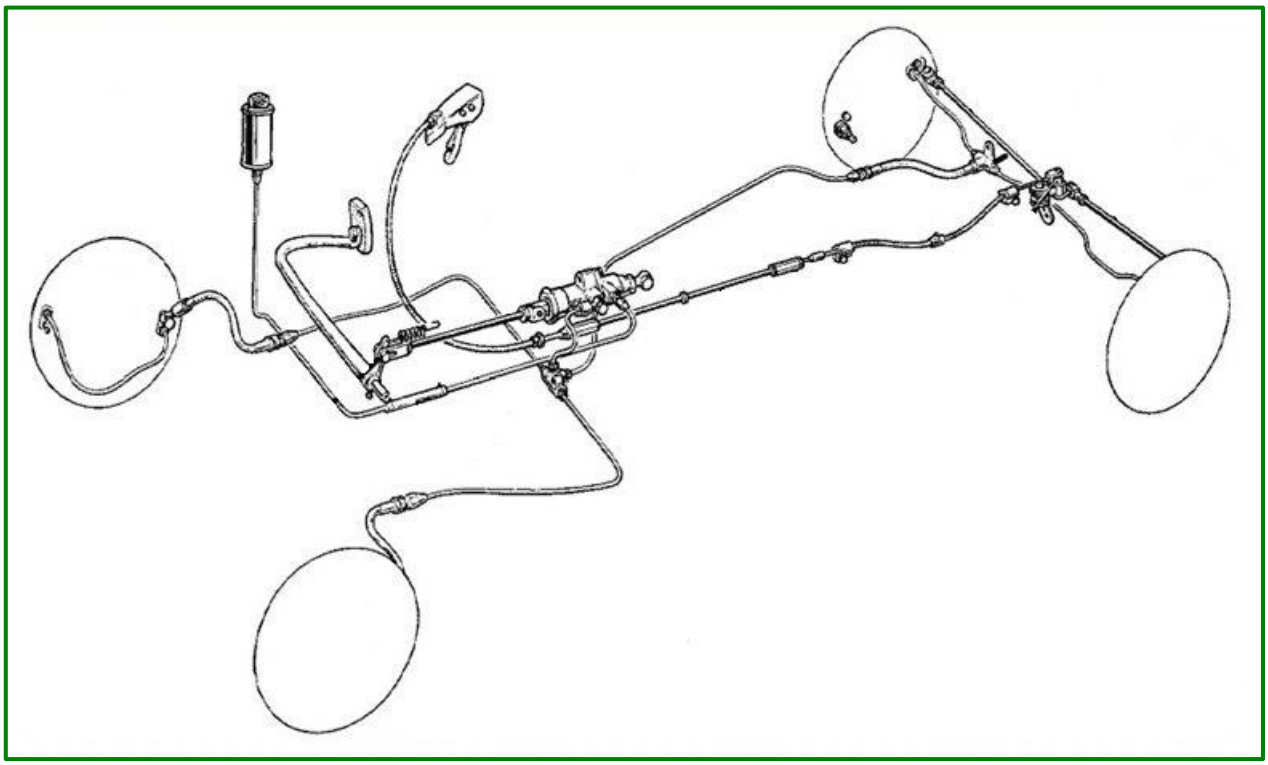
TECHNICAL NOTES SERIES

JOWETT JAVELIN – PA, PB, PC, PD & PE
JOWETT JUPITER – SA & SC



Jowett full-hydraulic brake system.

These notes have been assembled in a format that, as much as possible, they assist those who have never attempted such Jowett repair tasks as described in this document. They have been written to cater for younger Jowett Car Club members who may have limited mechanical knowledge.

Due to the fact that specialist brake system repairers, who understand older hydraulically operated drum brake systems, are fast becoming a rarity in the motor trade, a comprehensive Technical Note describing how the system operates, should be maintained and repaired when such requirements are needed is vital.

If a reader of these notes does not feel confident about the procedure described here, then the brake component and associated parts should be taken to a reputable repair professional – if available.

PART XXXIII – GIRLING BRAKES:
HYDRO-MECHANICAL BRAKING SYSTEM
FULL-HYDRAULIC BRAKING SYSTEM

The Jowett Car Club of Australia Incorporated is not responsible for any inaccuracies or changes that may occur within this document. Every effort has been made to ensure accuracy. It is not a Jowett Car Club publication and, therefore, the Club has no control over its contents. These Technical Notes have been compiled by using the information that was available, which was deemed accurate at the time.

Compiled by Mike Allfrey – March, 2024.

With Assistance from Keith Clements (JCC UK) and Neil Moore (JCC NZ) – With Thanks.

NOTE: THESE NOTES ARE A COMPILATION FROM DIFFERENT DOCUMENTS, THEREFORE FIGURE NUMBERS MAY BE FOUND TO BE OUT OF SEQUENCE. THIS COMPILATION WAS CREATED OVER A LENGTHY PERIOD.

CONTENTS

WARNING!
ASBESTOS COULD BE PRESENT IN GASKETS, FIBRE WASHERS & BRAKES

NOTE: Refer to *Technical Notes – Part XXXII* for master cylinder overhaul information.

INTRODUCTORY COMMENT FOR TECHNICAL NOTES

These introductory notes should be read prior to reading Part XXXIII of the Technical Notes Series.

The Jowett Technical Notes Series have been an ongoing activity for several years. That means that some techniques and specifications may have been superseded in later notes on the same, or associated topics in the series. Also be aware that some topics and recommendations may be specific to certain Engine Serial Number ranges. It appears that, in Australia, the various State Main Agents did not carry out Service Bulletin information during Jowett active times. A set of known Service Bulletins is in Part III.

Some of the notes are restorations of what was written by members of the Jowett Car Club (UK), the Jowett Car Club (NZ) and by members of the JCCA.

Over the years of involvement with matters Jowett, and with the dawning of the personal computer age, a personal decision was made to help members of the Jowett Car Club of Australia Inc. with technical information. Included with the Technical Notes are ‘restored’ versions of the Javelin and Jupiter Maintenance Manuals and the associated Spare Parts Catalogues. Future generations will prefer to flick through images on their personal device screens, rather than leafing through pages in a tattered and oil stained book to access information.

The term 'restored' has been used because it soon became apparent that, as with our efforts in restoring Jowett vehicles, we desire excellent quality of workmanship in the reproduction of Jowett related documentation. Not for us the crude, and crooked, photocopies that have been issued over the years. These have, even though accurate at their time, become partly out of date.

Hence the decision to ‘restore’ the publications and documents that have come to hand.

It should be noted that the Javelin and Jupiter Spare Parts Catalogue is a combination of all the catalogues that were to hand (from 1948 to 1953).

The Maintenance Manuals were originally written on the assumption that they would be used by skilled motor mechanics who had attended service training courses conducted by Jowett Cars Limited and after works closure, were made available for owners who had reasonable mechanical knowledge of motor car maintenance and overhaul.

Included with the Technical Notes Series is a Lucas Overseas Correspondence Course, which can be of great assistance when trouble-shooting electrical problems related to your Jowett, or any other British vehicle of the same period.

Please be aware that this is an ongoing project . . . .

Mike Allfrey – January, 2024.

Introduction – Part XXXIII

All models of the Jowett Javelin and Jupiter have a braking system that is either part-hydraulic or full-hydraulic in their operation, commonly described as Girling Hydro-Mechanical and Girling Full-Hydraulic operating systems. Jowett Cars Limited never manufactured a complete hydraulic brake system, they bought in various assemblies and added some of their own parts such as brake rods, cables and rear axle handbrake compensator assemblies. It is understood that Jowett held the patent for the compensator mechanism at the rear axle.

The brake systems in Javelin and Jupiter motor cars are, very likely, one of the most neglected parts of the car. This is probably due to the fact that the Girling system is, generally, very reliable and to most owners, all the maintenance that is required may be a periodic re-lining of the brake shoes.

There are other components (parts) in the braking systems that do require a periodic maintenance schedule. Should such maintenance be neglected, then problems can arise at unexpected times. Neither the car, nor Girling can be blamed for breakdowns caused by neglect.

Within these *Technical Notes* are descriptions of how the various parts of the system work, how they can be properly maintained, how those parts can be repaired in the event of a breakdown and, importantly, what to look out for when replacing parts.

For some Jowett owners/drivers there are points that are directly opposite to their attitude to brake system maintenance. Viewing our cars at rallies and other Club events, it has been obvious that great

attention has been given to the cosmetic appearance of the car. Looking deeper, it is sometimes clear that certain chassis running gear components have been neglected.

The entire braking system in a motor car is a crucial safety requirement. In modern traffic conditions, here in Melbourne, Australia (and elsewhere), driving can be hazardous due to a Jowett driver leaving suitable braking distance from the car in front, only to have some impatient sort to overtake a 'slow old car', and swerve violently into the pre-determined braking space with zero thought about the older car now right behind him/her. For such occasions, and they are frequent, our braking systems need to be kept in top condition. Hopefully, these notes will be of assistance.

ASBESTOS WARNING!

This warning relates to older vehicles that may have a brake system that contains a fibre called asbestos that was used for brake lining material at the time when Jowett vehicles were produced. It continued to be used for decades after Jowett production ceased. In comparatively recent times, the asbestos component in the brake lining material has been banned for human health reasons. This means that there could be brake linings in vehicles and in storage that contain asbestos. If in doubt, wear a face mask and disposable hand gloves while handling parts that may contain asbestos. Immediately after removal, place such parts in Zip-lock plastic bags and label them as containing asbestos. It is suggested that two bags per item should be employed.

When taking brake shoes that contain asbestos to a specialist repairer, be sure to state that the parts contain asbestos so that appropriate action can be taken.

Clean all brake parts with brake cleaning fluid, wash thoroughly and blow dry with clean compressed air. Ideally, such parts as back plates and pipework should be prepared and re-painted.

How The Hydraulic System Works

Most of us were taught at school that a liquid cannot be compressed, a fairly sweeping statement. In school, our physics teacher demonstrated this with a bicycle pump, first pushing the plunger against air (the discharge end of the pump being plugged), and then doing the same after filling with water. That was proof the fact is true, however, pressure can be applied to a liquid and be used to move another part, using fluid through pipes and hoses, at a distant point. For example, a hydraulic pump mounted on a truck engine can operate, *via* operator controls, the hydraulic rams that raise the bed of a tipping body to a steep angle, even though the two major elements can be many metres apart.

Exactly the same principle operates a Jowett car's hydraulic braking system. The brake pedal, as it is pressed, pulls a plunger which immediately generates pressure within the hydraulic system. In the car the liquid (brake fluid) is forced through pipes and hoses to either the front wheels only (hydro-mechanical) or to all four wheels (full-hydraulic). At each hydraulically actuated brake, in simple form, there is a piston that when pressure is applied, pushes one end of a brake shoe against the brake drum to cause friction between the brake lining and the drum, thus slowing the forward motion of the car. There can also be two pistons at both ends of one cylinder that act on the pair of brake shoes.

A benefit of the hydraulic system is that, provided the brakes are maintained, ensures equal pressure at all four brake assemblies. The pumping capacity of the master cylinder is carefully calculated to energise each brake without lengthy brake pedal travel, but providing effective force at the wheel cylinder pistons. Because the liquid cannot be compressed, initial pedal travel moves the brake shoes against their return springs to take up the running clearance between the brake shoes and drums

Those are the basic hydraulic principles, however, there are parts with exotic names that make up the hydraulic system, such as recuperating seal, plunger, outer seal, seal spreader, seal spreader spring, plunger return spring, shim, sleeve, fluid reservoir, pressure chamber, inlet chamber, cup seal, piston, hose, pipe-work, union fitting, banjo fitting, three-way junction, four-way junction, wheel cylinder and master cylinder. A number of these can be a bit mystifying, but are *all* vital to the safe operation of a hydraulic brake system. All of them will be described individually in this *Technical Note*.

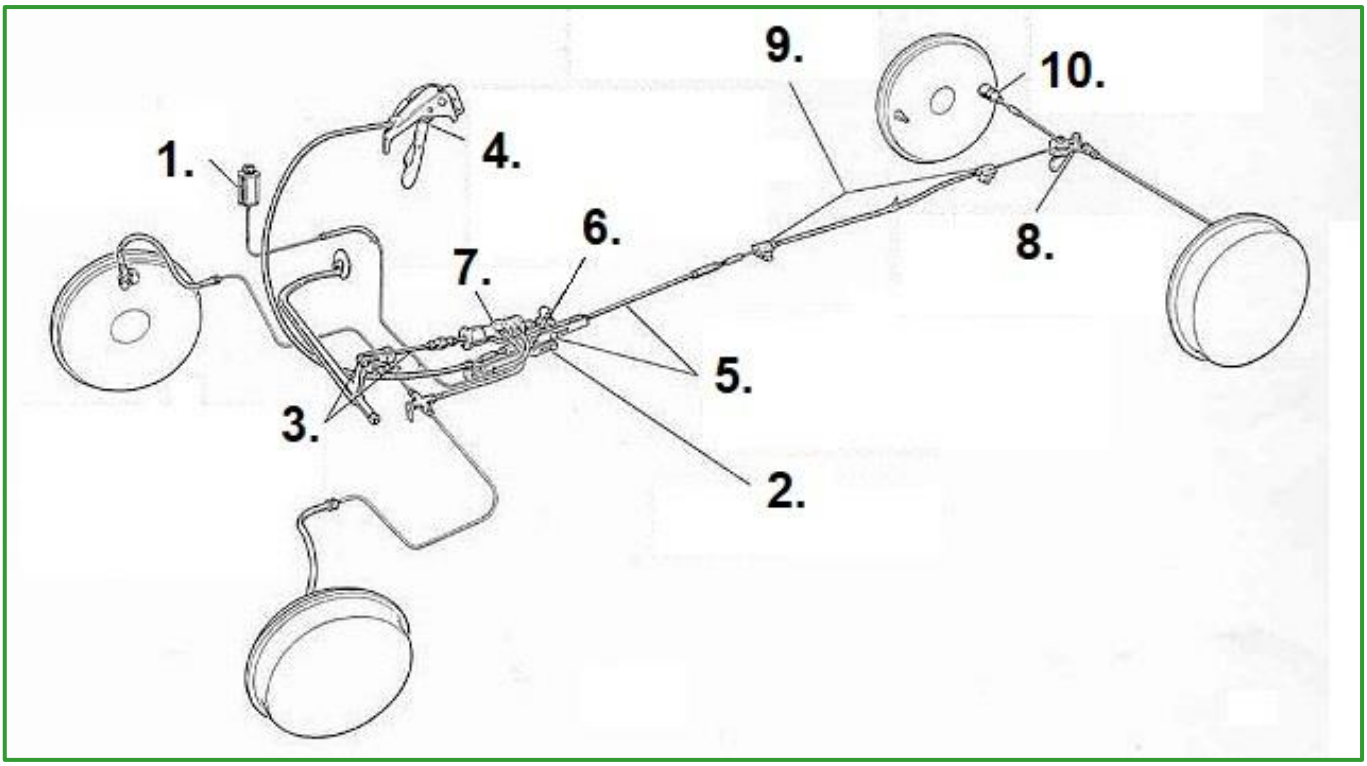
The handbrake mechanism will also be described – it is purely mechanical.

Description Of Brake System Components

The Hydro-Mechanical System

The early braking system is Hydro-mechanical. This is a system by which only the front brakes are hydraulically operated and rear brakes are mechanically operated by foot pedal application, whilst the rears have additional mechanism for handbrake actuation for parking purposes only.

The master cylinder is located in a direct line so that all pedal effort is effectively used and failure of either front or rear brakes does not put the pedal out of operation but leaves one pair of brakes in operation enabling a safe stop to be made.



Above: Figure 1. General layout of the Girling hydro-mechanical braking system (Jowett Javelin).

