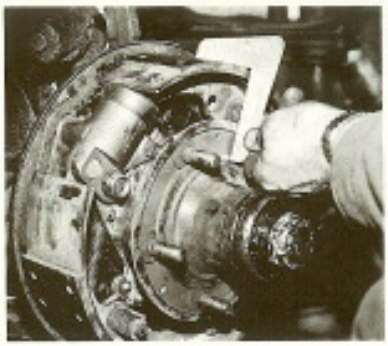
If you have access to a window drum (figure 10), making these adjustments is easier, quicker, and more accurate. The window drum is a necessity when setting up the 4-shoe brakes on the Continentals. With the window drum, you apply hydraulic pressure until the shoes bind hard, then complete the tightening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





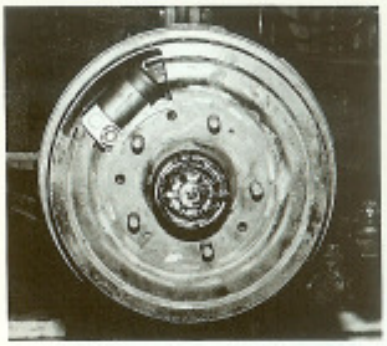


Figure 8: *Front brake assembly after overhaul, but prior to refitting. Observe correct placement of bias springs—behind carrier plate.* ***Figure 9:*** *Brake shoes must be aligned square to the drum for maximum braking. Adjust the steady post: first screw it out part way, then adjust in with your square (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

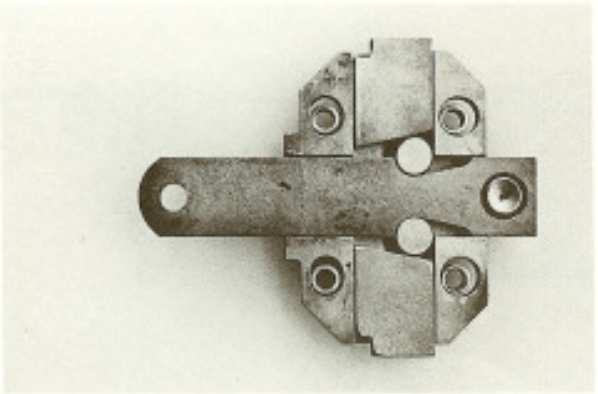
Because Rolls-Royce use a servo assist mechanism, the master cylinders are located amidships on the chassis frame in line with the servo, rather than being connected directly to the brake pedal as other car makers do. Moreover, because there are two master cylinders of different sizes and function, they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



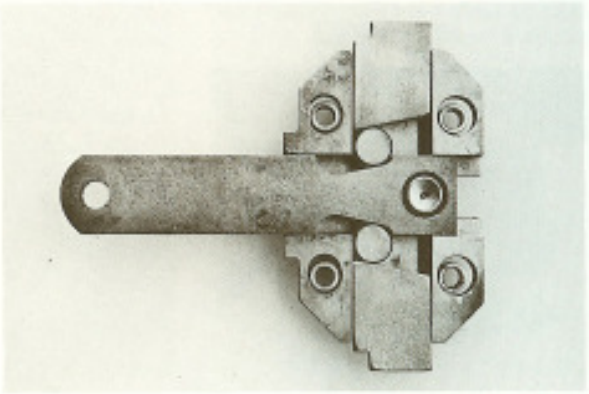
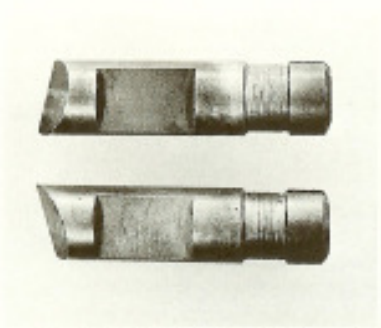


Figure 11: *Rear brake mechanical expander—brakes off. Note distance pieces with loose fit in 4 holes to allow tappet guide to centralize itself when fully reassembled.* ***Figure 12:*** *Rear brake mechanical expander—brakes on. Note tappets pushed out to apply brakes. When you overhaul the mechanical 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.*



