

## General Instructions

### Towing for recovery

If the engine will not start and the vehicle is being towed with the gears in neutral, the gearbox oil pump will not be functioning with consequent risk of gearbox seizure. To avoid this have the forward and reverse lever in the central or neutral position.

## DRIVING

### To move away

With the hand brake on, start and warm the engine. Check position of the forward and reverse lever. Select 1st or 2nd gear, using 2nd on a level road. Allow the engine to idle.

Press the gear change pedal down fully and release completely. Remember the positive movements—first fully down, then right back and foot off. The vehicle is now in gear and ready to move away.

Release the hand brake and accelerate, when the vehicle will move off smoothly.

On an incline, accelerate before removing the hand brake. Always let the hand brake off quickly and fully.

When the correct speed is reached for the particular gear, select the next higher gear.

**Note.**—From the point of view of matching engine speed with road speed, regard the gear change pedal as a foot-operated gear lever. Depressing the pedal is the same as putting the hand gear lever in neutral, and releasing engages the gear. Never use the gear change pedal as a clutch.

### To change up

Change up at approximately the following speeds :—

1st to 2nd .. ..	5 m.p.h.	2nd to 3rd .. ..	10 m.p.h.
3rd to 4th .. ..	20 m.p.h.	4th to Top .. ..	30 m.p.h.

Having selected the gear required, and when ready to make the change, release the accelerator and depress the gear change pedal.

At high speeds do not release the gear change pedal at once, but hold it right down until the engine revolutions have dropped, then release fully. *The higher the speed, the longer the pause.*

A jerky change means that the gear change pedal has not been held down for the correct length of time. Any jerk or whine indicates incorrect changing.

### To change down

Changing down should be made at approximately the following speeds :—

Top to 4th .. ..	25 m.p.h.	4th to 3rd .. ..	15 m.p.h.
3rd to 2nd .. ..	10 m.p.h.	2nd to 1st .. ..	6 m.p.h.

Never change down by just selecting a lower gear and pedalling with the foot off the accelerator, as this will damage the gearbox.

**On an incline.**—When climbing, and it is necessary to change, hold the accelerator down, select the next lower gear, then depress and release the gear change pedal as quickly as possible.

**On the level.**—Pre-select the lower gear. Depress the accelerator at the same time as the gear change pedal is depressed and released. No pause is necessary between depressing and releasing the pedal.

Alternatively, pre-select the lower gear, depress the gear change pedal, “rev up” and then release the gear change pedal.

**On a decline.**—To change down on a steep hill in order to use the engine as a brake, make the change as if on the level, but further increase the engine speed.

### Quick change from forward to reverse

Have the look-out in the rear of the body open. Immediately it is necessary to change from forward to reverse, apply the foot brake, depress the gear change pedal and hold down.

