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# LUCAS

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# EQUIPMENT

VOLUME 2

# WORKSHOP INSTRUCTIONS

## WINDSCREEN WIPER

## MODEL DRI

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# WINDSCREEN WIPER
## MODEL DR1

## 1. GENERAL

Model DR1 Windscreen Wipers are produced in three forms, these are:

(*a*) Two-speed with self-parking feature.
(*b*) Single-speed with self-parking feature.
(*c*) Single-speed without self-parking feature.

In general, these three forms are of similar construction, the chief difference being that a field resistor is included in the yoke of the two-speed types, and a modified gearbox is incorporated when the self-parking feature is not required.

Two-speed wipers are controlled by a three-positional rotary switch, 'High', 'Normal' and 'Park'. The higher speed is intended for use during heavy rain. It should not be used in heavy snow or with a dry or drying windscreen, i.e. when the load on the wiper motor is in excess of normal. Single-speed wipers are controlled by simple 'On/Off' switches.

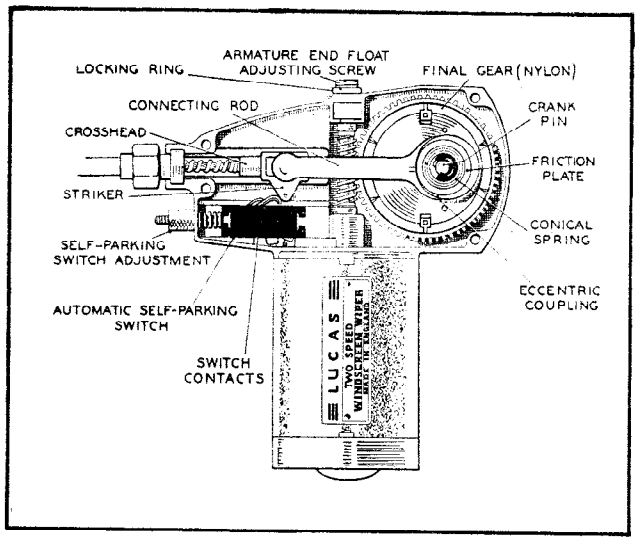


Fig. 1.
Self-parking wiper with gearbox cover removed

The dual arms of the windscreen wiper are driven by a cable rack from a separately mounted motor. The rotary motion of the motor armature is converted to the reciprocating motion of the cable rack by means of a single stage reduction gear, connecting rod and crosshead in the gear box.

The cable rack comprises an inner steel core carrying a wire helix, the whole being run within rigid connecting tubes between motor and wheelboxes. At the wheelboxes the rack engages with toothed wheels on the wiper arm spindles. The method of arm-to-spindle fixing consists of an internally splined headpiece and a retaining clip mating with a splined driving drum.

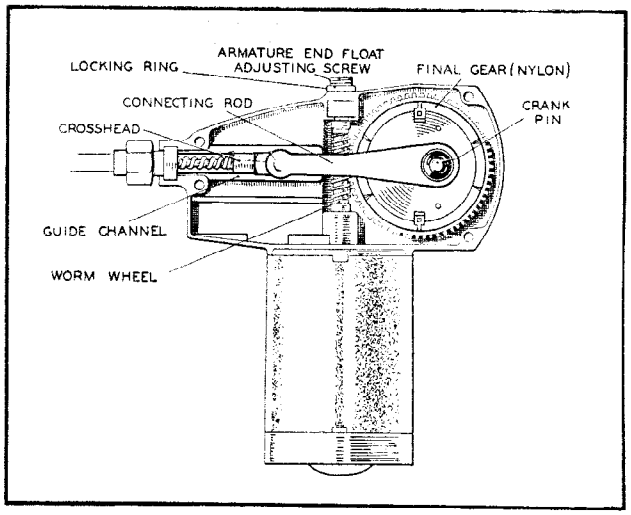


Fig. 2.
Wiper without self-parking feature, gearbox cover removed

A current-operated thermostatic circuit breaker mounted within the motor gives protection against excessive overloading. This device will operate if, for example, the blades are obstructed by ice or packed snow on the windscreen. Normal working will be resumed when the motor has cooled, and the obstruction has been removed.