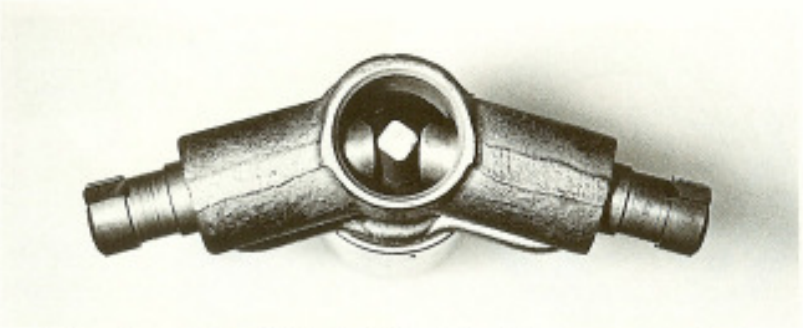


Figure 13: *Rear brake adjuster unit plungers. They really are right and left handed. The notches fit locating pegs machined on the two bolts holding the adjuster to the backplate.* ***Figure 14:*** *Rear brake adjuster unit. If handed plungers are interchanged, the shoes will not contract enough to 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.

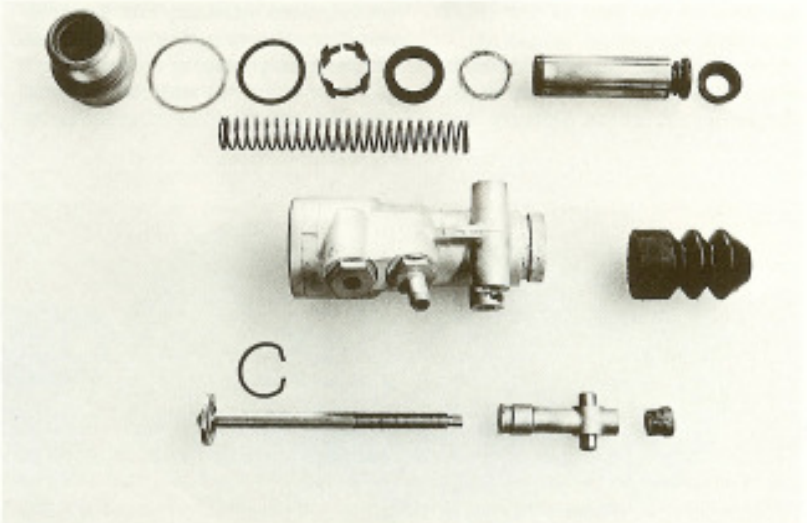
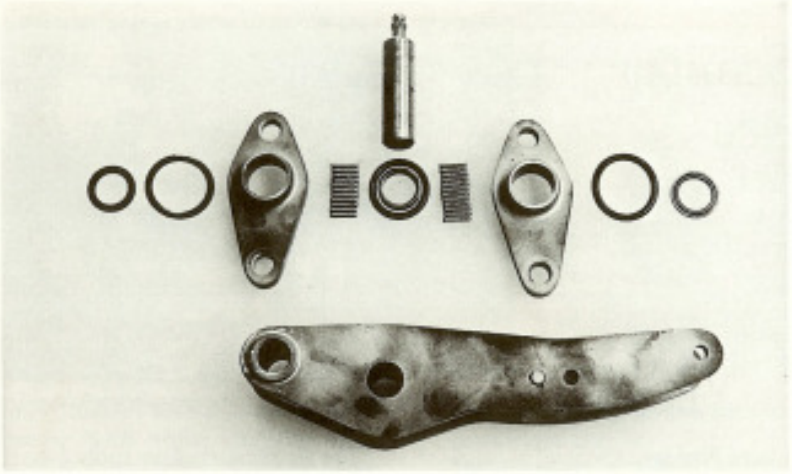


Figure 15: *Master cylinder immediately on removal from car. Grit and muck indicate seepage and leakage—clearly time for overhaul. The muck is the result of a mixture of brake fluid and water attacking die-cast aluminum. Despite all the corrosion, these brakes worked, though they did not retract. You 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.*