## Chapter I — Power Unit

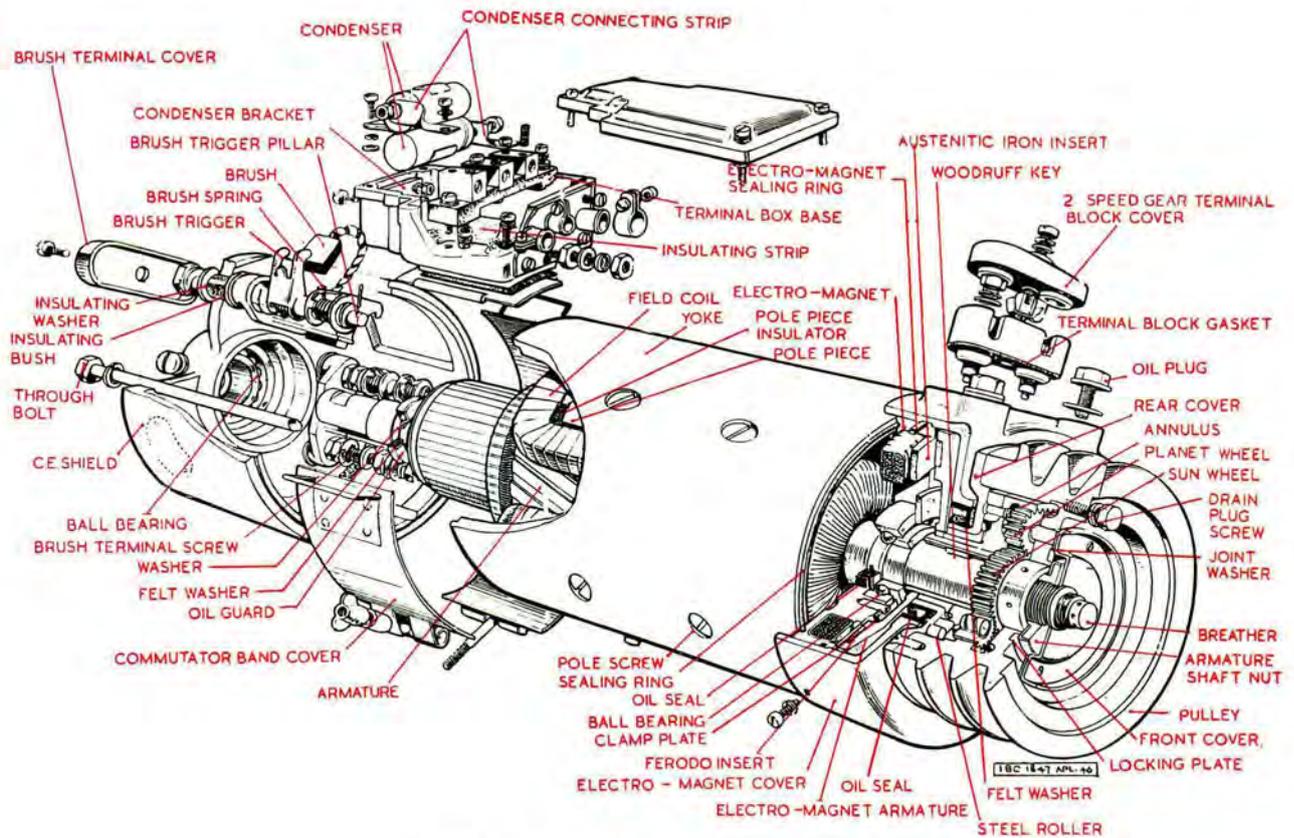


Fig. 57. Dynamo, Type 170MO-16X

Flatten the locking plate, hold the pulley and undo the armature shaft nut.

Withdraw the two-groove pulley complete with gears using a withdrawal tool if necessary.

To strip this unit unscrew the six screws securing the rear cover and prise off the rear cover complete with bearing bush. Lift off the annulus with bearing bush and roller bearing inner race, remove the three steel rollers and lift out the sun-wheel.

Unscrew the seven screws securing the electro-magnet cover and gently tap off the cover complete with oil seal using a hide or wooden mallet. Note the fitting of the oil seal and withdraw it, if necessary.

Extract the loose electro-magnet armature.

Take off the commutator band cover.

Pull back each brush trigger and lift the brush partially out of its holder and wedge it in its lifted position by means of the brush trigger.

Unscrew the four through bolts and withdraw them from the C.E.

Carefully tap on the C.E. shaft extension with a hide or wooden mallet and withdraw the armature from the yoke complete with the electro-magnet and bearing. It may be necessary to prise between the yoke and the electro-magnet in order to free from the sealing ring.

Remove the washer, felt washer and oil guard from the shaft C.E.

Extract the Woodruff key from the shaft.

By use of a withdrawal tool remove the electro-magnet from the shaft.

From the electro-magnet release the ball-bearing clamp plate.

Withdraw the bearing from its housing using a ball race extractor.

Note which way the oil seal is fitted and, if necessary, remove it.

Mark all connections to the brush gear and field coils to ensure correct replacement.

Disconnect the brush gear leads.

Take off the terminal box cover.

Mark all terminal box connections.

