RUNNING INSTRUCTIONS

FOR THE

LUCAS 1930 DYNAMO LIGHTING SETS

FOR MOTOR-CYCLES

(6 AND 4 VOLT EQUIPMENT)

LUCAS

DESIGNED AND MANUFACTURED BY

JOSEPH LUCAS LIMITED. BIRMINGHAM. ENGLAND

Instruction Booklet No. 139.

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JOSEPH LUCAS LIMITED,

HEAD OFFICES AND WORKS:

BIRMINGHAM, ENGLAND.

TELEGRAMS: "LUCAS, BIRMINGHAM." TELEPHONE: NORTHERN 2201 (10 LINES)

CODES USED—ABC (5TH & 6TH EDITIONS), BENTLEYS AND 2ND BENTLEYS.

P/129/L

Running Instructions for the Lucas 1930 Dynamo Lighting Sets.

THE DYNAMO (Types E3C and E25).

The E3 dynamo is a 6 volt machine and gives a maximum output of 4 to 5 amperes, while the E25 is a 4 volt machine giving from 4 to 4½ amperes. The regulation of both these dynamos is effected by means of the well-known three-brush method. The two main brushes lie across a horizontal diameter, the positive insulated, and the negative earthed to the frame of the machine.

The dynamo does not require a great deal of attention, but there are a few components which should be inspected occasionally to ensure satisfactory running.

Before removing the cover for any reason, *it is necessary* to disconnect the positive lead of the battery to avoid the danger of reversing the polarity of the dynamo, or short circuiting the battery, either of which might cause serious damage.

If at any time the motor cycle must be ridden with the batteries disconnected, or in any way out of service, it is essential to run with the switch in the **"OFF"** *position.*

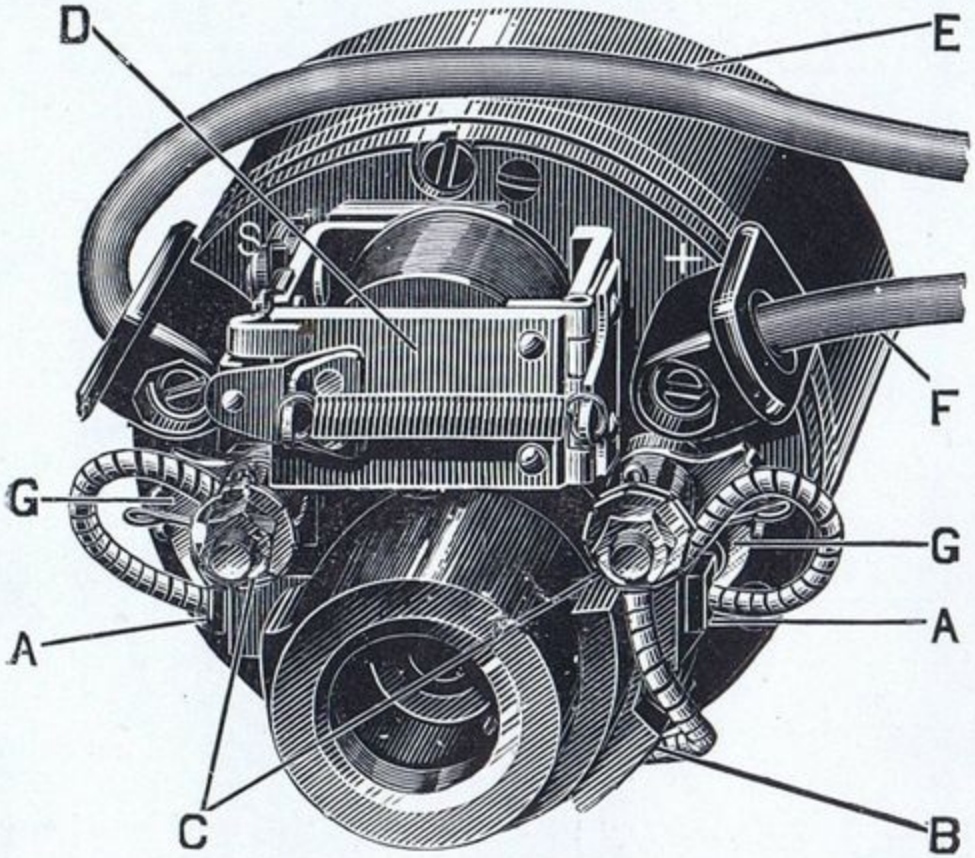


FIG. 1. DYNAMO TYPE E3.

A—Main brush.
B—Control brush.
C—Nuts securing brush eyelets.
D—Cutout.
E—Cable to head lamp switch terminal marked F.
F—Cable to head lamp switch terminal marked +.
G—Spring lever holding brushes in position.

