Section G
STEERING UNIT AND LINKAGE – ALL MODELS

INDEX

LIST OF ILLUSTRATIONS

Steering unit

To remove **Operation G/2**

1. Unscrew the clamp bolt and withdraw the steering wheel.
2. Disconnect the clamp securing the horn switch and support bracket to the steering outer column, then remove the assembly complete with leads.
3. Remove the spare wheel if mounted on bonnet, disconnect the support and lift the bonnet clear.
4. R.H.D. models only—Remove the air cleaner.
5. Remove the name plate and withdraw the radiator grille.
6. Loosen the bolt securing the upper relay lever to the relay unit and prise the lever clear.
7. Turn the road wheels to allow the longitudinal steering arm to move fully forward, then slacken the clamping bolt nearest the drop arm and unscrew the longitudinal arm complete with relay lever.
8. **2¼ Litre Petrol R.H.D.:** disconnect the accelerator control linkage.
9. Remove the bolts securing the steering support bracket to chassis side-member, scuttle and wing valance.
10. The support clip, rubber strip, support brackets and seal must now be removed from the dash.
11. Withdraw the steering unit complete with support plate, drop arm and ball joint from under the front wing.
12. Remove the securing screw and extract the drop arm, using special tool (Part No. 262776).
13. Unscrew the castellated nut and remove the ball joint from drop arm by tapping the side adjacent to taper smartly with a hammer.

Steering unit—to dismantle **Operation G/4**

1. Remove the side cover and drain off the oil.
2. Lift off the main nut, roller, and withdraw the rocker shaft.
3. With the outer column held in a vice, unscrew the nuts holding the steering box and tap the inner column at the steering wheel end with a hide-faced hammer to partially remove the box.
4. Withdraw the box and inner column complete. The dust cover at the top of steering column will be freed by this last operation and care must be taken to ensure that this or balls from the steering box are not inadvertently lost.

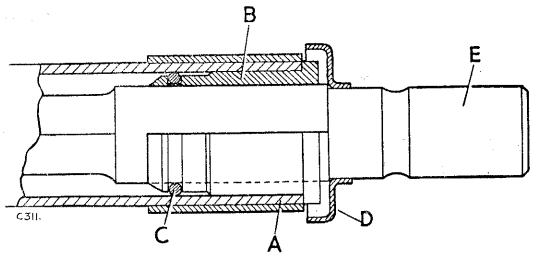


Fig. G-1—Sectioned view of steering column top

A—Column outer tube
B—Tufnol bush
C—Seal
D—Dust cover
E—Inner shaft

5. Make provision for catching the balls, and with a hide-faced hammer, gently tap the box away from the **inner column** sufficiently to remove the outer ball race.

   The main nut should be positioned approximately midway on the cam during this operation.

6. Turn the inner column to unscrew the main nut assembly and withdraw the column completely from the steering box. Remove the main nut assembly.

7. Remove the end cover, shims, ball race and any balls that may have dropped into the steering box.

8. The ball transfer tube may be removed from the main nut.

9. If oil leakage and bearing wear is excessive, remove the retaining washer, oil seal and press out the bush from steering box.

10. Remove the bush and seal from top of outer of column, if excessively worn.

Steering unit, to assemble Operation G/6

1. Press the Tufnol bush with oil seal into the top outer steering column tube.

2. If removed fit the rocker shaft bush to the steering box.

3. Locate the rocker shaft seal and retaining washer.

4. Grease a suitable shim and two paper washers each side of the shim, to the flange on the outer column, then mount the outer column in a vertical position in a vice (Tufnol bush downwards).

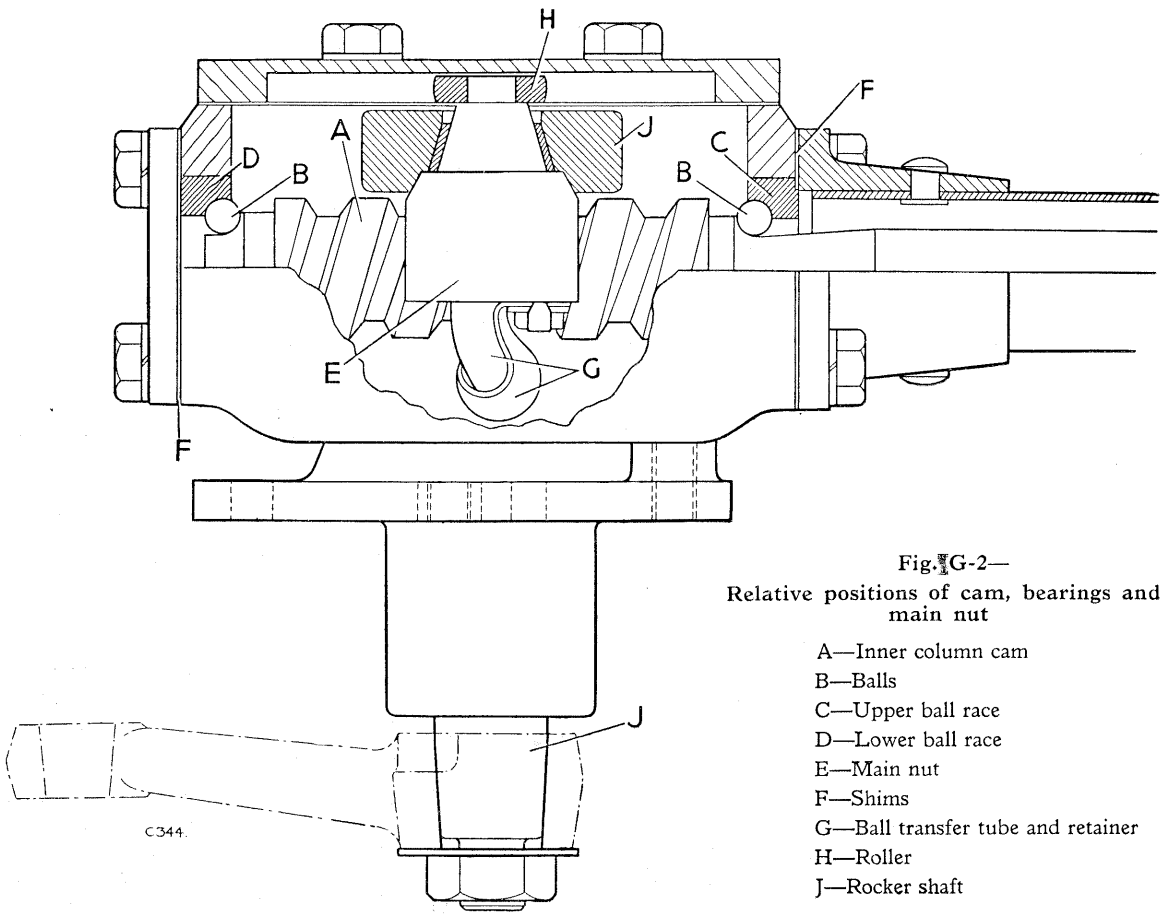


Fig. G-2—
Relative positions of cam, bearings and main nut

A—Inner column cam
B—Balls
C—Upper ball race
D—Lower ball race
E—Main nut
F—Shims
G—Ball transfer tube and retainer
H—Roller
J—Rocker shaft

5. Place one of the ball races less ball bearings over the inner column and slide the inner column into the outer column and Tufnol bush, ensuring it is free to rotate. Lift the inner column a little, grease the ball race and load with ten ball bearings, ensuring that none fall down the inside of the outer column.

6. Assemble the main nut, replacing balls as necessary and retain them in position with grease. Locate the assembly in steering box and lower on to the cam end of the inner column.

7. Carefully rotate the inner column, ensuring that the ball bearings in the main nut are not dislodged, and the steering box is up the correct way. (Filler plug towards the outer column.)

8. Grease the lower ball race and load with ten ball bearings, carefully insert the race into the steering box and locate on the inner column, ensuring that none of the ball bearings are dislodged.

9. Locate the shims, joint washer and end cover, then carefully tighten. The column may now be positioned horizontally.

   The inner shaft should have **no** end-float, but to ensure that the bearings are not over-stressed, sufficient shims must first be fitted to allow an end-float reading and then shims equivalent in thickness to this reading, be removed.

10. Replace the rocker shaft, roller, joint washer and cover, ensuring that the roller is correctly located in the cover slot.

11. With the main nut at mid-position on cam, tighten the adjusting screw on side cover by hand until resistance is felt as it contacts the rocker shaft; tighten a further tenth of a turn and lock the adjusting screw.

12. Refit the dust cover to top end of steering column.

Steering unit, to refit **Operation G/8**

1. Refit the support plate to chassis side-member, scuttle and wing valance.

2. Mount the steering unit less drop arm, then secure at dash and, using internal type shake-proof washers, support plate. Refit the horn switch and bracket assembly.

3. Turn the inner steering column lock to lock and select the intermediate position.

4. Replace the steering wheel with one series of spokes pointing forward and secure.

5. Screw the ball joint into the longitudinal arm and lock in the original position.

6. Fit the longitudinal arm complete with upper relay lever to the drop arm and insert the assembly along the top of chassis side-member. Connect the upper relay lever to relay unit.

7. With the front wheels positioned "straight ahead" and the steering wheel in the **intermediate** position, fit the drop arm to the rocker shaft. The longitudinal arm may require adjusting slightly to align the splines of drop arm and steering rocker shaft.

8. Check the steering, lock to lock, for correct functioning. Adjust if necessary by altering the length of the longitudinal arm.

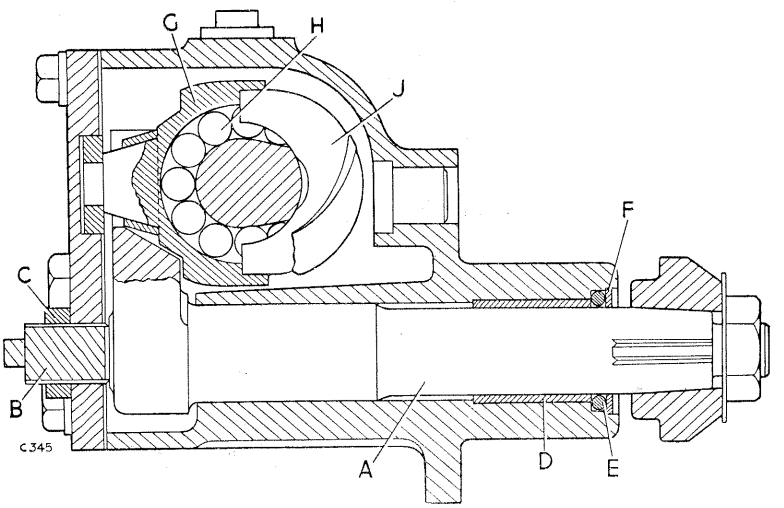
Steering relay unit

To remove **Operation G/10**

1. **R.H.D. models:** Remove the air cleaner and battery.

2. **Diesel models L.H.D.:** Remove battery on left-hand side.