Referring to *Figure 1*:

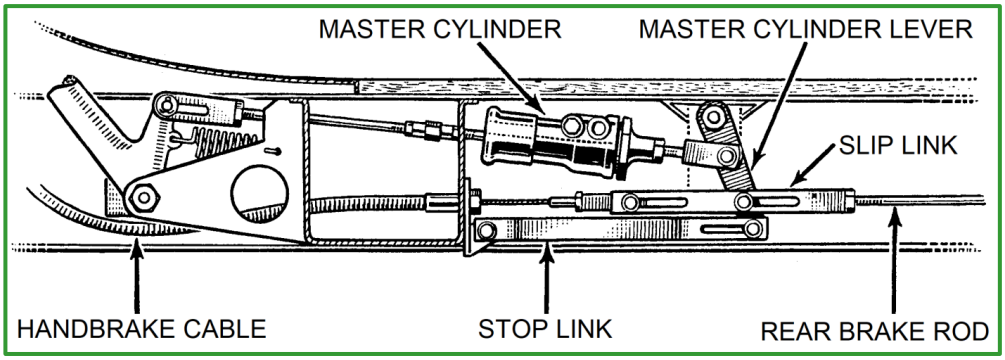
1. Master cylinder supply tank (use Girling fluid only).
2. Clevis pin to be set hard against rear of slot in slip link.
3. The master cylinder rod should be set so that the plunger in the master cylinder is fully retracted and the pedal arm has $^{1}/_{32}$-in. (0·80 mm) free movement at slotted fork.
4. With the handbrake lever on the first notch of the ratchet plate, and the cable taut the clevis pin connecting the cable to the slip link, is set hard against the front end of the slot.
5. With the brake shoes set correctly and in the ‘locked’ position the rear brake rod is adjusted so that the slip link clevis pin is hard against the front end of the rear slot in the slip link.
6. Front handbrake cable clevis pin set hard against the front end of the slot in the slip link.
7. Master cylinder.
8. Rear compensator bottom lever to be set at an angle of 15° to 20° to rear axle centreline.
9. Ensure that cable conduits are home in abutments by locking clamp bolts with load on the brake pedal.
10. Ensure that barrel nut is butted in position on short end and has lock nut on long rod.

Method Of Operation

The master cylinder is connected to the pedal by an adjustable rod and slotted clevis fork.

When the pedal is applied the master cylinder is pulled forward and causes a displacement of fluid which operates the front brakes. At the same time the rear brakes are operated by the rear brake fork screwed into the rear end of the of the master cylinder and fitted to the master cylinder lever. The pull is transmitted to the rear brakes *via* rear brake rod, connected to the slip link, and the rear cable, Item 9, *Figure 1*, to the compensator, to which are connected the two rear brake transverse rods.

In the event of failure on the rear brakes due to broken or damaged rod, the master cylinder lever arm stop contacts the stop link (see *Figure 2*) thus arresting any further movement of the cylinder body and the remaining pedal travel maintains hydraulic operation of the front brakes. Should a failure occur in the hydraulic system the master cylinder body is pulled forward until the completion of the plunger's stroke when in effect it becomes a solid unit and the remaining pedal travel maintains mechanical operation of the rear brakes.

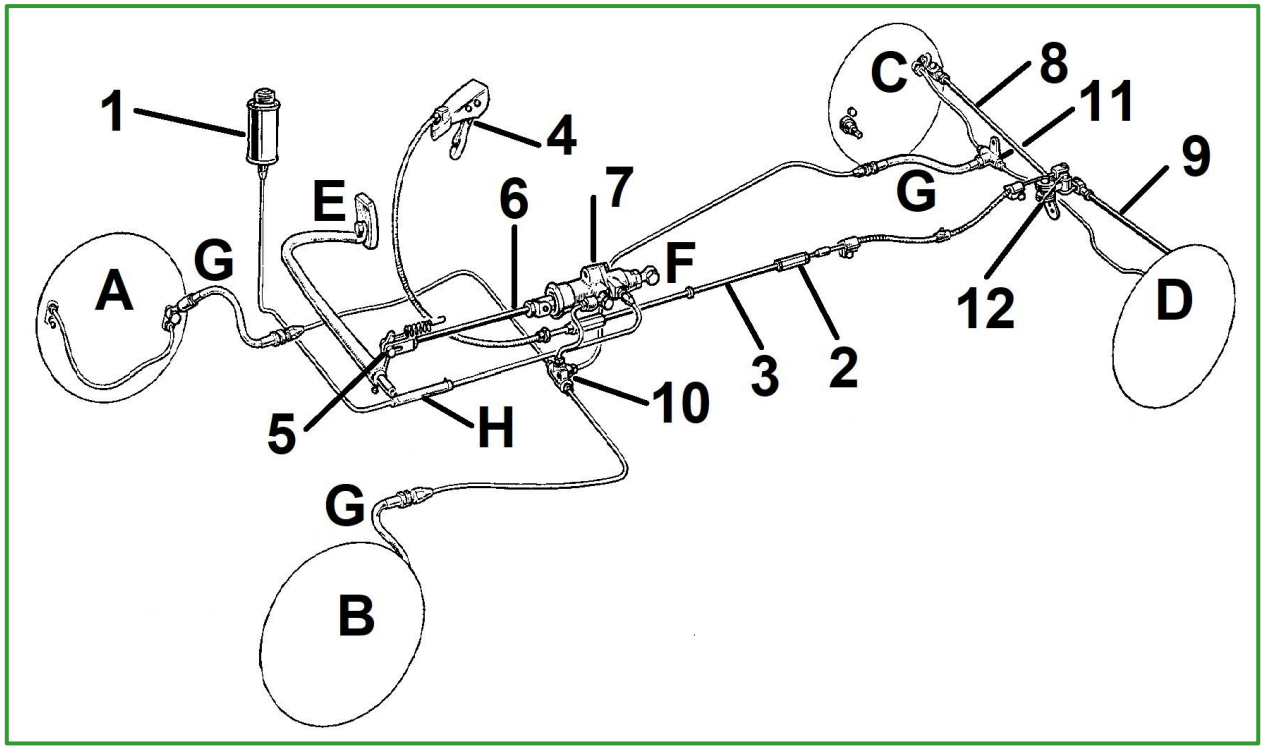


Right: Figure 2. The Jowett Javelin brake pedal, master cylinder, handbrake and slip link configuration. Jupiter is the same except for chassis differences.

Referring to *Figure 2*, when the handbrake lever is pulled to the applied position, the slip link moves forward over the clevis pin in the rear slot, thereby having no influence on the brake pedal. When the brake pedal, at left in *Figure 2*, is pressed the front slot in the slip link slides over the handbrake cable clevis pin. It is important that these components have free movement at all times.

All pivot points on the master cylinder lever must be kept lubricated

The Full-Hydraulic Brake System



Above: Figure 3. General layout of the Girling full-hydraulic braking system (Jowett Javelin).

Legend for *Figure 3*:

1 Fluid Reservoir
2 Rear Handbrake Connector And Adjuster
3 Rear Brake Rod
4 Handbrake Operating Lever
5 Pull Rod Slotted Fork And Clevis Pin
6 Master Cylinder Pull Rod With Lug For Brake Light Switch Spring
7 Master Cylinder
8 Right-hand Transverse Rod For Handbrake
9 Left-hand Transverse Rod For Handbrake
10 Four-way Hydraulic Pipe Junction (front)
11 Three-way Hydraulic Pipe Junction (rear)

12 Rear Compensator For Handbrake
A Front Right-hand Wheel Cylinders (2)
B Front Left-hand Wheel Cylinders (2)
C Rear Right-hand Wheel Cylinder
D Rear Left-hand Wheel Cylinder
E Brake Pedal
F Master Cylinder Chassis Mount Eye Bolt
G Flexible Brake Hoses
H Low Pressure Joiner Hose

The brakes on all four wheels are hydraulically operated by application of the foot pedal, whilst the rear brakes have an additional handbrake mechanism for parking, or emergency braking, purposes.

Method Of Operation

The master cylinder, *Item 7*, *Figure 3*, is supplied with fluid from a reservoir, *Item 1*, situated on the bulkhead. *Item H*, is a flexible hose joining the down tube from the fluid reservoir to the delivery pipe connected to the low pressure chamber in the master cylinder. The connecting hose should be replaced at regular intervals to ensure that the inner rubber liner cannot collapse and restrict fluid flow to the master cylinder. A piece of hose suitable for use with petrol should not be fitted, only fit a brake fluid compatible hose, with suitable clamps to prevent air being drawn into the system.

The pressure chamber in the master cylinder, at the forward end, is connected to the front four-way hydraulic pipe junction, *Item 10*, mounted on the gearbox cross member, by a standard metal pipe. When renewing the pipe, ensure that it has sufficient loop curvature so that it can withstand normal movement of the master cylinder. As the brake pedal, *Item E*, *Figure 3*, is pushed to apply the brakes, the pedal pull rod lever moves in an arc as the pedal moves. This action is followed by the master cylinder as it pivots on the chassis mounted eye bolt. A severely rust-affected pipe can easily fatigue and crack, resulting in total loss of brake effort.

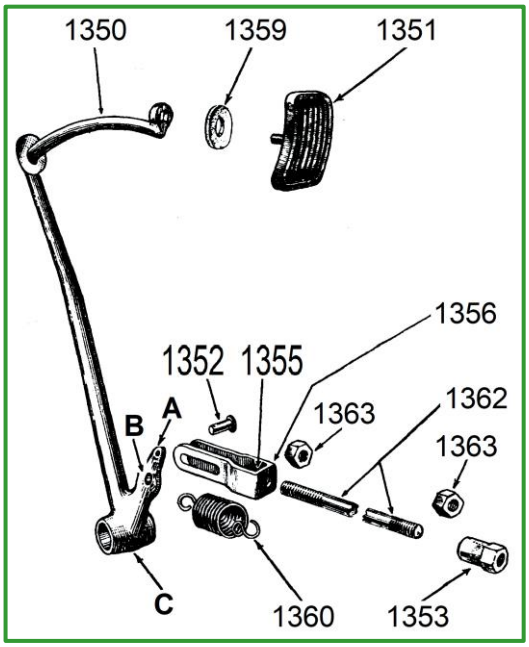
The rear three-way junction, *Item 11*, is bolted to a lug on the right-hand side rear axle tube.

Therefore, with all of the pipework and pressure hoses connected, when the system is filled with brake fluid and all air is bled from the system, then, when the brake pedal is operated, all eight wheel cylinder pistons (*Items A*, *B*, *C* and *D*) will move a proportional amount to move the brake shoes. At this point, forget about all of the other parts (seals, springs etc.), they do not matter at this juncture. The master cylinder plunger is pressurising a larger surface area than itself, thereby having a mechanical advantage that enables a great amount of braking power that is automatically balanced equally at all four wheels.

The Brake Pedal

In an hydraulic brake system the brake pedal is the lever that *pulls*, in the Jowett application, the plunger that is located in the master cylinder. In Girling terminology it is a tension type of master cylinder.

Right: Figure 4. Brake pedal, pull rod and pedal return spring assembly (from the May, 1952 Spare Parts Catalogue).



Legend for *Figure 4*:

1350 Brake Pedal
1351 Brake Pedal Pad (nut and washer not shown)*
1352 Slip Link Clevis Pin (split pin and washer not shown)*
1353 Master Cylinder Adaptor
1355 Master Cylinder Fork Nut (square)*
1356 Master Cylinder Rod Fork*
1359 Draught Excluder (felt pad)*
1360 Brake Pedal Return Spring*
1362 Master Cylinder Pull Rod
1363 Nut. Master Cylinder Rod (locking type)*

A Hole For Brake Pedal Return Spring
B Drilling For Slip Link Clevis Pin
C Location Of Grease Nipple
* Denotes Common to Jupiter.

The Jowett brake pedal pivots on a shaft mounted in the chassis frame. The brake pedal is either a forging or is made from cast steel, that has an independent lever arm that connects to the plunger pull rod. The hydro-mechanical brake pedal is different from the full-hydraulic brake pedal. There is also a difference between the Javelin and Jupiter brake pedals.

Over many years of use the pin in the chassis wears at the points where the brake and clutch pedals move against the upper surface of the pivot shaft, such wear is mostly caused by the position of the grease nipples. As shown at '*C*' *Figure 4*, the grease nipple is at the underside of the pivot, meaning that not much grease reaches the upper thrust area of the pedal's pivot. It is good maintenance to remove the pedal at annual intervals so that white grease can be smeared around the pivot shaft. This will ensure freedom of movement.

There should be a minimum of 1-in. free travel at the brake pedal pad when correctly adjusted.

The brake pedal return spring, *Item 1360*, hooks into the smaller drilling at the upper end of the pedal lever, the rear end of the spring being anchored at a chassis lug. The return spring should hold the brake pedal in its home position against the draught excluder felt pad, *Item 1359*.

The Master Cylinder Rod, Fork And The Pull Rod

Item 1356, *Figure 4*, is a clear illustration of the master cylinder rod fork, the purpose of the lengthy clevis pin slots being to ensure that as the chassis moves and as the brake fluid heats up under heavy braking, there is always clearance between the clevis pin and the forward end of the slots in the fork. This minimises the chance of hydraulic pressure being applied when the brake pedal is in the home position. The setting of the rod and fork assembly is an important adjustment that must be maintained at all times. The mounting of the master cylinder (of both configurations) has been factory set and should not require adjustment. If parts are dismantled, take measurements and store them.

Within the fork, *Item 1356*, *Figure 4*, there is located a thick square nut, *Item 1355*, that is conveniently held in position by the shape of the fork. The function of the square nut is to enable the adjustment at the clevis pin, *Item 1352*. With the brake pedal held by its return spring in the home position, the master cylinder pull rod should be turned into the square nut to reduce clearance, or turned out of the square nut to increase clearance at the clevis pin. The clearance must be $^{1}/_{32}$-in. (0·80 mm). To make an adjustment, slacken-off the jam nut, *Item 1363*, and screw the pull rod in or out of the square nut, until, with the jam nut tightened, there is the correct clearance for the clevis pin. During this operation a suitable spanner should be used at the adaptor, *Item 1353*, on the pull rod the plunger will rotate inside the master cylinder – this is normal. Do not grip the pull rod with sharp pliers.

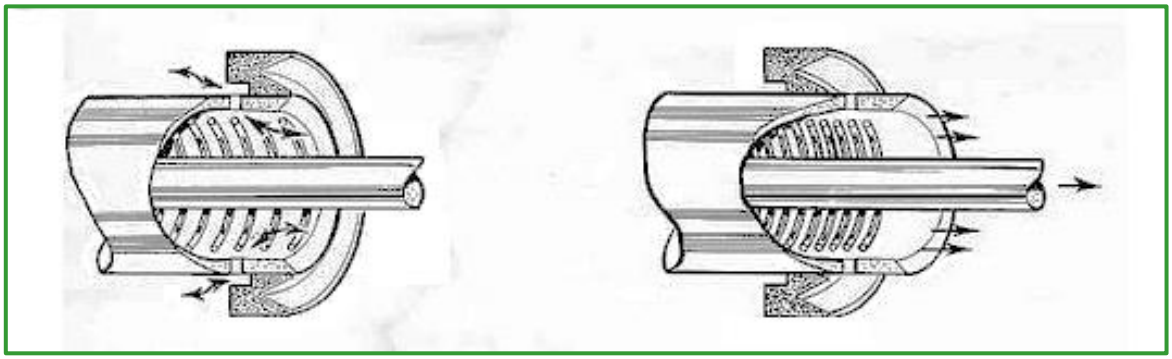
Note: The described adjustment is the same for both hydraulic brake systems.

Caution: A bent pull rod can cause binding between the rod fork, *Item 1356*, and the brake pedal lever arm. The rod must be completely free to return to the home position, being returned solely by the plunger return spring keeping the prescribed clearance at all times the brake pedal is in the home position. Friction at the fork slots can cause partial pressure in the hydraulic system and result in premature brake lining wear and increased petrol consumption.

To aid correct adjustment, (full-hydraulic system) the master cylinder must be free to pivot at the chassis mount eye bolt. It can be desirable to provide a small amount side movement at the pivot.

The clearance must be $^{1}/_{32}$-in. (0·80 mm), measured at the master cylinder pull rod fork, not at the brake pedal foot pad, *Item 1351*.

The Tension Type Master Cylinder – Operation Of Both Types



Above: Figure 5. Basic operation of the master cylinder plunger.

