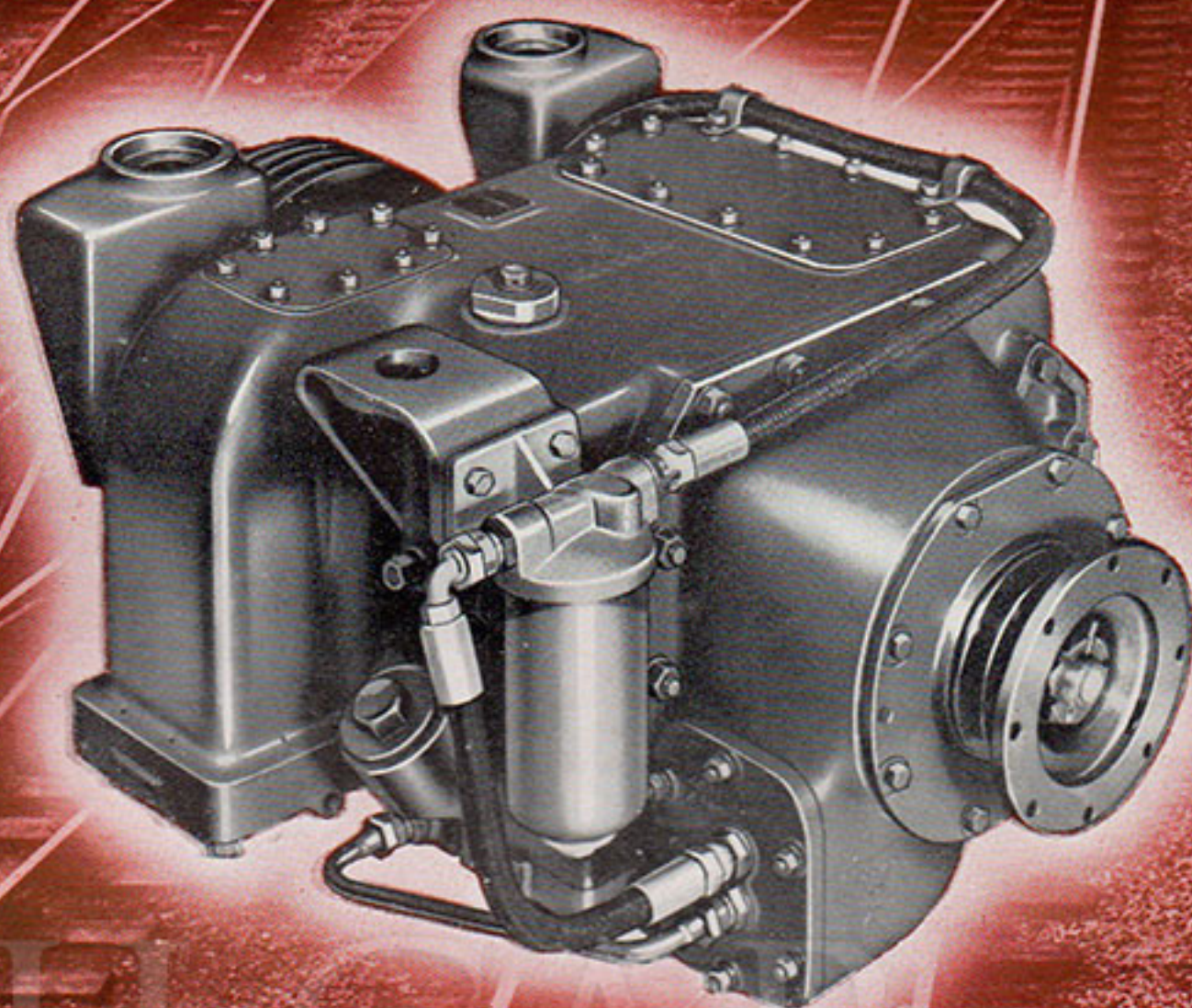


Air Operated railcar gearbox type RI4



used by
BRITISH RAILWAYS

SELF-CHANGING GEARS LTD.