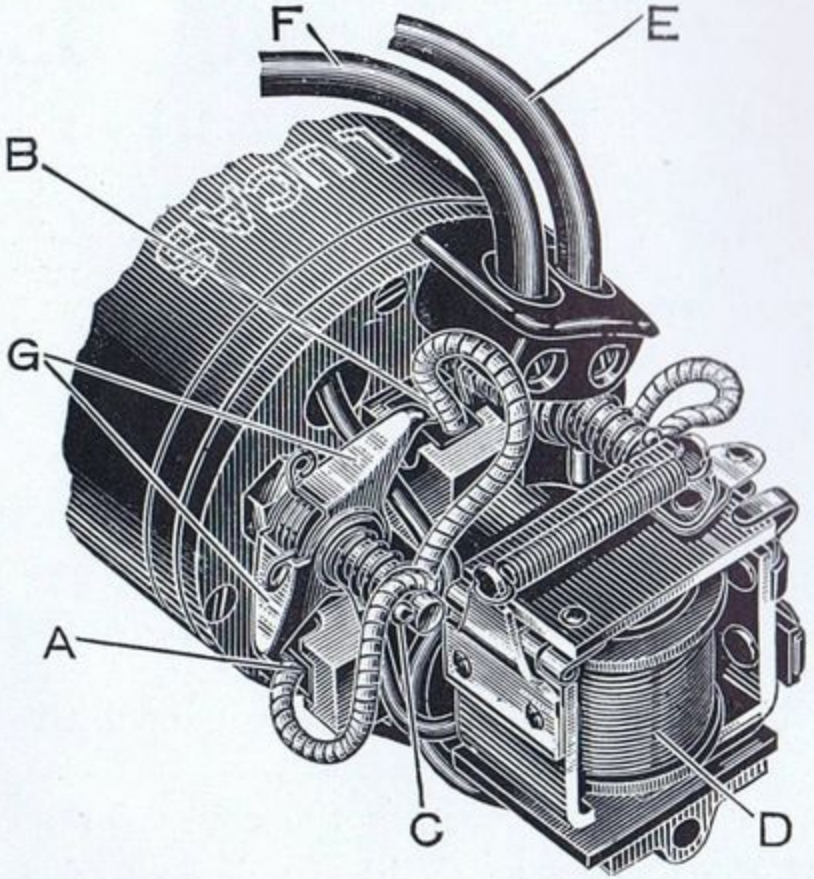


FIG. 2. DYNAMO TYPE E25.

A—Main brush.
B—Control brush.
C—Cotter pin securing brush eyelet.
D—Cutout.
E—Cable to head lamp switch terminal marked +.
F—Cable to head lamp switch terminal marked F.
G—Spring lever holding brushes in position.

Brushes.

It is very important to make sure that the brushes work freely in their holders. This can be easily ascertained by holding back the spring lever and gently pulling each flexible lead, when the brush should move without the slightest suggestion of sluggishness. The brushes should be clean and "bed" over the whole surface; that is, the face in contact with the commutator should appear uniformly polished. Dirty brushes may be cleaned with a cloth moistened with petrol.

If the brushes become so badly worn that it is necessary to replace them, this can easily be done as follows:—

Release the eyelet on the brush lead by unscrewing the hexagonal nut "C" (Fig. 1) or by withdrawing the cotter pin "C" (Fig. 2); then, holding back the spring lever "G" out of the way, withdraw the brush from its holder.

The brush springs should be inspected occasionally to see that they have sufficient tension to keep the brushes firmly pressed against the commutator when the machine is running. It is particularly necessary to keep this in mind when the brushes have been in use a long time and are very much worn down.

Owners are cautioned that it is unwise to insert brushes of a grade other than that supplied with the machine, or to change the tension springs. The arrangement provided has been made only after many years' experience, and will be found to give the best results and the longest life.

Commutator.

The surface of the commutator should be kept clean and free from oil or brush dust, etc. Should any grease or oil work its way on to the commutator through over-lubrication, it will not only cause sparking but in addition, carbon and copper dust will be collected in the grooves between the commutator segments. The best way to clean the commutator is, without disconnecting any leads, to remove from its box one of the main brushes, and, inserting a fine duster in the box, hold it, by means of a suitably shaped piece of wood, against the commutator surface, causing the armature to be rotated at the same time. If the commutator has been neglected for long periods, it may need cleaning with fine glass paper, but this is more difficult to do and should not be necessary if it has received regular attention.

Electro Magnetic Cut-out.

The cut-out, which is mounted on the commutator end bracket of the dynamo, automatically closes the charging circuit, as soon as the dynamo voltage rises above that of the battery. When the dynamo voltage falls below that of the battery, the reverse action takes place, that is, the cut-out opens and thereby prevents the battery from discharging itself through the dynamo.

The cut-out is accurately set before leaving the Works, and should not be tampered with or adjusted. Should the cut-out fail to close the circuit on accelerating the engine, the cause of the damage is likely to be found elsewhere on the system; the tables of possible faults, on pages 22 and 23, should be then referred to.

The question is sometimes asked, whether the operation of the cut-out in any way depends upon the state of charge of the battery. There is no such relation between the two; the sole function of the cut-out is to switch on the dynamo with rising engine speed, and to disconnect it when the engine slows down and stops.

Absence of Fuses.

In order to simplify the system as far as possible, no fuse is provided. If all the connections are kept clean and tight, there is no possibility of any excess current causing damage to the apparatus.

