LUCAS

Running Instructions for the ELECTRIC LIGHTING AND STARTING EQUIPMENT

A.J.S.

Instruction Booklet No. 179.

BRITISH MADE

RUNNING INSTRUCTIONS

FOR

LUCAS

ELECTRIC LIGHTING

AND

STARTING EQUIPMENT

DESIGNED AND MANUFACTURED BY

JOSEPH LUCAS LTD.,

HEAD OFFICES AND WORKS:

BIRMINGHAM, ENGLAND.

TELEGRAMS & CABLES: "LUCAS, BIRMINGHAM."

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INDEX
TO PRINCIPAL SECTIONS.

TO ENSURE THE BEST SERVICE FROM LUCAS ELECTRICAL EQUIPMENT
THE MOST IMPORTANT POINTS ARE:—

BATTERY. Inspect the battery regularly and keep acid level ⅜ in. above the top of the plates by adding distilled water. UNLESS YOU DO THIS, YOUR BATTERY WILL RAPIDLY DETERIORATE. Keep the terminals tight and smeared with vaseline to prevent corrosion.
Use the charging switch as described on page 8.

DYNAMO & STARTER MOTOR. Keep brushes and commutator clean.

HEAD LAMPS. Use only the correct Lucas replacement bulbs. Focus lamps after fitting new bulbs.

WIRING. Keep terminal connections on all units tight.

INTRODUCTION.

To ensure the best service from the electrical equipment the amount of attention needed is very small, but some attention is essential, for example, " topping-up " of the battery, which is just as important as refilling the radiator or pumping up the tyres. We therefore advise owners to make a periodical inspection and to carry out the instructions given in the following pages.

As this booklet covers equipment fitted to different cars, it may be found that an equipment differs slightly in detail from the description given, but no difficulty should be experienced as the essential information on maintenance remains unaltered.

For the benefit of owners who are not acquainted with the working principles of car electrical equipment, a brief description of its operation is given.

If you are in any difficulty or require further information and advice, no matter how trivial, do not hesitate to take advantage of the wide facilities of Lucas Service. A list of Lucas Service Depots is given on page 31.

RUNNING INSTRUCTIONS
FOR
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Description of Operation of Equipment. The electrical equipment on a car is a self contained system and is, in effect, a miniature electrical power plant. The dynamo, which is driven by the engine, is the source of supply of current for the lamps, starter motor and accessories, as well as the ignition coil when that system of ignition is fitted. A battery is included in the equipment to act as a "reservoir" of energy to supply the current for the starter motor and the lamps when the car is stationary.

The dynamo output is controlled by what is known as the third brush method. The object of this third-brush system is to regulate the output of the dynamo at high speeds and keep it steady, independent of the speed at which the dynamo is running, as it must be remembered that the dynamo speed varies as the engine speed. On the majority of cars, the dynamo is arranged so that it gives its full output or a reduced output according to the position of the charging switch. The markings on this switch are "Summer Half Charge" and "Winter Full Charge," and it is intended that the switch is kept in the former position during the summer months when the lamps are very little used, and in the latter position during the winter when the lighting and starting load is heavier. It should be noted that the dynamo automatically gives its full output whenever the lamps are switched on. This charging arrangement ensures that the battery is kept in good condition without the possibility of excessive over-charging.

Connected between the dynamo and the battery is the cut out. It is, in effect, an automatic switch which acts

as a "valve" in the dynamo charging circuit, allowing the flow of current from the dynamo to the battery only. It completes the charging circuit when the dynamo is running fast enough to generate a voltage sufficiently high to charge the battery, and disconnects it again when the speed is low. The function of the cut-out is very often misunderstood—it does not prevent overcharging of the battery. It fulfills no other object than that of preventing current from flowing from the battery through the dynamo windings when the car is stationary or when it is running very slowly.

The starting motor is constructed with a shaft fitted with a pinion, which, on rotation, runs into engagement with the geared rim of the flywheel. Immediately the engine begins to fire, the pinion is automatically thrown out of mesh.

Now let us observe what happens in the various circuits when the equipment is in use. First, the starting switch is closed, thereby allowing a current to flow from the battery to operate the starter motor, to start the engine. When the engine is running it is driving the dynamo, but will not charge the battery until the cut-out operates. When the speed of the engine is increased, the needle of the ammeter will be seen to flicker over to the "charge" side. This means that the cut-out has closed and is allowing a small current to pass to the battery. As the car speed increases, the current will increase also until it reaches a maximum. It will then remain nearly constant irrespective of the car speed owing to the third-brush regulating system.

At night, the lighting switch will be closed by the driver, allowing the current to pass from the battery to the lamps. If the lamps are switched on when the car is stationary, i. e., the dynamo not running, all the current for lighting has to come from the battery, and the amount will be shown on the discharge side of the ammeter. If the engine is running, the ammeter will register the difference of the amount of current being discharged by the battery and the current passing into the battery from the dynamo.

SWITCHES CONTROLLING THE EQUIPMENT.

The ignition switch usually takes the form of a key which can be withdrawn when the ignition is switched off, thus ensuring the safety of the car in the absence of the owner.

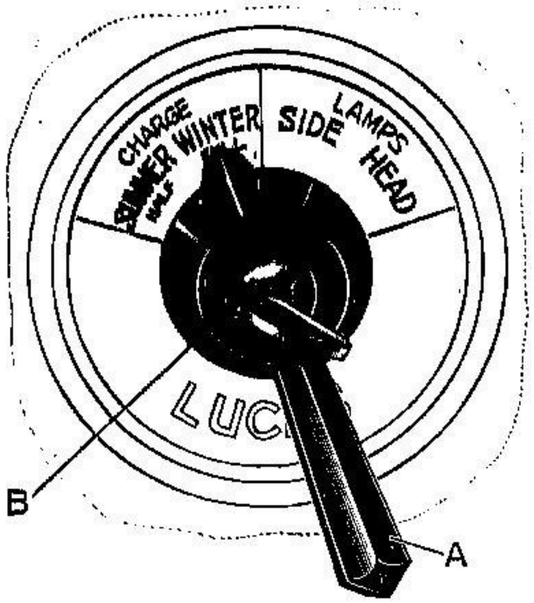


FIG. 1. COMBINED LIGHTING, CHARGING AND IGNITION SWITCH TYPE SA1.
A—Lighting and charging switch.
B—Ignition switch in "on" position.

The combined lighting and charging switch is mounted in the instrument panel, or with some equipments, it is fitted to the bottom of the steering column, and is controlled by a lever in the centre of the steering wheel.

With the majority of equipments, the charging switch has two alternative positions for daytime running. The one position allows the dynamo to give its full output and the other about half its normal output. With most sets, the dynamo is arranged to give its full output automatically when the lamps are switched on.

With some sets, the ignition, lighting and charging is controlled by two switches as shown in Fig. 2.

For full instructions on the use of the charging switch, see page 8.

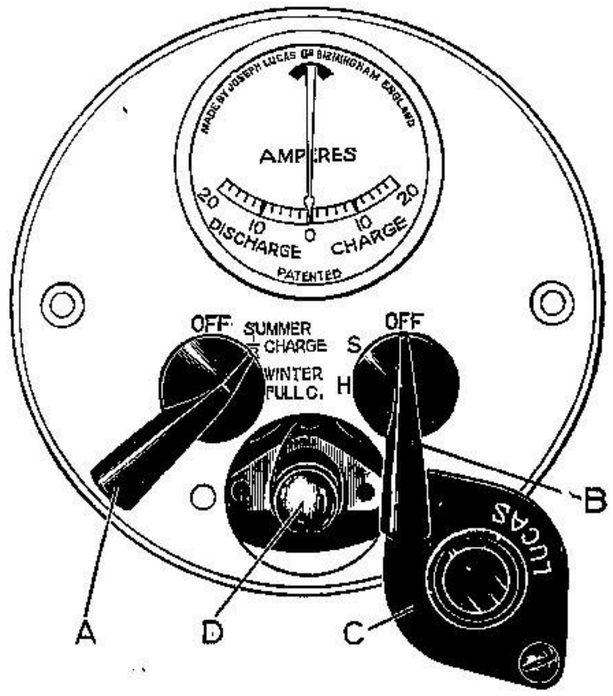


FIG. 2. SWITCHBOX TYPE SM, WITH IGNITION WARNING LAMP COVER REMOVED.
A—Charging and ignition switch.
B—Lighting switch.
C—Ignition warning lamp cover.
D—Warning lamp bulb.

COIL IGNITION WARNING LAMP.

This lamp is incorporated in the instrument panel when coil ignition is fitted. It automatically gives a red light whenever the ignition is on and the engine is stationary, and so reminds the driver to switch off. This prevents the possibility of the battery being discharged by current flowing through the coil windings.

