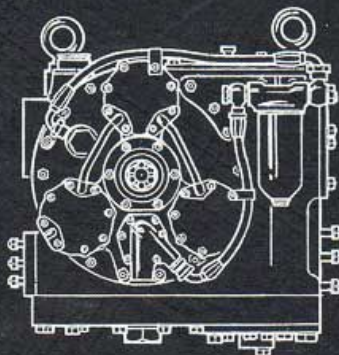


TYPE SE4 GEARBOX

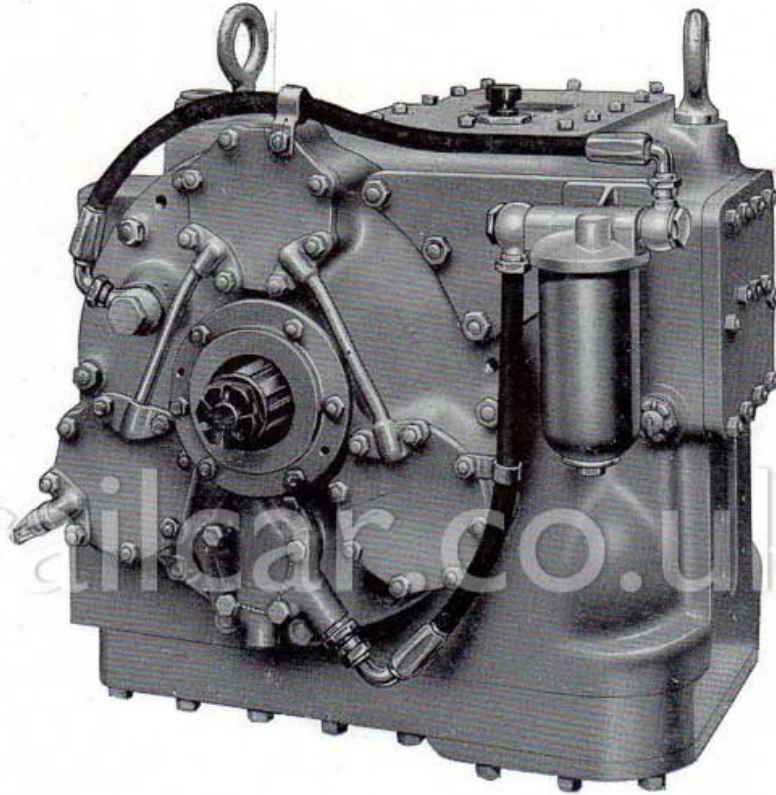


railcar.co.uk
**SERVICE
MANUAL**



SELF-CHANGING GEARS LIMITED

TYPE S.E.4 GEARBOX



LIST NUMBERS

5742 5743 5744 5963 5820
5982 6085 6335 6484 6230 6231

MANUFACTURED UNDER ONE OR MORE OF THE FOLLOWING
BRITISH PATENTS AND OTHER FOREIGN PATENTS.....

402778—402793—454149

ISSUED TO
LOCATION. D.M.U. SECTION
ISSUED BY SCHEDULED & STANDARD ENG.

SELF-CHANGING GEARS LIMITED
LYTHALLS LANE · COVENTRY · ENGLAND
TELEPHONE: COVENTRY 89081 TELEGRAMS: SELF-CHANGE, COVENTRY

TYPE S.E.4. GEARBOX

CONTENTS

DATA	Page 5
GENERAL DESCRIPTION	Page 5
LUBRICATION	Page 16
MAINTENANCE AND ADJUSTMENT	Page 18
ROUTINE ATTENTION	Page 21
SERVICING THE BRAKES	Page 22
OVERHAUL	Page 24
LIST OF PARTS	Page 32

LIST OF ILLUSTRATIONS

Fig. 1. Section through Gearbox. List No. 5742—5743	Page 7
Fig. 2. Section through Gearbox. List No. 6230—6231	Page 9
Fig. 3. Section through 1st Speed Brake Band (brake off)	Page 11
Fig. 4. Section through 1st Speed Brake Band (brake on)	Page 12
Fig. 5. The Automatic Adjuster	Page 12
Fig. 6. Torque Transmission Diagram.	Page 13
Fig. 7. Diagrammatic View of Epicyclic Gear Train	Page 14
Fig. 8. Internal View of Front Cover	Page 14
Fig. 9. Gearbox Output Oil Pump (Plunger Type)	Page 15
Fig. 10. Diagram of Input Oil Pump	Page 15
Fig. 11. Section through Oil Filter	Page 17
Fig. 12. View of Piston and Cylinder	Page 18
Fig. 13. View of Top Speed Piston Assembly and Oil Pump	Page 19
Fig. 14. Brake Setting Dimensions	Page 21
Fig. 15. Application of Toggle Setting Gauge	Page 22
Fig. 16. Checking Movement of Adjuster Nut	Page 22
Fig. 17. External View of Gearbox. List No. 5742—5743	Page 24
Fig. 18. External View of Gearbox. List No. 6230	Page 24
Fig. 19. Exploded View of Running Gear (viewed from Input End)	Page 25
Fig. 20. Exploded View of Running Gear (viewed from Output End)	Page 26
Fig. 21. View of Brake Band Assembly, Hooks, Centralisers and Base Plate	Page 27
Fig. 22. Method of Skimming the Brake Linings	Page 28
Fig. 23. Detail of Drilling Sizes for Rivet Holes in Internal and External Brake Lining...	Page 28
Fig. 24. View of Cylinder Block Plate showing Location of Air Restrictors	Page 30
Fig. 25. Special Tools	Page 30
Fig. 26. Running Gear End Float	Page 31
Fig. 27. Exploded View of Casings and Covers	Page 33
Fig. 28. Exploded View of Running Gears	Page 39
Fig. 29. Exploded View of Brake Gear	Page 43
Fig. 30. Exploded View of Oil Filter Assembly	Page 47

GEARBOX — DATA

(TYPE S.E. 4 SPEED)

TYPE:

S.E. 4 Speed Gearbox.

MAX. INPUT TORQUE:

750 lb. ft.

GEAR RATIOS:

List No. :

5742	{	1st speed 4.08 : 1
5743		2nd speed 2.33 : 1
5744		3rd speed 1.49 : 1
5963		Top speed 1 : 1
5820		
5982		
6085		
6335		
6484		

LIST No. :

6231	{	1st speed 4.25 : 1
6230		2nd speed 2.408 : 1
		3rd speed 1.596 : 1
		Top speed 1 : 1

LUBRICATION:

1 Plunger pump on output shaft.
1 Spur type pump geared to input shaft.

APPROXIMATE WEIGHTS:

Nett weight :

7 cwt. 3 qrs. Cast Iron casing (394Kg)
5 cwt. 00 qrs. Aluminium casing (255Kg)

GROSS WEIGHT:

9 cwt. Cast Iron casing (458Kg)
6 cwt. Aluminium casing (305Kg)

OIL CAPACITY:

2½ galls.

AIR PRESSURE:

65/70 lbs. per sq. in.

GEARBOX — GENERAL DESCRIPTION

(See figs. 1 and 3)

The S.E. type gearbox has been especially designed for satisfactory service under the arduous conditions of railway work, and also to provide, where required, a simple means of control for the remote operation of the gearbox as a single unit or for simultaneous control of two or more gearboxes.

The gearbox is of the compound epicyclic type, and is capable of transmitting a torque of 750 lb. ft., according to application.

The gears are engaged by applying a brake to the requisite gear train. The brakes being completely balanced, do not put any load on the gearbox bearings. They are also provided with automatic adjustments for

taking up any wear which may occur on the band linings. When in the "Off" position the bands are located by centralizers which hold them clear of the drums.

A separate air cylinder and actuating mechanism is provided for each brake, and the brake is applied by the admission of air at approximately 65/70 lbs. sq. in. pressure to the appropriate cylinder.

For controlling the admission and exhaustion of air to and from the operating cylinders, electromagnetic valves may be used. These valves enable two or more gearboxes to be controlled simultaneously simply by the completion of an electrical circuit.

Alternatively, the air may be fed directly into the operating cylinders, control then being effected by a 4-way air control valve situated in the driver's cab.

In top gear, the whole of the gearing rotates as a solid unit, giving direct drive from input to output takes the form of a multi-plate clutch which is engaged by axial pressure from three equally spaced air cylinders contained within the front cover.

The main casing of the gearbox may be in aluminium or cast iron, thus suiting either railcar or shunting locomotive work.

The gearing is constructed from high tensile steel forgings, hardened and ground where necessary.

BRAKE OPERATION (See figs. 3 and 4)

The brake mechanisms in this gearbox are used to bring into operation the reduction gears 1st, 2nd and 3rd speed, one brake band being provided for each.

When a gear is engaged the appropriate brake grips the brake drum bringing it to rest, thus providing a reaction so that power is transmitted to the gearbox output shaft.

FEATURES OF THE BRAKES (See fig. 3)

The brake consists of two concentric bands whose friction linings are situated side by side. The outer band when constricted by the brake mechanism closes the inner band, both linings being brought into contact with the brake drum.

By using suitable anchorage for the inner and outer bands, the brake is balanced, so preventing the shafts

and bearings from being subjected to any load arising from the application of the brakes. The brakes are centralised about the drums in such a manner as to prevent them rubbing when in the **Off** position.

The brake linings are made from an extremely hard-wearing material suitable for working in oil. It is inevitable, however, that some wear will take place in time, and this is corrected by the Automatic Adjuster Mechanism (See Fig. 5) which keeps the brakes constantly at their correct setting.

OPERATING SEQUENCE OF THE BRAKES

(See fig. 3)

The sequence of operation during brake application is as follows :—

When the change speed selector lever is moved into a gear position, air is admitted to the cylinder, forcing the piston (5) upwards. This movement applies an upward force to the thrust pad (29) which pivots about its knife edge on the hooks, thereby raising the adjuster mechanism (22, 27, 28) and with it the pull rod (32). Since the pull rod is attached to the lower end of the outer band (the upper end of which is anchored by the hooks) this action constricts the brake band.

AIR PRESSURE

At all times when the gearbox is in use, correct air pressure (65/70 lbs. per sq. inch) **must** be maintained.

This is essential because **air pressure alone** holds the friction surfaces of brakes and clutch together and prevents them from slipping.

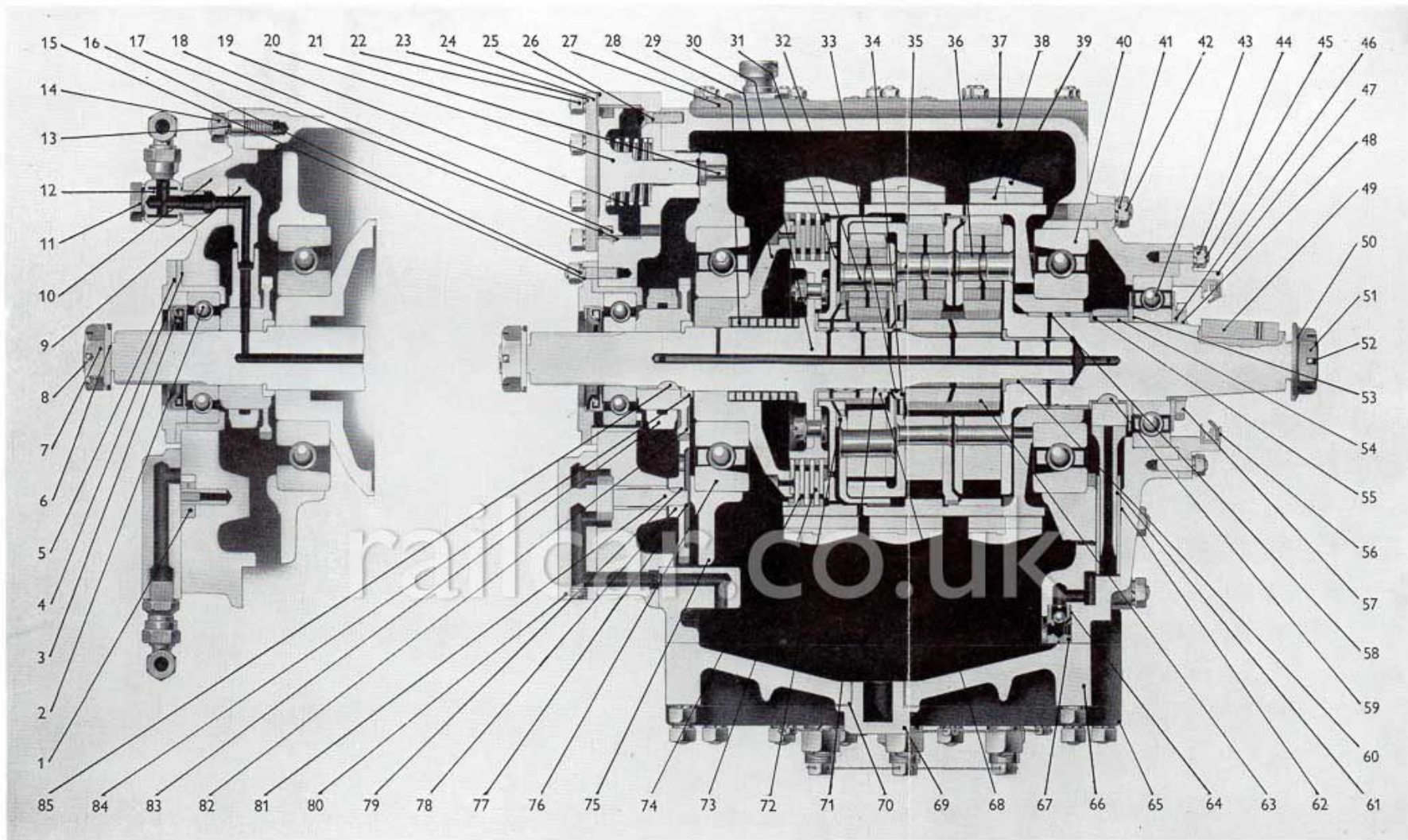


FIG. 1. SECTION THROUGH GEARBOX. LIST No. 5742-5743.

1. Pump Gear Driven.
2. Bearing.
3. Oil Seal (Input).
4. Bearing Sleeve (Front Cover).
5. Oil Seal Nut Washer (Input).
6. Input Nut Washer.
7. Input Nut.
8. Split Pin.
9. Bracket for Oil Muff.
10. Front Cover.
11. Banjo Bolt.
12. Banjo Union.
13. Spring Washer.
14. Nut.
15. Spring Washer.
16. Nut.
17. Top Speed Cylinder Liner.

18. Seal for Clutch Piston.
19. Top Speed Piston Spring.
20. Top Speed Piston.
21. Clutch Thrust Ring Button.
22. Nut.
23. Spring Washer.
24. Top Speed Air Cylinder Cover Plate.
25. Gasket.
26. Cone Headed Screw.
27. Inspection Cover Assembly.
28. Clutch Return Spring.
29. Clutch Actuation Member Assembly.
30. Input Shaft Assembly.
31. 3rd Speed Brake Drum Assembly.
32. 3rd Speed Train Assembly.
33. Bush—3rd Speed Planet Carrier.
34. Bush—3rd Speed Annulus.

35. 2nd Speed Train Assembly.
36. 1st Speed Train Assembly.
37. Gearcase.
38. Internal Brake Band.
39. External Brake Band.
40. Bearing.
41. Spring Washer.
42. Nut.
43. Bearing.
44. Spring Washer.
45. Nut.
46. Oil Thrower.
47. Oil Seal Housing.
48. Output Shaft Locknut Washer.
49. Output Shaft Key.
50. Output Shaft Washer.
51. Output Shaft Nut.

52. Output Shaft Split Pin.
53. Oil Pump Washer (Rear).
54. Oil Pump Eccentric (Rear).
55. Oil Pump Washer.
56. Oil Seal (Output).
57. Driven Shaft Locknut.
58. Bush 1st Speed Annulus.
59. Oil Pump Eccentric Key.
60. Output Shaft Bush.
61. Oil Pump Plunger.
62. Oil Pump Oscillating Cylinder.
63. 1st and 2nd Speed Sunwheel.
64. Oil Pump Valve Body Washer.
65. Plate for Cylinder Block.
66. Base Plate.
67. Oil Pump Valve Body.
68. 3rd Speed Sunwheel.

69. Oil Drain Plug.
70. Oil Drain Plug Washer.
71. 3rd Speed Sunwheel Bush.
72. 2nd Speed Brake Drum Bush.
73. Clutch Plate (Outer).
74. Clutch Plate (Inner).
75. Clutch Thrust Ring.
76. Bearing.
77. Circlip.
78. Pump Gear.
79. Key for Oil Pump.
80. Oil Pump Cover.
81. Pump Gear and Driving Shaft.
82. Oil Pump Driving Gear.
83. Oil Muff.
84. Spacing Piece.
85. Driving Gear Key.

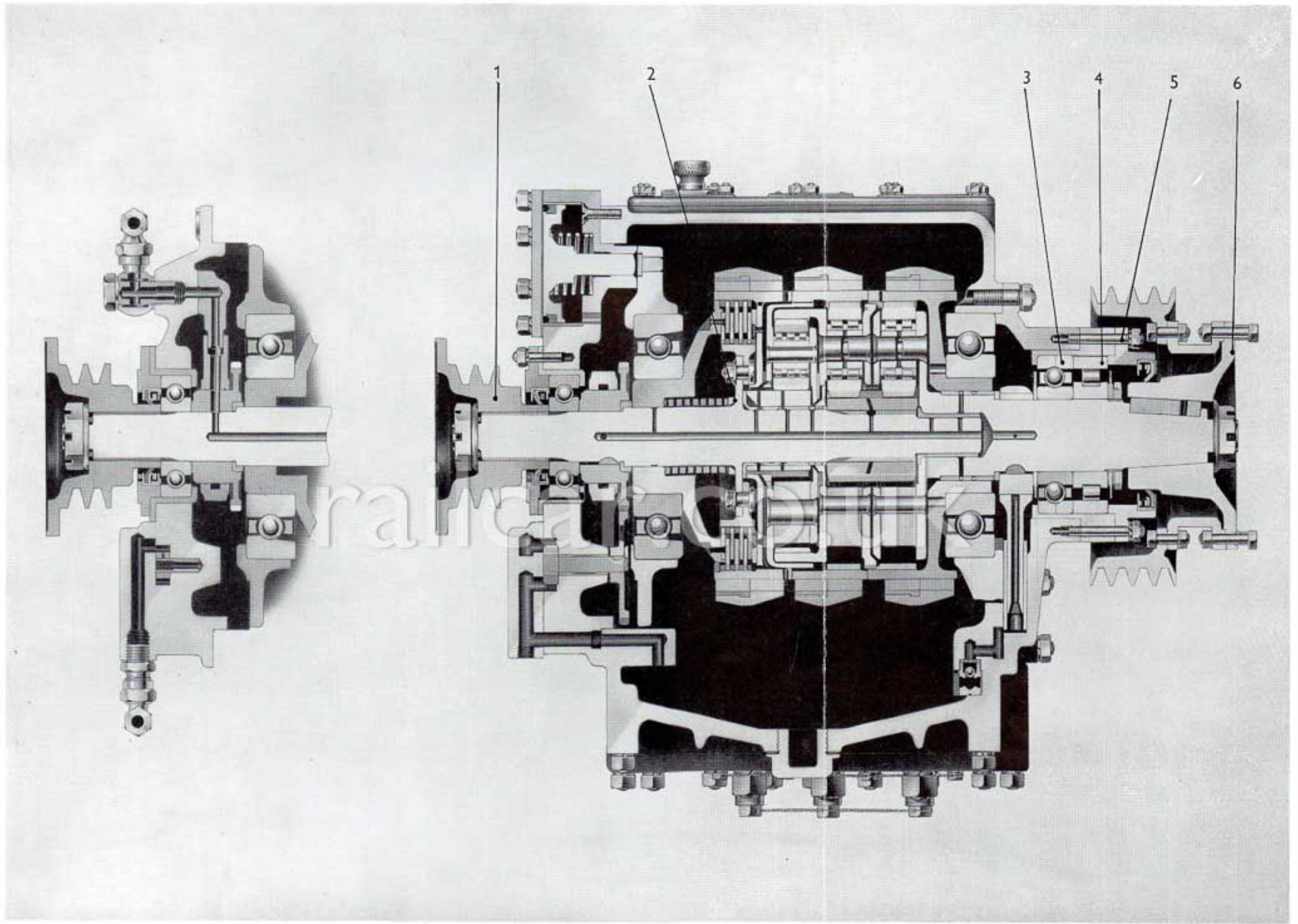


FIG. 2. SECTION THROUGH GEARBOX. LIST No. 6230-6231.