3. Remove the bolts securing the radiator grille panel to the front wings.



A—Rocker shaft

B—Adjusting screw—rocker shaft

C—Locknut

D—Rocker shaft bush

E—Rocker shaft seal

F—Seal retainer

G—Main nut

H—Main nut balls

J—Transfer tube

Fig. G-3—Sectioned view of rocker shaft and steering box

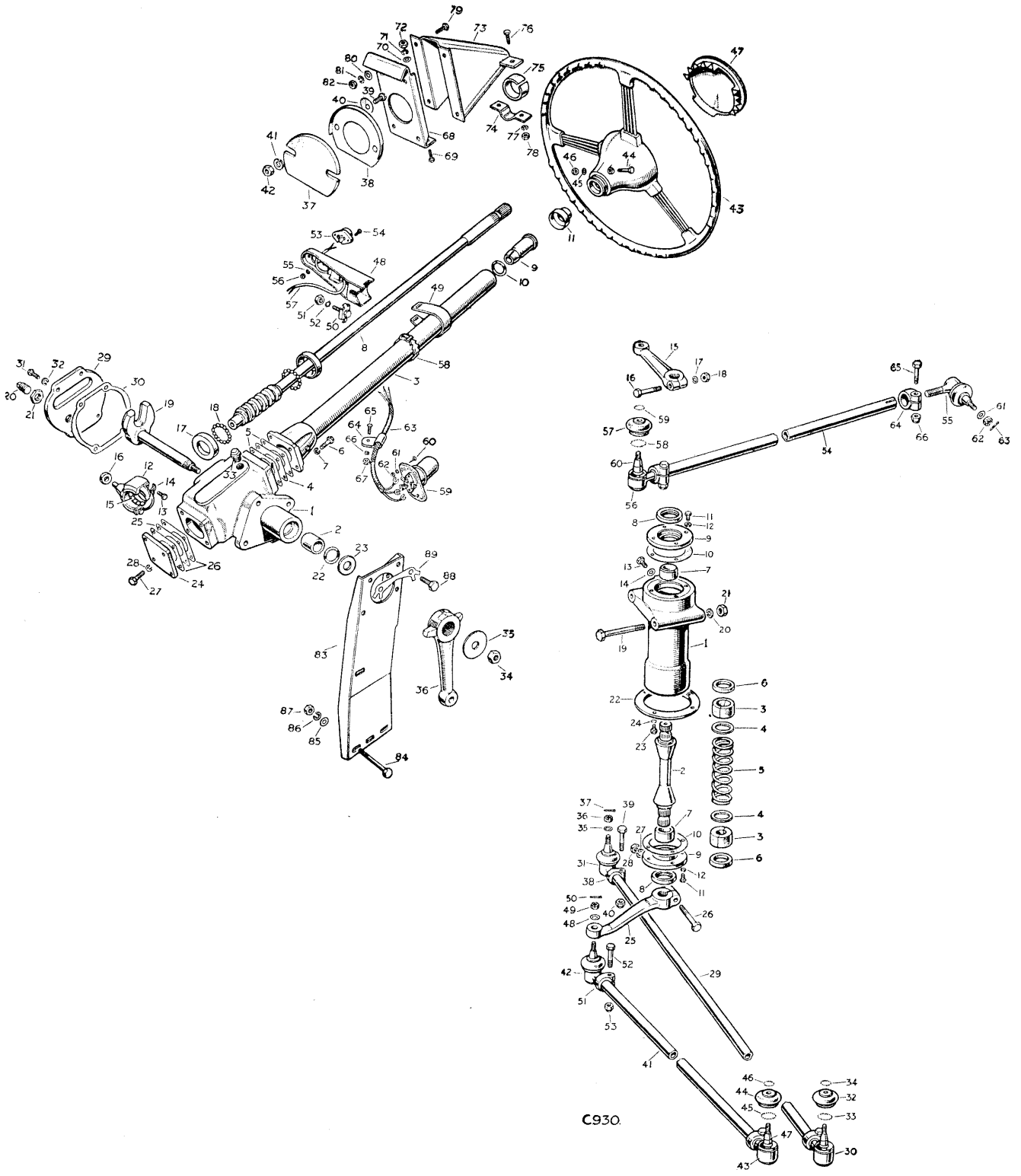


Fig. G-4—Layout of steering column and linkage

Key to Fig. G-4

Steering unit, wheel and drop arm

1 Steering box assembly
2 Bush for rocker shaft
3 Outer column
4 Joint washer, steel
5 Joint washer, paper
6–7 Fixings—for outer column
8 Inner column
9 Bush for inner column
10 Spring ring for inner column bush
11 Dust shield for inner column
12 Main nut assembly
13–14 Fixings—for retainer
15 Steel ball for main nut
16 Roller for main nut
17 Adjustable ball race
18 Steel balls for adjustable race
19 Rocker shaft
20 Adjuster screw for rocker shaft
21 Locknut for adjuster screw
22 Oil seal for rocker shaft
23 Washer for rocker shaft oil seal
24 End plate
25 Joint washer, steel
26 Joint washer, paper
27–28 Fixings—for end plate
29 Side cover plate
30 Joint washer for side cover plate
31–32 Fixings—for side cover plate
33 Oil filler plug
34–35 Fixings—for drop arm
36 Steering drop arm
37 Rubber seal for steering column
38 Cover for steering column seal
39–42 Fixings—cover and seal to dash
43 Steering wheel
44–46 Fixings—for steering wheel
47 Steering wheel centre cover
48 Horn push bracket
49 Clip for horn push bracket
50 Yoke assembly for push bracket
51–52 Fixings—for horn push bracket
53 Horn push
54–56 Fixings—horn push to bracket
57 Lead, horn push to junction box
58 Cable cleat on steering column
59 Dip switch
60–62 Fixings—for dip switch
63 Lead, dip switch to junction box
64 Clip fixing dip switch lead to floor
65–67 Fixings—for clip
68 Support bracket on dash
69–72 Fixings—support bracket to dash
73 Support bracket for steering column
74 Clip for steering column
75 Rubber strip for clip
76–78 Fixings—clip to support bracket
79–82 Fixings—support bracket to dash bracket
83 Support bracket—steering box on chassis
84–87 Fixings—bracket to chassis frame
88–89 Fixings—steering box to chassis support bracket

Relay unit and steering arms

1 Housing for relay shaft
2 Shaft for steering relay levers
3 Split bush for housing
4 Washer for spring
5 Spring for bushes
6 Thrust washer for shaft
7 Distance piece for shaft
8 Oil seal for shaft
9 Retainer for oil seal
10 Joint washer for retainer
11-12 Fixings for retainer
13 Plug for oil hole
14 Joint washer for plug
15 Relay lever, upper
16-18 Fixings for lever
19–21 Fixings for housing
22 Flange plate for relay mounting
23–24 Fixings for flange plate
25 Relay lever, lower
26-28 Fixings for lever
29 Steering track rod assembly
30 Ball joint assembly R.H. thread
31 Ball joint assembly L.H. thread
32 Rubber cover for ball joint
33 Spring ring, cover to body
34 Spring ring and retainer, cover to ball
35–37 Fixings for ball joints
38 Clip for ball joint
39–40 Fixings for ball joint clips
41 Steering drag link assembly
42 Ball joint assembly R.H. thread
43 Ball joint assembly L.H. thread
44 Rubber cover for ball joint
45 Spring ring, cover to body
46 Spring ring } Cover
47 Retainer } to ball
48–50 Fixings for ball joints
51 Clip for ball joint
52-53 Fixings for ball joint clips
54 Longitudinal steering tube assembly
55 Ball joint assembly R.H. thread
56 Ball joint assembly L.H. thread
57 Rubber cover for ball joint
58 Spring ring, cover to body
59 Spring ring } Cover
60 Retainer } to ball
61–63 Fixings for ball joints to levers
64 Clip for ball joint
65–66 Fixings for ball joint clips

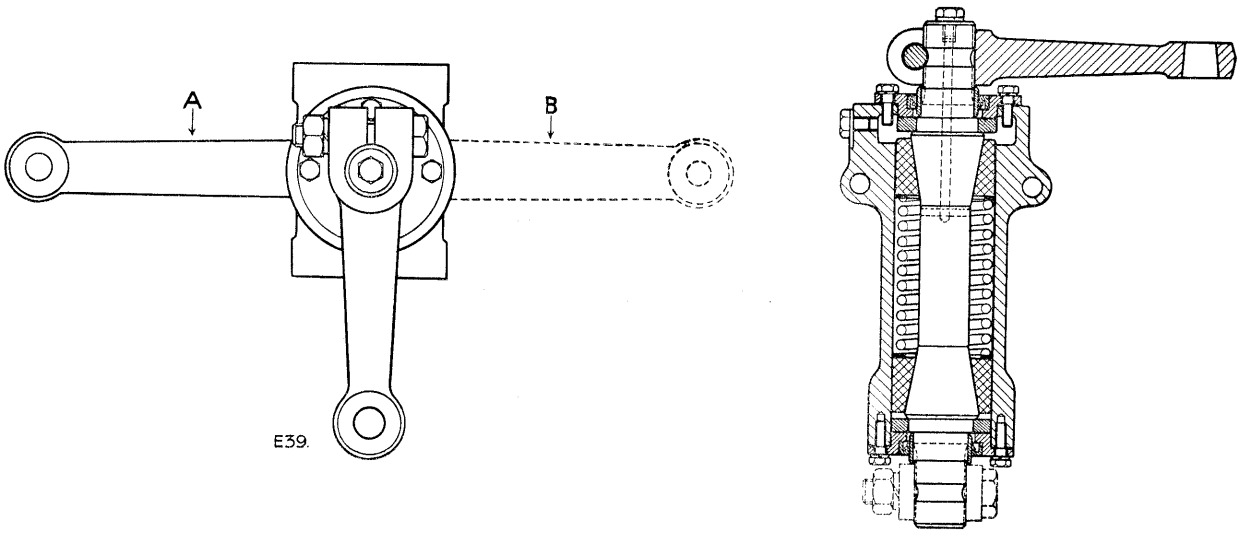


Fig. G-5—Relay unit
A—Lower relay lever, L.H.D. vehicles B—Lower relay lever, R.H.D. vehicles

4. Remove the bolts securing the grille panel to the chassis frame; remove the front apron panel; when the bolts are clear, the rubber packing pieces between the panel and frame may also be withdrawn. It will now be possible to move the radiator assembly slightly to assist in the removal of the relay unit, but care must be taken to prevent damage to the coolant hoses.
5. Raise the upper relay lever slightly to allow the ball joint pin to clear the lever; disconnect the longitudinal tube ball joint from the upper relay lever.
6. Detach the lower relay lever from the relay unit shaft.
7. Remove the relay unit upwards, tapping gently with a hide-faced hammer, if necessary. The flange plate can be left in position on the underside of the chassis cross-member.

To strip — Operation G/12

1. Remove the upper relay lever.
2. Drain off as much oil as possible by removing the oil filler and bleed plugs.
3. Remove the bottom plate complete with oil seal and joint washer.
4. Remove the brass thrust washer.
5. Cover the bottom end of the shaft by tying a sock to the relay body and carefully tap out the shaft, spring and Tufnol bush into the sock. **The spring is compressed to over 100 lb. in position, and will cause serious damage if care is not exercised.** If possible retain the split bushes in mated pairs.
6. Remove the bottom end plate and brass thrust washer.

To assemble — Operation G/14

1. Examine the oil seals in the end caps and renew them if damaged. Examine the distance pieces on the shaft (which form tracks for the oil seals) for damage which may have caused failures of the seals; renew them as necessary.
2. Renew the split Tufnol bushes if worn or damaged.
3. Check the spring in accordance with given data. Renew the spring if necessary.
4. Fit the top end plate and joint washer to the housing.

There are two methods of assembling the relay unit.

Method A

1. Fit one split bush to the taper on the shaft and secure tightly with a suitable 2 in. hose clip (Part No. 50320).

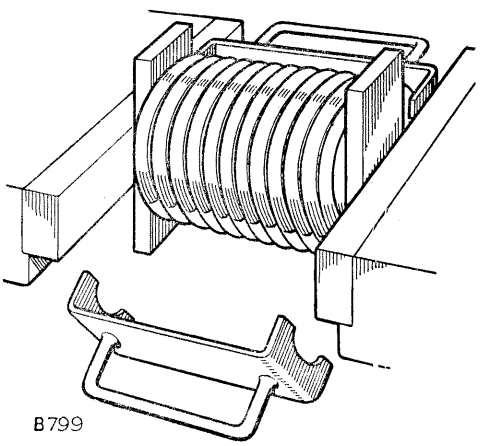


Fig. G-6—
Method of compressing steering relay spring

2. Hold a suitable bar (Part No. 262768) over each end of the spring and compress it to a length of 3 in. (75 mm) in a vice, with the bars central and vertical. Place a suitable clip (Part No. 262769) over each side of the spring, as shown at Fig. G-6. Release the vice and remove the spring and clips complete.

3. Slide a washer over the shaft and fit the spring to the shaft so that it abuts the washer and bush.

4. Slide a second washer over the shaft and fit the second split bush to the shaft, securing it with a hose clip as for the first one (Fig. G-7).

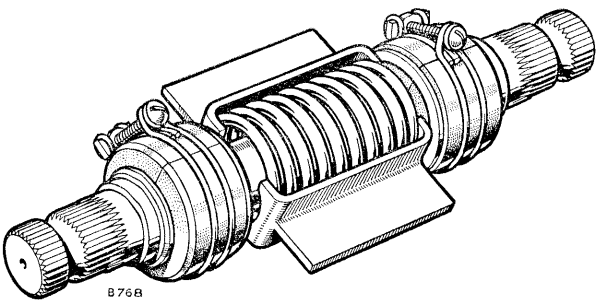


Fig. G-7—Assembling steering relay shaft assembly

5. Remove the clips retaining the spring, slide the lower brass thrust washer over the top end of the shaft and carefully enter the assembly, top end first, into the housing; push the shaft into the housing, up towards the bleed plug end, so leaving the first hose clip free. Remove the clip and push the shaft home; release the second hose clip. See Fig. G-9.

6. Fit a thrust washer to the bottom end of the shaft and fit the end cap and joint washer.

7. Fit the upper relay lever.

8. Fill the housing with oil, and fit the filler and bleed plugs and joint washers.

9. If the assembly is in order, it should need a force of at least 12 lb. (5,5 kg) to turn the relay lever and shaft, using a spring balance in the relay lever boss.

Method B

1. Examine all parts and renew as necessary.

2. Fit the top end plate and joint washer to the housing.

3. Fit one split bush to the taper on the bottom end of the shaft, and secure tightly with a suitable 2 in. hose clip (Part No. 50323).

4. Place a steel washer on to the shaft, next to the inner side of the Tufnol bush.

5. Place the spring over the shaft and insert the special tool (Part No. 510309) through the coils of the spring and right through the lubrication cross-drilling in the shaft. See Fig. G-8.

