SECTION L

BRAKES

Section No. L.1. Description.

Section No. L.2. Front brake assemblies

Section No. L.3. Rear brake assemblies

Section No. L.4. Brake pedal

Section No. L.5. Master cylinder

Section No. L.6. Handbrake

Section No. L.7. Maintenance

Section No. L.8. Fault diagnosis

Section L.1

DESCRIPTION

The brakes on all four wheels are hydraulically operated by foot pedal application, directly coupled to a master cylinder in which the hydraulic pressure of the brake operating fluid is originated. A supply tank cast integrally with the master cylinder provides a reservoir by which the fluid is replenished, and a pipe line consisting of tube, flexible hose and unions, interconnect the master cylinder and the wheel cylinders.

The pressure generated in the master cylinder by application with the foot pedal is transmitted with equal and undiminished force to all wheel cylinders simultaneously. This moves the pistons outwards, which in turn expand the brake shoes thus producing automatic equalisation, and efficiency in direct proportion to the effort applied at the pedal.

When the pedal is released the brake shoe springs return the shoes which then return the wheel cylinder pistons, and therefore the fluid back into the pipe lines and master cylinder.

An independent mechanical linkage actuated by a handbrake, mounted alongside the propeller shaft tunnel, operates the rear wheels by mechanical expanders attached to the rear wheel cylinder bodies.

The front brakes are of the two leading shoe types with sliding shoes which ensure automatic centralisation of the brake shoe in operation.

The rear brakes are also fitted with sliding shoes, and incorporate the handbrake mechanism.

Front Brakes

The front brakes are operated by two wheel cylinders situated diametrically opposite each other on the inside of the backplate and interconnected by a bridge pipe on the outside.

Each cylinder operates one shoe only. A single piston in each cylinder acts on the leading tip of its respective shoe, while the trailing tip of the shoe finds a floating anchor by utilizing the closed end of the actuating cylinder of the other shoe as its abutment. Between the piston the leading tip of each shoe is a 'Micram' adjuster which is located in a slot in the shoe.

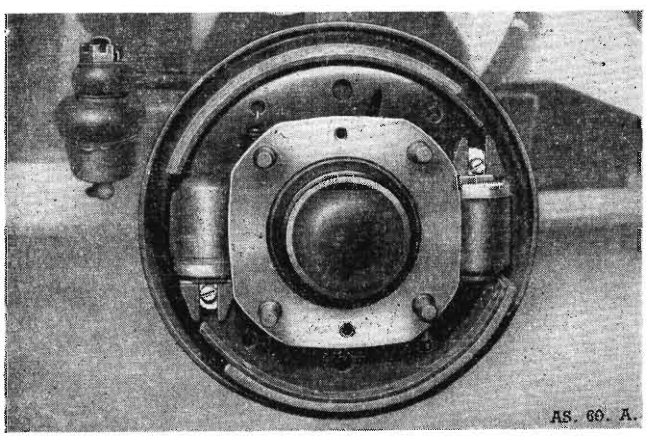


Fig. L.1. The front brake assembly.

Each wheel cylinder (Fig. L3.) consists of a casting containing a piston fitted with a cover and backed by a rubber cup. The space in front of the rubber cup is partially occupied by a cup filler which is loaded by a spring.

The brake shoes are held in position by two return springs.

The bleed screw is incorporated in the farthest brake cylinder from the master cylinder, being on a banjo connection at the back of the backplate. When the bleed screw is turned in an anti-clockwise direction a steel valve ball is released from its seat and hydraulic fluid escapes.

Rear Brakes

The rear brake shoes are not fixed but are allowed to slide and centralise with the same effect as in the front brakes. They are hydraulically operated by a single acting wheel cylinder. The cylinder which is fitted in a slot in the rear backplate is free to slide in the slot between the tips of the brake shoes (which are of the leading and trailing type). The cylinder has a single piston operating on the tip of the leading shoe and this shoe butts against the fixed anchor block on the backplate, the web of the shoe being free to slide in a slot in the block. The trailing shoe is located in a similar way between the anchor block and the closed end of the hydraulic cylinder, and is free to slide and therefore self-centring, this shoe is operated by movement of the cylinder assembly as a result of the reaction of the leading shoe against the brake drum.