1. Input Coupling.

2. Abutment Washer.

3. Bearing.

4. Bearing.

5. Sleeve.

6. Output Coupling.

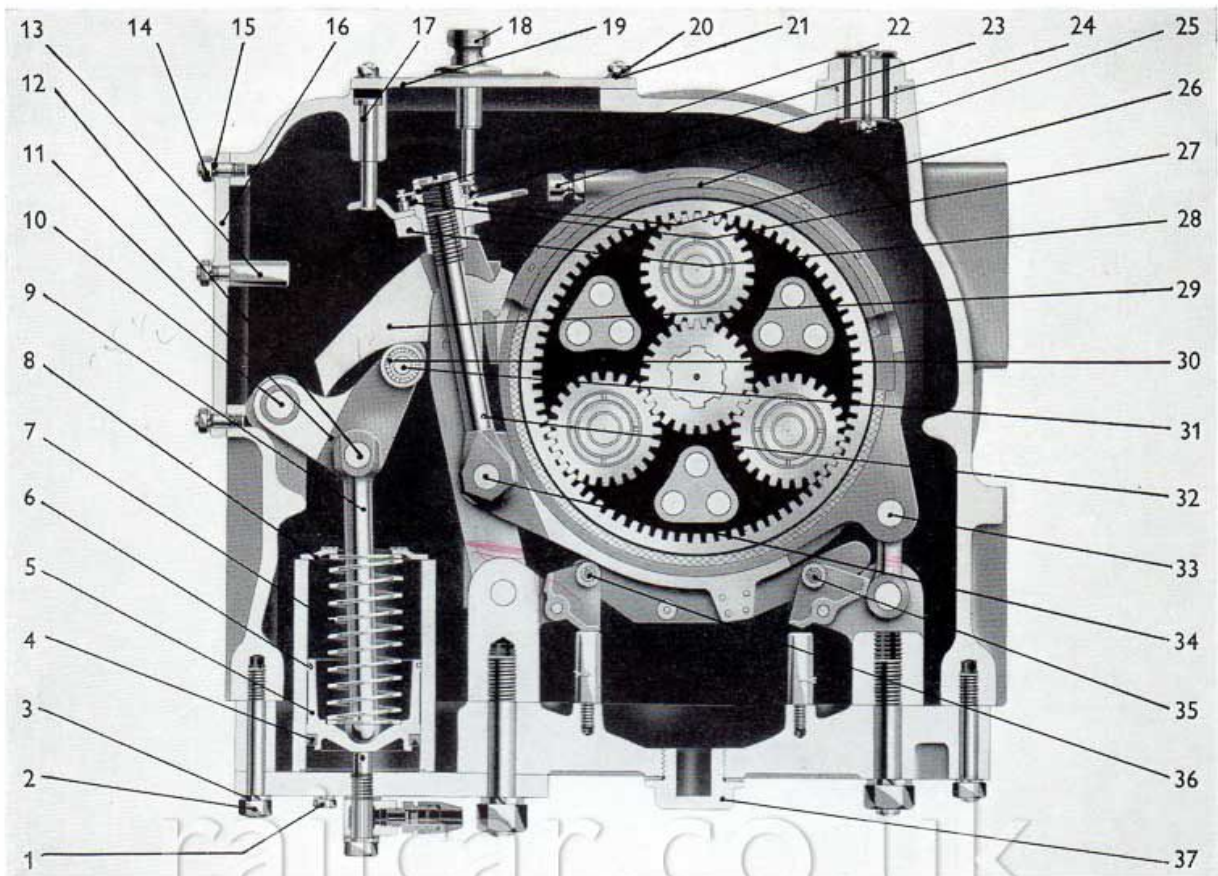


FIG. 3. SECTION THROUGH THE 1ST SPEED BRAKE BAND (BRAKE OFF).

- | | | |
|----------------------------|------------------------|----------------------------|
| 1. Setbolts. | 14. Nut. | 26. Adjuster Ring. |
| 2. Nut. | 15. Spring Washer. | 27. Adjuster Spring. |
| 3. Spring Washer. | 16. Side Cover. | 28. Adjuster Table. |
| 4. Seal. | 17. Adjuster Stop. | 29. Thrust Pad. |
| 5. Piston. | 18. Dipstick. | 30. Cam Roller Outer Race. |
| 6. "O" Ring. | 19. Inspection Cover. | 31. Actuating Link Bolt. |
| 7. Piston Spring. | 20. Nut. | 32. Pull Rod. |
| 8. Spring Retainer Plate. | 21. Spring Washer. | 33. Internal Band Pin. |
| 9. Operating Strut. | 22. Adjuster Nut. | 34. Pull Rod Pin. |
| 10. Actuating Link Pin. | 23. Adjuster Ring Pin. | 35. Centralizer Spring. |
| 11. Cam Plate. | 24. Adjuster Screw. | 36. Centralizer Spring. |
| 12. Operating Strut Bolts. | 25. Brake Band. | 37. Oil Drain Plug. |
| 13. Cam Plate Stop. | | |

THE AUTOMATIC ADJUSTER (See fig. 5)

This is a device for keeping the brakes constantly at their correct setting, this being accomplished by reducing the effective length of the pull rod and thus taking up the wear of the brake linings. There is one set per reduction gear train.

The height to which the thrust pad is allowed to swing determines the grip of the brake, and the travel of this thrust pad is governed by the automatic adjuster nut.

Wear on the brake linings will allow the thrust pad to move higher. When this happens the automatic adjuster ring striking the adjuster screw will be rotated **anti-clockwise**. The spring is pinned to the adjuster ring in such a way that this action loosens the spring from contact with the adjuster nut. When the brake approaches the **Off** position the rear portion of the adjuster ring strikes the tail pin. The adjuster ring now rotates in a clockwise direction taking with it the adjuster nut which is thereby screwed down, taking up the movement caused by the wear of the linings.

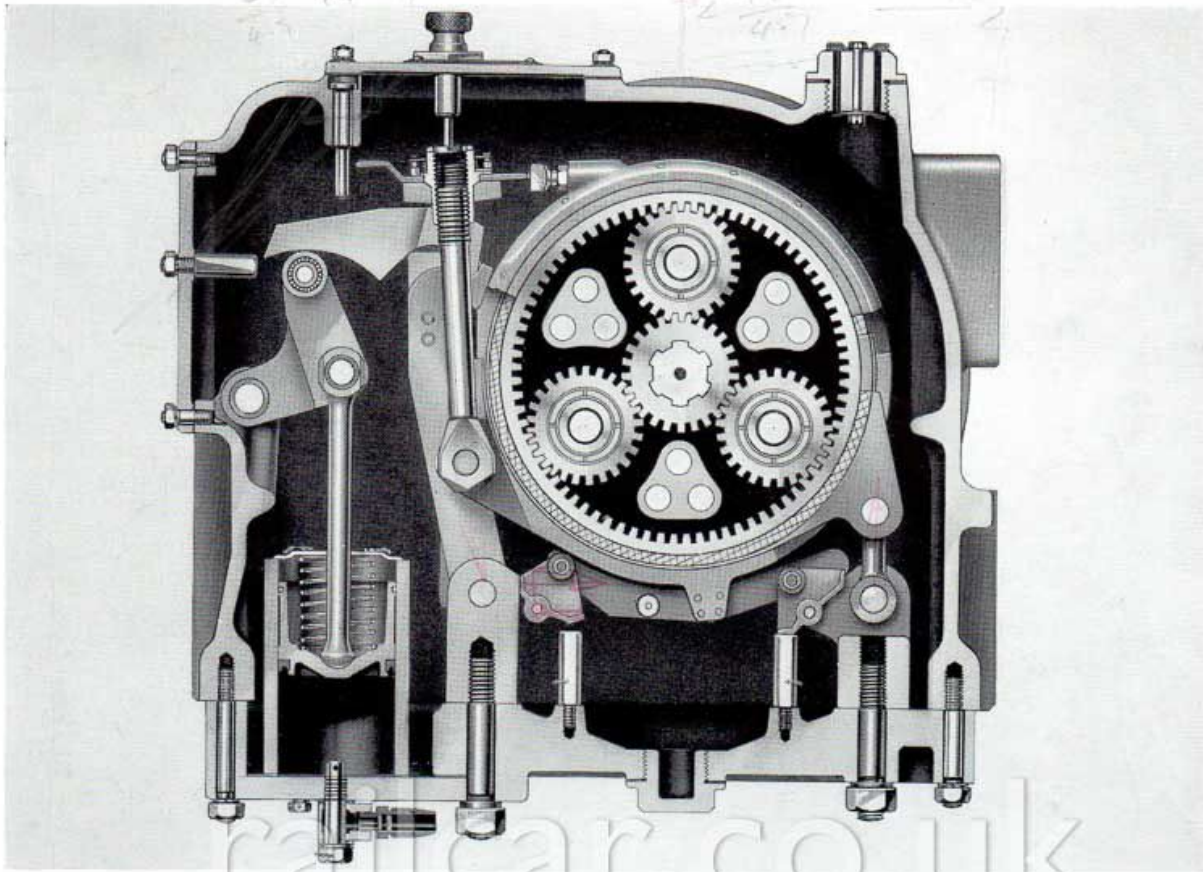


FIG. 4. SECTION THROUGH THE 1st SPEED BRAKE BAND (BRAKE ON).

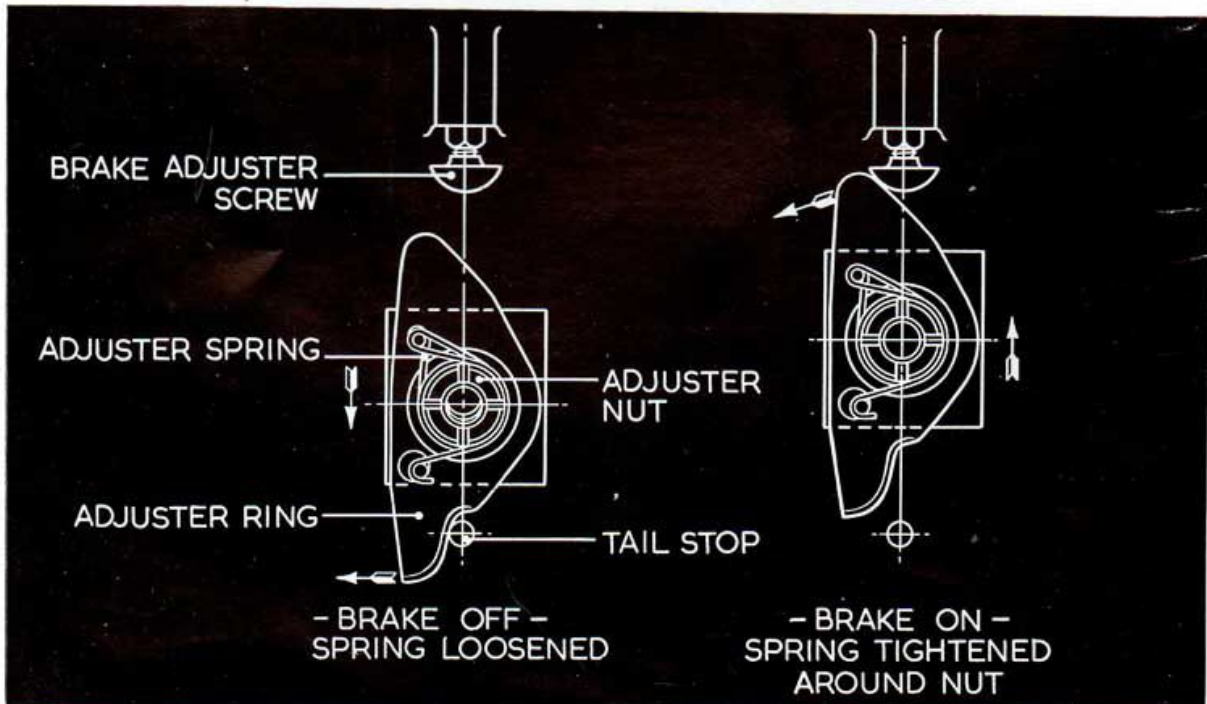


FIG. 5. THE AUTOMATIC ADJUSTER.

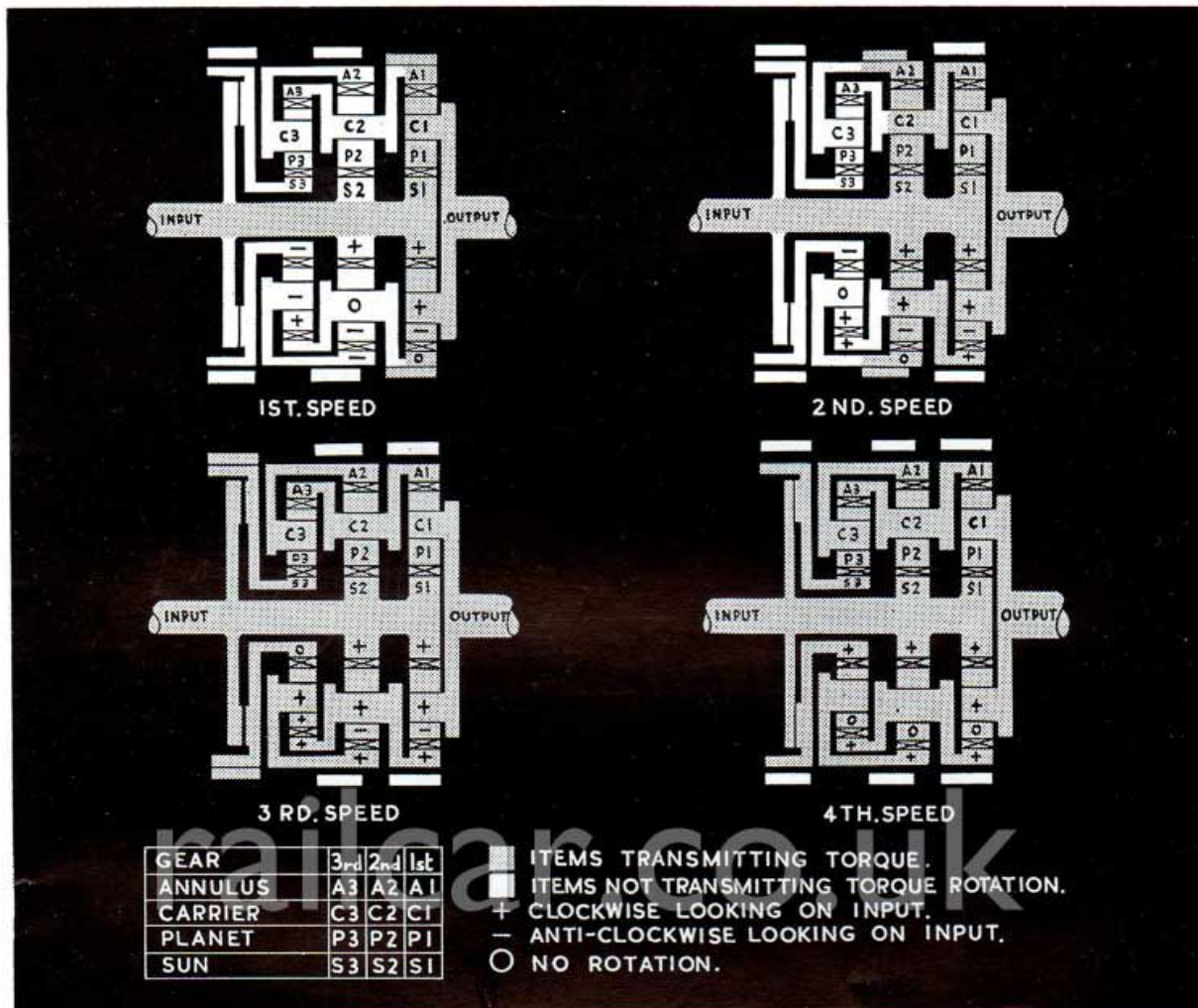


FIG. 6. TORQUE TRANSMISSION DIAGRAM.

PRINCIPLE OF OPERATION (See fig. 6)

With 1st gear engaged the brake holds stationary the 1st speed annulus (A1), so that revolution of the sun-wheel (S1), which is connected to the driving shaft causes the planets (P1) to roll round the internal teeth of the annulus, taking with them the planet carrier (C1) in the same direction as the driving shaft, but at a lower speed, the 1st speed planet carrier being integral with output shaft.

With the 2nd gear engaged, the annulus (A2) of the second gear train is held stationary, thus speeding up

the 1st gear annulus through its interconnection with the 2nd speed carrier.

With 3rd speed engaged a speeding up of the 1st and 2nd gear annuli is brought about by holding stationary the 3rd speed sunwheel.

Top gear is obtained by means of a plate clutch which, when engaged, connects the 3rd speed sunwheel to the 1st and 2nd gear sunwheel, thereby locking the whole assembly, and giving a direct drive. The top speed clutch needs no adjustment since wear on the clutch plates is compensated by increased movement of the operating pistons.

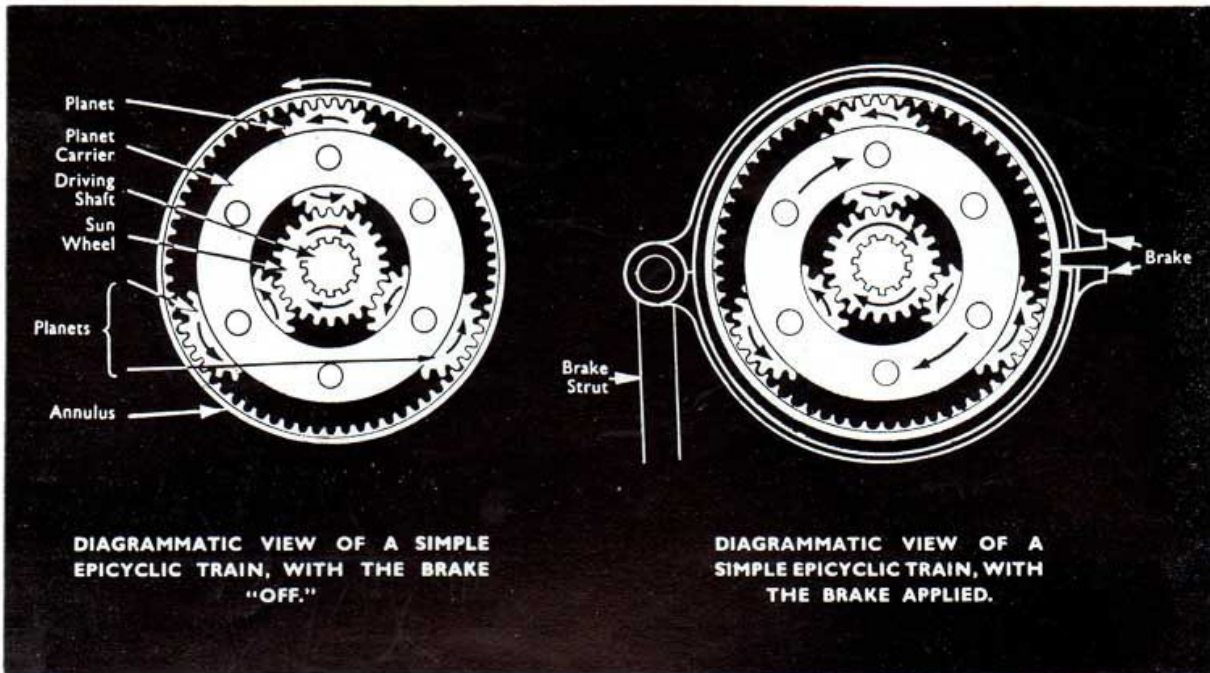


FIG. 7. DIAGRAMMATIC VIEW OF EPICYCLIC GEAR TRAIN.

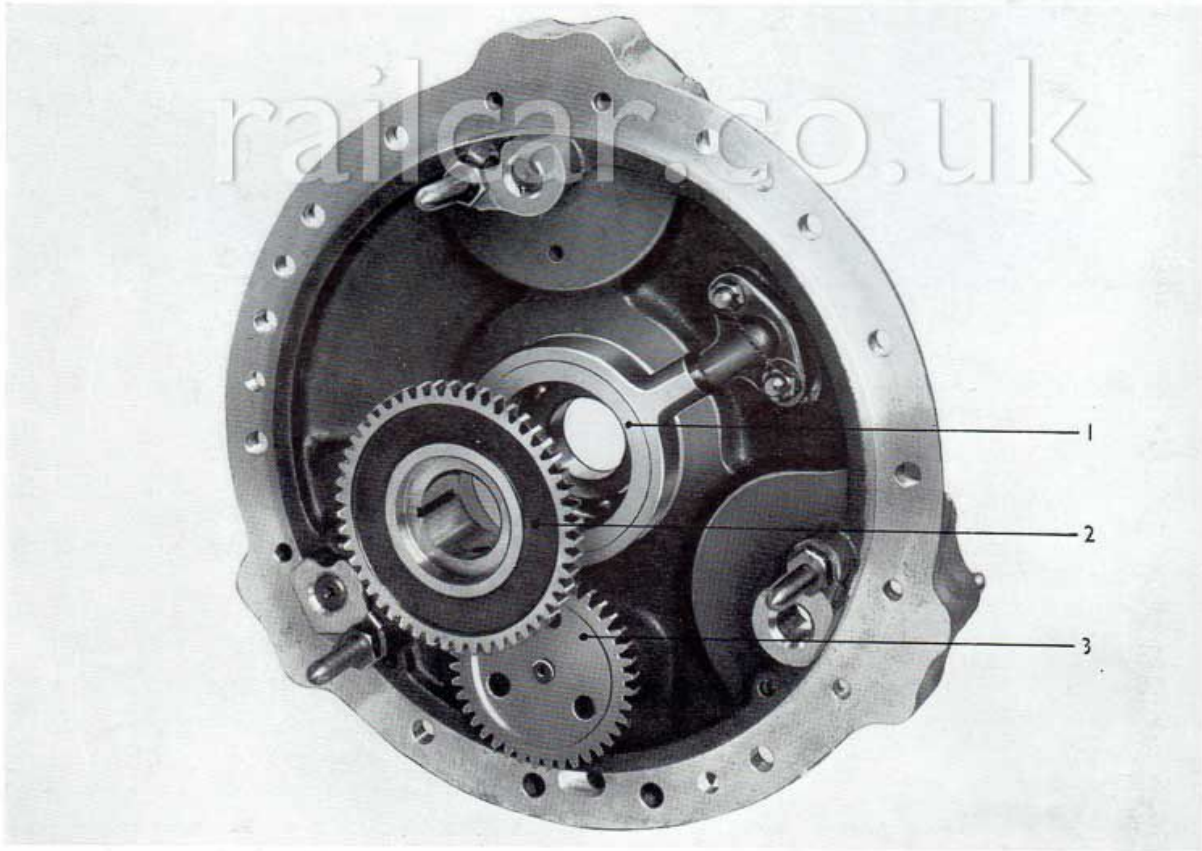


FIG. 8. INTERNAL VIEW OF FRONT COVER.