It will be noticed that the warning lamp also lights when the engine is running very slowly. This is because the lamp is connected across the cut-out points and will light up at speeds below the cutting-in-speed of the dynamo.

After long service, the warning lamp bulb may burn out. This will not affect the ignition, but it should be replaced as soon as possible so as to act as a safeguard to the

battery. Care must be taken that the replacement bulb is of the same size and type as the one originally fitted. The voltage and current consumption will be found stamped on the cap of the bulb.

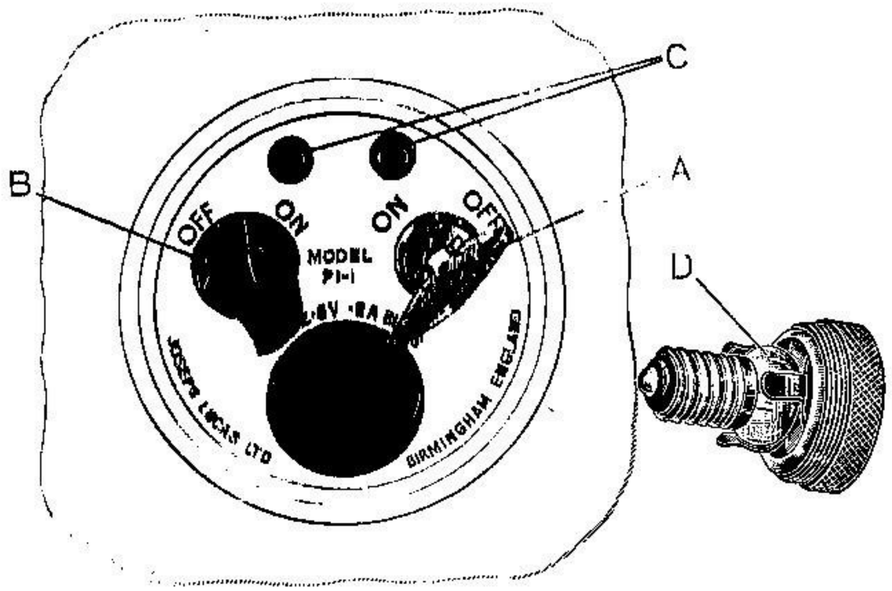


FIG. 3. SWITCH UNIT TYPE P1.

A—Ignition switch.
B—Panel lighting switch.
C—Sockets for inspection lamp.
D—Ignition warning light bulb.

The warning lamp bulb is usually rendered accessible for replacement by removal of the front carrying the red glass. With some switchboxes, this is secured by two screws as in Fig. 2, while with other units, it is removed by unscrewing as in Fig. 3. When the front is not detachable, the bulb holder can be released from the back of the panel by turning it to the left.

THE BATTERY.

It is of the utmost importance that the battery should receive regular attention, as upon its good condition depends the satisfactory running of the starting motor, the illumination of the lamps and, when coil ignition is fitted, the running of the car.

The following are the most important maintenance hints :—

1. Keep the acid level $\frac{3}{8}$in. 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.
5. Keep the terminals spanner tight, and smeared with vaseline. Also, with earth return sets, see that the nut securing the lead from the negative battery terminal to the chassis is tight.

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 indicated on either the side or the cover of the battery. 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.

Greasing Terminals. Examine the battery terminals and see that they are quite tight. Keep them smeared with vaseline to prevent corrosion. The top of the battery should be kept clean and dry; care should be taken not to spill water on it when adjusting the level of the electrolyte or taking specific gravity readings.

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 31. 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.

How to use the Hydrometer. Before measuring the specific gravity of the acid solution by means of the hydrometer, see that the acid is at its correct level. Readings should be taken for each of the cells in turn after a run on the car, when the electrolyte is thoroughly mixed. 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 at a Lucas Service Depot to trace the cause and prevent the trouble from developing.

With batteries for which the strength of the acid recommended is 1.225, the specific gravity of the solution when the battery is fully charged will be 1.225-1.250. When half discharged, it will be about 1.200, and when fully discharged about 1.150.

For other types of batteries for which the strength of acid recommended is 1.285 or 1.320, the specific gravity figures are :- 1.285-1.300 when fully charged, about 1.210

FIG. 4. LUCAS HYDROMETER.

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.

If the battery is found to be in a half discharged or lower state of charge, the charging switch should, if possible, be left in the full charge position for longer periods of running (see page 9.). It should be remembered that the battery will be helped to regain its normal condition if its load is temporarily lessened, as for instance, by using the side instead of the head lamps. If the gravity does not rise in a reasonable time, it is advisable to have the battery inspected at a Lucas Service Depot. On the other hand, if the battery is always found to be in a fully charged condition and the acid level gets unusually low, then decrease the charging time.

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 charged up from an independent electrical supply.

USE OF THE BATTERY CHARGING SWITCH.

The battery is the "reservoir" for the energy generated by the dynamo and once it is "full," there is no object in delivering further current to it. While it is always better to keep a battery overcharged rather than undercharged, it should be remembered that excessive overcharging will quickly reduce the acid level and tend to shorten the life of the battery.

Therefore, to ensure that the battery is kept in good condition without the possibility of excessive overcharging, the dynamo or dynamotor on the majority of cars, is arranged to give alternative outputs. In summer, when the lamps are very little used, the dynamo gives about half its full output during daytime running. During the winter, when the lighting and starting load is heavier, it is intended that the charging switch should be kept in the "full charge" position.

The charging switch should be kept in the appropriate position according to the season. For cars running under average conditions this will ensure that the battery is kept in a fully charged state.

However, in exceptional cases it may be advisable to use the switches out of season. For instance, if, in winter, the car is run regularly during the day with practically no night running, and the hydrometer readings are always found to be about 1.225 or 1.285 (according to the type of battery), and if the acid level gets unusually low, then it is probable that the battery is being overcharged. In these circumstances, move the charging switch to the half charge position. On the other hand, if exceptional use is made of the lamps and starter in the summer, causing the battery to be in a low state of charge (hydrometer readings of 1.200 or under), then run with the charging switch in the full charge position.

The majority of sets are arranged so that when the lamps are switched on, the dynamo automatically gives its full charge. This can easily be ascertained by noting that there is no change of ammeter reading on moving the charging switch, when the lamps are on and the car is running. If there is a change of reading, it follows that the dynamo is not arranged to give its full output when the lamps are switched on, and consequently, it is important to switch to this position whenever the lamps are in use.

In equipments where the dynamo is not arranged to give a reduced output, the battery should be charged for 1 to 2 hours during the daytime running in the summer, for slightly longer than this in the winter, and whenever the lamps are in use.

While these times will serve as a rough guide for cars running under average conditions, the charging period should obviously be varied if the hydrometer readings indicate that the battery is being under or overcharged.

DYNAMOS AND DYNAMOTORS.

The dynamo or dynamotor requires very little attention to ensure satisfactory running. Very occasionally—about every season—remove the end cover, and examine the brushes and commutator.

Brushes. Inspect the three brushes and see that they press firmly on to the commutator. With some machines (Fig. 5.), the brush "C" is secured by a screw "B" to a spring arm; the arms should move freely on their pivots.

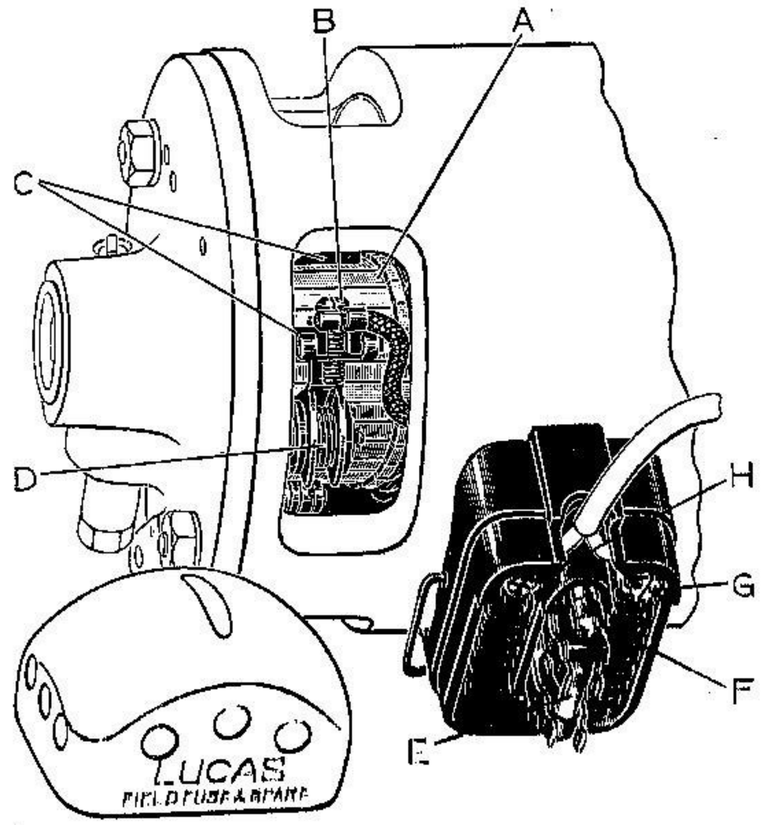


FIG. 5 C45E DYNAMO WITH COVERS REMOVED.