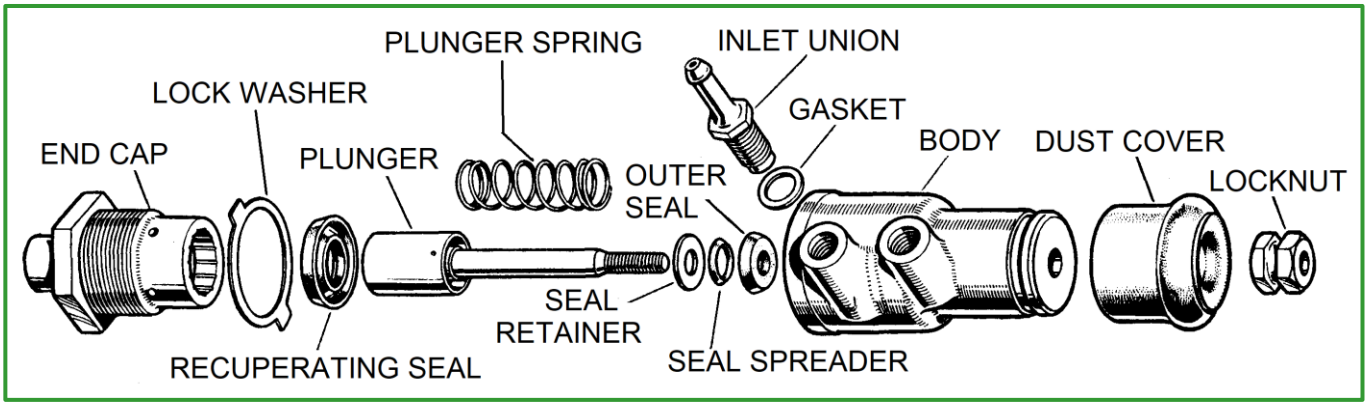
Referring to *Figure 5*, the sketch at left shows the plunger in its home position, the double ended arrows illustrate the path that brake fluid, supplied by gravity from the reservoir, can flow backwards and forwards (from left to right) through two small holes that have been drilled in a precise location in the plunger shell. The fluid is free to flow into what is called the pressure end of the master cylinder. In fact, should a tube be attached to the left-hand rear bleed nipple, when the nipple is loosened off, provided the reservoir is full, fluid will slowly flow through the tube.

The sketch at right shows that the plunger has been pulled forward (arrow to right of plunger rod) to the extent that the seal surrounding the plunger shell has, effectively, closed-off the fluid supply and the right pointing arrows at the shell indicate that pressure is being generated as the force on the brake pedal increases. This force will, in turn, push on the pistons in the wheel cylinders.

The seal, shown in section, surrounds the plunger shell, is firmly seated in the master cylinder body bore and, with the aid of a seal spreader, is an air and fluid tight seal. In the two sketches in *Figure 5*, the plunger has a solid end to the left-hand side of the sketches, ensuring that all fluid held in the pressure chamber can be compressed.

The outer seal, its spreader and spring seal the plunger rod at the front of the body.

The Hydro-Mechanical Master Cylinder



Above: Figure 6. The components of the hydro-mechanical master cylinder.

Referring to *Figure 6*, the Master Cylinder Body and End Cap can be considered a matched pair of parts. The end cap features a fine thread that ensures that the two components can be securely screw-tightened together, with the lock washer (copper) between them for an effective seal. Calling the washer as being a 'lock' washer is a bit misleading, because there is no groove machined into the front body for one of the tabs to be bent into after tightening. Once the end cap has been tightened into the body, it remains secure.

The plunger is unique to this type of master cylinder. The shell of the plunger has two precision drilled holes, their position determines exactly when brake fluid compression commences. Also, the end cap has similar drillings to enable fluid flow to the plunger shell, and on into the pressure chamber. The plunger shell is a free sliding fit in the bore in the end cap. The bore features longitudinal groves to enable the plunger to return to its home position without hydraulic resistance as the brake pedal is released.

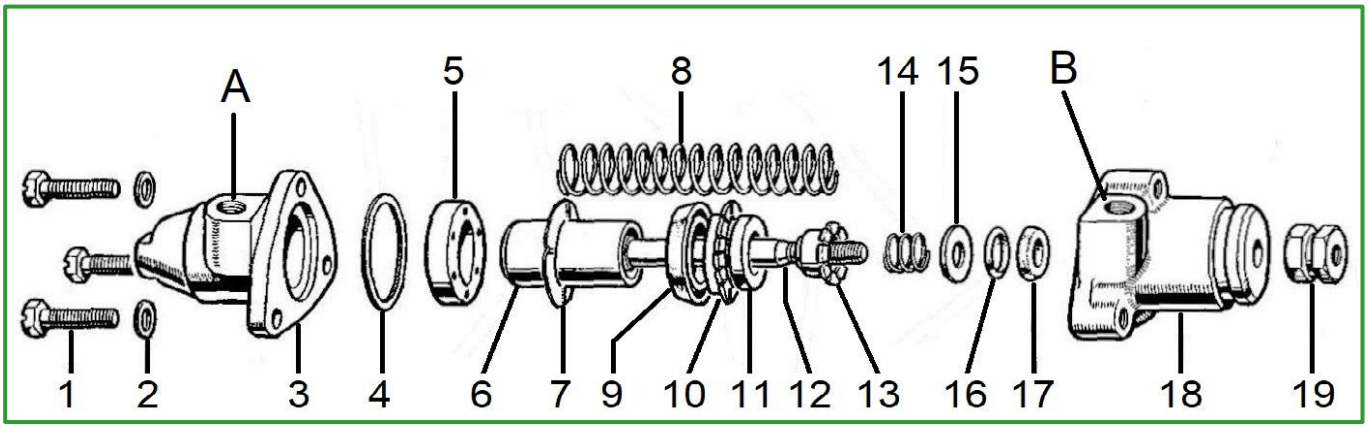
The outer seal, seal spreader and seal retainer are held in the bore in the body by the plunger spring. As the spring is compressed, it applies force to the seal retainer (a machined for purpose steel washer), which in turn applies force at the seal spreader. The spreader has a tapered face that fits into the cup of the outer seal, holding the outer seal firm on the plunger rod and, at the same time, holding the seal's outer lip tight in the master cylinder bore, thus making a fluid and air tight seal between the plunger rod and the front body.

The recuperating seal is secured in the front body by the front face of the end cap. An important aspect here is that the lock washer (copper) must be of the correct thickness. Should the lock washer be deleted and a smear of sealant be used instead, then extra crush on the recuperating seal can cause it to bind on the plunger shell, thus restricting its return to the home position. In extreme case scenario, the brakes can remain partially applied having serious consequences.

The inlet union gasket is a copper washer.

The locknut, which has a tapered bore in one end, should be tightened against the taper on the plunger rod. To facilitate tightening the locknut, two plain nuts can be tightened against each other and held with a spanner while the rod locknut is tightened or loosened. Do not grip the plunger shell or rod to tighten the assembly.

The Full-hydraulic Master Cylinder



Above: Figure 7. Exploded view of Girling full-hydraulic master cylinder

Legend for *Figure 7*:

1. Setscrews, 3 off, secure the two body portions.
2. Spring washers, 3 off.
3. Cylinder body, rear end with fluid inlet port.
4. Master cylinder body joint sealing ring.
5. Sleeve – plunger support. Can be aluminium or plastic. The bore wears should there be side load at plunger rod.
6. Plunger shell and rod, current version is stainless steel.
7. Shim – recuperating seal backup. See separate section on Page 12.
8. Spring – plunger return. The spring fits inside the plunger shell, it is supported at the front by the spring cover, *Item 13*.
9. Recuperating seal – the seal is a controlled fit in the forward end body. The seal is also a slide fit on the plunger shell.
10. Spreader (support) – recuperating seal, The spreader with spring loading holds the recuperating seal to ensure a fluid-tight seal when the plunger is pulled forward during braking.
11. Washer, special – carries load exerted by the plunger return spring, *Item 8*.
12. Taper on plunger rod for locknut, *Item 19*.
13. Support – for outer seal spring, *Item 14*.
14. Spring – for outer seal assembly. The spring exerts force on the washer, *Item 15*, the outer seal spreader, *Item 16*, and the outer seal, *Item 17*. This spring is augmented when hydraulic pressure is generated by brake pedal application.

15. Washer, special – machined for outer seal spring.
16. Spreader – outer seal. As spring force increases, the spreader which is harder than the outer seal, spreads the lips of the seal in the forward body bore and on the plunger rod to form an effective fluid and air tight seal. The spreader may be harder black rubber or white plastic. The outer seal assembly is an important unit in the master cylinder.
17. Outer seal – a flexible seal that relies on other components in the assembly. The outer seal keeps the fluid in the pressure chamber. As an assembly it also prevents air being sucked in during the return stroke of the plunger.
18. Body – master cylinder forward end. The front end of the body has a machined groove for the rubber dust cover (not shown).
19. Locknut – this is a special nut that has a machined taper bore in one end, The taper is a match to the taper, *Item 12*, on the plunger rod. The locknut has a groove machined in its hexagon for the rubber dust cover to seat in.

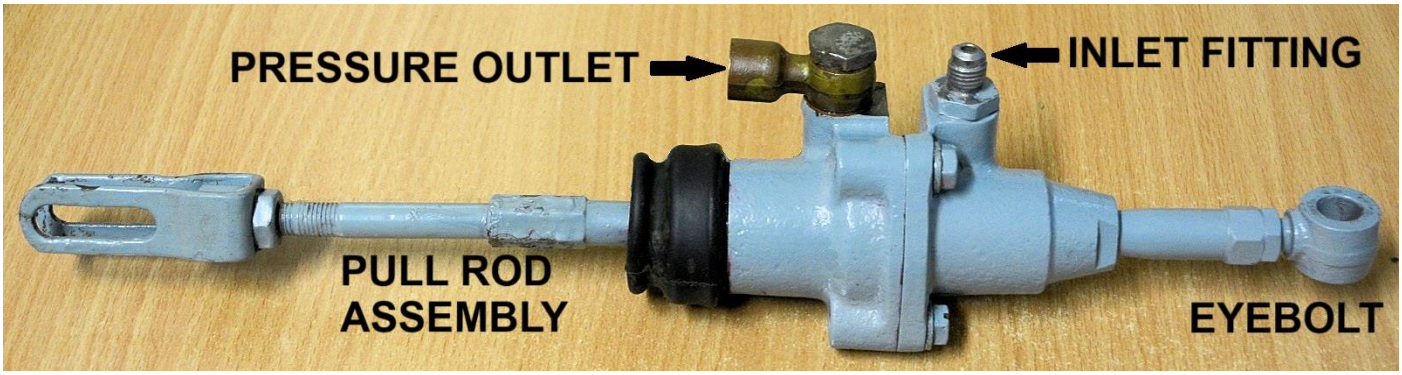
A Fluid inlet port – connects to pipe and hose assembly from reservoir.

B Fluid pressure port – connects to chassis mounted 4-way adaptor (H3489).

Figure 7, taken from Girling literature, illustrates the type of master cylinder used by Jowett Cars Limited. All of the component parts are clearly shown. The main difference from the previously described hydro-mechanical type, is in the two-piece construction of the body.

A word of caution is required at this point, although other master cylinders (Riley and Lea-Francis for example) may appear to be the same, but internally, they may not be. An example has been found where the bore in the cylinder body rear end was 0·085-in. (2·16 mm) deeper than that for the genuine Jowett specified master cylinder body – note that the dimension difference is well beyond any applicable manufacturing tolerances. The extra bore depth revealed that the plunger could move further rearwards into its home position, which in turn results in extra brake pedal travel before the plunger shell so that it moves its fluid drillings into the recuperating seal and then commences to compress the fluid. Should a master cylinder be found that appears to be the same as the original, the best method for positive identification is to remove the rubber dust cap and check that there is ⅛-in (3·18 mm) clearance between the locknut and the front face of the forward end body.

The easiest way to describe the full-hydraulic master cylinder is to deem it being basically the same in function as the hydro-mechanical unit.



Above: Figure 8. Pipe fittings on master cylinder from Jupiter E0 SA 42R.

The major difference being that, at the rear end, the master cylinder assembly includes a screwed home eye-bolt that fits over a securely fitted pin on the chassis frame to anchor it, as the brake pedal pulls the plunger inside. Another difference is the provision of an aluminium sleeve, *Item 5*, *Figure 7*, which holds the plunger shell axially central within the body assembly. The sleeve is a part that can wear and be easily replaced. The sleeve also locates the rear body in alignment with the front during assembly.

The two bodies of the master cylinder should be considered a matched pair, when the rear body is fitted over the plunger support sleeve, the three setscrews must thread freely into the holes in the front body while it is located over the support sleeve. Any misalignment at the three setscrews may cause side loading on the support sleeve and cause the plunger to bind and not fully return to its home position.

Some master cylinder front bodies have $^{5}/_{16}$-in. BSF threads, others may have $^{5}/_{16}$-in. UNF threads. The UNF setscrews can be usefully replaced with Allen head capscrews for easier tightening. The rear body is fitted with a union, at port '*A*', to attach the reservoir supply pipe. At the front body, on the

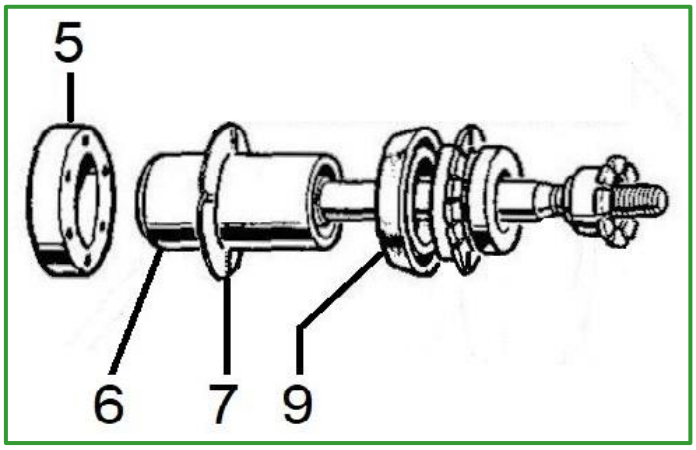
same side there is a banjo fitting for connecting port '*B*' to the hydraulic pipe arrangement. Both fittings are sealed with copper washers. The high pressure pipe from the master cylinder to the chassis mounted 'T' piece has a swan neck bend to cope with the small amount of arcing movement at the master cylinder as the brake pedal is moved forward during braking.

The locknut, which has a tapered bore in one end, should be tightened against the taper on the plunger rod. To facilitate tightening the locknut, two plain nuts can be tightened against each other and held with a spanner while the rod locknut is tightened. Do not grip the plunger shell or rod to tighten the assembly.

The rubber dust cover should contain a quantity of rubber grease inside before it is fitted.

Shim (Item 7)

Referring to *Figure 9*, the Girling description of 'shim' for the ring between the sleeve and the recuperating seal is, what is known in hydraulic systems as a backup ring. The shim has four indentations in its surface to allow fluid to access the rear face of *Item 9*, the recuperating seal, and lubricate it. The shim also allows fluid to move freely when the plunger, *Item 6*, strokes during brake application and release.



Right: Figure 9. Illustrating the shim, Item 7.

During repeated use of the hydraulic brakes, the shim can come under shock loads. The shim was made from tempered steel to cope with such loads, but with age, the shim can break through metal fatigue. The breaks usually occur at the small pressed-in dimples. Should a shim break into a number of pieces, then there is a possibility that a piece can affect the ability of the recuperating seal to form an effective seal between the two chambers in the master cylinder. In the worst case scenario, loss all braking can result.

That means that the brake pedal will reach the limit of its travel (the vehicle's floor), and the vehicle will continue its forward (or reverse) motion without any hindrance.

Breakage of the shim is comparatively rare, however, and due to the age of Jowetts it would be wise to fit a new shim as a matter of course. Fortunately, new shims are readily available.

Right: Figure 10. Current version of the shim.

It is assumed that, originally, Girling master cylinder repair kits contained a new shim and, hopefully they were put to use. The current shim has eight pressed-in indentations that alternate from face to face as shown in *Figure 10*. The method of pressing ensures that the shim can be fitted both ways and due, to the shape of the pressing, there should be less risk of fracture due to fatigue. The new shim is a direct substitute.

Overhaul Of Master Cylinder

This topic is covered in *Technical Notes – Part XXXII* and does not require repeating here.

