
MOTOR CYCLES

1937 - 1940

Instructions for

LUCAS

ELECTRIC LIGHTING
AND IGNITION
EQUIPMENT



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**ELECTRIC LIGHTING
AND IGNITION
EQUIPMENT
FOR MOTOR
CYCLES**

This booklet covers the different equipments fitted to various motor cycles, e.g., "Magdyno," Coil Ignition Equipment, etc. No difficulty should be experienced in following the instructions if the index is referred to.

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The BATTERY

Lead-Acid Types

The battery is the reservoir of the energy generated by the dynamo and upon its satisfactory functioning depends the lighting of the lamps, the working of the electric horn, and, when coil ignition is fitted, the actual running of the motor cycle.

Perhaps because the battery is sometimes mounted in a position where it is not readily accessible, some motor cyclists are apt to forget that it needs attention in just the same way as any part of the engine's mechanism. The amount of attention needed is small and need take only a few minutes. Follow the instructions given here and your battery will last longer and will give better service.

About once a month, remove the battery lid and unscrew the filler caps. Pour a small quantity of distilled water into each of the cells to bring the acid just level with the tops of the separators.

This is done to replace water which has been lost by evaporation, and it is just as important as pumping air into your tyres. In effect, you are doing the same thing in each case—replacing something which has been lost in service.



as the acid in the cells. This is measured by the hydrometer.

It is important to examine the acid level regularly as, if the plates are left uncovered for long they will suffer a chemical change and be irretrievably damaged.

You can obtain distilled water from any chemist and most garages. On no account use tap water as it contains impurities detrimental to the battery. The best method of topping up is to use a hydrometer, an instrument which looks rather like an out-size fountain pen filler, and is used for measuring the state of charge of the battery, or, as it were, finding out the state of its health.

Remember it is only the water which evaporates, not the acid. If you do spill any acid, it must be replaced by sulphuric acid solution, diluted to the same specific gravity

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.

Once a month make a point of examining the health of your battery by taking hydrometer readings. This operation is quite simple and need not take long. There is no better way of ascertaining the state of charge of your battery. This instrument enables you to "take a sample" of the acid solution. It contains a graduated float which indicates the specific gravity of the acid in the cell from which the sample was taken. The specific gravity readings and their indications are as follows:—

1.250—1.300	Battery fully charged.
1.150—1.250	Battery about half discharged.
Below 1.150	Battery fully discharged.

These figures are given assuming the temperature of the solution is about 60°F. For particulars regarding temperature corrections, see our "First Charge Instructions," a copy of which can be obtained on application.

The readings for each of the three cells should be approximately the same. If one cell gives a reading very different from the rest, it may be that acid has spilled or has leaked from this particular cell or there may be a short circuit between the plates. In this case, we advise the owner to have his battery examined by a Lucas Service Depot—neglect may lead to costly repairs later on.

It must be remembered that you cannot get more energy out of the battery than is put in. If the motor cycle is left parked for long periods at night with the lights on, with very little daytime running, then the battery may get in a low state of charge. This may be remedied by running the motor cycle for longer periods during daytime or by economising in the use of the main headlight. If this is not possible, have the battery recharged from an independent electrical supply.

Never leave the battery in a discharged condition for any appreciable length of time.

If the motor cycle is to be out of use for any time, see that the battery is fully charged and about every fortnight give it a short freshening charge to prevent any tendency to permanent sulphation of the plates.

Make a habit of keeping regularly to these instructions and your battery will give you long and faithful service. Finally, remember that if you are in the least difficulty your nearest Official Battery Service Agent is there to help you out of it. Give him a call whenever you need help and advice.

"Lucas-Nife" Steel Plate Type

For instructions on the latest Lucas-Nife Steel Plate Battery Type C105, see Booklet No. 164, a copy of which can be obtained on application.

Third Brush Control Equipment.

Keeping the Battery Charged.