1. Oil Muff.

2. Pump Gear.

3. Pump—Driving Gear (Positioned in Oil Muff).

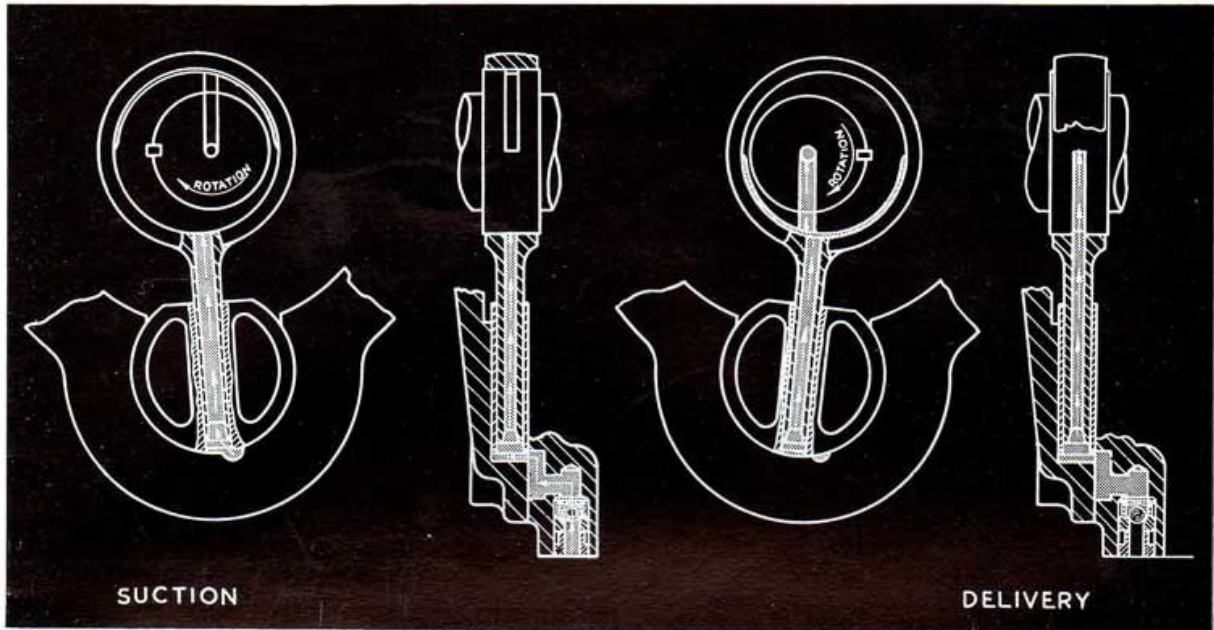


FIG. 9. GEARBOX OUTPUT OIL PUMP (PLUNGER TYPE).

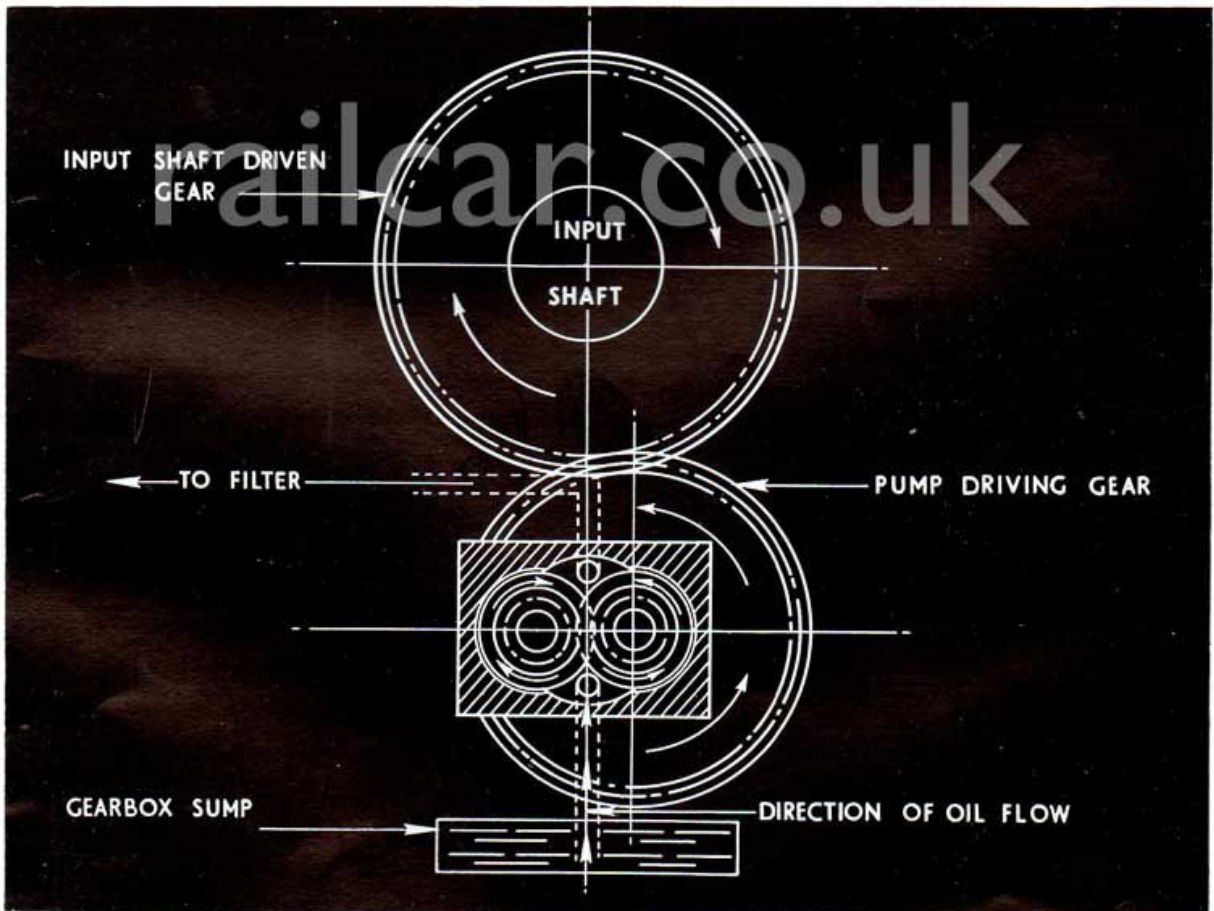


FIG. 10. DIAGRAM OF INPUT OIL PUMP.

LUBRICATION

(See figs. 9 and 10)

Lubrication is provided by a plunger type pump on the output shaft, and a gear type pump on the input shaft. The input pump oil passes through an external pipe and filter to an oil muff and is then delivered to the various bushes, gear trains and bearings. The plunger pump is driven by an eccentric on the output shaft and drains oil from the sump, delivering it to the various bushes, etc., via a centre hole along the shaft.

The gearbox requires $2\frac{1}{2}$ gallons of oil.

The base lubricant should be 100% mineral oil of good quality possessing a high resistance to oxidation and a natural viscosity index of not less than 90.

When tested by I.P. 114/55T the increase in acidity of the oil must not be greater than 0.1 milligramme KOH/gramme, whilst the total acidity after oxidation must not exceed 0.2 milligramme KOH/gramme. In order to meet this clause and ensure satisfactory operation in service it is advised that oxidation inhibitors are included in the formulation.

The oil must also contain additives against corrosion and preferably, in addition, it should contain additives against frothing and must be consistent with the requirements of a high quality turbine lubricant.

The viscosity of the lubricant shall also conform to the following requirements.

	CLIMATE		
	TEMPERATE	ARCTIC	TROPICAL
Redwood No. 1 Viscosity at 140°F.	120—200	90—130	180—280

OIL CHANGES

Shunting locomotive application.

First change after 1,000 miles or 500 hours, whichever comes first, then every 15,000 miles or 3,000 hours, whichever comes first.

Railcar application.

First change after 1,000 then every 30,000 miles. This applies also to reconditioned gearboxes.

OIL FILTER (See fig. 11)

The filter assembly consists of a sump (3) positioned by a centre bolt (5) to a filter head (1). The bolt screws into a centre tube which is locked in the filter head and retains an element guide. The sump beds on a seal (2) carried in a groove formed in the filter head. The lower end of the centre bolt is fitted with a spring (8), washer (11), gasket (12) and a lower element guide (7) retained by a circlip (6). The base of the sump has a reinforcing plate (9) bored to accommodate a seal (10). A filter element (4) is assembled in the sump between the upper and lower element guides.

The filter head is formed with inlet and outlet passages and bored to receive a relief valve which consists of a spring (13) and ball valve (15) retained in the bore by a threaded body (14).

RENEWING THE FILTER ELEMENT (See fig. 11)

1. Clean the exterior of the filter assembly before removing sump.
2. Unscrew the centre bolt (5) and withdraw the sump (3) and filter element (4) from the head (1), remove element from the sump.
3. Thoroughly clean the interior of the sump and examine seal (2). Replace seal if damaged, and ensure it is correctly assembled in its groove in the filter head.

- Place the new element in the sump so that it rests on lower element guide, and then assemble the sump to the filter head, ensuring that the former seats squarely on the seal (2). Screw the centre bolt (5) into the centre tube firmly enough to ensure that there will be no oil leakage past the seals (2) and (10).

DISMANTLING AND ASSEMBLING THE FILTER
(See fig. 11)

Unscrew the centre bolt (5) and the centre tube, withdraw the sump (3), extract the seal (2) from the head (1) and remove the filter element (4). Extract the circlip (6) from the centre bolt (5), slide the lower element guide (7), gasket (12), washer (11) and spring (8) off

the centre bolt and withdraw the sump, remove the seal (10) and reinforcing plate (9) from the centre bolt (5).

To assemble the filter place the seal (10) and reinforcing plate (9) on the centre bolt (5) followed by the sump (3). Slide the spring (8), washer (11), gasket (12) and lower element guide (7) recess foremost, over the centre bolt and fit the circlip (6). Place the filter element (4) in the sump so that it rests on the lower element guide, fit the seal (2) in its groove in the filter head, place the sump into position and screw the centre bolt into centre tube firmly enough to ensure that there will be no oil leakage past the seals (2) and (10).

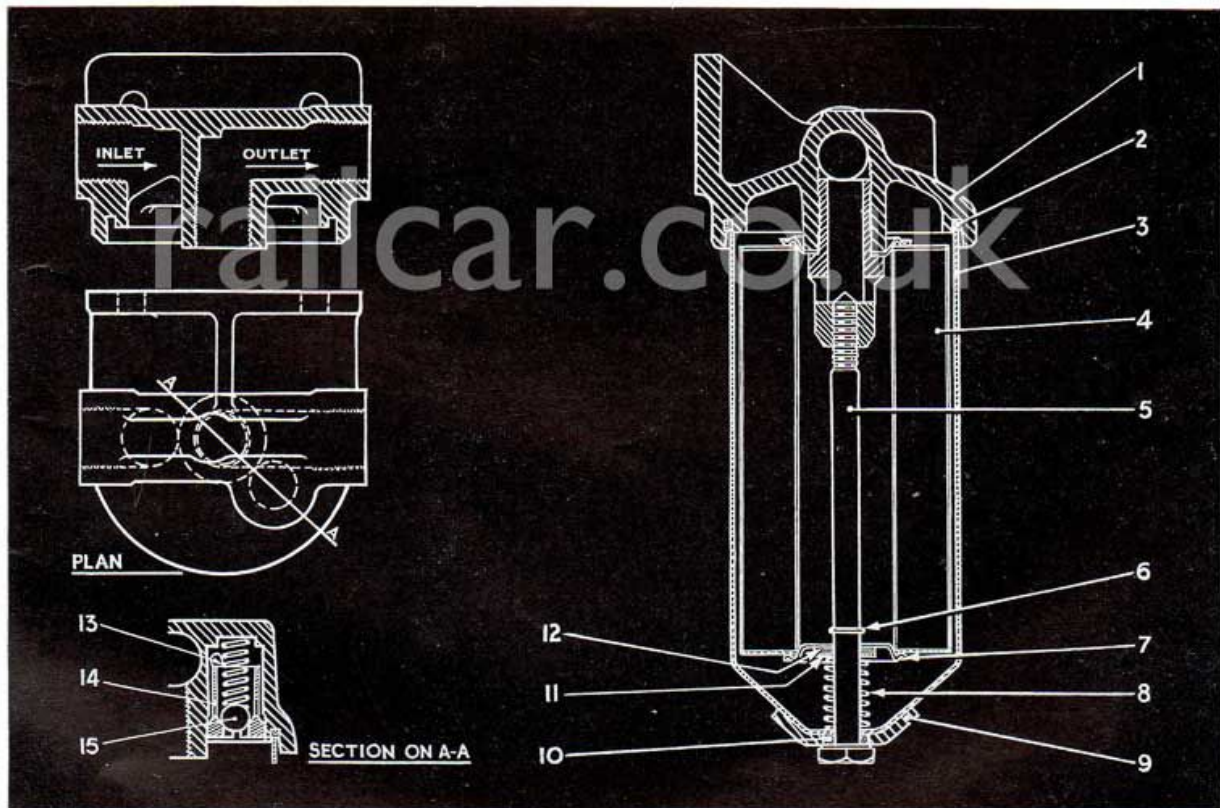


FIG. 11. SECTION THROUGH OIL FILTER.

- | | | |
|-------------------|--------------------------|----------------|
| 1. Filter head | 6. Circlip | 11. Washer |
| 2. Seal, top | 7. Element guide, bottom | 12. Gasket |
| 3. Sump | 8. Spring | 13. Spring |
| 4. Filter element | 9. Reinforcing plate | 14. Valve body |
| 5. Centre bolt | 10. Seal, bottom | 15. Ball Valve |

MAINTENANCE AND ADJUSTMENT

SERVICING THE AIR PISTONS

(See fig. 12)

To remove and replace 1st, 2nd and 3rd speed pistons.

1. Remove drain plug (Fig. 1 - Item 69) from beneath main case and drain away oil.
2. Take off nuts securing cylinder block plate (2) and remove together with cylinder block (1).
3. Remove spring retaining plate (6) from cylinder block.
4. Remove the piston return springs (5) and pistons (3).
5. Carefully examine seals (4) (or "O" rings where fitted) and renew if hardened, or having worn or cracked lips. Fit new seals by stretching them over the flanges on the pistons, the lip to be facing outward when in position.
6. Inspect cylinder block plate gasket and renew if necessary.
7. Insert pistons and piston return springs into their cylinders, and replace spring retaining plate and secure in position with setscrews and locking wire.
8. Replace the cylinder block plate (2) and secure with nuts and spring washers.

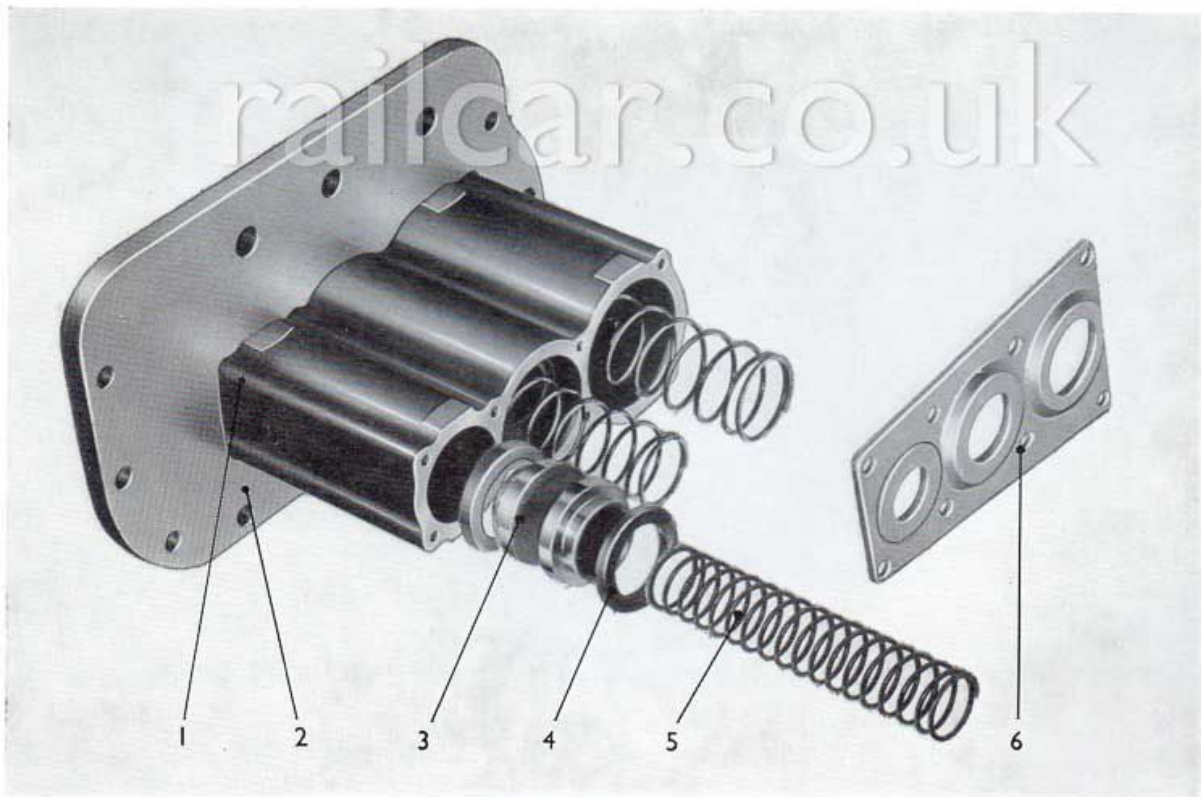


FIG. 12. VIEW OF PISTON AND CYLINDER.

- | | | |
|--------------------------|------------|---------------------------|
| 1. Cylinder Block. | 3. Piston. | 5. Spring. |
| 2. Cylinder Block Plate. | 4. Seal. | 6. Spring Retainer Plate. |

**TO REMOVE AND REPLACE 4TH SPEED PISTONS
(See fig. 13)**

1. Remove air pipes which are connected to cylinders covers.
2. Remove the cylinder covers (1), the pistons (3) will then emerge under pressure of the piston return springs (4).
3. Inspect seals (2) and renew if hardened or damaged.

Fit new seals by stretching them over the flanges on the pistons, the lips to be facing outwards when in position.

4. Wash the components in paraffin, drain and immerse in clean oil.
5. Examine gaskets and replace if necessary.
6. Replace pistons and springs, replace cylinder covers and secure with nuts and washers.

Note: When new seals are being fitted or the pistons are removed for examination, cylinder liners,

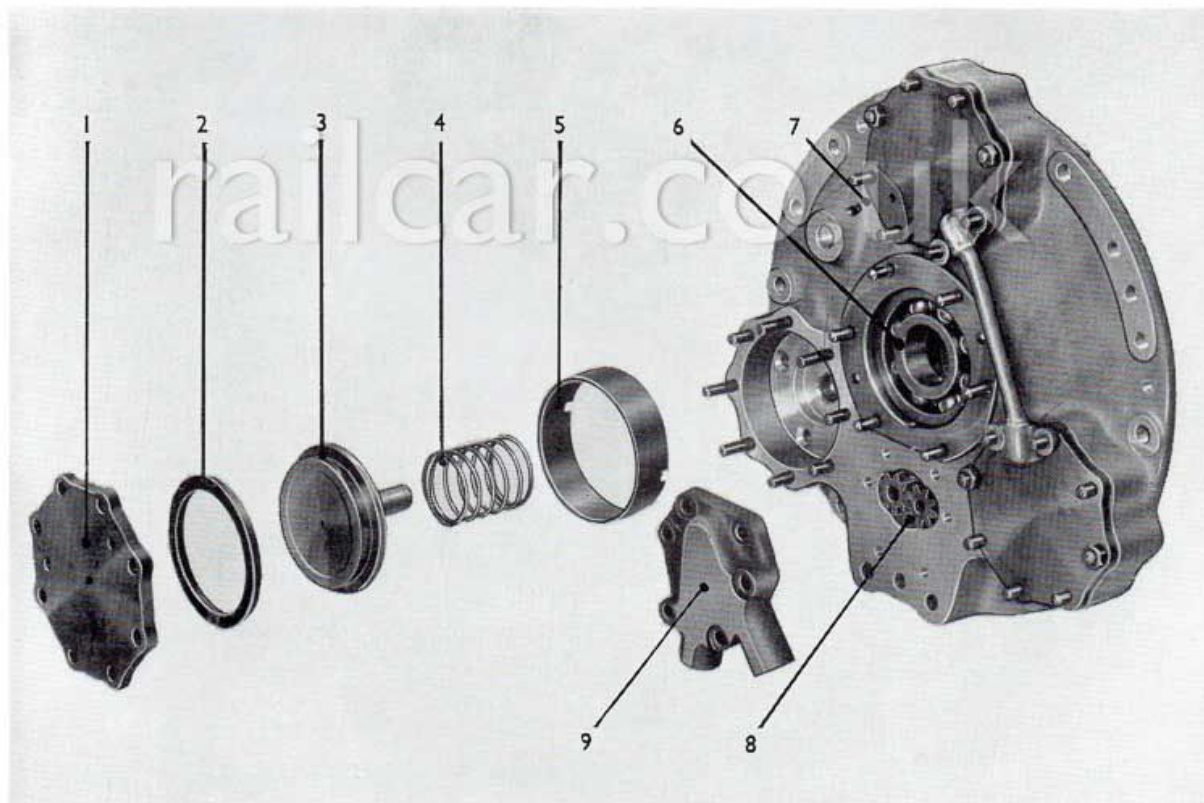


FIG. 13. VIEW OF TOP SPEED PISTON ASSEMBLY AND OIL PUMP.

