SECTION J–5
ISSUE 2, MAY 1959
Supersedes Issue 1, August 1955
and also Section J–1 Part B Page 2

LUCAS

Quality

EQUIPMENT

VOLUME 2

WORKSHOP INSTRUCTIONS

WINDSCREEN WIPERS

MODELS DR2 and 4W

JOSEPH LUCAS LTD : BIRMINGHAM 19 : ENGLAND

Printed in England

WINDSCREEN WIPERS

MODELS DR2 AND 4W

(With Notes and Test Data Covering Thermostatic Circuit Breakers)

1. GENERAL

DR2 and 4W windscreen wiper installations consist of a shunt wound electric motor and gearbox unit connected by a cable rack type transmission to a pair of wheelboxes near the edge of the windscreen. In each wheelbox is a gear or sprocket wheel having a splined spindle to which an arm carrying one of the wiper blades is attached. The motor is mounted on three pillars cast integral with the gearbox casing and is normally located in the engine compartment. Some DR2 units, however, particularly those normally fitted in commercial vehicles, are designed for mounting between the wheelboxes and are referred to as 'Centre-Rack' or 'Double-Entry' types, from the position of the cable rack which, in these types, emerges from both ends of the crosshead cover. The cable rack consists of a flexible core of steel wire wound with a wire helix for meshing with the gear in each wheelbox. Rotation of the motor armature is converted to a reciprocating motion in the cable rack by means of a single stage worm and nylon gear reduction drive, the motor end of the cable rack being coupled to a connecting rod and crosshead in the gearbox. The cable rack passes through protective outer tubing (rigid for DR2, flexible for 4W) to the wheelboxes and thus imparts an oscillating motion to the wiper arm spindles.

Externally, models DR2 and 4W are of similar appearance but while model 4W has the less powerful motor this is more powerful than that of model CRT14, which it superseded on some vehicles, the relative cold stall torques of these three units being 975, 650 and 600 ounce-inches, respectively. The information contained in this Manual is given for units in normal automobile use and does not necessarily apply to units produced in small quantities for special applications. Particulars of units in the latter category can, on request, be provided for bona fide applicants.

(*a*) SELF-SWITCHING

With most DR2 installations (but not 4W), the arms and blades return automatically to the edge of the windscreen before stopping, irrespective of their positions at the instant of switching off. This is effected by means of a limit switch located in the gearbox, its action being controlled by the crank pin in under-bonnet mounted motors and by a striker pin on the crosshead of centre-rack type motors. For the greater part of each wiping cycle the switch contacts are closed and provide an earth return path for the motor operating current, alternative to and in parallel with the earth return path provided by the wiper control switch. Each time the blades reach the edge of the windscreen, however, the limit switch contacts open. Thus, when a control switch is turned to 'OFF', the motor continues to run until the blades reach their parked position. The limit switch can be adjusted for setting the instant of cut-off.

(*b*) TWO-SPEED OPERATION

DR2 and 4W motors are normally constructed for single speed operation but some centre-rack types are designed to provide a second and higher speed of

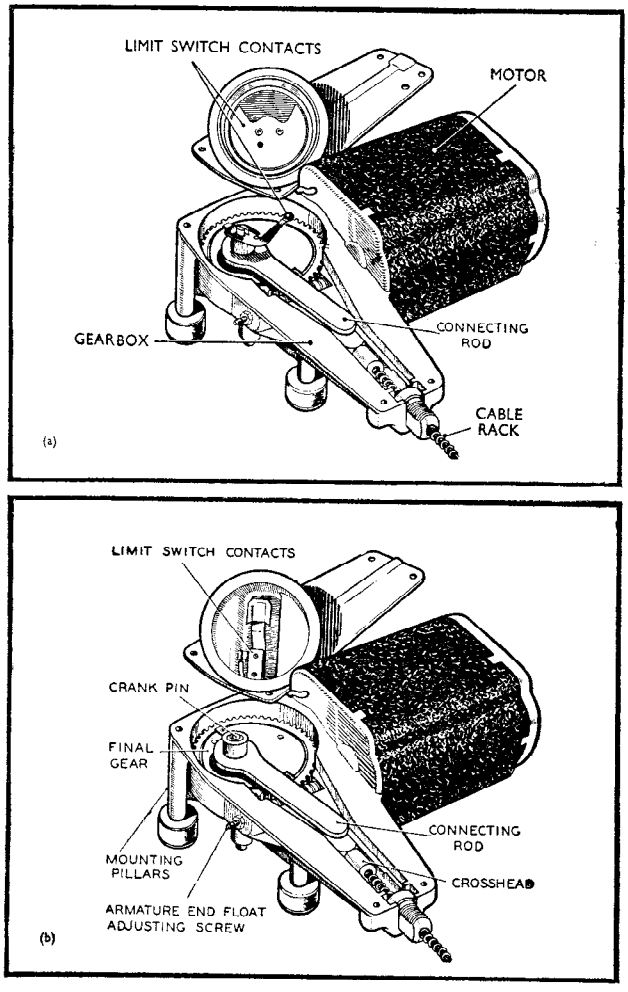

Fig. 1.