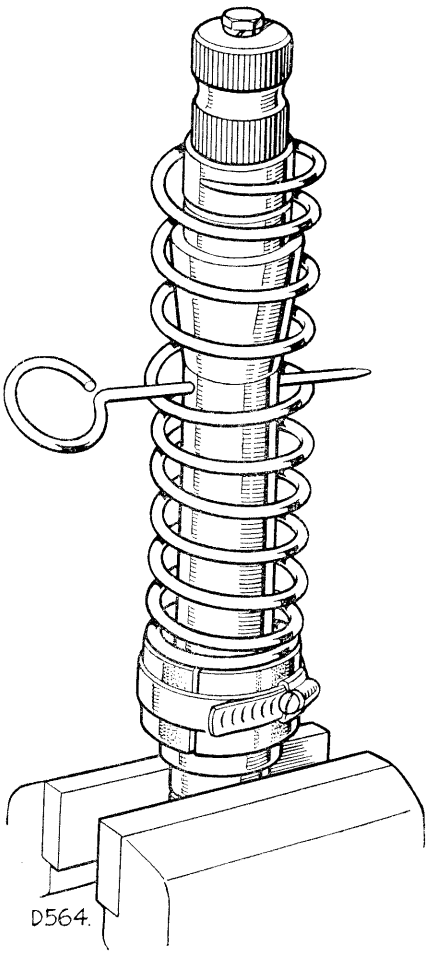


Fig. G-8—Compressing steering relay spring

6. The spring can now be wound down the tool until the steel washer and the split Tufnol bush can be secured to the taper on the other end of the shaft with a hose clip.

7. Remove the special tool (Part No. 510309).

8. Place a brass thrust washer on the top end of the shaft, lubricate the shaft and insert into the housing.

9. With a plastic hammer gently tap the shaft into the housing until the first hose clip slides off the Tufnol bush, remove the clip completely from the shaft. See Fig. G-9.

10. Continue to tap the shaft into the housing until the second clip is freed and the shaft abuts the top end cover.

11. Fit the bleed and filler plugs, fill the unit with oil, replace the bottom end thrust washer, joint washer, end cover and tighten the retaining bolts.

12. Fit the upper relay lever.

13. If the unit is in order, it should require a force of at least 12 lb. (5,5 kg) to turn the relay shaft, using a spring balance in the relay lever boss.

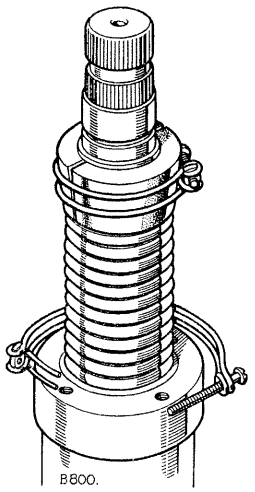


Fig. G-9—Replacing steering relay shaft and bushes in housing

Steering relay, to refit **Operation G-15**

1. Reverse removal procedure. The lower relay lever must be fitted as illustrated at Fig. G-5.

Longitudinal steering arm

To remove **Operation G/16**

1. Remove spare wheel, if mounted on bonnet; disconnect the support and lift the bonnet clear.
2. **R.H.D. models:** Remove air cleaner and battery.
3. **Diesel models L.H.D.:** Remove battery on left-hand side.
4. Remove the radiator grille, loosen the clamping bolt securing the upper relay lever and prise the lever off the relay unit.
5. Turn the steering wheel to allow the longitudinal steering arm to move fully forward, loosen the clamping bolt nearest to drop arm and unscrew the longitudinal arm complete with relay lever. Withdraw the assembly from the front of vehicle.
6. Unscrew the castellated nut securing the ball joint to the drop arm, then with a solid metallic object on one side of the drop arm adjacent to the taper, tap the other side with a hammer to loosen the ball joint.
7. Turn the steering wheel to move the drop arm rearwards and remove the ball joint.

Drag link or track rod, to remove **Operation G/18**

Disconnect the track rod ball joints from the steering levers by tapping smartly around the eye of tapered pin.

Ball joints, to check **Operation G/19**

The steering ball joints have been designed in such a way as to retain the intial filling of grease for the normal life of the ball joint; however, this applies only if the rubber boot remains in position on the joint. The rubber boots should be checked every 3,000 miles (5.000 km) to ensure that they have not become dislodged or the joint damaged. Should any of the rubber boots be dislodged, proceed as follows—

(*a*) Remove the ball end from the drop arm lever by tapping smartly around the eye of the pin.

If necessary unscrew the ball joints from the steering rods, noting that there is one left-hand and one right-hand threaded ball joint to each steering rod.

(*b*) Remove the rubber boot.

(*c*) Thoroughly clean all parts.

(*d*) Place the castle nut upside down on the pin and screw on a few threads, then place the ball joint under a press or between the jaws of a vice and carefully force the pin and ball down against the spring. In this position the interior of the ball joint can be cleaned and lubricated.

(*e*) Apply grease around the taper, and fill the rubber boot.

(*f*) Reassemble, using new rubbers and spring rings as required.

Steering linkage, to replace **Operation G/20**

(*g*) When refitting steering linkage and ball joints to the steering arms, ensure that the ball joints are aligned with each other, in order to allow full unrestricted movement of the steering linkage.

Wheel alignment

To check and adjust **Operation G/22**

1. No adjustment is provided for castor, camber or swivel pin inclination.
2. The toe-in is adjustable; proceed as follows:
3. Set the vehicle on level ground with the road wheels in the straight-ahead position, and push it forward a short distance.
4. Measure the toe-in with the aid of a tracking stick or suitable proprietary equipment; it should be 3/64 in. to 3/32 in. (1,2 mm to 2,4 mm).
5. If correction is required to the toe-in, slacken the clips securing the ball joints to the track rod and turn the rod to decrease or increase its effective length as necessary, until the toe-in is correct.
6. Tighten the ball joint clips.

Steering kick or wheel wobble

Operation G/24

In many cases the swivel cone bearing springs are being fitted in an attempt to cure steering wheel kick, but replacement is actually seldom required and will by itself not normally cure such a complaint.

A certain amount of kick is experienced over rough surfaces, but where this is excessive or if actual wheel wobble should be reported the following checks must be carried out.

Only after these checks have failed to reveal the cause, should the cone bearing springs be examined.

Checks:

(i) Ensure that the bolts securing the steering box to its mounting bracket, and the bolts securing the bracket to the frame, are tight. Also ensure that the stiffener bracket is fitted.

(ii) Check the steering box adjustment.

(iii) Check for tightness the nuts securing drop arm to rocker shaft and nuts securing ball joints to track rods and steering arms.

(iv) Check the ball joints for excessive wear and renew as necessary.

(v) Check the relay top and bottom lever clamp bolt for tightness and check for wear on lever and shaft splines. Rectify any play in the relay unit.

(vi) The through bolts securing relay to chassis must be checked for tightness, also the four bolts at the bottom plate of the relay. Check the bolt flanges for cracking and check the fit of the bottom of the relay in the spigot.

(vii) The nuts and studs securing the steering arms must be checked, and ensure that the one special "fitting" stud on each side is a tight fit and that it positively locates the arm.

(viii) Check shock absorber action, replace if weak. Examine the rubber bushes and replace as necessary. Check shackle pins and bushes for wear and tighten the spring 'U' bolts. Ensure that the spring location bolt has not sheared and that its seating hole is not elongated.

(ix) Check all the spring leaves, either side of the centre bolt, for breakage.

(x) Check the front wheel alignment.

(xi) Check the road wheels for out-of-balance and rectify as necessary.

(xii) Check the swivel pin poundage figure. Check for cone and spline wear.

(xiii) Check for badly or unevenly worn tyres. Similar tread pattern tyres should be fitted. Check the pressures. (Normal road condition —25 lb/sq.in. (1,7 kg/cm^2) all round.)

(xiv) While the vehicle is on ramp or pit, it is a good plan to examine the chassis members and axle casing for accident damage.

DEFECT LOCATION

(Symptom, Cause and Remedy)

A—EXCESSIVE LOOSENESS OR BACKLASH IN THE STEERING

1. Steering rocker shaft incorrectly adjusted or badly worn—*Adjust or renew.*
2. Steering linkage loose or worn—*Rectify or renew.*
3. Swivel pins and bearings loose or worn—*Section F.*
4. Loose or worn front wheel bearings—*Section F.*
5. Steering box securing bolts loose—*Tighten, and ensure that the unit is secured to the mounting bracket with internal type shakeproof washers.*

B—TIGHT STEERING

1. Low or unequal tyre pressures—*Section S.*
2. Steering box oil level low—*Replenish.*
3. Steering rocker shaft adjusted too tightly—*Adjust.*

C—RATTLE IN STEERING COLUMN

1. Steering rocker shaft incorrectly adjusted or badly worn—*Adjust or renew.*

D—VEHICLE PULLS TO ONE SIDE

1. Section F.

E—VEHICLE WANDERS

1. Section F.

F—WHEEL SHIMMY

1. Section F.

GENERAL DATA

Type	Re-circulating ball
Ratio: Straight ahead	15.6 : 1
Full lock	23.8 : 1
Inner column end-float	Nil
Rocker shaft end-float	Nil
Number of turns of steering wheel from lock to lock	3.3

DETAIL DATA

Relay shaft clearances in bushes .003 to .0045 (0,08 to 0,12 mm)

Longitudinal steering tube

Ball joints

Type	Non-adjustable; 7/16 in. B.S.F. thread
Tightening torque	30 lb./ft. (4 kg/m)

Steering relay unit

Bushes

Type	Tufnol cones

Spring

Number of working coils	10
Free length	7¼ in. (184 mm)
Fitted length	3 in. (72 mm)
Load at fitted length	104 lb. (47 kg)

Wheel alignment

Wheel camber	1½°
Wheel castor	3°
Swivel pin inclination	7°
Toe-in	3/64 in. to 3/32 in. (1,2 mm to 2,4 mm)

Section H — BRAKE SYSTEM — ALL MODELS

INDEX

LIST OF ILLUSTRATIONS

Wheel brake system

To bleed **Operation H/2**

If the level of the fluid in the supply tank is allowed to fall too low, or if any section of the pipe line has been disconnected, the brakes will feel "spongy" due to air having been absorbed into the system. It is necessary to remove the air-lock, bleeding the system at the wheel cylinders. Bleeding must always be carried out at all four wheels, irrespective of which portion of the pipe line is affected, starting with the wheel cylinder farthest from the master cylinder.

1. Remove the rubber dust cover and attach a length of rubber tubing to the bleed screw and place the lower end of the tube in a glass jar, containing a small amount of fluid.
2. Slacken the bleed screw and pump the brake pedal, pausing at each end of each stroke, until the fluid issuing from the tube shows no sign of air bubbles when the tube is held below the surface of the fluid in the jar.
3. Holding the tube under the fluid surface, tighten the bleed screw.
4. The fluid in the reservoir must be replenished throughout the operation to prevent another air lock being formed.

   Never use fluid that has just been bled from the system for topping up the reservoir, as it may have become aerated.
5. In the event of a master cylinder being changed, the system may be bled from the bleed screw located on the engine side of the scuttle.