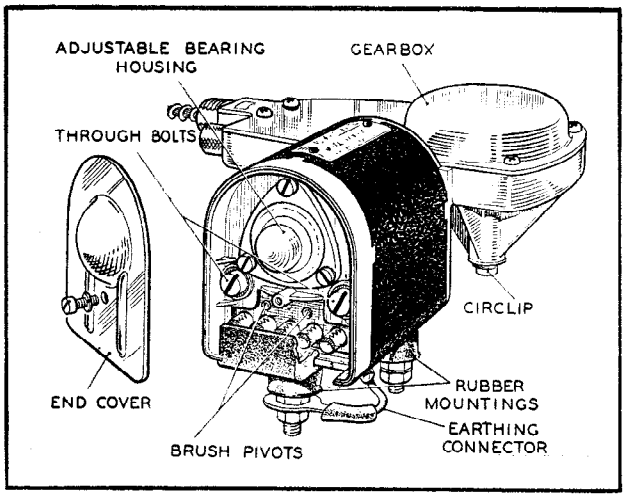


Fig. 3.
Self-parking wiper with end cover plate removed

OPERATION OF SELF-PARKING MECHANISM

When the control switch is turned to the 'Park' position the direction of rotation of the armature is reversed. This causes an eccentric between the crank-pin and the connecting rod to increase the traverse of the crosshead. A striker carried by the crosshead then opens the self-parking switch, which cuts off the current supply to the motor. The blades come to rest in the correct parking position irrespective of their position at the moment of turning the control switch to 'Park'.

## 2. MAINTENANCE

(*a*) If, on the self-parking types, the wiper arms fail to park correctly, the parking position can be corrected by turning the knurled adjusting nut, located near the gearbox cable outlet. Turn the adjusting nut one or two serrations at a time, testing for correct operation at each adjustment.

(*b*) Inspect the rubber wiping elements which after long service become worn and should be renewed. In the case of windsceens with flat surfaces the blades and elements must be renewed as units. With the articulated 'Rainbow' blades as used with curved windscreens the elements can be replaced without the necessity of fitting a complete new blade, see para. 5 (*a*).

(*c*) Methylated spirits (de-natured alcohol) should be used to remove oil, tar spots and other stains from the windscreen. It has been found that the use of some silicone and wax-based polishes for this purpose can be detrimental to the rubber wiping elements.

(*d*) The rubber grommet or washer around the wheelbox spindle should be lubricated with a few drops of glycerine.

(*e*) Occasionally check the teeth of the final gear, if they are damaged the gear must be replaced, see para. 4 (e) (iv).

(*f*) The gearbox and cable rack are packed with grease and require no lubrication.

## 3. TEST DATA

| | 6 v. | 12 v. | 24 v. |
|---|---|---|---|
| (*a*) Current consumption (high speed): ... ... (66–74 cycles per min.) | 3.6—4.4 amp. | 2.0—2.5 amp. | 0.9—1.2 amp. |
| (*b*) Current consumption (low speed): ... ... (45–49 cycles per min.) | 4.5—5.8 amp. | 2.5—3.25 amp. | 1.2—1.7 amp. |
| (*c*) Stall current (motor cold): ... ... ... | 33 amp. | 15.5 amp. | 7.5 amp. |
| (*d*) Stall current. (motor hot): ... ... ... | 18 amp. | 8.5 amp. | 4.2 amp. |
| (e) Resistance between adjacent commutator segments: ... ... ... ... ... ... | 0.051—0.067 ohms | 0.26—0.32 ohms | 0.8—1.3 ohms |
| (*f*) Field current: ... ... ... ... ... | 3.1 amp. | 1.5 amp. | 0.8 amp. |
| (*g*) Field resistance: ... ... ... ... ... | 1.83—2.03 ohms | 7.75—8.25 ohms | 29—31 ohms |
| (*h*) Speed Control resistor: ... ... ... | 3—3.25 ohms | 12—14 ohms | 47—51 ohms |
| (*i*) Current-operated thermostat: ... ... | Operates at 135–150°C. and recloses before the temperature has fallen to 80°C. Under stall conditions the thermostat operates within 13 minutes. | | |
| (*j*) Armature end float: ... ... ... | The armature end float adjusting screw must be set to give an armature end play of 0.008"–0.012". | | |

## 4. SERVICING

### (a) CHECKING SWITCHES AND PARKING MECHANISM.

If the wiper fails to park or parks unsatisfactorily the switch and control circuit or the operating mechanism should be checked.