A—Commutator.
B—Screw securing brush.
C—Brushes.
D—Brush tension spring.
E—Field fuse.
F—Spare fuse.
G—Positive terminal.
H—Field terminal.

With other types of machines (Fig. 6.), the brush "C" is held in a holder by a spring lever "D." It should be seen that the brushes slide freely in their holders. Brushes

should "bed" evenly on the commutator; that is, the face in contact with the commutator should present a uniformly polished appearance. Dirty brushes may be cleaned with a cloth moistened with petrol.

After cleaning or removal for any purpose, care must be taken to replace brushes in their original positions, otherwise they will not "bed" properly on the commutator. This is particularly important with control brushes (the smallest of the three brushes). Some of these brushes are stepped, i. e., narrower at the bottom than at the top, and if they are not returned to their boxes the correct way they will not fit properly and may fracture.

After long service, when the brushes have become worn so that they will not bear properly on the commutator,

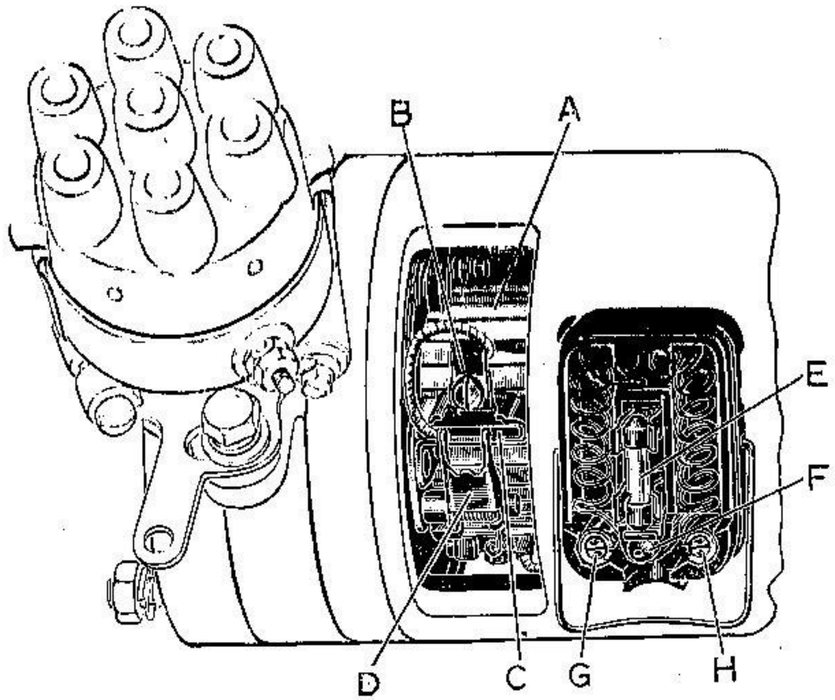


FIG. 6. C45AL DYNAMO WITH COVERS REMOVED.

A—Commutator.
B—Brush lead eyelet.
C—Brush.
D—Brush spring lever.
E—Field fuse.
F—Spare fuse.
G—Positive terminal.
H—Field terminal.

they should be replaced. It is recommended that none but genuine Lucas brushes are fitted, as these are specially made and will give the best results and the longest life. We advise owners to have the brushes fitted at a Lucas Service Depot so that they can be properly "bedded" to the commutator.

When ordering brush replacements, state whether they are main or control brushes, and for what type of machine they are required.

Cleaning Commutator. The surface of the commutator should be kept clean and free from oil and brush dust, etc., neglect of this precaution will result in the commutator becoming blackened, causing sparking to occur at the brushes, and consequently shortening the life of the machine. The best way to clean the commutator is to insert a fine duster, held by means of a suitably-shaped piece of wood, against the commutator surface, slowly rotating the armature at the same time.

Lubrication. As the bearings are packed with grease before leaving the works, very little attention is needed. A few drops of oil, however, may be added through the lubricators, when provided, say every 1,000 miles. The reader is cautioned that far more trouble has been caused by excessive oiling than by too little.

After a considerable mileage, the dynamo should be dismantled for cleaning, adjustment and repacking the bearings with grease. This should be done preferably by the nearest Lucas Service Depot.

Dynamo Field Fuse. With some machines, a fuse is provided in the dynamo field circuit to protect the machine in the event of anything being wrong in the charging circuit, e. g., a loose or broken battery connection. The fuse is of the cartridge type and is housed along with the half charge resistance in a small rectangular unit fixed on the dynamo yoke. If the dynamo fails to charge the battery at any time (indicated by no charge reading being given on the ammeter during daytime running), inspect the fuse and if it has blown, replace it with the spare fuse provided. If the new fuse

blows after starting up, the cause of the trouble must be found, and we advise that the equipment is examined by one of our Service Depots. Never fit any fuse other than the Lucas standard fuse as originally fitted. The size of the fuse is marked on a coloured paper slip which can be seen inside the fuse.

STARTER MOTORS.

The starter switch is arranged either for hand or foot operation and should be operated firmly and quickly. With some equipments a solenoid operated switch is fitted. This is controlled by a press button switch incorporated in the instrument panel. In order to facilitate starting in cold weather, it is advisable to flood the carburetter, make use of the mixture control or air strangler, etc., and before using the electric starter, crank the engine over slowly by the starting handle for two or three revolutions, as this will considerably diminish the load for starting.

If, for any reason, the pinion wheel on the motor does not engage with the flywheel teeth, examine the screwed sleeve on the armature spindle to see that it is free from dirt; if necessary, wash over with paraffin. Occasionally give it a few drops of machine oil.

Some types of starters are provided with extended shafts with square ends, which can be rotated by means of a spanner in the remote possibility of the pinion becoming jammed in mesh with the flywheel for any reason, e.g., a worn flywheel.

As in the case of the dynamo, the surface of the commutator must be kept clean and free from oil, brush dust, etc.

CUT-OUT AND FUSE UNITS.

With most equipments, the cut-out is mounted together with one or more fuses as one unit, which usually also forms a junction box. This unit is generally mounted on the engine side of the dash. The terminals are identified by letters and the cable ends by coloured sleevings. With some equipments, the cut-out is mounted as a separate unit on the dynamo yoke.

The cut-out is accurately set before leaving the Works and does not require adjustment, and therefore, the cover protecting it is sealed.

REPLACEMENT OF FUSES.

Before replacing a blown fuse, inspect the equipment the fuse protects for faulty wiring, and see that all connections and terminals are tight. If the fuse blows repeatedly, and the cause cannot be traced, have the equipment examined at the nearest Lucas Service Depot.

Type CF1 Unit. The fuse in this unit is in the dynamotor or dynamo charging circuit, the indication that it has blown being that no charge reading will be observed on the ammeter when the car is running under normal daytime conditions.

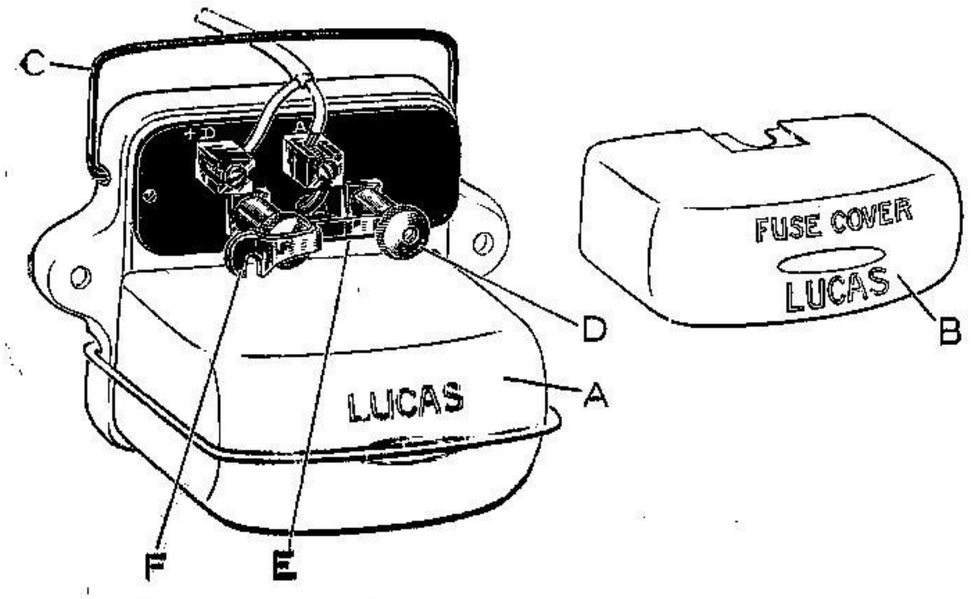


FIG. 7. CUT-OUT AND FUSE TYPE CF1.