Under-bonnet ('Single Entry') DR2 windscreen wiper motor with gearbox cover removed to show limit switch (*a*) present type (*b*) earlier type

operation. This is intended for use in heavy rain or light snow. It should not be used in heavy snow or with a dry or drying windscreen.

(*c*) THERMOSTATIC CIRCUIT BREAKER

A current-operated thermostatic circuit breaker, such as model 2CB, is sometimes connected in the supply cable to the motor to protect the motor from serious overloading. If, for example, the blades are prevented from moving by packed snow or ice on the windscreen, the motor is automatically disconnected from the supply before damage can occur. Normal working is resumed when the motor and circuit breaker have cooled, provided the obstruction has been removed.

A thermostatic circuit breaker which utilises the magnetic field between the armature and yoke to give a snap action to the contacts is incorporated in some special DR2 motors—usually where considerations of space have precluded use of models DR1 or DR3. Such motors can be recognised externally by two pointed tags which secure the circuit breaker to the yoke.

2. MAINTENANCE

The gearbox, cable rack and wheelboxes are greased during manufacture and need no periodic lubrication. Efficient wiping is dependent upon having a clean windscreen and wiper blades in good condition. Windscreens can be cleaned with methylated spirits (denatured alcohol) or with good quality silver plate polish in order to remove oil, tar spots and other forms of contamination. Silicone or wax based polishes must not be used. Worn or perished wiper blades are readily removed for replacement.

3. TEST DATA

(*a*) MODEL DR2

Note: Where more than one set of figures is given, the first applies to units of present production and the last to units of earliest production. A replacement armature must always match the existing field coil, and vice versa.

	6-volt units	*12-volt units*	*24-volt units*
(*i*) Current consumption of motor 60 seconds after switching on (with rack disconnected):[1] ...	5.3—6.3 amp. 5.0—6.3 amp.	2.7—3.4 amp. 2.3—3.1 amp.	1.1—1.5 amp. 1.15—1.45 amp.
(*ii*) Stall torque (applied 60 seconds after switching on):	975 oz.–in. (0.702 kg.–m.) 900 oz.–in. (0.646 kg.–m.)	975 oz.–in. (0.702 kg.–m.) 900 oz.–in. (0.646 kg.–m.)	975 oz.–in. (0.702 kg.–m.) 900 oz.–in. (0.646 kg.–m.)
(*iii*) Revolutions per minute of final gear 60 seconds after switching on (with rack disconnected): ...	44—50 r.p.m.	44—50 r.p.m.	44—50 r.p.m.
(*iv*) Minimum voltage at which motor should run with rack disconnected	1.5 volts	3 volts	6 volts
(*v*) Resistance in ohms at 60°F. (15.5°C.) of armature winding, measured between adjacent commutator segments. Gauge of wire given to assist identification:*	0.07—0.09 (22½ S.W.G.) 0.09—0.11 (23 S.W.G.)	0.29—0.35 (25 S.W.G.) 0.34—0.41 (26 S.W.G.)	1.3—1.6 (30 S.W.G.) 1.4—1.7 (30 S.W.G.)
(*vi*) Resistance in ohms at 60°F. (15.5°C.) of field winding. Gauge of wire given to assist identification:*	2.1—2.3 (22 S.W.G.) 3.0—3.3 (23 S.W.G.)	8.0—9.5 (25 S.W.G.) 8.0—11.0 (25 S.W.G.)[2] 12.8—14.0 (27 S.W.G.)	30—34 (28 S.W.G.) 33—37 (28½ S.W.G.) 49—54 (31 S.W.G.)

[1]Due to differences, between one vehicle and another, of blade friction and windscreen surfaces and to the difficulty of accurately measuring widely fluctuating currents, practical data cannot be given for current consumptions of complete working installations. However, if arms and blades are first removed the current consumption of a cold motor driving only cable and wheelboxes will be found to vary little from the bench values given above for the motor only—being between 2.8 and 3.5 amperes for a unit of present production if the motor and transmission is satisfactory.
To obtain the approximate current consumption for the higher speed of two-speed motors, subtract half an ampere from the appropriate limits given above for normal single-speed operation.

[2]Applicable only to units produced in late 1955 and early 1956.

*See footnote on Page 3.