- | | | |
|--------------------|--------------------|--------------------|
| 1. Cylinder Cover. | 4. Spring. | 7. Front Cover. |
| 2. Seal. | 5. Cylinder Liner. | 8. Oil Pump. |
| 3. Piston. | 6. Bearing. | 9. Oil Pump Cover. |

seals and pistons should be oiled before being replaced, preferably with 'Oildag' Acheson's Colloidal Graphite. If the gearbox has been standing without use for some months, the pistons should be withdrawn and the parts oiled as described above.

RENEWING INPUT SHAFT OIL SEAL (See fig. 1)

Remove the split pin (8), nut (7) and washer (6) on input shaft, and withdraw input coupling.

Remove nuts (16) and spring washer (15) and take off oil seal housing (5), remove faulty oil seal (3) from housing.

Clean the oil seal housing joint face, and wash the oil seal housing and coupling in paraffin and drain.

Lay the oil seal housing on the bench, with joint face uppermost and with great care press the oil seal into position, lip facing inward.

Lightly smear the oil seal housing joint face with a suitable shellac jointing compound and replace housing, securing with nuts and spring washers.

Slide input coupling back into position, and replace washer, nut and split pin.

RENEWING OUTPUT SHAFT OIL SEAL (See fig. 1)

Remove split pin (52), nut (51) and washer (50) on output shaft, and withdraw output coupling using suitable extractor.

Remove nuts (45) and spring washers (44) and withdraw oil seal housing (47). Remove faulty oil seal (56) from its housing. Clean the oil seal housing joint face and wash the oil seal housing and coupling in paraffin and drain.

Lay the oil seal housing on the bench with joint face downwards and with great care press the oil seal into position, lips facing inward. It should be noted that the oil seal should only be pressed down until it is flush with face of oil seal housing.

Lightly smear the oil seal housing joint with a suitable shellac jointing compound and replace housing, securing with nuts and spring washers.

Replace output coupling and secure with washer, nut and split pin.

AIR SUPPLY FOR BRAKE ADJUSTMENT

It is essential that dry compressed air, maintained at the correct pressure, is available and connected through a suitable two-way valve to the brake receiving attention.

The air supply may be obtained from any compressor of suitable capacity, or from a "live" railcar or locomotive in which an engine can be kept running.

If the gearbox is already installed in a railcar in the absence of an independent supply, its own reservoir may be charged by running the engines with the gearbox in "Neutral" and the inspection cover in place.

The engine must be stopped before the cover is removed. Brake setting can proceed until the main reservoir pressure drops to 5 lbs. per sq. inch higher than the gearbox operating pressure, when it is necessary to recharge by replacing the inspection cover and starting the engines again.

FITTING THE AUTOMATIC ADJUSTER SPRING

The spring is fitted over adjuster nut with the wide coil uppermost. The eyelet and loop are placed on adjuster ring pin, and the remaining half loop is fitted over the table pin.

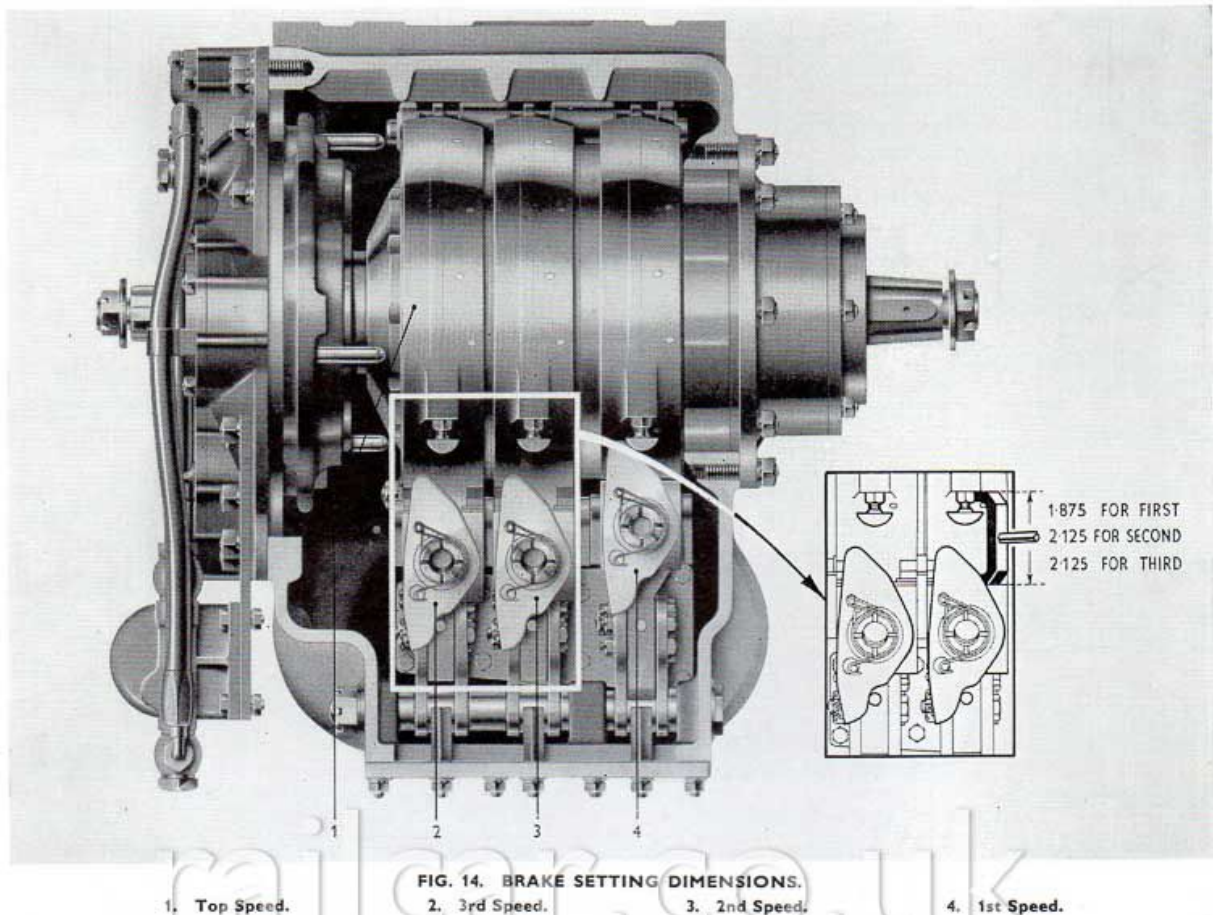


FIG. 14. BRAKE SETTING DIMENSIONS.

1. Top Speed.

2. 3rd Speed.

3. 2nd Speed.

4. 1st Speed.

ROUTINE ATTENTION

Daily

Check oil level with the dipstick, top up if necessary. When topping up by side filler (if fitted) oil should overflow from filler before replacing plug. Any oil leakage should be traced and corrected.

Every 3,000 miles.

1. Check upper piston seals on 1st, 2nd and 3rd speed pistons for oil leakage by removing gearbox cylinder block air unions. If oil leakage is suspected check piston seals and replace if necessary.

The free flow of air indicates clear supply pipes. If the flow is unduly restricted, clean the air restrictors in gearbox air inlet unions and also the supply pipe if necessary.

2. Check all the pistons for air blockage by engaging each gear in turn. Leaking air can be detected escaping from the gearbox breather. Replace any seal found to leak.

3. Thoroughly clean top of gearbox and remove inspection cover. Ensure that main air reservoir pressure does not fall below 65 lbs. per sq. inch during the following tests. Engage each brake in turn and check that the appropriate setting gauge (see fig. 14) will enter.

4. Check that the brakes are still serviceable. Relining is necessary when top faces of the adjuster nut and pull rod coincide.

Every 6,000 miles (in addition to the foregoing).

1. Check filter element and renew if choked or damaged, clean filter and bypass valve.

Every 30,000 miles (in addition to the foregoing).

2. Drain gearbox and refill with new oil.

Every 150,000 miles.

3. Remove gearbox for complete overhaul.

SERVICING THE BRAKES

THE BRAKE SETTING DIMENSION

(See figs. 14 and 15)

When a gear is engaged it will be seen that the adjuster mechanism travels inwards towards the brake band when moving from the **off** to the **on** position.

By measuring the gap between brake band and the adjuster mechanism with the brake in the **on** position, it is possible to obtain the setting required for each brake. The surfaces used for measuring are the face of the boss on the brake band on which the locknut rests, and the face of the adjuster table. The brake setting dimensions are as follows :

1st, 1.875 2nd, 2.125 3rd, 2.125

SETTING THE BRAKES

(See figs. 5, 14 and 15)

1. Remove the adjuster spring.
 2. Loosen the locknut on the adjuster screw in the brake band, and screw the adjuster screw right in.
 3. Apply the brake and try gauge between the face of the adjuster table and the boss on the brake
4. If gauge will not enter, release brake and screw the adjuster nut **clockwise**, apply the brake and check with the gauge until the correct setting is obtained.
 5. If the gauge has too much clearance the adjuster nut must be screwed **anti-clockwise** to obtain the correct setting.
 6. When the correct setting has been obtained release the brake, hold the adjusting ring against the tail pin and replace the spring.
 7. Apply and release the brake, moving the adjuster screw out at each release, until the adjuster ring just touches the screw in the **on** position.
 8. Lock the adjuster screw, with face which contacts the adjuster ring vertical.
 9. Release the spring, then screw the adjuster nut **anti-clockwise** half a turn and replace the spring.

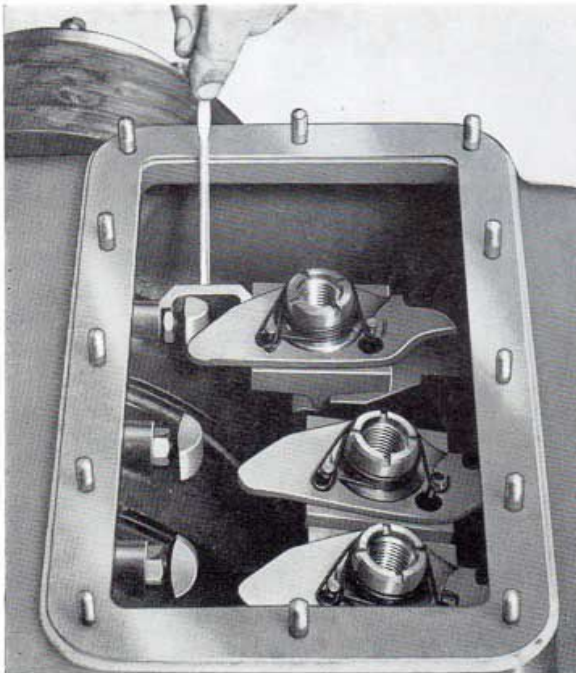


FIG. 15. APPLICATION OF TOGGLE SETTING GAUGE.

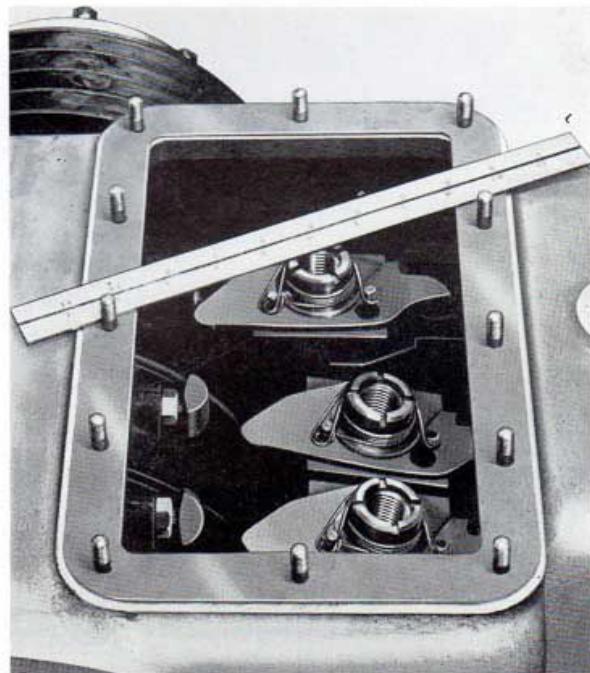


FIG. 16. CHECKING MOVEMENT OF ADJUSTER NUT.

10. Apply and release the brakes several times and note if the adjuster nut has turned. (This may be seen by laying a straight edge across the inspection aperture parallel to the slots in the nut when the brake is in the **off** position, and then sighting the slots at each release).
11. If the adjuster nut has turned, apply and release the brake repeatedly until the nut stops turning. When the nut appears to have stopped turning, another six applications should be made to ensure that no further movement takes place.
12. If the adjuster nut has not turned, move the adjuster screw out half a turn at a time, until the nut commences to turn, apply and release the brake until the nut has ceased to turn, and check the gap with the gauge.

FINAL ADJUSTMENT

INSUFFICIENT GAUGE CLEARANCE

1. If the gauge will not enter, release the brake adjuster spring and move the adjuster screw half a turn outwards and relock.
2. Apply and release the brake until the adjuster nut stops turning.
3. Replace the adjuster spring, apply and release the brake until the adjuster nut stops turning.
4. Check the gap.

Repeat the operations 1 to 3 if required.

EXCESSIVE GAUGE CLEARANCE

1. If the gauge has too much clearance release the brake and adjuster springs and then move the adjuster screw half a turn inward and relock.
2. Release the adjuster spring and screw the adjuster nut half a turn in the **anti-clockwise** direction.
3. Replace the adjuster spring, apply and release the brake until the adjuster nut stops turning.
4. Check the gap.

Repeat the operations 1 to 4 if required.

Note : Should the mechanism fail to respond to this setting sequence (especially failure of the adjuster nut to turn when the adjuster spring is considerably deflected) see failure of Automatic Adjuster.

FAILURE OF AUTOMATIC ADJUSTER

This mechanism depends on the ratcheting effect of the automatic adjuster spring turning the adjuster nut. This lifts the pullrod and reduces the clearance between the brake band and the drum so reducing the amount of movement permitted to the linkage.

Adjustment compensates for normal lining wear, but the mechanism will not work if the brake is badly out of adjustment.

If failure is suspected, first adjust the brake according to "**Setting the Brakes.**"

A fault in the automatic adjuster will become apparent in the application of paragraph 11.

When failure is established :

1. Engage the brake.
2. Remove the spring.
3. Check that the ring swings freely around the nut. It should have both vertical and journal clearance.
4. Release the brake.
5. With the special key, turn the adjuster nut clockwise (to test for tightness), and back again. If tight refer to 6 (B).
6. If checks 3 or 5 reveal trouble, remove the adjuster nut, ring and table.

A. Tightness of the ring may be occasioned by the intrusion of foreign matter or by wear.

Remove parts from the gearbox, clean and check that they are free from damage. Burrs, etc., should be removed. Fit the ring to the nut and check that in its working position it swings freely. With the ring in position press the nut into its seating on the table and test for clearance between the face of the ring and the abutment shoulder on the nut. If less than .005" clearance exists, the underside of the plate should be filed down to give .005" to .010" clearance.

B. Remove the thrust pad and check the fit of nut on the pullrod. It should screw down by hand (without the use of the key) until the rod protrudes $\frac{1}{8}$ " above the top of it. Tightness in the nut may be corrected by the use of a $\frac{7}{8}$ " B.S.F. free fit tap.

C. If (A) and (B) do not reveal the trouble, fit new automatic adjuster spring.

OVERHAUL

GEARBOX—TO REMOVE AND REFIT

Drain the oil from the gearbox by removing the drain plug fitted in the bottom cover. Disconnect the propeller shaft couplings from the front and rear of gearbox, also the pulley belts if fitted. Release the air connections from the gearbox. Pack up the gearbox and remove the mounting bolts.

Remove the gearbox from the railcar to the bench for dismantling.

To replace the gearbox, reverse the above procedure.

GEARBOX—TO DISMANTLE

(See fig. 3)

Clean outside of gearbox thoroughly, masking the breather and air unions to prevent entrance of foreign matter.

Check the necessity for relining the brakes by observing position of the adjuster nut (22) on the pullrod (32). Brake life is exhausted when the top faces of the adjuster nut and pullrod coincide.



FIG. 17. EXTERNAL VIEW OF GEARBOX. LIST No. 5742—5743.

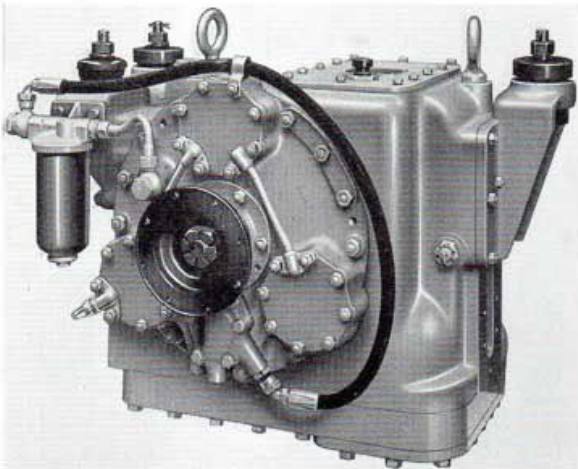


FIG. 18. EXTERNAL VIEW OF GEARBOX. LIST No. 6230.



Preparatory to removing the running gear the brake adjuster mechanisms must be slackened off. Access to the adjusters is obtained by removing the inspection cover on top of gearcase. Remove the eye and loop of each adjuster spring (27) from adjuster ring pin (23) and the half loop from table pin to release the adjuster nut (22), this should then be screwed three complete turns **anti-clockwise**.

TO REMOVE FRONT COVER (See fig. 1)

Disconnect external oil pipes and remove filter and filter mounting bracket (if fitted). Take off split pin (8), slotted nut (7) and washer (6). Withdraw input coupling, remove nuts and spring washers securing oil seal housing (5) and remove oil seal housing together with oil seal (3).

Disconnect air pipes which are connected to top speed cylinder covers. Remove the cylinder covers (24), and withdraw pistons (20), piston spring (19) and cylinder liners (17). Unscrew cone headed screws (26) which are located in the piston bores. Withdraw the input pump cover (80) and remove all nuts (14) and spring washers (13) securing the front cover to the gearcase (37). The front cover (10) can now be removed, which will be complete with bearing (2), oil muff (83) and input oil pump assembly.

TO REMOVE REAR END COVER (See figs. 1 and 2)

Remove split pin (52), slotted nut (51) and washer (50) with suitable extractor withdraw the output coupling

and pulley if fitted. Remove oil seal housing (47), and utilising the $\frac{1}{4}$ " B.S.F. tapped hole provided remove the shaft key (49). Unlock tab washer (48) and take off the nut (57), tab washer and oil thrower ring (46).

Remove the nuts (42) and spring washers (41) allowing the end cover to be withdrawn complete with bearings.

Next remove rear oil pump washer (53), oil pump plunger (61), eccentric (54), key (59), oscillating cylinder (62) and oil pump washer (55). To further dismantle end cover, tap out the bearings together with bearing sleeve (fig. 2, item 5) where fitted.

DISMANTLING THE RUNNING GEAR (See figs. 1 and 2)

(See figs. 1 and 2)

Depress clutch thrust ring (75) to facilitate removal of the oil pump driving gear (82), key (85) and the spacing piece (84) and then allow the clutch thrust ring and the actuating member (29) to come out under the action of the return spring (28). Withdraw these two components together with the ball bearing, clutch return spring and abutment washer (fig. 2, item 2) (where fitted). The input shaft assembly (30) can now be withdrawn.

Remove 3rd speed sunwheel bush (71) and top speed clutch plates (73) and (74).