## Chapter II — Transmission

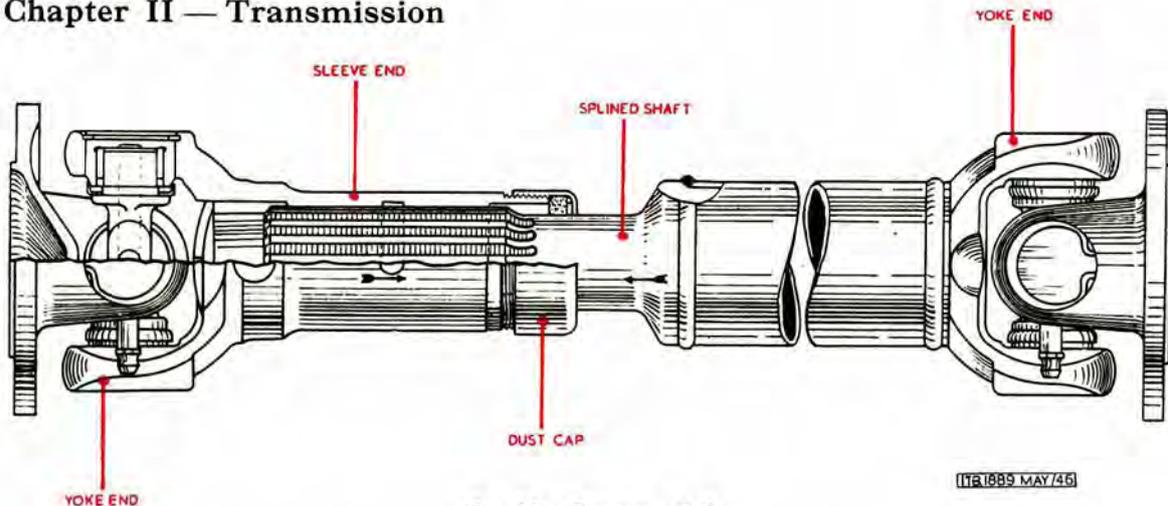


Fig. 23. Driving shaft

Disconnect the driving shaft from the transfer box coupling by removing the four coupling bolts, access to which is obtained through an aperture in the chassis frame cross-member.

Disconnect the driving shaft from the bevel box coupling by removing the four coupling bolts and remove the driving shaft.

### Replacement

Before replacing the driving shafts ensure that the arrows marked on the sleeve ends are in line with those on the splined shaft (fig. 23). If the arrows are not discernible, see that the yoke ends of the sleeve and the splined shaft lie in the same plane. Under no circumstances must they be fitted otherwise.

Reverse the procedure given for removal according to the location of the driving shaft.

The specified lengths of the four driving shafts are :—

Front right	..	23 $\frac{5}{16}$ in.
Front left	..	14 $\frac{3}{4}$ in.
Rear right	..	26 $\frac{1}{2}$ in.
Rear left	..	34 $\frac{3}{4}$ in.

### BEVEL DRIVES

Special tools required :—

Spanner, D.E., box tubular,  $\frac{1}{4} \times \frac{5}{16}$  in., B.S.W.:—

for observer's seat .. .. V.A.O.S., Sect. LV5/BM-406082

### Removal

#### FRONT RIGHT AND LEFT BEVEL BOXES

The following components are those to be removed or disconnected for the removal of either the front right or the front left bevel boxes. Those components to be disconnected or removed which are peculiar to the front right bevel box or front left bevel box, are shown under their respective headings.

For method disconnecting control rod ball sockets from the ball pins see inset in fig. 19.

Remove the front undershield which is secured by fifteen slotted-head set screws (fig. 10, refs. F and G).

Remove the observer's seat (fig. 12) which is secured to its bearing housing by six set screws. Use the special spanner, BM.406082 for this purpose.

Remove the driver's back-rest (fig. 12) which is secured to the floor plate by two set screws and two bolts.