	6-volt units	12-volt units	24-volt units
(vii) Resistance of 'Ferry' wire wound on field coils of two-speed motors:	2.0—2.2 ohms	9.5—11.0 ohms	35—40 ohms
(viii) Pressure of brushes against commutator:	125—140g. (4.4—4.93 oz.)	125—140g. (4.4—4.93 oz.)	125—140g. (4.4—4.93 oz.)
(ix) Armature end play:	Adjusting screw in gearbox set and locked to give 0.008″—0.012″ (0.2—0.3 mm.) endwise movement of armature. See also Para. 4(c)(ii).		
(x) Wheelbox end play:	0.003″ (0.076 mm.) max. Adjustable, in later (pressed steel) patterns only, by bending tongue in gear cover plate. Earlier (pressed steel) patterns, 0.003″—0.015″ (0.076—0.38 mm.) non-adjustable.		
(xi) Maximum permissible force required to move cable rack in protective outer tubing (Blades away from windscreen and rack disconnected at gearbox): ...	6 lb. (2.7 kg.)	6 lb. (2.7 kg.)	6 lb. (2.7 kg.)

(b) MODEL 4W

	12-volt units	24-volt units
(i) Current consumption of motor 60 seconds after switching on (with rack disconnected): ...	2.4—2.9 amp.	1.1—1.5 amp.
(ii) Stall torque (applied 60 seconds after switching on):	650 oz.–in. (0.467 kg.–m.)	650 oz.–in. (0.467 kg.–m.)
(iii) Revolutions per minute of final gear 60 seconds after switching on (with rack disconnected):	45—50 r.p.m.	45—50 r.p.m.
(iv) Minimum voltage at which motor should run with rack disconnected:	3 volts	6 volts
(v) Resistance in ohms at 60°F. (15.5°C.) of armature winding, measured between adjacent commutator segments. Gauge of wire given to assist identification: *	0.4—0.47 (27½ S.W.G.)	1.32—1.78 (31 S.W.G.)
(vi) Resistance in ohms at 60°F. (15.5°C.) of field winding. Gauge of wire given to assist identification: *	12.8—14.0 (27 S.W.G.)	49—54 (31 S.W.G.)
(vii) Pressure of brushes against commutator:	125—140 g. (4.4—4.93 oz.)	125—140 g. (4.4—4.93 oz.)
(viii) Armature end play:	Adjusting screw in gearbox set and locked to give 0.008″—0.012″ (0.2—0.3 mm.) endwise movement of armature. See also Para. 4(c)(ii).	
(ix) Wheelbox end play:	0.002″—0.008″ (0.05—0.23 mm.) non-adjustable zinc diecast pattern.	
(x) Maximum permissible force required to move cable rack in protective outer tubing (Blades away from windscreen and rack disconnected at gearbox): ...	6 lb. (2.7 kg.)	6 lb. (2.7 kg.)

*Standard (B.S.I.) Wire Gauge diameters (nominal bare wire sizes): 22 S.W.G., 0.028″, 0.7112 mm; 22½ S.W.G., 0.026″, 0.6604 mm; 23 S.W.G., 0.024″, 0.6096 mm; 25 S.W.G., 0.020″, 0.5080 mm; 26 S.W.G., 0.018″, 0.4572 mm; 27 S.W.G., 0.0164″, 0.4166 mm; 27½ S.W.G., 0.0156″, 0.3962 mm; 28 S.W.G., 0.0148″, 0.3759 mm; 28½ S.W.G., 0.0142″, 0.3607 mm; 30 S.W.G., 0.0124″, 0.3150 mm; 31 S.W.G., 0.0116″, 0.2946 mm.

(c) THERMOSTATIC CIRCUIT BREAKER, MODEL 2CB

The following settings are not adjustable in service:

	6-*volt units* (78322)	12-*volt units* (78316)
(*i*) Continuous current rating at 70°F. (21.1°C.):	10—11 amp.	5.0—5.5 amp.
(*ii*) Maximum time lag before initial operation at 70°F. (21.1°C.): ...	30 seconds at 18 amp. and 15 seconds at 24 amp.	30 seconds at 9 amp. and 15 seconds at 12 amp.
(*iii*) Time off/time on ratio:	1.7:1 (min.) at 18 amp.	1.7:1 (min.) at 9 amp.
(*iv*) Tripping temperature (current switched off):	194°F. (90°C.) minimum	194°F. (90°C.) minimum
(*v*) Resetting temperature: ...	113°F. (45°C.) minimum	113°F. (45°C.) minimum
(*vi*) Voltage drop across contacts: ...	0.15-volt (max.) at 10 amp.	0.25-volt (max.) at 5 amp.

(d) THERMOSTATIC CIRCUIT BREAKER, MODEL 3CB (78327)

Model 3CB is a main circuit breaker for 6 and 12-volt installations and is not normally intended for the protection of individual items of equipment. Like model 2CB, it cannot be adjusted in service.