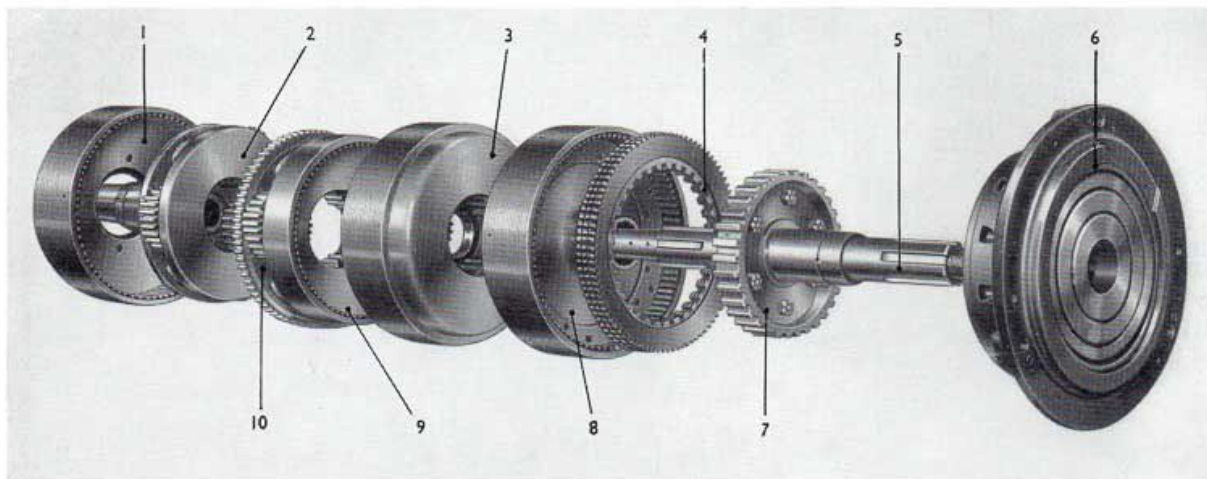


FIG. 19. EXPLODED VIEW OF RUNNING GEAR (VIEWED FROM INPUT END).

- | | | | |
|---|-------------------|---------------------------|---------------------------|
| 1. 1st Speed Brake Drum. | 4. Clutch Plate. | 6. Clutch Thrust Ring. | 8. 3rd Speed Brake Drum. |
| 2. 1st Speed Gear Train and Output Shaft. | 5. Driving Shaft. | 7. Clutch Driving Member. | 9. 3rd Speed Annulus. |
| 3. 2nd Speed Brake Drum. | | | 10. 2nd Speed Gear Train. |

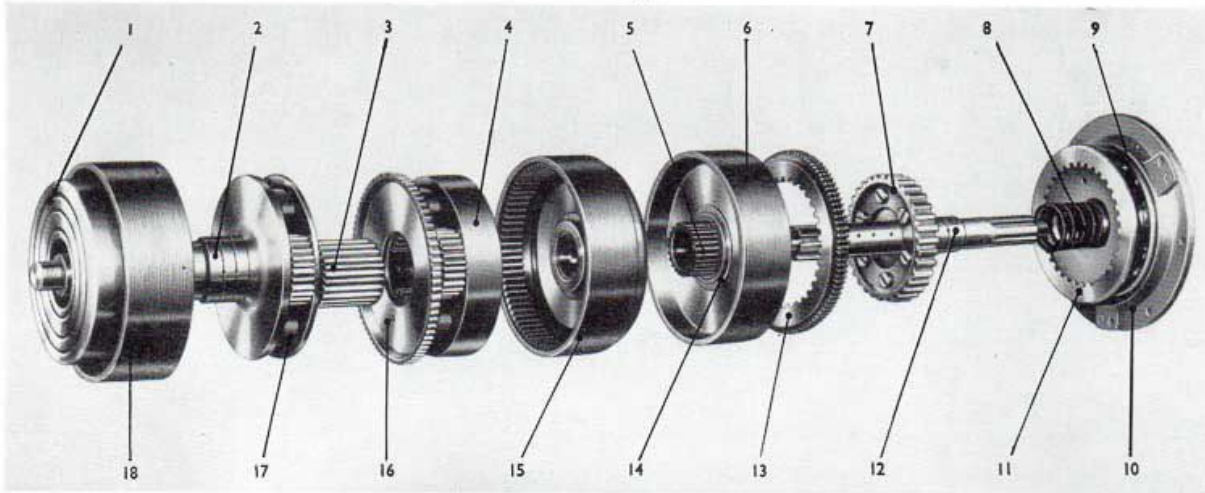


FIG. 20. EXPLODED VIEW OF RUNNING GEAR (VIEWED FROM OUTPUT END).

- | | | |
|----------------------------------|------------------------------|--|
| 1. 1st Speed Brake Drum Bearing. | 7. Clutch Driving Member. | 13. Clutch Plate. |
| 2. 1st Speed Brake Drum Bush. | 8. Clutch Return Spring. | 14. 2nd Speed Brake Drum Bush. |
| 3. 1st and 2nd Speed Sunwheel. | 9. Clutch Thrust Bearing. | 15. 2nd Speed Brake Drum. |
| 4. 3rd Speed Annulus. | 10. Clutch Thrust Ring. | 16. 2nd Speed Planet Carrier. |
| 5. 3rd Speed Sunwheel. | 11. Clutch Actuation Member. | 17. 1st Speed Gear Train and Output Shaft. |
| 6. 3rd Speed Brake Drum. | 12. Input Shaft. | 18. 1st Speed Brake Drum. |

Remove 3rd speed brake drum (31) followed by bush (72).

Remove 3rd speed train assembly (32) consisting of 3rd speed carrier and 2nd speed drum followed by 3rd speed bushes (33) and (34).

Remove 2nd speed train assembly (35) consisting of 3rd speed annulus and 2nd speed planet carrier.

Remove 1st and 2nd speed sunwheel (63) and bush (60).

Remove the 1st speed train assembly (36) and bush (58).

Remove 1st speed brake drum (fig. 20, item 18) together with ball bearing (40).

REMOVAL OF BRAKE BANDS (See fig. 3)

Remove the automatic adjuster spring (27), nut (22), ring (26), table (28) and thrust pad (29) from each brake. It is advisable to keep these in sets for subsequent reassembly to the same band.

Remove the nuts securing the base plate to the gearcase and lift gearcase away. The brake bands and their associate parts are now readily accessible.

Press down on top of each brake band (25) to release the hooks. Withdraw split pins from the internal band link pins (33) and remove the pins, lift away the brake bands (25) complete with pullrods (32), first placing rag round the centralizers (36) and (35) to prevent the small but powerful springs from flying out.

To remove pullrods from brake band, tap clear pullrod pins (34).

BRAKE OPERATING MECHANISM, ETC.

(See fig. 3)

To dismantle the brake operating mechanism from the gearbox remove split pin, and slotted nut from pin (10), allowing the pin to be withdrawn, thus allowing the actuating link assemblies together with the operating struts (9) and the distance pieces to be removed from the gearcase.

To release the cylinder block from cylinder block plate remove the eight setbolts (1).

The oil pump non-return valve (fig. 1, item 67) situated in the output end of the gearcase can be removed when the case is lifted clear of the gearbox base.

RELINING THE BRAKE BAND (See figs. 22 and 23)

Separate the internal band from the external band.

Remove the old linings from the bands.

Check that the bands have not taken a permanent set by measuring the gap. Renew outer and inner band if gap is less than 2·0".

Replace the internal band lining and position it in the band, securing with clamps, ensuring that the lining is flush at lug side.

Next drill through the band and lining using a No. 20 (·161" dia.) drill.

Countersink to ·160" depth the holes in lining using a $\frac{11}{32}$ " drill. Rivet the lining to the internal band and file flush.

Trim lining at extreme ends, level with brake band.

Position the new lining in the external band, ensuring

that lining is level at the edge that will mate with the internal band lining. The band should be then drawn together by means of a clamp affixed across its end.

Drill through band and lining and countersink as with inner band. Rivet the lining to the band leaving out the two end rivets.

Cut the lining and release the clamp, rivet the ends of the lining. The linings should then be trimmed at the ends.

File the rivets level to the band on the machined surface. After relining, the lug on the internal band is fed through its slot in the external band and the free end again pushed toward the centre, when the band will slip easily into position.

The linings are skimmed up (as shown in fig. 22) and the bands can then be replaced.

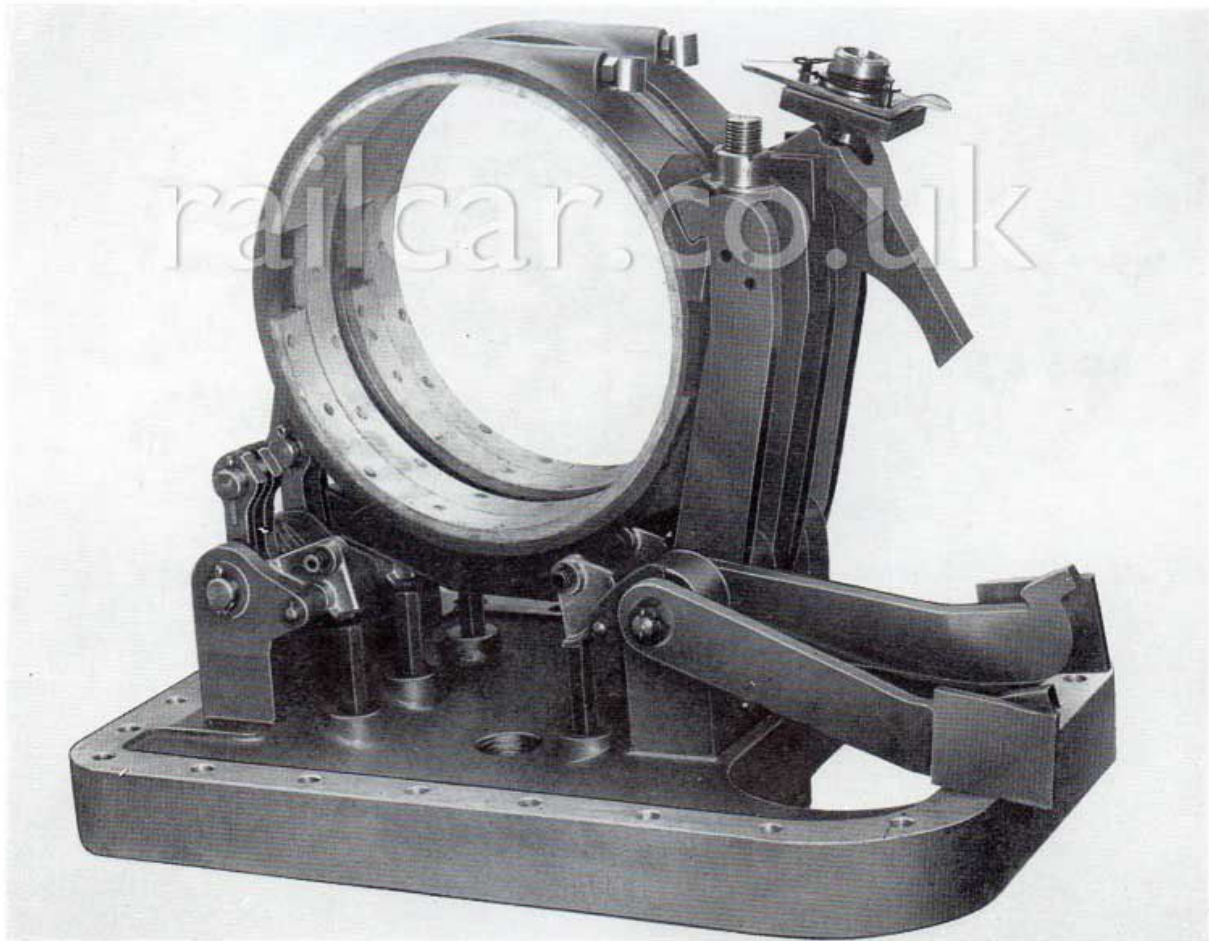


FIG. 21. VIEW OF BRAKE BAND ASSEMBLY, HOOKS, CENTRALISERS AND BASE PLATE.

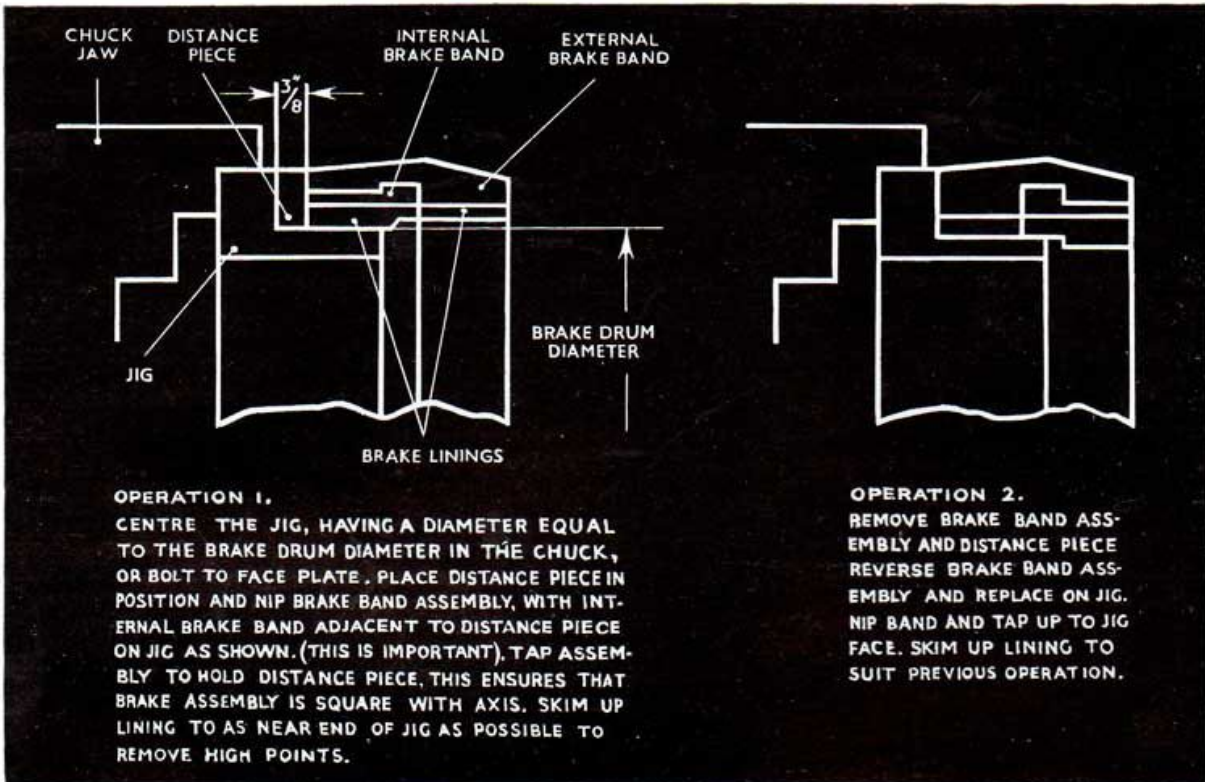


FIG. 22. METHOD OF SKIMMING BRAKE LININGS.

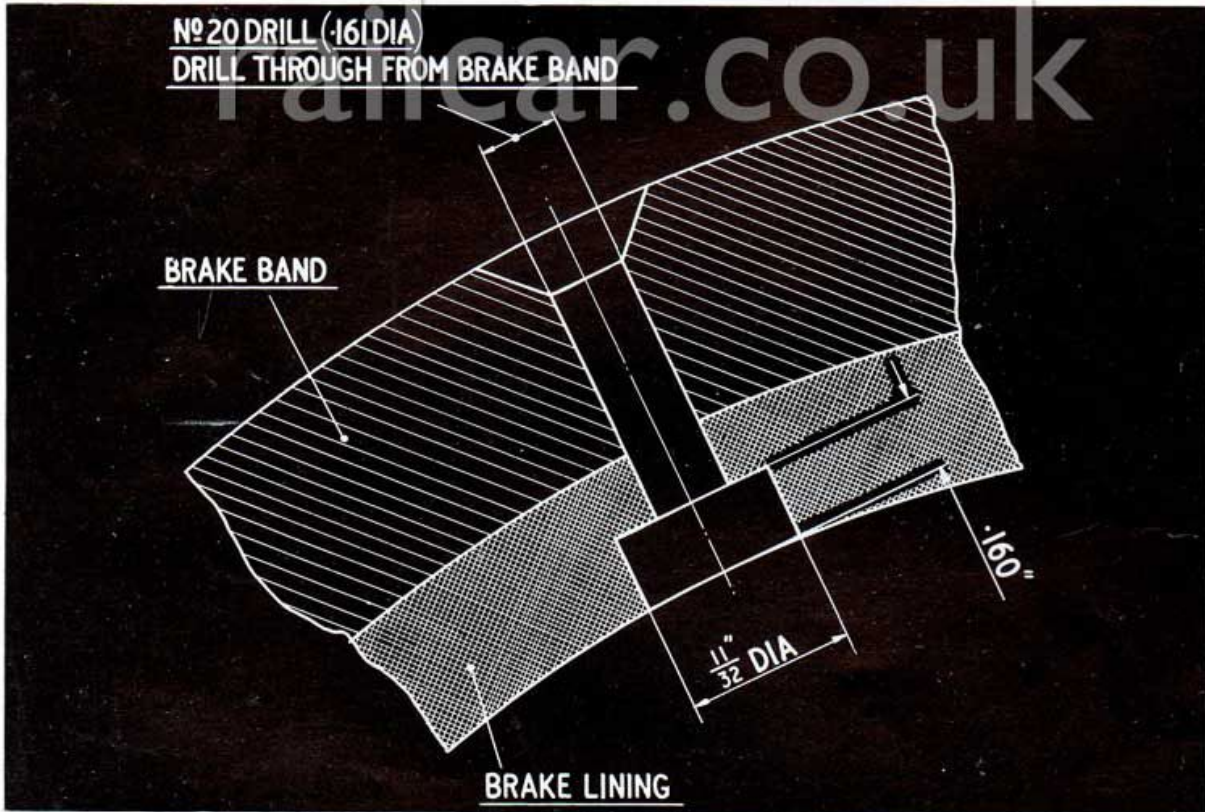


FIG. 23. DETAIL OF DRILLING SIZES FOR RIVET HOLE IN INTERNAL AND EXTERNAL BRAKE LINING

GEARBOX — TO ASSEMBLE

Ensure that all parts are thoroughly clean and fit for further service.

REPLACE PISTONS

Refer to page 19 for replacement of the pistons.

REPLACE BRAKE BANDS (See fig. 3)

Before commencing ensure that the adjuster nuts (22) are an easy fit on the pull rod (32) ($\frac{7}{8}$ " B.S.F. free fit). Tight threads may be eased by use of a tap. Ill-fitting or damaged pull rods can be corrected by the use of a die nut.

It is essential that brakes which have not been relined are assembled in their original positions, together with their original drums.

Considerable time in the adjustment of the brakes can be saved by making a practice of re-assembling brakes, pullrods, thrust pads and adjuster components in their original positions.

Replace pull rods (32) on to brake bands (25) and replace in position pullrod pins (34).

Insert the springs into the right and left hand centralizers (35) and (36) and compress each spring in turn with a small suitable clamp and pass the ears of the brake band over them, at the same time pushing the clamps clear. Replace the internal band link pins (33) securing with split pins.

Compress the external bands and engage the brake hooks.

Fit to the pullrods (32), thrust pads (29), adjuster tables (28) and the adjuster rings (26), secure these with adjuster nuts (22) and screw down far enough to keep them in position.

Replace the adjuster springs (27).

REPLACE BRAKE OPERATING MECHANISM, ETC. (See figs. 3 and 12)

Assemble the actuating link and piston rod assemblies and distance pieces on to the gearcase by threading actuating link pin through case from output end, and replacing slotted nut and split pin. Do not tighten down adjuster nuts (fig. 3, item 22) or these will constrict brake bands (fig. 3, item 25) and so prevent the entry of running gear assemblies. The cylinder block

(fig. 12, item 1), cylinder block plate (fig. 12, item 2), together with pistons (fig. 12, item 3), seals (fig. 12, item 4), return springs (fig. 12, item 5), spring retaining plate (fig. 12, item 6), and gasket can now be replaced into gearcase and secured in position with nuts and spring washers.

REPLACE THE GEARCASE TO BOTTOM COVER (See fig. 1)

Refit the oil pump non-return valve assembly into the gearcase ensuring that the valve body washer (64) is in position. Cover the joint faces with a suitable shellac and replace gearcase onto the bottom cover and secure in position.

POSITION OF AIR RESTRICTORS ASSEMBLY (See fig. 24)

It should be noted that if restrictors are removed they must be replaced in their original position, to facilitate the connection of the air feed pipes and to ensure that the correct size of restrictor is used for each cylinder.

REPLACE RUNNING GEAR (figs. 1 and 2)

Press on to 1st speed brake drum (fig. 20, item 18), ball bearing (40) and replace in the casing. It should be noted that the ball bearing should be pressed further into the case than its normal working position, to ensure that when the end cover is replaced it is fully positioned against the ball bearing, which will be correctly repositioned as end cover is secured. Locate into position bush (58) together with the 1st speed train assembly (36) which includes output shaft. Replace oil pump washer (55) then fit oil pump eccentric key (59) and oil pump eccentric (54) to the output shaft, **ensuring that the oil hole in the eccentric registers with the oil way in the shaft.** Slide the oil pump oscillating cylinder (62) on to the pump plunger (61). Replace oil pump oscillating cylinder into its housing in end cover. Smear the joint faces of the end cover with jointing compound and replace on to the casing. At the same time it is necessary to guide the oil pump plunger into position on to the oil pump eccentric.

Secure rear cover with nuts (42) and spring washers (41).

Replace oil pump washer rear (53), bearings (together with sleeve where fitted, fig. 2, item 4) and oil thrower ring (46).