Air operated Railcar Gearbox Type RI4

BASED on the well-tried epicyclic design used in railcars for over 20 years, the air-operated RI4 gearbox provides simple control, rapid gearchanging, multiple-unit operation, reliability and low maintenance.

Cushioned gearchange

Softness of gearchange is characteristic of the gearbox. Air-operated balanced band brakes are used to bring the desired gear into operation, and air restrictors within the gearbox give smooth, progressive action of the brakes ensuring positive cushioned gearchanging.

Simple control

To control the gearbox the driver has a simple rotary electrical switch and movement of this switch to a gear position engages the desired gear.

No clutch operation

The gearbox is used in conjunction with a hydraulic coupling and freewheel, thus no clutch operation is required and coasting is automatic. Reversing is accomplished by a spiral bevel unit mounted on the axle, operated by a separate control.

Fast acceleration

Maximum acceleration, smoothness, and kindness to the remainder of the transmission are some of the advantages given by this gearbox.

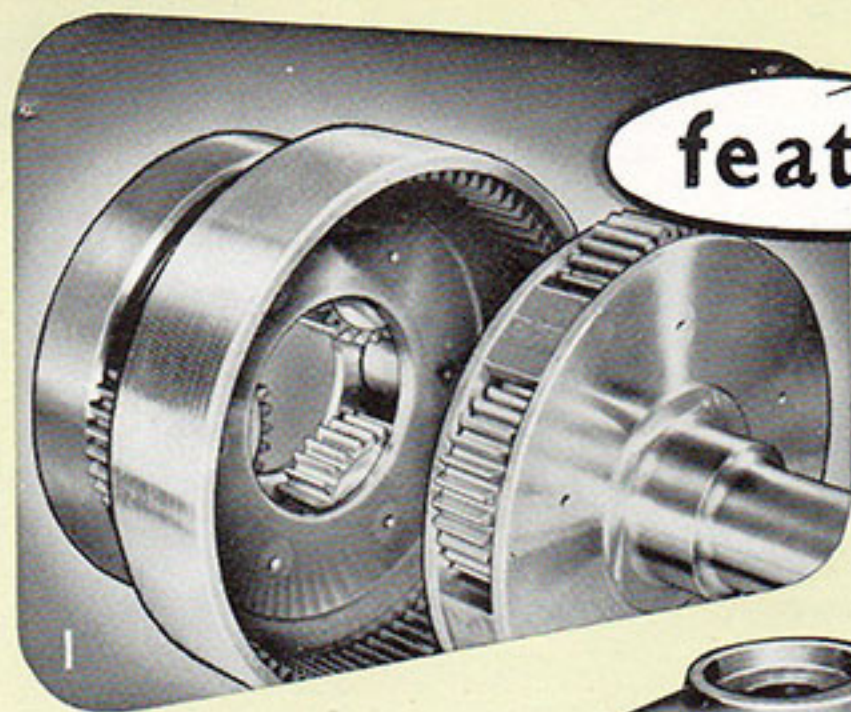
Multiple-unit operation

In the British Railways light-weight diesel railcars, two gearboxes normally operate together by means of electro-pneumatic valves controlled from one switch, for each power car/trailer set. These sets are then made up into six car trains with six gearboxes operating simultaneously, again by a simple movement of the driver's switch in the leading car.