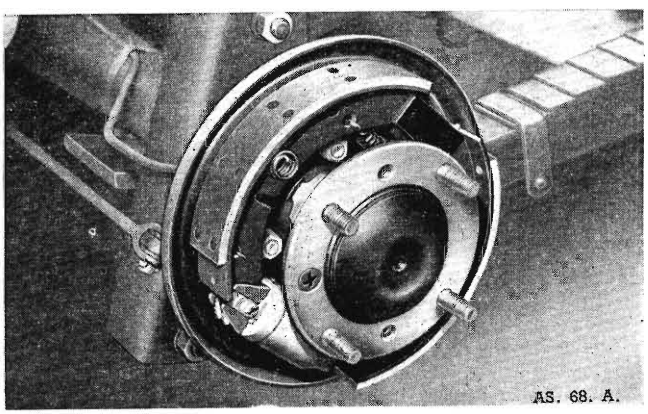


Fig. L.2. The rear brake assembly.

A 'Micram' adjuster is located in a slot in the tip of the leading shoe.

The wheel cylinder contains two pistons, the inner being hydraulically operated while the outer is

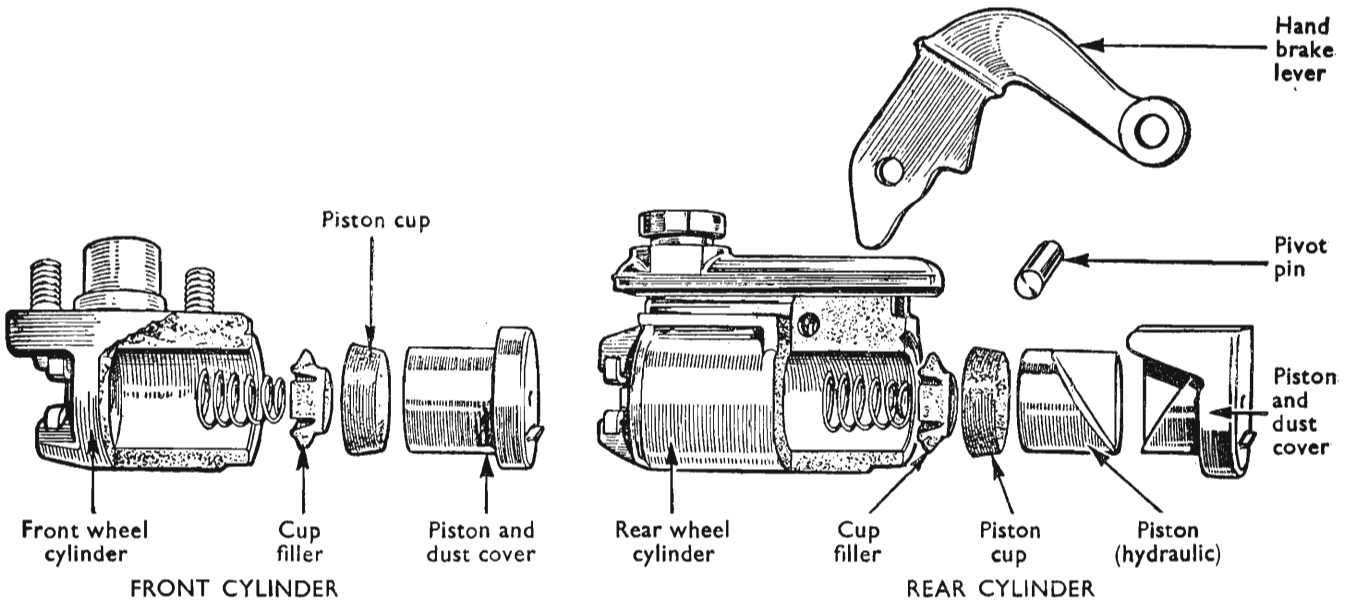


Fig. L.3. Components of the front and rear wheel cylinders.