Lubrication.

As the bearings are packed with grease before leaving the Works, lubricators are not provided. After the motor cycle has run, say, 20,000 miles, the dynamo should be dismantled for cleaning, adjustment and repacking the bearings with grease. This is carried out preferably at the nearest Lucas Service Depot.

BATTERY. LEAD ACID TYPES.

It is of the utmost importance that the battery should receive regular attention to keep it in good condition.

The following are the most important maintenance hints :—

1.—Keep the acid level ¼in. above the top of the plates.

2.—Add only distilled water, never tap water.

3.—Test the condition of the battery by taking readings of the specific gravity of the acid with a hydrometer.

4.—The battery must never be left in a discharged condition.

Topping Up.

At least once a month, the vent plugs in the top of the battery should be removed, and the level of the acid solution examined. If necessary, distilled water, which can be obtained at all chemists and most garages, should be added to bring the level above the top of the plates, but well short of the bottom of the vent plugs. If, however, acid solution has been spilled, it should be replaced by a diluted sulphuric acid solution of the strength, 1.285. It is important when examining the cells that naked lights should not be held near the vents, on account of the possible danger of igniting the gas coming from the plates.

Storage.

If the equipment is laid by for several months, the battery must be given a small charge from a separate source of electrical energy about once a fortnight, in order to obviate any permanent sulphation of the plates. In no circumstances must the electrolyte be removed from the battery and the plates allowed to dry, as certain changes take place which result in loss of capacity.

Testing the condition of the Battery.

It is advisable to complete the inspection by measuring the specific gravity of the acid, as this gives a very good indication of the state of charge of the battery.

An instrument known as a "hydrometer" is employed for this purpose, and should be of the type illustrated. These can be bought at any of our Service Depots, the addresses of which are given on page 21. Voltmeter readings of each cell do not provide a reliable indication of the condition of the battery, unless special precautions are taken which make such a test unsuitable for the average owner, and on that account we do not recommend this test.

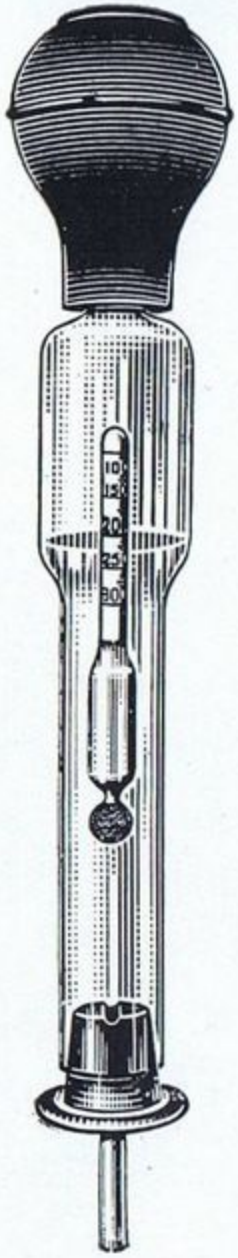


FIG. 3.
LUCAS
HYDROMETER.

How to Use the Hydrometer. Before measuring the specific gravity of the electrolyte by means of the hydrometer, see that the acid is at its correct level. Readings should be taken after a run on the machine, when the electrolyte is thoroughly mixed. The hydrometer should be assembled as shown in Fig. 3 Then holding the instrument vertically, compress the bulb and insert the red rubber tube as far as possible into the electrolyte, then gradually lessen the pressure on the bulb until the solution rises in the barrel to lift the hydrometer float about 1in. Removing the hydrometer from the cell, note the scale reading at the surface of the electrolyte; this gives the density or specific gravity. Care must be taken that the stem of the float does not touch any part of the barrel or bulb while the reading is actually being taken.

Having taken the reading, return the acid solution to the cell and proceed to take readings of the other cells. The readings should be approximately the same. If one cell gives a reading very different from the rest, it may be that the acid has been spilled or has leaked from this particular cell, or there may be a short between the plates. In this case we advise the owner to have his battery examined by a Service Depot to trace the cause and prevent the trouble from developing. The specific gravity figures are:— 1.285—1.300 when fully charged, about 1.210 when half discharged and about 1.150 when fully discharged. These figures are given assuming the temperature of the solution is about 60°F. For fuller particulars regarding temperature corrections, see our "First Charge" instructions, a copy of which can be obtained on application.

Period for which the Battery should be Charged.

It is difficult to lay down rigid instructions on this subject, as the conditions under which motor cycles are used vary considerably, and obviously, the amount of charging a battery will require, is directly dependent on the extent to which the lamps are used. The following suggestions will serve as a rough guide :—

The switch should be left in the **" C "** position for about 1 hour daily. This time should only be increased if the period of night running is considerable, or when the battery is found to be in a low state of charge (if the specific gravity of the acid solution is 1.210 or below).

The battery must never be left in a fully discharged condition, and unless some long runs are to be taken, it is advisable to have the battery removed from the machine and charged up from an independent electrical supply.