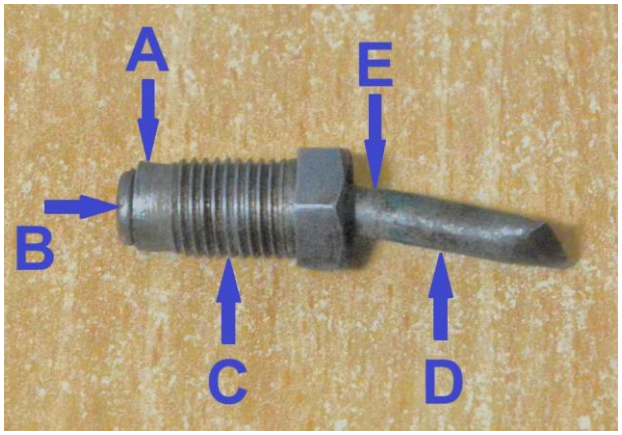
Brake Hoses, Pipes And Union Fittings

In *Figures 1* and *3* (Pages 5 and 6) the hydraulic hoses, pipes and union fittings can be seen. All of these items require inspection at vehicle service time and, the hoses in particular, should be replaced at scheduled intervals. Hoses and pipework should be kept clean, both externally and internally.

Each component in the hydraulic system between the brake fluid tank, the master cylinder and the wheel cylinders are discussed here:

a) Brake system low pressure hose – probably the most neglected hose on the vehicle is the one that forms a flexible joint in the pipes that supply the master cylinder with brake fluid. External rubber perishes (suffers cracking) or hardens due to age. The inner lining of the hose can swell due to the effects of brake fluid acting on the rubber. The inner lining can also separate from the hose structure and, under some conditions can collapse and cause restriction of fluid flow to the master cylinder. This hose should only be replaced with material that is compatible with brake fluid, not petrol hose. Change at five year intervals for peace of mind. Make sure that air cannot be drawn in at the pipe joints.

b) Brake system high pressure hoses – also often neglected, the hoses at the front brakes and at the rear axle have to cope with suspension movement as well as aging. The outer rubber covering and the inner sleeve can be affected. Hardness due to age can cause external cracks to appear and the inner sleeve can swell causing restriction to brake fluid flow. The hoses should be changed at five to seven year intervals.



Right: Figure 11. An abused brake pipe and union nut.

c) Pipework – in the Girling system was formed from Bundy pipe. The steel strip is sometimes copper plated at the inside and zinc plated at the outer diameter for corrosion protection from corrosives that can collect in the brake system and to prevent rust forming due to weather conditions.

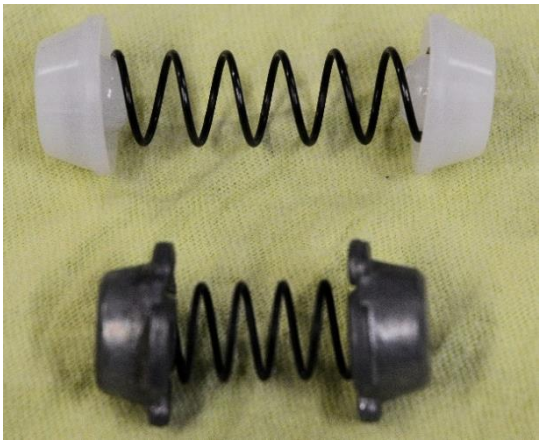
Referring to *Figure 11*, it can be seen that at '*A*' the seat area of the union nut has distorted due to over tightening against the flare '*B*'. In severe cases, this can be to the extent that the flare seat can be expanded sufficiently to tear out the thread in the wheel cylinder, or other hydraulic fitting, as the union nut is unscrewed. In the Jowett, the threads of union nuts are ⅜-in. UNF and require a $^{7}/_{16}$-in. A/F spanner. At '*D*' the Bundy pipe has rust damage and at '*E*' the pipe has been bent, thus it can cause binding as it is unscrewed.

Right: Figure 12. A new piece of Bundy pipe showing the reverse flare and a short thread union nut.

Referring to *Figure 12*, the Bundy pipe has been copper plated on the external surface. This can be easily confused with solid copper pipe, however the flare reveals the steel that it was formed from. Copper pipe is not approved for brake pipework in some areas. The reason for this situation is that copper can work-harden due to in use vibration, and due to pipe fracture, can cause total loss of braking. Prior to using copper pipe, check with local authorities. Should copper be used, then the flaring should be carried out by a quality tool that causes no damage at the neck of the flare.

Hydraulic Wheel Cylinders – General Notes

Girling wheel cylinders were widely used by numerous British manufacturers – Austin, Ford, Daimler, Rover, to name a few, as well as Jowett. Therefore, if selecting new or second-hand wheel cylinders, great care needs to be taken in that selection process. A Girling (or a reproduction) wheel cylinder may look identical, however, there could be internal differences even though the cylinder body may carry the same part number cast on it in relief, The 'same' cylinder assembly may have been employed for operation in a different diameter brake drum. For example, a slightly larger drum diameter could use longer pistons, *Item 5*, *Figure 14*, and longer seal springs, *Item 2*, *Figure 14*. It is understood that the air excluders can also be different.

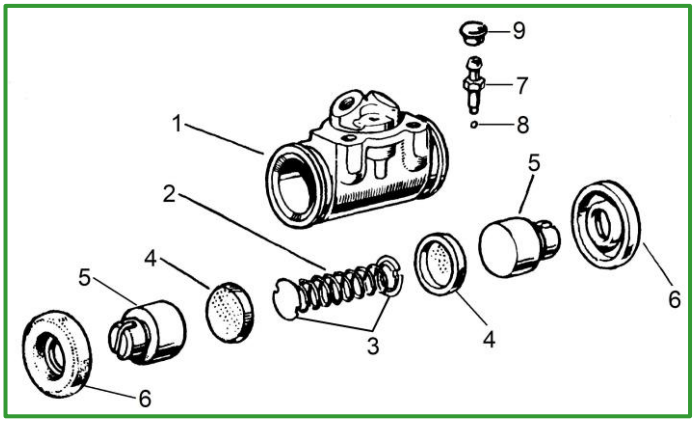


Right: Figure 13. Comparison of air excluders and springs.

One point that requires consideration, is that when the brake shoes are fitted, the seal spring, *Item 3*, *Figure 14*, should not be coil-bound – this applies to one-piston and two-piston wheel cylinders. A too long spring can become coil-bound resulting in a greater overall length of the cylinder assembly, making brake drum installation difficult or even impossible. Also to be watched out for is the type of air excluder that is mounted on a spring. *Figure 13* shows, at top, a non-genuine pair of air excluders – first, they are obviously of modern plastic material, although the coil spring fits over a lengthy spigot. The bottom assembly shows a genuine Girling assembly, the excluders are diecast and have no extended spigot for the spring. In this example, the fully compressed length of the top assembly will be longer than that of the Girling assembly in the same situation. Such extra compressed length dan cause great difficulty when fitting a brake drum.

Front Wheel Cylinders – Hydro-Mechanical Brake System

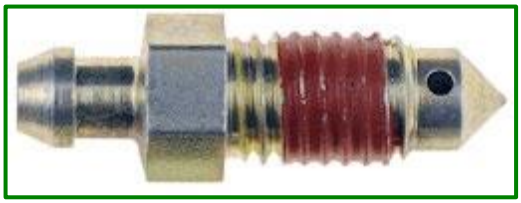
Right: Figure 14. Parts that make up the front wheel cylinder.



Legend for *Figure 14*:

1. Expander housing (cylinder body). It should be noted that new cylinder assemblies are no longer available.
2. Seal spring – must match Jowett length and spring strength.
3. Air excluder (seal support, seal spreader) – 2 off, with the spring, *Item 2*, hold the seals firmly against the pistons, *Item 5*. The main function of the air excluders is to hold the seal against the pistons and prevent the seals from tipping as they move in the cylinder body. Should a seal move away from its held position, air could be drawn in as the brake shoes return to their home position. This situation can arise if the travel of the pistons is excessive due to worn brake linings and brake shoe adjustment has been neglected. Incorrect length air excluders can be the cause of the spring, *Item 2*, becoming coil-bound and preventing the brake drum from being fitted over the brake shoes.
4. Seal – 2 off, wheel cylinder, the purpose of the seals is to hold fluid in the hydraulic system, and to prevent air being drawn into the fluid when the brake shoes return to home position.
5. Piston (tappet) – 2 off, when pressure is applied from the master cylinder, the pistons are forced outwards from the body, *Item 1*. As the pressure reduces, the brake shoe spring brings the pistons to their home position.
6. Dust cover, *Item 6*, – 2 off, these covers prevent brake lining dust (and road dust and moisture) from restricting piston movement. The covers are a snug fit over the wheel cylinder body and the groove in the pistons.

7. Bleed screw, *Item 7*, – is used for bleeding air from the hydraulic system.



Right: Figure 15. A modern bleed screw with ⅜-in. UNF thread coated with air seal material, tapered seat and bleed port to right of threaded portion.

8. Bleed screw ball – designed to seat against a small drilling in the body, Item 1. This small item can cause problems should the bleed screw be over-tightened. The ball can be forced into the bleeder drilling and lodge securely. Later design bleed screws feature a taper seat that seals against the drilling, making the ball obsolete (see *Figure 15*).
9. Dust and moisture cover – keeps dust, road grime and water out of the bleed screw passages.

It is important that the wheel cylinders are properly maintained. The pistons and seals should slide freely in the wheel cylinder bore, which must present a smooth surface for the seals and pistons to operate with. Corrosion in the bore can be repaired by machining the bore oversize and pressing in a stainless steel sleeve. A brake specialist repairer can carry out this work at a modest cost. The two pistons should be supplied so that the finished bore matches them. New stainless steel pistons should be available to Club members.

The wheel cylinder is attached to the brake back plate with two studs and nuts. To remove, first refer to the Maintenance Manual and remove the wheel and brake drum. Support the car on suitable chassis stands. The brake shoes should be removed, by gently levering out of the piston slots and the bottom adjuster tappets and placing to one side, prior to removing the wheel cylinder. The brake shoe return springs must not be over-stretched. Completely drain the hydraulic system before disconnecting the hose at the chassis and at the wheel cylinder.

The wheel cylinder forms an integral part of the brake assembly. It is vital that the correct air excluders, *Item 3*, and spring, Item 2, *Figure 14*, are used during reassembly. If a longer spring, or different dimension air excluders are used, the situation could exist where the spring becomes coil-bound. This condition can hold the brake shoes further apart than is normal, and, in severe cases, cause the brake drum to be impossible to be slid home over the shoes. A severely over-length spring may cause damage to the wheel cylinder seals, *Item 4*.

The brake shoes are prevented from forcing the wheel cylinder pistons too far into the body, *Item 1*, *Figure 14*, by the adjuster cams (snails) acting against the pegs on the brake shoes.

The wheel cylinder securing nuts should be tightened, then backed off half a turn. Next, after the brake shoes have been fitted and the brake drum installed, the adjuster cams should be rotated so that both brake shoes lock the drum equally. When the hydraulic system has been bled of all traces of air, the brake pedal should be firmly stroked four times to centralise the brake shoes. If one of the adjusters has released its hold on the brake shoe, readjust to hold the drum and repeat the pedal stroking. Then tighten the two securing nuts to hold the wheel cylinder securely in place. Adjust the brake shoes so that the drum just spins freely.

Front Wheel Cylinders – Full-Hydraulic Brake System

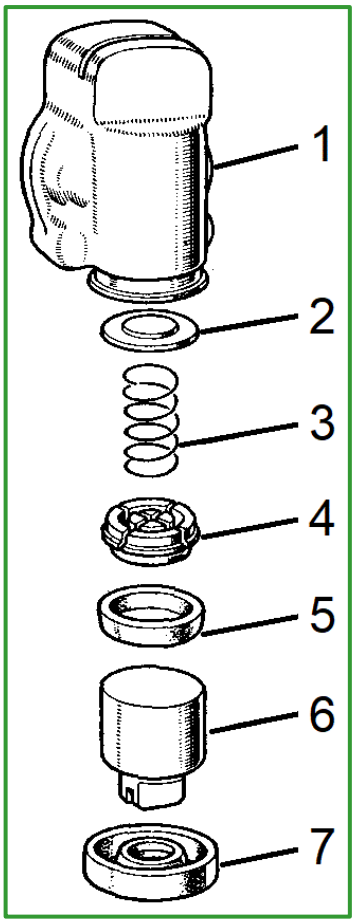
The Girling front wheel cylinders that are specified for the full-hydraulic brake system are different from those for the hydro-mechanical front brakes:

1. There are two single end cylinders per brake,
2. The bodies are cast in aluminium.
3. There can be three versions:
   a) Equipped with a pressed steel dust shield and a simple flat ended piston – this is the early type and may carry, for example, Girling Part No. H3063-RH. There is no groove for holding a rubber dust cover.
   b) Equipped with a rubber dust cover with grooves in body and piston for the cover, along with a slot in the piston to locate the brake shoe. May carry Girling Part Nos. H3432-LH or 303200W-LH.
   c) Essentially the same as b) above, but has a steel pad in the cylinder body for the brake shoe to bear on. Girling Part No. not known, however, the reproduction County brand has the wear plate and carries their Part Nos. County AF-31-L and AF-31-R.

4. The two wheel cylinders are linked hydraulically by a bridge pipe from cylinder to cylinder.

The front brakes are described by Girling as Hydraulic Leading Shoe Sliding (HLSS) type indicating that the brake shoes are free to centralise by sliding in both the wheel cylinder bodies and pistons.

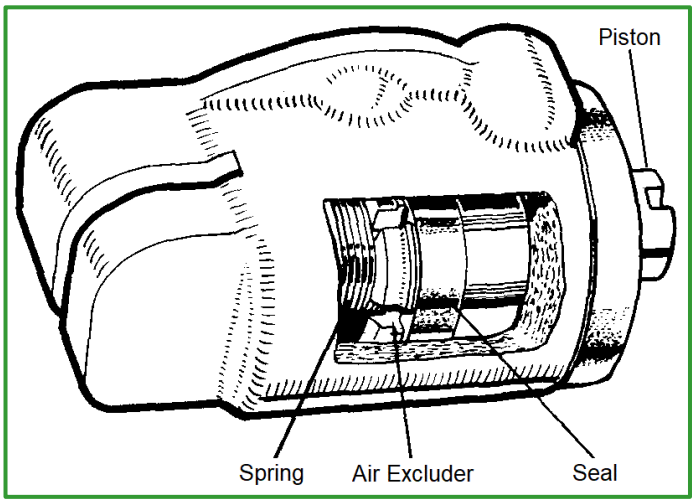
Right: Figure 16. A sketch from a Girling service publication, not entirely true to form, but the cylinder components are representative.



Referring to *Figure 16*, the legend applies:

1. Wheel cylinder body – 2 off per side, left and right hand.
2. Base plate for seal air excluder spring. Could only apply to the earliest full-hydraulic front wheel cylinder type – 2 off per side.
3. Seal spring – must match Jowett length and spring strength. 2 off per side.
4. Air excluder (seal support, seal spreader) – 2 off per side, with the spring, Item 3, hold the seal firmly against the piston, Item 6. The main function of the air excluders is to hold the seal against the pistons and prevent the seals from tipping as they move in the cylinder body. Should a seal move away from its held position, air could be drawn in as the brake shoes return to their home position. This situation can arise if the travel of the pistons is excessive due to worn brake linings and brake shoe adjustment has been neglected.
5. Seal – 2 off per side, 1 per wheel cylinder, the purpose of the seals is to hold fluid in the hydraulic system, and to prevent air being drawn into the fluid when the brake shoes return to home position.
6. Piston (tappet) – 2 off per side, when pressure is applied from the master cylinder, the pistons are forced outwards from the body, *Item 1*. As the pressure reduces, the brake shoe spring brings the pistons to their home position.
7. Rubber dust cover – 2 off per side, the cover is a snug fit in the grooves in the body, *Item 1*, and the piston, *Item 6*. The early style body can have a dust cover groove machined, if this is done, the later style piston, as described at b) on Page 14.