A—Cut-out cover.
B—Fuse cover.
C—Wire for securing fuse cover.
D—Fuse securing nut.
E—Fuse strip.
F—Spare fuse strips.

NOTE. With insulated return sets or when the unit is mounted on a wooden dash, the cut-out has three terminals instead of the two shown above.

To fit a new fuse, it is only necessary to release the knurled nut " D " (Fig. 7.), place one of the spare fuse strips " F " over the post and then replace and tighten up the nut.

If the fuse blows repeatedly, do not use two or more strips to prevent this occurring, but have the equipment thoroughly examined to find out the cause of the trouble.

Type CJ2 Unit. The fuse in this unit is in the accessory circuit, and the indication of a blown fuse will be the failing of the horn, windscreen wiper or other accessory.

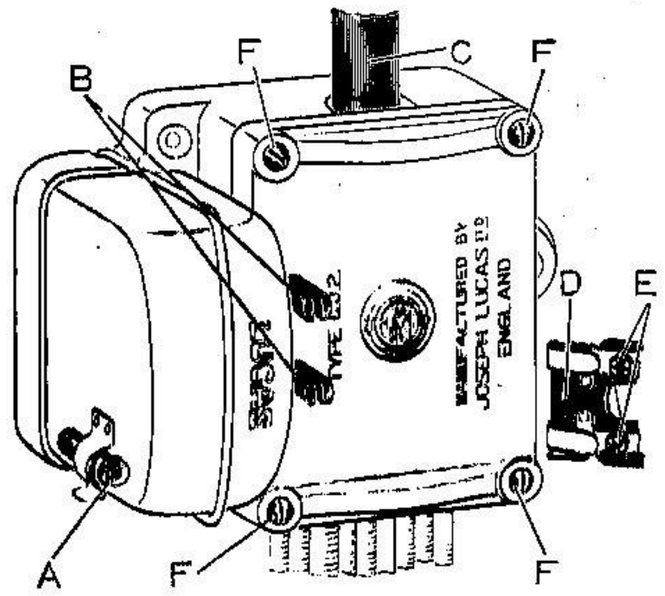


FIG. 8. VIEW OF JUNCTION BOX TYPE CJ WITH FUSE REMOVED.

A—Carton containing spare fuse wire.
B—Fuse posts.
C—Multi-core cable to switch.
D—Fuse holder.
E—Fuse wire securing screws.
F—Cover fixing screws.

To fit a new fuse, take a length of spare fuse wire from the carton " A " and secure it by the two screws " E," taking care that the wire does not cross underneath the washers.

Type CJF Unit. There are three fuses, of the cartridge type in this unit, which protect the equipment in the event of short circuits. One, marked " H," protects the head lamps; another, marked " S & T," the side and tail lamps; and the third, marked " AUX," the circuits of the auxiliary accessories, which include the horn, electric windscreen wiper, etc.

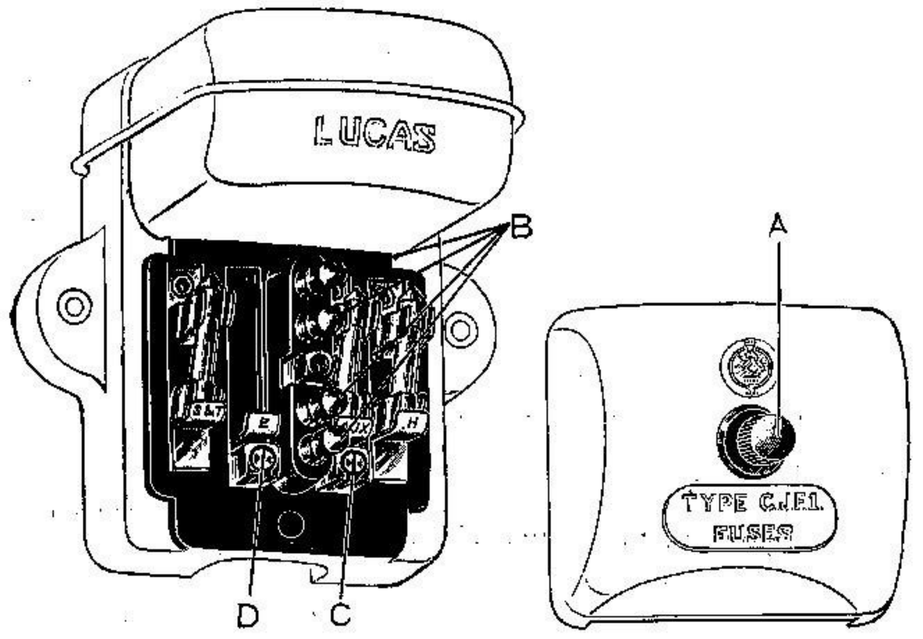


FIG. 9. COMBINED CUT-OUT AND JUNCTION BOX TYPE CJF1.

A—Cover fixing screw.
B—Spare fuses.
C—Terminal for connecting horn, windscreen wiper and other extra accessories.
D—Earthing terminal.

If the head lamps, or the side and tail lamps, or all the units connected to the auxiliary accessory terminal fail to function, examine the particular fuse protecting them.

Replace with one of the spare fuses provided.

Type CF3 Unit. The fuse in this unit is in the accessories circuits and the indication that it has blown will be the failing of the horn or any other electrical accessory

connected to the "+" and "E" terminals. Remove the fuse from its holder, and see whether there is a break in the fuse wire. If it has blown, replace with the spare fuse "C."

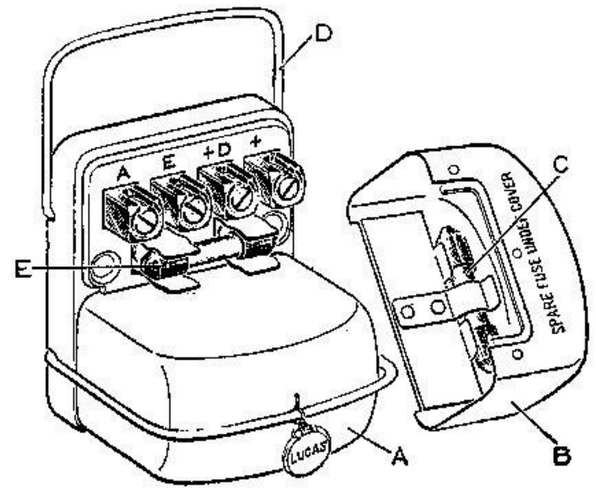


FIG. 10. CUT-OUT AND FUSE. TYPE CF3.

A—Cut-out cover. C—Spare fuse.
B—Fuse cover. D—Clip for securing fuse cover.
E—Fuse in auxiliary accessories circuits.

WIRING EXTRA ACCESSORIES.

When fitting extra accessories to the car they should be wired to the combined junction box, cut-out and fuse unit, usually mounted on the engine side of the dash.

With the CJF unit (Fig. 9.), the accessories should be wired to the terminals marked "AUX" & "E."

With the CJ or CF3 units (Figs. 8 & 10.), the terminals marked "+" & "E" are utilized.

When wiring up accessories to these units, the fuse should be removed while wiring is being carried out.

With equipments that do not include one of the above junction box units, accessories must be connected to the terminals at the back of the switchbox or instrument panel. The supply terminal is usually marked "A" and the earthing terminal is marked "E." If an earthing terminal is not provided, the negative lead must be secured in good electrical contact with a metal part of the chassis.

With insulated return sets, the negative terminal is marked "—B."

Terminals in Lucas switchboxes, junction boxes, etc., are of a standard grub screw type. To make efficient connections to terminals, proceed as follows:—

Bare about ⅜in. of the cable, twist the wire strands together and turn back about ⅛in. 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 a good electrical connection.

LAMPS.

REPLACEMENT OF BULBS.

When the replacement of any bulb is necessary, it is important that the same size bulb is fitted. The B.A.S. number will be found stamped on the cap of the burnt out bulb. We strongly recommend that bulbs supplied by us are used, as these are arranged to be in focus and give the best results with our reflectors. For particulars of Lucas Blue Star High Efficiency Bulbs, see separate leaflet. The methods of removing the fronts of the lamps for bulb replacement are given below.

Head Lamps. The fronts of most types of head lamps are secured by means of a screw "C" (Fig.11.). To remove the front, slacken the screw and swing it aside from the slot "D." The front can then be removed. When replacing the front, locate the top first, then press on the rim at the bottom of the lamp.