The battery is the reservoir for the energy generated by the dynamo, 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 extremes of undercharging or overcharging will tend to shorten the life of the battery.

Obviously, the amount of charging will depend on how you use the motor cycle. If it is used chiefly for night riding and only occasionally during daytime, the battery naturally will require more charging than if it is used for long daytime runs.

In order to meet these varying demands, the dynamo is arranged to give alternative outputs.

How to Use the Charging Switch.

With "Magdyno" and Separate Dynamo lighting equipment, the switch must be kept in the "C" position for about 1 hour daily. In this position the dynamo is giving half its maximum output. This time should be increased only if the period of night running is considerable or if the battery is found to be in a low state of charge (specific gravity reading of 1.210 or below) The dynamo is arranged to give its maximum output whenever the lamps are switched on.

With some Coil Ignition equipments, the charging switch has two positions marked "Summer Half" and "Winter Full." The dynamo is arranged to give its maximum output whenever the lamps are switched on. For motor cycles running under average conditions, keep the switch in the appropriate position according to the Season.

In some cases, however, where exceptional use is made of the lamps in summer, causing the battery to be in a low state of charge—run with the switch in the "Winter Full" position. On the other hand if in winter, the motor cycle is used chiefly during the day with practically no night riding, and the hydrometer readings are always found to be high and the acid level gets unusually low, then the battery is probably being overcharged. In these circumstances move the switch to the "Summer Half" position.

Compensated Voltage Control Equipment.

The Dynamo Automatically Keeps the Battery in Good Condition.

The dynamo on some motor cycles is what is known as a *compensated voltage control* type. This machine works in conjunction with a regulator unit which is mounted together with the cut-out. The regulator and cut-out units are accurately set after assembly and do not require any adjustment in service. The cover protecting these units is therefore sealed.

What the Regulator does—a completely automatic control.

The regulator causes the dynamo to give an output which varies according to the load on the battery and its state of charge. When the battery is discharged, the dynamo gives a high output so that the battery receives a quick recharge which brings it back to its normal state in the minimum possible time. On the other hand, if the battery is fully charged, the dynamo is arranged to give only a trickle charge which is sufficient to keep it in good condition without any possibility of causing damage to the battery by over-charging.

In addition to controlling the output of the dynamo according to the condition of the battery the regulator provides for an increase of output to balance the current taken by the lamps whenever they are switched on.

Ammeter Readings.

It must be remembered, when noting ammeter readings that normally during daytime running, when the battery is in good condition, the dynamo gives only a trickle charge so that the ammeter reading will seldom be more than 1 or 2 amperes.

A discharge reading may be observed immediately after switching on the headlamp. This usually happens after a long run when the voltage of the battery is high. After a short time the battery voltage will drop and the regulator will respond, causing the dynamo output to balance the lamp load.

Important.

If for any reason a "Lucas-Nife" battery is substituted for the normal lead-acid type, it is advisable to call at a Lucas Service Depot to have a new regulator fitted. Should it not be possible for the regulator to be changed immediately, the equipment will still function reasonably well, although the charging rate with a discharged battery will not be so high as with the correct regulator.

The DYNAMO

Care of the Dynamo.

