SECTION N

ELECTRICAL EQUIPMENT

GENERAL DESCRIPTION

The electrical equipment fitted to the M.G. Midget is of the 12-volt type incorporating constant voltage control for the charging circuit. The positive earth system of wiring is employed.

The battery is mounted on the dash under the bonnet and is readily accessible for examination and maintenance attention.

The dynamo is mounted on the left of the cylinder block and driven by endless belt from the engine crankshaft. A hinged mounting enables the belt tension to be adjusted.

The control box is sealed and should not normally need attention. The fuses are carried in external holders, as are the spare fuses, so that there is no need to remove the control box cover to gain access to them.

The starter motor is mounted on the flywheel housing on the right-hand side of the engine unit and operates on the flywheel through the usual sliding pinion device.

The headlamps on early Home models are of the "dip and switch" type, in which the near-side lamp beam is dipped and the off-side lamp extinguished on operation of the dipping switch. On Export models and later Home models both lamps are fitted with double-filament bulbs.

Section N.1

THE BATTERY

Model GTW9A. Capacity (10-hour rate) 51 ampere hours.

ROUTINE MAINTENANCE

In order to keep the battery in good condition, a periodical inspection should be made and the following carried out :—

(i) *Topping up*

About once a month (more often in warmer climates), remove the vent plugs from the top of each of the cells and examine the level of the electrolyte. If necessary, add distilled water **until the top edges of the separators are just covered on early models. Do not fill above this level, otherwise the excess electrolyte will be thrown out of the cell.** Later models are fitted with a "correct-acid-level" device, which is described in Section N.27. A hydrometer will be found useful for topping up, as it prevents distilled water from being spilled on the top of the battery.

Note.—*In very cold weather it is essential that the car be used immediately after topping up the battery to ensure that the distilled water is thoroughly mixed with the electrolyte. Neglect of this precaution may result in the distilled water freezing, with consequent damage to the battery.*

When examining the cells, do not hold naked lights near the vent holes, as there is a danger of igniting the gas coming from the plates.

(ii) *Testing the condition of the battery*

Occasionally examine the condition of the battery by taking hydrometer readings. There is no better way of ascertaining the state of charge of the battery. The hydrometer contains a graduated float on which is indicated the specific gravity of the acid in the cell from which the sample is taken.

The specific gravity readings and their indications are as follow :—

1·280—1·300	Battery fully charged.
About 1·210	Battery about half discharged.
Below 1·150	Battery fully discharged.

These figures are given assuming an electrolyte temperature of 60° F. (16° C.). If the temperature of the electrolyte exceeds this, ·002 must be added to hydrometer readings for each 5° F. (2·8° C.) rise to give the true specific gravity. Similarly ·002 must be subtracted from the hydrometer readings for every 5° F. (2·8° C.) below 60° F. (16° C.).

The readings for each of the cells should be approximately the same. If one cell gives a reading very different from the rest it may be that the electrolyte has been spilled or has leaked from one of the cells, or there may be an internal fault. In this case it is advisable to have the battery examined by a battery specialist. Should the battery be in a low state of charge, it should be recharged by taking the car for a long daytime run or by charging from an external source of D.C. supply at a current rate of 5 amperes until the cells are gassing freely.

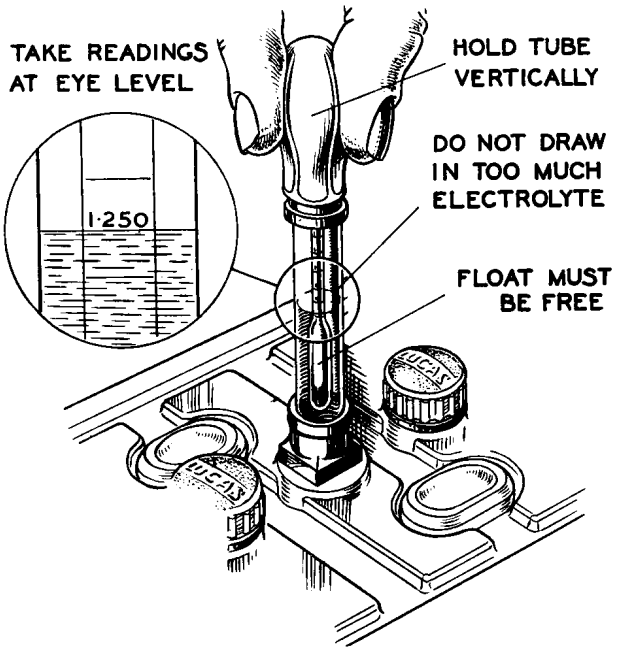


Fig. N.1.
The hydrometer in use to determine the condition of the individual cells.

After examining the battery, check the vent plugs, making sure that the air passages are clear, and screw the plugs into position. Wipe the top of the battery to remove all dirt and moisture.

STORAGE

If a battery is to be out of use for any length of time, it should first be fully charged and then given a freshening charge about every fortnight.

A battery must never be allowed to remain in a discharged condition, as this will cause the plates to become sulphated.

INITIAL FILLING AND CHARGING

Usually the battery will have been filled and initially charged. If, however, it should be found necessary to prepare a new battery, supplied dry, proceed as follows :—

(a) Preparation of electrolyte

The specific gravity of the electrolyte necessary to fill the new battery, and the specific gravity at the end of the charge, are as follow :—

Climate	*S.G. of Filling Acid (corrected to 60° F. (16° C.))*	*S.G. at End of Charge*
Ordinarily below 80° F. (27° C.)	1·350	1·280—1·300
Between 80°—100° F. ...	1·320	1·250—1·270
Over 100° F. (38° C.) ...	1·300	1·220—1·240

The electrolyte is prepared by mixing distilled water and concentrated sulphuric acid 1·835 S.G. The mixing must be carried out in a lead-lined tank or a suitable glass or earthenware vessel. Steel or iron containers must **not** be used. The acid must be added slowly to the water, while the mixture is stirred with a glass rod. **Never add the water to the acid,** as the resulting chemical reaction may have dangerous consequences.

To produce electrolyte of the correct specific gravity, use the following proportions of acid and distilled water :—

To obtain Specific Gravity (corrected to 60° F. (16° C.))	*Add 1 part by volume of 1·835 S.G. acid to distilled water by volume as below*
1·350	1·8 parts
1·320	2·2 ,,
1·300	2·5 ,,

Heat is produced by the mixture of acid and water, and it should therefore be allowed to cool before pouring it into the battery, otherwise the plates, separators and moulded container may become damaged.

(b) Filling in and soaking

The temperature of the filling-in acid, battery and charging room should be above 32° F. (0° C.).

Carefully break the seals in the filling holes and half-fill each cell in the battery with dilute sulphuric acid solution of the appropriate specific gravity (according to temperature) (see table in (*a*) above). The quantity of electrolyte required to half-fill a two-volt cell is ½ pint (·28 litre). Allow to stand for at least six hours, then complete the filling of the cells by the addition of more diluted acid of the same specific gravity as before until the level reaches the bottom of the filling holes, and allow the battery to stand for at least another two hours before commencing the first charge.

(c) Duration and rate of initial charge

Charge at a constant current of 3·5 amps. until the voltage and temperature-corrected specific gravity readings show no increase over five successive hourly readings. This period is dependent upon the length of time the battery has been stored since manufacture, and will be from forty to eighty hours, but usually not more than sixty.

Throughout the charge the acid must be kept level with the tops of the separators in each cell by the addition of acid solution of the same specific gravity as the original filling-in acid.

If, during charge, the temperature of the acid in any cell of the battery reaches the maximum permissible temperature of 120° F. (49° C.), the charge must be interrupted and the battery temperature allowed to fall at least 10° F. (5·5° C.) before charging is resumed.

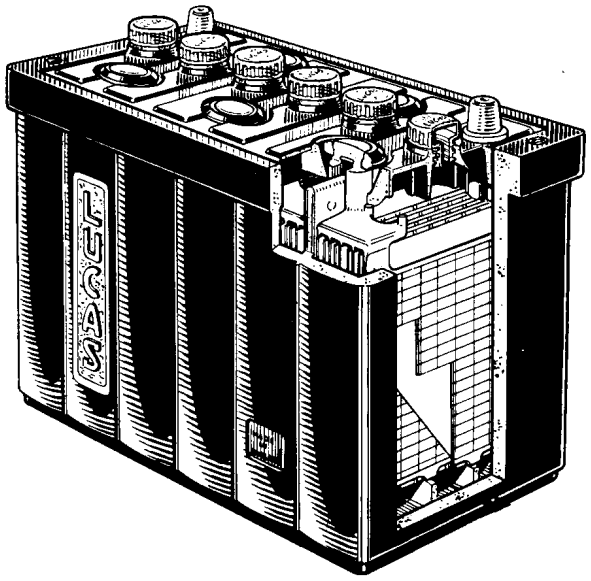


Fig. N.2.

The early type Lucas battery partly sectioned to show the arrangement of the plates and separators. Later models are fitted with a correct acid level device and rubber vent plugs.

At the end of the first charge, i.e. when specific gravity and voltage measurements remain substantially constant, carefully check the specific gravity in each cell to ensure that it lies within the limits specified. If any cell requires adjustment, some electrolyte must be siphoned off, and replaced with either acid of the strength used for the original filling in or distilled water, according to whether the specific gravity is too low or too high respectively. After such adjustment the gassing charge should be continued for one or two hours to ensure adequate mixing of the electrolyte. Re-check, if necessary, repeating the procedure until the desired result is obtained. Finally adjust electrolyte to correct level.

Section N.2

THE DYNAMO

Type

The dynamo on early models is a Lucas Model C39PV, Service No. 22257A. On later models a Lucas Model C39PV2, Service No. 22265B is fitted. These identification marks are stamped on the yoke. When ordering replacements always quote these numbers.

To test on vehicle

The cutting-in speed is from 1,050 to 1,200 r.p.m. at 13 dynamo volts.

The output of the C39PV model is 17 amps. at 1,800–2,000 r.p.m. and of the C39PV2 model 19 amps. at 1,850–2,100 r.p.m., both at 13·5 dynamo volts taken on a resistance load of 0·8 ohm without regulator.

(*a*) Make sure that the driving belt is not slipping, and it should be capable of being deflected approximately $\frac{1}{2}$ in. (12·7 mm.) at the centre of its run between the pulleys with moderate hand pressure. If the belt is too slack, tightening is effected by slackening the two bolts attaching the dynamo end plate extensions to the cylinder head, loosening the bolt attaching it to the slotted adjustment link and gently pulling the dynamo outwards by hand until the correct tension is obtained. The slotted link bolt must then be tightened, followed by the two lower bolts.

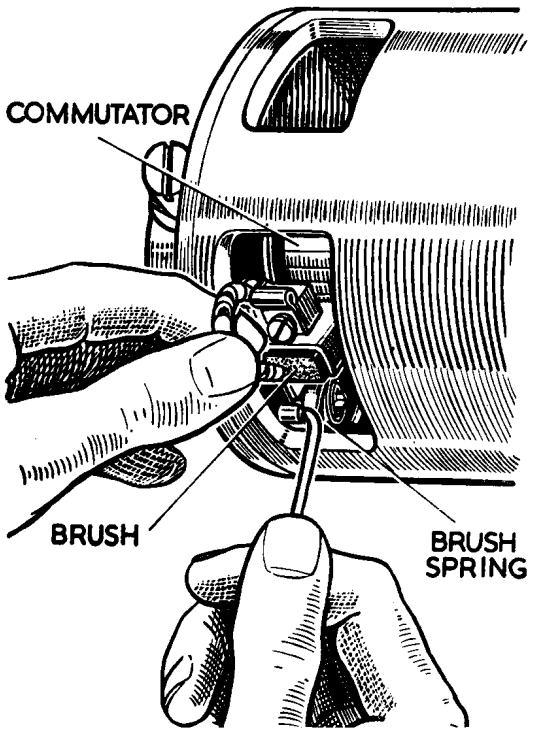


Fig. N.3.
To release the brushes hold back the brush spring with a piece of bent wire as shown.

(*b*) Check that the dynamo and control box are connected correctly. The dynamo terminal "D" should be connected to the control box terminal "D" and the dynamo terminal "F" connected to the control box terminal "F."

(*c*) After switching off all lights and accessories, disconnect the cables from the terminals of dynamo marked "D" and "F" respectively.

(*d*) Connect the two terminals with a short length of wire.

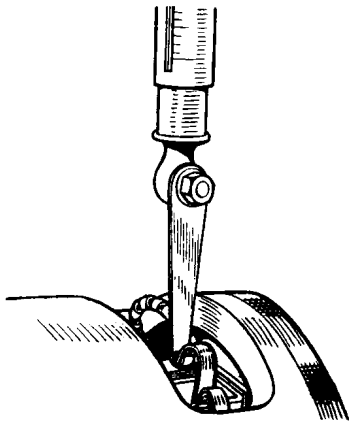


Fig. N.4.
Testing the tension of the brush springs with a spring balance. (See Section N.5.)

(e) Start the engine and set it to run at normal idling speed.

(*f*) Clip the negative lead of a moving coil type voltmeter, calibrated 0–20 volts, to one dynamo terminal and the other lead to a good earthing point on the dynamo yoke.

(*g*) Gradually increase the engine speed, when the voltmeter reading should rise rapidly and without fluctuation. Do not allow the voltmeter reading to reach 20 volts. Do not race the engine in an attempt to increase the voltage. It is sufficient to run the dynamo up to a speed of 1,000 r.p.m.

If there is no reading—check the brush gear.

If the reading is low (approximately 1 volt) the field winding may be faulty.

If the reading is approximately 5 volts the armature winding may be faulty.

(*h*) Remove the dynamo cover band and examine the brushes and commutator. Hold back each of the brush springs and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush

from its holder and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are worn so that they no longer bear on the commutator, or if the brush flexible has become exposed on the running face, new brushes must be fitted. If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the engine is turned slowly by hand cranking. Re-test the dynamo ; if there is still no reading on the voltmeter, there is an internal fault and the complete unit should be renewed, if a spare is obtainable.

If the dynamo is in good order, leave the temporary link in position between the terminals and restore the original connections, taking care to connect the dynamo terminal " D " to the control box terminal " D," and the dynamo terminal " F " to the control box terminal " F." Remove the lead from the " D " terminal on the control box and connect the voltmeter between this cable and a good earthing point on the vehicle. Run the engine as before. The reading should be the same as that measured directly at the dynamo. No reading on the voltmeter indicates a break in the cable to the dynamo. Carry out the same procedure for the " F " terminal, connecting the voltmeter between cable and earth. Finally remove link from the dynamo.