(i) *On switching from 'Park' to 'Normal' the wiper arms begin a downward stroke instead of operating in the normal manner.*
This failure is caused by a faulty control switch—the spring contacts 'C' (Fig. 4) operated by a cam on the spindle, making contact before the other stud-type contacts have taken up their 'Normal' positions. The motor thus starts in a reverse direction and the striker on the cross-head travels past the self-parking switch. If this fault is suspected, check the switch by substitution, and, if necessary, fit a new switch. This defect can only occur when Model PRS5 is fitted. It does not occur with Model PRS7 switch.

(ii) *On switching from 'Normal' to 'Park' the wiper arms traverse beyond the 'Park' position, and operate at the edge of the screen.*
The self-parking switch in the gearbox is faulty and the striker on the cross-head has failed to open the leaf contacts. Examine the self-parking switch and, if necessary, bend the leaf contact spring back into line with the striker. If the spring contact leaf has lost its tension fit a new switch.

(iii) *On switching from 'Normal' to 'Park' the wiper arms continue to operate, or, on switching from 'Park' to 'Normal' the wiper arms instead of travelling across the screen, travel down off the screen.*
The eccentric on the final drive gear fails to operate, when the motor changes from reverse to normal, and the wiper arm traverse continues in the 'Park' position. To check, remove the gearbox cover and observe whether the length of the connecting rod alters when the motor is switched from 'Park' to 'Normal'. If the length does not alter, remove the eccentric and connecting rod for examination and, if necessary, replace them with a new unit.

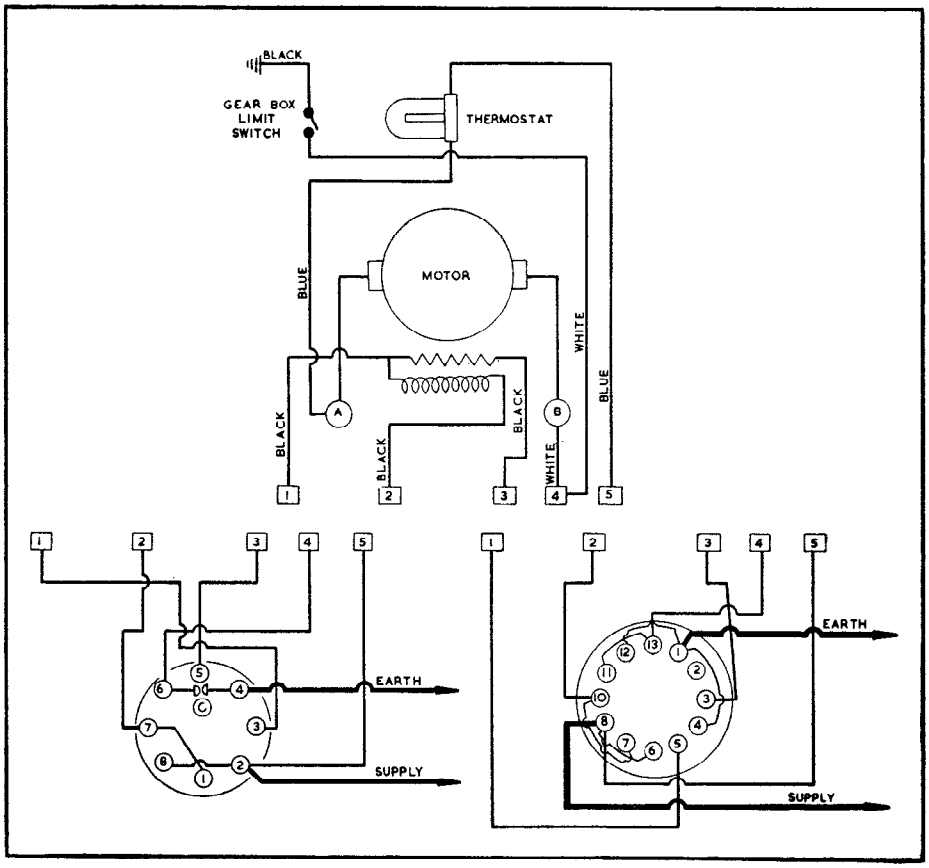


Fig. 4.
Circuit diagram of motor and alternative control switches used with two-speed wipers