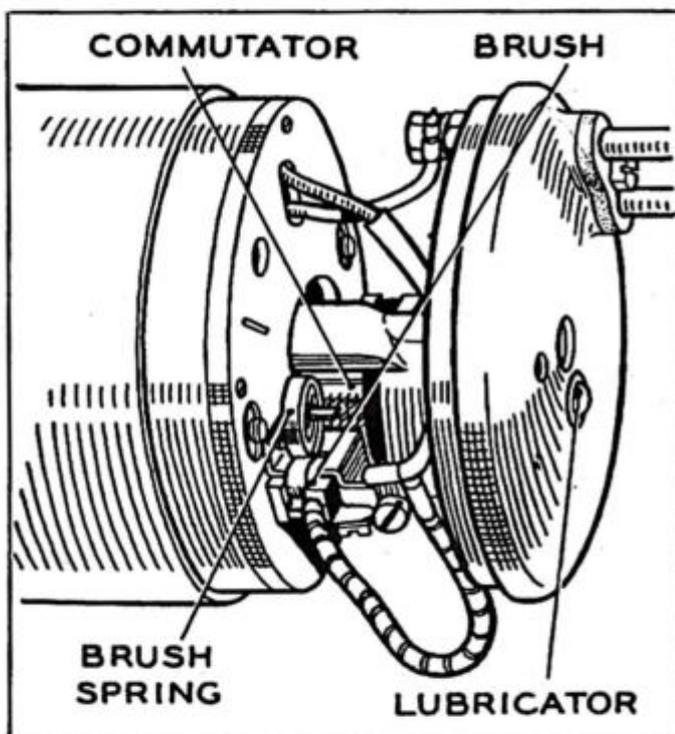
Lucas dynamos will give thousands of miles of uninterrupted service with hardly any attention beyond occasional inspection of the commutator and brushgear.

Lubrication.

On some dynamos, a lubricator is provided on the commutator end bracket. Add a few drops of good grade thin machine oil about every 4,000—5,000 miles. The bearing at the driving end is packed with grease before leaving the Works. This lasts until the motor cycle is taken down for a general overhaul when it is advisable to have the machine dismantled, preferably by a Lucas Service Depot for cleaning, adjustment and repacking the bearings with grease.

Inspection of Commutator and Brushgear.

About once a season, remove the metal cover from the dynamo for inspection of the commutator and the carbon brushes.



It is essential that the brushes make good firm contact with the commutator. The brushes are held in boxes by means of springs. Hold back the spring lever and at the same time, move the brush to see that it is free to slide in its holder. If there are any signs of sticking, remove it from its box and clean it with a cloth moistened with petrol.

After removing brushes for cleaning or another purpose, care must be taken to replace them in their original positions otherwise they will not "bed" properly on the commutator.

If, after long service, the brushes have become worn to such an extent that they will not bear properly on the commutator, they must be replaced. Always fit

genuine Lucas brushes, as these are made specifically for use on Lucas machines and will give far the best results and the longest life. We advise you to have the brushes fitted at a Lucas Service Depot so that they can be properly "bedded" to the commutator.

Next examine the commutator. It should be clean and free from any trace of oil or dirt and should have a highly polished appearance. The best way to clean a dirty or blackened commutator is by pressing against it a fine dry duster while the engine is slowly turned over by hand. If the commutator is very dirty, the duster may be moistened with petrol.

Dynamo Output.

The dynamo output is accurately set before leaving the Works, to suit the requirements of the equipment fitted on your motor cycle, and in normal service, the battery will be kept in good condition. If, due to very special running conditions, however, you should find that the battery is not kept in a charged condition, or is being excessively overcharged, we advise you to consult your nearest Lucas Service Depot, where any necessary adjustments can be made. We do not recommend owners to attempt the adjustment themselves.

Ammeter Readings.

The ammeter indicates the amount of current passing into or out of the battery. For instance, suppose the dynamo is generating 3 amperes at a particular speed and that the pilot light and tail lamp are in use, taking, say 1 ampere, then 2 amperes are left for charging the battery—this is the reading given on the ammeter.

The Cut-out—an Automatic Dynamo Switch.

It will be noticed from the ammeter readings that the dynamo does not charge at very low engine speeds. This is because it is not moving fast enough to generate sufficient energy to charge the battery.

Connected between the dynamo and the battery is the cut-out—an automatic switch which allows the flow of current from the dynamo to the battery only. It closes when the dynamo is running fast enough to charge the battery, and opens when the speed is low or the engine is stationary, thus preventing current from flowing from the battery through the dynamo windings.

LAMPS

How to Get the Best from your Lamps.