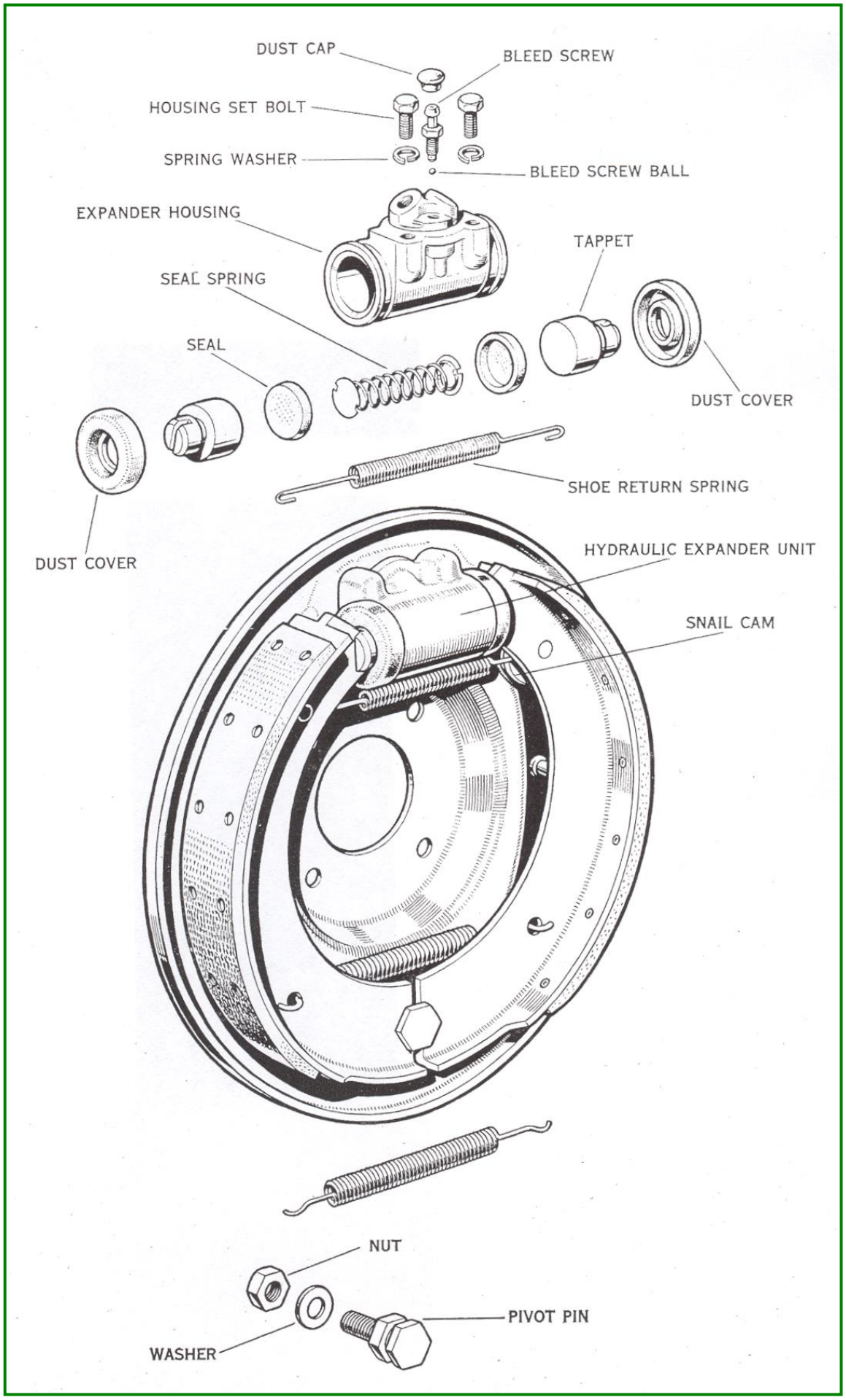
Right: Figure 17. A sketch from a Girling service publication, not entirely true to form, but the wheel cylinder internal assembly is representative.



Referring to *Figure 17*, the cutaway shows the piston in its fully retracted position, with the spring virtually coil-bound and maintaining firm contact with the inboard face of the piston. The air excluder can be seen between the spring and the seal. When the wheel cylinder is correctly mounted on the back plate, the brake shoe adjuster peg will be lodged against the snail cam adjuster, thus the spring will relax, while keeping the seal firmly in contact with the piston.

Brake Assemblies – Hydro-Mechanical

Illustrations of the brake assemblies are on this page and Page 17.



Above: Figure 18. Typical Girling semi-hydrastatic brake as fitted to Jowett Javelin (Fronts).

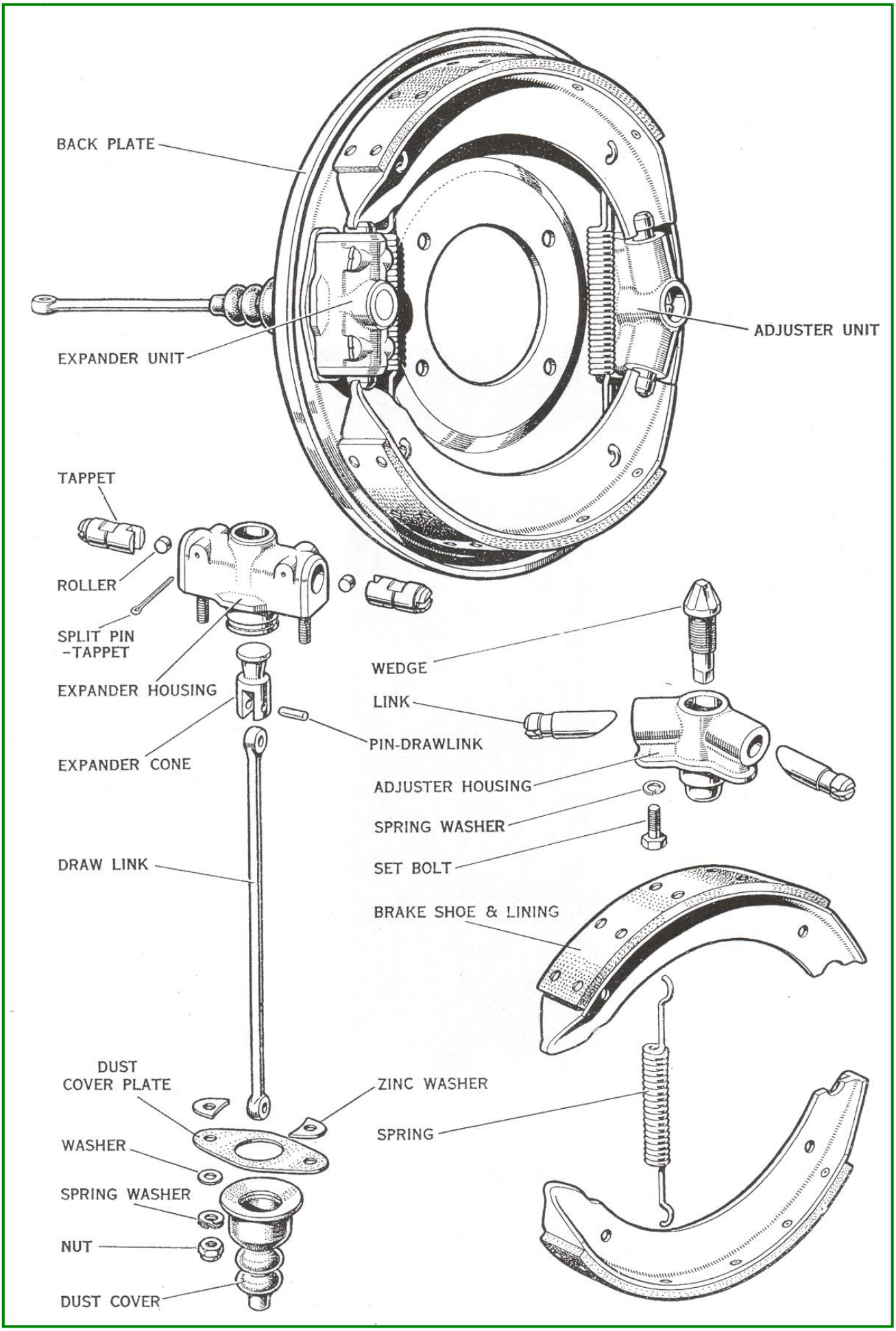
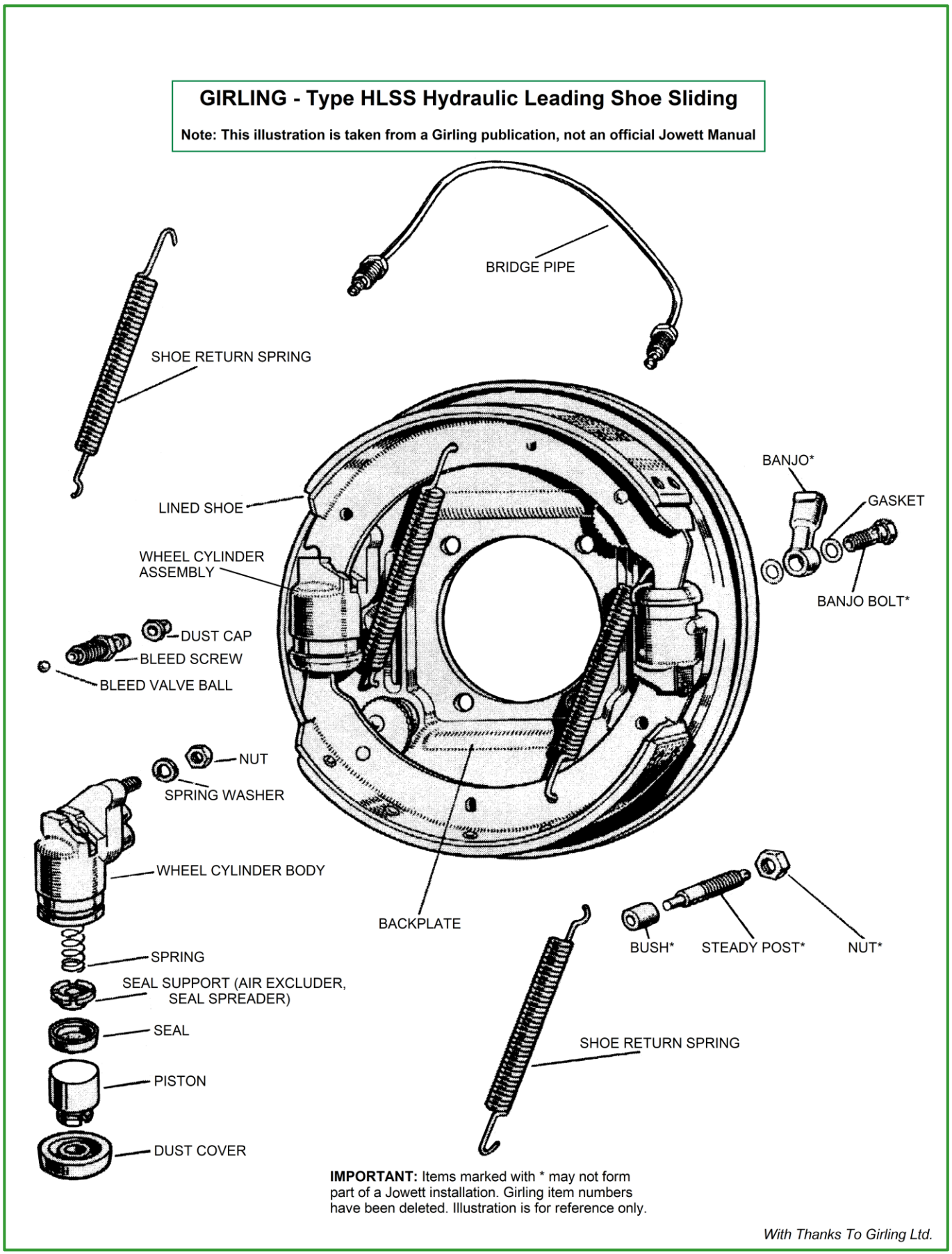
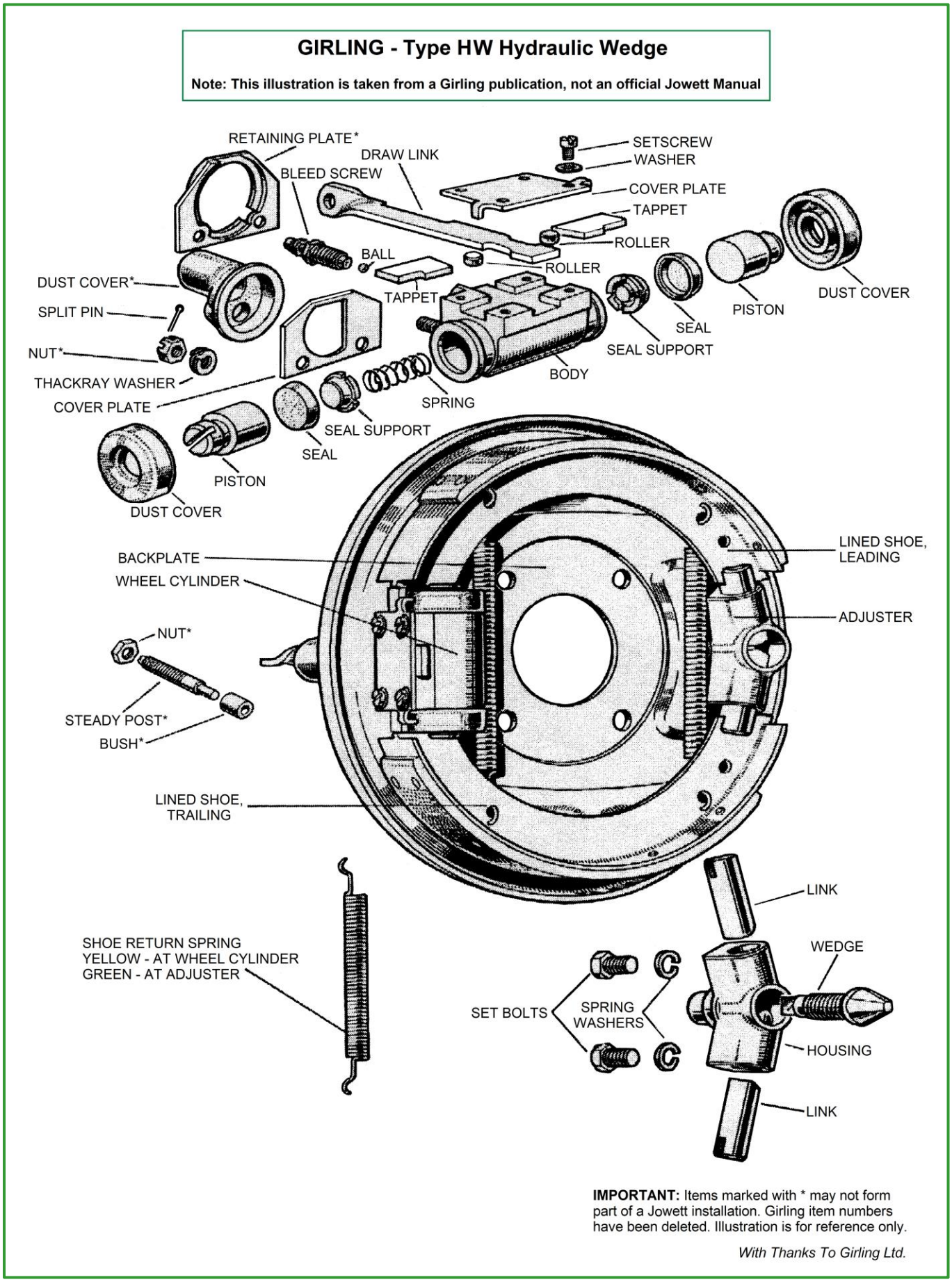


Figure 19. Typical Girling non-servo brake as fitted to Jowett Javelin (Rears – RHS).

Brake Assemblies – Full-Hydraulic



Above: Figure 20. Girling hydraulic twin leading shoe front brake assembly.



Above: Figure 21. Girling hydraulic wedge rear brake.