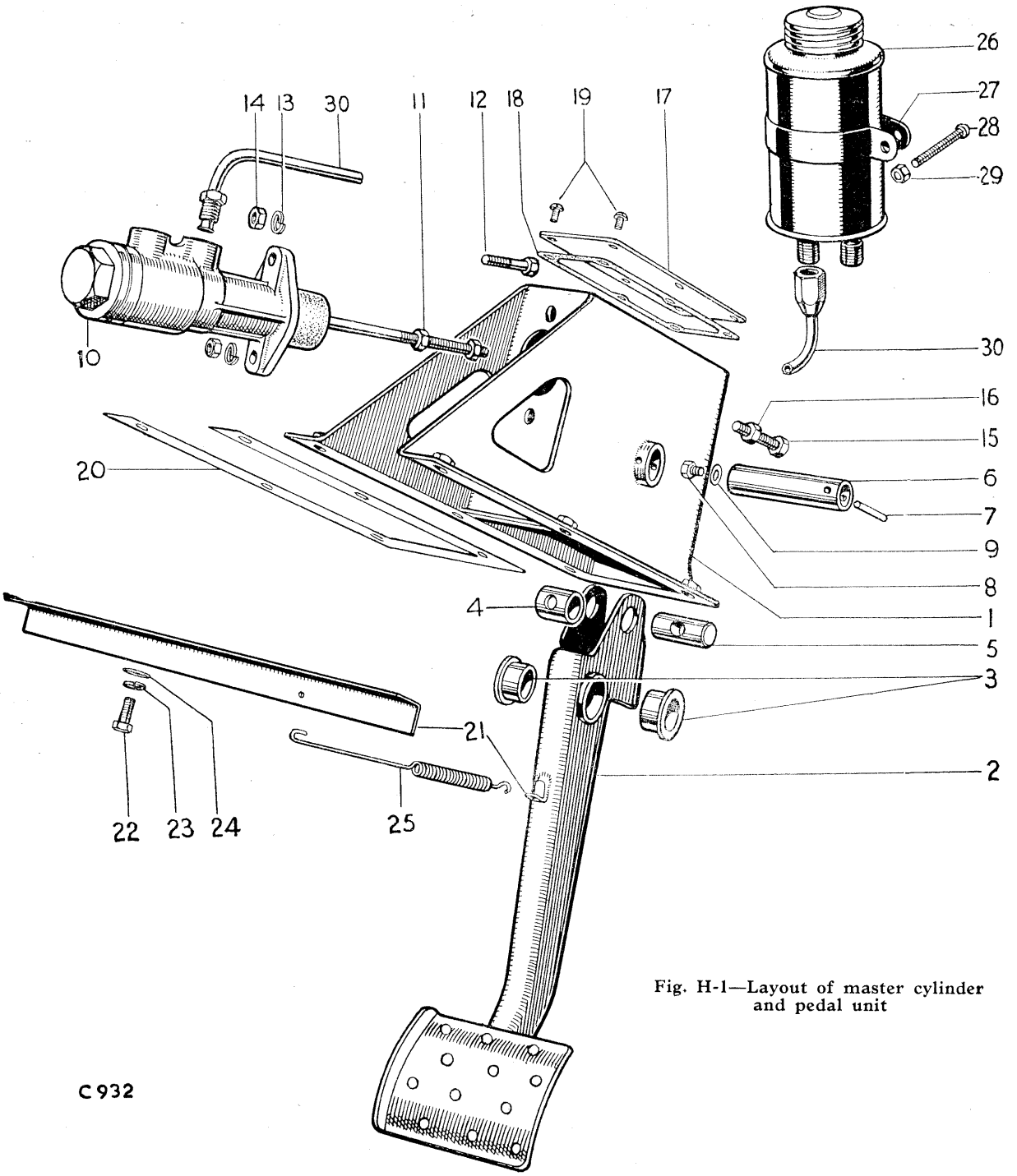


Fig. H-1—Layout of master cylinder and pedal unit

1 Brake pedal bracket
2 Brake pedal
3 Bushes
4 Distance piece
5 Pedal trunnion
6 Pedal shaft
7 Pedal shaft locating pin
8 Oil plug
9 Joint washer
10 Brake master cylinder
11 Nut for master cylinder push rod
12–14 Fixings—master cylinder to pedal bracket
15–16 Bracket pedal stop
17 Pedal bracket top cover
18 Gasket
19 Fixings—top cover to pedal bracket
20 Pedal bracket gasket
21 Pedal return spring anchors
22–24 Fixings—anchor plate and pedal bracket to dash
25 Pedal return spring
26 Brake and clutch fluid reservoir
27 Reservoir retaining clip
28–29 Fixings—clip to reservoir
30 Pipe complete—reservoir to master cylinder

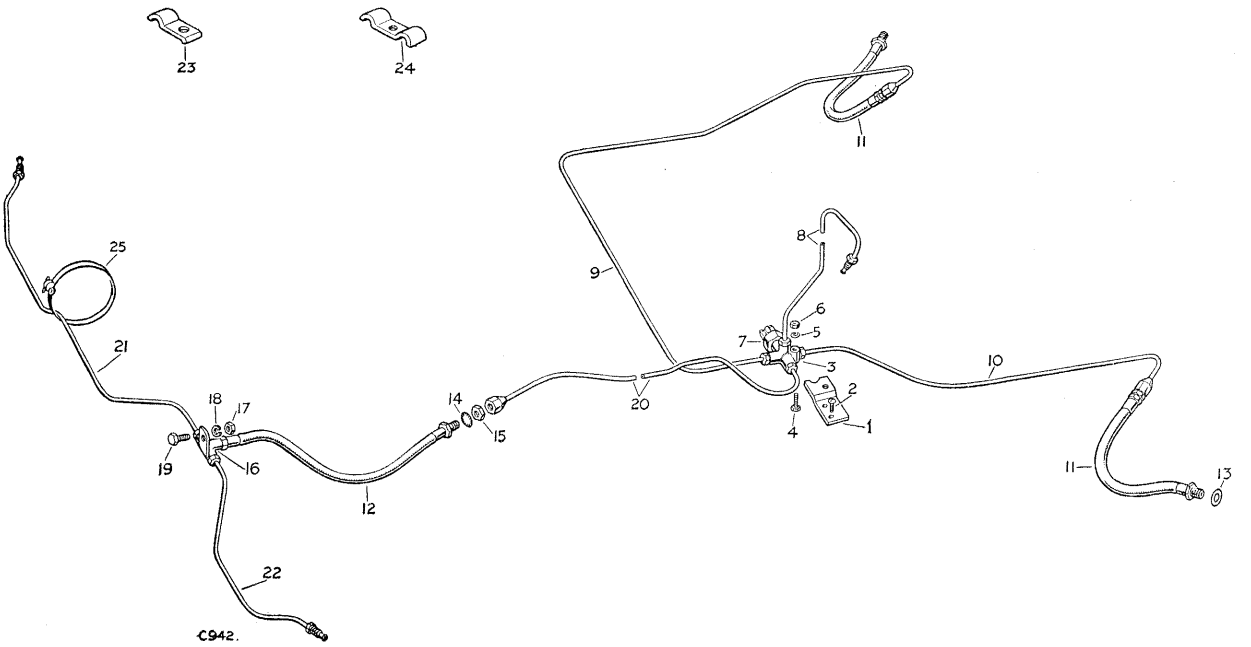


Fig. H-2—Layout of pipe lines

1 Bracket, for 5-way piece
2 Drive screw, fixing bracket
3 5-way piece for brake pipes
4–6 Fixings—5-way piece
7 Stop lamp switch
8 Brake pipe, master cylinder to 3-way piece
9 Brake pipe, 5-way to L.H. front
10 Brake pipe, 5-way to R.H. front
11 Hose complete for front wheels
12 Hose complete to rear axle
13 Joint washer for hoses
14–15 Fixings—hose to bracket
16 "T" piece on rear axle
17–19 Fixing—"T" piece
20 Brake pipe to rear hose
21 Brake pipe, L.H. rear to "T" piece
22 Brake pipe R.H. rear to "T" piece
23 Clip, brake pipes to chassis frame
24 Clip, brake and clutch pipes to dash
25 Clip on rear axle for L.H. pipe

All normal bleeding operations **must** be carried out at the wheel cylinders. Note particularly that the fluid reservoir for the brakes is the outer container of the combined reservoir and that the level is correct when the fluid is just above the top of the inner reservoir. Use only Girling Crimson brake fluid.

Fluid reservoir

To remove **Operation H/4**

1. Disconnect the brake and clutch outlet pipes.
2. Remove the securing nut and spring washer and withdraw assembly complete with clamp.

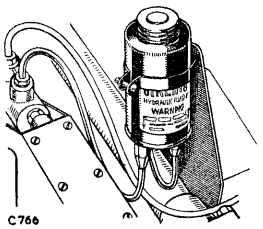


Fig. H-3—
Brake and clutch fluid reservoir

To refit **Operation H/6**

1. Reverse the removal procedure.
2. Bleed the system.

Brake pedal

To remove **Operation H/8**

1. Remove bonnet. (Remove spare wheel if fitted.)
2. Remove securing nut and pull fluid reservoir away from cover plate.
3. Remove cover plate and gasket from brake pedal bracket.
4. Disconnect input and output unions from brake master cylinder.
5. Remove retaining nut from plunger, and push plunger up into master cylinder.
6. Using a suitable punch, drift out pin, from the pedal shaft.
7. Remove pedal shaft.
8. Remove spring, pedal to anchor bracket (inside vehicle) and withdraw pedal.

To refit **Operation H/10**

1. Reverse removal procedure, renewing cover plate gasket if necessary.
2. Bleed system. Operation H/2.

Brake master cylinder

To remove **Operation H/12**

1. Remove the securing bolts (inside vehicle) and remove pedal bracket, complete with master cylinder, and pedal.
2. Remove the nut securing the plunger to the trunnion, then remove the securing self-locking nuts, plain washers and bolts, and withdraw the master cylinder.

To strip **Operation H/14**

1. Remove the locknut and rubber cover from the piston push rod; remove the circlip and withdraw the push rod and retaining washer.
2. Apply a low air pressure to the intake orifice in order to expel the piston assembly from the cylinder.

To assemble **Operation H/16**

1. Clean all the component parts in Girling Crimson brake fluid.
2. Carefully inspect the seals and rubber dust cover; renew as necessary; smear the seals with Wakefield No. 3 rubber grease.
3. Assemble the unit by reversing the dismantling procedure.

   The lock stop bolt, located in the pedal bracket back plate, should not be disturbed, but in the event of this being absolutely necessary, it must be reset as follows:—

   With the master cylinder removed, support the pedal pad 6 in. (15 cm) from the toe-board, and screw in the bolt until it touches the pedal shaft stop plate. Tighten the locknut.

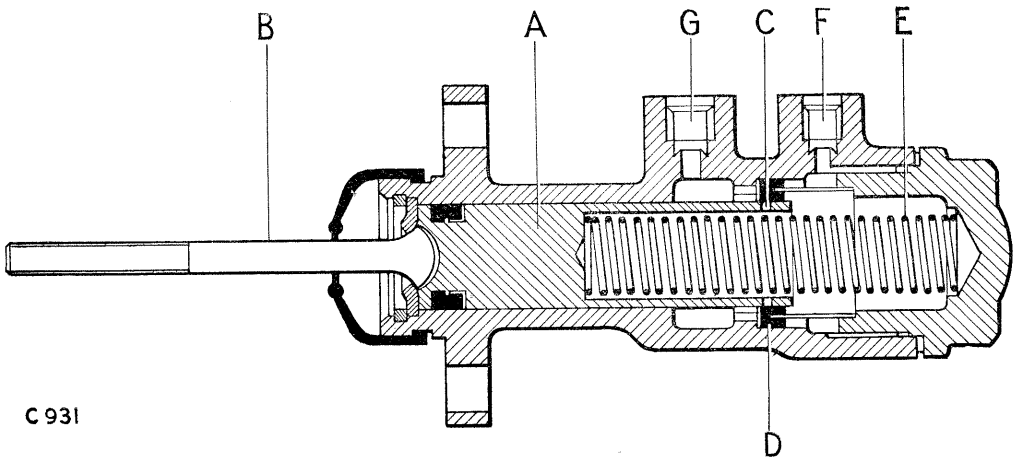


Fig. H-4
Cross-section of brake master cylinder
A—Piston
B—Push rod
C—Inlet ports
D—Recuperating seal
E—Piston spring
F—Outlet to wheel cylinders
G—Inlet from reservoir

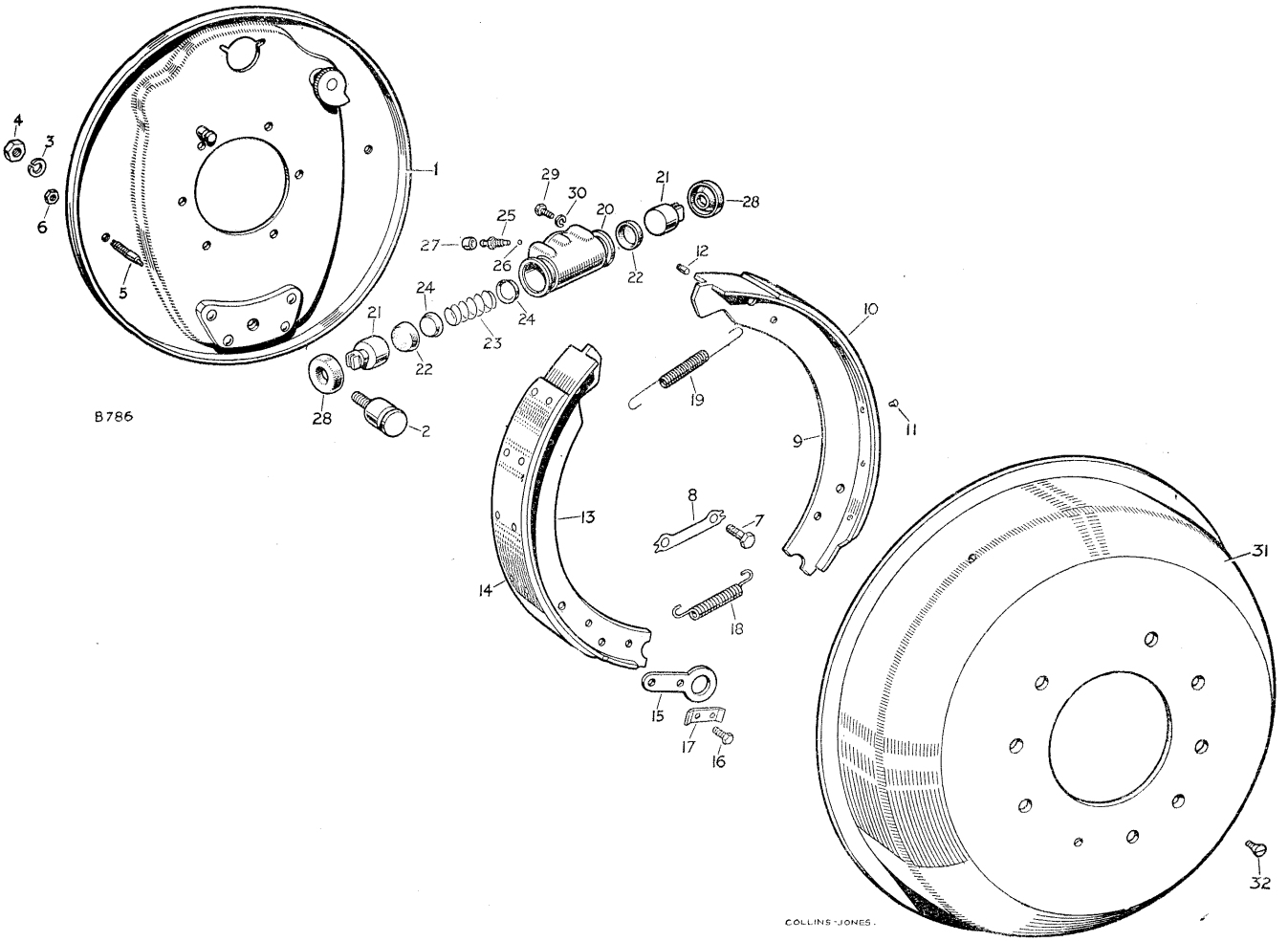


Fig. H-5—Layout of wheel brake unit—front and rear (10″ brakes)