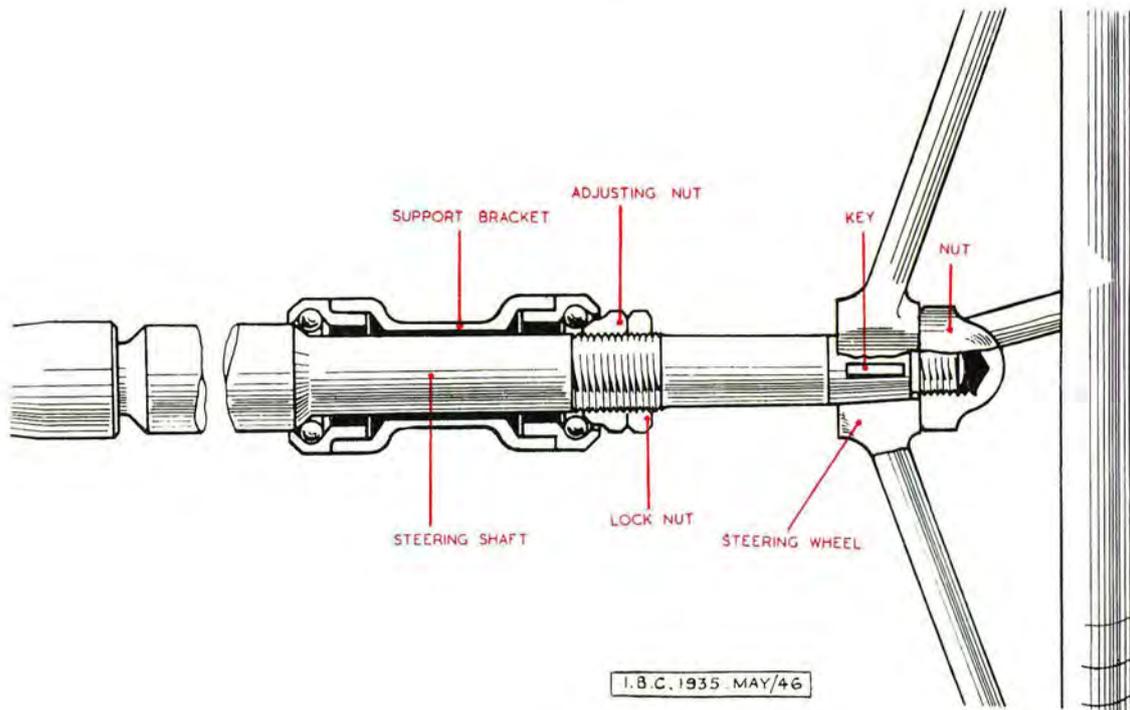


Fig. 102. Steering wheel shaft

**To reassemble**

Place the balls in each race of the support bracket using grease to retain them in position. Enter the steering shaft into the bracket and screw up the adjusting nut to give free movement without lift, secure with the lock nut.

Fit the steering wheel key, steering wheel and nut.

**Steering, intermediate and coupling shaft (fig. 103)**

**To dismantle**

With a suitable punch drive out the two Mills pins that secure the yokes to the shaft, withdraw the yokes and remove the Woodruff keys.

Thoroughly clean the yoke faces above the snap rings and needle bearings.

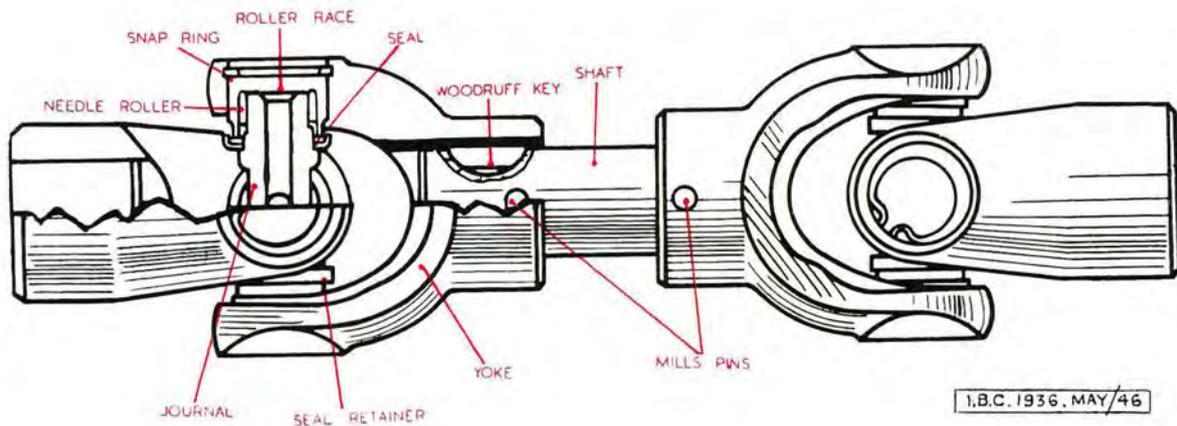


Fig. 103. Coupling shaft

## Chapter IV — Electrical Equipment

Before attempting to dismantle the instrument panel, ensure that the cable colour codes are intact, legible and agree with the wiring diagram.