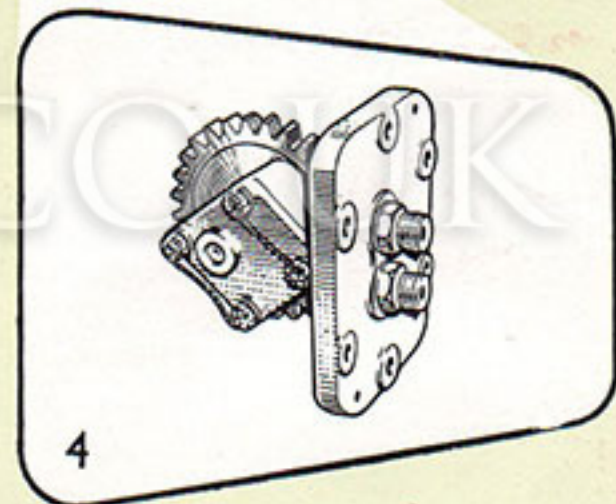
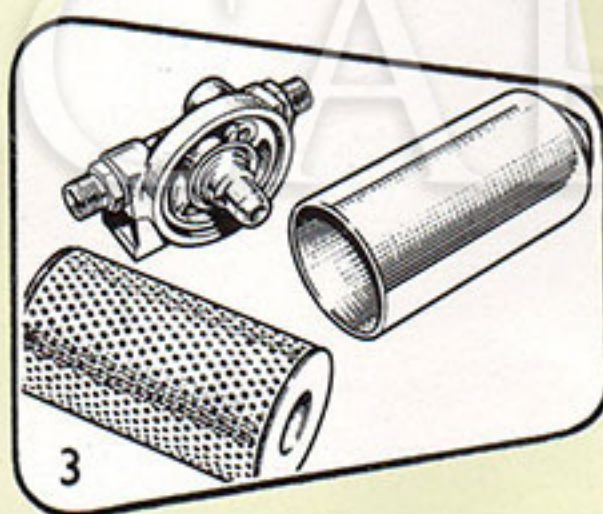