First Filling and Charging of New Batteries. Batteries are sometimes supplied in a dry, uncharged condition. The cells should be filled with diluted sulphuric acid to a depth of ¼in. above the tops of the plates. The sulphuric acid used must be quite pure and of the correct density (1.285 at 60°F. for batteries types LUW7E and LOW5G). Particulars regarding first and subsequent charge rates will be found moulded on the side of the battery. Further detail instructions are given in our " First Charge Instructions " a copy of which can be obtained on application.

"LUCAS-NIFE" STEEL-PLATE BATTERY.

Special attention should be given to the following instructions relating to nickel-iron alkaline type batteries, as the attention required for their maintenance differs from that needed for the more familiar lead acid type.

The Important Points are:—

1.—Maintain the electrolyte above the plates by adding distilled water.

2.—Every precaution must be taken that **no trace of acid gets into the battery.**

3.—Occasionally take hydrometer readings. If the reading has fallen below 1.17, fresh electrolyte must be added.

4.—The electrolyte must be completely changed about every 12 months.

MAINTENANCE.

Topping up the Battery.

Under working conditions, the electrolyte loses water by evaporation. At least once a month, the vent plugs should be removed and, if necessary, distilled water should be added to bring the level $\frac{1}{2}$in. above the tops of the plates in the case of type C124 batteries and $\frac{1}{8}$in. with the C104 type. Do not overfill, as this will cause slopping when the machine is running over rough roads. Care should be taken when "topping up" cells, taking specific gravity readings, etc., that no liquid is spilled on the tops of the cells. When examining cells, naked lights must not be held near the vents; the gases evolved from a NIFE cell are just as inflammable as those evolved from a lead cell.

It is important to remember that the slightest trace of acid will ruin the NIFE cell. The greatest care must be taken that funnels and containers which have been used for acid are not used. Further, the owner must see that he uses only pure distilled water. We stress this point, because we have heard of garages keeping their "battery water" in acid carboys, causing it to be definitely acidic.

Taking Hydrometer Readings.

The density of the electrolyte in a NIFE cell does not vary with the state of charge or discharge, and therefore the hyrometer does not give readings by which the state of charge of the cell is known, as is the case with the lead battery. The density of the electrolyte should be 1.19 under normal working conditions. In regular use, the solution will become gradually diluted until when the reading is 1.17 the battery will begin to lose its efficiency and become sluggish. Consequently, the electrolyte must be completely renewed when this condition is reached, which, with a battery in regular service, is about every 12 months.

If the density of the electrolyte is found to be less than 1.17 after only a short period of service, it is probable that this is due to spillage, and in this case, some of the diluted electrolyte must be renewed and fresh solution added to bring the density between the limits 1.17—1.21.

Finally, keep the tops of the cells clean and see that the terminals are kept tight. It is advisable to keep the terminals smeared with vaseline to prevent corrosion. Care should be taken not to allow any grease to come into contact with the electrolyte, as this causes frothing.

Renewal of Electrolyte.

In normal use it will be necessary to renew the electrolyte about once in 12-18 months.

Renewal solution ready for immediate use can be obtained from any of our Service Depots or Agents in the United Kingdom. Abroad, however, the electrolyte is supplied in solid form, and must be dissolved in water, in strict accordance with the instructions given on page 12.

When refilling, the battery must first be completely discharged, the cells shaken in order to loosen dirt, and the solution poured out. Rinse out with clean water until the cells are thoroughly cleansed of sediment, and then invert the cells for half an hour, so as to drain away the water completely. It is important not to leave the cells standing with the plates exposed to the atmosphere unless they have been thoroughly washed out with clean water, and even then not for more than half an hour. Fill up with the new solution, and give the battery a charge of 3 amperes for a period of 12 hours, when it will be fully charged and ready for use.

STORAGE.

The battery may be stored indefinitely, provided that care is taken to keep the electrolyte above the tops of the plates. Before storing, the battery should be fully charged and then half discharged. When required for service after a long period of idleness, it should be given a "First Charge, as described below.

FIRST FILLING AND CHARGING OF NEW BATTERIES.

Batteries are sometimes supplied in a dry, uncharged condition. Electrolyte is supplied in a separate container, and in the case of batteries supplied in the United Kingdom is ready for immediate use. The electrolyte supplied with export batteries is in a solid form and must be dissolved in water in accordance with the instructions given on page 12.

The cells should be filled with electrolyte to a height of $\frac{1}{2}$in. above the tops of the plates in the case of type C124 batteries and $\frac{1}{8}$in. with the C104 type. On pouring the solution into the cells, the specific gravity will gradually fall to the correct working figure of 1.19. After

filling, give the battery a charge of 3 amperes for a period of 12 hours. It will then be fully charged and ready for immediate use. Subsequent charging should be at the rate of 3 amps. for 6 hours.

Preparing the Electrolyte (when supplied in solid form for Export batteries).

This material, and the solution to be made from it, are both **highly corrosive,** and must not come in contact with the clothes or fingers. Iron or porcelain vessels must be used for mixing and filling; on no account use galvanised vessels or vessels with soldered joints. Vessels which have been used for acid at any time should not be used. After making sure that the mixing receptacle is perfectly clean, dissolve the material in the proportion of 1lb. of solid to 2lb. of distilled water.