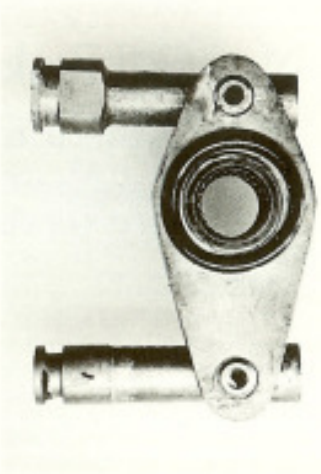
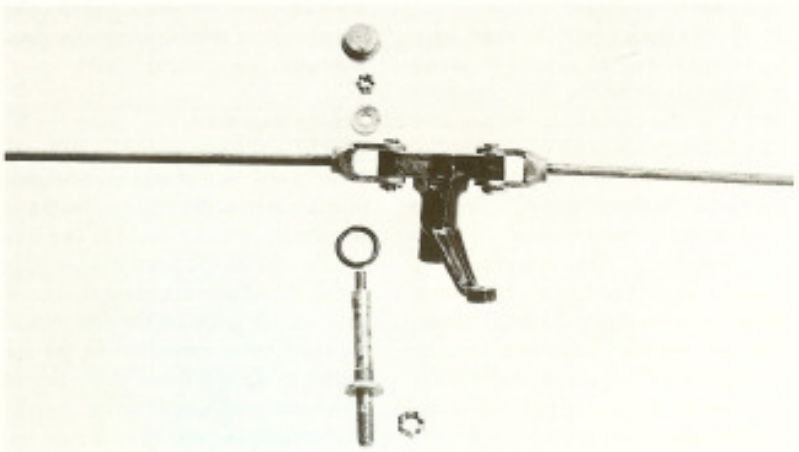


Figure 17: *Master cylinder balance lever, exploded view, with operating lever and one of the two sets of needle bearings. The balance lever balances the effects of the two master cylinders. It pivots in a needle roller bearing which is well protected and seldom causes trouble. At overhaul, replace the 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



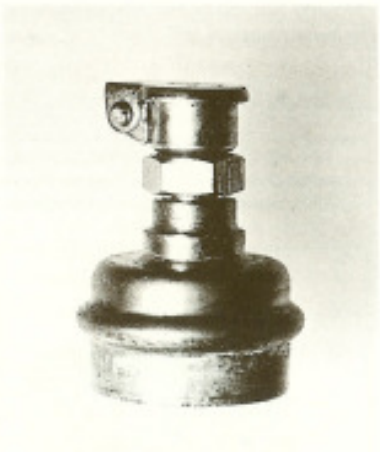


Figure 19: *Rear brake equalizer and linkage. The pivot pin and bushes here were rusty, an indicator that the whole system, hydraulic and mechanical, requires attention. It is not enough to clean up this easily accessible unit and then stop.* ***Figure 20:*** *Author's modification: since there is no 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

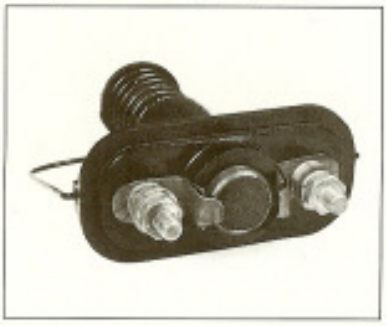
by Guy Williams

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

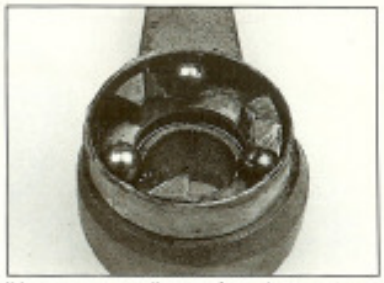
The sequence works as follows:- brake pedal to linkage, to one servo primary arm, to the other primary arm, the two arms move together as a unit, which pulls on the handbrake linkage, which connects to the rod to the rear, to the equalizer pivot, to the side rods, to the mechanical expanders in the rear 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.)