To get the best results from the lamps, occasionally examine the bulbs to see that they are not blackening and in need of replacement. It is a good plan at the beginning of the winter to give the lamps, particularly the headlamp, the "once over" to ensure that the lamps will not be a source of dazzle to other road users, and that the best driving light is being obtained.

Two things are necessary if your headlamp is to give the best results.

1. It must be aligned so that the main driving beam is directed straight ahead and parallel with the road surface.
2. Genuine Official Lucas Bulbs must be fitted as these are arranged to suit the optical characteristics of Lucas reflectors.

Alignment and Focussing.

Checking the Alignment.

The simplest way of checking the alignment of the headlamp is to take the motor cycle on a straight level stretch of road at night and examine the direction of the beam with the main driving light switched on. If the lamp is mounted so that its beam is being directed too high or too much on to the road, adjust the lamp by slackening the two fixing screws and moving the lamp until its beam is straight ahead and parallel with the road surface. Tighten the fixing screws after making the adjustment.

Focussing.

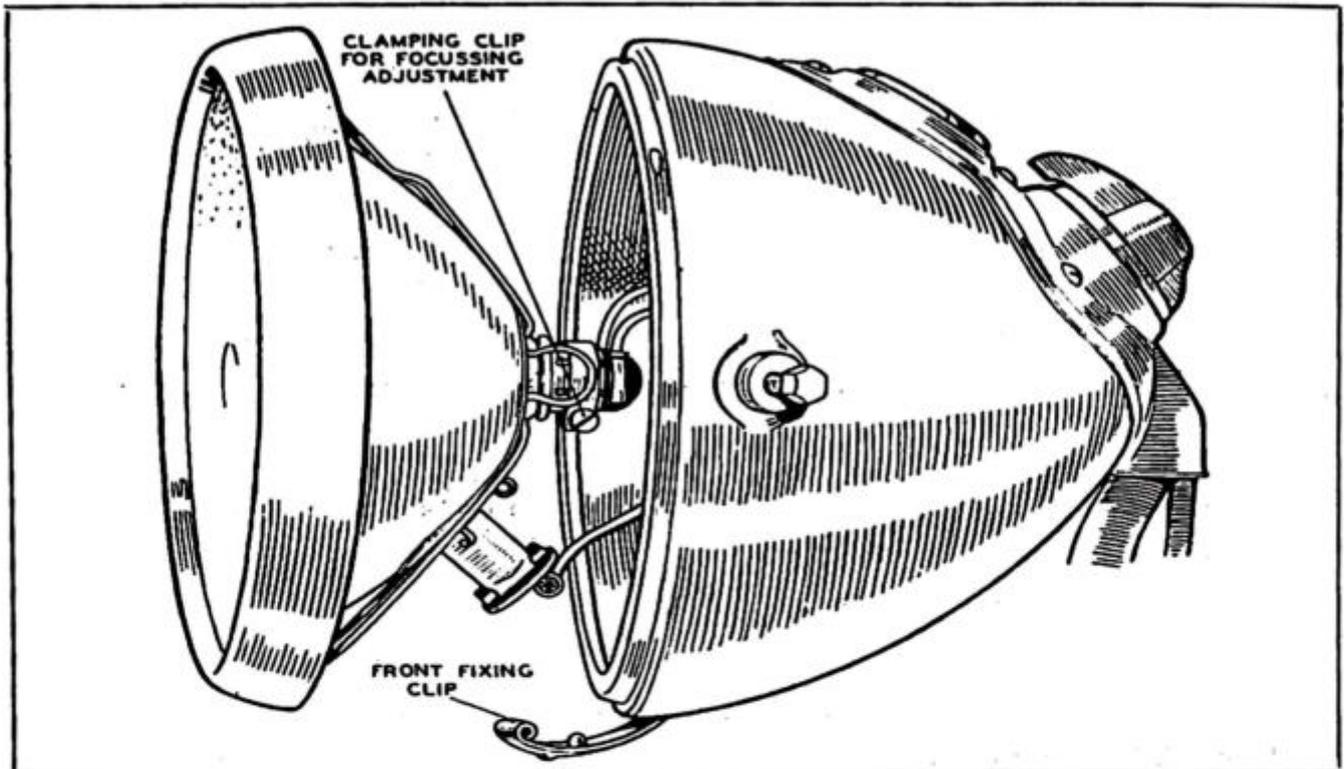
In order for the headlamp to give a parallel beam, the main driving light filament must be as near as possible to the focus of the reflector. If the filament is behind the focal point of the reflector, the beam will be divergent, while on the other hand, if the filament is in front of the focal point, the beam will be convergent, with a dark area in the centre of the beam. In either case the lamp will have a poor range and will cause dazzle to approaching traffic.