For stirring during the mixing process, use a clean unpainted wooden stick.

During the process of mixing, heat is given out, and the liquid must be allowed to cool before its specific gravity is taken. The final specific gravity of the solution before pouring into the cells must be 1.21. If the solution as obtained above is too strong, further small quantities of distilled water must be added until the correct figure is obtained. Stir the solution thoroughly before testing its strength.

Remove any floating scum by means of a bent strip of clean sheet iron or steel before filling the cells.

HEADLAMP (Type H52).

This lamp is fitted with a double filament bulb, the one filament providing the normal driving light, while the second one gives an anti-dazzle dipped beam. The change over from the normal driving light to the dipped beam, is made by a handle bar switch. A small pilot bulb is provided for use when the machine is stationary or when riding in town.

An ammeter is incorporated in the lamp, which gives the driver an indication of the amount of current in amperes by which the battery is being charged or discharged under the various conditions governed by the particular position of the switch. When the lamp is switched

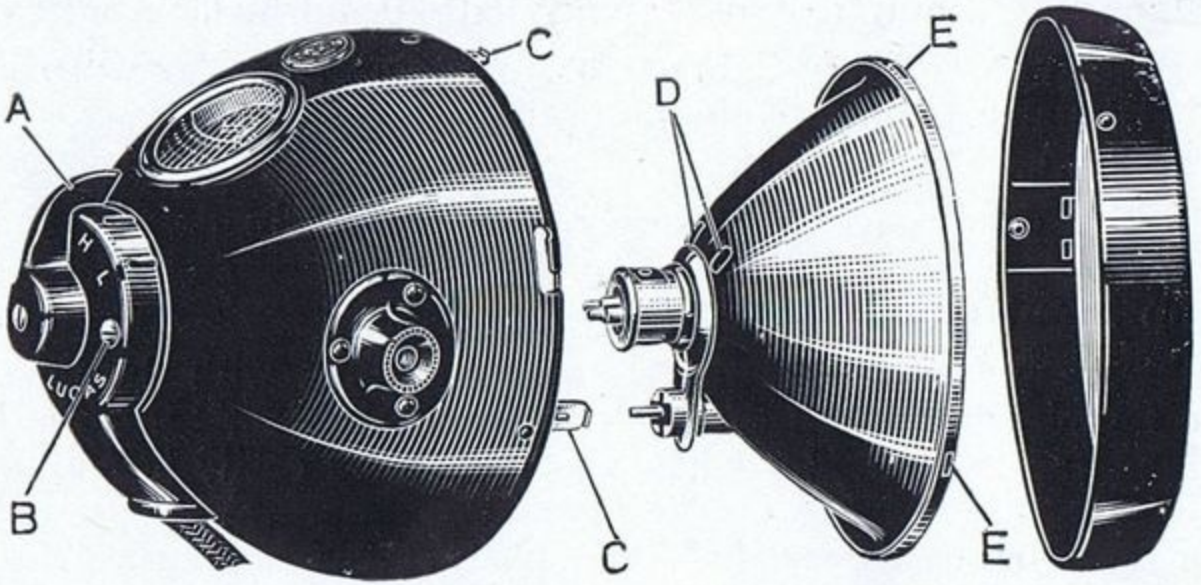


FIG. 4. HEADLAMP TYPE H52 DISMANTLED.

A—Switch.
B—Fixing screw.
C—Reflector supports.
D—Apertures through which light passes to illuminate ammeter.
E—Slots in reflector rim.

on, the ammeter is illuminated by indirect lighting. This is arranged by means of two small apertures " D " (Fig. 4.) in the reflector, from which light is reflected across the dial, through slots in the ammeter case. A special mask is placed across the ammeter dial to prevent any glare that would tend to distract the rider's attention from the road.

Switch Positions.

The switch housed at the back of the lamp has the following positions :—

" Off "—Lamps off, and dynamo not charging.

" C "—Lamps off and dynamo giving half its normal output.

" H "—Headlamp (driving light) tail lamp and side car lamp (when fitted) on; dynamo giving maximum output.

" L "—With the exception that the pilot light is in the place of the driving light, the conditions are exactly the same as in position **" H."**

Removing the Lamp Front and Reflector.

To remove the lamp front, hold the sides of the lamp with the fingers, press the front rim evenly with the thumbs and palms of the hands, and then rotate to the left (looking at the front of the lamp) as far as possible, when the front may easily be withdrawn.

The reflector can be easily removed from its three supports " C." To replace the reflector, locate the slot marked " TOP " in the rim, with the top support, and then fit the rim over the other two supports.

Focussing Headlamp Bulb.