Brake Shoe Installation Technique

The Jowett full hydraulic rear brakes feature leading and trailing brake shoes in each rear brake. All printed material shows only the right hand brake shoe setup on the backing plate assembly. Getting this right for the left hand side can be a bit confusing. There are a few points to watch out for:

a) There are two ways the brake adjuster tappets (Part Numbers 54226, 54227) can fit in the brake adjuster housing. Should they be incorrectly installed, the brake drum cannot be fitted. It is wise to place the tappets in labelled plastic bags, and store after dismantling.

b) Essentially the same applies to the brake shoes, the brake lining material does not cover the whole shoe face. The Spare Parts Catalogue and the Maintenance Manual show the right-hand side only. For the left-hand side, the fit of the brake shoes is the same, but the backing plate is flipped over. This means that, in the direction of wheel rotation, at the wheel cylinder (on both sides) the upper piston is fitted with the brake shoe end that has the shoe portion that is less lining material. The second brake shoe, has the less lining material at the brake adjuster tappet.

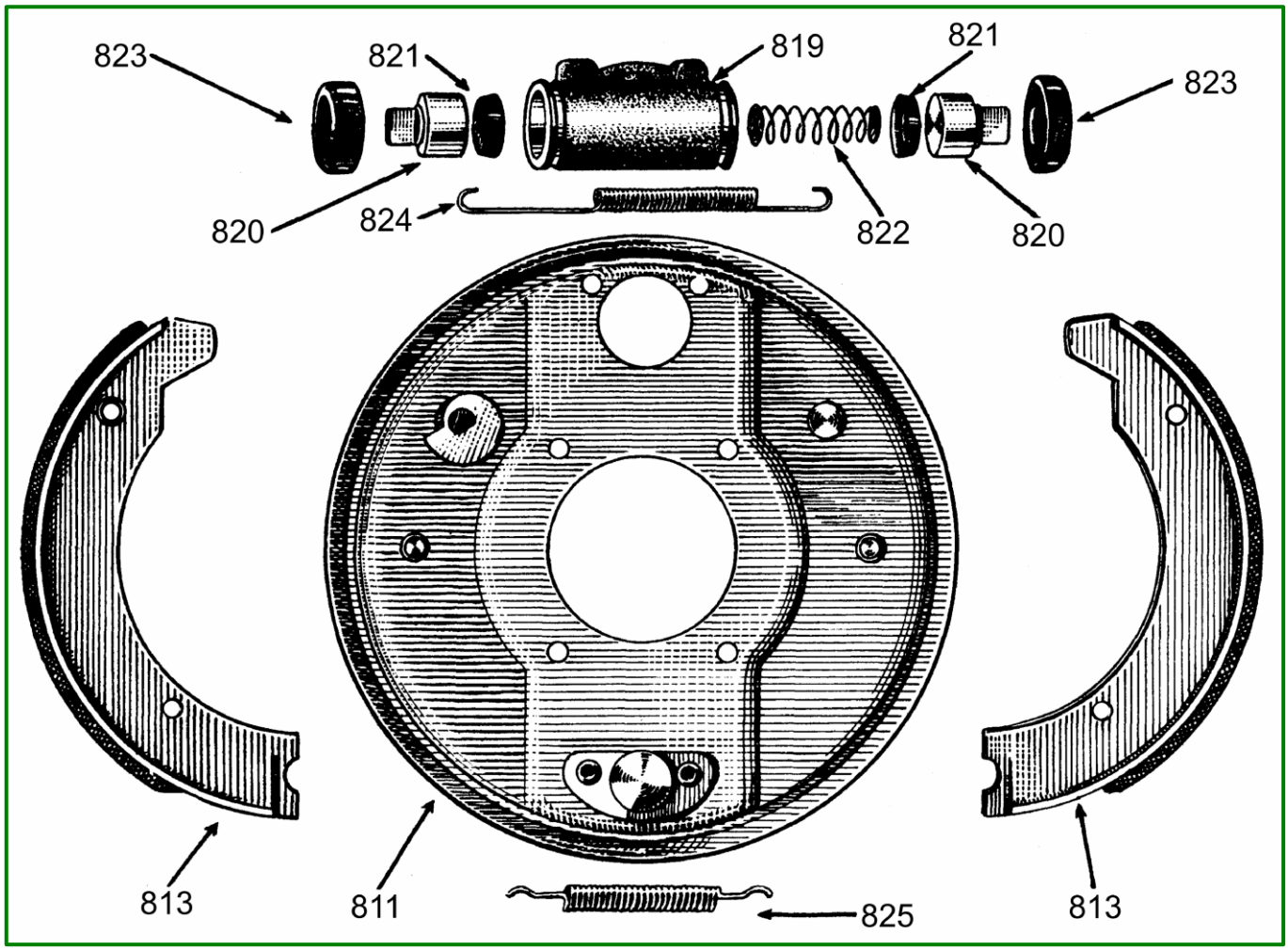
   The reason for this type of brake shoe installation is to create a wedging action to improve brake performance. Should the brake shoes be reversed, there could be severe brake judder.

c) When installing brake shoes and their springs, it is safer to hold the backing plate assembly in a solidly mounted bench vice.

   The backing plate can be clamped in the vice jaws with two of the backing plate mounting bolts and nuts installed and the nuts firmly clamped. The bolts should be tight, thus making a solid work area for pulling the brake shoes against spring tension.

d) The longer (yellow) brake shoe spring fits closest to the wheel cylinder, the shorter (green) spring fits closest to the brake adjuster, in the second holes from the end of the brake shoe web.

To Install The Front Brake Shoes – Hydro-Mechanical



Above: Figure 22. Front brake assembly (L.H. side).

Legend for *Figure 22*:

Item	Qty.	Part No.	Description
*^810	1	GB37876	Front Backing Plate Assembly – R.H.
*811	1	GB37875	Front Backing Plate Assembly – L.H.
*^812	1	GB38168	Shoe and Lining Assembly – R.H. Pair (Leading and Trailing)
*813	1	GB38167	Shoe and Lining Assembly – L.H. Pair (Leading and Trailing)
*^814	1	RGB38168	Reconditioned Shoe and Lining Assembly – R.H. Pair (Leading and Trailing)
*^815	2	RGB38167	Reconditioned Shoe and Lining Assembly – L.H. Pair (Leading and Trailing)
*^816	1	H1833	Hydraulic Wheel Cylinder – Complete – R.H.
*^817	1	H1832	Hydraulic Wheel Cylinder – Complete – L.H.
*^818	1	H1801	Wheel Cylinder only – R.H.
*819	1	H1800	Wheel Cylinder only – L.H.
*820	4	H1815	Pistons (Tappets)
*821	4	H1169	Seal
*822	2	H2198	Spring and End Covers (Air Excluders)
*823	4	H1171	Dust Boot
*824	2	GB38170	Brake Shoe Return Spring
*825	2	GB36959	Bias Reducing Spring

Above: From the January, 1950 Spare Parts Catalogue.

Denotes: * Common to Jupiter, ^ Not Illustrated.

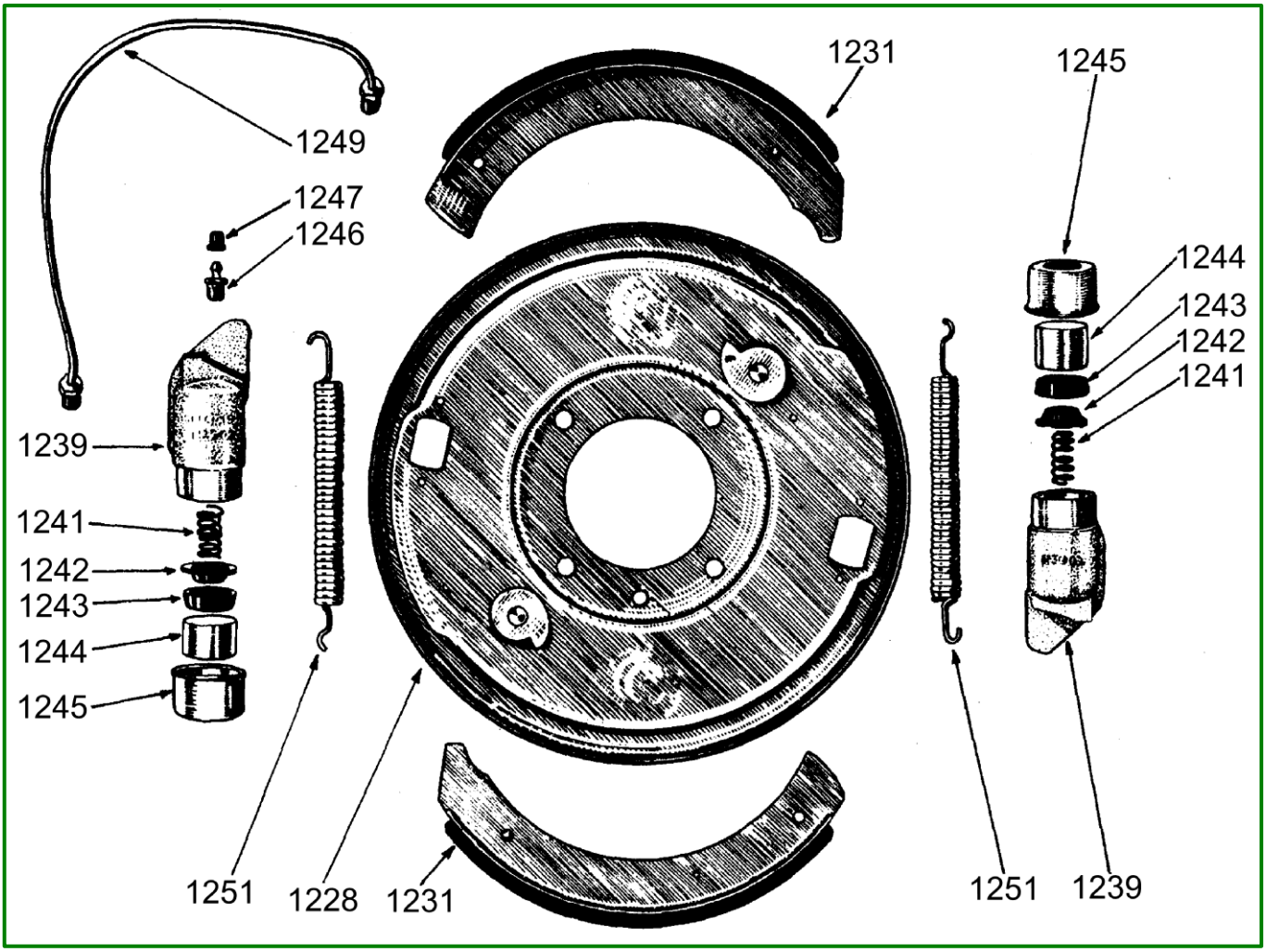
Refer to *Figure 22* for identification of components. The left-hand brake is used as the example. The following procedure should be adopted to ensure that the brake shoes are correctly installed:

1. Ensure that the wheel cylinder body, *Item 819*, is not worn or corroded at its bore. If damaged, the only option is to have the cylinder bored out and have a stainless steel sleeve pressed in.
2. Lubricate with brake fluid or rubber grease the spring, air excluders, seals and pistons, *Items 820* to *822*, and assemble in correct order into the wheel cylinder body, *Item 819*. Apply a smear of rubber grease inside the rubber dust covers, *Item 823*, and restrain the assembly against spring pressure with a fine wire tie. Do not allow the seals, *Item 821*, to pop out.

   It should be noted that, provided new rubber dust covers are fitted, the pistons will be restrained.
3. Install the wheel cylinder, *Item 817*, onto the backing plate (*Item 811*) with the two setscrews with Penrite Copper Eze on threads and new spring washers. Fully tighten and back off half a turn.
4. Ensure that the brake shoe pivot (anchor) pin is tightened securely
5. Make sure that the adjuster cam is in the fully backed-off position.
6. Fit two ⅜-in. setscrews into two of the stub axle mount bolt holes and clamp the assembly into a bench vice to hold firmly while the brake shoes are being fitted in place.
7. Apply white grease at the brake shoe anchor pin, at the adjuster cam, the brake shoe steady post and at the slots in the pistons (tappets), *Item 820*.
8. Each brake shoe, *Item 813*, has a radiused notch that fits into the anchor pin.
9. The bias resisting spring, *Item 825*, is located at the anchor pin ends of the brake shoe webs, and the upper brake shoe return spring, *Item 824*, hook is connected to the trailing shoe only, leaving the leading shoe in continuous light contact with the brake drum.
10. With both springs located at the springs, ease the shoes over the anchor pin and into the groove.
11. Taking great care to keep grease and brake fluid from contaminating the brake lining material, ease the brake shoe webs into the piston indentations. Make sure that the brake adjuster cam is backed off at the peg.
12. Fit a new flexible hose into the wheel cylinder, with a new copper washer. Tighten the hose in place and take precautions to prevent dirt entry at the open end.

13. Fit the assembly onto the stub axle, connect the brake hose at the chassis, tighten the union nuts at the bridge pipe and bleed the air from the hydraulic system as described in the Jowett *Maintenance Manual*.
14. At the brake shoe adjusters, set each shoe so that the brake drum is locked. Operate the brake pedal a few times, have it held down while the wheel cylinder setscrews are tightened.
15. Release the brake shoe adjuster so that the brake drum spins with minimal resistance.
16. Repeat Steps 1 to 15 for the right-hand side front brake.
17. After 500 miles (804·65 kilometres) have been travelled, check for fluid leaks, that hardware is tight and the brake shoe adjustment is correct.

To Install The Front Brake Shoes – Full-Hydraulic



Above: Figure 23. Front Brake Assembly (L.H.S, shown).

Legend for *Figure 23*:

Item	Qty.	Part No.	Description
*^1225	1	54092	Front Brake Complete – L.H. (GB41368)
*^1226	1	54093	Front Brake Complete – R.H. (GB41369)
*^1227	1	54192	Front Backing Plate Assembly – R.H. (GB41337)
*1228	1	54191	Front Backing Plate Assembly – L.H. (GB41336)
*^1229	8	54094	Front Back Bolt
*^1230	2	54194	Shoes and Linings – R.H. (GB41333BN)
*1231	2	54193	Shoes and Linings – L.H. (GB41332BN)
*^1232	2	54194R	Reconditioned Shoes and Linings – L.H.
*^1233	2	54193R	Reconditioned Shoes and Linings – R.H.

Continued			
*^1234	4	54249	Front Brake Shoe Linings only (GB41331BN)
*^1235	4	54248	Front Shoe only (GB41330)
*^1236	40	54222	Rivets (71-BS-1C)
*^1237	2	54196	Hydraulic Wheel Cylinder – R.H. (H3116)
*1238	2	54195	Hydraulic Wheel Cylinder – L.H. (H3063)
*1239	2	54366	Cylinder Body – L.H. (H3062)
*^1240	2	54367	Cylinder Body – R.H. (H3062)
*1241	4	54368	Spring (H3082)
*1242	4	54369	Air Excluder (H3112)
*1243	4	54370	Seal (H1847)
*1244	4	54371	Piston (H5149)
*1245	4	54372	Dust Cap (H3114) – Pressed Steel
*1246	2	54197	Bleed Screw (H2675)
*1247	2	54198	Dust Cap (H3228)
*^1248	2	54199	Ball $^{3}/_{16}$-in. Diameter (9003/26)
*1249	1	54231	Bridge Pipe – L.H. (H3368)
*^1250	1	54232	Bridge Pipe – R.H. (H3369)
*1251	4	54202	Shoe Return Spring (GB40454)
*^1252	8	54204	Nut ¼-in. A.N.F. – UNF (30-BS-150)

Above: From the May, 1952 Spare Parts Catalogue.

Denotes: * Common to Jupiter, ^ Not Illustrated.