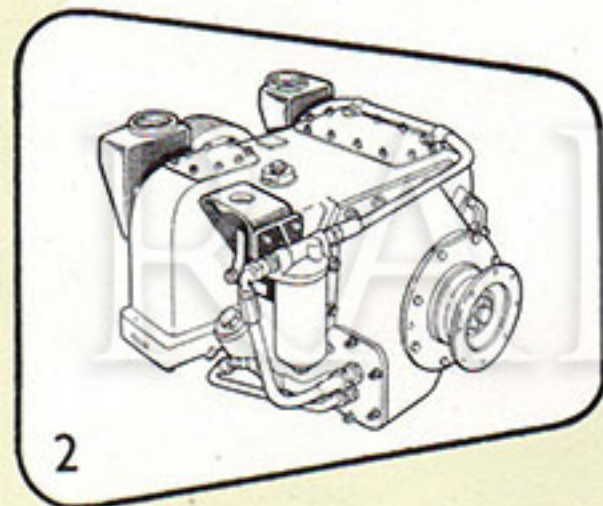
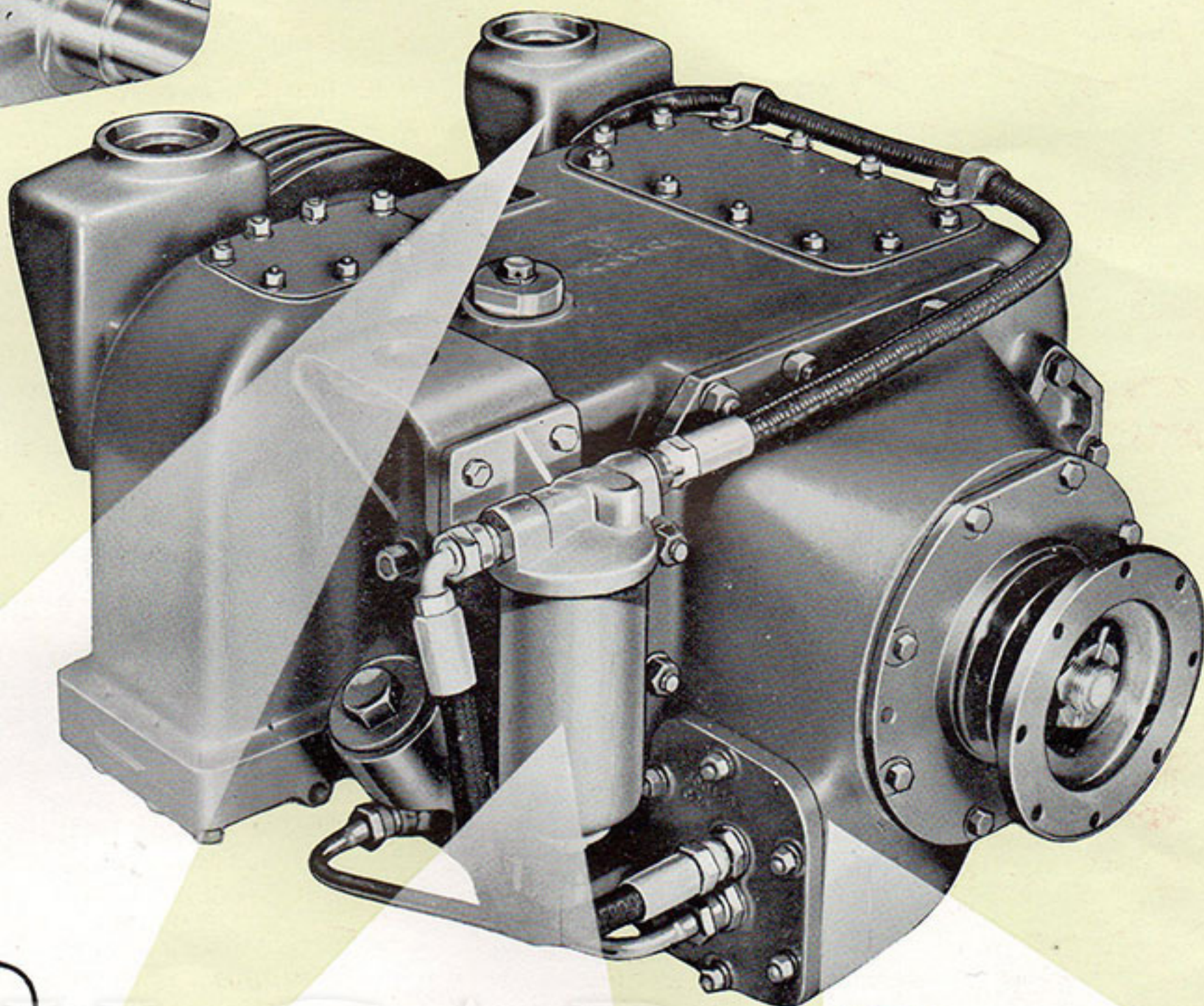
Features