1 Brake anchor plate assembly, R.H.
2 Anchor pin for brake shoe
3 Spring washer } Fixing
4 Special nut } anchor pin
5 Shoe steady post
6 Locknut for steady post
7-8 Fixings for front anchor plate
9 Brake shoe assembly R.H., leading
10 Lining for brake shoe
11 Rivet fixing lining
12 Spring post for brake shoe
13 Brake shoe assembly, trailing
14 Lining for brake shoe
15 Anchor for brake shoe
16 Special set screw fixing anchor
17 Locking plate for bolt
18 Pull-off spring for brake shoe
19 Pull-off spring for leading shoe
20 Wheel cylinder only R.H. front
21 Piston for cylinder, front
22 Rubber cup for piston, front
23 Spring for piston, front
24 Washer for spring, front
25 Bleed screw
26 Steel ball for bleed screw
27 Rubber dust cap for bleed screw
28 Rubber boot for wheel cylinder, front
29–30 Fixings for wheel cylinder
31 Brake drum
32 Set screw fixing brake drum

To refit, master cylinder to bracket **Operation H/18**

1. Reverse the removal procedure, renewing gaskets as necessary.
2. Bleed system. Operation H/2.

To refit, pedal bracket complete **Operation H/20**

1. Reverse the removal procedure, renewing gaskets as necessary.
2. Refill the fluid reservoir.
3. Bleed the system. Operation H/2.
4. Check for leaks and rectify as necessary.
5. Check the free play in the push rod, which should be 1/16 in. (1,5 mm) if it is less than the given figure:—
6. Slacken off the locknut and rotate the push rod, with the fingers, until the correct movement has been attained.
7. Tighten the locknut and recheck the free play.

Brake flexible pipe

To remove **Operation H/22**

1. Hold the brake pedal down to prevent loss of fluid from the supply tank.
2. Unscrew the pipe nut (A) clear of the hose adaptor.
3. Hold the adaptor nut (B) with a spanner and remove the bulkhead nut (C) and shakeproof washer (D).

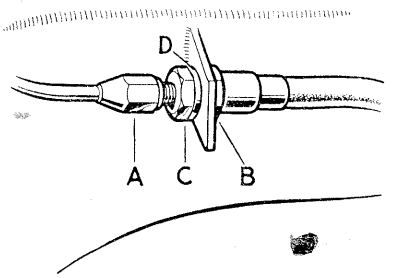


Fig. H-6—Attachment of flexible brake hoses

A—Pipe nut
B—Adaptor nut
C—Bulkhead nut
D—Shakeproof washer

4. Withdraw the hose from the chassis bracket and disconnect from the banjo on the wheel cylinder.

To refit **Operation H/24**

1. Reverse the removal procedure.
2. Bleed the brake system. Operation H/2.

Whenever any section of the pressure pipe system has been removed, a careful check should be made on replacement to ensure that all the connections and joint washers are in good condition. A faulty connection will admit air into the system, so causing poor and "spongy" braking.

Wheel brake unit, front and rear 10″ brakes—88 models

To adjust **Operation H/26**

Jack up each wheel in turn. On the back face of the brake anchor plate will be found a hexagon adjustment bolt, which operates a snail cam bearing on the leading shoe. Only one of these is fitted to each wheel brake unit, thereby providing single-point

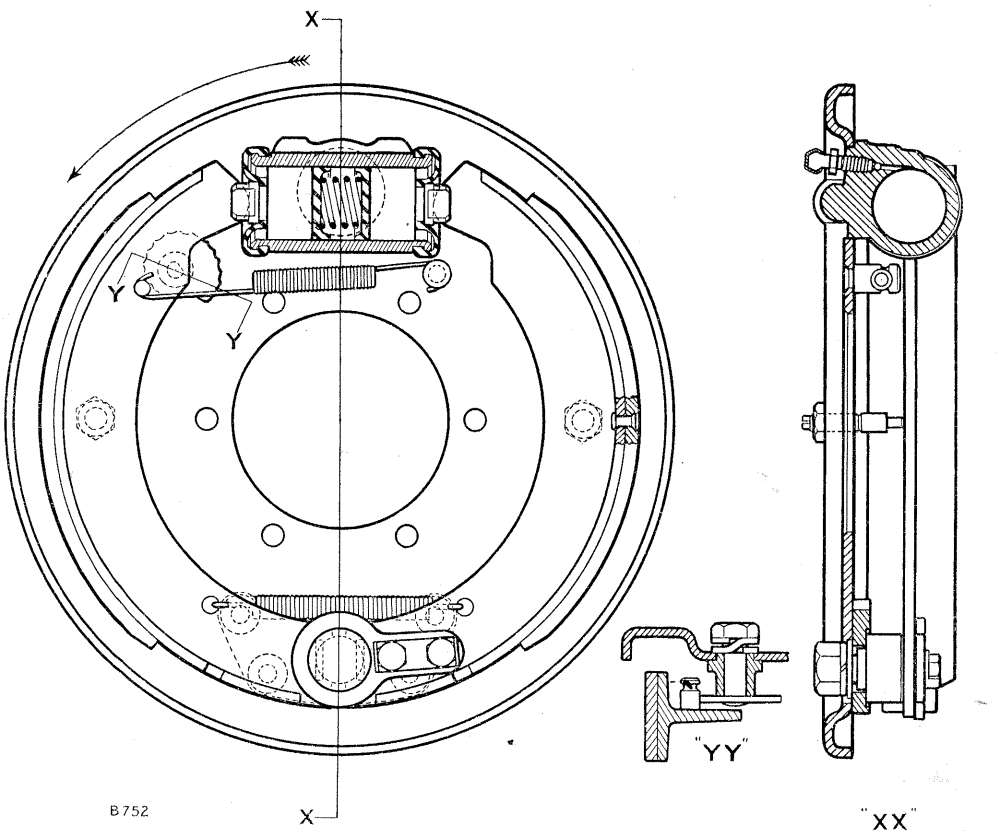


Fig. H-7—Wheel brake unit—front and rear 10″ brakes—88 models

adjustment. Spin the wheel and rotate the adjuster bolt until the brake shoe contacts the drum, then ease the adjuster until the wheel again rotates freely. Repeat for the other three wheels.

To strip **Operation H/28**

1. Jack up the vehicle.
2. Remove the road wheel and brake drum.
3. Turn back the adjuster cam to release the tension of the leading shoe pull-off spring and remove the spring.
4. Remove the trailing shoe anchor plate.
5. Remove the brake shoes together from the pivot end first; part them by disconnecting the bias reducing spring. If the wheel cylinder is not to be removed, e.g., when relining the shoes, it is well to slip the special clip Part No. 242526 over the cylinder pistons to prevent loss of fluid and admission of air to the system.
6. In cases where the unit is to be completely dismantled, the front flexible hose to wheel cylinder must be disconnected at the support bracket on frame before unscrewing from wheel cylinder, to avoid twisting and damaging of hose. The securing nut for rear wheel cylinder pipe may be unscrewed directly.
7. Depress the brake pedal to its fullest extent and wedge in that position, so preventing leakage of fluid from the supply tank; it is also advantageous to secure the loose end of the flexible hose as high as possible to reduce loss of fluid from the pipeline to a minimum.
8. Remove the wheel cylinder and detach the rubber dust covers, pistons, piston cups and spring; remove the bleed nipple cover, nipple and ball.
9. Remove the brake anchor plate after first removing the hub components. Sections E and F.

To assemble **Operation H/30**

1. Clean and replace the anchor plate.
2. Clean all the wheel cylinder components, using Girling Crimson Brake Fluid, and assemble wet.
3. Replace the bleed ball and nipple.
4. Examine the piston cups for damage or distortion and renew as necessary, replace the piston spring, cups and pistons.
5. Examine the rubber dust covers; renew if damaged.
6. Refit the wheel cylinder to the anchor plate.
7. Reconnect the bias reducing spring, renewing it if necessary; the brake shoes should be fitted together at the wheel cylinder end first (Fig. H-7).
8. Reconnect the leading shoe pull-off spring, renewing it if necessary; replace it with its longest extremity hooked over the post on the shoe web.
9. Replace the trailing shoe anchor plate.
10. Examine the brake drum for scoring, ovality, and skim if required, standard diameter 10 in. (254 mm). Reclamation limit .030 in. (0,75 mm) oversize on diameter.
11. Replace the brake drum and set the leading shoe adjuster. See Instruction Manual.
12. Early 88 models. If the brake shoe steady posts have been disturbed, they should be reset as follows:—

    Screw the posts, where fitted, well back, clear of the shoes. Apply the brakes lightly and turn the drum by hand to centralise the shoes; continue depressing the pedal until the shoes are hard on the drum. Screw in the steady posts, where fitted, until they just contact the shoe webs and secure by means of the locknuts.

    Later models (88) are fitted with anchor plates embodying a pressed projection in place of the shoe steady posts.
13. Replace the road wheel.
14. Lower the vehicle from the jack.
15. If air has entered the system during the re-lining operation, or if the unit has been completely stripped, the brake system must now be bled. Operation H/2.

Front wheel brake unit, 11″ brakes—109 models

To adjust **Operation H/32**

Each shoe is independently set by means of an adjuster operating through a serrated snail cam.

1. With the front wheels jacked up, ensure that the wheels rotate freely; slacken off the adjusters if necessary by turning anti-clockwise.
2. Turn the adjuster for each shoe clockwise until the shoe just brushes the brake drum, then slacken off two serrations.

To strip **Operation H/34**

1. Slacken wheel nuts slightly and jack up the vehicle.
2. Unscrew the wheel nuts completely and remove road wheel.
3. Turn adjuster cams at rear of brake anchor plate (anti-clockwise) to increase clearance between linings and brake drum and facilitate removal of brake drum.
4. Remove the three countersunk head screws retaining brake drum and withdraw brake drum.
5. Release brake shoes and pull-off springs by levering the trailing edge of each shoe away from the wheel cylinders.

   If the wheel cylinders are not to be removed, e.g., when relining brake shoes, a clip must be used to hold the pistons in position and prevent loss of fluid and admission of air to the system.
6. Release bleed nipple on bottom wheel cylinder, then depress brake pedal to fullest extent and wedge in this position, thereby preventing leakage of fluid from supply tank.