With some lamps, the front is secured by means of a spring, which should be pressed back and then swung aside to enable the front to be removed.

Lamp fronts that are not secured by means of a screw or spring are removed by pressing the rim evenly and turning it to the left as far as possible.

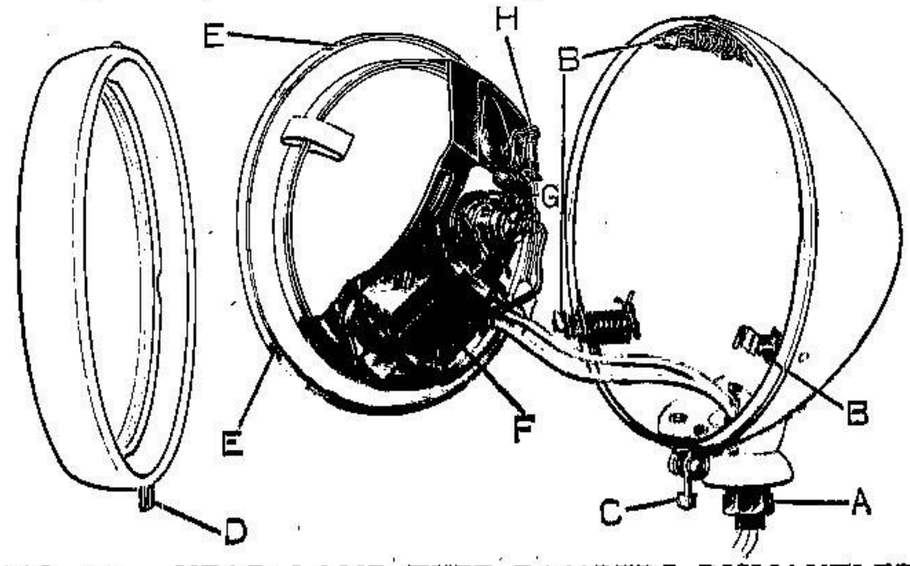


FIG. 11. HEAD LAMP TYPE R140BEDS DISMANTLED.

A—Locking nut for adjustable mounting.
B—Reflector supports.
C—Fixing screw.
D—Slot.
E—Slots in reflector rim.
F—Fuse.
G—Clamping clip for bulb holder.
H—Spare fuse.

Side Lamps. The method of removing the side lamp fronts is similar to that for the head lamps.
The fronts of some lamps are secured by means of a screw at the top of the lamp.

With other types of lamps it is necessary to remove the body from its base in order to carry out a bulb replacement. This is achieved by slackening a securing screw or with some models by unscrewing the body itself.

Rear Lamps. The front of the "Stop" Tail Lamp is secured by means of a screw "A" (Fig. 12.), which is withdrawn to remove the front for bulb replacement.

To remove the front of the "Stop" Tail and Reversing Lamp withdraw the four fixing screws.

With some types of tail lamps, remove the front portion of the lamp by turning it to the left and withdraw it from the base. When replacing, see that the studs locate with the slots in the lamp front, then push it home to lock it in position.

With other types of tail lamps, the front can be removed by unscrewing it to the left.

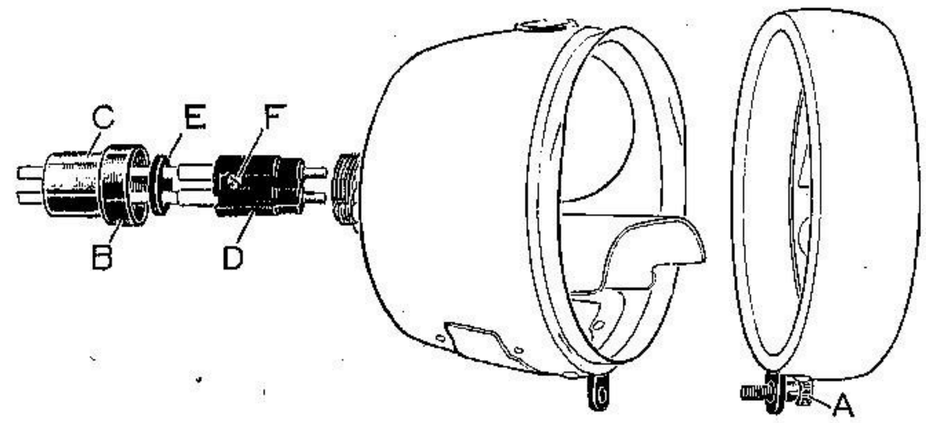


FIG. 12. "STOP" TAIL LAMP TYPE 40A.

A—Fixing screw.
B—Coupling nut.
C—Shell.
D—Cable plug.
E—Rubber washer.
F—Grub screw.

Panel Lamps and Dash Lamps. Panel lamps incorporated in instrument panels are usually accessible from the back of the panel.

With some types, the bulb holders can be released from the back of the panel, for bulb replacements by turning them to the left. With other types the bulb holders are mounted on hinged brackets. To replace a bulb, the bracket can be moved upwards leaving the bulb accessible.

On some cars a dash lamp is fitted. The cover can easily be withdrawn from the lamp body for a bulb replacement.

ALIGNING AND FOCUSSING.

To obtain the best results from the lamps, it is essential that they are in good alignment and that the bulbs are focussed correctly.

For the best projection of light, the bulb filament must be as near as possible to the focus of the reflector. As the position of the bulb filament relative to the cap varies slightly with different bulbs, provision is made for adjusting the position of the bulb relative to the reflector.

With some types of lamps, the bulb holder is arranged so that it can be moved backwards or forwards when the clamping clip "D"(Fig. 13) at back of the reflector is slackened. Care must be taken to tighten the clip after the adjustment. The reflector may easily be removed when

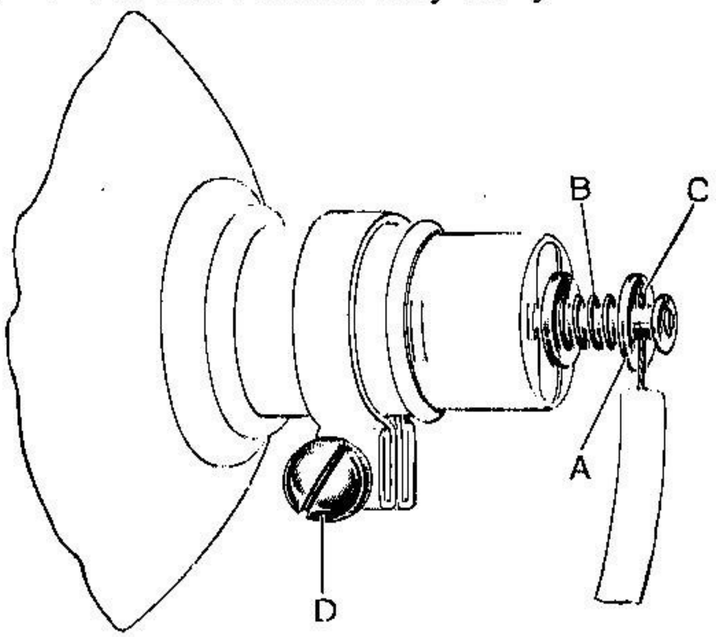


FIG. 13. SPRING TERMINAL AND FOCUSSING.

A—Washer.
B—Spring.
C—Hole in stem.
D—Clamping clip for bulb holder.

focussing. With most types it is secured on three supports. Reflectors that have a cork washer in the rim are secured by a screw. Turn back the two ends of the washer at the top of the rim, the screw can then be removed and the reflector withdrawn by turning it to the left.

With other types of lamps, alternative positions are provided for the bulb in its holder. Each position should be tried for the best result.

The alignment of the lamps is very easily carried out, as they are usually fixed on a universal mounting, which is locked by a single nut.

The simplest method of adjusting and focussing the lamps is to take the car on to a straight, level road at night, and then to align them so that the beams are parallel with the road and with each other. Then focus the driving light bulbs as follows :—

> Cover over the one lamp and adjust the position of the bulb in the other lamp so as to obtain the most intense beam. Finally, focus the other lamp bulb in the same way.

DIPPING REFLECTOR EQUIPMENT
(Electrically Operated.)

Many cars are equipped with head lamps fitted with an anti-dazzle device arranged for operation by a switch which is usually mounted on the steering column. When the switch is moved to the "DIP" position, the near-side head lamp beam is dipped and turned to the near-side of the road, and at the same time the offside head lamp is switched off. With some equipments both head lamp beams are arranged to dip and turn to the left.