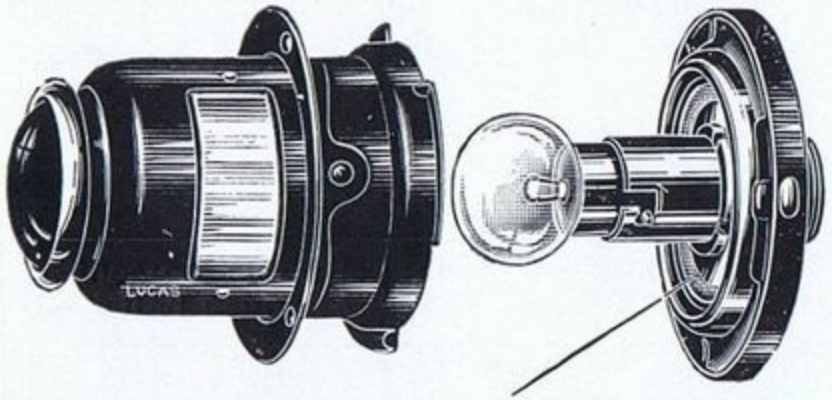
To ensure that the main bulb filament is approximately at the focus of the reflector, the bulb holder is arranged so that it can be adjusted. By turning the bulb in a clockwise direction it is moved inwards, and by turning it in an anti-clockwise direction, it is moved outwards. The best position can readily be found by trial. The normal driving light should, of course, be switched on while focussing is being carried out.

In adjusting the bulb, it is important that it is given a complete turn at a time, so that the filaments are in the correct position; a spring stop is incorporated in the holder which indicates every time the bulb has been given a complete turn by a click action.

The best way of focussing and setting the lamp is to take the motor cycle to a straight, level road, find the correct bulb adjustment and then move the lamp on its adjustable mounting, until the best road position is obtained. The driving light should be switched on when focussing is carried out.

Sidecar Lamp.

To enable the bulb to be correctly focussed, there are two or three alternative positions in the holder. Try each position for the best result. *Types* **R**440 *S and* **R**330*S*. The front and reflector are secured to the lamp body by means of bayonet fixings. To remove, simply depress the rim evenly, turn to the left as far as possible and withdraw. *Type* **R**370. The front together with the reflector can be withdrawn when the fixing screw is removed, The bulb holder can then be withdrawn from the back of the reflector.



Rubber Diaphragm.

FIG. 5. TAIL LAMP.

Tail Lamp.

This lamp is usually mounted directly on the number plate; it displays a red light to the rear, and through the side window illuminates the number plate.

The bulb holder is mounted on a rubber diaphragm (Fig. 5) which prevents road and engine vibration from being transmitted to the filament, thus greatly prolonging its life.

The rear portion of the lamp is removed

for bulb replacements by giving it half a turn to the left, when it becomes detached from its bayonet fixing.

Care of the Lamps.

The reflectors are protected by a transparent and colourless covering, which enables any accidental finger marks to be removed with a soft cloth or chamois leather, without affecting the surface of the reflector. On no account should any metal polishes be used on Lucas reflectors. If the ebony black of the outer body becomes dull in service, the original finish can be restored, no matter how neglected it may be, by a good furniture or car polish.

Replacement of Bulbs.

When the replacement of any bulb is necessary, we strongly recommend that Lucas official bulbs are used. The filaments are arranged to be in focus, and give the best results with our reflectors. When it is necessary to replace the main headlamp bulb, screw it out two or three turns in an anti-clockwise direction. This will release the pressure on the bulb contacts, and enable the bulb to be withdrawn easily. Care should be taken that the bulb is fitted the correct way round, i.e., that the dipped beam filament is above the centre filament. Particulars of replacement bulbs are given below.

For	No.	Volts.	Watts.	Remarks.
Headlamp (driving and dipped beam lights)	624DVMC	6	24 & 24	For E3C 6-volt Sets — Double filament gas-filled bulbs.
	412DVMC	4	12 & 12	For E25 4-volt Sets
Headlamp (pilot light), & Sidecar & Tail Lamps	B.A S. 8S	6	3	For E3C 6-volt Sets — Centre contact vacuum bulbs.
	42S	4	2	For E25 4-volt Sets

WIRING OF THE EQUIPMENT.

Before making any alteration to the wiring, or removing the switch from the back of the Headlamp, disconnect the positive lead at the Battery to prevent the possibility of short circuits.

The cables required for wiring up the equipment are assembled in the correct order before fitting to the machine, and are then braided together to form a complete cable assembly or harness. This method of wiring allows the cables to be easily clipped to the frame, and, if it is necessary to take the electrical equipment off the machine at any time, the cables may be removed as a complete cable assembly. Another advantage is that the sheathing protects the cables against abrasion through vibration. This is important, as the equipment is wired on the "earth return" system, and any injury to the insulation is liable to cause a short circuit, which will quickly discharge and seriously damage the battery. The earthing leads from the headlamp and the negative battery terminal must be in good electrical contact with the frame of the machine. For instance, the leads may be soldered to an eyelet, which, in turn, must be secured by a bolt; care must be taken that the enamel where the eyelet makes contact with the frame is removed. In the same way it is important to see that the base of the tail lamp and of the side-car lamp (when fitted) are in good contact with a metal part of the machine.

All cables to the headlamp are taken directly into the switch, which can be easily withdrawn from the lamp body when the two fixing screws "B" (Fig. 4) are removed. Care must be taken that the precaution of disconnecting the positive lead at the battery is taken before this is done.