(*b*) CHECKING CURRENT CONSUMPTION

If the wiper fails to operate or operates unsatisfactorily, switch on the wiper and note the current being supplied to the motor. Use a 0—30 amp. moving coil ammeter connected in the wiper circuit then proceed as follows:

(i) *Wiper takes no current.*
Examine the fuse protecting the wiper circuit. If the fuse has 'blown', examine the wiring of the motor circuit and of all other circuits protected by that fuse. Replace any cables which are badly worn or chafed.

If the external wiring is found to be in order, replace the fuse with one of the recommended size. Then proceed as for the wiper taking an abnormally high current, see para. 4 (iii).

If the fuse is intact examine the wiring of the motor circuit for breaks. If control switch PRS5 is fitted, test for faulty spring contacts by connecting a length of cable between terminal number '4' on the switch and socket number '4' on the motor. If the motor will now work when the switch is turned to 'Normal', the contacts on the switch are faulty, and the switch should be replaced.

(ii) *Wiper takes abnormally low current.*
Check that the battery is fully charged. The performance of the motor is dependent on the condition of the battery.

Test the current-operated thermostat by disconnecting the wiper motor from the control switch and connecting an ohmmeter between terminal number '5' and the brush pivot above terminal number '2'. If a closed circuit is indicated the thermostat is in order. An open circuit means that the thermostat has operated but not reset. Check the operation of the thermostat by comparing the temperature of the motor with the values given in para. 3 (i). Adjustment must not be attempted and a faulty thermostat must be replaced. If the thermostat has operated and is in order, proceed as for wiper taking abnormally high current, see para. 4 (*b*) (iii).

Remove the commutator end bracket, see para. 4 (*d*) (iii), and examine the brush gear. The tension spring must be renewed if the brushes do not bear firmly on the commutator. Brush levers must move freely on their pivots. If these levers are stiff they should be freed by working them backwards and forwards by hand.

Examine the commutator, if it is dirty it should be cleaned with a petrol-moistened cloth or, if necessary, by polishing it with a strip of very fine emery cloth.

(iii) *Wiper takes abnormally high current.*
If an abnormally high current is shown on the ammeter, it may be due to excessive load on the driving shaft. If there is no obvious reason for this, such as a sticking wiper blade, or packed snow on the windscreen, a check should be made at the gearbox.

Remove the gearbox cover and examine the gear assembly, checking that a blow on the gearbox end bracket has not reduced the armature end float, see para. 3 (*j*).

The bearing in the commutator end bracket can be checked by loosening the three securing screws one quarter of a turn and moving the bearing housing until a normal current reading is given by the ammeter.

Sluggish operation with excessive current consumption may be caused through frictional losses in badly positioned, or defective, connecting tubes. The connecting tubes can be checked using a cable gauge. The gauge cable is similar in appearance to the driving rack but is 0.010″ larger in diameter and is less flexible. The gauge will not easily pass through connecting tubes having less than the minimum permissible curvature.

To check the tubing using the gauge, it is necessary to remove the inner rack as described in para. 4 (*d*) (i). Pull back the wheelbox spindles and slide the gauge through the whole assembly. If the gauge moves freely, the tubing is correctly installed and the inner rack should be reassembled, as described in para. 4 (e). If the gauge does not move freely, the tubing must be checked for sharp bends and obstructions.

Pieces of carbon short-circuiting adjacent segments of the commutator will also cause excessive current consumption, these can be removed by cleaning the commutator and brushgear. Slip a new piece of sleeving over any charred connections and arrange them so that they do not rub against sharp edges.

Check the value of field resistance. If it is found to be much lower than the value given in para. 3 (*g*) a short circuit in the field windings is indicated, and a new field coil must be fitted. Other evidence of a short circuit will be given by charred connections from the field coil.

(*c*) MOTOR OPERATES BUT DOES NOT DRIVE THE WIPER ARMS.