The dipping of the head lamp beam is effected by a movement of the reflectors. These are made in two parts; the centre portion is pivoted on ball bearings in a fixed rim which is in turn secured to the head lamp body. The movement of the reflector is controlled by means of a solenoid mounted on a bracket astride the back of the reflector. Although the dipper gives a very definite action on dipping, careful tests have been made to show that the movement does not affect the bulb. The travel of the reflector is limited by means of rubber buffers, which prevent excessive shock.

The mechanism calls for no attention whatever. There is nothing to adjust and no lubrication is required.

Should a car be run in countries where the rule of the road is right hand (as against left hand in the U.K.), the reflector can be arranged to dip and turn to the right simply by fitting it so that the slot in the rim marked " R " engages with the top support.

Fuses. A fuse "F" (Fig. 11) is provided with the electrical dipper unit to protect the equipment in the event of the reflector failing to function properly. The fuse is of the cartridge type, and is carried in spring clips alongside the dipping mechanism. If the reflector fails to function, remove the fuse from its holder and see if there is a break in the fuse wire. A spare fuse " H " is clipped to the reflector bracket.

If the fuse should blow repeatedly, and the cause of the trouble cannot be found, have the reflector examined at the nearest Lucas Service Depot.

CLEANING LAMPS.

The reflectors are protected by a transparent and colourless covering, which enables any accidental finger marks to be removed with chamois leather or a soft cloth without affecting the surface of the reflector. Do not use metal polishes on Lucas reflectors. Ebony black lamps can be cleaned with a good car polish. Chromium plated lamps will not tarnish and only need wiping over with a damp cloth to remove dust or dirt.

ELECTRIC HORNS.

All electric horns, before being passed out of the Works, are adjusted to give the best performance, and they will give long periods of service without any attention.

The adjustment of a horn does not alter the characteristic of the note as is sometimes supposed, but takes up the wear of vibrating parts. Do not alter the adjustment unnecessarily.

If the horn becomes uncertain in its action, giving only a choking sound, or does not vibrate, 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, a loose connection or short circuit in the wiring of the horn, or in some cases a blown fuse. It is also possible that the performance of a horn may be upset by the horn becoming loose on its mounting. In the case of horns mounted on cross bars in front of the radiator, the note may be impaired by the bar itself vibrating, or by any rattling or drumming of mudwings or head lamps which may be attached to the cross bar. Also see that the front or grille is secure.

If after adjustment, the tone of the horn is still unsatisfactory, the owner is urged to return it to a Lucas Service Depot to have other adjustments made.

ADJUSTING HORNS.

Altette Types. The horn is adjusted by moving the screw in the centre of the grille. This screw is notched on its underside. Do not turn it through more than one or two notches at a time. The best adjustment can be found by trial.

Alto Types. To adjust the note, remove the cover and proceed as follows :—

> Slacken the locking nut " A " (Fig. 14.), and turn the striking screw " B " a fraction of a turn towards the insulator " C " on the spring blade. To facilitate making the adjustment, the condenser " D " which is secured by a clip and screw, can be easily removed.

The best position for the adjusting screw can readily be found by trial. Care must be taken that the locking nut is tightened up every time the horn is tested.

It is important that no other screws are touched, otherwise the performance of the horn may be impaired.

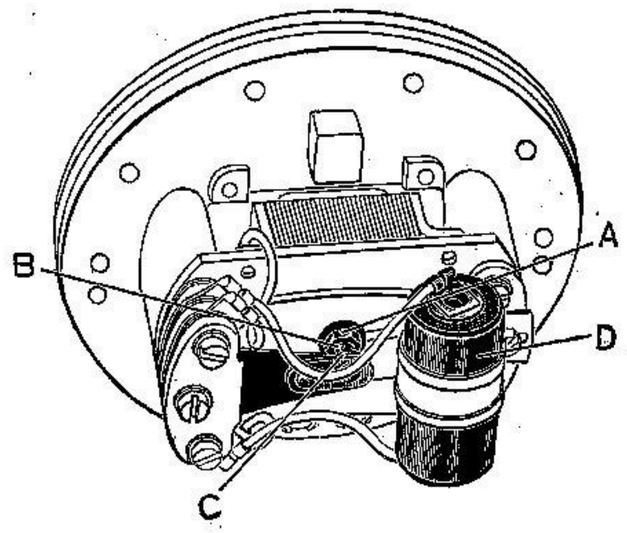


FIG. 14. ALTO HORN WITH COVER REMOVED.

A—Locking nut.
B—Striking screw.
C—Insulator on end of spring blade
D—Condenser.

Motor-Driven Types. Occasionally remove the cover and wipe commutator, or grease. Keep it clean and free from oil

To adjust the note, turn the adjusting screw which is accessible without removing the cover. With some models, the screw can be turned by means of a small lever provided on the cover.

The horn requires no lubrication as the bearings are packed with grease.

ELECTRIC WINDSCREEN WIPERS.

To start the wiper, pull out the small knob and give it a spin. To stop, simply push in the knob. It is important that the knob is pushed right home, as although the wiper can be stopped by holding the knob, the current will not be switched off unless this precaution is taken.

Most models are fitted with a hand control operated by a curved metal handle, which also acts as a lock for the switch. To start the wiper, pull out the curved handle and swing it aside so as to move the cleaning arm into position on the screen. Then pull out the switch knob and give it a spin. To stop the wiper, push in the knob. Then pull out the curved handle to disengage the wiper blade from its drive, and turn the end of the handle over the switch knob. This locks the cleaning arm out of the line of vision of the driver and ensures that the wiper is switched off.

The wiper requires no adjustment. All moving parts are packed with grease during assembly and no lubrication is necessary, except with dual arm types. With these wipers, occasionally give the two bearings on the coupling bar, and the spindle of the arm on the passenger's side, a single drop of oil. Do not add more, otherwise oil may get on to the blades.

When cleaning the windscreen, the wiper arm can be easily lifted from the glass, but care must be taken that it is not moved from side to side.

If the rubber squeegees become worn or perished, they can be easily replaced at very small cost.

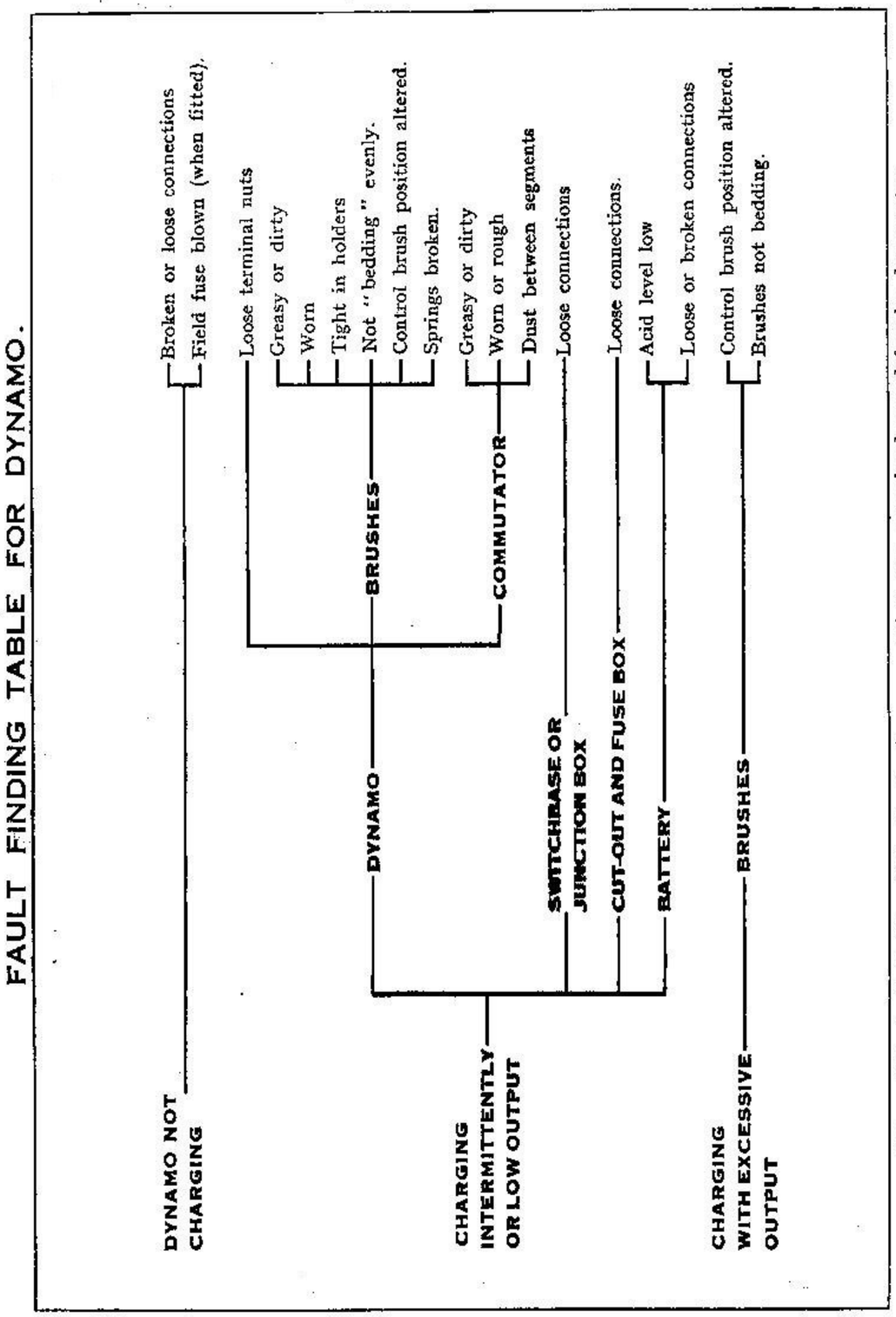
LOCATION OF FAULTS IN THE STARTING AND LIGHTING SET.