The ends of all the cables are identified by means of coloured sleevings. The colour scheme and the diagram of connections are given at the end of the booklet, and a small diagram is also fitted inside the lamp, and can be seen when the reflector is removed. When making a connection, proceed as follows: Bare about $\frac{3}{8}$in. of the cable, twist the wire strands together and turn back about $\frac{1}{8}$in. so as to form a small ball. Remove the grub screw from the appropriate terminal and insert the wire so that the ball fits in the terminal post. Now replace and tighten the grub screw; this will compress the ball to make good electrical connection.

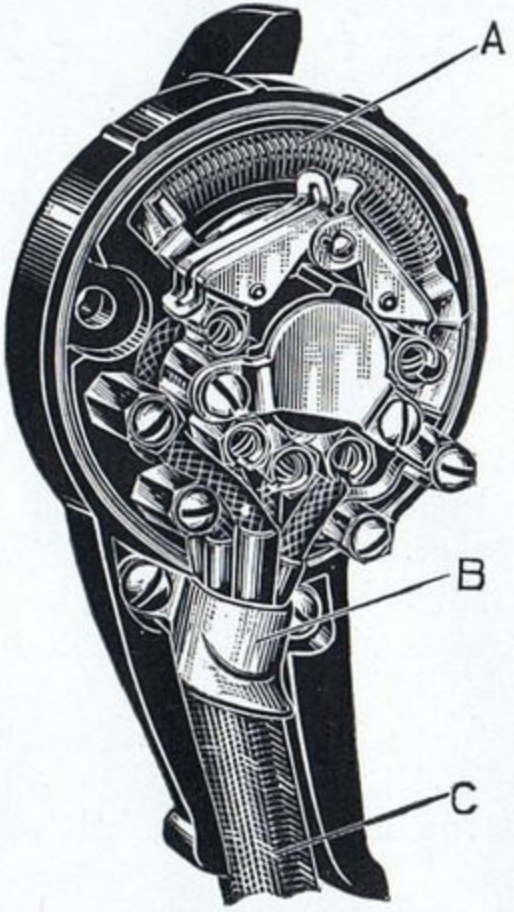


FIG. 6. SWITCH REMOVED FROM BACK OF HEADLAMP.

A—Resistance.
B—Clamping clip for cables.
C—Cable harness.

The cables to the battery are sweated directly to the battery terminals, thus obviating all chance of corrosion. The lead from the positive battery terminal is connected to the switch by means of a brass connector. Care must be taken that the rubber shield is pulled over the connector after it has been tightened up. This connector is a very convenient place for wiring up an electric horn. Open out the hole in the connector to $\frac{1}{8}$in. when it will be possible to get two wires in. They should be twisted together to make a secure connection.

HINTS FOR THE DETECTION OF LIGHTING FAULTS.

Although every precaution is taken to eliminate all possible causes of trouble, failure may occasionally develop through lack of attention to the equipment or damage to the wiring. The most probable faults are tabulated, according to the symptoms which are displayed, in the fault-finding tables at the end of the booklet.

We give a few hints on the best way to make use of these tables, as the sources of many troubles are by no means obvious.

Much evidence can be gained from observation of the ammeter. If, for instance, no reading is indicated when the engine is running at, say, 20 miles per hour with the switch in the "C" position, the dynamo is failing to charge. To ensure that the ammeter is not at fault the engine should be stopped and the switch turned to the "H" position, when a reading on the discharge side of the scale should be observed. Again, if the needle fluctuates when the engine is running steadily, an intermittent dynamo output can be suspected. The dynamo may have been neglected, and the trouble could be caused by, say, worn brushes or a dirty commutator.

A possible cause of the dynamo failing to charge is the reversal of its polarity, due either to the headlamp being ineffectively earthed or to the accidental shorting of a terminal or "live" part of the cut-out, perhaps with a screwdriver, when making adjustments without having taken the precaution of removing the positive battery lead.

Examine connections of earthing lead from the headlamp switch to some part of the cycle frame. The bolt on the frame which clamps the one end of the cable may have become loose, or the cable end may not be making good contact due to dirt or enamel.

Having examined all cable connections, the polarity of the machine can be corrected by running the engine, putting the switch in the "C" position, and then pressing the cut-out contacts momentarily together, when the machine should begin to generate again.

If dynamo still does not function satisfactorily, look for the trouble elsewhere.

Should the intensity of the lights vary, or should they fail entirely, it is probably due to the battery terminals being allowed to corrode, and the consequent breaking of a connection or to a defective earth connection. If the cause of the trouble is not located at the battery, the switch should next be examined to see that all the terminals are tight. If one particular lamp does not light, look for a broken filament, or a defective electrical contact between the lamp body and the machine frame. When the engine is not running and the lamps light when switched on, but gradually go out, the battery is probably exhausted, due to excessive use of lights when stationary, or to the dynamo failing to charge. If it is found that the battery is the cause of the trouble have it removed from the machine and examined. If the battery is merely exhausted, have it charged up from an independent electrical supply.