If the reading is correct test the control box (see Section N.12).

Section N.3

REMOVAL AND REPLACEMENT OF THE DYNAMO

Remove the set screw securing the insulator pad to the rear face of the dynamo.

Disconnect the dynamo leads from the dynamo terminals.

Disconnect the revolution counter drive from the dynamo.

To remove the dynamo, slacken its three attachment bolts and swing the dynamo towards the engine to give maximum belt slackness. Carefully free the belt from the dynamo pulley.

Supporting the dynamo, completely remove its attachment bolts, enabling it to be lifted from the engine.

Replacement of the dynamo is an exact reversal of this procedure.

Section N.4

DISMANTLING THE DYNAMO

Take off the dynamo pulley.

Remove the cover band, hold back the brush springs and remove the brushes from their holders.

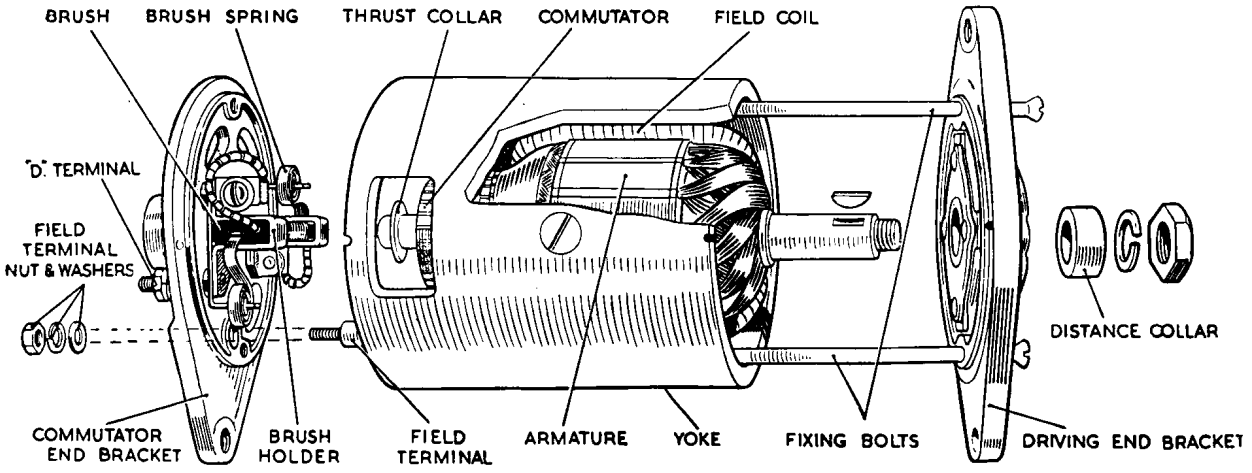


Fig. N.5.
The dynamo components.

Unscrew the locking nuts from the through bolts at the commutator end.

Withdraw the two through bolts from the driving end.

Remove the nut, spring washer and flat washer from the smaller terminal (i.e. field terminal) on the

commutator end bracket and remove the bracket from the dynamo yoke.

The driving end bracket, together with the armature, can now be lifted out of the yoke.

The driving end bracket which, on removal from the yoke, has withdrawn with it the armature and armature shaft ball bearing, need not be separated from the shaft unless the bearing is suspected and requires examination, in which event the armature should be removed from the end bracket by means of a hand press.

Section N.5

SERVICING THE DYNAMO

Brushes

Test if the brushes are sticking. Clean them with petrol and, if necessary, ease the sides by lightly polishing with a smooth file. Replace the brushes in their original positions.

Test the brush spring tension with a spring scale if available. The correct tension is 20/25 oz. (567/709 grams). Fit a new spring if the tension is low.

If the brushes are worn so that the flexible is exposed on the running face, new brushes *must* be fitted. Brushes are pre-formed so that bedding to the commutator is unnecessary.

Commutator

A commutator in good condition will be smooth and free from pits or burned spots. Clean the commutator with a petrol-moistened cloth. If this is

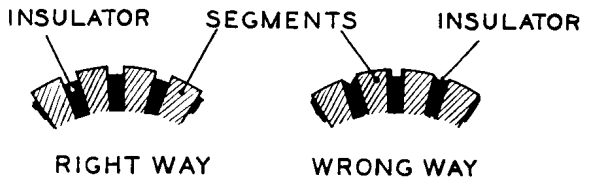


Fig. N.6.
The correct method of undercutting the dynamo commutator segments.

ineffective, carefully polish with a strip of fine glass-paper while rotating the armature. To remedy a badly worn commutator, mount the armature (with or without the drive end bracket) in a lathe, rotate at high speed and take a light cut with a very sharp tool. Do not remove more metal than is necessary. Polish the commutator with very fine glass-paper. Undercut the insulators between the segments to a depth of $\frac{1}{32}$ in. (·8 mm.) with a hack-saw blade ground down to the thickness of the insulator.

Field coils

Test the field coils, without removing them from the dynamo yoke, by means of an ohmmeter. The reading on the ohmmeter should be between 6·0 and 6·3 ohms. If this is not available, connect a 12-volt D.C. supply with an ammeter in series between the field terminal and dynamo yoke. The ammeter reading should be approximately 2 amps. If no reading is indicated the field coils are open-circuited and must be renewed. To test for earthed field coils, unsolder the end of the field winding from the earth terminal on the dynamo yoke and, with a test lamp connected from supply mains, test across the field terminal and earth. If the lamp lights the field coils are earthed and must be renewed.

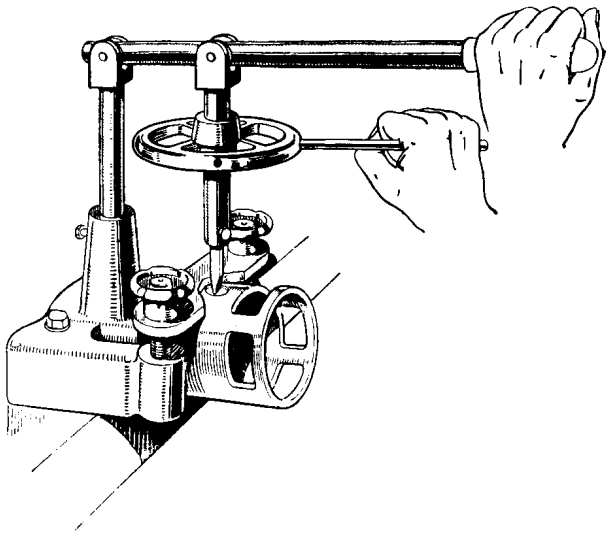


Fig. N.7.
The use of a wheel-operated screwdriver is necessary to remove and replace the pole shoe attachment screws.

When renewing field coils, carry out the procedure outlined below, using an expander and wheel-operated screwdriver.

(*a*) Remove the insulation piece which is provided to prevent the junction of the field coils from contacting the yoke.

(*b*) Mark the yoke and pole shoes in order that they can be fitted in their original positions.

(*c*) Unscrew the two pole shoe retaining screws by means of the wheel-operated screwdriver.

(*d*) Draw the pole shoes and coils out of the dynamo yoke and lift off the coils.

(*e*) Fit the new field coils over the pole shoes and place them in position inside the yoke. Take care to ensure that the taping of the field coils is not trapped between the pole shoes and the yoke.

(*f*) Locate the pole shoes and field coils by lightly tightening the fixing screw.

(*g*) Insert the pole shoe expander, open it to the fullest extent and tighten the screws.

(*h*) Finally tighten the screws by means of the wheel-operated screwdriver and lock them by caulking.

(*i*) Replace the insulation piece between the field coil connections and the yoke.

Armature

The testing of the armature winding requires the use of a voltage drop test and growler. If these are not available, the armature should be checked by substitution. No attempt should be made to machine the armature core or to true a distorted armature shaft.

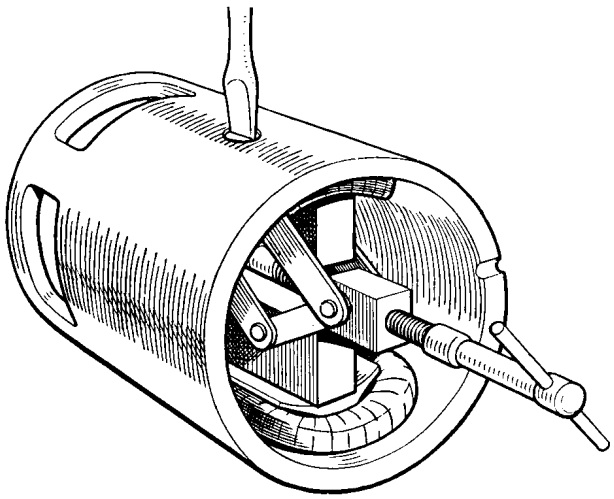


Fig. N.8.
To fit the pole shoes correctly an expander of the type illustrated is required.

Bearings

Bearings which are worn to such an extent that they will allow side movement of the armature shaft must be renewed.

To renew the bearing bush at the commutator end, proceed as follows :—

(*a*) Press the bearing bush out of the commutator end bracket.

(*b*) Press the new bearing bush into the end bracket, using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearing.

Note.—*Before fitting the new bearing bush it should be allowed to stand completely immersed for twenty-four hours in thin engine oil to Ref. F (page P.2). This will allow the pores of the bush to be filled with lubricant.*

The ball bearing at the driving end is replaced as follows :—

(*a*) Knock out the rivets which secure the bearing retaining plate to the end bracket and remove the plate.

(*b*) Press the bearing out of the end bracket and remove the corrugated washer, felt washer and oil retaining washer.

(*c*) Before fitting the replacement bearing see that it is clean and pack it with a high-melting-point grease.

(*d*) Place the oil retaining washer, felt washer and corrugated washer in the bearing housing in the end bracket.

(*e*) Locate the bearing in the housing and press it home by means of a hand press.

(*f*) Fit the bearing retaining plate. Insert the new rivets from the inside of the end bracket and open the rivets by means of a punch to secure the plate rigidly in position.

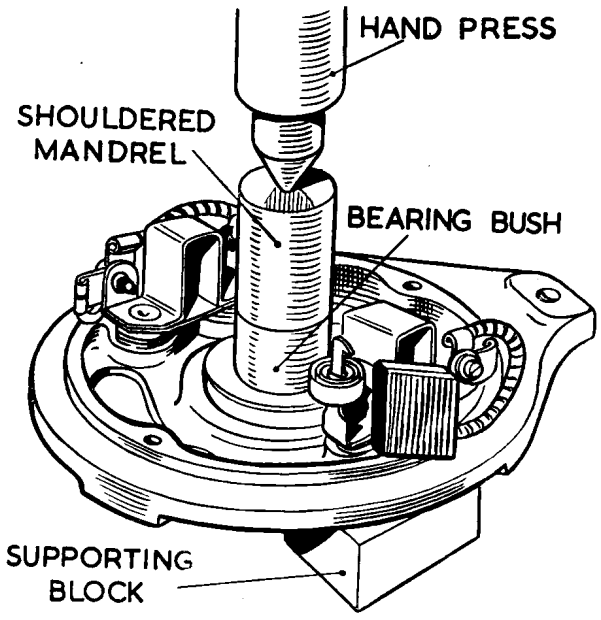


Fig. N.9.
The correct method of fitting the bronze bearing bush on the dynamo. Note the supporting blocks.

Reassembly

In the main the reassembly of the dynamo is a reversal of the operations described in Section N.4.

Before refitting the dynamo to the vehicle, unscrew the lubricator from the commutator end bracket, lift out the felt wick and spring and half fill the cap with high-melting-point grease to Ref. D (page P.2). Replace

spring and wick and screw the lubricator in position in the end bracket.

Section N.6

THE STARTER

Type

The starter is a Lucas Model M35G, Service No. 25022. These identification marks are stamped on the yoke. When ordering replacements always quote these numbers.

Its lock torque is approximately 9·3 lb./ft.(1·3 m./kg.), with 300–350 amps. and 7·5–8·0 volts.

To test on vehicle

Switch on the lamps and operate the starter control. If the lights go dim, but the starter is not heard to operate, an indication is given that current is flowing through the starter windings, but that the starter is meshed permanently with the geared ring on the flywheel. This has probably been caused by the starter being operated while the engine was still running. In this case the starter must be removed from the engine for examination.

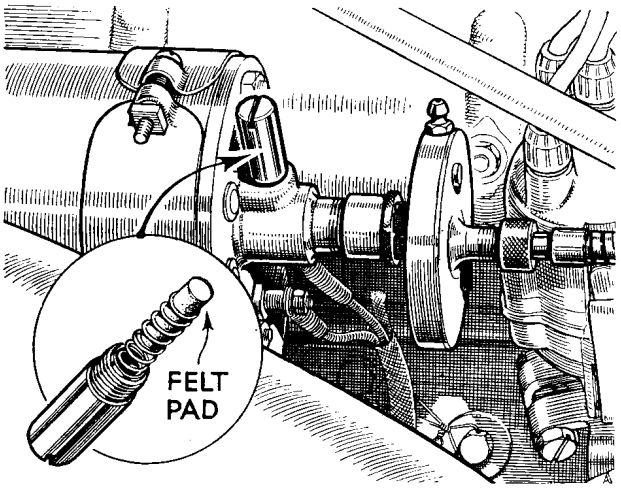


Fig. N.10.
The dynamo lubricator, with the felt pad and spring shown in the inset.

Should the lamps retain their full brilliance when the starter switch is operated, check that the switch is functioning. If the switch is in order, examine the connections at the battery, starter switch and starter, and also check the wiring between these units. Continued failure of the starter to operate indicates an internal fault in the starter, and the starter must be removed from the engine for examination.

Sluggish or slow action of the starter is usually caused by a poor connection in the wiring which produces a high resistance in the starter circuit. Check as described above.

Damage to the starter drive is indicated if the starter is heard to operate but does not crank the engine.

Section N.7

REMOVAL AND REPLACEMENT OF STARTER

Remove the two nuts, bolts and spring washers securing the rear exhaust bracket to the rear cross-member.

Remove the two nuts, bolts and spring washers securing the exhaust bracket to the third cross-member.

Remove the nut, bolt and spring washer securing the exhaust pipe clip to the exhaust bracket attached to the gearbox.

Remove the three nuts and spring washers attaching the exhaust pipe to the exhaust manifold and lower the exhaust system complete to the ground.

(The exhaust system should be supported at intervals during these operations.)

Remove the set screw securing the cable from the starter switch to the starter motor at the commutator end.

Unscrew the set bolts securing the starter motor to the flywheel housing and withdraw the starter.