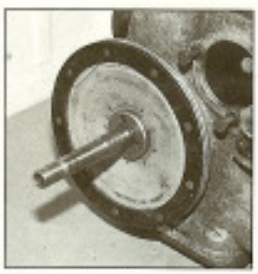
If you are still reading this far, the accompanying chart should now be making sense to you. Note that the numbers represent the decreasing order of the percentage of brake pressure supplied by each system. The sequence of action is No. 3 then No. 1 and No. 2 simultaneously.

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.

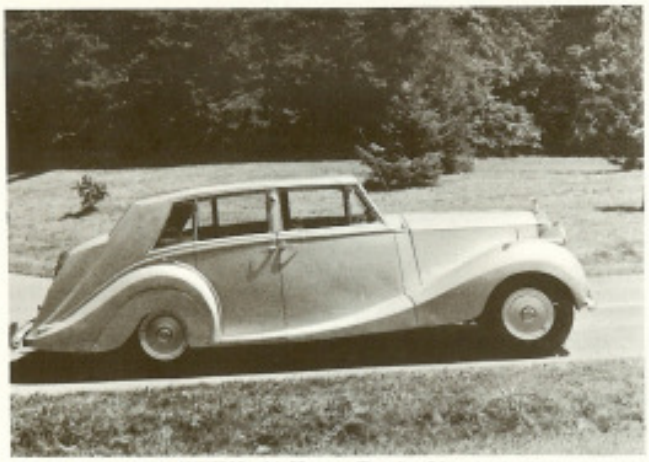
In examining brake linkages for play, don't forget to check the pivot at the base of the pedal arm (not at pedal itself) for undue wear.

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.

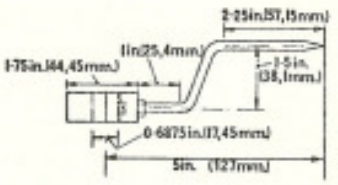


Silver Wraith WVH32 with Hooper Touring Limo body. Happy owner is R. W. Richards, W.Va.

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.

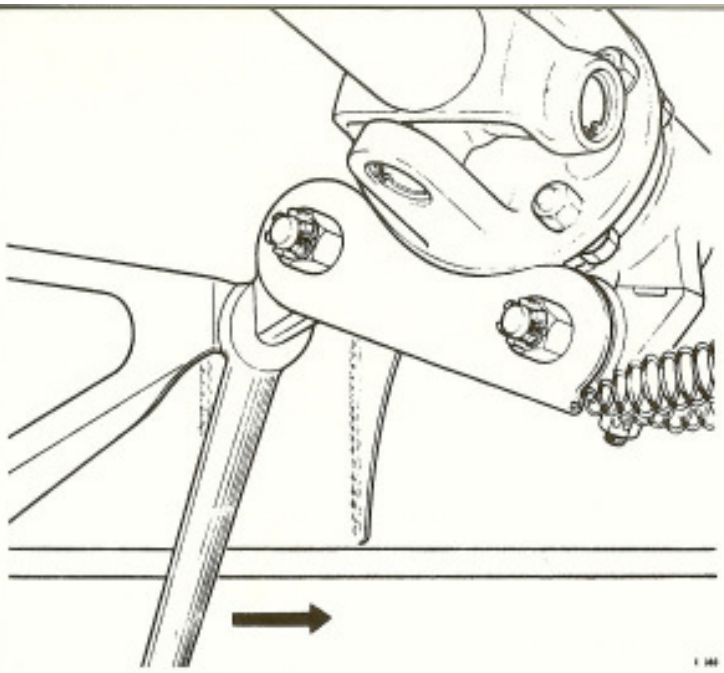
On manual boxes more is involved. The bronze gear is 'hourglass' in shape with the "waist" of the gear snugly fitted into the driving gear on the third motion shaft. It is therefore impossible to draw the bronze gear over the third motion shaft with the latter in position. If it is not desired to remove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

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