manually operated by the handbrake lever. The inner piston is backed by a rubber cup and the space in front of the cup partially occupied by a cup filler which is loaded by a spring. When operated hydraulically, the inner piston butts against the outer piston leaving the handbrake lever undisturbed, and applies a thrust to the tip of the leading shoe through the dustcover, 'Micram' adjuster and mask. When operated manually, an inwards movement of the handbrake lever brings the heel of the lever into contact with the outer piston, thrusting it outwards against the leading shoe without disturbing the inner piston. A rubber boot is fitted to exclude foreign matter.

The brake shoes are held in position by two return springs.

Note: When refitting brake shoes the springs must lie between the brake shoes and the backplate, this also applies to the front brake shoes.

The rear brake shoes are located relative to the backplate by two steady springs.

Section L.2

FRONT BRAKE ASSEMBLIES

To Remove

(1) Disconnect the hydraulic pipe from the master cylinder at the backplate.
(2) Remove the front brake backplate from the front suspension as described in Section K.

To Dismantle

(1) Pull one of the brake shoes against the load of the return springs, away from the abutment on the closed end of the adjacent cylinder and slide the 'Micram' mask off the piston cover of the operating cylinder; on releasing the tension of the return springs the opposite brake shoe will fall away.
(2) Disconnect the bridge pipe between the two brake cylinders complete with the banjo adaptors.
(3) Unscrew the nuts and withdraw the brake cylinders from the backplate.
(4) To dismantle a brake cylinder withdraw the piston complete with the piston cover from the cylinder and apply a gentle air pressure to the fluid connection to blow out the rubber cup, and cup filler.

Examination for Wear

Examine the rubber cups for wear perishing and swelling, and renew were necessary.

Any rust on the cylinder bore or piston must be removed or this will eventually cause a seizure of the piston. If the cup filler is fractured it must be renewed. Clean all the components with Lockheed brake fluid.

To Reassemble

(1) Fit the smaller end of the coil spring over the projection in the cup filler.
(2) Place the assembly in the cylinder, spring foremost, followed by the cup, lip foremost, and the piston. Take care not to damage or turn back the lip of the cup when entering the cylinder bore.

To Replace

The replacement is a reversal of the procedure 'To Remove'.

Before replacing the brake shoes examine them for

excessive wearing or glazing. Brake linings may be removed, or complete exchange brake shoes are available.

Section L.3

REAR BRAKE ASSEMBLIES

To Remove

(1) Disconnect the hydraulic pipe from the master cylinder at the backplate.

(2) Disconnect the rod from the hand brake lever at the backplate.

(3) Remove the rear brake backplate from the back axle.

To Dismantle

(1) Pull the trailing shoe against the load of the return springs and away from its abutment at either end. On releasing the tension of the return springs the leading shoe will fall away. Collect the 'Micram' adjuster and mask.

(2) Unscrew the banjo bolt securing the banjo adaptor to the wheel cylinder and remove the rubber boot.

(3) Remove the wheel cylinder piston, swing the handbrake lever until the shoulder is clear of the backplate and slide the cylinder casting forward Pivot the cylinder about its forward end and withdraw the rear end from the slot in the backplate, a rearward movement of the cylinder will now bring its forward end clear of the backplate.

(4) Withdraw the piston complete with cover from the cylinder. Remove the handbrake pivot pin and lever. Apply a gentle air pressure to the fluid connection and blow out the hydraulic piston, rubber cup, and cup filler.

To Reassemble

(1) Fit the spring in the cup filler and insert the parts, spring leading, into the bore followed by the rubber cup, lip foremost, taking care not to damage or turn back the lip of the cup.

(2) Insert the hydraulic piston ensuring that the slot in the piston coincides with the lever slot in the cylinder casting.