(*i*) Continuous current rating: ...	20 amperes
(*ii*) Maximum time lag before initial operation at 77°F. (25°C.): ...	60 minutes at 30 amp. 60 seconds at 40 amp. (to reset within 20 seconds)
(*iii*) Voltage drop across contacts: ...	0.15-volt (max.) at 20 amp.
(*iv*) Effective value of overload current:	25 amperes (max.)

(e) BUILT-IN THERMO-MAGNETIC CIRCUIT BREAKER

The following settings are effected in a jig before assembly of the circuit breaker in the motor.

(*i*) Method of setting: ... ... Bending moving contact blade carrier (ribbed steel strip) at necked point using a suitable tool and utilising the projections provided for this purpose.

	Below 15°C. (59°F.)	20°C. (68°F.)	*Above* 25°C. (77°F.)
(*ii*) Maximum force to open contacts (applied $\frac{3}{8}$", 9.5 mm., from end of moving contact blade, with 12-volt battery and 2.2-watt test bulb in series):	108 g. (3.78 oz.)	105 g. (3.67 oz.)	102 g. (3.53 oz.)
(*iii*) Minimum force at which contacts must remain closed: ...	98 g. (3.43 oz.)	95 g. (3.32 oz.)	92 g. (3.22 oz.)

4. SERVICING

Before disconnecting a defective motor, make notes of the existing wiring, etc. Inaccessibility of the gearbox or crosshead covers may necessitate the removal of arms and blades and withdrawal of the motor and rack from the tubing. In other cases, the complete installation (tubing and wheelboxes) may have to be removed from the vehicle.

(a) FAULT DIAGNOSIS

(*i*) *Possible Causes of Poor Performance*

Poor performance can be electrical or mechanical in origin and not necessarily due to a faulty motor. For example:—

Low voltage at the motor due to poor connections or to a discharged battery.

Cable rack binding in protective outer tubing.

Excessive loading on the wiper blades.

Wheelboxes loose, out of alignment or spindles binding in the bearing housing.

(*ii*) *Wiring of single-speed motors:*

Motor terminal '1' to one terminal of panel switch (normally, a black-with-green cable).

Motor terminal '2' to supply point (normally, a

green cable to ignition auxiliaries fuse or circuit breaker, when fitted).
Motor terminal 'E' and other terminal of panel switch to earth (normally, black cables). N.B., when no limit switch is fitted, terminal 'E' is disused and the panel switch is normally connected on the supply side of the motor.

(iii) *Wiring of two-speed motors:*
The following instructions apply to units controlled by a Model PRS7 panel switch having terminals '8' and '10' linked externally:
Green cable to supply point, or external circuit breaker (when fitted).
Brown cable to panel switch terminal '5'.
Red cable to panel switch terminal '11'.
Motor terminal 'E' and panel switch terminal '1' to earth.

(iv) *Testing:*
Unless the origin of the fault is apparent, proceed as follows to determine the cause of failure:—

Measuring Supply Voltage:

Switch on the motor.

Using a first grade moving coil voltmeter, measure the voltage between the motor supply terminal '2' and a good earthing point. If the reading is low, check the battery, cabling, connections and (by substitution) the panel switch.

Check fuse and, when fitted, the external circuit breaker. If the fault is outside the motor, locate and rectify.

Measuring Light Running Current:

If the correct operating voltage is obtained at terminal '2', disconnect the cable rack and measure the light running current with a first grade moving coil ammeter connected in the supply cable.

As disconnecting the cable rack involves removing the gearbox or crosshead cover, the opportunity can be taken to observe the speed of operation by counting the cycles per minute of the crosshead and comparing it with the figure given under 'Test Data'.

N.B. When refitting the cable rack to underbonnet mounted motors, ensure that the hexagon nut which secures the tubing to the gearbox is not cross-threaded.

If, due to a defective motor, the light running current or speed is outside the appropriate limits, replace the motor or dismantle for examination.

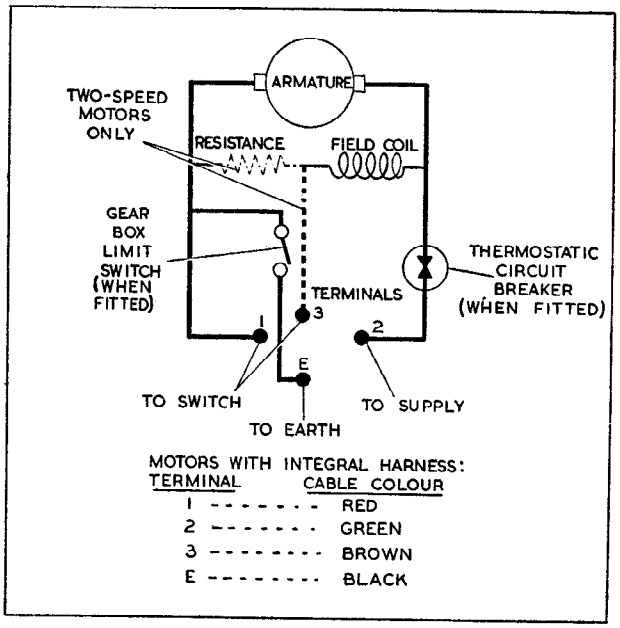

Fig. 2.
Schematic circuit diagram showing internal connections of DR2 (various) and 4W wiper motors