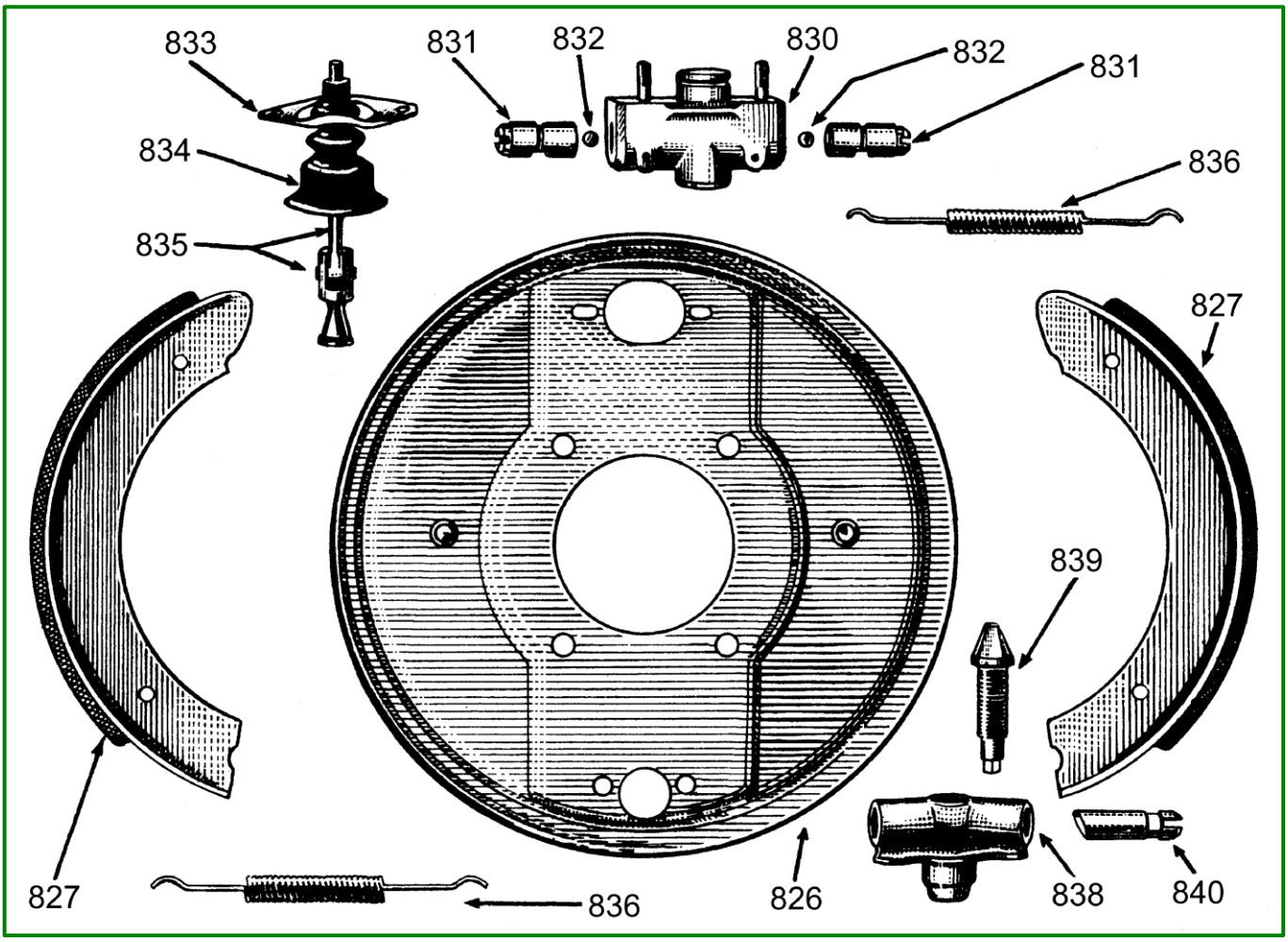
Refer to *Figure 23* for identification of components. The left-hand brake is used as the example. The following procedure should be adopted to ensure that the brake shoes are correctly installed:

1. Lubricate with brake fluid or rubber grease the springs, air excluders, seals and pistons, *Items 1241* to *1244*, and assemble in correct order into the wheel cylinder bodies, *Item 1239*. Apply a smear of rubber grease inside the dust cap (rubber cover), *Item 1245*, and restrain the assembly against spring pressure with a fine wire tie. Do not allow the seal, *Item 1243*, to pop out.

   It should be noted that, provided new rubber dust covers are fitted, the pistons will be restrained.
2. Install the wheel cylinders, *Item 1238*, onto the backing plate, *Item 1228*, with the four ¼-in. plain washers and Nyloc nuts. Fully tighten and back off half a turn.
3. Make sure that the adjuster cams are in the fully backed-off position.
4. Apply white grease at the adjuster cams and in the brake shoe slots in the wheel cylinder bodies. White grease should also be applied at the slots in the dust caps (pistons for rubber dust covers).
5. Tighten two ⅜-in. setscrews and nuts into the brake back plate at the stub axle mount holes. Clamp at the nuts in a bench vice with the wheel cylinders uppermost.
5. Referring to *Figure 18*, select the brake shoes, *Item 1231*, and springs, *Item 1251*, that match the left-hand brake assembly.
6. Taking great care to keep the brake linings clear of any grease or fluid, locate the brake shoe return spring into its hole in the back plate and hook the other end of the spring into the brake shoe. Pull, without over-extending the spring, the shoe into the dust cap(piston) indentation, and then pull the other end of the brake shoe into the slot in the other cylinder body.
7. Check that the adjuster cam is in the fully backed-off position against the shoe peg.
8. Repeat Steps 6 and 7 for the second brake shoe.
9. Cut and remove the retaining wire, as set in Step 1.
10. Remove the assembly from the bench vice, turn over and re-clamp.

11. Install the bridge pipe, *Item 1249*, leaving the union nuts loose. The pipe should not cause the union nut to bind at all.
12. Install a new brake hose in the rear wheel cylinder with a new copper washer.
13. Fit the assembly onto the stub axle, connect the brake hose at the chassis, tighten the union nuts at the bridge pipe and bleed the air from the hydraulic system as described in the Jowett *Maintenance Manual*.
14. At the brake shoe adjusters, set each shoe so that the brake drum is locked. Operate the brake pedal a few times, have it held down while the wheel cylinder nuts are tightened.
15. Release the brake shoe adjusters so that the brake drum spins freely.
16. Repeat Steps 1 to 15 for the right-hand side front brake.
17. After 500 miles (804·65 kilometres) have been travelled, check for fluid leaks, that hardware is tight and the brake shoe adjustment is correct.

To Install The Rear Brake Shoes – Hydro-Mechanical



Above: Figure 24. Rear brake assembly (L.H. side).

Legend for *Figure 24*:

Item	Qty.	Part No.	Description
*826	2	GB32407	Rear Backing Plate Assembly
*827	4	GA/G2240	Shoe and Lining Assembly – Rear Pair
*^828	4	RGA/G2240	Reconditioned Shoe and Lining Assembly – Rear Pair
*^829	2	GA/G2842	Expander Housing Assembly – Complete
*830	2	GB2712	Expander Housing only
*831	4	GB1403/1	Plunger
*^832	4	GB535	Roller

Continued			
*833	2	GB33955	Expander Housing Plate
*834	2	GB2531	Dust Cover
*835	2	GB760	Operating Rod and Cone
*836	4	GB2478	Brake Shoe Spring
*^837	2	GA/G448	Adjuster Unit Assembly – Complete
*838	2	GB/1938	Adjuster Housing only
*839	2	GB522	Adjuster Housing Cone
*840	2	GB1399/1	Adjuster Plunger (Tappet) – R.H.
*^841	2	GB1399A/1	Adjuster Plunger (Tappet) – L.H.

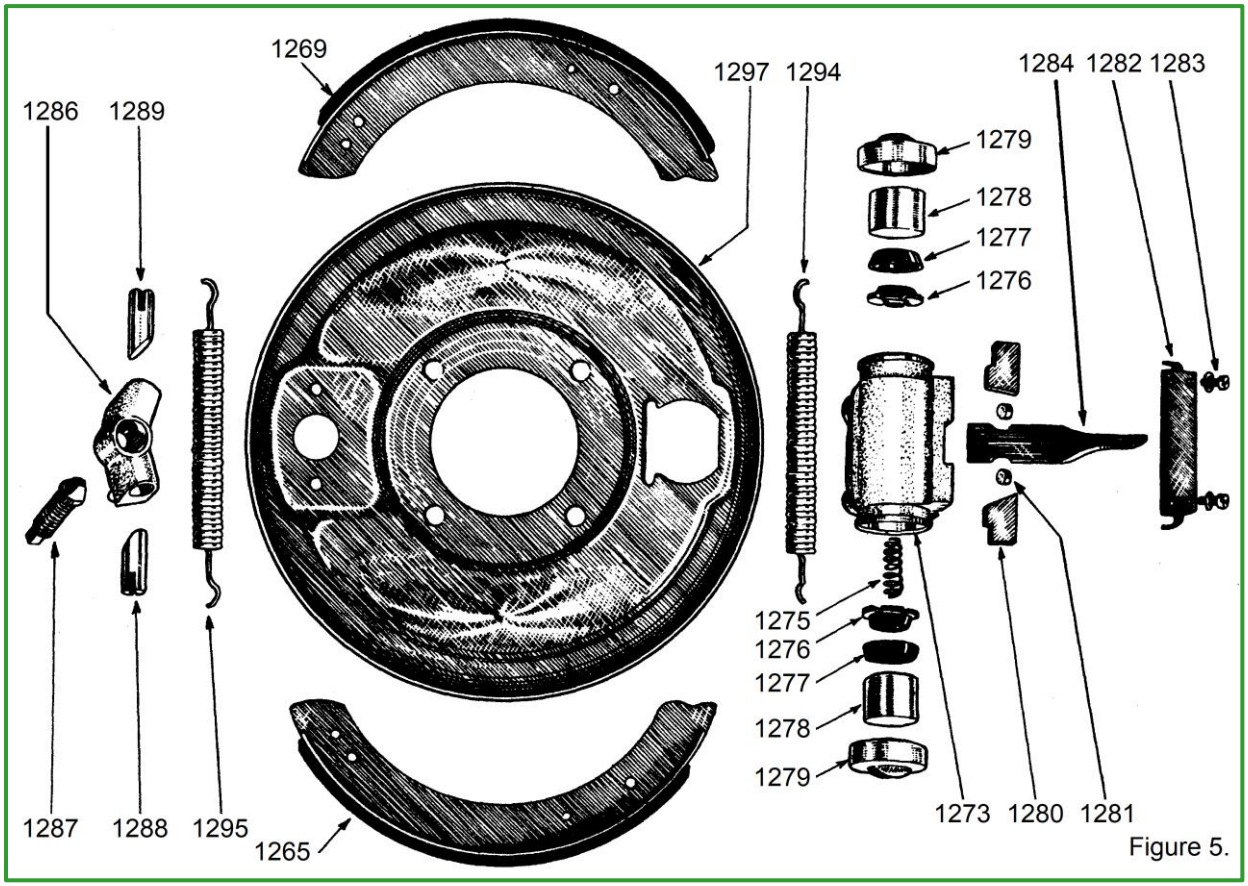
Above: From the January, 1950 Spare Parts Catalogue.

Denotes: * Common to Jupiter, ^ Not Illustrated.

Refer to *Figure 24* for identification of components. The left-hand brake is used as the example. The following procedure should be adopted to ensure that the brake shoes are correctly installed:

1. Ensure that the wheel expander body, *Item 830*, is not worn or corroded at its bore. If damaged, the only option is to have the body bored out and have a stainless steel sleeve pressed in.
2. Lubricate with white grease the body bore, operating rod and cone, rollers and plungers, *Items 830* to *832*, and assemble in correct order into the expander body, *Item 830*. Do not allow the plungers and rollers to pop out.
3. Install the expander, *Item 829*, smeared with white grease where it contacts the backing plate, *Item 826*), and can slide freely for the full length of the mount slots. Slide on the dust cover (*Item 834*, the securing plate, *Item 833*, with two new Nyloc nuts, lubricated with Penrite Copper Eze on threads and new spring washers. Fully tighten and back off one turn.
4. Install the brake shoe adjuster housing, *Item 838*, onto the backing plate, *Item 826*, with the two setscrews lubricated with Penrite Copper Eze. Tighten the setscrews securely.
5. Lubricate the adjuster cone, *Item 839*, thread with Copper Eze and thread it to fully backed-off position. Lubricate the cone flats and adjuster plungers, *Items 840/1*, with white grease.
6. Fit two ⅜-in. setscrews into two of the rear axle mount bolt holes and clamp the assembly into a bench vice to hold firmly while the brake shoes are being fitted in place.
7. Apply white grease at the brake shoe web ends, the brake shoe steady post and at the slots in the plungers (tappets), *Item 840/1*.
8. Transfer the springs, *Item 836*, to the brake shoes, *Item 827*, so that the spring coils are inboard of the brake shoe webs.
9. Place the brake shoes with the springs attached against the back plate and fit the half-round slots to the adjuster plungers.
10. With both springs located at the springs, ease the shoes over the anchor pin and into the groove.
11. Taking great care to keep grease from contaminating the brake lining material, using a suitable lever, ease the brake shoe webs into the expander plunger slots.
13. Fit the assembly onto the rear axle, connect the brake cross rod ensuring the rear brake cable and compensator are set as described on Pages 5 and 6. Refer also to the Jowett *Maintenance Manual*, dated June, 1950.
14. At the brake shoe adjuster, set the shoes so that the brake drum is locked. Operate the brake pedal a few times, have it held down while the brake expander nuts are tightened. Release the brake pedal and check the Nyloc nuts so that the expander unit slides freely (without binding).
15. Release the brake shoe adjuster so that the brake drum spins with minimal resistance.
16. Repeat Steps 1 to 15 for the right-hand side rear brake.
17. After 500 miles (804·65 kilometres) have been travelled, check that hardware is tight and the brake shoe adjustment is correct.

To Install The Rear Brake Shoes – Full-Hydraulic



Above: Figure 25. The rear brake assembly (R.H.S. Shown).

Legend for *Figure 25*:

Item	Qty.	Part No.	Description
*^1263	1	54099	Rear Brake Complete – L.H. (GB41370)
*^1264	1	54100	Rear Brake Complete – R.H. (GB41371)
*1265	2	54206	Leading Shoe & Lining Assembly – R.H. & L.H. (GB41324BO)
*^1266	2	54220	Leading Shoe Only (GB41328)
*^1267	4	54221	Leading & Trailing Lining Only (GB41331BO)
*^1268	40	54222	Rivets (71-BS-1C)
*1269	2	54207	Trailing Shoe & Lining Assembly – R.H. & L.H. (GB41325BN)
*^1270	2	54223	Trailing Shoe Only (GB41329)
*^1271	1	54209	Wheel Cylinder & Handbrake Mechanism – L.H. (495515)
*^1272	1	54210	Wheel Cylinder & Handbrake Mechanism – R.H. (495516)
*1273	1	54373	Wheel Cylinder Body – L.H. Now has Groove for Rubber Boot (412811)!
*^1274	1	54374	Wheel Cylinder Body – R.H. Now has Groove for Rubber Boot (412821)!
*1275	2	54368	Spring (31118)
*1276	4	54375	Air Excluder (469841)
*1277	4	54270	Seal (468315)
*1278	4	54376	Piston – Now Replaced With Included Brake Shoe Notch (480272)
*1279	4	54377	Metal Dust Cover – Now Replaced With Rubber Boot (482747)
*1280	4	54361	Handbrake Tappet (480711)
*1281	4	54378	Roller 0·3125-in. Diameter x 0·1875-in. (27015)
*1282	2	54379	Cover Plate (487143)
*1283	8	54380	Cheese Head Screw – 2BA (13112)

Continued			
*1284	2	54381	Draw Link (481841)
*^1285	2	54224	Adjuster Unit Assembly – R.H. & L.H. (GB40875)
*1286	2	54224	Adjuster Housing (GB41130)
*1287	2	54225	Adjuster Wedge (GB522)
*1288	2	54226	Tappet – L.H. Bottom (GB40876)
*1289	2	54227	Tappet – L.H. Top (GB40877)
*^1290	4	54213	Adjuster Housing Setscrew (GB41132)
*^1291	4	54214	Grover Washer (GB539)
*^1292	2	54218	Dust Cover Plate (GB40994)
*^1293	4	54215	Slotted Nut ¼-in. UNF – Use Nyloc Nut (GB41158)
*1294	2	54211	Top Shoe Return Spring – Yellow (GB40897)
*1295	2	54212	Bottom Shoe Return Spring – Green (GB40655)
^1296	8	54204	Nut – ¼-in. UNF (GB41356)
*1297	2	54228	Rear Backing Plate Assembly (GB41316)

Above: From the May, 1952 Spare Parts Catalogue.

Notes: * Common to Jupiter, ^ Not Illustrated, ! Handed Due to Hydraulic Ports.