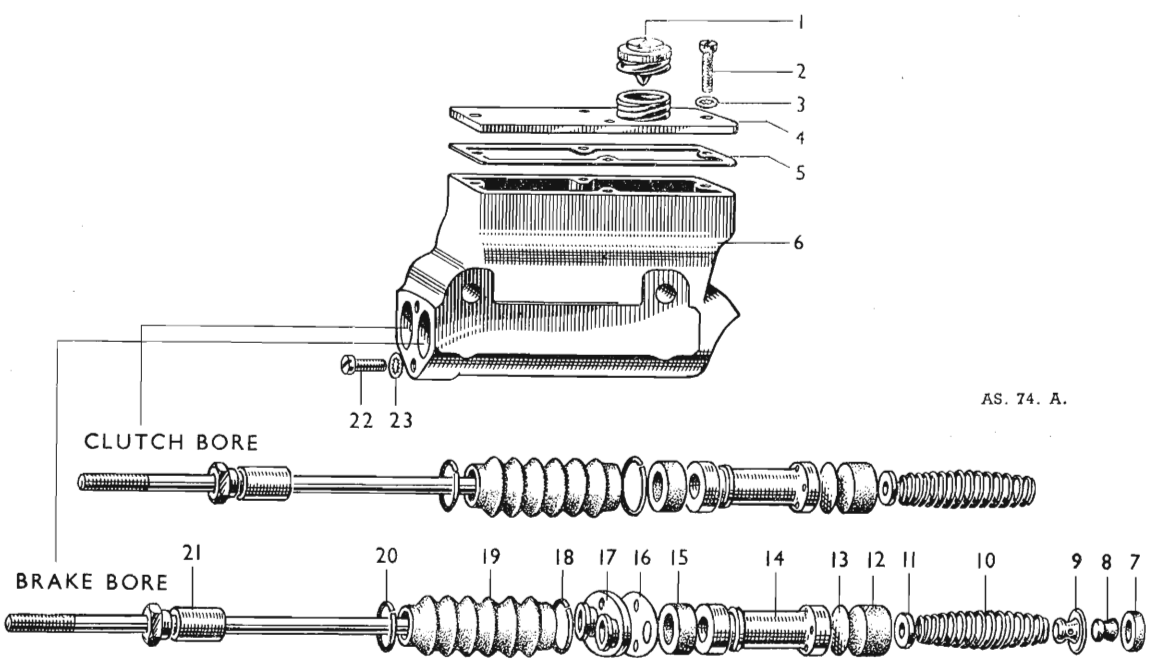


Fig. L.4. The master cylinder exploded.

1. *Filler cap.*
2. *Fixing screw.*
3. *Shakeproof washer.*
4. *Tank cover.*
5. *Tank cover gasket.*
6. *Cylinder barrel and tank.*
7. *Valve washer.*
8. *Valve cup.*
9. *Valve body.*
10. *Return spring.*
11. *Spring retainer.*
12. *Main cup.*
13. *Piston washer.*
14. *Piston.*
15. *Secondary cup.*
16. *Gasket.*
17. *Boot fixing plate.*
18. *Boot clip.*
19. *Boot.*
20. *Boot clip.*
21. *Push rod.*
22. *Fixing screw.*
23. *Shakeproof washer.*

(3) Place the handbrake lever in position and fit the pivot pin. Insert the handbrake piston complete with dust cover, ensuring that the lever is engaged in the slot in the piston.

(4) Offer up the wheel cylinder to the backplate with the handbrake lever through the slot, and the piston pointing in the direction of forward rotation of the wheel. Engage the forward end of the cylinder in the slot and slide it well forward, taking care to position the lever so that its shoulder clears the backplate. Engage the rear end of the cylinder in the slot and slide it back to hold it in position.

(5) Fit the rubber boot. Mount the banjo connection on the cylinder and, using a new copper washer fit the banjo bolt.

(6) Assemble the brake shoes, ensuring that the 'Micram' adjuster is in the slot in the leading shoe with the mask in position, and that the return springs lie between the brake shoes and the backplate. It should be noted that the unlined end of the leading shoe is to be nearest to the brake cylinder, whilst the unlined end of the trailing shoe is to be nearest the abutment block.