Instruments are not repairable and must be replaced if faulty.

Instruments are secured to the panel in an obvious manner, but instances where difficulty may be experienced are given below.

The switchbox is secured to the panel by means of a clamping spring which locates in recesses in the switchbox body and lies against the back of the panel. The clamping spring is secured by means of a screw and nut.

The ammeter is secured to the panel by lips on the ammeter body which are opened out when the ammeter is in position.

The two warning lamps are each secured to the panel by means of a spring and retaining clip. To remove the lamp, depress the spring, release the retaining clip and slip off the cup and spring. The switch may then be pushed through to the front of the panel.

The speedometer panel bulb-holder comprises two parts, the holder and the plate which is secured to the panel by two screws each with a spring washer. The bulb-holder embodies two lugs which locate beneath clips on the plate and to remove the bulb-holder it is necessary to turn the body until the lugs are clear of the clips.

### LAMPS AND FITTINGS

**HEADLAMP** (Type, Butler, B/WD/HIR alternative Lucas, L/WD/HIR (fig. 121)  
(Type, Butler, B/WD/HIR/DP ,, Lucas, L/WD/HIR/DP (fig. 122)

To remove the lamp rim, slacken the securing screw at the bottom of the rim and swing it downwards, out of the slot into which it fits. Remove the rim from the bottom of the lamp first.

To release the rectangular glass, unscrew the four nuts from the screws which secure the glass retaining frame; remove the frame, glass and gasket. In the DP type lamps, the two lower screws also secure the "D" shaped glass retaining clamps and the flap hinge. This latter type glass is further retained by a clamp in the Butler lamp and two retaining springs in the Lucas lamp.

Remove the bulb by pressing inwards and turning in an anti-clockwise direction.

The reflector is located in the lamp body by means of a rubber bead.

To give the best driving light, the bulb should be correctly focussed in the reflector. To obtain this position, slacken the screw on the clamping clip at the back of the reflector and slide the bulb-holder backwards or forwards until the best lighting is obtained, then tighten the clamping screw.

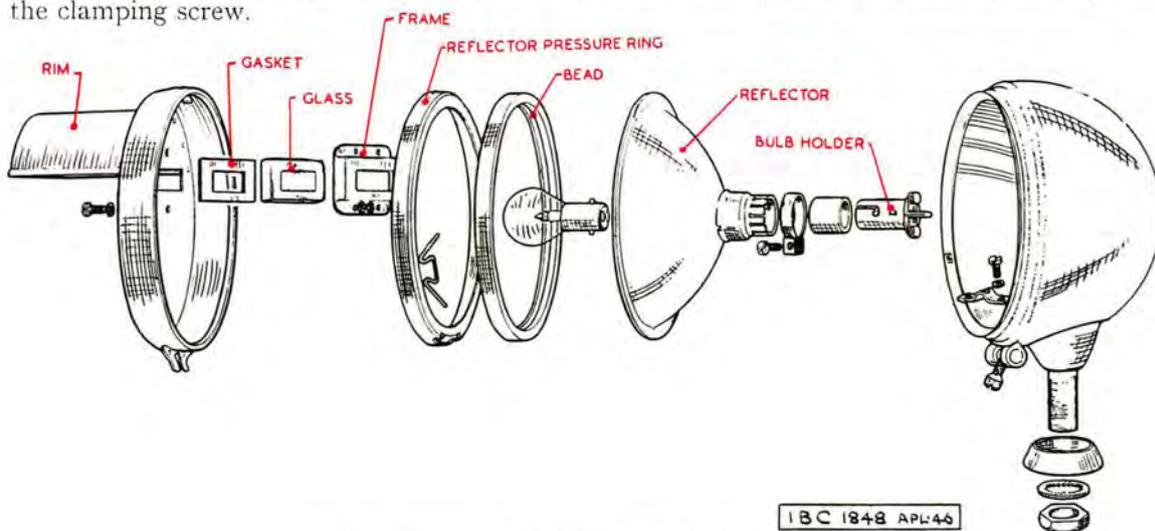


Fig. 121. Headlamp, Lucas, Type L/WD/HIR