LUCAS SERVICE DEPOTS

In the event of any difficulty with any part of the equipment, no matter how trivial, we shall be only too pleased to give every assistance possible. The best course to adopt is to call at the nearest Lucas Service Depot (the addresses of which are given below), when the equipment can be examined as a whole. The depots are not only at your disposal for repairs, overhauls and adjustments, but to give free advice. If it is necessary, however, to communicate, or when ordering spare parts, always give the type and number of the unit in question, the make and, if possible, the date of the Motor Cycle on which it is fitted.

BELFAST	**3/5, Calvin Street, Mountpottinger**	
Telephone: Belfast 7017	Telegrams: "Servdep, Belfast"	
BIRMINGHAM	**Great Hampton Street**	
Telephone: Central 8401 (10 lines)	Telegrams: "Lucas, Birmingham"	
BRISTOL	**345, Bath Road**	
Telephone: Bristol 8400 (4 lines)	Telegrams: "Kingly, Bristol"	
CARDIFF	**54a, Penarth Road**	
Telephone: Cardiff 4603 (4 lines)	Telegrams: "Lucas, Cardiff"	
COVENTRY	**Priory Street**	
Telephone: Coventry 3068 & 3841	Telegrams: "Lucas, Coventry"	
DUBLIN	**41, Middle Abbey Street**	
Telephone: Dublin 653	Telegrams: "Autolite, Dublin"	
GLASGOW	**227/229, St. George's Road**	
Telephone: Douglas 3075 (5 lines)	Telegrams: "Lucas, Glasgow"	
LEEDS	**64, Roseville Road**	
Telephone: Leeds 28591 (5 lines)	Telegrams: "Luserdep, Leeds"	
LIVERPOOL	**450/456, Edge Lane**	
Telephone: Old Swan 1408 (3 lines)	Telegrams: "Luserv, Liverpool'	
LONDON	**Dordrecht Road, Acton Vale, W.3**	
Telephone: Chiswick 3801 (18 lines)	Telegrams: "Dynomagna, Act, London"	
LONDON	**759, High Road, Leyton, E.10**	
Telephone: Walthamstow 2161 (3 lines)	Telegrams: "Luserdep, Walt, London"	
LONDON	**155, Merton Road, Wandsworth, S.W.18**	
Telephone: Putney 5131 (4 lines) & 5501	Telegrams: "Luserv, Wands. London"	
MANCHESTER	**Talbot Road, Stretford**	
Telephone: Longford 1101 (5 lines)	Telegrams: "Lucas, Stretford"	
NEWCASTLE-ON-TYNE	**64/66, St. Mary's Place**	
Telephone: Central 3571 (3 lines)	Telegrams: "Motolite, Newcastle-on-Tyne"	

HOW TO LOCATE AND REMEDY TROUBLE.

TABLE No. 1.

CONDITION.	POSSIBLE CAUSES AND METHODS OF DETECTION.	REMEDY.
Lamps give dim, flickering, or no light when the engine is not running.	Bulb filament broken.	Replace with new bulb.
	Bulb discoloured with use.	Replace with new bulb.
	Bulb out of focus.	Focus by turning the bulb until the best illumination is obtained (see page 14)
	Dirty reflector or bulb.	Clean dirty reflector with chamois leather or a soft cloth.
	Severed or worn cable, or loose connections at headlamp switch, dynamo, or battery.	Tighten loose connections and replace faulty cables.
	Faulty earthing of headlamp. The end of the earthing cable may not be making good contact with the frame due to dirt or enamel.	Tighten the bolt on the frame which clamps the end of the cable from switch terminal "E," and see that it makes good contact.
	Faulty earthing of battery. The end of the cable from the negative battery terminal may not be making good contact with the frame.	Tighten the bolt in the frame which clamps the end of the cable from the negative battery terminal, and see that it makes good contact.
	Battery exhausted. Take hydrometer readings when acid level is correct ($\frac{1}{4}$in. above plates) and after a run when electrolyte is thoroughly mixed. When half discharged, readings are about 1.210. When fully discharged, readings are about 1.150.	Machine should be taken on the road for a long daytime run with switch in "C" position, or battery charged from independent electrical supply.

HOW TO LOCATE AND REMEDY TROUBLE.

TABLE No. 2.

CONDITION.	POSSIBLE CAUSES AND METHODS OF DETECTION.	REMEDY.
After carrying out examination on Table I, and lamps still give dim, flickering, or no light when the engine is running.	Dynamo not charging, or charging intermittently. Ammeter should give a reading on the charge side when the machine is running at say 20 m.p.h. with switch in "C" position. Possible causes of dynamo trouble are :—	
	Worn or dirty brushes.	Clean dirty or greasy brushes with a cloth moistened with petrol. Badly worn brushes must be replaced.
	Dirty commutator.	To clean dirty commutator, remove one of the main brushes from its holder and insert a fine duster, holding it pressed against the commutator surface by means of a suitably shaped piece of wood, at the same time slowly turning the engine. If commutator has been badly neglected, clean with very fine glass paper.
	Reversed polarity of dynamo.	To correct polarity of machine, run engine slowly, put switch in "C" position, and then press cutout contacts momentarily together.