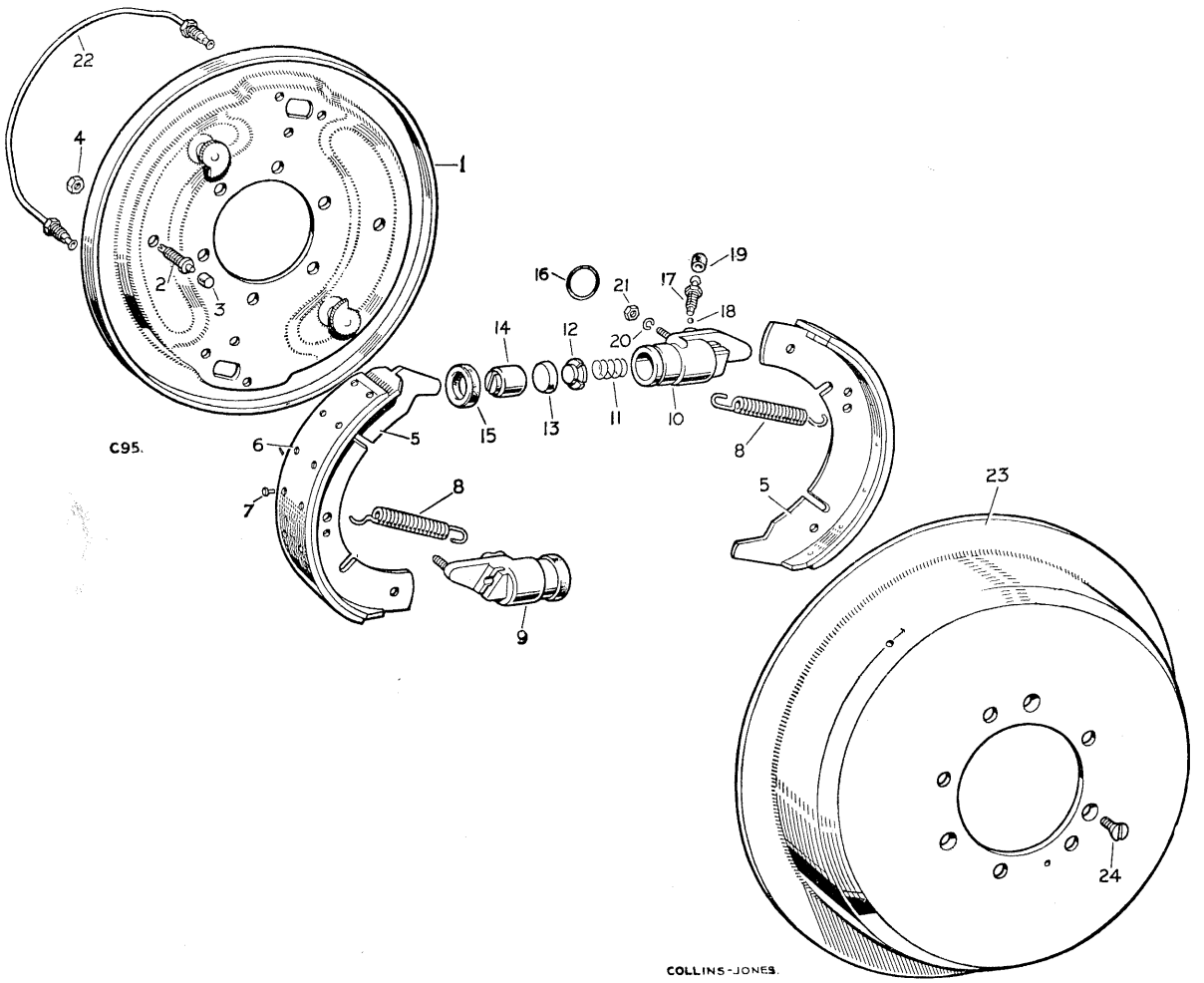


Fig. H-8—Layout of front wheel brake unit, 11″ brakes—109 models

1 Brake anchor plate assembly—L.H.
2 Steady post for brake shoe
3 Bush for steady post
4 Special nut—fixing steady post
5 Brake shoe assembly—L.H.
6 Lining for brake shoe
7 Rivet securing lining
8 Pull-off spring
9 Wheel cylinder assembly—L.H.
10 Wheel cylinder—L.H. } Part of wheel cylinder assembly
11 Spring
12 Air excluder
13 Seal
14 Piston
15 Rubber boot
16 Sealing ring for cylinder
17 Bleed screw
18 Steel ball for bleed screw
19 Rubber dust cap for bleed screw
20 Spring washer } Securing wheel cylinder
21 Nut
22 Connecting pipe for wheel cylinders
23 Brake drum
24 Set screw fixing brake drum

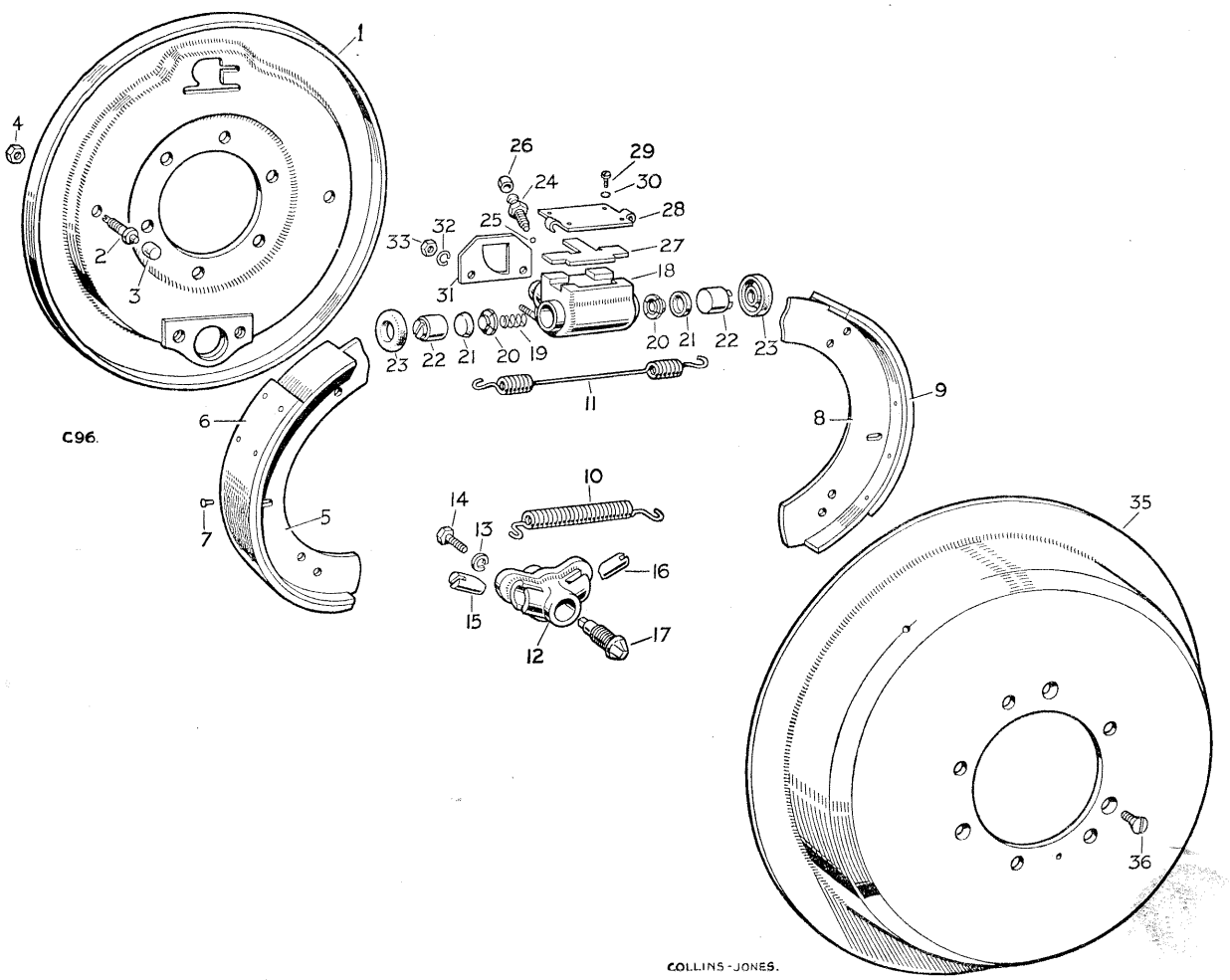


Fig. H-9—Layout of rear wheel brake unit, 11" brakes—109 models

1 Brake anchor plate—L.H.
2 Steady post for brake shoe
3 Bush for steady post
4 Special nut—fixing steady post
5 Shoe assembly—leading
6 Lining for leading shoe
7 Rivet securing linings
8 Shoe assembly—trailing
9 Lining for trailing shoe
10 Pull-off spring—adjuster end
11 Pull-off spring—cylinder end
12 Adjuster housing
13 Spring washer } Securing adjuster housing
14 Set bolt }
15 Plunger—L.H.
16 Plunger—R.H.
17 Cone for adjuster
18 Wheel cylinder—L.H. } Part of wheel cylinder assembly
19 Spring
20 Air excluder
21 Seal
22 Piston
23 Seal
24 Bleed screw
25 Ball for bleed screw
26 Rubber dust cap for bleed screw
27 Abutment plate } For wheel cylinder
28 Dust cover plate }
29 Set screw } Securing abutment and dust cover plates
30 Spring washer }
31 Dust cover plate for brake anchor plate
32 Spring washer } Securing wheel cylinder
33 Nut }
35 Brake drum
36 Retaining screw

7. Disconnect union nut of brake fluid supply pipe from flexible pipe, and remove locknut securing flexible pipe to support bracket on chassis, forward of shock absorber.
8. Disconnect flexible pipe and connecting pipe from wheel cylinders.
9. Unscrew securing nuts, then remove wheel cylinders from anchor plate and detach the rubber dust covers, pistons, seals, air excluders and springs.
10. Remove the brake anchor plate and steady posts if necessary.

To assemble **Operation H/36**

Clean and examine all parts and renew as necessary. If the brake linings have been renewed, the ends must be backed off. Reverse the sequence of stripping operations excepting for bleed nipple which should be fitted to wheel cylinder before assembly to anchor plate. Finally bleed each wheel cylinder in accordance with Operation H/2.

If the brake shoe steady posts have been disturbed, reset as instructed in Item 12 of Operation H/30.

Rear wheel brake unit, 11″ brakes—109 models

To adjust **Operation H/38**

The rear brake shoes are adjusted by means of a single adjuster assembly fitted at the lower side of the brake anchor plate which allows the shoes to expand or contract equally.

1. With the rear wheels jacked up ensure that they rotate freely; slacken the adjuster if necessary, by turning anti-clockwise.
2. Apply the foot brake to ensure that the shoes are bedded in and turn the adjuster clockwise until the linings brush the brake drum, then slacken adjuster off (anti-clockwise) two clicks.

To strip **Operation H/40**

1. Slacken wheel nuts slightly and jack up the vehicle.
2. Unscrew the wheel nuts completely and remove road wheel.
3. Turn adjusters at lower end of anchor plate anti-clockwise to increase clearance between linings and brake drum and thereby facilitate removal of brake drum.
4. Remove the three countersunk head securing screws and withdraw brake drum.
5. Release the brake shoes and pull-off springs by levering the shoes away from the wheel cylinder.

   If the wheel cylinders are not to be removed, e.g., when relining brake shoes, a clip must be used to hold the pistons in position and prevent loss of fluid and admission of air to the system.
6. Disconnect the fluid pipes from wheel cylinders and depress brake pedal to the fullest extent, then wedge in this position, thereby preventing leakage of brake fluid from supply tank.
7. Remove the securing nuts and withdraw the wheel cylinders from anchor plates, then detach the rubber dust covers, pistons, seals, air excluders and springs.
8. Remove the securing bolts and withdraw the adjuster assemblies complete with cover plates. Withdraw the plungers and unscrew the adjuster cones.
9. Unscrew the steady posts, with fibre bushes and locknuts.
10. Remove the anchor plates if necessary (see Section E).

To assemble **Operation H/42**

Clean and examine all parts and renew as necessary, then reverse the sequence of stripping operations.

The following points should be observed:—

1. Lubricate the cone and adjuster plungers with graphite grease.

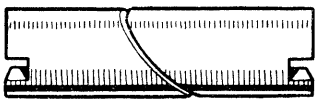


Fig. H-10—
Plungers
correctly paired

2. Ensure that the plungers are fitted in pairs. This can be checked by placing them end to end; in this position the slots should be parallel to each other.
3. Check that the plungers are fitted to the correct bore in adjuster housing. When the plungers are fitted correctly and forced down on the flats of the adjusting cone, the slot for brake shoe web will be in line with the slots in adjuster housing and the angle of the plunger slot will coincide with the angle of brake shoe web.

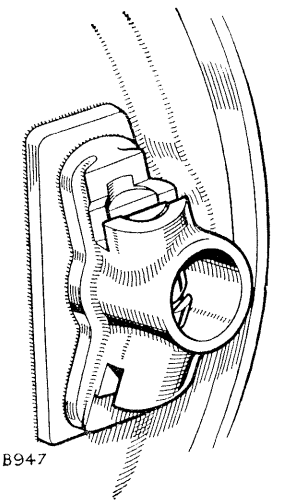


Fig. H-11—
Plungers correctly located

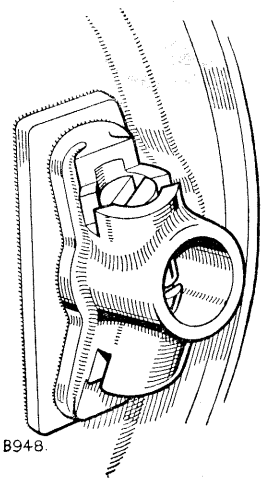


Fig. H-12—
Plungers incorrectly located

4. Leave the wheel cylinder fixing nuts one turn slack so that the cylinder is free to float on the anchor plate.

5. If new linings have been fitted the ends must be backed off. The trailing shoe has the shorter lining and care must be taken to ensure it is not fitted in the leading position.
6. Finally bleed the wheel cylinders and if the brake shoe steady posts have been disturbed, reset as instructed in Item 12 of Operation H/30.