Possible causes of low current consumption include worn brushes, weakened brush spring, brush levers not free to move on their pivots and dirty commutator, while excessive light running current may be due to reduced armature end play or to worn bearings or to internal short circuits either of the field or armature or of adjacent commutator segments by pieces of carbon. Clean the commutator and brushes with a petrol-moistened cloth and check resistances of field and armature with an ohm meter.
Excessive current consumption during normal operation may be due to a sticking wiper blade or to a fault in the transmission.

(v) *Checking Cable Rack and Tubing:*
The maximum permissible force to move the cable rack in its protective tubing is 6 pounds with the wiper arms, blades and motor disconnected. The measurement can be made by hooking a spring balance in the hole in the crosshead (into which a pin on the connecting rod is normally located) and withdrawing the rack with the balance.
Binding of the rack can be due to kinked or flattened tubing or to faulty installation. Minor faults can be cleared with a suitable test mandrel sold specifically for checking wiper installations. Badly kinked or flattened tubing must be renewed. Any bends of less than 9" radius must be reformed.

At the wheelboxes the flared ends of the protective outer tubing should be located in the outer narrow slots of the clamp plates. The inner wider slots are provided for use in the event of fixing hole inaccuracies precluding the employment of the more positive tube anchorages afforded by the outer narrow slots. The cable rack should be well lubricated with Ragosine Listate or Duckhams H.B.B. greases.

(*vi*) *Checking Wheelboxes:*

Check the wheelboxes for misalignment or looseness and rectify as required. The correct wheelbox end play is given under 'Test Data'. Renew seized wheelboxes.

(*b*) DISMANTLING

(*i*) *Removal of Under-Bonnet ('Single Entry') Motors from Vehicle:*

Isolate battery.
Note the terminal connections before disconnecting the motor, to assist subsequent refitting.
Note, similarly, the angular position of the domed limit switch cover relative to the flat gearbox cover before dismantling.
Withdraw the four gearbox cover securing screws. As these are self-tapping, each screw should be returned to its original hole when reassembling.
Remove the switch and gearbox covers.
Unscrew the hexagon nut securing the protective tubing to the gearbox.
Remove the three nuts securing the motor.
Remove the circlip from the shaft of the final gear on underside of gearbox.
Remove any burr from around the circlip groove with a fine file. This will obviate scoring of the bearing bore during shaft withdrawal.
Partially withdraw the final gear assembly and disengage the cable rack and tubing from the connecting rod and gearbox.
The motor can now be removed from the vehicle.

Final Gear and Limit Switch:

Lift out the final gear, connecting rod and limit switch blade assembly from the gearbox.
Examine the gear teeth and, if worn or damaged, renew the assembly.
Withdraw the circlip from the crank pin, noting particularly that the prongs of the circlip pass on either side of a small turned up tag on the slotted portion of the switch blade. The circlip must be positioned in like manner when refitted.
Lift off the switch blade from the crank pin.
Lift off the connecting rod.
Lift off the pen steel washer, taking care not to lose this item which must be refitted in the same position on reassembly.

N.B. The above notes refer to the modified limit switch introduced in 1958 and which can be identified by the presence of a terminal tag on top of the domed limit switch cover. Units produced prior to 1958 were fitted with a limit switch of which both fixed and moving portions were permanently located under the domed cover. The wire connection from the motor windings in these units entered the side of the domed cover. The switch contacts were opened once per wiping cycle on being struck by the tip of the rotating crank pin.