The features of this gearbox are its robust epicyclic running gear, pressure lubrication by gear-type pump, paper element oil filter, and independent mounting.

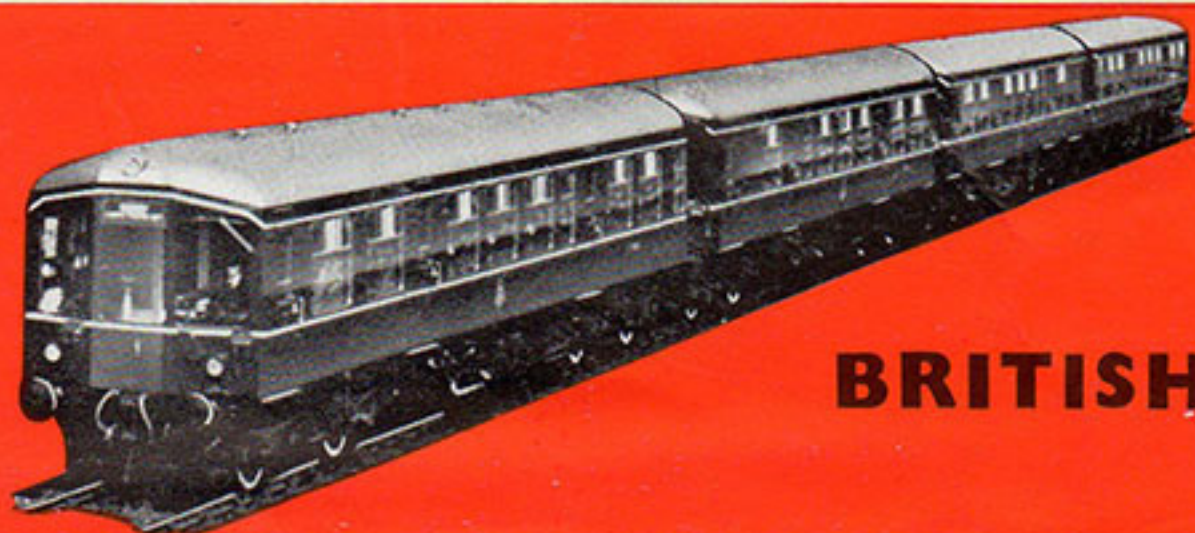
features of the RI4 GEARBOX



1. ROBUST EPICYCLIC RUNNING GEAR.
2. INDEPENDENT MOUNTING OR UNIT CONSTRUCTION.
3. PAPER-ELEMENT OIL FILTER.
4. PRESSURE LUBRICATION BY GEAR-TYPE PUMP.