Before the lamps are despatched from the Works, the main bulb is carefully focussed to give the best results. Provided that the correct number Genuine Lucas Bulb is fitted as a replacement, it should not be necessary to disturb the setting. If for any reason a Lucas bulb is not obtainable and an ordinary bulb has to be used it may be necessary to re-focus as follows:—

Focussing involves moving the bulb backwards and forwards along the axis of the reflector until the best lighting is obtained.

If the lamp does not give a uniform long range beam without any dark centre, the bulb needs adjusting. To do this, remove the lamp front and reflector, as described below, and slacken the clamping clip at the back of the

reflector. After each adjustment, note the effect with the reflector and front refitted.



When the best position for the bulb has been found, see that the clamping screw is tightened.

When focussing and aligning a headlamp which is fitted with a fluted front glass it must be remembered that the beam will be spread to give an oval shape and so illuminate a greater width of road.

Removing Headlamp Front and Reflector.

To remove lamp front and reflector, press back the fixing clip at the bottom of the lamp. When replacing the front, locate the top of the rim first, then press on at the bottom and secure by means of the fixing clip. Make sure that the earthing clip makes good contact with the back of the reflector.

To remove the bulb holder, press back the two securing springs.

With some lamps, the front and reflector are removed by pulling out the spring clip at the bottom of the lamp and moving it out of its location.

Replacement of Bulbs.

When the replacement of a bulb is necessary, it is important not only that the same size bulb is fitted, but that it has a high efficiency and will focus in the reflector. Cheap and inferior replacement bulbs often have the filament of such a shape that it is impossible to focus correctly; for example, the filament may be to the one side of the axis of the bulb resulting in loss of range and light efficiency.

It always pays you to fit bulbs recommended by the lamp manufacturers as these problems will then not arise.

When fitting a main headlamp bulb, care must be taken to insert it the correct way round, i.e., with the dipped beam filament above the centre filament.

Lucas Genuine Spare Bulbs.

Lucas Genuine Spare Bulbs are sold by any reputable garage and are specially tested to check that the filament is in the correct position to give the best results with Lucas lamps. To assist in identification, Lucas bulbs are marked on the metal cap with a number. When fitting a replacement, see that it is the same number as the original bulb.

We advise you to replace bulbs after long service before they actually burn out, as very often the filaments sag, making it impossible for them to be focussed correctly.

Side-car Lamp.

To remove lamp front and reflector, slacken the screw at the bottom of the lamp. Pull the bulb holder from the back of the reflector.

When replacing the front, locate the top of the rim first, then press on at the bottom and tighten the fixing screw. With other types of sidelamps, slacken the screw at the top of the lamp and then withdraw the front together with the reflector. The bulb holder must be unclipped from the back of the reflector. If it is a tight fit it can be carefully levered off with a small screw-driver. When refitting the lamp front, locate the bottom first and secure with the screw.

Tail Lamp.