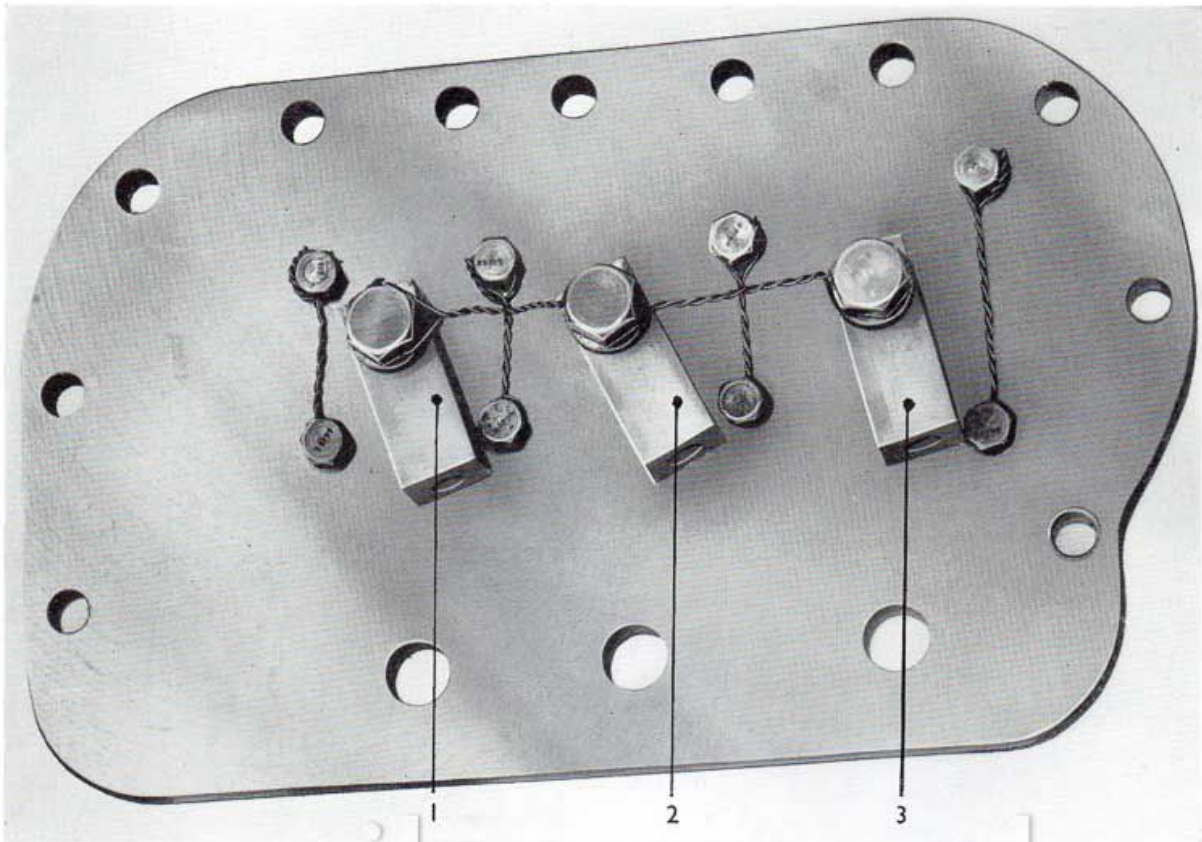


FIG. 24. VIEW OF CYLINDER BLOCK PLATE SHOWING LOCATION OF AIR RESTRICTORS.

1. Third Speed.

2. Second Speed.

3. First Speed.

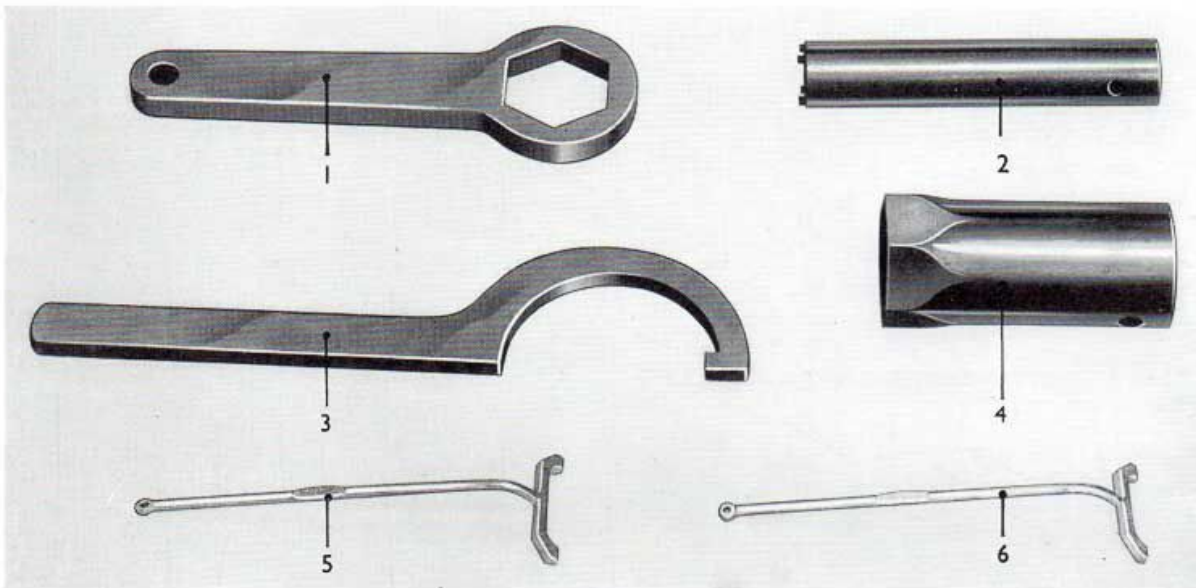


FIG. 25. SPECIAL TOOLS.

1. Ring Spanner.
2. Spanner for Auto Adjuster Nut.

3. "C" Spanner.
4. Spanner for Oil Filler Plug.

5. Toggle Setting Gauge, 2nd and 3rd Speeds.
6. Toggle Setting Gauge, 1st Speed.

Refit locknut washer (48) and tighten shaft locknut (57) into position and lock with washer (48). Replace oil seal housing (47) together with oil seal (56), coating joint face of oil seal housing with jointing compound and securing with nuts (45) and spring washers (44). Replace shaft key (49), output coupling and pulley if fitted; secure with output shaft washer (50), output shaft nut (51) and split pin (52).

Replace bush (60) and 1st and 2nd speed sunwheel (63). Replace 2nd speed gear train assembly (35) followed by bush (34), 3rd speed gear train assembly (32) and bushes (72) and (33).

Replace 3rd speed brake drum assembly (31) and bush (71). Guide home input shaft assembly (30) into the running gear assembly. Replace the clutch plates (73) and (74) in that order.

Position abutment washer (fig. 2, item 2) where fitted. Clutch return spring (28) and clutch actuation member assembly (29) can now be replaced together with ball bearing (76) and clutch thrust ring (75). The cut-away section on the clutch thrust ring must be positioned toward the bottom of the gearcase as this ensures a clearance for the pump gear (78).

REPLACE FRONT COVER ASSEMBLY (See fig. 1)

Depress clutch thrust ring (75) and replace spacing piece (84), oil pump driving gear key (85) and oil pump driving gear (82). Assemble oil muff (83) on to oil

muff bracket (9) in front cover (10). Coat joint face of gearcase with jointing compound and replace front cover together with oil pump assembly, at the same time locating the oil muff (83) over oil pump driving gear and engaging pump gear (78). Secure front cover with nuts and spring washers, and cone-headed screws (26) inside cylinder bores.

Replace 4th speed piston liners (17) slots inwards, piston spring (19) and clutch piston (20) together with seals (18). Next replace cover plates (24) together with gasket (25). Replace ball bearing (2) together with bearing sleeve (4). Fit the oil seal housing (5) complete with oil seal (3). Coat joint face with jointing compound and secure with nuts (16) and spring washer (15). Replace coupling and secure with input nut washer (6), input nut (7) and split pin (8). Replace driven pump gear (1) into oil pump assembly and replace oil pump front cover (80).

Replace mountings, filter brackets if fitted, external filter, pipes, covers, dipstick, etc.

CHECKING END FLOAT (See fig. 26)

Note: Front cover and assembled running gear to be stood on end to ensure abutment of components while taking measurement of end float.

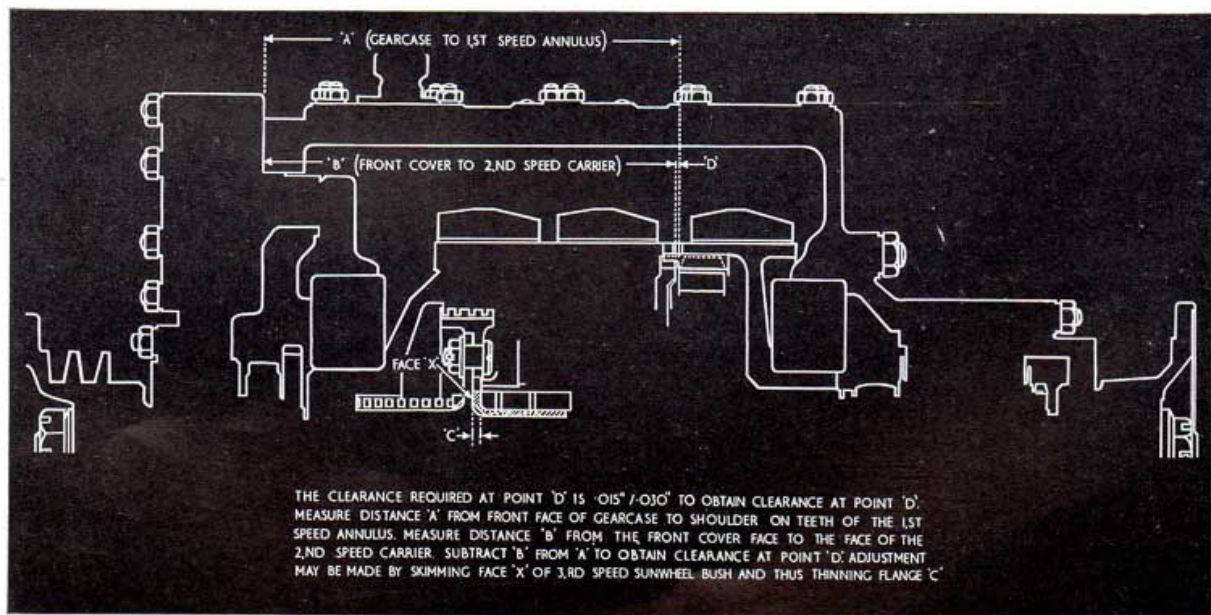


FIG. 26. RUNNING GEAR END FLOAT.

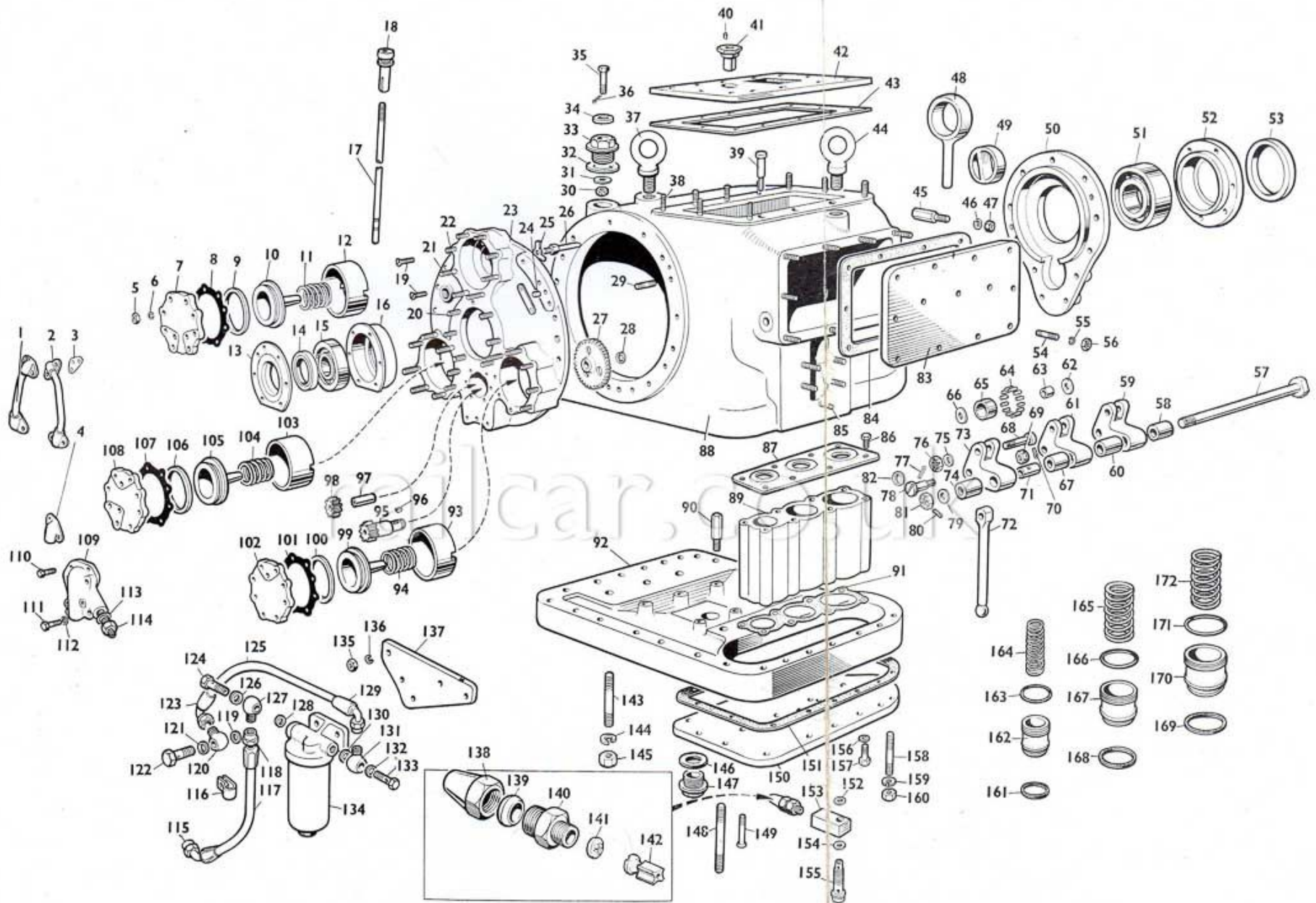


FIG. 27. EXPLODED VIEW OF CASINGS AND COVERS

SE4 PARTS LIST

THIS PARTS LIST IS APPLICABLE TO LIST No. 5743

FIG. 27 (Casings and Covers)

Ref. No.	Part No.	Description	No. off
1	37058	Air feed pipe (top speed)	2
2	37057	External elbow flange (top speed)	4
3	37068	Gasket for external elbow flange	5
4	37067	External elbow flange (top speed)	1
5	17937	" B.S.F. nut (front cover to piston cover)	24
6	17330	" dia. spring washer (front cover to piston cover)	24
7	37051	Air cylinder cover plate (top speed)	1
8	37059	Gasket (for top speed cylinder cover)	3
9	22337	Seal (for clutch piston)	3
10	37048	Clutch piston	3
11	37053	Spring (for clutch piston)	3
12	37046	4th speed cylinder liner	3
13	37042	Oil seal housing	1
14	11672	Oil seal (input)	1
15	11507	Hoffmann bearing (MS 14)	1
16	37044	Bearing liner (for front cover)	1
17	22853	Dipstick	1
18	10597	Dipstick handle	1
19	22452	" B.S.F. cone headed screw	6
	17937	" B.S.F. nut (front cover to oil seal housing)	6
20	12704/8	" B.S.F. stud (front cover to oil seal housing)	6
	17330	" B.S.F. spring washer (front cover to oil seal housing)	6
21	11377/14	" B.S.F. stud (front cover to piston cover)	10
22	22869	" B.S.F. stud (front cover to piston cover)	14
23	37039	Front cover	1
24	20639	Dowel (in front cover)	1
25	17983	Tab washer	3
26	37063	Clutch bearing housing stop pin	3
27	37056	Pump gear	1
28	29100	Circlip	1
	17330	" spring washer (rear cover to oil seal housing)	6
29	22883	" B.S.F. Stud (gearcase to front cover)	2
	17947	" B.S.F. nut (gearcase to rear cover)	11
	17048	" B.S.F. stud (gearcase to front cover)	7
	17937	" B.S.F. nut (rear cover to oil seal housing)	6
	10100/1	" B.S.F. stud (gearcase to filter support plate)	3
	18385	" B.S.F. stud (rear cover to oil seal housing)	6
	11377/8	" B.S.F. stud (gearcase to rear cover (short)	7
	17855	" B.S.F. stud (gearcase to rear cover (long)	4

Ref. No.	Part No.	Description	No. off
30	17943	$\frac{1}{2}$ " B.S.F. Slotted Nut	1
31	22848	Breather baffle plate	1
	17332	$\frac{1}{2}$ " dia. spring washer (gearcase to rear cover)	11
32	11415	Oil drain plug and breather washer	2
33	22846	Oil filler plug and breather body	1
34	22850	Breather cover plate	1
35	22852	Breather bolt	1
36	17965	Split pin	1
37	30076	$\frac{7}{8}$ " Whit. eyebolt	2
	17329	$\frac{1}{8}$ " spring washer (gearcase to inspection cover)	12
38	17023	$\frac{5}{16}$ " B.S.F. stud (gearcase to inspection cover)	12
	17942	$\frac{5}{16}$ " B.S.F. nut (gearcase to inspection cover) ...	12
39	11337	Automatic adjuster stop	3
40	22839	Grubscrew (inspection cover)	1
41	22845	Adaptor to dipstick	1
42	26451	Inspection cover	1
43	22864	Gasket for inspection cover	1
44	30076	(See Item 37)	
45	22859	Stop for cam plate	3
46	17330	$\frac{3}{8}$ " dia. spring washers (stop for cam plate) ...	3
47	17937	$\frac{3}{8}$ " B.S.F. nut (stop for cam plate)	3
48	22854	Oil pump plunger	1
49	10559	Oil pump oscillating cylinder	1
50	26449	Rear cover	1
51	11525	Hoffmann bearing MS17	1
52	22847	Oil seal housing	1
53	32142	Oil seal (output)	1
54	23816	$\frac{1}{2}$ " B.S.F. stud (gearcase to side cover)	10
55	17330	$\frac{1}{2}$ " dia. spring washer (gearcase to side cover)	10
56	17937	$\frac{1}{2}$ " B.S.F. nut (gearcase to side cover)	10
57	11360	Pin for actuating link	1
58	11363	Distance piece for actuating link	1
59	22985	Cam plate	3
60	11365	Distance piece for actuating link	2
61	22985	(See Item 59)	
62	11456	Retaining washer for cam roller	6
63	11454	Cam roller (inner race)	3
64	11527	Cam roller—(needle roller)	66
65	11453	Cam roller—outer race	3
66	11456	(See Item 62)	
67	11362	Distance piece for actuating link	1
68	11316	Bolt for actuating link	3
69	17939	$\frac{1}{2}$ " B.S.F. slotted nuts (operating strut bolts)	3
70	17960	Split pin (operating strut bolts)	3
71	22984	Cam plate bush	3
72	23178	Operating strut	3
73	22985	(See Item 59)	
74	11365	(See Item 60)	
75	17304	$\frac{3}{8}$ " dia. washer (actuating link bolts)	9
76	17936	$\frac{3}{8}$ " B.S.F. slotted nuts	3
77	17957	Split pin	3
78	11366	Bolt (operating strut)	3
	11485	Dowel (operating strut)	3
79	17310	$\frac{3}{4}$ " dia. washer (cam plate pin)	1
80	17326	Split pin (cam plate pin)	1
81	17301	$\frac{3}{4}$ " B.S.F. fine slotted nut (cam plate pin) ...	1

Ref. No.	Part No.	Description	No. off
82	17972	$\frac{1}{2}$ " dia. washer (operating strut bolt)	3
83	26450	Side cover	1
84	22863	Gasket for side cover	1
	17332	$\frac{1}{2}$ " dia. spring washers (gearcase to brackets)	17
85	18393	$\frac{1}{2}$ " B.S.F. stud (gearcase to brackets)	17
	17947	$\frac{1}{2}$ " B.S.F. nut (gearcase to brackets)	17
86	22904	Setscrew (cylinder block to spring retainer plate)	8
87	22874	Spring retainer plate	1
88	26448	Gearcase	1
89	22837	Cylinder block	1
90	22862	Centralizer stop	6
91	24239	Cylinder joint washer	1
92	26492	Base plate	1
93	37046	See Item 12	
94	37053	See Item 11	
95	37055	Pump gear and driving shaft	1
	37054	Plain bearing for pump (input oil pump)	1
96	11940	Key—for pump gear	1
97	37064	Shaft—oil pump driven gear	1
98	L529739	Pump gear—driven	1
99	37048	See Item 10	
100	22337	See Item 9	
101	37059	See Item 8	
102	37049	Air cylinder cover plate (top speed)	1
103	37046	See Item 12	
104	37053	See Item 11	
105	37048	See Item 10	
106	22337	See Item 9	
107	37059	See Item 8	
108	37050	Air cylinder cover plate (top speed)	1
109	37040	Oil pump cover	1
110	15072	$\frac{3}{8}$ " B.S.F. bolt (oil pump cover to front cover short)	3
111	22093	$\frac{3}{8}$ " B.S.F. bolt (oil pump cover to front cover, long)	3
112	34867	Dowty bonded seal	6
113	34878	$\frac{1}{2}$ " B.S.P. Dowty bonded seal	7
114	240919	Adaptor	1
115	36006/3	Aeroquip end fitting (90°)	3
116	37535	Pipe clip	2
117	36055/1	Aeroquip hose (1' long)	1
118	36004/4	Aeroquip end fitting (straight)	1
119	34878	See Item 113	
120	37532	Banjo union	3
121	34878	See Item 113	
122	37531	Banjo bolt	3
123	36006/3	See Item 115	
124	37531	See Item 122	
125	36055/3	Aeroquip hose (2' long)	1
126	34878	See Item 113	
127	37532	See Item 120	
128	34878	See Item 113	
129	36006/3	See Item 115	
130	34878	See Item 113	
131	37532	See Item 120	
132	34878	See Item 113	
133	37531	See Item 122	
134	4257	Oil filter assembly	1