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. In some cases, a considerable amount of deduction from the symptoms is needed before the cause of the trouble 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, and the final cause of the trouble may be perhaps a loose terminal nut either at the battery or elsewhere in the charging circuit.

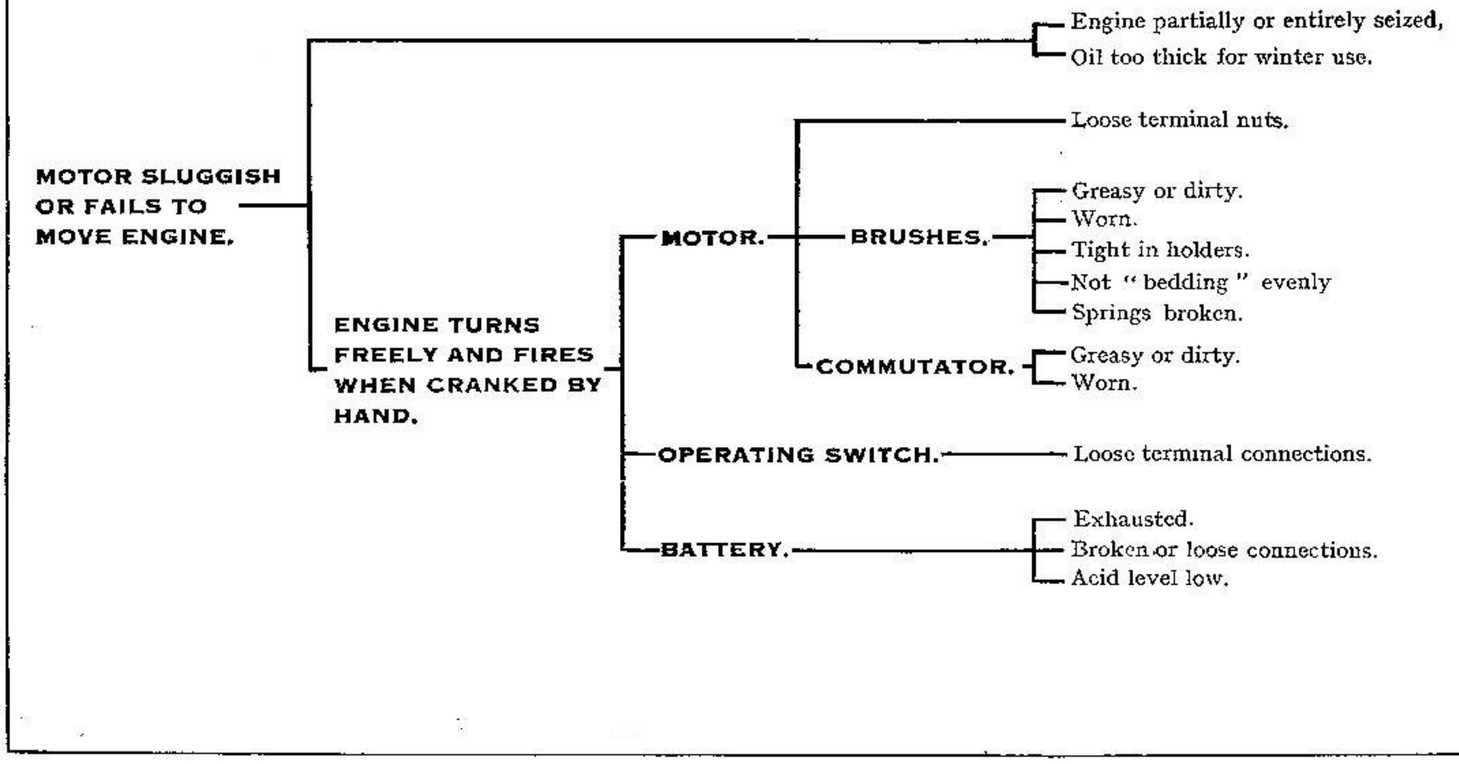
Much evidence can be gained from the ammeter. If, for instance no charge reading is indicated when the car is running at, say, 20 miles per hour, with the charging switch in the full charge position and the lights "off," the dynamo is failing to charge. To ensure that the ammeter is not at fault, the lights should be switched on, while the car is stationary, when a reading on the discharge side of the scale should be observed. Again, if the maximum ammeter reading is much below normal when the dynamo is charging, or if the needle fluctuates when the car is running steadily, a low or 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.

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. If the cause of the trouble is not located at the battery, the switchbase or the junction box should next be examined; particularly see that all the terminals are quite tight. If one particular lamp does not light, look for a broken filament or a loose connection at the lamp. When the car is stationary and the lamps light when switched on, but gradually go out, the battery is probably exhausted, due to excessive use of the starter motor and lights, or to the dynamo failing to charge.

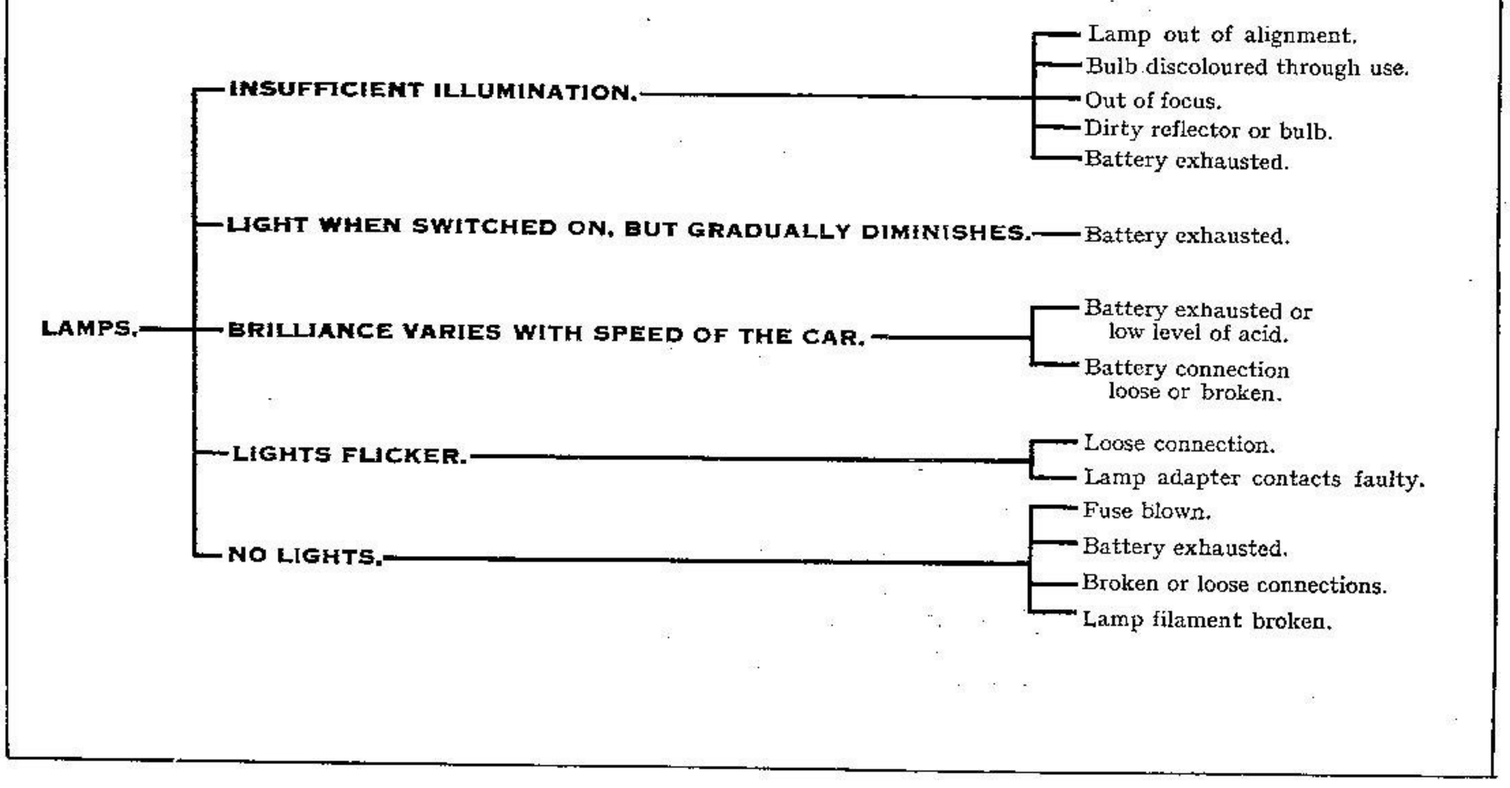


Note.—The fault finding tables for the dynamo and starter can also be used for the dynamotor.