Wheel brake shoes

To re-line **Operation H/44**

1. Remove the old linings from the shoes by shearing the rivets.
2. Re-line both shoes in the normal way, with the correct linings, and "back-off" both ends of each lining. Uneven braking is liable to occur if mixed sets of linings are employed.

Hand brake lever and linkage

To strip (R.H.D. models) **Operation H/46**

1. Remove the centre inspection panel from the seat box.
2. Disconnect the transmission brake expander rod and vertical adjuster rod from the bell-crank lever.
3. Remove the hand brake assembly complete from the vehicle, withdrawing the lever grip carefully through the rubber draught excluder in the front of the seat box.
4. Remove the adjuster rod from the adjuster pin; remove the adjuster pin, thus releasing the brake catch and locating plate.
5. Remove the locating plate.
6. Remove the lever from the ratchet plate.
7. Remove the brake catch from the plunger rod and unscrew the plunger, plunger rod and spring from the brake lever.
8. Remove the bell-crank and spindle complete from the chassis.
9. Remove the bell crank lever from the spindle.
10. If necessary, press the bush out of the lever.

To strip (L.H.D. models) **Operation H/48**

1. Remove the centre panel from seat box.
2. Disconnect the transmission brake expander rod and vertical adjuster rod from the bell crank lever.
3. Remove the hand brake and cross-shaft complete.
4. Remove the split housing from the cross-shaft support brackets, remove the felt dust seals and self-lubricating bushes supporting the hand brake cross-shaft.
5. Strip the unit. Operation H/46.
6. Remove the bell crank lever. Operation H/46.

To assemble **Operation H/50**

1. Reverse the sequence of operations detailed for stripping.
2. Renew the bell crank lever bush and spindle if required.
3. L.H.D. models. The bushes should be greased prior to assembly and new felt seals fitted as required.
4. Set the adjuster rod by means of the locknuts at the adjuster pin, so that the hand brake lever has two ratchet clicks free movement in the "off" position.

Transmission brake unit

To strip **Operation H/52**

1. Remove the centre inspection panel from the seat box.
2. Drain the transfer box.
3. Disconnect the brake expander rod from the bell crank lever.
4. Disconnect the rear propeller shaft from the transfer box output shaft.
5. Withdraw the brake drum and rear drive output flange. Remove the brake drum from the flange, if necessary.

   If access is only required to the brake shoes, e.g., for re-lining, the propeller shaft may be left in position; the brake drum may then be detached from the output flange and pushed back over the propeller shaft.

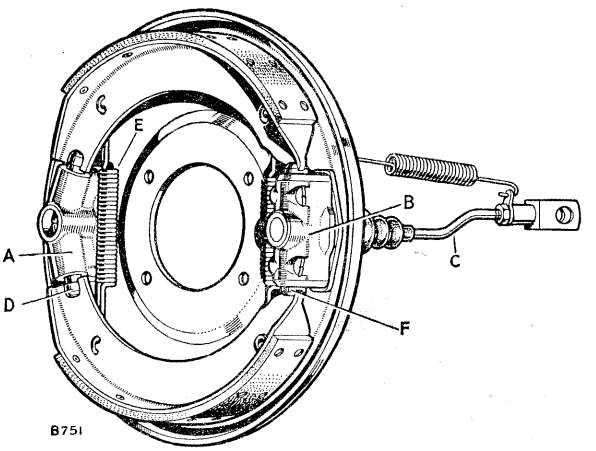
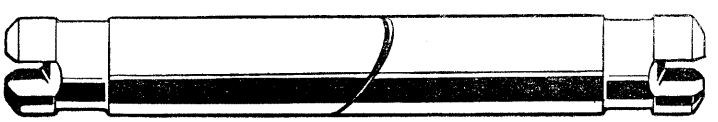


Fig. H-13—Transmission brake unit, early type

A—Adjuster unit
B—Expander unit
C—Expander rod
D—Adjuster plunger
E—Pull-off spring
F—Expander plunger



L.H. Plunger R.H. Plunger

Fig. H-14
Early type

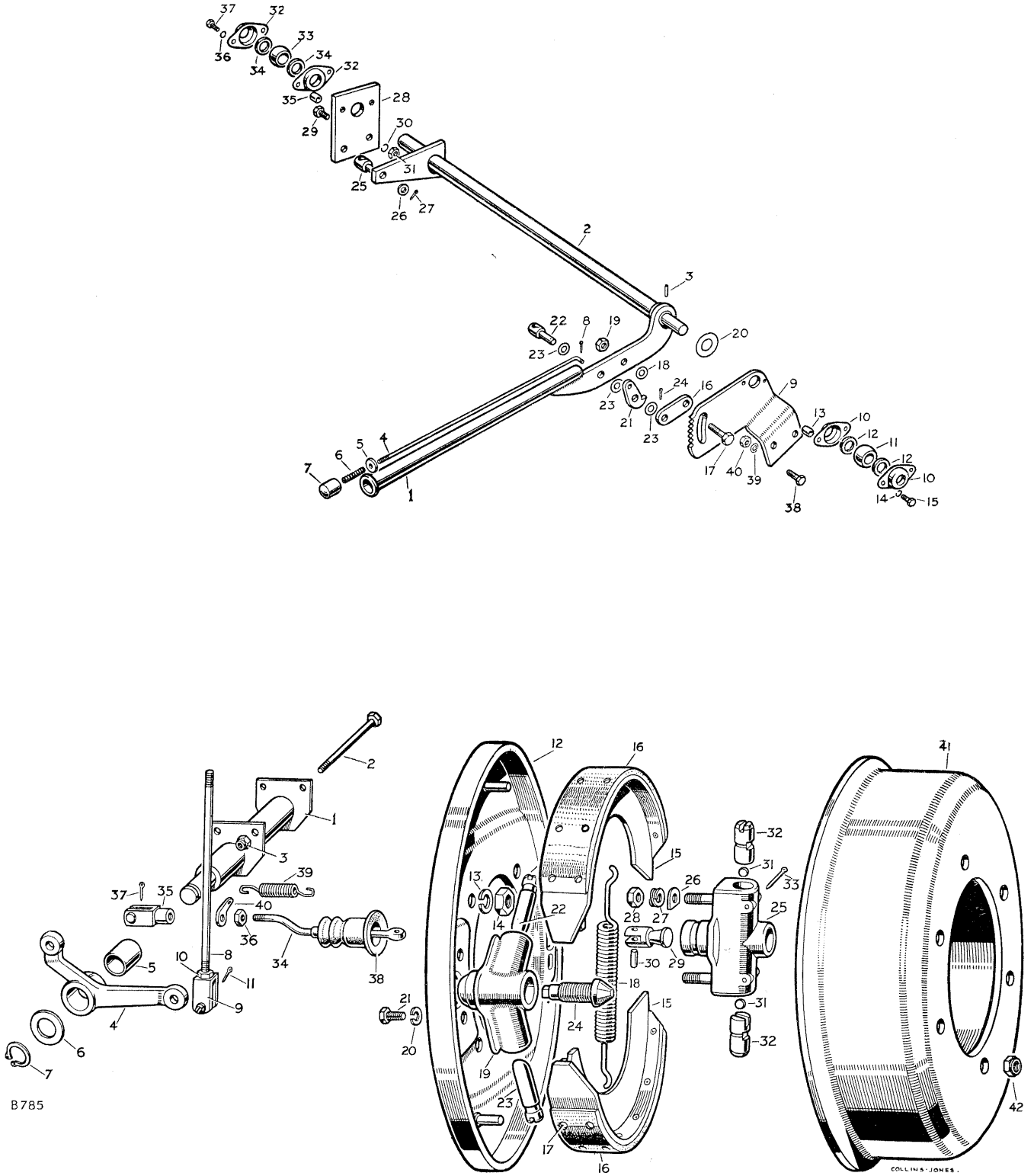


Fig. H-15—Layout of transmission brake, early type

Key to Fig. H-15

1 Hand brake lever
2 Cross-shaft for hand brake
3 Pin fixing lever to shaft
4 Plunger rod
5 Washer for plunger spring
6 Spring for plunger rod
7 Plunger
8 Split pin fixing rod to catch
9 Ratchet for hand brake
10 Housing for cross-shaft bearing
11 Spherical bearing for cross-shaft
12 Felt ring for bearing
13–15 Fixings for bearing and housing
16 Locating plate
17–19 Fixings for locating plate and lever
20 Plain washer between lever and ratchet
21 Brake catch
22–24 Fixings for catch to lever
25 Pin for hand brake adjuster rod
26–27 Fixings for pin
28 Support plate for hand brake bearing housing
29–31 Fixings for support plate
32 Housing for cross-shaft bearing
33 Spherical bearing for cross-shaft
34 Felt ring for bearing
35–37 Fixings for housing and bearing
38–40 Fixings for hand brake lever

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1 Spindle for hand brake relay lever
2–3 Fixings for spindle
4 Relay lever assembly for hand brake
5 Bush for relay lever
6–7 Fixings for lever
8 Brake rod, relay to hand brake lever
9–11 Fixings for brake rod to relay and hand brake lever
12 Anchor plate, transmission brake
13–14 Fixings for anchor plate
15 Brake shoe assembly
16 Lining for shoe
17 Rivet for lining
18 Pull-off spring for brake shoe
19 Adjuster housing
20–21 Fixings for adjuster housing
22 Plunger R.H.
23 Plunger L.H.
24 Adjuster cone
25 Expander housing
26–28 Fixings for expander housing
29 Expander cone
30 Pin fixing cone to brake rod
31 Roller for expander
32 Plunger for expander
33 Split pin fixing plunger
34 Brake rod, expander to relay lever
35–37 Fixings for brake rod
38 Dust cover for brake rod
39 Return spring for brake rod
40 Anchor for spring
41 Brake drum
42 Self-locking nut fixing brake drum

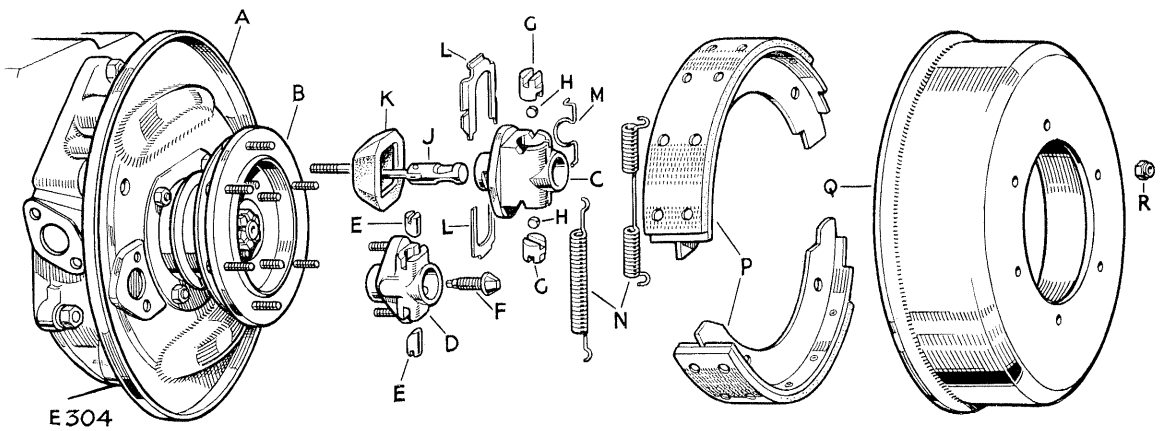

Fig. H-16—Layout of transmission brake, late type

A—Anchor plate
B—Hub flange
C—Expander housing
D—Adjuster housing
E—Adjusting plungers
F—Adjusting cone
G—Expander plungers
H—Expander rollers
J—Expander operating lever
K—Rubber dust cover
L—Expander securing clip
M—Spring clip retaining expander parts
N—Pull-off springs
P—Brake shoes
Q—Brake drum
R—Self-locking securing nut

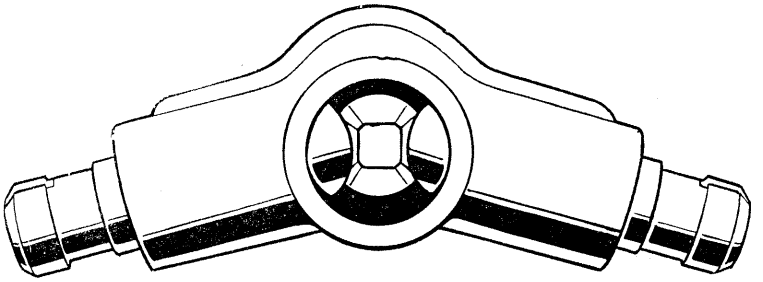

Fig. H-17—Plungers in correct bores, early type

6. Remove the brake shoes together with the pull-off springs, separate the shoes by detaching the springs.
7. Remove the anchor plate complete with adjuster and expander housings from the speedometer drive housing.
8. **Early type.** Remove the clevis, return spring, spring anchor and rubber dust cover from the expander rod and remove the expander housing complete. If necessary, remove the split pins from the expander housing, thus releasing the plungers, steel balls and expander cone; detach the expander rod from the cone.
9. **Late type.** Withdraw the rubber dust excluder and remove the clip securing the expander housing to the anchor plate. Withdraw the expander assembly. If necessary remove the spring clip and withdraw the plungers, steel rollers and operating rod.
10. Remove the adjuster housing, pull out the plungers and unscrew the adjuster cone from the housing.