This indicates a break in the transmission which can be located by examining the drive at the gearbox and wheelboxes with the motor running.

(*d*) DISMANTLING.

(*i*) *To remove the rack and motor unit:*
Release the wiping arms from the spindles, see para. 5 (*c*). Unscrew the union on the Bundy tube at the gearbox, and remove the nuts from the motor mounting bolts. Withdraw the motor and cable rack clear of the Bundy tube.

(*ii*) *To dismantle the gearbox:*
Withdraw the four screws securing the gearbox cover and remove the cover. Remove the circlip or, in the case of earlier forms, the split pin from the crank pin on the final gear, being careful to retain the conical spring and to note the order in which the parts are removed. Remove the eccentric coupling and connecting rod; this allows the crosshead and rack to be released. Take away the circlip or, with earlier forms, the locking nut from the end of the final gear shaft. Remove any burr from the final gear shaft before lifting out the final gear.

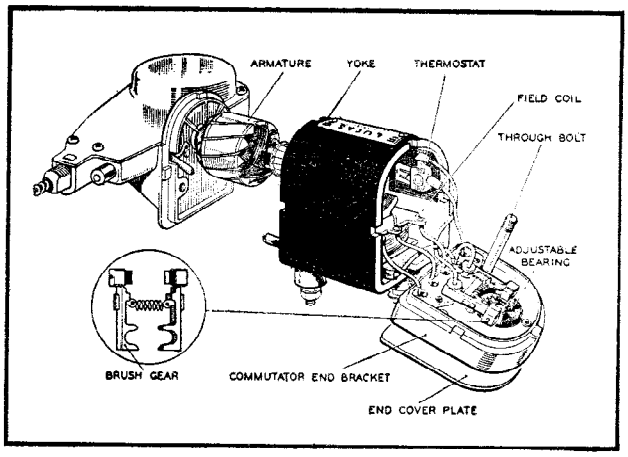


**Fig. 5.**
Dismantled view of wiper motor

(*iii*) *To dismantle the motor:*
Remove the two through bolts, located one each side of the adjustable bearing housing. Separate the yoke and commutator end bracket, taking care not to damage the interconnecting cables. This releases the brush gear which falls away from its pivots; take care not to lose any part of the brush gear. Withdraw the small screw, underneath the gearbox casting, and also the armature lubricating wick. Withdraw the armature from its bearing in the gearbox. **Do not remove the adjustable bearing housing from the commutator end bracket** as this will disturb the factory setting.

(*iv*) *To remove the field coil:*
Withdraw the two screws securing the pole piece to the yoke. Mark these screws so that they can be replaced in their original holes. Press out the pole piece complete with field coil, marking the pole piece so that it can be replaced in its correct position inside the yoke. Separate the field coil and pole piece.

(e) REASSEMBLY.

(i) When reassembling, the following components should be lubricated, using the lubricants recommended:

(*i*) *Armature Bearings:*
These should be lubricated with Oiline BBB—the self-aligning bearing being immersed in Oiline for 24 hours, before assembly.

(*ii*) *Armature Shaft (Commutator End)*
Apply Oiline BBB sparingly.

(*iii*) *Armature Bearing Wick*
Apply Oiline BBB carefully. The wick will be the main source of bearing lubrication during the initial running-in period of the reassembled motor.

(*iv*) *Worm Wheel Bearing*
Grease liberally with Duckhams HBB.

(*v*) *Crosshead, Guide Channel, Connecting Rod, Crank Pin, Worm, Eccentric Coupling Assembly and Final Gear Shaft*
Grease liberally with Ragosine Listate.

(*vi*) *Eccentric Sub-Assembly Bearing Surface*
Apply Oiline BBB sparingly.

(*vii*) *Cable Rack and Wheelboxes*
Grease liberally with Duckhams HBB.

(ii) Replace the field coil and pole piece inside the yoke.

(iii) Locate the yoke with the gearbox casting and slide the armature shaft into the gearbox, arresting it before the commutator has entered the confines of the yoke. If the old brushes are to be refitted they must be returned to their original brush holders and in the same position as before. This retains the maximum contact area between brush and commutator. Assemble the brushgear on the commutator end bracket pivots then locate the commutator end bracket on the yoke. As the brushes slide over the commutator, allow the armature to slide into the yoke until the complete unit is assembled. Insert the two through bolts and screw them firmly home in the gearbox casting.