(7) Reassemble the backplate to the back axle. Ensure that all the adjustment is backed-off, fit the brake drum and the road wheel, connect the handbrake pull-rod and hydraulic pipe, 'bleed' and adjust the brakes.

Section L.4

BRAKE PEDAL

To Remove

(1) Working under the bonnet disconnect the pedal from the master cylinder by removing the clevis pin anchoring the master cylinder push-rod to the brake pedal.

(2) Working within the car unscrew the nut securing the brake and clutch pedal shaft, and withdraw the shaft to release the brake and clutch pedals and their distance piece.

(3) Withdraw the brake pedal downwards out of the car.

(4) Inspect the lever bush for wear and renew if necessary.

Section L.5

MASTER CYLINDER

Description

The master cylinder caters for operation of both brake and clutch. It has two bores which are side by side and, except for the fact that one has no check valve, each bore accommodates normal master cylinder parts. The bore with the check valve serves the brakes, the other serves the clutch slave cylinder.

Dismantling the Brake Cylinder

(1) Unscrew the set screws securing the boot fixing plate to the master cylinder body.

(2) Detach the fixing plate from the master cylinder leaving the boots and push rods attached to the clutch and brake pedals.

(3) Unscrew the common filler cap and drain the fluid into a clean container.

(4) Withdraw the piston (14) Fig. L.4, piston washer (13), main cup (12) and return spring (10), valve body (9) complete with rubber cup (8) and rubber washer (7).

(5) Using only the fingers to prevent damage, remove the secondary cup (15) by stretching it over the end flange of the piston.

(6) Examine all parts, especially the washers, for wear or distortion, and replace with new parts where necessary.

Assembling the Brake Cylinder

(1) Fit the secondary cup (15) on the piston (14), so that the lip of the cup faces the piston head and gently work the cup round the groove with the fingers to ensure that it is properly seated.

(2) Place the rubber washer (7) in position in the bottom of the cylinder bore. Fit the rubber cup (8) in the valve body (9) and assemble the body on the larger end of the return spring (10).

(3) Assemble the retainer (11) on the smaller end of the return spring and insert the assembly into the cylinder.

(4) Install the main cup (12) into the cylinder, lip foremost, taking care not to damage or turn back the lip of the cup.

(5) Follow up with the piston washer, pay particular attention to the illustration showing method of assembly.

(6) Press the piston (14) into the cylinder taking care not to damage or turn back the lip of the secondary cup (15).

(7) Insert the push rod in the piston and manoeuvre the boot fixing plate into position. Secure the plate by its two set screws and then ascertain that the rubber boots are seating correctly. The vent holes in each boot should be at the bottom where the cylinder is mounted on the vehicle.

If the boots are damaged or perished, new ones should be fitted.

(8) Fill the reservoir with clean Lockheed brake fluid and test the brake cylinder by pushing the piston inwards and allowing it to return unassisted. After a few applications, fluid should flow from the outlet connection in the cylinder barrel.

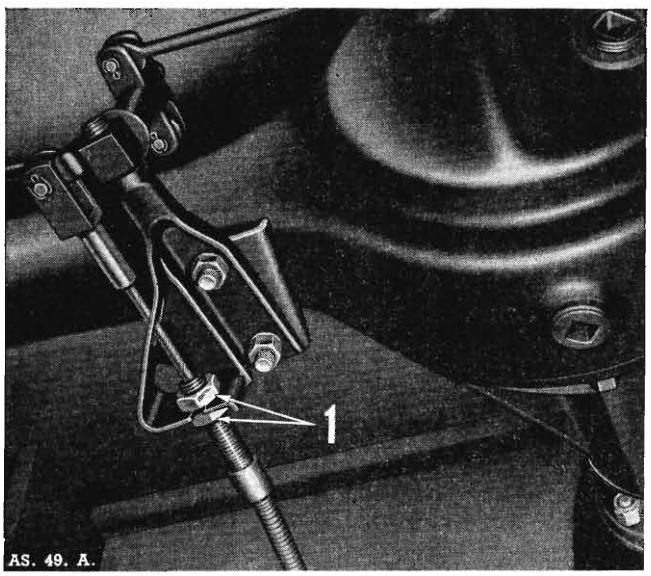


Fig. L.5. Shows location of handbrake cable adjustment (1) *on the rear axle.*

Replacement.