Replacement is carried out in the reverse manner to that detailed for removal.

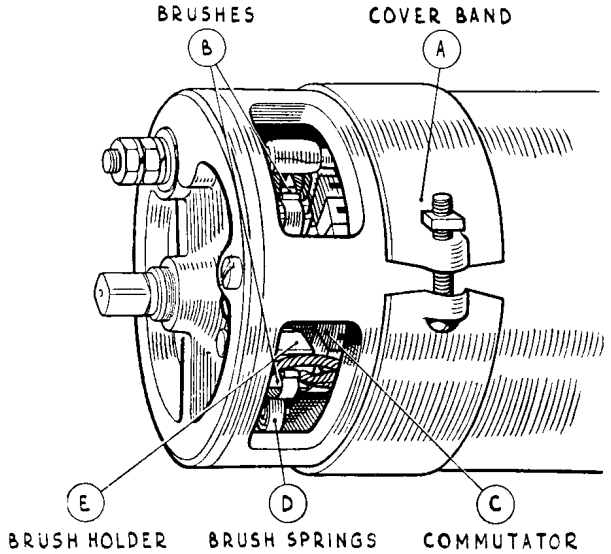


Fig. N.11.
The starter brush gear.

Section N.8

THE STARTER SWITCH

The starter switch is fitted on the engine side of the bulkhead and is operated by pulling the control knob in the instrument panel. The knob is connected to the switch by means of a cable. At the back of the starter switch are two terminals, from one of which two cables are connected, the heavy one to the battery and the other to the ammeter. From the second terminal a heavy cable is taken to the terminal on the commutator end bracket of the starter.

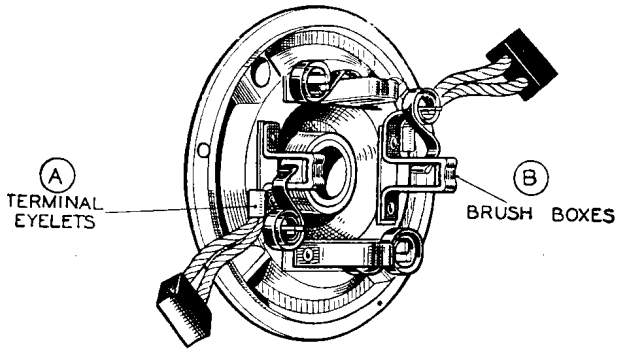


Fig. N.12.
The starter end cover.

Section N.9

THE STARTER COMMUTATOR AND BRUSH GEAR

Inspect the commutator and brush gear in the manner described for the dynamo in Sections N.4 and N.5. The brush spring tension should be 30–40 oz. (850–1134 grams). This operation should be carried out every 12,000 miles or 20000 kilometres.

In the unlikely event of brush replacement being necessary, this must be carried out by a Lucas Service Agent, as the operation entails dismantling of the starter.

Section N.10

THE STARTER DRIVE

It is recommended that the starter drive be examined every 12,000 miles or 20000 kilometres, taking particular care to ensure that the pinion moves freely on the screwed sleeve. Any dirt or other foreign matter on the sleeve must be washed away with paraffin (kerosene).

When the starter is operated, the rotation of the armature screws the pinion along the sleeve to mesh with the flywheel teeth. As soon as the engine starts firing, it will drive the flywheel faster than it is being driven by the starter. This will cause the pinion to screw back along the sleeve and so draw out of mesh with the flywheel teeth. A pinion restraining spring is fitted over the shaft to prevent the pinion from being vibrated into mesh when the engine is running.

In the event of the starter drive being jammed in mesh with the flywheel, it can usually be freed by turning the starter armature by means of a spanner

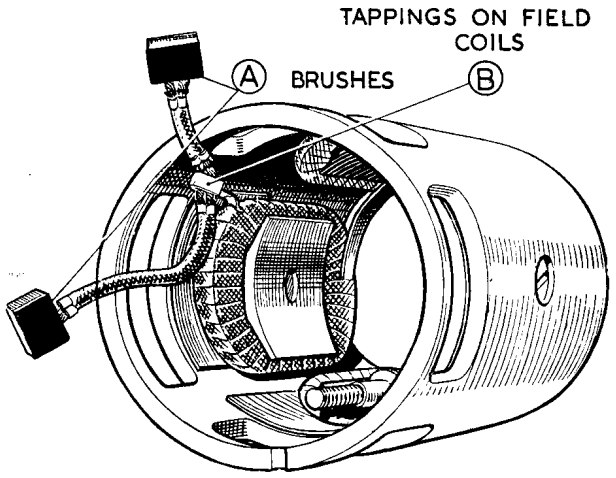


Fig. N.13.
The brush connections for the starter.

applied to the shaft extension at the commutator end. This is accessible by taking off the small cap, which is secured by two screws on some models and is a push fit on others.

If the pinion is found to be damaged or worn, it must be renewed together with the screwed sleeve. Similarly, if the main spring is broken, or the restraining spring weak or broken, replacement must be made.

Section N.11

SERVICING THE STARTER

Examination of commutator and brush gear

Remove the starter cover band "A" (Fig. N.11) and examine the brushes " B " and the commutator " C." Hold back each of the brush springs " D " and move the brush by pulling gently on its flexible connector. If the movement is sluggish, remove the brush from its holder " E " and ease the sides by lightly polishing on a smooth file. Always replace brushes in their original positions. If the brushes are

worn so that they no longer bear on the commutator or if the brush flexible has become exposed on the running face they must be renewed.

If the commutator is blackened or dirty, clean it by holding a petrol-moistened cloth against it while the armature is rotated.

Dismantling

Take off the cover band "A" (Fig. N.11) at the commutator end, hold back the brush springs " D " and take out the brushes " B " from their holders.

Withdraw the two through bolts and remove the armature complete with driving end bracket.

Remove the terminal nuts and washers from the terminal post at the commutator end bracket and remove the commutator end bracket.

Brushes

(*a*) Test the brush springs with a spring scale. The correct tension is 30–40 oz. (850–1134 grams). Fit a new spring if the tension is low.

(*b*) If the brushes are worn so that they no longer bear on the commutator, or if the flexible connector has become exposed on the running face, they must be renewed. Two of the brushes are connected to terminal eyelets "A" (Fig. N.12) attached to the brush boxes " B " on the commutator end bracket, and two "A" (Fig. N.13) are connected to a tapping " B " on the field coils.

The flexible connectors must be removed by unsoldering and the connectors of the new brushes secured in their place by soldering. The brushes are pre-formed so that bedding of their working face to the commutator is unnecessary.

Drive

(*a*) If the pinion is tight on the screwed sleeve, wash away any dirt with paraffin (kerosene).

(*b*) If any parts are worn or damaged they must be renewed.

(*c*) Remove the split pin " H " (Fig. N.14) from the shaft nut at the end of the starter drive. Hold the squared end of the starter shaft at the commutator end by means of a spanner and unscrew the shaft nut " J."

(*d*) Lift off the main spring " K " (Fig. N.14) and remove the retaining ring " L."

(*e*) The control nut " M," sleeve " N " and restraining spring " P " will now slide off.

(*f*) Withdraw the splined washer from the armature shaft and remove the pinion and barrel assembly.

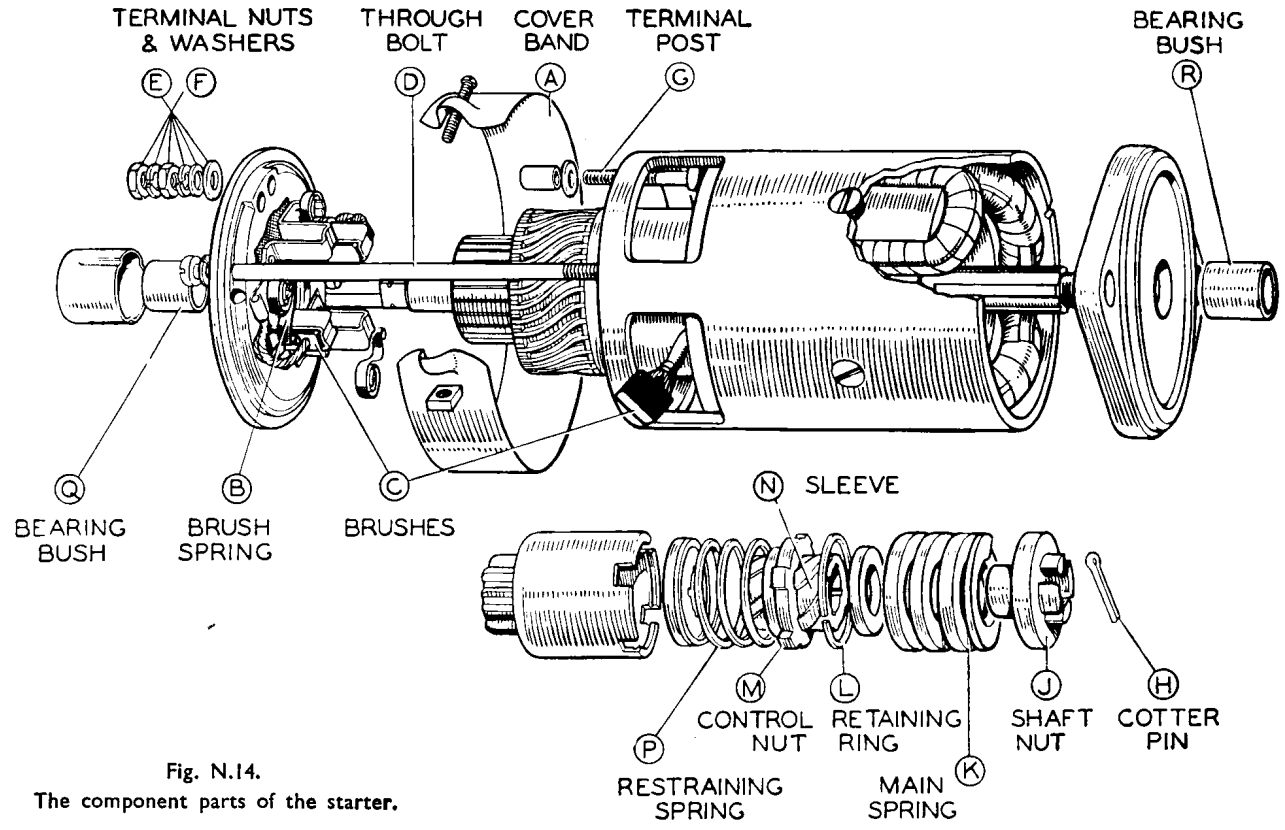


Fig. N.14.
The component parts of the starter.

Commutator

A commutator in good condition will be smooth and free from pits and burned spots. Clean the commutator with a petrol-moistened cloth. If this is ineffective, carefully polish with a strip of fine glass-paper, while rotating the armature. To remedy a badly worn commutator, dismantle the starter drive as previously described and remove the armature from the end bracket. Now mount the armature in a lathe, rotate it at a high speed and take a light cut with a very sharp tool. Do not remove any more metal than is absolutely necessary, and finally polish with very fine glass-paper.

The insulator between the commutator segments **must not be undercut.**

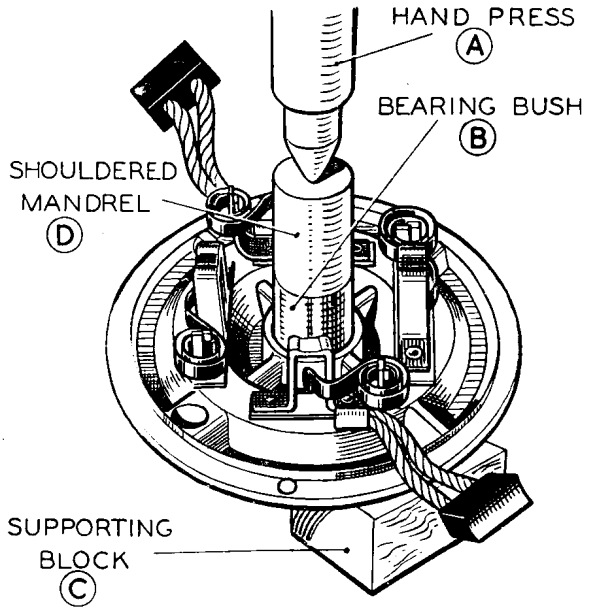


Fig. N.15.
The method of inserting a new bush in the starter end cover. Note use of supporting blocks.

Field coils

The field coils can be tested for an open circuit by connecting a 12-volt battery, with a 12-volt bulb in one of the leads, to the tapping point of the field coils to which the brushes are connected, and the field terminal post. If the lamp does not light, there is an open circuit in the wiring of the field coils.

Lighting of the lamp does not necessarily mean that the field coils are in order, as it is possible that one of them may be earthed to a pole shoe or to the yoke. This may be checked by removing the lead from the brush connector and holding it on a clean part of the starter yoke. Should the bulb now light it indicates that the field coils are earthed.

Should the above tests indicate that the fault lies in the field coils, they must be renewed. When renewing field coils carry out the procedure detailed in the Dynamo Section N.5.

Armature

Examination of the armature will in many cases reveal the cause of failure, e.g. conductors lifted from the commutator due to the starter being engaged while the engine is running and causing the armature to be rotated at an excessive speed. A damaged armature must in all cases be renewed—no attempt should be made to machine the armature core or to true a distorted armature shaft.

Bearings

Bearings which are worn to such an extent that they will allow excessive side play of the armature shaft must be renewed. To renew the bearing bush, proceed as follows :—

(*a*) Remove the old bearing bush by pressing it out of the end bearing, using a suitable shouldered mandrel in the press. Take care that the mandrel does not contact the bearing face and damage it during removal.

(*b*) Press the new bearing bush into the end bracket, using a shouldered mandrel of the same diameter as the shaft which is to fit in the bearing.

Note.—*The bearing bushes are of the porous phosphor-bronze type, and before fitting them they should be allowed to stand completely immersed for twenty-four hours in thin engine oil to Ref. F (page P.2) in order to fill the pores of the bush with lubricant.*

Reassembly

The reassembly of the starter is a reversal of the operations described above.

Note.—*Secure the body of the starter in a vice and test by connecting it with heavy-gauge cables to a battery of the correct voltage. One cable must be connected to the starter terminal and the other held against the starter body or end bracket. Under these light load conditions the starter should run at a very high speed.*

Section N.12

THE CONTROL BOX

Regulator adjustment

The regulator is carefully set before leaving the Works to suit the normal requirements of the standard equipment, and in general it should not be necessary to alter it. If, however, the battery does not keep in a charged condition, or if the dynamo output does not fall when the battery is fully charged, it may be advisable to check the setting and if necessary to re-adjust it.