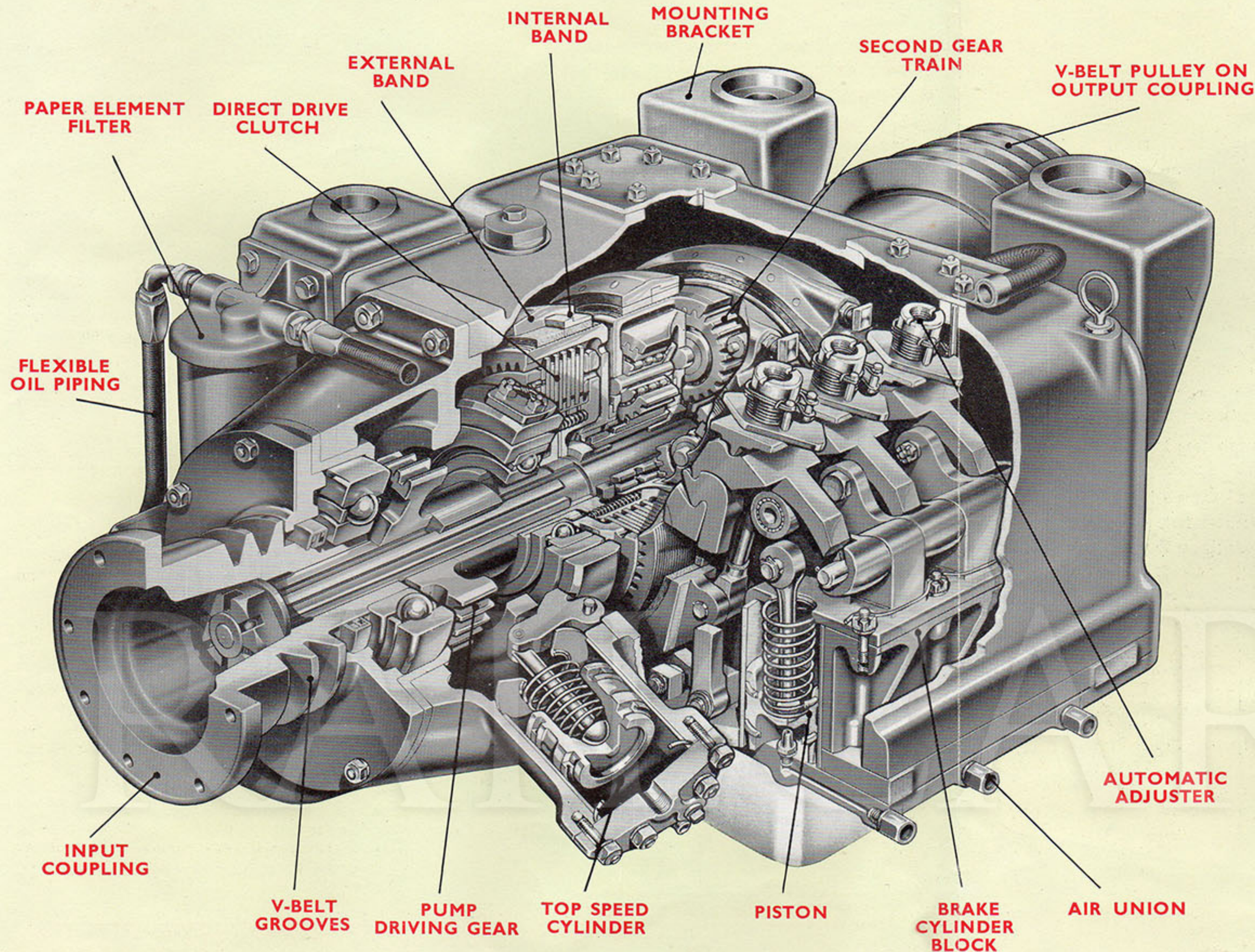
USED BY



BRITISH RAILWAYS

The working of the

RI4 gearbox



THE part-sectioned illustration opposite shows the general layout of the gearbox.

Each indirect gear has its own balanced brake which consists of two concentric bands, one within the other. They are wrapping brakes, i.e. the friction of the brakes on the brake drums tends to increase their grip.

The running gear is of the compound epicyclic type. This is best understood by regarding the 1st speed gear train as being the basic train. The sunwheel of this train is splined to the input shaft and meshes with the planets which are carried on a flange on the output shaft. The planets in turn mesh with the first speed annulus.

When this is held stationary by its brake and the input shaft is driven, the planets are caused to roll round inside the annulus, carrying with them the output shaft at a speed determined by the reduction ratio of this gear train.

By means of the other epicyclic trains the annulus of the basic train is caused to rotate at certain fixed increments of input speed which has the effect of producing the other ratios.

Movement of the driver's control switch energizes an electro-pneumatic valve which directs air to the appropriate brake cylinder. This raises a simple piston and through toggle mechanism applies the brake. The pistons are of varying size according to the torque reaction which each brake has to sustain.

As with any friction surface, a small degree of brake lining wear is inevitable, but this is corrected by an efficient auto-adjuster. This is illustrated, and its action described overleaf.

The top speed clutch locks together two of the running gear elements and causes all the gearing to rotate as one unit. Thus in top gear there is no wear in the intermediate gear trains. The drive is then direct from input to output and a very high overall efficiency is obtained.

power take-off Provision is made for a v-belt power take-off on the input and output couplings.

oil cooler Since the lubricating oil is delivered from the gear pump to the running gear through an external pipe an oil cooler can be fitted if tropical conditions make this desirable.

maintenance Periodic topping up of the oil is the only maintenance required between overhaul periods. Wear on the brake band linings is automatically compensated throughout their life by the automatic adjuster mechanism.

Simple control of the R14 Gearbox

The simplicity of control enjoyed with this type of gearbox is due to two special features—its constant mesh epicyclic gearing and its power-operated gearchange.

Each indirect gear has its own epicyclic gear train and suitable compounding of these gear trains varies the ratio.

The desired ratio is obtained by applying an air-operated brake to the brake drum for that gear.

Admission of air to the piston applying the brake is controlled by an electro-pneumatic valve (one for each gear) which is energized by the driver's control switch.

Since the gearbox is used in conjunction with a hydraulic coupling, there is no clutch to operate and a gear can be engaged whilst the vehicle is stationary without stalling the engine.

The full sequence of gear engagement, therefore, for two or more gearboxes is as follows.