To assemble **Operation H/54**

1. Clean the brake anchor plate.
2. Replace the adjuster housing, leaving the securing bolts slack at this stage; screw in the adjuster cone, leaving it in the fully "off" position.
3. Grease the adjuster plungers and replace them in the housings.

   It is essential that the adjuster plungers be replaced in the correct bores of the housing. They are handed, due to the fact that in addition to the adjustment flats being at an angle of 30° when viewed vertically, they are also inclined at an angle of 15° to the plunger axes, owing to the housing bores being similarly inclined. When dismantled the plungers are not readily distinguished, and care must be taken to ensure that handed pairs are fitted.

   A quick method of selecting pairs is shown at Fig. H-14. The plungers should be placed end to end with the flats mated exactly, when a correct pair will show the brake shoe slots parallel with each other. If the slots are not in line, both plungers are of the same hand, but this test gives no indication as to which hand, right or left.

   Having made certain that a correct pair has been chosen, it will still be necessary to make sure that they are fitted in the proper bores, as in Fig. H-17, i.e., with the flats of the adjuster cone and plungers face to face; the slots in the ends of the plungers must be in line and vertical (parallel with the anchor plate). In this case, four distinct "clicks" will be felt for each revolution of the adjuster cone.

   When assembled wrongly, the brake shoes will force the plunger slots into a vertical position, throwing the plunger flat off the flat of the adjuster cone, pushing the plunger approximately 1/16 in. (1,5 mm) out of the housing and so upsetting the centralisation of the shoes.

   It is possible to erect the units incorrectly in three ways:

   (*a*) R.H. plunger in L.H. bore and L.H. plunger in R.H. bore (Fig. H-18).

   In this case it is likely that no "click" will be felt when adjusting the brake.

   (*b*) Two L.H. plungers in the housing.

   (*c*) Two R.H. plungers in the housing (Fig. H-19).

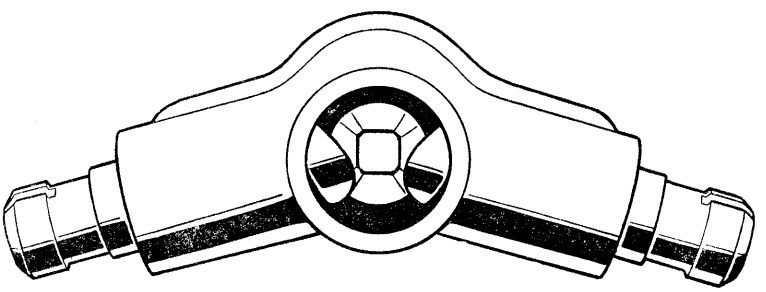

Fig. H-18—Correct pair of plungers in incorrect bores, early type

In both these cases the correct plunger will "click" on adjustment, thus giving the erroneous impression that the assembly is in order.

Early type, items 4, 5 and 6

4. Grease and replace the expander plungers, steel rollers and expander cone in the housing and locate with split pins.
5. Reconnect the expander rod to the cone and fit the complete housing to the brake anchor plate, leaving the Simmonds securing nuts one turn slack. Ensure that the housing is free to float on the anchor plate.
6. Replace the rubber dust cover, spring anchor plate, return spring and clevis on the expander rod.

Late type, items 7 and 8

7. Grease and replace the plungers, steel rollers and operating rod in the expander housing.
8. Refit the housing to the anchor plate with the spring clip fitted as illustrated. Refit the rubber dust excluder and ensure that the housing retaining clip is positively fitted under the lip formed in the dust excluder.
9. Mount the complete anchor plate on the speedometer drive housing.
10. Refit the brake shoes and pull-off springs together; **Early type**—the half-round slots in the shoe webs should be fitted to the adjuster housing. **Late type**—the fully lined ends of the shoes should be fitted to the adjuster housing plungers.
11. Clean and replace the brake drum and rear drive output flange.
12. Reconnect the propeller shaft to the transfer box output shaft.
13. Reconnect the expander rod to the hand brake bell-crank lever.
14. To ensure correct clearance between the brake shoes and drum, turn the adjuster cone until the brake shoes are locked tightly against the drum; tighten the set bolts securing the adjuster housing (these were left slack on assembly) and slacken off the cone two clicks; give the brake a firm application to ensure that the shoes have centralised at the expander end. The brake drum should now be free to rotate.
15. Set the hand brake linkage at the vertical adjuster rod, so that the hand brake has one or two clicks free movement in the "off" position.
16. Refill the transfer box with oil, 4½ pints (2,5 litres).
17. Replace the seat box centre inspection panel.

Transmission brake shoes

To re-line **Operation H/56**

1. Remove the old linings from the shoes by shearing the rivets.
2. Re-line both shoes in the normal way with the correct linings, and "back-off" both ends of each lining.

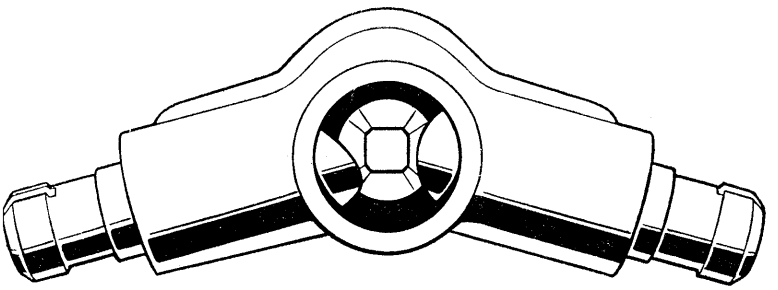

Fig. H-19—Two R.H. plungers in the housing, early type

DEFECT LOCATION

(Symptom, Cause and Remedy)

A—SPONGY PEDAL ACTION

1. Air in system—*Bleed the brake system.*
2. Swollen rubber components due to incorrect brake fluid—*Renew the affected parts, drain the system and refill with Girling Crimson Brake Fluid.*
3. Incorrect adjustment of brake shoes—*Adjust.*

B—CHATTERING BRAKES

1. Incorrect adjustment of brake shoes—*Adjust.*
2. Loose front wheel bearings—*Section F.*
3. Hard spots on brake drum—*Renew linings as necessary and fit a new brake drum.*
4. Distorted brake drum—*Renew linings as necessary and fit a new brake drum.*

C—LOSS OF PEDAL PRESSURE

1. Leak in master cylinder—*Renew.*
2. Leak in wheel cylinder—*Renew.*
3. Leak in brake pipes—*Renew.*

D—HARD BRAKE PEDAL

1. Incorrect lining—*Renew.*
2. Restriction in master cylinder—*Rectify.*
3. Incorrect shoe adjustment—*Adjust.*

E—BINDING BRAKE PEDAL

1. Worn or tight pedal shaft—*Rectify, renewing any excessively worn parts. Lubricate.*
2. Loose master cylinder mounting bolts—*Tighten.*

F—BRAKE PEDAL FAILS TO RETURN

1. Weak pedal return spring—*Renew.*
2. Loose master cylinder mounting bolts—*Tighten.*
3. Sticking pedal shaft—*Free the pedal shaft, renewing any excessively worn part. Lubricate.*

G—POOR BRAKES

1. Water-soaked linings—*Dry the brake linings by applying the brakes lightly whilst driving.*
2. Incorrect linings—*Renew.*
3. Glazed linings—*Renew.*
4. Incorrect shoe adjustment—*Adjust.*
5. Incorrect master cylinder adjustment—*Adjust.*

H—GRABBING BRAKES

1. Grease, oil or brake fluid soaked linings—*Replace and rectify leaks.*
2. Scored or cracked drums—*Recondition or replace.*
3. Incorrect shoe adjustment—*Adjust.*
4. Incorrect linings—*Renew.*
5. Hard spots on drums—*Renew.*

J—SIDE PULL

1. Grease, oil or fluid soaked linings—*Renew and rectify leaks.*
2. Incorrect shoe adjustment—*Adjust.*
3. Loose wheel cylinders—*Tighten.*
4. Clogged or crimped brake hose—*Clear the hose with air pressure or renew.*
5. Excessive wear in drum or scored drum—*Recondition or renew.*
6. Mixed linings—*Replace.*
7. Incorrect tyre pressures—*Section S.*
8. Water and mud in brakes—*Clean the brake assemblies, examine drums for scoring, and linings for wear. Renew as necessary.*

K—SQUEALING BRAKES

1. Incorrect linings—*Renew.*
2. Distorted brake drum—*Renew.*
3. Bent brake anchor plate—*Renew.*
4. Sprung or bent brake shoes—*Renew.*
5. Foreign bodies embedded in brake linings—*Recondition or renew.*
6. Dust or road dirt in the drums—*Clean thoroughly. If necessary, renew the linings and recondition or renew the drums.*
7. Where applicable. Shoes binding on the steady posts—*Adjust.*
8. Loose wheel cylinders—*Tighten. Check the brake linings and renew as necessary.*

L—BRAKES OVERHEATING

1. Brake shoes continuously in contact with drum—*Adjust.*
2. High spots on brake drums—*Recondition or renew.*
3. Defective master cylinder or swollen rubber components—*Renew.*
4. Dust or road dirt in the drums—*Clean thoroughly. If necessary, renew the linings and recondition or renew the drums.*
5. Incorrect master cylinder adjustment—*Adjust.*

M—FADING BRAKES

1. Incorrect linings—*Renew.*
2. Poor lining contact—*Adjust.*
3. Excessive heat—*Renew linings.*

N—BRAKE DRAGS

1. Incorrect brake adjustment—*Adjust.*
2. Distorted rubber boots—*Renew.*
3. Seized brake shoe—*Free the brake shoe from its anchor and smear the point of seizure lightly with grease.*
4. Weak brake shoe pull-off springs—*Renew.*
5. Loose front wheel bearings—*Section F.*
6. Restriction or obstruction in brake pipe—*Clear the pipe.*
7. Distorted brake drum—*Renew.*

P—ALL BRAKES DRAG

1. Incorrect adjustment of brakes—*Adjust.*
2. Incorrect master cylinder adjustment—*Adjust.*
3. Rubber cylinder boots swollen—*Renew.*
4. Restriction in master cylinder—*Remove, clean or recondition.*
5. Linings too thick—*Check.*
6. Weak pull-off springs—*Renew.*

Q—BRAKE LOCKS

1. Oil or brake fluid soaked linings—*Replace; rectify leaks.*
2. Torn or loose lining—*Renew and check the shoe for distortion.*
3. Loose wheel cylinders—*Tighten. Check the brake linings and renew as necessary.*
4. Swollen rubber components—*Renew.*

R—PEDAL GOES TO FLOOR BOARD

1. Linings badly worn—*Re-line.*
2. Pedal incorrectly set—*Adjust.*

DATA

Brakes:

Type .... Girling
Operation .... Hydraulic

Foot pedal:

Fit of bush on pedal shaft .... .001 to .003 in. (0,02 to 0,07 mm)
Bush reamed bore .... $\frac{3}{4}$ in. + .001 in. (19 mm + 0,02)

Wheel brake unit, front and rear (10 in. brakes):

Lining:
Length .... $8\frac{1}{2}$ in. (215 mm)
Width .... $1\frac{1}{2}$ in. (38 mm)
Thickness .... 3/16 in. (4,75 mm)

Brake drum:

Standard diameter .... 10 in. + .004 (254 mm + 0,1)
Reclamation limit .... .030 in. (0,75 mm) oversize on diameter

Wheel brake unit, front (11 in. brakes):

Lining:
Length .... 10.45 in. (265 mm)
Width .... $2\frac{1}{4}$ in. (57 mm)
Thickness .... 3/16 in. (4,75 mm)

Wheel brake unit, rear (11 in. brakes):

Lining:
Length .... 8.6 in. (218 mm)
Width .... $2\frac{1}{4}$ in. (57 mm)
Thickness .... 3/16 in. (4,75 mm)

Brake drum:

Standard diameter .... 11 in. + .004 (279,4 mm + 0,10)
Reclamation limit .... .030 in. (0,75 mm) oversize on diameter

Transmission brake:

Lining:
Length .... 7.70 in. (195 mm)
Width .... $1\frac{3}{4}$ in. (44,5 mm)
Thickness .... 3/16 in. (4,75 mm)

Brake drum:

Standard diameter .... 9 in. + .004 (228,6 mm + 0,1)
Reclamation limit .... 0.30 in. (0,75 mm) oversize on diameter

Master cylinder:

Type (88 models) .... Girling CB
Bore .... $\frac{3}{4}$ in. (19 mm)
Stroke .... $1\frac{1}{2}$ in. (38 mm)
Type (109 models) .... Girling CB
Bore .... 1 in. (25 mm)
Stroke .... $1\frac{1}{2}$ in. (38 mm)
Pushrod free movement .... 1/16 in. (1,5 mm)