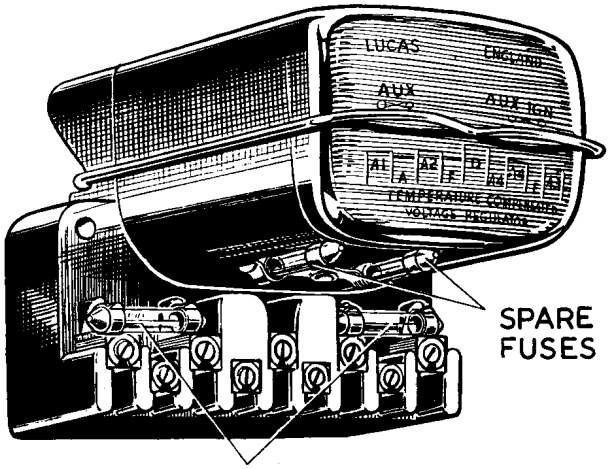


Fig. N.16.
The control box on early models, showing the location of the fuses. On later models a separate fuse box is fitted (see Fig. N.21).

It is important, before altering the regulator setting, when the battery is in a low state of charge, to check that its condition is not due to a battery defect or to the dynamo belt slipping.

How to check and adjust electrical setting

The regulator setting can be checked without removing the cover on the control box.

Withdraw the cables from the terminals marked "A" and "A.1" at the control box and join them together. Connect the negative lead of a moving coil voltmeter (0—20 volts full scale reading) to the "D" terminal on the dynamo and connect the other lead from the meter to a convenient chassis earth.

Slowly increase the speed of the engine until the voltmeter needle "flicks" and then steadies ; this should occur at a voltmeter reading between the limits given in the next column for the appropriate temperature of the regulator.

Setting at 10° C. (50° F.)	16·1—16·7 volts
,, ,, 20° C. (68° F.)	15·8—16·4 ,,
,, ,, 30° C. (86° F.)	15·6—16·2 ,,
,, ,, 40° C. (104° F.)	15·3—15·9 ,,

If the voltage at which the reading becomes steady occurs outside these limits, the regulator must be adjusted.

Shut off the engine, remove the control box cover, release the locknut "A" (Fig. N.17) holding the adjusting screw "B." The screw turns in a clockwise direction to raise the setting or in an anti-clockwise direction to lower the setting. Turn the adjusting screw a fraction of a turn in the required direction and then tighten the locknut.

When the dynamo is run at a high speed on open circuit it builds up a high voltage. When adjusting the regulator do not run the engine up to more than half-throttle or a false voltmeter reading will be obtained.

Mechanical setting

The mechanical setting of the regulator is accurately adjusted before leaving the Works, and provided that the armature carrying the moving contact is not

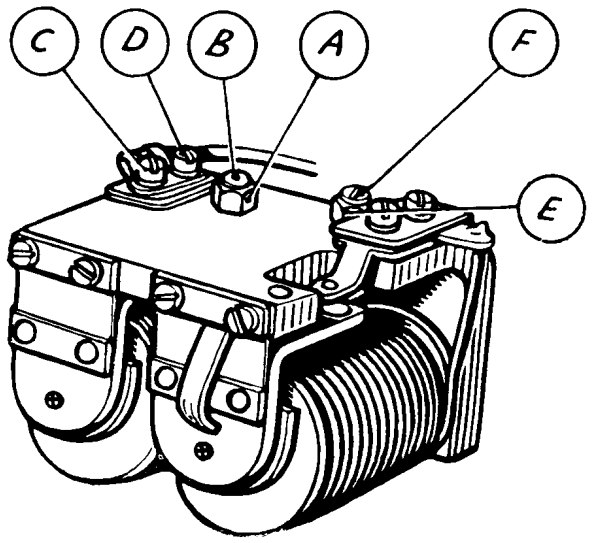


Fig. N.17.
The cut-out and regulator assembly.

removed, the regulator will not require mechanical adjustment. If, however, the armature has been removed from the regulator for any reason, the contacts will have to be reset. To do this, proceed as follows :—

(i) Slacken the two armature fixing screws "E" (N.18). Insert a ·018 in. (·46 mm.) feeler gauge

between the back of the armature "A" and the regulator frame "B."

(ii) Press back the armature against the regulator frame and down on to the top of the bobbin core with the gauge in position, and lock the armature by tightening the two fixing screws.

(iii) Check the gap between the under side of the arm and the top of the bobbin core. This must be ·012—·020 in. (·30—·50 mm.). If the gap is outside these limits correct by adding or removing shims "F" at the back of the fixed contact "D."

(iv) Remove the gauge and press the armature down, when the gap between the contacts should be between ·006 in. (·15 mm.) and ·017 in. (·43 mm.).

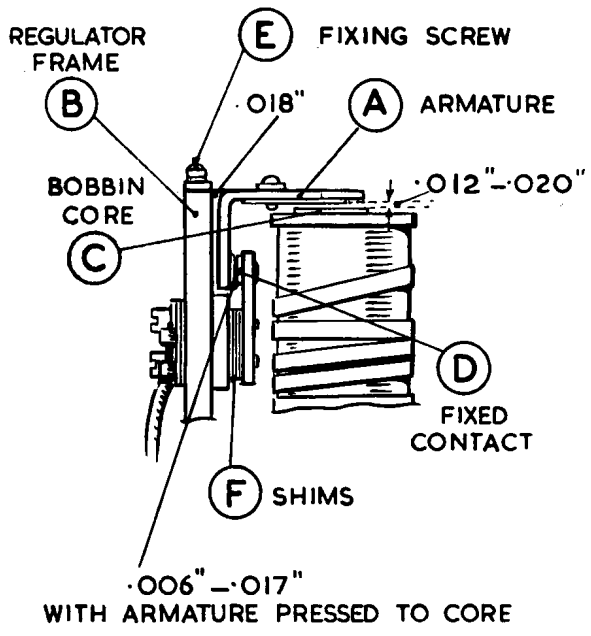


Fig. N.18.
The mechanical adjustment for the regulator.

Cleaning contacts

To render the regulator contacts accessible for cleaning, slacken the screws securing the plate carrying the fixed contact. It will be necessary to slacken the upper screw "C" (Fig. N.17) a little more than the lower "D" so that the contact plate can be swung outwards. Clean the contacts by means of fine carborundum stone or fine emery cloth. Carefully wipe away all traces of dirt or other foreign matter. Finally tighten the securing screws.

CUT-OUT

Adjustment

If it is suspected that the cutting-in speed of the dynamo is too high, connect a voltmeter between the terminals marked "D" and "E" at the control box and slowly raise the engine speed. When the voltmeter reading rises to between 12·7 and 13·3 the cut-out contact should close.

If the cut-out has become out of adjustment and operates at a voltage outside these limits it must be reset. To make the adjustment, slacken the locknut "E" (Fig. N.17), turn the adjusting screw "F" a fraction of a turn in a clockwise direction to raise the operating voltage or in an anti-clockwise direction to lower the voltage. **Tighten locknut after making the adjustment.**

Cleaning

To clean the contacts remove the cover, place a strip of fine glass-paper between the contacts and then, closing the contacts by hand, draw the paper through. This should be done two or three times, with the rough side towards each contact.

Radio suppression

When it is desired to fit suppressors for radio equipment on early models make sure that this is done only in accordance with the recommended practice. Suppressors and capacitors wrongly fitted may cause damage to the electrical equipment. Later models are fitted with suppressors at the factory.

Section N.13

WINDSCREEN WIPER—TYPE CW

The motor is a three-pole wound armature type running in a two-pole field. A celeron plate carries the brush gear for two carbon brushes which bear on the commutator.

If the wiper fails to operate or operates unsatisfactorily, proceed as follows :—

Ascertain if the battery is supplying current to the wiper by switching on and noting if the ammeter responds.

Examine the fuse protecting the wiper. If it has blown, examine the wiring for evidence of short circuits or chafed leads. If, on replacing the fuse, it blows again, remove the wiper from the car. Momentarily connect wiper to a battery and see if the wiper then operates satisfactorily.

1. *Switch setting out of adjustment or switch contacts dirty*

If the cover of the wiper has been damaged, or if the switch has been tampered with, the contacts may be remaining permanently open. Remove the cover and see that the switch control moves freely—when the cover is removed the switch contacts should remain closed. Examine the contacts and if necessary clean them with fine emery cloth.

2. *Loose or broken connections*

Remove the wiper cover and examine the wiring of the motor. If necessary, re-solder any connections which are loose or broken.

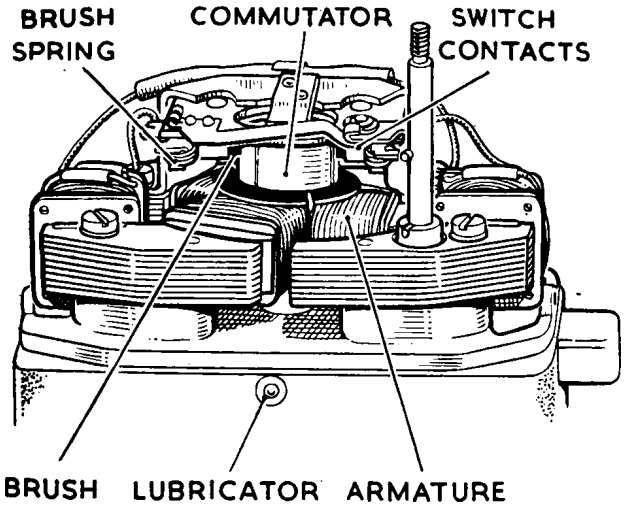


Fig. N.19.
The windscreen wiper with its cover removed, showing its internal construction.

3. *Brush worn out or not bearing on commutator*

The brushes are carried in small boxes and are pressed against the commutator by means of springs. See that the springs press firmly on the brushes and that they do not foul the sides of the brush boxes. The brushes must be clean and move freely in their holders. To remove the brushes for examination, hold back the springs by means of a bent piece of wire and gently lever the brushes from their holders.

If the brushes are dirty or greasy, causing them to stick in their holders, clean them with a cloth moistened with petrol.

When refitting the brushes, replace them in the same boxes and in the same positions as originally fitted, in order to preserve the brush bedding.

If the brushes have become worn to such an extent that they no longer make good contact with the commutator, they must be renewed. Replacement brushes can be obtained from any Lucas Agent.

4. *Armature binding or bearings stiff*

Turn armature by hand for several revolutions—if it is consistently tight the wiper probably needs lubrication (see paragraph 8). If the armature is only tight occasionally, the stiffness is probably in the gearbox or is caused by dirt or other foreign matter in the air gap between the armature and the pole shoes. Remove the wiper back plate and examine the gears and links for evidence of stiffness.

5. *Commutator dirty*

Clean the commutator by means of a cloth moistened with petrol. Carefully remove any carbon dust from between the segments of the commutator.

6. *Brush gear short-circuited*

This may be caused either by damage to the wiper cover or to a stray conductor making contact with the brush gear. Rectify the damage to the wiper cover or fit a new cover and remedy any other damage.

7. *Armature damaged*

If, after following the preceding examination, the wiper still does not operate or its performance is unsatisfactory, the fault may be due to the armature being damaged. Fit a replacement armature.

8. *Lubrication*

If the rotor is consistently stiff when turned by hand, add a few drops of thin machine oil to the lubricator provided. When examining the gearbox, if necessary, lightly pack the gears with a good-quality high-melting-point zinc-oxide grease, such as Duckham's Keenol KG.25.

Section N.14

THE ELECTRIC HORNS

MODEL WT614

All horns before being passed out of the Works are adjusted to give their best performance and will give a long period of service without any attention ; no subsequent adjustment is required.

If one of the horns fails or becomes uncertain in its action, it does not follow that the horn has broken down. First ascertain that the trouble is not due to some outside source, e.g. a discharged battery, or loose connection or short circuit in the wiring of the horn ; a short circuit in the horn wiring will cause the fuse to blow. If both horns fail or become uncertain in action, the trouble is probably due to a discharged battery or blown fuse. If the fuse has blown, examine

the wiring for the fault and replace with the spare fuse provided.

It is also possible that the performance of a horn may be upset by the fixing bolt working loose, or by some component near the horn becoming loose. If after carrying out the above examination the trouble is not rectified, the horn may need adjustment, but this should not be necessary until the horns have been in service for a long period.

Adjustment does not alter the pitch of the note, it merely takes up wear of moving parts. When adjusting the horns, short-circuit the fuse, otherwise it is liable to blow. Again, if the horns do not sound on adjustment, release the push instantly.

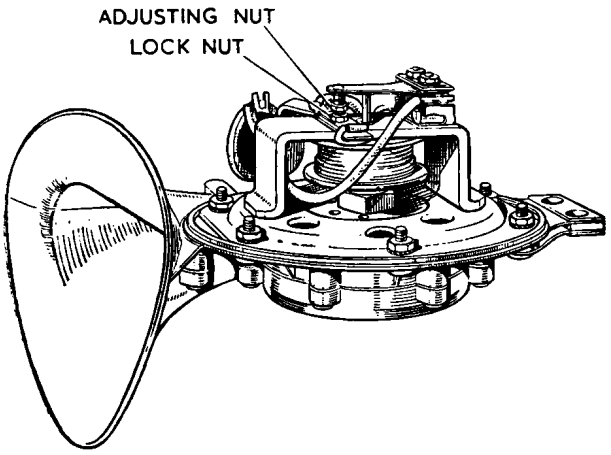


Fig. N.20.
The Lucas model WT614 windtone horn with its cover removed to show the adjustment provided to compensate for wear.

When making adjustments to a horn, always disconnect the supply lead of the other horn, taking care to ensure that it does not come into contact with any part of the chassis and so cause a short circuit.

Adjustment

Remove the horn cover after withdrawing the fixing screw and detach the cover securing bracket by springing it from its fixing.

Slacken the locknut on the fixed contact and rotate the adjusting nut until the contacts are just separated (indicated by horns failing to sound). Turn the adjusting nut half a turn in the opposite direction and secure in this position by tightening the locknut. Finally, if the note is still unsatisfactory, do not dismantle the horn but return it to a Lucas Service Depot or Service Agent for examination.

Section N.15

THE FUSES

The fuses are accessible without removing the cover over the cut-out and regulator. The cover is therefore sealed.