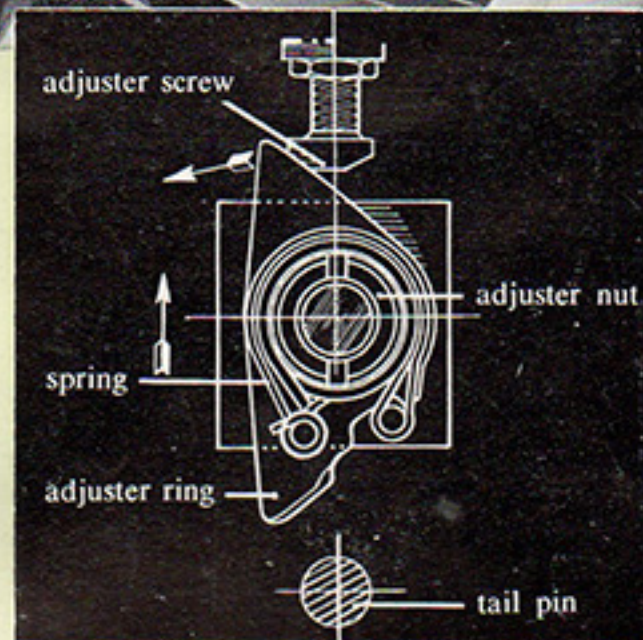
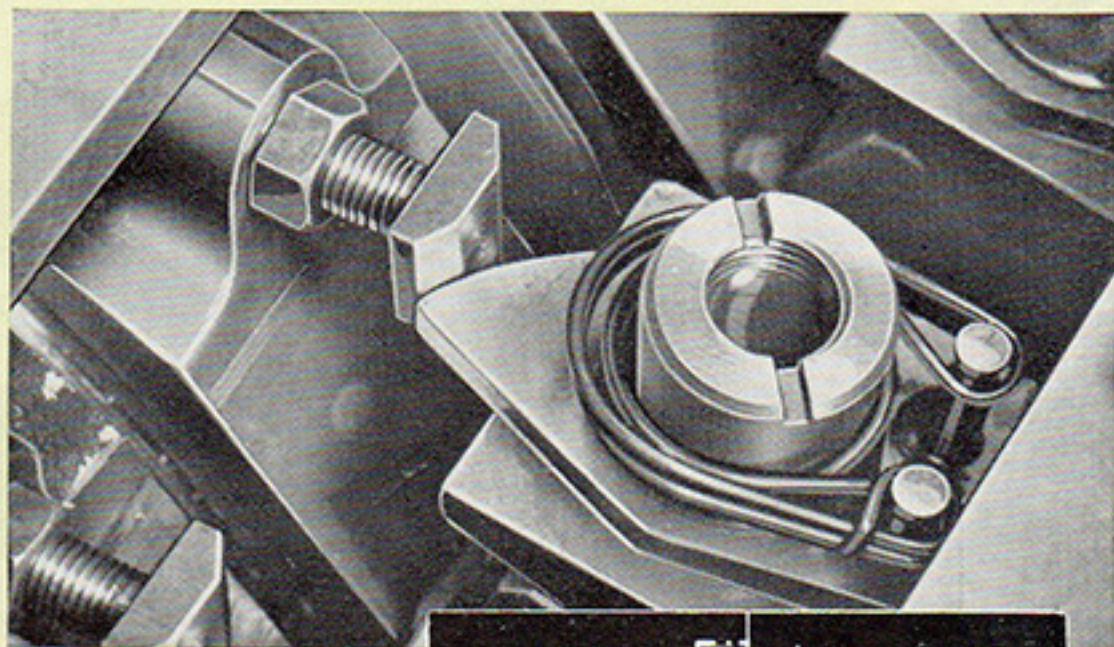
The driver moves his control to the gear position; this energizes the electro-pneumatic valve appropriate to the gear engaged; the electro-pneumatic valve allows air to act on the piston for that gear; the piston applies the band brake and the desired gear is obtained.

data

Gear Ratios Top 1 to 1	Rating 150 h.p. Max.
3rd 1.59 to 1	torque 500 lb/ft (69
2nd 2.43 to 1	Metre Kilograms)
1st 4.28 to 1	Air pressure. For full
	rated capacity 60/65
Weight 498lb (226	lb p.s.i. (4.22/4.57
kilograms)	Kilograms / square
	centimetre)

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The Automatic Adjuster



As each brake is applied, the adjuster mechanism swings toward the brake band bringing the adjuster ring into contact with the adjuster screw. The faces of these components in contact is shown very clearly in the illustration above.

As the brake linings wear, the adjuster ring is deflected when the brake is applied loosening the special spring from around the adjuster nut.

When the brake is next released the spring tightens round the nut and holds the adjuster ring in its new position until the ring is partially rotated by striking the tail pin affixed to the gearcase.

This screws down the adjuster nut by the correct amount and maintains the proper brake setting.

Self-Changing Gears Ltd

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