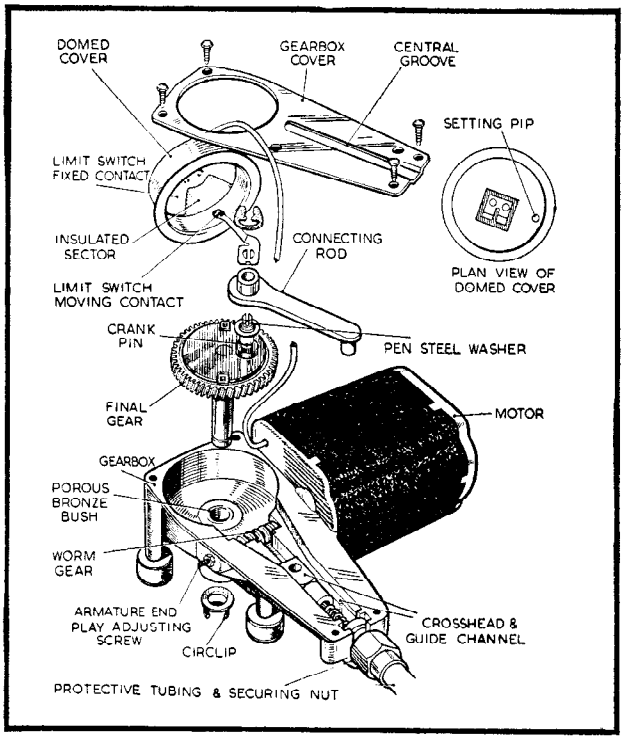

Fig. 3.
Under-bonnet ('Single Entry') DR2 with gearbox dismantled

(*ii*) *Removal of Centre-Rack ('Double Entry') Motors from Vehicle.*

Disconnect the battery and motor cables.
Remove the wiper blades from the wheelbox spindles.

Unscrew the wheelbox retaining nuts and withdraw the front bushes.

Unscrew the three motor fixing nuts and withdraw the three washers from the mounting stems.
Withdraw the motor from the rubber mounting grommets complete with the wheelboxes and tubes, taking care not to lose the wheelbox rear bushes and sealing washers.

Separating Cable Rack and Tubing from Motor:

Withdraw the three crosshead cover securing screws.

Slacken the screws securing the two outer tubing retaining plates and turn the plates through 90°.

Lift out the cable rack assembly from the crosshead guide channel, noting that (when in situ) the bell mouthed tube ends locate with slots cast in the gearbox cover and that the crosshead driving pin fits into a brass bushed hole in the end of the connecting rod.

Withdrawing Final Gear Assembly:

Withdraw the four gearbox cover securing screws and remove the cover.
Lift out the connecting rod.
Remove from the final gear shaft the circlip and washer located beneath the gearbox.
Remove any burr from around the circlip groove.
Withdraw the shaft and gear assembly.
Examine the gear teeth and, if worn or damaged, renew the assembly.

(*iii*) *Removing Armature*

Withdraw the Lucar cable connectors (terminal screws, in early models) and through bolts, taking care not to lose the Lucar earthing blade from beneath the head of the right hand through bolt.
Withdraw the commutator end cover.
Withdraw the brush arm retainer from below the terminal assembly. The sole function of this comb-shaped fibre plate, introduced in 1959, is to prevent the brush arms leaving their pivots in the event of rough handling of the unit while in transit to the vehicle assembly line. Its omission in service would not affect performance.

Note carefully the side and position occupied by each brush to ensure refitting exactly the same way round and then withdraw the brushgear, taking care not to over-stretch the tension spring.
If a limit switch is fitted, unsolder the switch wire at the terminal tag. Disconnect the thermostatic circuit breaker, if fitted.
Withdraw the yoke from the armature.
Unscrew the two self-tapping screws which secure the field coil assembly to the yoke and withdraw the assembly out of the yoke, noting carefully the hole occupied by each screw for subsequent reassembly.
Withdraw the armature and worm assembly from the gearbox.

(*c*) REASSEMBLY

In the main, reassembly is the reversal of the dismantling procedure previously described. A number of precautions have been given therein and these should be observed.

(*i*) *Lubrication:*

The following parts should be lubricated, taking great care to keep the commutator and brushgear free from oil and grease.

Limit Switch:

With motors having the limit switch wire attached to the top of the domed cover, the brass sector inside the cover should be smeared with petroleum jelly.

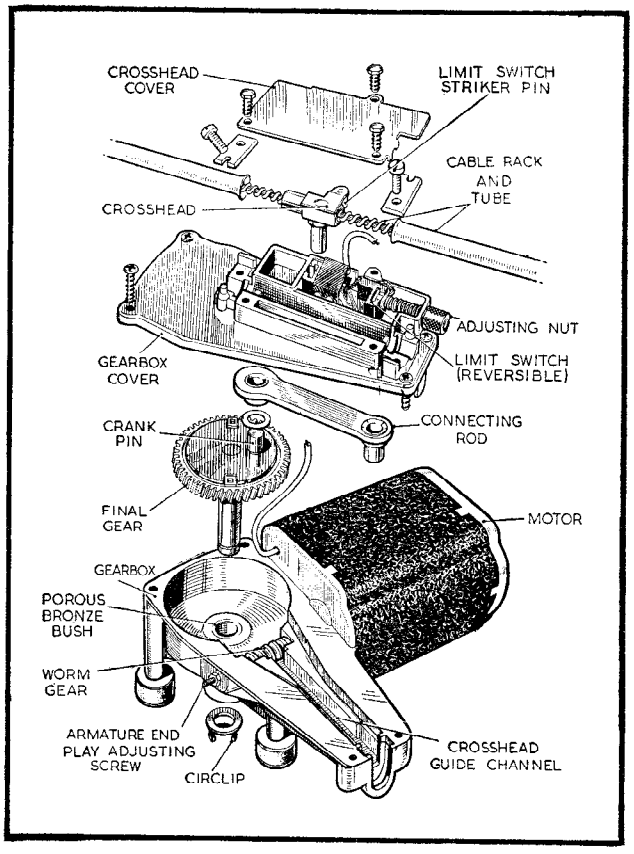

Fig. 4.
Centre-rack ('Double Entry') DR2 with gearbox dismantled

Bearing and Gears:

Three oil impregnated porous bronze bearings are fitted—one for the final gear shaft and two for the armature shaft, the bearings for the latter being self-aligning. Oiline B.B.B. should be applied sparingly before assembly to these bearings, the felt backing washers and the armature shaft. It is important that the felt washers are not over-loaded with oil.

Note: Up to early in 1956, a lubricating groove was machined round the final gear shaft and the shaft ran in a plain brass bearing (Part No. 743044). When servicing this type, the groove should be filled with Ragosine Listate grease and the complete shaft smeared with Rocol Molypad oil.

While a groove continues to be machined in all final gear shafts provided for service replacement purposes, it is important that this is not filled with grease when a shaft is to run in an oil impregnated porous bronze bearing (Part No. 743964).

In production, Oiline B.B.B. is applied sparingly to the final gear shaft, Rocol Molypad molybdenised disulphide oil to the crank pin, and Ragosine Listate grease to the crosshead, guide channel and driving pin. Between 25 and 35 cubic centimetres of Ragosine Listate grease is applied to the worm and gear. This latter grease is also applied to the cable rack.

(*ii*) *Armature End Play:*

The adjusting screw in the side of the gearbox should be set and firmly locked to give 0.008″ to 0.012″ end play of the armature.

Some units are produced with a cheese-headed 'Wedglok' non-adjustable set screw of predetermined length in place of the adjustable grub screw and locknut, the correct end play being obtained by automatic counterboring of the casting during assembly of the motor. In the event of a replacement commutator end cover or armature being fitted in service, it may be necessary to replace the 'Wedglok' screw by a 2BA grub screw and locknut in order to obtain the correct end play.

(*iii*) *Brushgear:*

After assembling the spring, the brush arms must clip on to and be able to move quite freely about the pivots, care being taken not to over-stretch the tension spring whilst refitting. Care must be taken to see that no part of the brushgear or brushes can foul the commutator tags or connections and that the brushes ride wholly on the copper segments.

The pressure exerted by the brushes on the commutator should be 125 to 140 grammes.

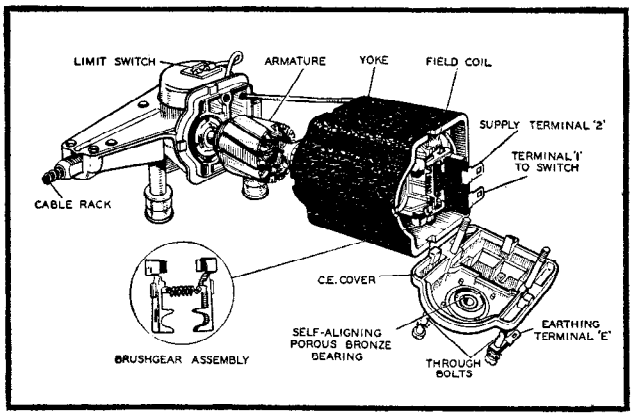

Fig. 5.

Under-bonnet ('Single Entry') DR2 with commutator end cover and yoke withdrawn from armature

(*iv*) *Fitting Arms and Blades:*

First ensure that the wheelbox spindles are in the correct parking position by switching on the motor and then switching off and waiting for them to come to rest at the end of a cycle.

Fit the arms and blades to the splined driving drums on the wheelbox spindles at the correct parking angle, pressing the headpieces on until the retaining clip is heard to snap over the end of the drum.

Switch on and note the wiped areas. If necessary, the position of the arms can be adjusted by removing and re-engaging them in the appropriate position, the pitch of the driving drum splines being 5°.

N.B. Do not attempt to turn the arms on the spindles but press back the retaining clip in the headpieces and withdraw the arms from the driving drums and refit in the desired position.

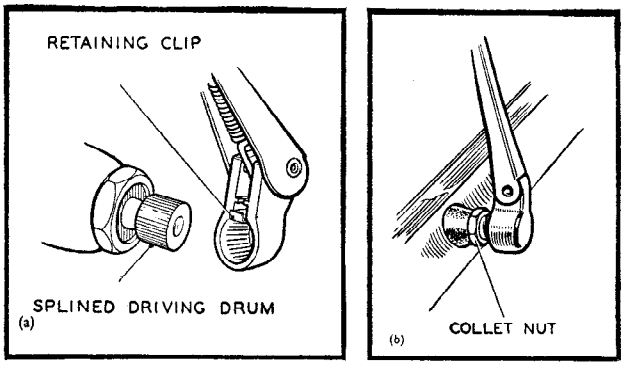

Fig. 6.