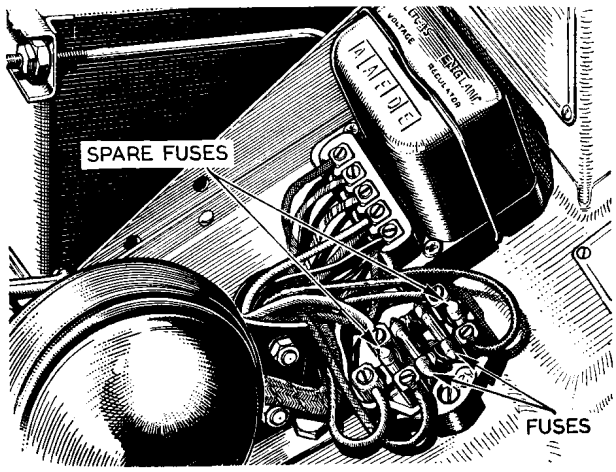


Fig. N.21.
Two spare fuses are carried in recesses on the later separate fuse box.

Fuse marked "AUX" (early models)
Fuse connecting A.1 and A.2 (later models)

This fuse protects the accessories which are connected so that they operate irrespective of whether the ignition switch is on or off.

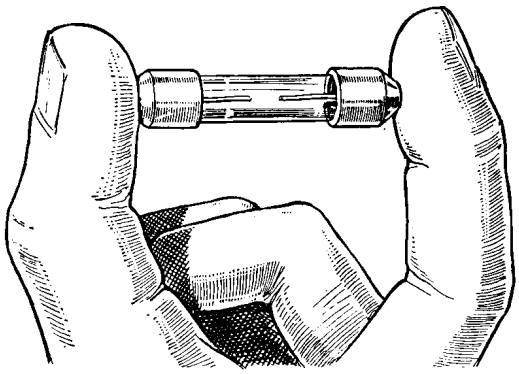


Fig. N.22.
The appearance of a burnt-out fuse.

Fuse marked "AUX IGN" (early models)
Fuse connecting A.3 and A.4 (later models)

This fuse protects the accessories which are connected so that they operate only when the ignition is switched on.

Units protected

The units which are protected by each fuse can readily be identified by referring to the wiring diagrams on pages N.21 to N.23.

Blown fuses

A blown fuse is indicated by the failure of all the units protected by it, and is confirmed by examination of the fuse, which can easily be withdrawn from the spring clips in which it fits. If it has blown, the fused state of the wire will be visible inside the glass tube. Before renewing a blown fuse, inspect the wiring of the units that have failed for evidence of a short circuit or other faults which may have caused the fuse to blow, and remedy the cause of the trouble. This is essential or the fuse is liable to blow again on replacement.

Always use a fuse of the correct fusing value when fitting a new one. The value is clearly marked on the paper strip inside the fuse.

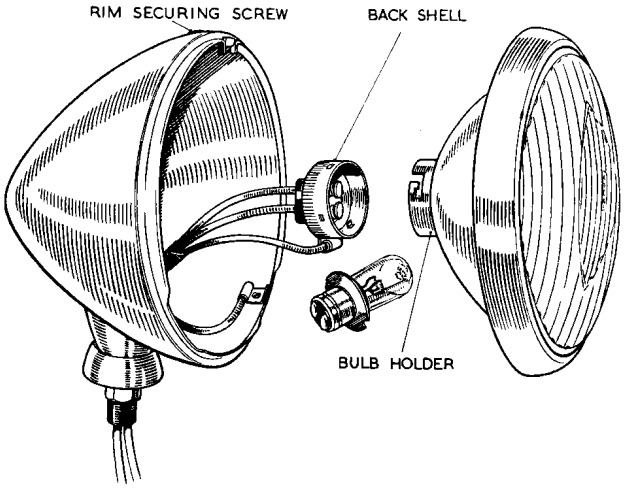


Fig. N.23.
The headlamp separated to show its component parts.

Section N.16

THE HEADLAMPS

Each headlamp incorporates a Lucas light unit, which consists essentially of a reflector and front glass assembly. The bulb, which is a Lucas pre-focus type, is located accurately in the reflector and is secured by a bayonet-fixed back shell which also provides the contact to the bulb. The design of the bulb and of its holder is such that the bulb is correctly positioned in relation to the reflector and no focusing is required when a replacement bulb is fitted.

It is to be noted that the block-type lenses fitted to later models are different on LHD models from those on RHD models and that it is essential to fit correct replacement glasses if the beam formation is to be retained.

The anti-dazzle device

Early Home models are equipped with a double-filament bulb in the left-hand headlamp, controlled by the dipping switch. Operation of the dip switch extinguishes the right-hand lamp and simultaneously deflects the left-hand headlamp beam downwards and to the left to provide good illumination of the left-hand kerb.

On Export models and later Home models both headlamps are fitted with double-filament bulbs.

Operation of the dip-switch extinguishes the main driving beam in each headlamp and brings the dipping beams into action.

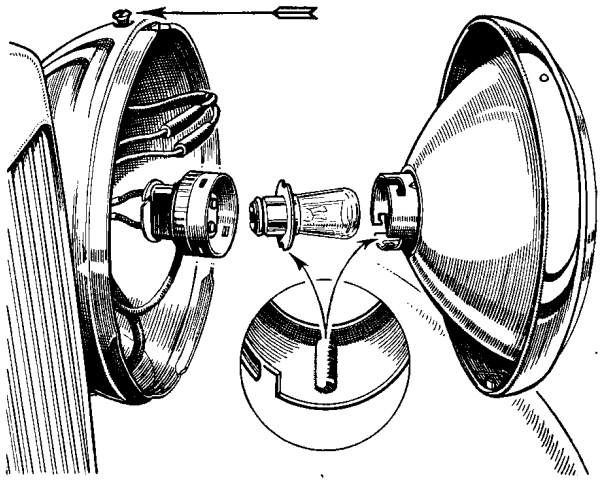


Fig. N.24.
The headlamp with the light unit removed, showing the attachment screw for the light unit and the keyway for the pre-focus bulb.

Bulb replacement

To gain access to the bulb, slacken the screw at the top of the lamp and remove the front rim and light unit assembly. Twist the back shell in an anti-clockwise direction and pull it off. The bulb can now be removed from the rear of the reflector. Place the replacement bulb in the holder and engage the projections of the back shell with the slots in the bulb holder, press on and secure by twisting to the left.

Section N.17

SETTING THE HEADLAMPS

Lucas beam setter

All Lucas Service Depots and many service agents now include among their special testing facilities an apparatus known as the Lucas Beam Setter. This is a specially designed instrument by means of which headlamps can be set with extreme accuracy, thereby ensuring the maximum efficiency from the lamps.

You are strongly advised to make use of this service. If, however, it is not possible to have the lamps adjusted

by this method, the procedure for setting is as follows :—

Each lamp must be set so that the main driving beam is parallel with the road surface, or in accordance with the local regulations. To make the adjustment,

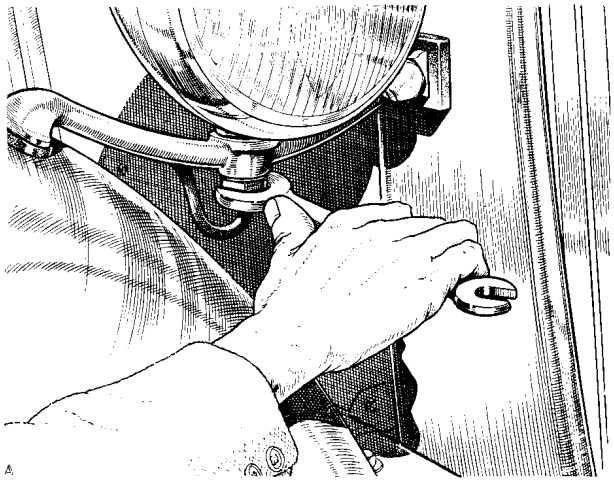


Fig. N.25.

The headlamps are mounted on a spherical seating and can be set accurately when the hexagon attachment nut is slackened.

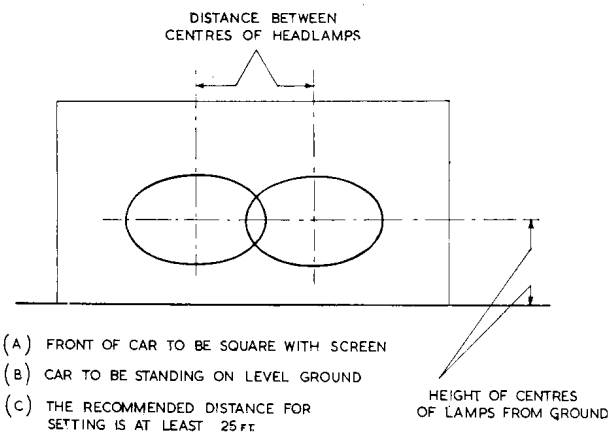


Fig. N.26.

The correct setting for the headlamps is demonstrated in this diagram. On no account should the beams be set higher than this.

slacken the single fixing nut at the base of the lamp and move the lamp on its adjustable mounting to the required position. Finally tighten the locknut.

Section N.18

THE SIDELAMPS

To gain access to the bulb slacken the screw at the top of the lamp and withdraw the front rim and glass assembly.

Section N.19

THE TAIL- AND STOP-LAMPS

Twin lamps are fitted to all models. Each lamp is fitted with a double-filament bulb (6/24 watt). The small-wattage filament is connected to the tail-lamp circuit and the large-wattage filament to the stop-lamp circuit.

Two types of tail-lamp bulb holder have been employed, the normal symmetrical type and, more recently, holders with offset bayonet slots.

The latter type have been introduced to ensure that the bulbs cannot be fitted the wrong way round, thus causing the high-wattage filament to be in circuit when the tail-lamp switch is on, and the low-wattage filament to be operated by the stop switch.

When fitting replacement bulbs no difficulty should be experienced in fitting them correctly, as Lucas No. 189 bulbs (symmetrical type) are marked with the word

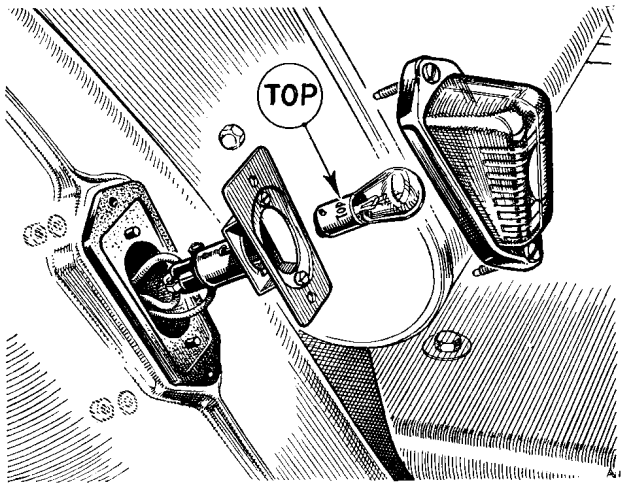


Fig. N.27.

The tail-lamp dismantled to show its component parts and how access is obtained to the bulb. A later type is described and illustrated in Section N.28.

"TOP" on the cap and Lucas No. 361 bulbs (non-reversible type) are designed so that the locating pegs are offset and therefore can only be fitted into the bulb holder in the correct position.

To gain access to the bulb on early models, slacken the two screws held by nuts and spring washers under the wing and withdraw the rim and glass assembly. (For later models see Section N.28.)

Section N.20

THE NUMBER-PLATE ILLUMINATION LAMP

To gain access to the bulb, slacken the single central securing screw for the plated cover and withdraw the cover and glass assembly.

The 12-volt lamp bulb is of the miniature bayonet type and bears the Lucas Part No. 989. Early models were fitted with two bulbs.

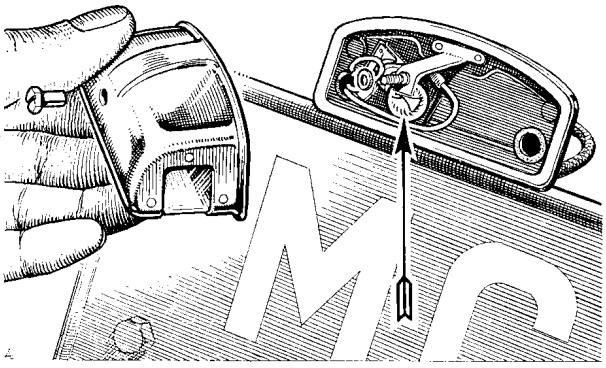


Fig. N.28.
The cover of the number-plate lamp removed to show the mounting of the bulbs on later models. On early models two bulbs were employed.

Section N.21

THE PANEL LAMPS

The instruments are illuminated by small screw-in type bulbs located behind the instrument panel and access to them can be obtained through a hand-hole cut in the inner panel close to the steering column.

More comfortable access can be achieved by removing the facia board undershield panel. Early models were fitted with four bulbs, but on later models only three are employed.

Section N.22

REMOVAL OF THE INSTRUMENT PANEL

Release the large facia panel undershield and lower the steering column. This will give access to the rear of the instrument panel, which is held by six nuts. Disconnect the starter and mixture controls, remove the panel attachment nuts and withdraw the panel.

Section N.23

THE IGNITION AND FUEL WARNING LAMPS

Access to the bulbs of the ignition and fuel warning lamps is obtained by unscrewing the slotted plated rims surrounding the lights. Removal of the rims releases the bulbs from their spring holders and no difficulty arises in replacement.

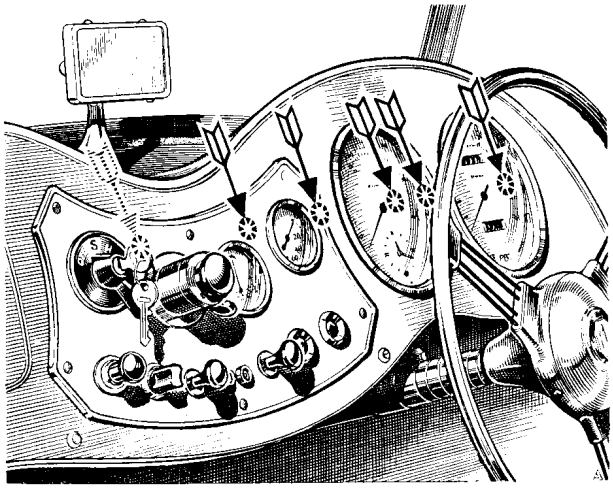


Fig. N.29.
Access to the panel lamps is obtained by removing the instrument panel cover.

The ignition and fuel warning bulbs are Lucas No. 970 2·5-volt, ·5-watt.