Ref. No.	Part No.	Description	No. off
	17937	³ / ₈ " B.S.F. nut (filter to filter support plate)	2
	18863	³ / ₈ " B.S.F. bolt (filter to filter support plate)	2
	17330	³ / ₈ " dia. spring washer (filter to filter support plate)	2
135	17947	¹ / ₂ " B.S.F. nut (gearcase to front cover)	12
136	17332	¹ / ₂ " dia. spring washer (gearcase to front cover)	12
137	37060	Filter support plate	1
138	13628	} Union and nipple assembly (not supplied separately)	4
139	12628		
140	12628		
141	28760	Abutment (2nd and 3rd speed)	2
	28761	Abutment (1st speed)	1
142	32368	Air restrictor valve (1st, 2nd and 3rd speed)	3
143	22856	³ / ₈ " B.S.F. stud (base plate to external band hook bracket)	3
	22857	³ / ₈ " B.S.F. stud (base plate to internal band link bracket)	3
144	17335	³ / ₈ " dia. spring washer (base plate to external band hook bracket)	3
	17335	³ / ₈ " dia. spring washer (base plate to Internal band link bracket)	3
145	17292	³ / ₈ " B.S.F. nut (base plate to external band hook bracket)	3
	17292	³ / ₈ " B.S.F. nut (base plate to internal band link bracket)	3
146	11415	See Item 32	
147	11414	Oil drain plug	1
148	14259	¹ / ₂ " B.S.F. stud (gearcase to bottom plate long)	11
149	32636	⁵ / ₁₆ " Whit. bolt base plate to hook bracket	2
150	22873	Plate for cylinder block	1
151	22866	Gasket for brake cylinder plate	1
152	22858	Copper washer for air union (1st, 2nd and 3rd speed)	6
153	32367	Union for air cylinders (1st, 2nd and 3rd speed)	3
154	22858	See Item 152	
155	22861	Plug for air union (1st, 2nd and 3rd speed)	3
156	23176	Copper washer	8
157	23177	Bolt	8
158	22883	¹ / ₂ " B.S.F. stud (gearcase to base plate)	15
159	17332	¹ / ₂ " dia. spring washer (gearcase to base plate)	26
160	17947	¹ / ₂ " B.S.F. nut (gearcase to base plate)	26
161	20463	Seal for 3rd speed piston	1
162	20399	Piston (3rd speed)	1
163	32145	'O' ring (3rd speed)	1
164	12622	Piston return spring (3rd speed)	1
165	12558	Piston return spring (1st and 2nd speed)	2
166	32146	'O' ring (2nd speed)	1
167	20400	Piston (2nd speed)	1
168	20464	Seal (for 2nd speed piston)	1
169	20465	Seal (for 1st speed piston)	1
170	20401	Piston (1st speed)	1
171	32147	'O' ring (1st speed)	1
172	12558	(See Item 165)	
	40453	Input coupling	1
	40454	Output coupling	1

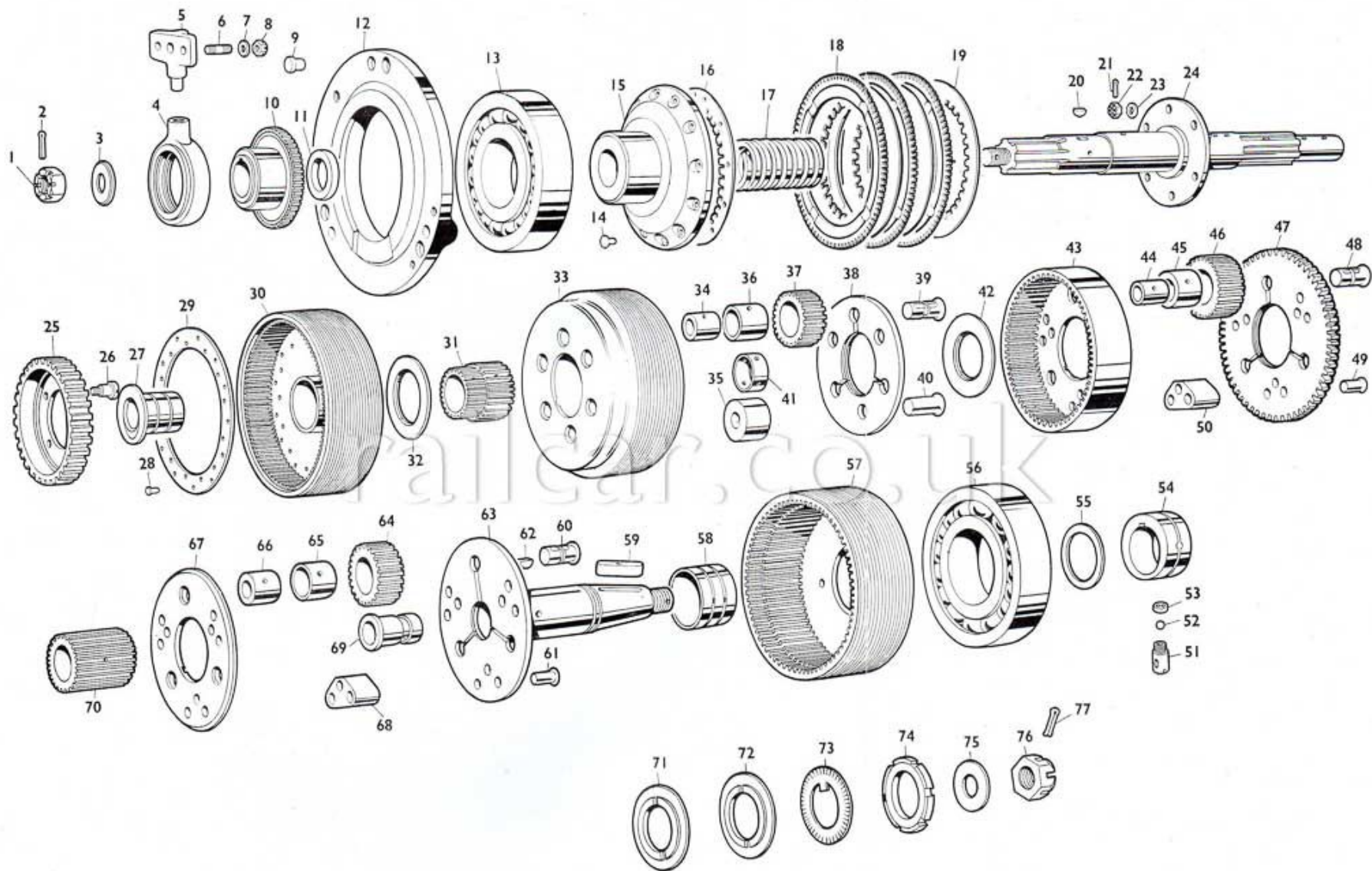


FIG. 28. EXPLODED VIEW OF RUNNING GEARS

FIG. 28 (Running Gears)

Ref. No.	Part No.	Description	No. off
1	38533	Driving shaft nut	1
2	19069	Split pin	1
3	38536	Driving shaft washer	1
4	37047	Oil muff	1
5	37052	Bracket for oil muff	1
6	37065	" B.S.F. stud (front cover to oil muff bracket)	2
7	17305	" dia. washer (front cover to oil muff bracket)	2
8	17944	" B.S.F. slotted nut (front cover to oil muff bracket)	2
9	11355	Clutch thrust ring button	3
10	37043	Oil pump driving gear	1
11	37045	Spacing piece	1
12	37041	Clutch thrust ring	1
13	22784	Hoffmann bearing M.S. 21 A.C.V.	2
14	19134	Rivet	12
15	11374	Clutch actuation member	1
16	31375	Clutch plate	1
17	11309	Clutch return spring	1
18	18535	Clutch plate (driven)	3
19	31376	Clutch plate (driver)	3
20	11944	Key for oil pump (driving gear)	1
21	17957	Split pin	6
22	17944	" B.S.F. slotted nut	6
23	17305	" dia. washer	6
24	11618	Input shaft	1
25	37062	Clutch driving member	1
26	11368	Clutch driving member bolt	6
27	11351	3rd speed sunwheel bush	1
28	17377	Rivet	24
29	18560	Clutch pressure plate	1
30	22371	3rd speed brake drum	1
31	11303	3rd speed sunwheel	1
32	11353	2nd speed brake drum bush	1
33	22372	2nd speed brake drum	1
34	30104	Planet inner race	3
35	11293	Distance piece	3
36	33189	Plain bearing	3
37	30108	Planet wheel	3
38	11285	3rd speed carrier	1
39	11400	Planet rivet	3
40	11419	3rd speed planet distance piece rivet	3
41	11352	3rd speed planet carrier bush	1
42	11359	3rd speed annulus bush	1
43	31313	3rd speed annulus...	1
44	30104	2nd speed planet wheel inner race	3
45	33188	Plain bearing	3
46	30107	Planet wheel	3
47	31314	2nd speed planet carrier	1
48	11400	2nd speed planet rivet	3
49	11401	2nd speed distance piece rivet	9
50	31274	2nd speed distance piece	3
51	29135	Valve body	1
52	11528	Oil pump valve ball ($\frac{3}{8}$ " dia.)	1
53	11438	Oil pump valve body washer	1
54	11295	Oil pump eccentric	1

Ref. No.	Part No.	Description	No. off
55	11434	Oil pump washer	1
56	22784	See Item 13	1
57	22370	1st speed brake drum	1
58	11354	1st speed annulus bush	1
59	11943	Driven shaft key	1
60	11400	1st speed planet rivet (See Item 63) } Part of	3
61	11401	1st speed distance piece rivet ... } Assy. 4497	9
62	11944	Oil pump eccentric key	1
63	31276	Output shaft (See Item 60) }	1
64	30107	1st speed planet wheel ... }	3
65	33188	Plain bearing ... }	3
66	30104	Planet inner race ... }	3
67	31273	1st speed planet carrier ... }	1
68	31274	1st speed distance piece ... }	3
69	11304	Driven shaft bush	1
70	10803	1st and 2nd speed sunwheel	1
71	11435	Oil pump washer (rear)	1
72	11436	Oil thrower	1
73	11311	Driven shaft locknut washer	1
74	11310	Driven shaft locknut	1
75	11339	Driven shaft washer	1
76	11338	Driven shaft nut	1
77	19046	Split pin	1

railcar.co.uk

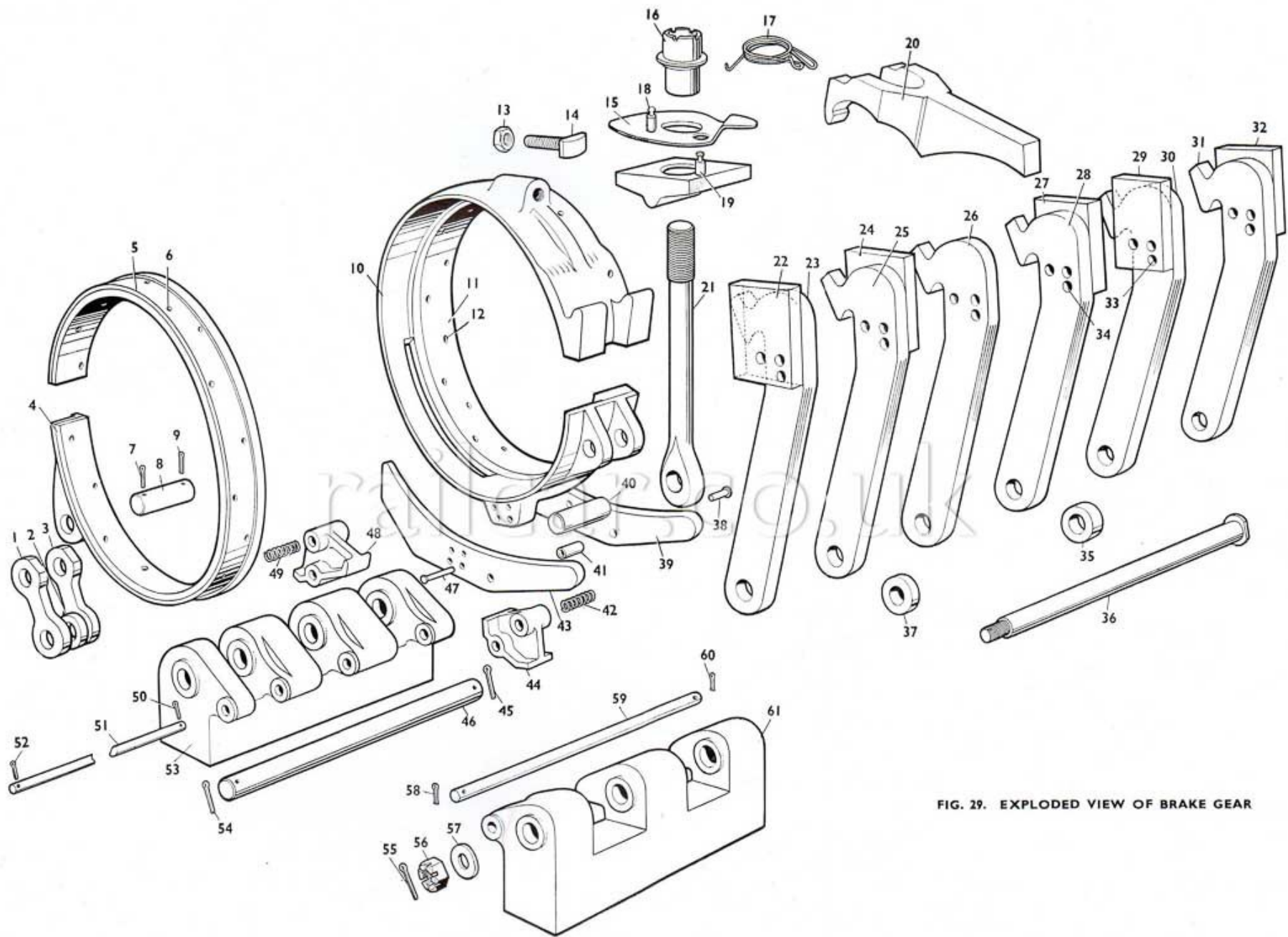


FIG. 29. EXPLODED VIEW OF BRAKE GEAR

FIG. 29 (Brake Gear)

Ref. No.	Part No.	Description	No. off
1	10562	Internal bank link	6
2	10582	Distance piece for links	3
3	10562	See Item 1	—
4	22991	1st, 2nd and 3rd speed int. band liner ... } Sub. Assy. 2543	3
5	22989	1st, 2nd and 3rd speed int. band ... } Part of Assy.	3
6	19130	1st, 2nd and 3rd speed int. band rivet } 4069	48
7	17326	Split pin	6
8	10629	Internal band pin	3
9	17326	See Item 7	—
10	22988	1st, 2nd and 3rd speed ext. band ... } Sub. Assy. 2544	3
11	22990	1st, 2nd and 3rd speed ext. band liner ... } Part of Assy.	3
12	19131	1st, 2nd and 3rd speed ext. band rivet ... } 4069	51
13	17937	³ / ₁₆ " B.S.F. nut auto adjuster (2nd & 3rd speed)	2
	17988	³ / ₁₆ " B.S.F. nut (thin) auto adjuster (1st speed)	1
14	10612	Automatic adjuster screw	3
15	11317	Automatic adjuster ring	3
16	10606	Automatic adjuster nut	3
17	10611	Automatic adjuster spring	3
18	10610	Automatic adjuster ring pin	3
19	10609	Automatic adjuster table pin	3
20	11277	Thrust pad	3
21	10605	Pull rod	3
22	11344	Ext. band hook plate (rear)	2
23	22993	Ext. band hook	6
24	11345	Ext. band hook plate (front)	2
25	22993	See Item 23	
26	22993	See Item 23	
27	11346	Ext. band hook plate	1
28	22993	See Item 23	
29	11344	See Item 22	
30	22993	See Item 23	
31	22993	See Item 23	
32	11345	See Item 24	
33	19127	Rivet	12
34	19128	Rivet	3
35	11343	Ext. band link distance piece	1
36	11319	Ext. band eyebolt pin	1
37	11342	Ext. band link distance piece	1
38	18568	Rivet	3
39	10655	Centralizer plate	6
40	10631	Pull rod pin	3
41	22983	Distance piece	3
42	10579	Centralizer spring	6
43	10655	See Item 39	
44	22888	Centralizer (L.H.)	3
45	17326	Split pin	2
46	22877	Pin for internal band link	1
47	18565	Rivet	12
48	22887	Centralizer (R.H.)... ..	3
49	10579	See Item 42	
50	17957	Split Pin	4
51	22881	Centralizer pin (R.H.)	1
52	17957	See Item 50	
53	22844	Brkt. for int. band link and centralizers	1

Ref. No.	Part No.	Description	No. off
54	17326	See Item 45	
55	17960	Split pin	1
56	17939	$\frac{1}{2}$ " B.S.F. slotted nut	1
57	17972	$\frac{1}{2}$ " dia. washer	1
58	17957	See Item 50	
59	22882	Centralizer pin (L.H.)	1
60	17957	See Item 50	
61	22843	Brkt. for ext. band hooks and centralizers	1

railcar.co.uk

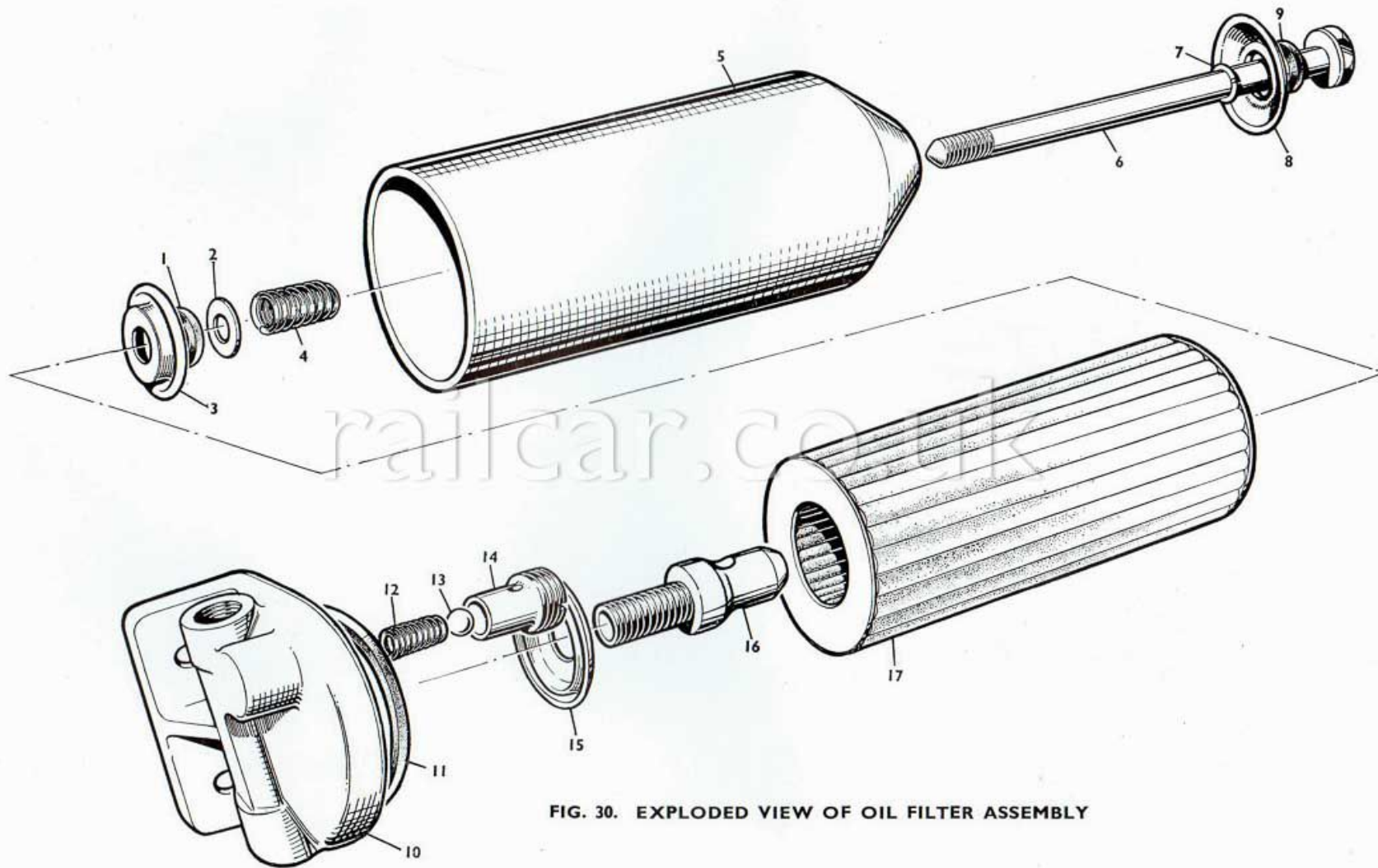


FIG. 30. EXPLODED VIEW OF OIL FILTER ASSEMBLY

FIG. 30 (Oil Filter Assembly)