Wiper arm-to-wheelbox attachment
(*a*) DR2 (*b*) 4W

(*d*) LIMIT SWITCH ADJUSTMENTS

(*i*) *Under-Bonnet ('Single Entry') Motors with Limit Switch Wire Attached to Top of Domed Cover:*

Slacken the four gearbox cover securing screws. Rotate the domed cover until the setting pip on the top of the cover is in line with the central groove in the gearbox cover. The pip must be on the side of the cover nearest the cable rack to obtain parking with the crosshead away from the worm gear, or turned through 180° to obtain parking with the crosshead toward the worm gear.

Retighten the gearbox cover securing screws.

(*ii*) *Under-Bonnet ('Single-Entry') Motors with Limit Switch Wire Entering Side of Domed Cover:*

Slacken the four gearbox cover securing screws. Initially, rotate the domed cover until the vertical setting projection on the lower edge of the cover is in line with the central groove in the gearbox cover. The projection must be on the side of the cover nearest the cable rack to obtain parking with the crosshead away from the worm gear, or turned through 180° to obtain parking with the crosshead toward the worm gear. Then, turn the cover 20°—clockwise, if the wheelboxes are below the windscreen, or anti-clockwise if the wheelboxes are above the windscreen.

Retighten the gearbox cover securing screws.

(*iii*) *Centre-Rack ('Double Entry') Motors:*

When fitted, the limit switch in the above motors is located beneath the crosshead cover and is actuated by a striker pin carried on the crosshead. A knurled adjusting nut is provided at the narrow end of the gearbox by which the instant of switch-off may be set, the nut being turned one or two serrations at a time until the correct parking position is obtained.

When required, the arms and blades can be made to park on the opposite side of the windscreen by removing the knurled nut and crosshead cover and then withdrawing the switch assembly and refitting it the opposite way round.

(*e*) SETTING THE WIPER ARMS AND BLADES

Withdraw the wiper arms from the splined driving spindles.

Switch on the supply (normally, at the ignition switch) and operate the panel switch.

Switch off the wiper motor and, in the case of motors fitted with a limit switch, wait for the spindles to come to rest at the end of a cycle. (When no limit switch is fitted, operate the panel switch at the end of a cycle).

Refit the arms and blades to the spindles. With DR2 models, the angular pitch of the splines on the driving drums is 5° to enable an appropriate arm position to be engaged. With 4W models, the wiper arms are secured to the wheelbox spindles by a collet nut. To remove such an arm, first loosen the collet nut and then withdraw the arm from the spindle.

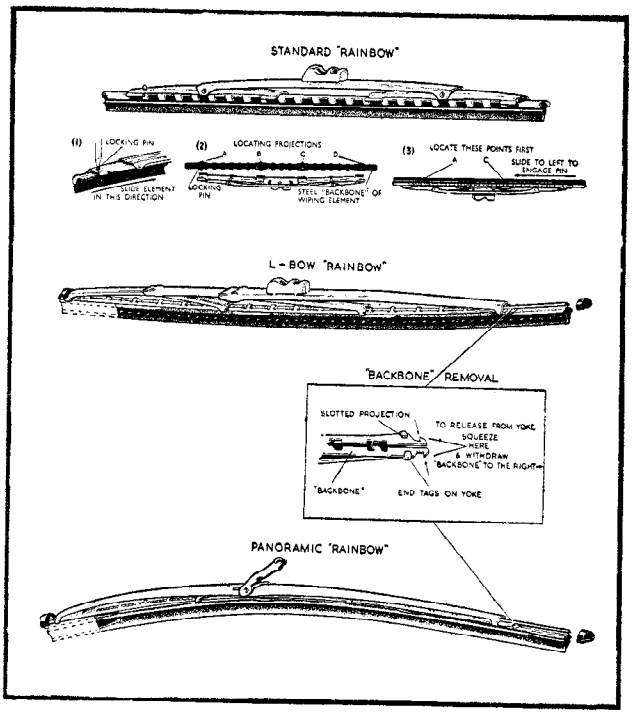

Fig. 7.

Replacing wiper elements to 'Rainbow' blades, as used in DR installations

(*f*) WIPER BLADE REPLACEMENT

DR2 installations are normally fitted with 'Rainbow' wiper blades of Standard, L-bow or Panoramic pattern in which the rubber wiping element and 'backbone' is a replaceable part. Before fitting a replacement, however, the blade carrier and wiper arm must be carefully examined for signs of wear. If these are found to be worn or distorted they should be replaced in addition to the wiping element and 'backbone'. No responsibility can be accepted for subsequent poor wiping performance or **damage to the windscreen** if a replacement element and 'backbone' is fitted to existing worn parts.

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