Refer to *Figure 25* for identification of components. The following procedure should be adopted to ensure that the brake shoes are correctly installed:

1. The grease seal housing, with a new seal installed, and backing plate support should be bolted to the backing plate, *Item 1297*, with the four ⅜-in. BSF bolts, plain washers and Nyloc nuts.
2. Assemble the brake adjuster housing, *Item 1286*, into the backing plate, *Item 1297*, apply a smear of Penrite Copper Eze to the two housing setscrews. Make sure that the setscrews do not protrude into the bores for the tappets, *Items 1288, 1289*. Coat the thread on the adjuster wedge, *Item 1287*, with Copper Eze and screw it fully home in the brake adjuster housing. Apply Penrite White Grease at the adjuster wedge cone flats and the tappet bores in the housing. Ensure that the pair of tappets are located so that the ends are closest to the housing, check that they are free to slide easily in their bores. Leave the adjuster wedge in the fully backed-off position.
3. Apply white grease, as a film, between the wheel cylinder assembly, *Items 1271, 1272*, and the backing plate, *Item 1297*, then install the wheel cylinder and check that it slides freely in its slot, next, apply a smear of white grease on the rear axle side of the backing plate for the dust cover plate, *Item 1292*, fit the cover using two ¼-in. plain washers and Nyloc ¼-in. UNF nuts, firmly tighten to lock the wheel cylinder body in place – then back-off the two nuts, equally, until the assembly just slides in the backing plate. The wheel cylinder body should not be able to tilt.
4. The wheel cylinder rubber dust covers will hold the pistons in place. If the wheel cylinder body is of the earlier type, then a piece of light gauge wire can be used to hold the metal covers, *Item 1279*, in place against the spring, *Item 1275*.
5. Apply a smear of white grease on the wheel cylinder body where the handbrake mechanism fits. Install the draw-link, *Item 1284*, tappets, *Item 1280*, and rollers, *Item 1281*, smear with white grease before fitting the cover plate, *Item 1282*. Secure with cheese head screws.

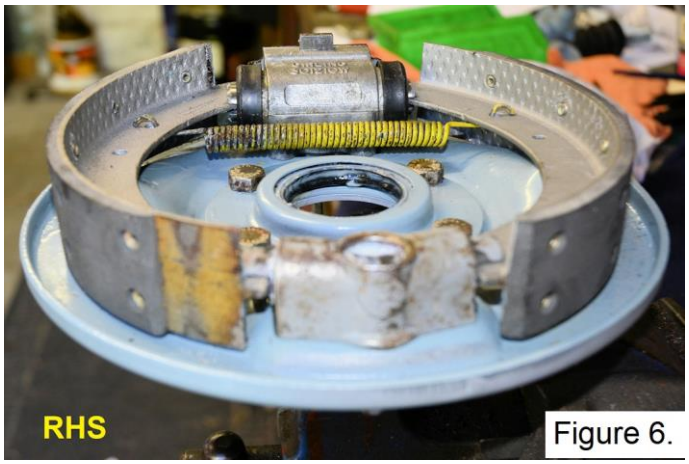


Figure 6.

Right: Figure 26 (6). RHS backing plate assembly held firmly in vice with brake shoes installed. Note the leading shoe (right) and trailing shoe at left. The brake adjuster is in foreground.

NOTE: A stripped screw thread in the wheel cylinder body for cheese head screw, *Item 1283*, is an ideal tap size for a 5 mm screw thread. The cover will need drilling to 5 mm to match.

6. The assembly should then be firmly clamped at two ⅜-in. backing plate mount nuts, in a bench vice. The bolts should be tight, to hold the backing plate firmly. Refer to *Figures 26 (6), 27 (7)*.
7. Apply white grease in slots for ends of the brake shoes.
8. For right hand side, use *Figure 26 (6)* as a guide for fitting the brake shoe springs. The yellow spring at wheel cylinder, green spring at adjuster housing end – both springs with clearance to the wheel cylinder body and the adjuster housing.
9. *Figure 27 (7)* shows a special tool made up for safely pulling the brake shoes, *Items 1265, 1269*, into their respective notches.

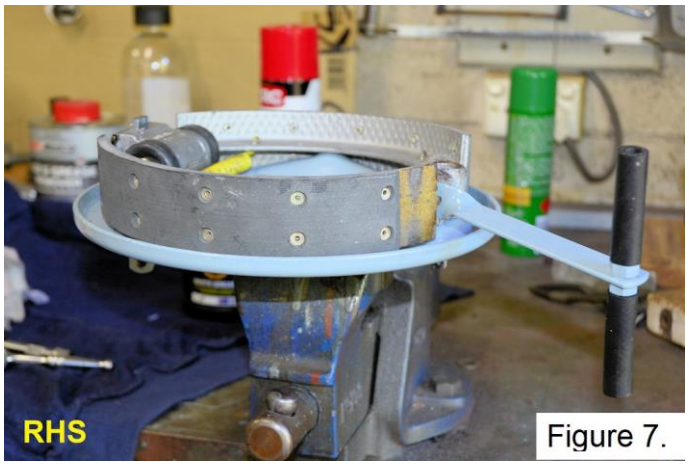


Figure 7.

Right: Figure 27 (7). Easy to grip tool for pulling brake shoes cleanly over adjuster and wheel cylinder.

10. Repeat Steps one to nine for the left hand side brake assembly. Be sure that the leading brake shoe has its lining gap in front of the wheel cylinder (in direction of forward rotation), and the trailing brake shoe has its lining gap at the brake adjuster housing.
11. *Figure 28 (8)* also illustrates the correct positioning of the two brake shoe return springs.
12. *Figure 29 (9)* shows the brake assembly fitted to the rear axle. This view shows the left hand side installation. The leading shoe is the upper brake shoe and the lower brake shoe is the trailing shoe. This setup provides wedge type brake shoe engagement with the brake drum and is less prone to brake judder concerns.

Figure 8.

Right: Figure 28 (8). L.H.S. backing plate assembly held firmly in vice. Note the lining gap at the shoe adjacent to the wheel cylinder piston.

13. Installation notes:

    Mount half shaft end float shims on the four securing bolts.

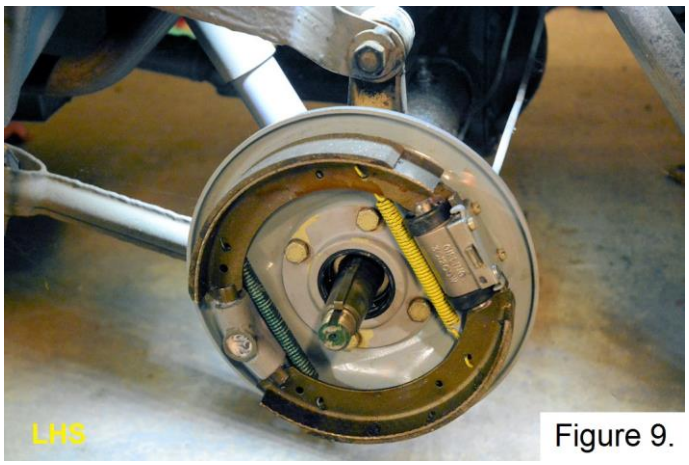


Figure 9.

Right: Figure 29 (9). Backing plate assembly installed on rear axle, left hand side shown. Installation on Jupiter – Javelin is the same.

    As the assembly is offered to the rear axle, it is advisable to ensure that the hydraulic pipe enters the port in the wheel cylinder.

    Coat bolts, pipe and union with Penrite Copper Eze to facilitate ease of future removal.

    Do not over tighten pipe union nut, pipe flare can widen and, as a consequence, be difficult to remove at a later time, see *Figure 11,* Page 13.

14. When connecting the handbrake rod clevis pins, coat the threaded pin with Copper Eze and place a ¼-in. plain washer between the anti-rattle spring and the draw link, *Item 1284*. The split pin hole is approximately 90° to the screwdriver slot in the threaded pin.
15. The taper surfaces at axle shaft and brake drum must be grease, oil and rust free. There should not be any burrs at the locating key. During brake drum installation, the brake shoes may require nudging in their notches, or the wheel cylinder sliding, to provide clearance for the brake drum. With the adjuster wedge backed right off, there should be ample clearance for the drum.
16. Apply Copper Eze at the shaft thread, fit the plain washer and tighten the nut dead tight.

A length of square tube with a hole to fit over a wheel stud, and wedged against the floor will assist with the nut tightening. The split pin hole in the axle shaft is at 90° to the keyway in the shaft. Should it not align with a slot in the nut, tighten the nut further to gain pin access. Install the pin and open the ends out, do not bend right over the nut and shaft. Cut off excess pin length for a neat appearance job.

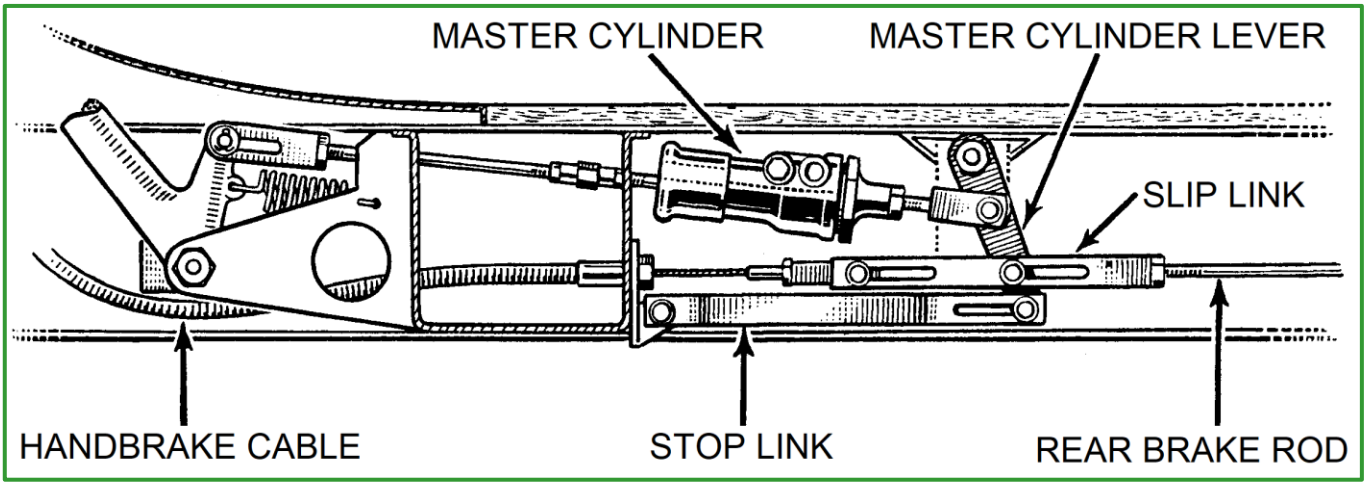
17. The entire braking system should have all air bled from the hydraulic components, in accordance with the instructions provided in the *Maintenance Manual*. Install rubber caps over bleed screws.

Setting The Handbrake

In both brake systems, the handbrake operates the brakes at the rear wheels, employing sheathed cables, rods and a brake compensator between the rear brake assemblies. Provided the handbrake system is properly maintained, rear brake shoe adjustment should keep handbrake lever travel to the usual four to six notches at the ratchet plate.

However, should the entire handbrake cables, rods and linkage have been disturbed, then the following procedures should be adopted:

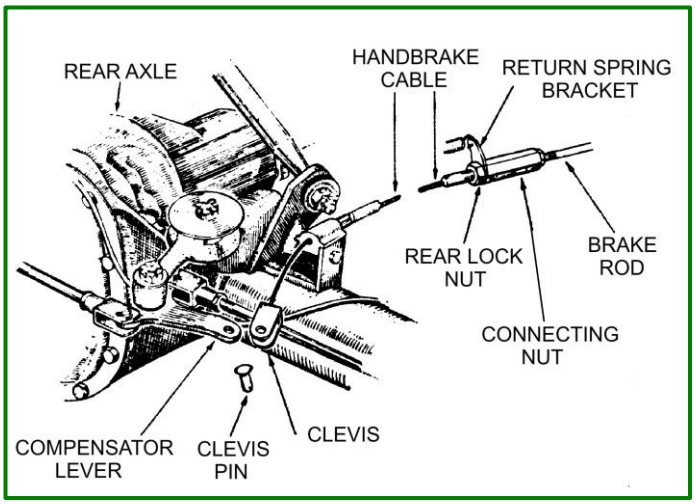
a) Hydro-Mechanical system – if adjustment of the rear brake shoes requires that the handbrake be reset, further adjustment should be made at the slip link behind the gearbox cross member, which connects the handbrake cable, at lower left in *Figure 28*., to the rear brake rod at lower right.



Above: Figure 30. Handbrake adjustment.

The handbrake lever should be in the full off position at the ratchet plate, the lever should be kept in this position throughout the setting procedure. The cable should be adjusted so that the slip link rear slot is against the master cylinder lever clevis pin. Adjust the rear brake rod to hold the slip link in this position. The rear compensator lever should be set with the pull arm at 15° rearward of the axle centre line, with the cross rods adjusted to enable the clevis pins to be fitted without strain. The brass connecting link must pivot freely on the brake compensator bracket. Adjust the rear brake rod for the handbrake to be fully applied at four to six notches. This setting is important because the rear axle to chassis relationship can change due to suspension movement.

b) Full-Hydraulic system – For this system, the handbrake is a completely separate mechanical setup that operates only on the rear brakes.



Right: Figure 31. Handbrake cable and rear brake compensator with cable and rod.

Normal adjustment is carried out at the rear brake shoe adjusters. If, however, the hand lever pulls seven or more ‘clicks’ at the ratchet it will be necessary to readjust the setting.

To do this, remove the split pin and withdraw the clevis pin from the clevis connecting the handbrake cable to the brake compensator lever at the rear axle (*Figure 31*). Move the

compensator lever forward to take up any free movement in the brake linkage, leaving the lever in this position, move the brake cable and brake rod connecting nut which is situated at the side of the centre universal joint. Slacken off the rear locknut which secures the threaded end of the cable in the connecting nut, and dis-connect the return spring. Screw the threaded end of the cable into the connecting nut until the holes in the rear handbrake cable clevis just coincide with the hole in the compensator lever. Replace the clevis pin and test the handbrake, which should click over four or five notches at this setting. Replace the split pin in the clevis pin and tighten the rear cable lock nut positioning the return spring bracket so that the spring pulls in line with the brake cable. Refasten the return spring.

c) Lubrication – Applies to both systems, the cables should be lubricated at 2,500 miles (4,023 kilometres) intervals with graphite grease. Should graphite grease not be readily available, mix graphite powder with good quality general purpose grease.

   Every 10,000 miles (16,093 Kilometres) the cables should be checked for inner cable fraying and for freedom of movement. The cables can be removed from the vehicle, immersed in non-corrosive engine degreaser. While the assembly is soaking, the inner cable should be worked fore and aft to help dislodge accumulated and stiffened grease out of the sheath. Always apply grease to the exposed portions of the inner cable to prevent rust.

   Note: A frayed inner cable should be replaced immediately. This is particularly important with regard to the hydro-mechanical braking system.

The Importance Of Brake Implementation

Driving in modern day traffic conditions relies extensively on a vehicle's maximum braking ability. Younger drivers of modern vehicles have minimal comprehension about the braking performance of an older motor car being less efficient than that of the ultra-modern vehicle they are driving. A Jowett is not equipped with predictive brake system. All too often, a safe distance from the vehicle in front, is suddenly filled by an impatient vehicle driver, and planned braking distance has vanished.

For such ignorant and impatient driving behaviour conditions, a Jowett's braking system has to be in well-maintained condition at all times. A vital part of good braking performance is minimal brake pedal travel, it is worthwhile experimenting on a quiet country road to find out how far the car has travelled in the time from initiating pedal movement and the brakes actually commencing to retard the car – this can be surprising at varying speeds. Brakes that are properly adjusted and maintained in good condition can have a great effect when having to brake urgently in a confined traffic space.

Think about it!

WARNING! BRAKE COMPONENT MODIFICATION

Most importantly, the actuation components of a Jowett vehicle's braking system should not be modified. The ramifications of such modifications can be, in the event of an accident where a person is injured, extremely profound.

An example could be converting a hydro-mechanical system to a full-hydraulic system. Such a major change would require a VSR-33 report signed by a VicRoads approved Vehicle Safety Engineer.