The installation of the master cylinder is the reversal of the removal procedure.

If no further maintenance of the brake is necessary remember to bleed the system.

Section L.6

HANDBRAKE

The handbrake operates on the rear wheels only and is applied by a pull-up type of lever situated on the side of the propeller shaft tunnel. The Bowden cable from the control is attached to the compensator mounted on the rear axle. From compensator to the brake levers are transverse rods which are non-adjustable.

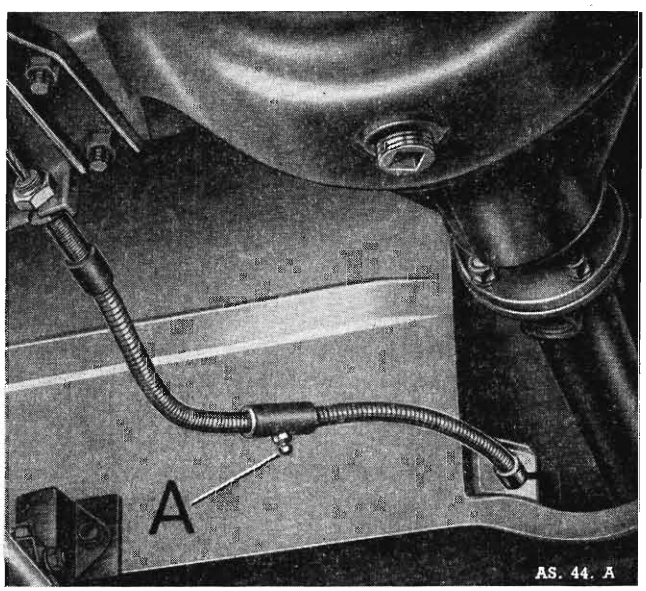


Fig. L.6. The handbrake rear cable lubricator (*A*).

The handbrake linkage is set when leaving the works and should not require any attention. Only when a complete overhaul is necessary should the handbrake linkage require re-setting.

To adjust the handbrake, the rear shoes should be locked to the drums, the handbrake control just slightly applied, and the cable slackness just removed, by means of adjusting the sleeve nut at the rear of the Bowden cable (Fig. L.5).

The handbrake mechanism is lubricated by two grease nipples, one on the compensating mechanism and the other on the Bowden cable.

Section L.7

MAINTENANCE

Replenishment of Hydraulic Fluid

Inspect the supply tank at regular intervals and ascertain that the fluid level is up to the bottom of the filler plug threads.

Great care should be exercised when adding brake fluid, to prevent dirt or foreign matter entering the system.

Important: Serious consequences may result from the use of incorrect fluids, and **Lockheed Genuine Brake Fluid** or a fluid conforming to specification S.A.E. 70 R.1. must be used. This fluid has been specially prepared and is unaffected by high temperature or freezing.

Bleeding the Hydraulic System

Bleeding is necessary any time a portion of the hydraulic system has been disconnected, or if the level of the brake