(iv) The reassembly of the gearbox is in general a reversal of the procedure for dismantling. If a steel final gear has become worn it may be replaced by a nylon final gear. To do this it is necessary to retain the washer fitted between the conical spring and the split pin on the final gear, see Fig. 6. The two 0.010" washers, locknut and split pin fitted on the steel gear must be discarded. Fit the nylon gear as shown in Fig. 7, locating the new 0.030" washer above the lower circlip and the original washer below the upper circlip.

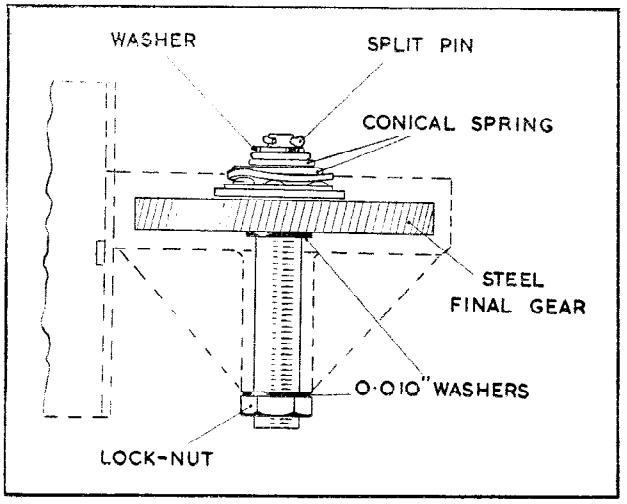


Fig. 6.
Steel final gear

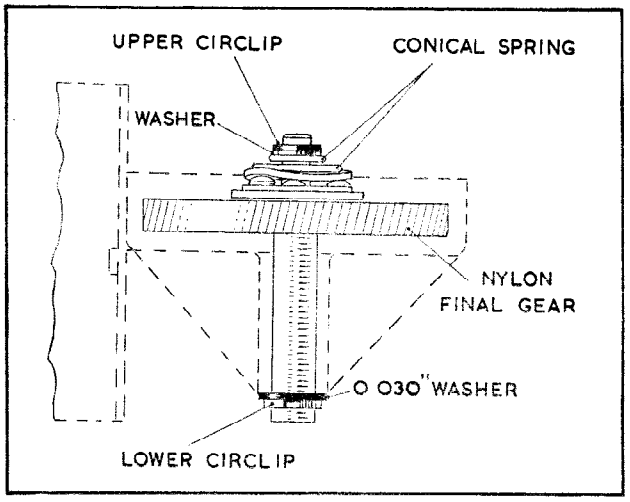


Fig. 7.
Nylon final gear

## 5. FITTING AND ADJUSTING WIPER ARMS

(*a*) FITTING A NEW WIPING ELEMENT TO A RAINBOW BLADE, AS USED ON CURVED SCREENS.

New elements must be handled with care. It is particularly important to keep the rubber clean and free from oil and petrol and to avoid distortion of the metal 'backbone'.

To replace a defective element proceed as described below:

(i) Press down the locking pin and slide the old element in the direction shown in Fig. 8 (B) to free it from the supporting yokes.