STARTER MOTOR FAULT FINDING TABLE.



LIGHTING FAULT FINDING TABLE.



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 car on which it is fitted.

BELFAST ... ... **3/5, Calvin Street, Mount Pottinger**
Telephone: BELFAST 7017 Telegrams: "SERVDEP, BELFAST"

BIRMINGHAM ... ... **Great Hampton Street**
Telephone: CENTRAL 8401 (10 lines) Telegrams: "LUCAS, BIRMINGHAM"

BRIGHTON .... **Old Shoreham Road, Hove**
Telephone: PRESTON 3001 (4 lines) Telegrams: "LUSERV, BRIGHTON"

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 ... **Portland Street North, North Circular Road**
Telephone: DRUMCONDRA 434 (6 lines) Telegrams: "LUSERV, DUBLIN"

EDINBURGH ... ... **32, Stevenson Road, Gorgie**
Telephone: EDINBURGH 62921 (4 lines) Telegrams: "LUSERV, EDINBURGH"

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**
Phone: SHEPHERDS BUSH 3160 (10 lines) Grams: "DYNOMAGNA, ACT, LONDON"

LONDON ... ...**759, High Road, Leyton, E.10**
'Phone: LEYTONSTONE 3361 (3 lines) 'Grams: "LUSERDEP, WALT, LONDON"

LONDON ... **155, Merton Road, Wandsworth, S.W.18**
'Phone: PUTNEY 5131 (6 lines) & 5501 'Grams: "LUSERV, WANDS, LONDON"

MANCHESTER ... ... **Talbot Road, Stretford**
Telephone: LONGFORD 1101 (5 lines) Telegrams: "LUCAS, STRETFORD"

NEWCASTLE-ON-TYNE ... **64/66, St. Mary's Place**
'Phone: CENTRAL 25571 (3 lines) 'Grams: "MOTOLITE, NEWCASTLE-ON-TYNE"

IN ADDITION THERE ARE LUCAS-C.A.V.-ROTAX OFFICIAL BATTERY SERVICE AGENTS IN IMPORTANT CENTRES THROUGHOUT THE COUNTRY. LIST ON APPLICATION.

LUCAS-C·A·V-ROTAX
RAPID BATTERY SERVICE

The Quickest and Most Generous Scheme —how you can benefit by this Service.

This original scheme of Battery Service is of vital interest to all owners of cars equipped with a LUCAS, C.A.V. or ROTAX Battery, and is available at all LUCAS—C.A.V.—ROTAX Service Depots (see opposite page) and Official Battery Service Agents (list of the latter forwarded on application). It is simple and straightforward, and has been introduced with the express purpose of providing motorists throughout the country with facilities for rapid Battery Service which will give complete satisfaction to the owner with a minimum loss of time, trouble and expense. Also, it is an addition to the existing 90 days' free Service covering defective materials or workmanship under which any repair or replacement is carried out entirely free of charge.

Battery Exchanged for Brand New One during the First Two Years.

At any time during the first two years' life of a LUCAS, C.A.V. or ROTAX Battery (providing there has been no obvious misuse or accidental damage) you can be supplied with a brand new Battery in exchange for your present one, you paying the proportionate charge of one twenty-fourth of the list price of the new Battery for each month since the Battery to be replaced was first put into service (assuming you are the first and only user). This exchange can be effected in Twenty Minutes as it is not necessary to make an internal examination of your present Battery and this can be immediately replaced with a fully charged one from stock. It will be necessary, of course, to produce some evidence of the date on which your present Battery was first put into Service. It will be understood that the benefit of this arrangement cannot be extended where the Battery has been damaged by accident or obviously misused.

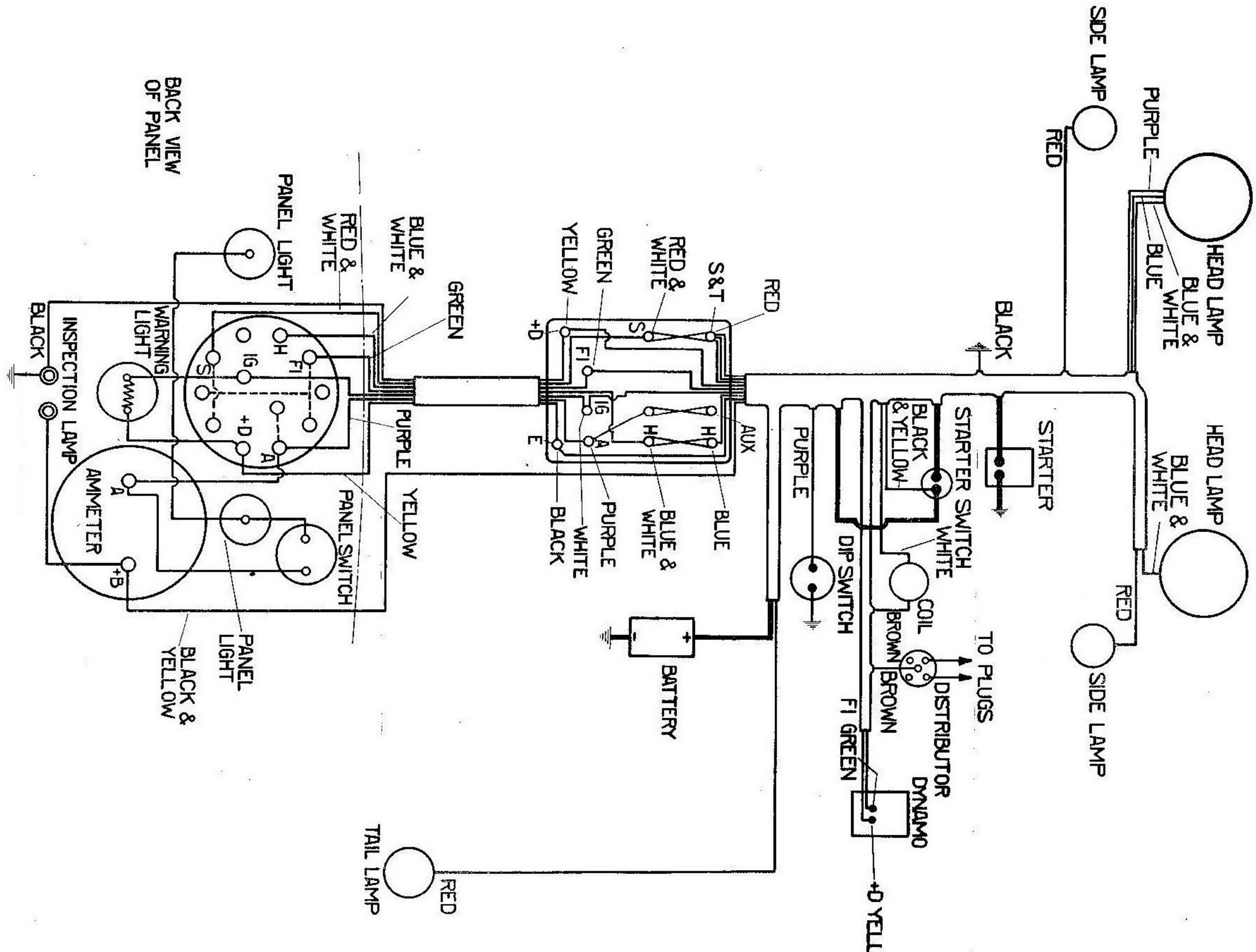
SPECIFICATION	
DYNAMO	C45CF
STARTER	SE54
SWITCH	SA1
CUT-OUT	CJF1
COIL	P4
DISTRIBUTOR	D41

LUCAS LIGHTING, STARTING & COIL IGNITION SYSTEM

WIRING DIAGRAM FOR 12-VOLT EQUIPMENT (EARTH RETURN)

AS FITTED TO A.J.S. 9 H.P. CARS (1931)

DR'G. No. W111-B



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