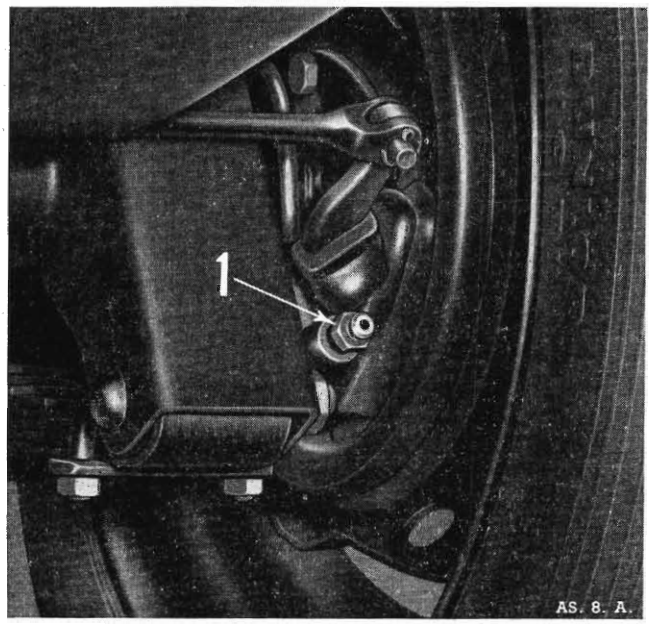


Fig. L.7. Illustrating a rear brake bleed nipple.

fluid has been allowed to fall so low that air has entered the master cylinder.

With all the hydraulic connections secure and the supply tank topped up with the fluid, remove the rubber cap from the rear bleed nipple which is farthest away from the master cylinder and fit the bleed tube over the bleed nipple, immersing the free end of the tube in a clean jar containing a little brake fluid.

Unscrew the bleed nipple about three-quarters of a turn and then operate the brake pedal with a slow full stroke until the fluid entering the jar is completely free of air bubbles. Then, during a down stroke of the brake pedal, tighten the bleed screw sufficiently to seat the ball, remove bleed tube and replace the bleed nipple dust cap. **Under no circumstances must excessive force be used when tightening the bleed screws.**

This process must now be repeated for each bleed screw at each of the three remaining backplates, finishing at the wheel nearest the master cylinder. Always keep a careful check on the supply tank during bleeding, since it is most important that a full level is maintained. Should air reach the master cylinder from the supply tank, the whole of the bleeding operation must be repeated.

After bleeding, top up the supply tank to its correct level.

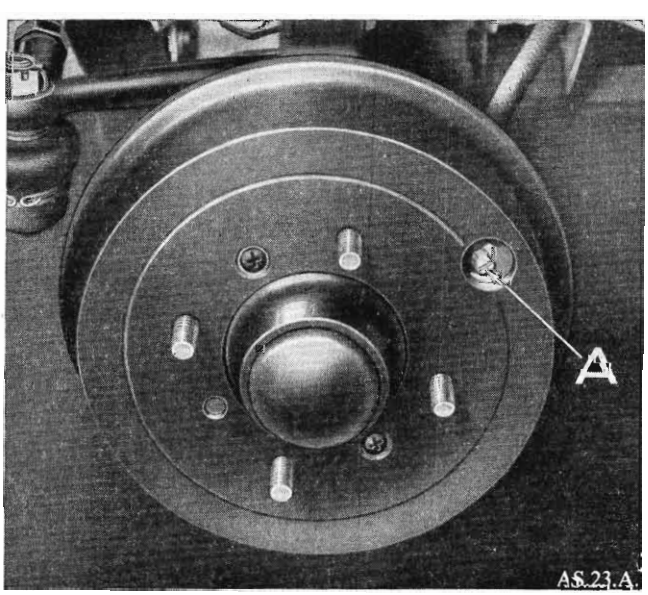


Fig. L.8. Showing front brake drum with one of the brake shoe adjusters 'A'.