Section N.24

LOCATION AND REMEDY OF FAULTS

Although every precaution is taken to eliminate possible causes of trouble, failure may occasionally

REPLACEMENT BULBS

	Lucas No.	*Volts*	*Watts*
Headlamps (Main), Home (L/H)—early models	300 (dip left)	12	36/36
Headlamps (Main), Home (R/H)—early models	162	12	36
Headlamps, Export (R.H.D.) and Home later models	354 (dip left)	12	42/36
Headlamps, Export (L.H.D.)	301 (dip right)	12	36/36
Headlamps, Export (Europe [except France] and N. Africa)	360	12	45/35
Sidelamps	207	12	6
Stop/tail-lamps (reversible)	189	12	6/24
Stop/tail-lamps (non-reversible)	361	12	6/18
Number-plate illumination lamp	989	12	6
Ignition, fuel and headlamp beam warning light	970	2·5	·5
Fog-lamp	323	12	48

develop through lack of attention to the equipment, or damage to the wiring. The following pages set out the recommended procedure for a systematic examination to locate and remedy the causes of some of the more usual faults encountered.

The sources of trouble are by no means always obvious, and in some cases a considerable amount of deduction from the symptoms is needed before the cause is disclosed.

For instance, the engine might not respond to the starter switch ; a hasty inference would be that the starter motor is at fault. However, as the motor is dependent on the battery, it may be that the battery is exhausted.

This, in turn, may be due to the dynamo failing to charge the battery, and the final cause of the trouble may be, perhaps, a loose connection in some part of the charging circuit.

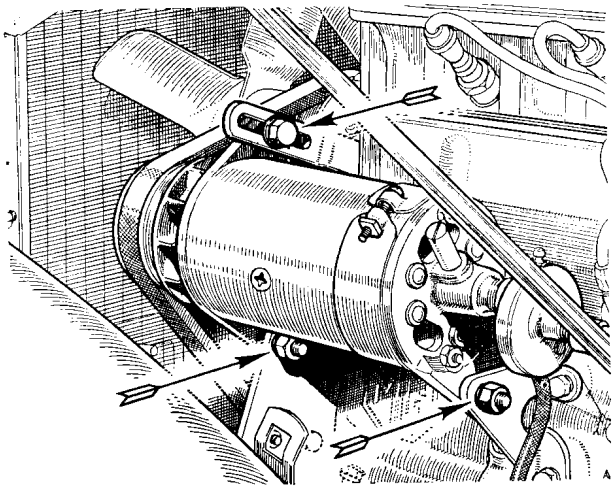


Fig. N.30.

The dynamo drive belt is adjusted by slackening the three dynamo attachment bolts and swinging the dynamo on the two lower ones into the desired position. All three must then be tightened carefully.

If, after carrying out an examination, the cause of the trouble is not found, the equipment should be checked by the nearest Lucas Service Depot or Agent.

Much needless damage can be done to items of the equipment by attempting to correct faults without the necessary equipment and experience.

THE CHARGING CIRCUIT

1. *Battery in low state of charge*

(*a*) This state will be shown by lack of power when starting, poor light from the lamps, and hydrometer readings below 1·200. It may be due to the dynamo not charging or giving low or intermittent output. The ignition warning light will not go out if the dynamo fails to charge, or will flicker on and off in the event of intermittent output.

(*b*) Examine the charging and field circuit wiring, tightening any loose connections or renewing broken cables. Pay particular attention to the battery connections.

(*c*) Examine the dynamo driving belt ; take up any undue slackness by swinging the dynamo outwards on its mounting after slackening the attachment bolts.

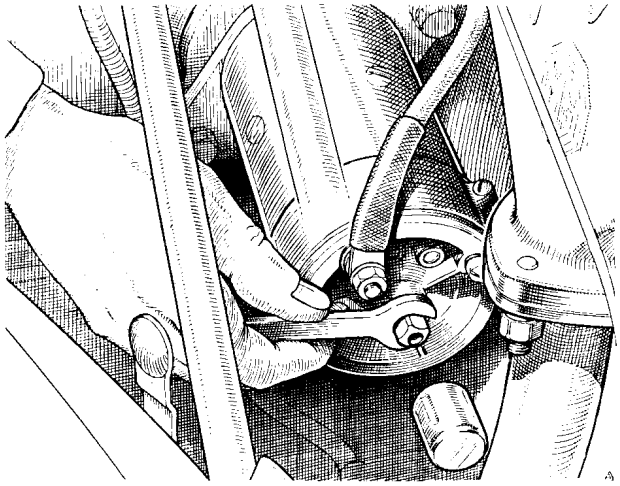


Fig. N.31.

Should the starter motor pinion become jammed with the flywheel it may be freed by rotating the spindle by the square provided on the end.

(*d*) Check the regulator setting and adjust if necessary.

(*e*) If, after carrying out the above, the trouble is still not cured, have the equipment examined by a Lucas Service Depot or Agent.

2. *Battery overcharged*

(*a*) This will be indicated by burnt-out bulbs, very frequent need for topping up the battery, and high hydrometer readings. Check the charging current when the engine is running steadily with a fully charged battery and no lights or accessories in use ; the charge reading should be of the order of only 3–4 amperes.

If the charge reading is in excess of this value, it is advisable to check the regulator setting and adjust if necessary.

THE STARTER MOTOR

1. *Starter motor lacks power or fails to turn engine*
   (*a*) See if the engine can be turned over by hand. If not, the cause of the stiffness in the engine must be located and remedied.
   (*b*) If the engine can be turned by hand, first check that the trouble is not due to a discharged battery.
   (*c*) Examine the connections to the battery, starter and starter switch, making sure that they are tight and that the cables connecting these units are not damaged.
   (*d*) It is also possible that the starter pinion may have jammed in mesh with the flywheel, although this is by no means a common occurrence. To disengage the pinion, rotate the squared end of the starter shaft by means of a spanner.

2. *Starter operates but does not crank engine*
   This fault will occur if the pinion of the starter drive is not allowed to move along the screwed sleeve into engagement with the flywheel, due to dirt having collected on the screwed sleeve. Remove the starter and clean the sleeve carefully with paraffin.

3. *Starter pinion will not disengage from flywheel when engine is running*
   Stop the engine and see if the starter pinion is jammed in mesh with the flywheel, releasing it if necessary by rotation of the squared end of the starter shaft. If the pinion persists in sticking in mesh, have the equipment examined at a Service Depot. Serious damage may result to the starter if it is driven by the flywheel.

THE LIGHTING CIRCUITS

1. *Lamps give insufficient illumination*
   (*a*) Test the state of charge of the battery, recharging it if necessary from an independent electrical supply.
   (*b*) Check the setting of the lamps.
   (*c*) If the bulbs are discoloured as the result of long service, they should be renewed.

2. *Lamps light when switched on but gradually fade out*
   As paragraph 1 (*a*).

3. *Brilliance varies with speed of car*
   (*a*) As paragraph 1 (*a*).
   (*b*) Examine the battery connections, making sure that they are tight, and renew any faulty cables.

Section N.25

THE HEADLAMP BEAM WARNING LIGHT

In order to give the driver visual warning to dip his headlamp beams on approaching other vehicles, later M.G. Midget cars have a warning light in the speedometer which glows when the headlamp beams are in the raised position and is extinguished when the beams are dipped.

Section N.26

MODIFIED DIPPING SWITCH

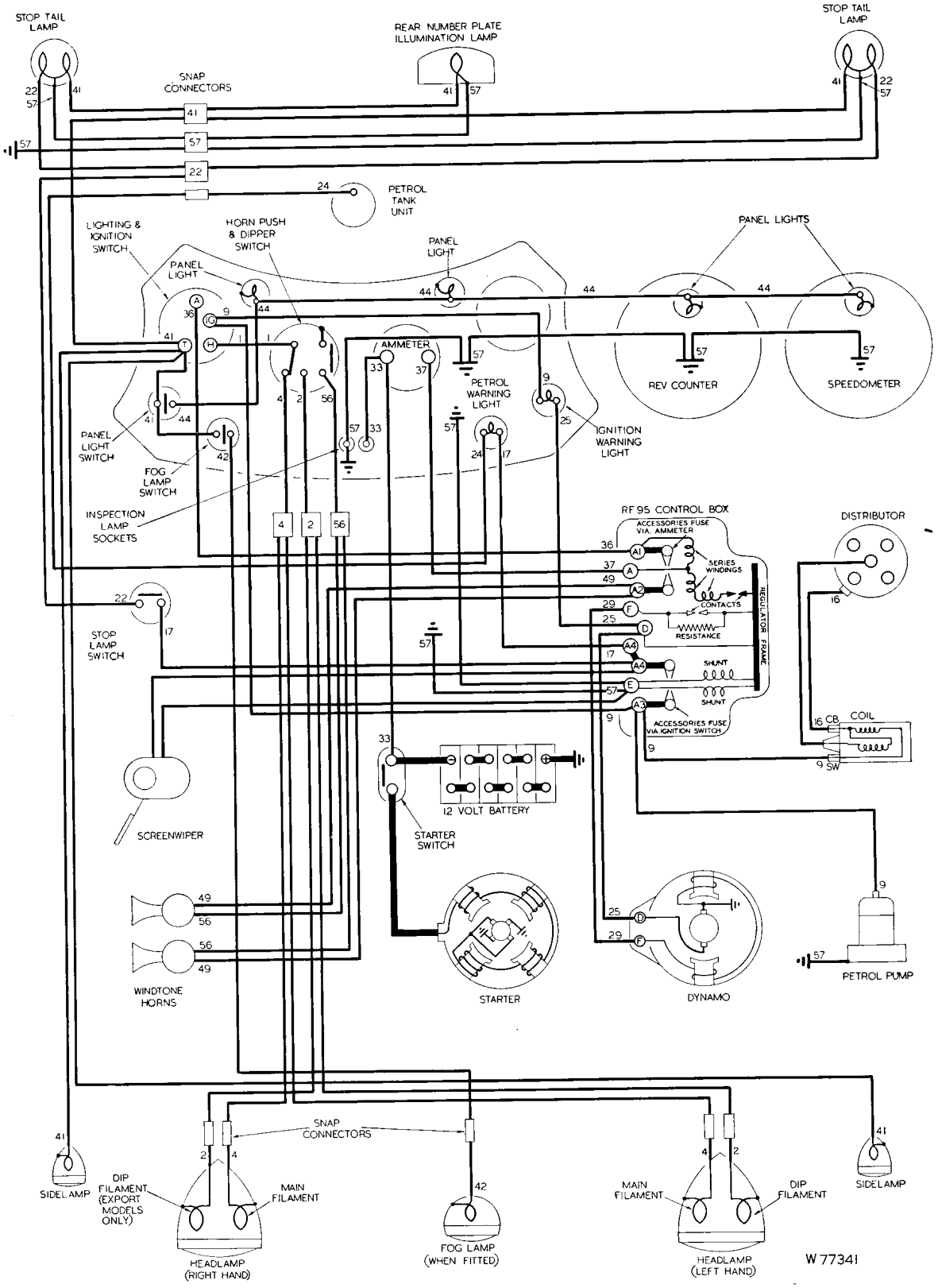
Later M.G. Midget Series " TD " cars are provided with a foot-operated headlamp beam dipping switch, replacing the hand switch on the facia panel which was originally fitted.

The new wiring diagram covering this equipment is given on page N.23.

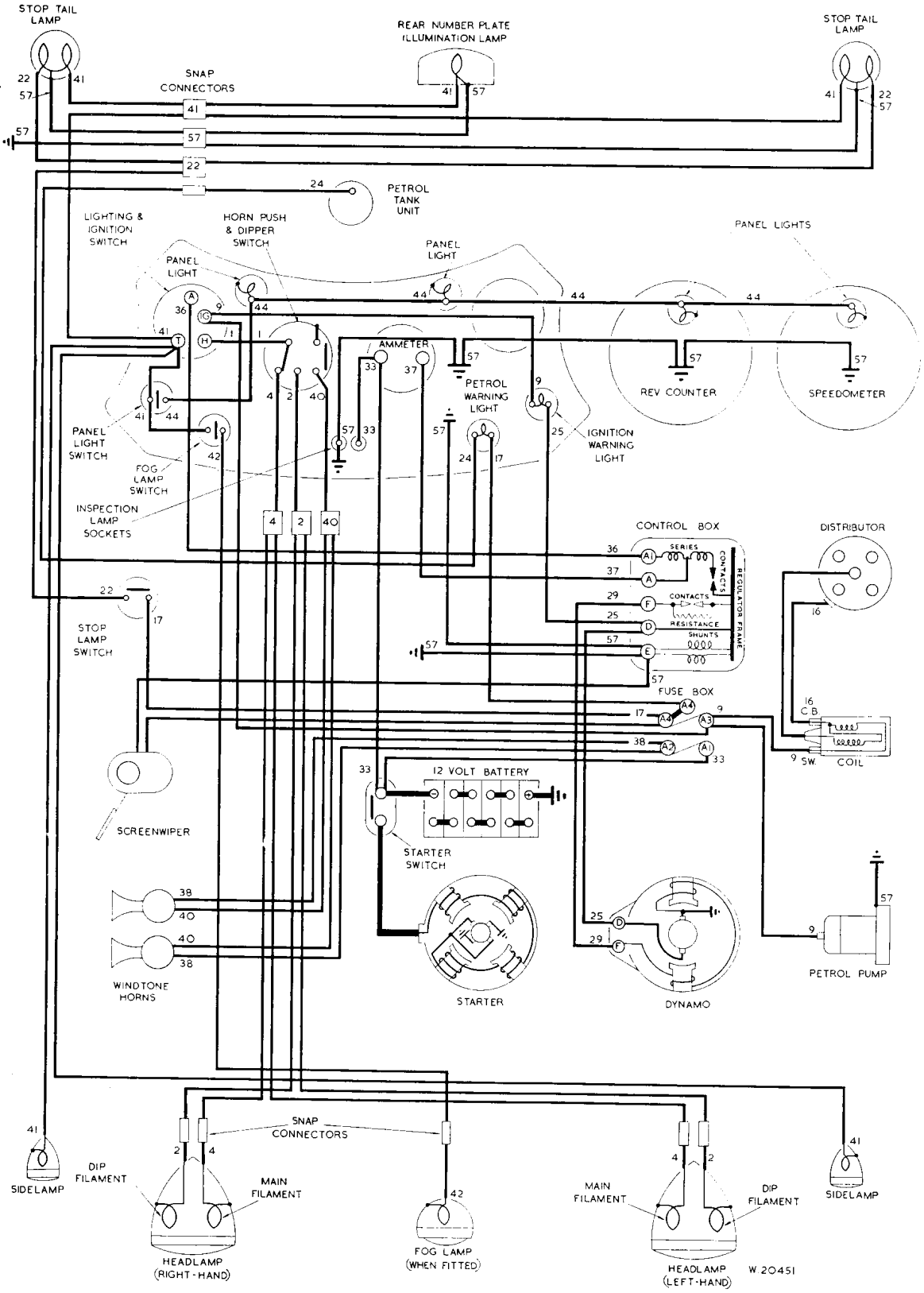
KEY TO CABLE COLOURS

1 Blue
2 Blue *with* Red
3 Blue *with* Yellow
4 Blue *with* White
5 Blue *with* Green
6 Blue *with* Purple
7 Blue *with* Brown
8 Blue *with* Black
9 White
10 White *with* Red
11 White *with* Yellow
12 White *with* Blue
13 White *with* Green
14 White *with* Purple
15 White *with* Brown
16 White *with* Black
17 Green
18 Green *with* Red
19 Green *with* Yellow
20 Green *with* Blue
21 Green *with* White
22 Green *with* Purple
23 Green *with* Brown
24 Green *with* Black
25 Yellow
26 Yellow *with* Red
27 Yellow *with* Blue
28 Yellow *with* White
29 Yellow *with* Green
30 Yellow *with* Purple
31 Yellow *with* Brown
32 Yellow *with* Black
33 Brown
34 Brown *with* Red
35 Brown *with* Yellow
36 Brown *with* Blue
37 Brown *with* White
38 Brown *with* Green
39 Brown *with* Purple
40 Brown *with* Black
41 Red
42 Red *with* Yellow
43 Red *with* Blue
44 Red *with* White
45 Red *with* Green
46 Red *with* Purple
47 Red *with* Brown
48 Red *with* Black
49 Purple
50 Purple *with* Red
51 Purple *with* Yellow
52 Purple *with* Blue
53 Purple *with* White
54 Purple *with* Green
55 Purple *with* Brown
56 Purple *with* Black
57 Black
58 Black *with* Red
59 Black *with* Yellow
60 Black *with* Blue
61 Black *with* White
62 Black *with* Green
63 Black *with* Purple
64 Black *with* Brown
65 Dark Green
66 Light Green