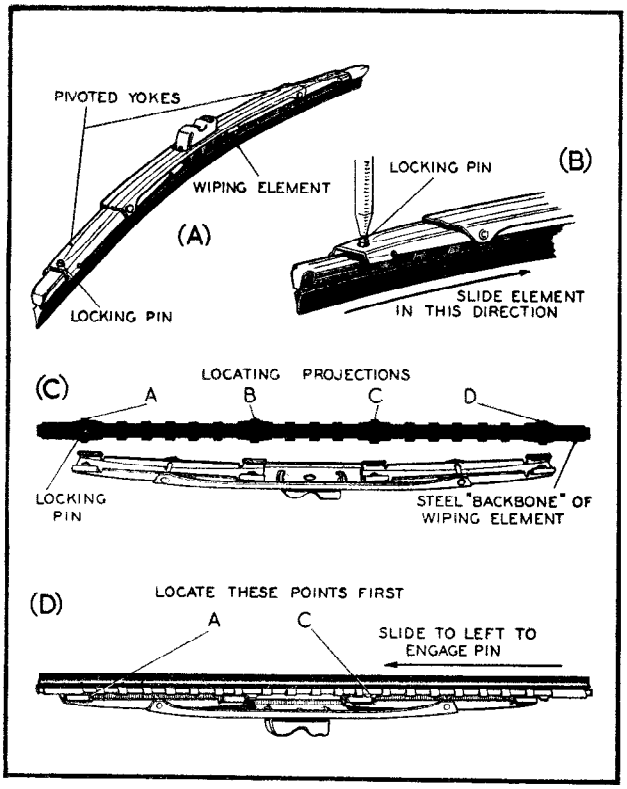


Fig. 8.
Method of replacing rubber wiping element

(ii) There are four pairs of locating projections along the 'backbone' of the new wiping element, as shown in Fig. 8 (C). When fitting, first locate the element projections 'A' and 'C', afterwards guiding projections 'B' and 'D' into position and sliding the element to the left, as shown in Fig. 8 (D), until the locking pin is heard to snap into position.

(*b*) FITTING A BLADE TO A WIPER ARM.

Pull the wiper arm away from the windscreen and insert the curved 'wrist' of the arm into the slotted spring fastening of the blade. Swivel the two components into engagement.

(*c*) FITTING A WIPER ARM TO A DRIVING SPINDLE.

First ensure that the wiper spindles are in the correct parking position by switching on the ignition and turning the wiper control switch to 'Normal' and then to 'Park'.

To fit the arms, press the headpieces on to the spindles at the correct parking angle until the retaining clip is heard to snap over the end of the spindle drum.

(*d*) TESTING.

Switch on the ignition and turn the wiper control switch to 'Normal'. The two wiped areas should be approximately symmetrical on the windscreen.

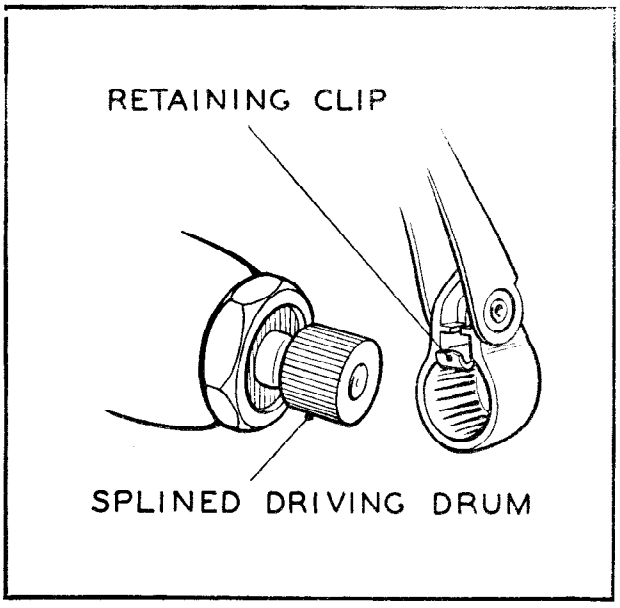


Fig. 9.
Method of arm-to-spindle fixing

Turn the wiper control switch to 'Park'. The arms should now come to rest in the correct parking position. If the factory setting has been altered, the above conditions of wiping and parking will not be obtained.

(e) ADJUSTING.

Correct operation can be obtained by adjusting the position of the arms relative to the spindles. If necessary, the position of the arms may be adjusted by removing and re-engaging them with the splined driving spindles, the angular pitch of the splines being 5 degrees.

Do not attempt to turn the arms whilst in position, but press back the retaining clip (Fig. 9) in the headpieces with a suitable screwdriver and withdraw the arms from the driving spindles. Refit in the desired position. The above adjustment may affect the self-parking position. If so, it may be corrected by turning the knurled adjusting nut as described in para. 2 (*a*).

(*f*) TO REVERSE PARKING POSITION.

Reverse the two internal connections to the brush gear, located behind the terminal cover plate. Change over the limit switch in the gearbox to its alternative position.