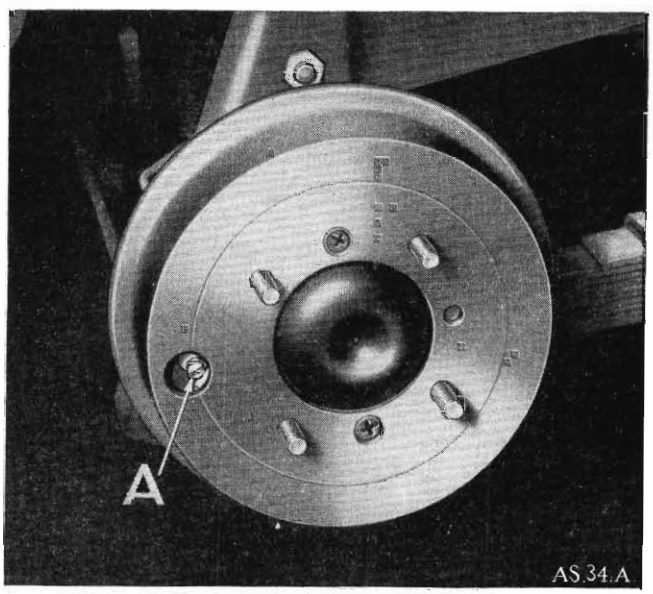


Fig. L.9. Showing rear brake shoe adjuster 'A'.

Never use fluid that has just been bled from a brake system for topping up the supply tank, as this brake fluid may be to some extent aerated. Such fluid must be allowed to stand for at **least** twenty-four hours before it is used again. This will allow the air bubbles in the fluid time to disperse.

Great cleanliness is essential when dealing with any part of the hydraulic system, and especially so where the brake fluid is concerned. Dirty fluid must never be added to the system.

Note: It is advisable to turn all the brake shoe adjusters to their full 'off' position before bleeding. After bleeding adjust brakes as described below.

Adjusting the Brake Shoes

The brakes are adjusted for lining wear, **only** at the brakes themselves, and on no account should any alteration be made to the handbrake cable for this purpose.

Front Brakes. A separate 'Micram' adjuster is provided for each shoe. Jack up the car until the wheel concerned is clear of the ground. Remove the wheel disc, and rubber dust plug from the adjusting hole. Rotate the wheel until the adjusting hole comes opposite one of the adjusters (located at 8 and 2 o'clock). Using a screwdriver turn the adjuster in a clockwise direction until the brake shoe is in contact with the brake drum, then turn the adjuster back one notch, this should provide correct clearance between the shoe and the drum. If closer adjustment is required spin the drum and apply the brakes hard, this will correctly position the shoe after which a further adjustment check should be made. Repeat these operations on the second adjuster. Adjust the other wheel cylinders in similar manner.

Rear Brakes. Place chocks under one of the front wheels and release the handbrake. Proceed as for the front brake adjustment but noting that there is only one wheel adjuster to adjust each rear wheel, and that it may be necessary to back off two notches to provide adequate clearance for the two shoes.

Section L.8 FAULT DIAGNOSIS

Symptom	No.	Possible Fault
(a) **Spongy Pedal (loss of fluid pressure)**	1	Leak in system
	2	Master cylinder plunger worn
	3	Wheel cylinder leaking
	4	Air in system
	5	Lining not "down" on shoe
(b) **Excessive Pedal Depression**		In (a) check 1 and 4
	1	Excessive lining wear
	2	Extremely low brake fluid level
	3	Too much pedal free movement
(c) **Brakes Grab or Pull to Side**	1	Brake backplate loose on axle
	2	Scored, cracked or distorted drum
	3	High spots on drum
	4	Incorrect shoe adjustment
	5	Oily or wet linings
	6	Rear axle or front suspension anchorage loose
	7	Worn or loose rear spring anchorage
	8	Worn steering connections
	9	Different grade or types of lining fitted
	10	Uneven tyre pressures

Symptom	No.	Possible Fault
(d) Dragging Brakes		In (c), check 3
	1	Wheel cylinder piston seized
	2	Weak or broken brake shoe return springs
	3	Master cylinder by-pass port restricted
	4	Too little pedal free movement
	5	Handbrake mechanism seized
	6	Supply tank overfilled
	7	Filler cap air vent choked
(e) Springy Pedal	1	Lining not 'bedded-in'
	2	Brake drums weak or cracked
	3	Master cylinder fixing loose
(f) Brakes Inefficient		In (c), check 4
		In (d), check 7
	1	Incorrect type of linings fitted