WIRING DIAGRAM

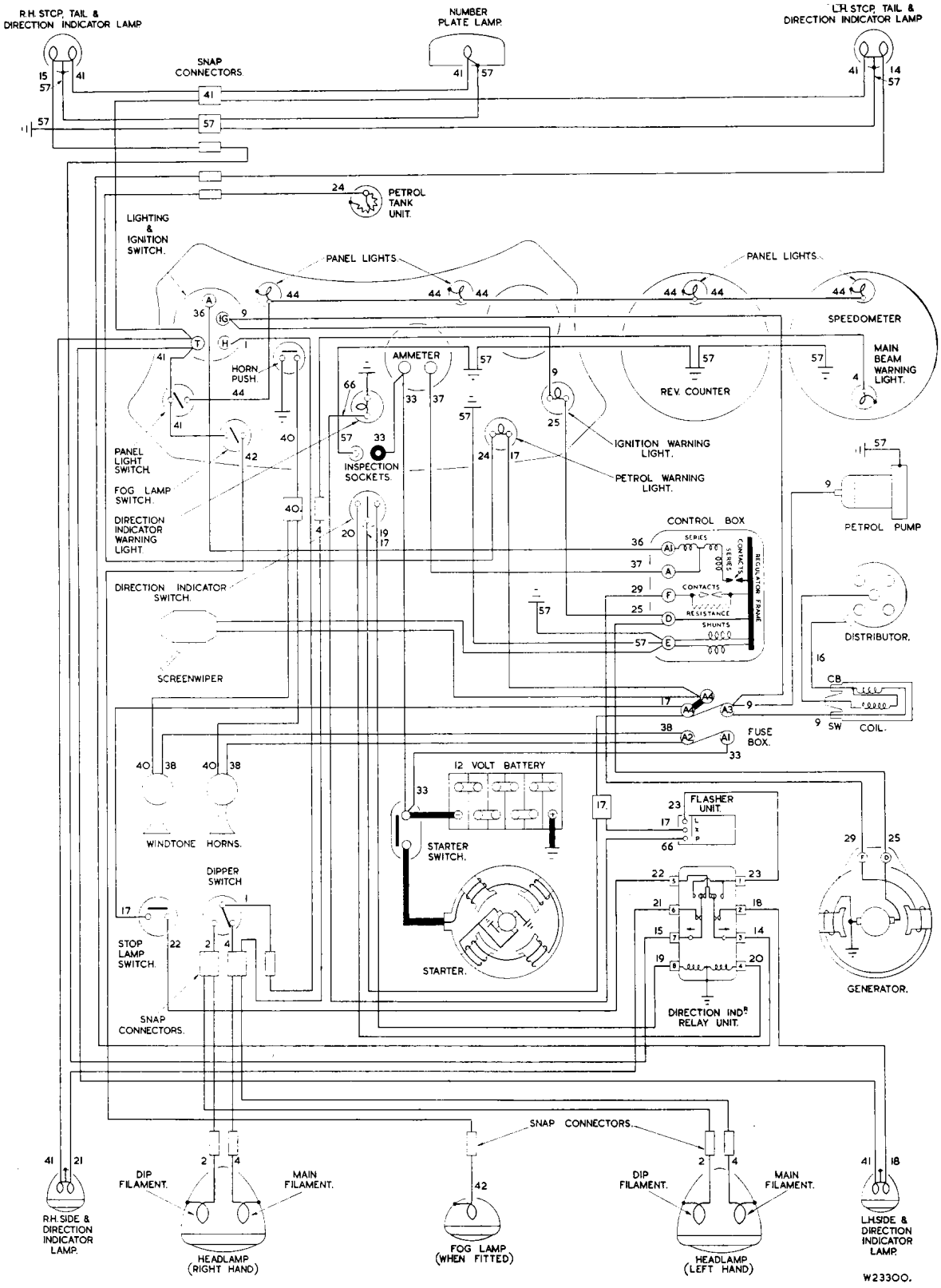


WIRING DIAGRAM FOR CARS WITH SEPARATE CONTROL AND FUSE BOXES



Key to cable colours as on page N.20.

WIRING DIAGRAM FOR CARS WITH SEPARATE CONTROL AND FUSE BOXES, HEADLAMP BEAM WARNING LIGHT, FOOT-OPERATED DIP SWITCH, AND PROVISION FOR FLASHING TRAFFIC INDICATOR LIGHTS



Key to cable colours as on page N.20.

Section N.27

THE "CORRECT-ACID-LEVEL" DEVICE

Correct-acid-level devices are now fitted as standard to the majority of Lucas batteries, one of these devices being located in each cell filler hole. The method of topping up a battery fitted with these is shown in Fig. N.32. It will be seen that the well-known "air-trap" is the principle underlying their operation.

The device consists of a central tube with a perforated flange which rests on a ledge in the filling orifice. When topping up, pour distilled water *into the flange* until no more drains through into the cell and the water begins to rise in the flange. This will happen when the electrolyte level reaches the

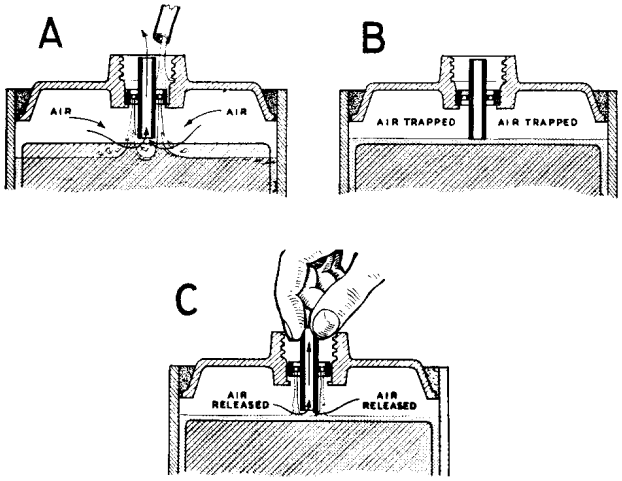


Fig. N.32.
The operation of the "correct-acid-level" device.

bottom of the central tube, thereby preventing further escape of air displaced by the topping up water introduced. By lifting the tube slightly the small amount of water held in the flange will drain into the cell and the electrolyte level will then be correct.

The illustration (Fig. N.32) shows :—

(*a*) Electrolyte level below normal. Pour distilled water into the flange around the central tube.

(*b*) Cease pouring when the water ceases to flow through the flange and begins to rise above it. The electrolyte level is now controlled by the air lock.

(*c*) Release the water which has collected in the flange by lifting the tube slightly.

The electrolyte level is then correct.

Section N.28

MODIFIED TAIL- AND STOP-LAMPS

Later models are fitted with circular tail- and stop-lamps in place of the moulded type previously used. They are mounted on chromium-plated plinths, which are attached to the rear wings by Phillips screws.

The plated rim and glass are held in grooves in the rubber surround. Move aside the rubber ring and remove the plated rim and then, in a similar manner, remove the glass. The bulb, which is then accessible, is of the double-filament type (6/18 watts). The smaller wattage filament is connected to the tail-lamp circuit and the larger wattage filament to the stop-lamp circuit. When fitting replacement bulbs no difficulty should be experienced in fitting them correctly as the bulbs are designed so that the locating pegs are offset and therefore can only be fitted into the bulb holder in the correct position.

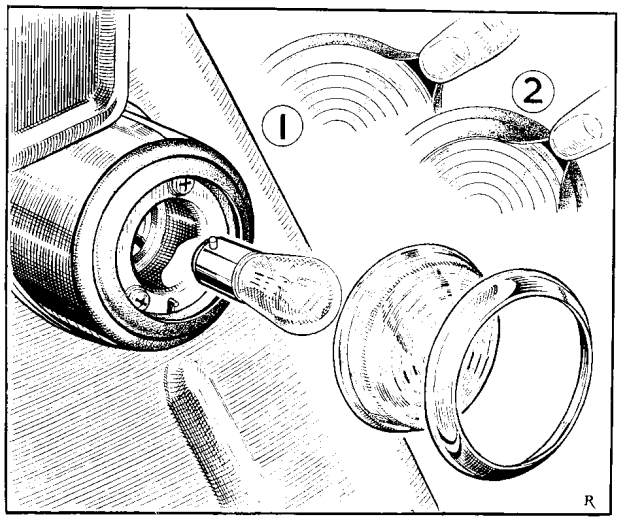


Fig. N.33.

The tail- and stop-lamps fitted to later models. To gain access to the bulb turn back the rubber flange and extract the plate rim (1); next turn back the inner lip and pull out the glass (2).

Section N.29

THE HEADLAMPS (Series "TF")

The headlamps are built into the wings and are fitted with double-filament bulbs.

The design of the headlamp and its holder is such that the bulb is correctly positioned in relation to the reflector, and no special attention to focusing is required when a replacement bulb is fitted.

In short, the lamps are of the pre-focused type, with replaceable bulbs.

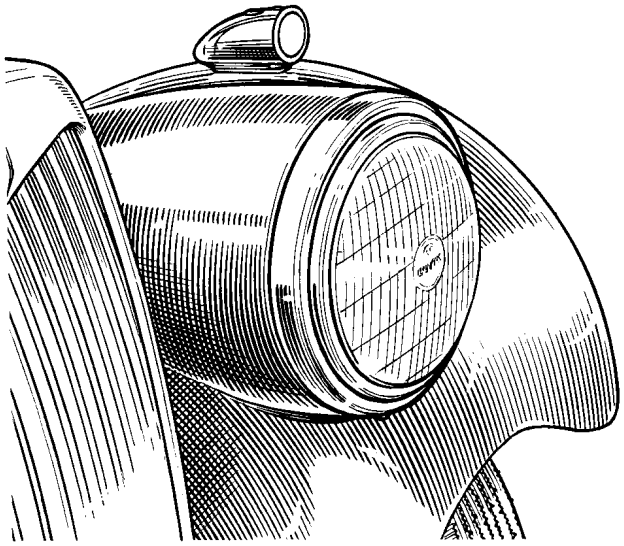


Fig. N.34.
The headlamp mounting on the Midget (Series "TF").

The anti-dazzle device

All models are equipped with double-filament bulbs controlled by the foot-operated dipping switch.

Operation of the dip switch deflects both headlamp beams downwards to avoid dazzle.

Certain countries have lighting regulations to which the foregoing arrangements do not conform, and cars exported to such countries have lighting equipment modified to suit the regulations existing in the countries concerned.

Section N.30

THE LIGHT UNITS (Series "TF")

The light units consist of a lamp glass, reflector, and a back shell. The light unit is located to the front wing by three spring-loaded attachment screws in a domed shield attached to the wing. The back of the lamp is therefore sealed to give complete protection.

A dust- and weather-excluding rubber is fitted in the recess of the rim of the light unit and a plated rim is fitted over this to complete the weather sealing.

Section N.31

REMOVING THE LIGHT UNITS (Series "TF")

To remove the light unit for bulb replacement, unscrew the retaining screw at the bottom of the plated lamp rim and lift the rim away from the dust-excluding rubber.

Remove the dust-excluding rubber, which will reveal the three spring-loaded screws. Press the light unit inwards against the tension of the springs and turn it in an anti-clockwise direction until the heads of the screws can pass through the enlarged ends of the keyhole slots in the lamp rim.

This will enable you to withdraw the light unit sufficiently to give attention to the wiring and bulbs.

Section N.32

REPLACING HEADLAMP BULBS (Series "TF")

Twist the back shell anti-clockwise and pull it off. Withdraw the bulb from the holder.

Insert the replacement bulb in the holder, making sure that the slot in the periphery of the bulb flange engages the projection in the holder.

Engage the projections on the back shell with the slots of the holder, press it on and twist it clockwise until it engages with its catch.

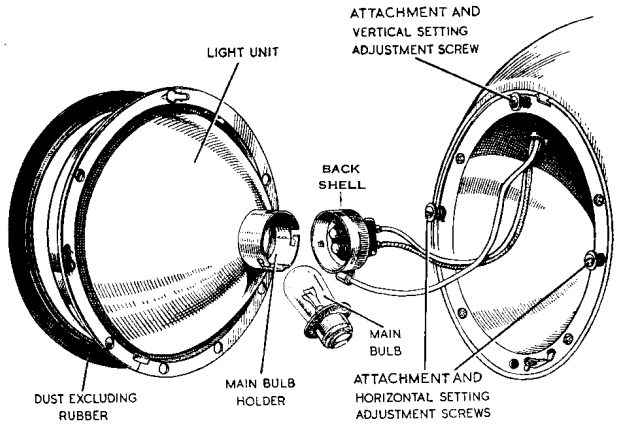


Fig. N.35.
The lamp holder and back shell is exposed when the lamp unit is removed.