Ref. No.	Part No.	Description	No. off
1	36429	Gasket	1
2	36430	Washer	1
3	36428	Lower element guide	1
4	36431	Spring	1
5	36425	Sump	1
6	36426	Centre bolt	1
7	36427	Circlip	1
8	36433	Reinforcing plate	1
9	36432	Seal	1
10	36421	Filter head	1
	37376	$\frac{3}{8}$ " U.N.F. setscrew—filter to casing	2
	32404	Union nut	2
	32403	Conical nipple	2
11	36424	Seal	1
12	36434	Spring	1
13	36435	Ball valve	1
14	36436	Retaining body	1
15	36423	Upper element guide	1
16	36422	Centre tube	1
17	36420	Filter element	1

LIST No. 5744 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	37074	Output shaft (Part of Assy. 4873)	1
	37739	1st speed brake drum	1
	37585	1st speed annulus bush	1
	11524	Hoffman bearing (MS21)	1
	22784	Hoffman bearing (MS12ACV)	1
	36306	Hoffman bearing (M17CD)	1
	11584	Hoffman bearing (RMS17)	1
	37078	Oil pump washer	1
	37238	Gearcase	1
	37077	Rear cover	1
	37076	Bearing sleeve	1
	26451	Inspection cover	1
	37039	Front cover	1
	38464	Dowel retaining plate	1
	28762	Abutment (1st, 2nd and 3rd speed)	3
	39749	Air restrictor valve (1st, 2nd and 3rd speed) } Part of Assembly 4975	3
	37058	Air feed pipe (top speed)	4
	37531	Banjo bolt	2
	37532	Banjo union	2
	36403	" UNF bolt } Filter to Mounting Bracket	2
	17330	Locking washer }	2
	17395	" BSP Nipple } Oil Pipe Assembly 4453	2
	19070	" BSP nut }	2
	37742	" O/DIA. pipe }	1
	36007/3	135° Aeroquip end fitting	1
	36006/3	90° Aeroquip end fitting	1
	36055/10	Aeroquip hose (3'—1½' long)	1
	34878	Dowty bonded seals	6
	37588	" BSF stud (rear cover to cap)	6
	37509	" BSF stud (gearcase to side cover)	10
	17048	" BSF stud (gearcase to front cover)	10
	10100/16	" BSF stud (gearcase to mounting bracket)	8
	17947	" BSF nut (gearcase to mounting bracket)	8
	17332	" dia. spring washer (gearcase to bracket)	8
	37390	Mounting bracket (rear)	1
	38148	Mounting bracket (front)	1
	37407	Mounting bracket and side cover	1
	38867	Dowel retaining plate (for bracket 37407)	1
	38868	Dowel retaining plate (for bracket 37390)	1
	36994	Rubber	6
	36995	Cover	4
	36996	Cover	2
	36997	Washer	2
	36998	Distance piece	1
	36999	" BSF bolt } Mounting Brackets	3
	17301	" BSF slotted nut }	3
	25287	Washer	3
	37000	Taper washer	3
	19069	Split pin	3
	513147	Dowel	2

Ref. No.	Part No.	Description	No. off
	37584	Input coupling	1
	37583	Output coupling	1
	37586	Pulley spacing piece	1
	36113	Pulley	1
	37587/1	Bolt	8
	17944	Nut	8
	17359	Split pin	8
	37587/2	Bolt	8
	17944	Nut	8
	17359	Split pin	8
	37589	Distance piece	8

railcar.co.uk

LIST No. 6085 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	37238	Gearcase	1
	38464	Dowel retaining plate	1
	28762	Abutment (1st, 2nd & 3rd speed) ...	3
	39749	Air restrictor valve (1st, 2nd & 3rd speed) ...	3
	37058	Air feed pipe (top speed)	4
	17395	$\frac{1}{2}$ " B.S.P. nipple ...	2
	19070	$\frac{1}{2}$ " B.S.P. nut ...	2
	37742	$\frac{1}{2}$ " O/dia. pipe ...	1
	36007/3	135° Aeroquip end fitting	1
	36006/3	90° Aeroquip end fitting	1
	34878	Dowty bonded seal	6
	37531	Banjo bolt	2
	37532	Banjo union	2
	36403	$\frac{3}{8}$ " U.N.F. bolt	2
	17330	Locking washer	2
	37509	$\frac{3}{8}$ " B.S.F. stud (gearcase to side cover) ...	10
	17048	$\frac{3}{8}$ " B.S.F. stud (gearcase to front cover) ...	10
	10100/16	$\frac{3}{8}$ " B.S.F. stud (gearcase to mounting brackets) ...	8
	17947	$\frac{3}{8}$ " B.S.F. nut (gearcase to mounting brackets) ...	8
	17332	$\frac{3}{8}$ " B.S.F. spring washer (gearcase to mounting bracket) ...	8
	37390	Mounting bracket (rear)	1
	36127	Mounting bracket (front)	1
	37407	Mounting bracket and side cover	1
	38867	Dowel retaining plate (for bracket 37407)	1
	38868	Dowel retaining plate (for bracket 37390)	1
	36994	Rubber	6
	36995	Cover	4
	36996	Cover	2
	36997	Washer	2
	36998	Distance piece	1
	36999	$\frac{3}{4}$ " B.S.F. bolt	3
	17301	$\frac{3}{4}$ " B.S.F. slotted nut	3
	25287	Washer	12
	19069	Split pin	3
	513147	Dowel	2
	37584	Input coupling	1
	37582	Coupling flange	1
	37396	Sleeve for coupling	1

LIST No. 5963 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	37074	Output shaft (Part of Assembly 4873)	1
	37739	1st speed brake drum	1
	37585	1st speed annulus bush	1
	22784	Hoffmann bearing MS21 ACV	1
	11524	Hoffmann bearing MS21	1
	36306	Hoffmann bearing M17 CD	1
	11584	Hoffmann bearing RMS17	1
	37078	Oil pump washer	1
	37238	Gearcase	1
	37077	Rear cover	1
	37076	Bearing sleeve	1
	26451	Inspection cover	1
	37039	Front cover	1
	38464	Dowel retaining plate	1
	28762	Abutment (1st, 2nd & 3rd speed)	3
	39749	Air restrictor valve (1st, 2nd & 3rd speed)	3
	37058	Air speed pipe (top speed)	4
	17395	1/2" B.S.P. nipple	2
	19070	1/2" B.S.P. nut	2
	37742	1/2" O/dia. pipe	1
	36007/3	135° Aeroquip end fitting	1
	36006/3	90° Aeroquip end fitting	1
	34878	Dowty bonded seal	6
	37531	Banjo bolt	2
	37532	Banjo union	2
	36403	1/2" U.N.F. bolt	2
	17330	Locking washer	2
	37588	1/2" B.S.F. stud (rear cover to cap)	6
	37509	1/2" B.S.F. stud (gearcase to side cover)	10
	17048	1/2" B.S.F. stud (gearcase to front cover)	10
	10100/16	1/2" B.S.F. stud (gearcase to mounting brackets)	8
	17947	1/2" B.S.F. nut (gearcase to brackets)	8
	17332	1/2" dia. spring washer	8
	37390	Mounting bracket (rear)	1
	38148	Mounting bracket (front)	1
	37407	Mounting bracket and side cover	1
	38867	Dowel retaining plate (for bracket 37407)	1
	38868	Dowel retaining plate (for bracket 37390)	1
	36994	Rubber	6
	36995	Cover	4
	36996	Cover	2
	36997	Washer	2
	36998	Distance piece	1
	36999	3/4" B.S.F. bolt	3
	17301	3/4" B.S.F. slotted nut	3
	25287	Washer	3
	37000	Taper washer	3
	19069	Split pin	3
	513147	Dowel	2
	37584	Input coupling	1
	37583	Output coupling	1

LIST No. 6092 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	38744	Output shaft (Part of Assembly 4819)	1
	38934	1st speed brake drum	1
	38937	Locknut driven shaft	1
	38938	Locknut washer—(driven shaft)	1
	38939	Key (driven shaft)	1
	22784	Hoffmann bearing MS.21 A.C.V.	1
	11507	Hoffmann bearing MS14	1
	11524	Hoffmann bearing MS21	1
	30008	Hoffmann bearing 570	1
	25213	Oil pump oscillating cylinder	1
	25184	Oil pump plunger	1
	38935	Oil pump eccentric	1
	30224	Oil pump eccentric key	1
	22841	Base plate	1
	38899	Gearcase	1
	38743	Rear cover and adaptor	1
	22851	Side cover	1
	22840	Inspection cover	1
	37066	Front cover	1
	26325	Oil seal (output)	1
	35267	'O' ring	1
	38936	Oil seal housing	1
	38930	Sleeve for oil seal	1
	13776/1	Set screw ($\frac{3}{8}$ " B.S.F.)	8
	17330	Spring washer	8
	24579	$\frac{1}{2}$ " B.S.F. stud (gearcase to rear cover short)	10
	38945	" B.S.F. stud (gearcase to rear cover long)	2
	17947	" B.S.F. nut (gearcase to rear cover)	12
	17332	$\frac{1}{2}$ " dia. spring washer (gearcase to rear cover)	12
	38940	Input coupling	1

LIST No. 6230 & 6231 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	17305	$\frac{3}{8}$ " dia. standard washer ...	6
	17944	$\frac{1}{4}$ " BSF slotted nut ...	6
	17957	$\frac{1}{16}$ " dia. x $\frac{3}{4}$ " long split pin ...	6
	38963	Input shaft ...	1
	38964	Clutch driving member ...	1
	38965	Clutch driving member bolt ...	6
	38958	3rd speed brake drum ...	1
	38946	3rd speed sunwheel ...	1
	38966	Abutment washer ...	1
	11530	$\frac{1}{4}$ " x $\frac{1}{4}$ " planet rollers ...	126
	38947	Bush ...	1
	38950	Planet rivet ...	3
	38948	Rivet ...	6
	38951	3rd speed planet carrier ...	1
	38952	3rd speed distance piece ...	3
	38953	Distance washer ...	12
	38954	Bush ...	1
	38955	3rd speed planet ...	3
	38956	3rd speed planet inner race ...	3
	38957	2nd speed brake drum ...	1
	11578	$\frac{3}{8}$ " x $\frac{3}{8}$ " planet roller ...	84
	30102	Distance washer ...	9
	38960	2nd speed planet ...	3
	38961	2nd speed planet carrier ...	1
	38989	Distance piece ...	3
	38962	1st and 2nd speed sunwheel ...	1
	11578	$\frac{3}{8}$ " x $\frac{3}{8}$ " planet roller ...	84
	30102	Distance washer ...	9
	37074	Output shaft ...	1
	38960	Planet—1st speed ...	3
	38989	Distance piece ...	3
	37585	Bush—1st speed annulus ...	1
	38959	1st speed brake drum ...	1
	22784	Hoffmann bearing MS21ACV ...	1
	11524	" " M821 ...	1
	36306	" " M17CD ...	1
	11584	" " RMS17 ...	1
	37078	Oil pump washer ...	1
	41016	Spring retaining washer ...	1
	39185	Pneumatic piston —3rd speed ...	1
	39184	" " —2nd speed ...	1
	39183	" " —1st speed ...	1
	39186	Piston return spring 3rd speed ...	1
	37238	Gearcase ...	1
	37077	Rear cover ...	1
	37076	Bearing sleeve ...	1
	26451	Inspection cover ...	1
	37039	Front cover ...	1
	38464	Dowel retaining plate ...	1

Ref. No.	Part No.	Description	No. off
	28762	Abutment (1st, 2nd and 3rd speed) ...	3
	39749	Air restrictor valve (1st, 2nd and 3rd speed) }	3
	37058	Air feed pipe (top speed) ...	4
	17395	¹ / ₄ " BSP nipple } Oil Pipe ...	2
	19070	" BSP nut } Assy. ...	2
	37742	" O/dia. Pipe } 4453 ...	1
	36007/3	135° Aeroquip end fitting ...	1
	36006/3	90° Aeroquip end fitting ...	1
	34878	Dowty bonded seal ...	6
	37531	Banjo bolt ...	2
	37532	Banjo union ...	2
	36403	³ / ₄ " UNF bolt ...	2
	17330	Lock washer ...	2
	36055/10	Aeroquip hose (3'—1½" long (List 6230 only) ...	1
	37588	³ / ₁₆ " BSF stud (rear cover to cap) ...	6
	37509	" BSF stud (gearcase to side cover) ...	10
	17048	" BSF stud (gearcase to front cover) ...	10
	10100/16	" BSF stud (gearcase to mounting bracket) ...	8
	17947	" BSF nut (gearcase to mounting bracket) ...	8
	17332	³ / ₄ " dia. spring washer (gearcase to mounting bracket) ...	8
	37390	Mounting bracket—(rear) ...	1
	38148	Mounting bracket—(front) ...	1
	37407	Mounting bracket and side cover ...	1
	38867	Dowel retaining plate (for bracket 37407) ...	1
	38868	Dowel retaining plate (for bracket 37390) ...	1
	36994	Rubber ...	6
	36995	Cover ...	4
	36996	Cover ...	2
	36997	Washer ...	2
	36998	Distance piece ...	1
	36999	³ / ₄ " BSF bolt } Mounting Bracket ...	3
	17301	³ / ₄ " BSF slotted nut ...	3
	25287	Washer ...	3
	37000	Taper washer ...	3
	19069	Split pin ...	3
	513147	Dowel ...	2
	37583	Output coupling ...	1
	39703	Input coupling ...	1
	37586	Pulley spacing piece ...	1
	36113	Pulley ...	1
	37587/1	Bolt (pulley to pulley spacing piece) ...	8
	17944	Nut (pulley to pulley spacing piece) ...	8
	17359	Split pin (pulley to pulley spacing piece) ...	8
	37587/2	Bolt (output coupling to pulley spacing piece) ...	8
	17944	Nut (output coupling to pulley spacing piece) ...	8
	17359	Split pin (output coupling to pulley spacing piece) ...	8

LIST No. 5820 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	37757	Input shaft nut	1
	37755	Locking bar	1
	37756	Tab washer	1
	23399	Set screw	2
	38536	Driving shaft washer	1
	37238	Gearcase	1
	38464	Dowel retaining plate	1
	28762	Abutment (1st, 2nd and 3rd speed)	3
	39749	Air restrictor valve (1st, 2nd and 3rd speed) } Part of Assy. 4975	3
	37058	Air feed pipe (top speed)	4
	36006/3	90° Aeroquip end fitting	1
	36007/3	135° Aeroquip end fitting	1
	17395	$\frac{1}{4}$ " BSP nipple } Assy. 4453	2
	19070	" BSP nut }	2
	37742	" O/dia. pipe }	1
	34878	Dowty bonded seal $\frac{1}{2}$ " BSP	6
	37531	Banjo bolt	2
	37532	Banjo union	2
	36403	$\frac{3}{8}$ " UNF bolt } Filter to Mounting	2
	17330	Locking washer } Bracket	2
	37509	" BSF stud (gearcase to side cover)	10
	17048	" BSF stud (gearcase to front cover)	10
	10100/16	" BSF stud (gearcase to mounting brackets)	8
	17947	" BSF nut (gearcase to brackets)	8
	17332	" BSF spring washer (gearcase to bracket)	8
	37390	Mounting bracket (rear)	1
	36127	Mounting bracket (front)	1
	37407	Mounting bracket and side cover	1
	38867	Dowel retaining plate (for bracket 37407)	1
	38868	Dowel retaining plate (for bracket 37390)	1
	36994	Rubber	6
	36995	Cover	4
	36996	Cover	2
	36997	Washer	2
	36998	Distance piece	1
	36999	$\frac{3}{4}$ " BSF bolt	3
	17301	$\frac{3}{4}$ " BSF slotted nut	3
	25287	Washer	3
	37000	Taper washer	3
	19069	Split pin	3
	513147	Dowel	2
	37397	Input coupling	1
	37582	Coupling flange } Assembly 4385	1
	37396	Sleeve for coupling }	1

LIST No. 5982 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	37054	Plain bearing for pump	1
	38612	Filter support bracket	1
	36006/3	Aeroquip end fitting (90°)	2
	38615	Oil feed pipe—oil pump to filter	1
	17395	1/2" B.S.P. nipple	2
	19070	1/2" B.S.P. nut	2
	36055/8	Aeroquip hose (2' 9" long)	1
	10100/1	1/2" B.S.F. stud (front cover to filter support plate)	4
	17048	1/2" B.S.F. stud (gearcase to front cover)	6
	10873/1	1/2" B.S.F. bolt (pipe clip to base plate)	1
	17330	1/2" B.S.F. spring washer (pipe clip to base plate)	1

oil pipe
Assy. 4680
railcar.co.uk

LIST No. 6484 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	Part No.
	37074	Output shaft (part of Assy. 4873)	1
	37739	1st speed brake drum	1
	37585	1st speed annulus bush	1
	22784	Hoffmann bearing MS21 ACV	1
	11524	Hoffmann bearing MS21	1
	36306	Hoffmann bearing M17 CD	1
	11584	Hoffmann bearing RMS 17	1
	37078	Oil pump washer	1
	37238	Gearcase	1
	37077	Rear cover	1
	37076	Bearing sleeve	1
	26451	Inspection cover	1
	37039	Front cover	1
	38464	Dowel retaining plate	1
	28762	Abutment	3
	39749	Air restrictor valve	3
	37058	Air feed pipe	4
	37531	Banjo bolt	2
	37532	Banjo union	2
	36403	$\frac{3}{4}$ " U.N.F. bolt	2
	17330	Locking washer	2
	37588	" B.S.F. stud (rear cover to cap)	6
	37509	" B.S.F. stud (gearcase to side cover)	10
	17048	" B.S.F. stud (gearcase to front cover)	10
	10100/16	" B.S.F. stud (gearcase to mounting brackets)	8
	17947	" B.S.F. nut (gearcase to mounting brackets)	8
	17332	" dia. spring washer (gearcase to mounting brackets)	8
	37390	Mounting bracket—(rear)	1
	38148	Mounting bracket—(front)	1
	37407	Mounting bracket & side cover	1
	38867	Dowel retaining plate	1
	38868	Dowel retaining plate	1
	36994	Rubber	6
	36995	Cover	4
	36996	Cover	2
	36997	Washer	2
	36998	Distance piece	1
	36999	$\frac{3}{4}$ " B.S.F. bolt	3
	17301	$\frac{3}{4}$ " B.S.F. slotted nut	3
	25287	Washer	3
	37000	Taper Washer	3
	19069	Split pin	3
	513147	Dowel	2
	37584	Input coupling	1
	41027	Output coupling	1
	41028	Pulley spacing piece	1
	37219	Pulley	1
	37587/1	Bolt	8
	17944	Nut	8
	17359	Split pin	8
	41201	Bolt	12
	17946	Nut	12
	17654	Split pin	12

LIST No. 5742 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30
SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	22841	Base plate	1
	22851	Side cover	1
	22834	Gearcase	1
	22838	Rear cover	1
	22840	Inspection cover	1
	37066	Front cover	1

railcar.co.uk

LIST No. 6335 PARTS LIST

THE MAJORITY OF PARTS FOR THIS GEARBOX ARE AS LIST No. 5743. FIGS. 27, 28, 29 and 30 SHOULD BE CONSULTED. DIFFERING PARTS ARE LISTED BELOW.

Ref. No.	Part No.	Description	No. off
	37853	Gearcase	1
	26450	Side cover	1
	26449	Rear cover	1
	26451	Inspection cover	1
	37039	Front cover	1
	12628	Union and nipple assy.	8
	41118	1st speed air pipe	1
	41119	2nd speed air pipe	1
	41120	3rd speed air pipe	1
	40254	4th speed air pipe... ..	1
	11441	Clamp for air pipes	2
	40252	Air pipe (short)	4
	40253	Air pipe (long)	1
	17342	Plug	1
	17093	T. piece	4
	37061	Bracket for 4th speed E.P. valve	1
	1148	E.P. valve	4
	12631	Elbow for E.P. valve	4
	17048	$\frac{1}{2}$ " B.S.F. stud	5
	18399	Bolt $\frac{1}{2}$ " B.S.F. (E.P. valve to gearbox)	8
	17937	" B.S.F. nut (air pipe clamp to gearcase)	4
	17330	" B.S.F. spring washer (air pipe clamp to gearcase)	4
	17332	" dia. spring washer (E.P. valve)	8
	22976	Mounting bracket	1
	22977	Mounting bracket	2

SPECIAL TOOLS

ALL LIST NUMBERS

Ref. No.	Part No.	Description	No. off
	11484	Box spanner for oil filler plug	1
	11475	Plate for extractor	1
	11476	Bolt for extractor	3
	11477	Screw for extractor	1
	11482	Bolt for extractor (coupling)	4
	11479	Box spanner for auto adjuster nut	1
	11478	'C' spanner	1
	28959	Toggle setting gauge 1st speed	1
	28960	Toggle setting gauge 2nd & 3rd speed	1
	23510	Ring spanner	1

} Not supplied unless
requested by customer

railcar.co.uk