Section N.33

REPLACING THE LIGHT UNITS (Series "TF")

Position the light unit so that the heads of the adjusting screws coincide with the enlarged ends of the attachment slots. Push the light unit towards the wing to compress the springs and turn the unit

to the right as far as it will go, that is, approximately ½ in. (13 mm.).

Replace the dust-excluding rubber on the light rim with its flanged face forward and refit the plated rim.

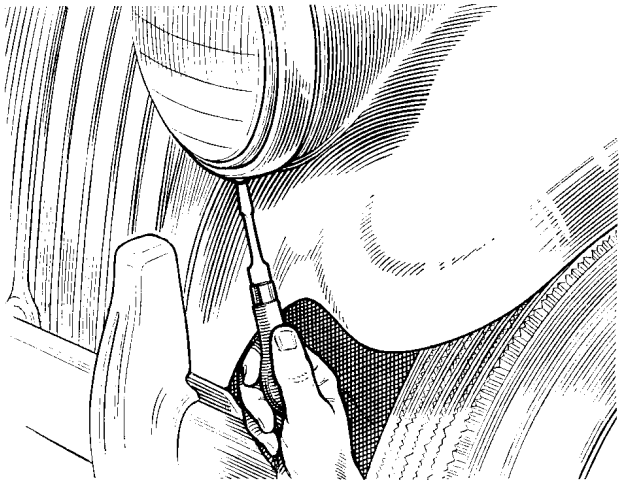


Fig. N.36.
The headlamp rim retaining screw.

Section N.34

SETTING THE HEADLAMPS (Series "TF")

The lamps should be set so that the main driving beams are parallel with the road surface or in accordance with your local regulations.

If adjustment is required, this is achieved by removing the plated rim and dust-excluding rubber as indicated in Section N.17.

Vertical adjustment can then be made by turning the screws at the top of the lamp in the necessary direction.

Horizontal adjustment can be effected by using the adjustment screws on each side of the light unit.

Section N.35

CLEANING THE LAMPS (Series "TF")

Care must be taken when handling headlamp reflectors to prevent them from becoming finger-marked. A transparent and colourless protective covering enables any finger-marks to be removed by polishing with a chamois leather or a very soft dry cloth if they do become marked. **Do not use metal polish on reflectors.**

Chromium-plated surfaces such as lamp rims should be washed with plenty of water, and when the dirt is completely removed they may be polished with a chamois leather or soft dry cloth. **Do not use metal polishes on chromium plating.**

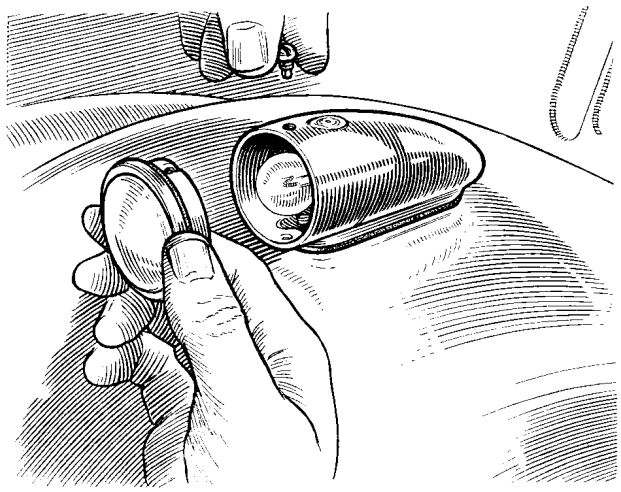


Fig. N.37.
Removal of the securing screw enables the glass and rim to be withdrawn to give access to the bulb.

Section N.36

SIDELAMPS

To reach the bulb in a sidelamp, take out the screw in the top of the lamp and withdraw the glass and rim forward.

The bulb has a bayonet fitting.

Section N.37

THE TAIL-LAMPS AND STOP-LIGHTS (Series "TF")

The tail-lamps are of the double-filament type, the second filament giving a marked increase in brilliance when the brakes are applied.

To obtain access to the bulbs, withdraw the rims

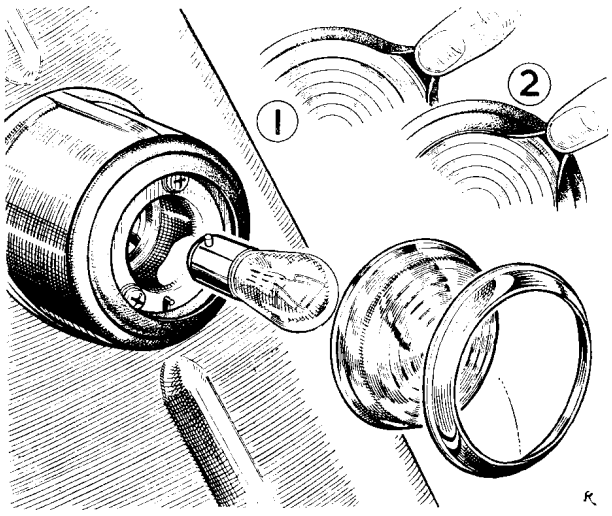


Fig. N.38.
Illustrating the rim and glass removal from a tail-lamp.

and glasses from the rubber flanges by folding the flange back with the fingers. The bulbs are held in bayonet-type holders with offset pins and are easily removed for replacement.

Note.—*Twin-filament bulbs can normally be fitted in their bayonet holders in either of the two positions. If they are fitted the wrong way round the action of the lamp will be reversed, and a bright light will be emitted under normal conditions while a dim light will appear when the stop switch comes into operation.*

It is therefore essential to make sure that the bulbs have been fitted the right way round, and they are marked " top " to facilitate their correct replacement **in addition to possessing offset pins to prevent their incorrect replacement.**

Section N.38

NUMBER-PLATE LAMP (Series "TF")

A single bulb with bayonet fixing is fitted and the cover may be removed after slackening the small retaining screw.

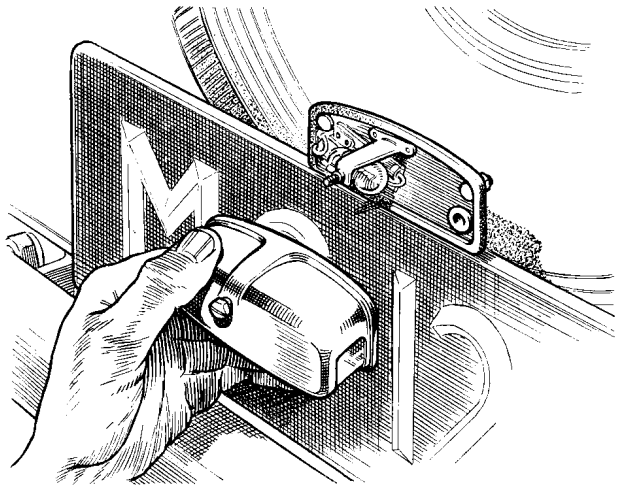


Fig. N.39.
Illustrating the removal of the number-plate lamp cover.

Section N.39

THE PANEL AND MAP LIGHTS (Series "TF")

There are three bulbs illuminating the instruments and their locations are shown in the accompanying illustration.

To obtain access to them it is necessary to remove the protective panel under the facia board. There is one in each of the casings for the revolution indicator and speedometer, and one above the ammeter and oil pressure gauge. The map lamp above each glove pocket may be withdrawn from its bracket to facilitate bulb replacement.

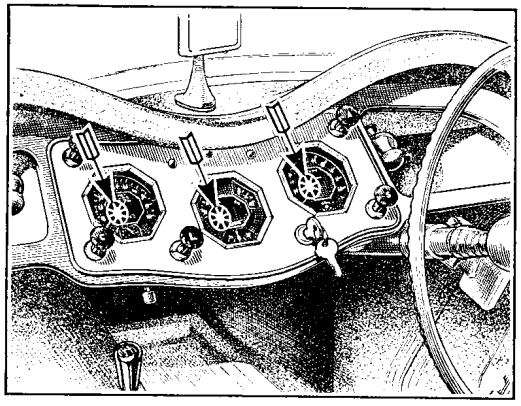


Fig. N.40.
Showing the location of the panel lamp bulbs.

Section N.40

WARNING LIGHTS (Series "TF")

The four warning lights are accessible after removal of the protective panel under the facia board. The bulbs are the same as those used for panel illumination.

Section N.41

REPLACEMENT BULBS (12 VOLT) (Series "TF")

	Watts		*Lucas No.*
Headlamps, Home and Export (RHD) (dip left)	42/36	(pre-focus)	354
Headlamps, Export and U.S.A. (LHD) (dip right) ...	36/36	(pre-focus)	301
Headlamps, Export (Europe except France)	45/35	(pre-focus)	360
Sidelamp	6/18	(S.C.C.)	369
Stop tail-lamp (irreversible)	6/18	(S.B.C.)	361
Number-plate lamp	4	(M.C.C.)	222
Panel light	2·2	(M.E.S.)	987
Ignition warning light	2·2	(M.E.S.)	985
Fuel warning light	2·2	(M.E.S.)	987
Flasher warning light	2·2	(M.E.S.)	987

Section N.42

WINDSCREEN WIPER (Series "TF")

Normally the windscreen wiper will not require any servicing apart from the occasional renewal of the rubber blades.

Should any trouble be experienced, first check for loose connections, worn insulation, etc., before dismantling the motor.

1. *To detach the cable rack from the motor and gearbox*

Remove the gearbox cover.

Remove the split pin and washer from the crank pin and final gear wheel.

Lift off the connecting link.

2. *Commutator dirty*

Remove the connecting leads to the terminals, withdraw the three screws securing the cover at the commutator end. Lift off the cover. Clean the commutator with a cloth moistened with petrol and carefully remove any carbon dust from between the commutator segments.

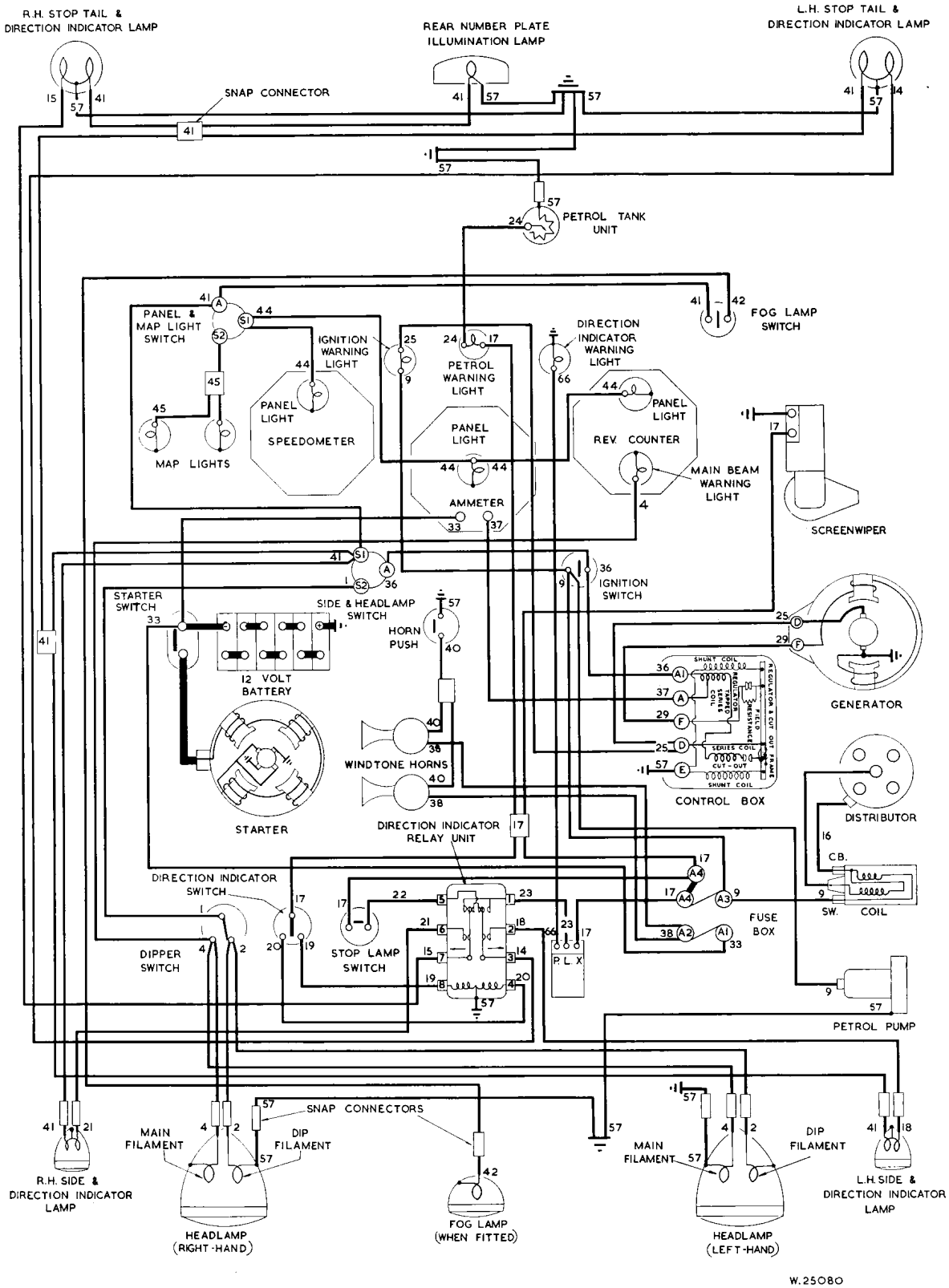
3. *Brush lever stiff or brushes not bearing on commutator*

Check that the brushes bear freely on the commutator. If they are loose, and do not make contact, a replacement tension spring is necessary. The brush levers must be free on their pivots. If they are stiff they should be freed by working them backwards and forwards by hand and by applying a trace of thin machine oil. Packing shims are fitted beneath the legs of the brush levers to ensure that the brushes are central and that there is no possibility of the brush boxes fouling the commutator. If the brushes are considerably worn they must be replaced.

4. *Motor operates but does not transit motion to spindles*

Remove the cover of the gearbox. A push-pull motion should be transmitted to the inner cable of the flexible rack. If the cross-head moves sluggishly between the guides, lightly smear a small amount of medium grade engine oil in the groove formed in the die-cast housing. When overhauling, the gear must be lubricated by lightly packing the gearbox with a grease to Ref. D (page P.2).

WIRING DIAGRAM FOR M.G. MIDGET (Series "TF")



Key to cable colours as on page N.20.