With some types of tail lamps, the portion carrying the red glass can be removed by giving it half a turn to the left when it becomes detached from its fixing, on others, the portion incorporating the bulb holder is detached by giving it half a turn to the left. Whilst with a third type the red glass can be removed when the fixing screw at the top of the lamp is withdrawn.

"Stop" Tail Lamp.

The fronts of stop tail lamps are secured by means of a clip. To remove lamp front move aside the spring clip. When refitting the front, first locate the slot with the tongue on the body, and then secure it by means of the spring clip.

Cleaning Lamps.

All Lucas reflectors are protected by a fine transparent and colourless covering, which enables any accidental finger marks to be removed by lightly polishing with chamois leather or a soft cloth. This can be done without affecting the surface of the reflector. Never use metal polishes on Lucas reflectors. Ebony black lamps can be cleaned with a good car polish. Chromium plated lamps must be washed with plenty of water, and when the dirt is completely removed the lamp bodies must be polished with a chamois leather or a soft dry cloth.

Dipper Switch.

Every 5,000 miles the moving parts of the dipper switch must be lubricated with a thin machine oil.

The MAGNETO

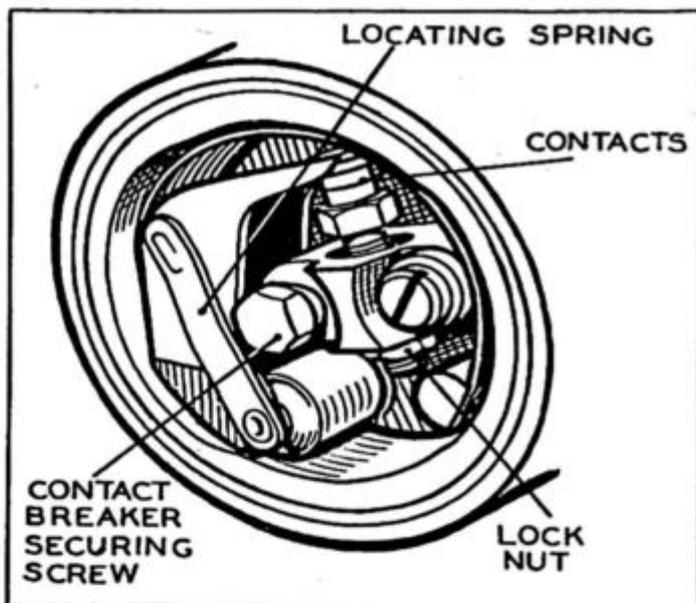
Cleaning.

Dirty contacts may be cleaned by polishing with fine carborundum stone or if this is not available fine emery cloth may be used. Wipe away any dirt or metal dust with a cloth moistened with petrol.

Contact breaker springs should be examined, and any rust wiped away.

To render the contacts accessible for cleaning, proceed as follows:—

Ring Cam Type. Withdraw the contact breaker from its housing by unscrewing the hexagon-headed screw. The whole contact breaker can be pulled off the tapered shaft on which it fits. Now push aside the locating spring and prise the rocker arm off its bearing, when it will be possible to begin cleaning the contacts.



When replacing the contact breaker, take care to ensure that the projecting key on the tapered portion of the contact breaker base engages with the keyway cut in the armature spindle, or the timing of the magneto will be upset. Tighten the hexagon headed screw with care—it must not be too slack, nor must undue force be used.

Face Cam Type. Remove the spring arm carrying the moving contact by withdrawing the securing screw. When replacing the arm see that the small backing spring is fitted in its original position, i.e.

immediately under the securing screw and spring washer and with the bent portion facing outwards.

Next remove the pick-up or high tension terminal (there are two in Magdynos or magnetos for two cylinder engines). Wipe the moulding clean with a dry cloth. See that the carbon brush moves freely in its holder, being careful not to stretch the brush spring unduly. With the pick-up still removed, carefully clean the slip ring track and flanges by holding a soft cloth on the ring by means of a suitably shaped piece of wood while the engine is slowly turned round.

Adjustment.

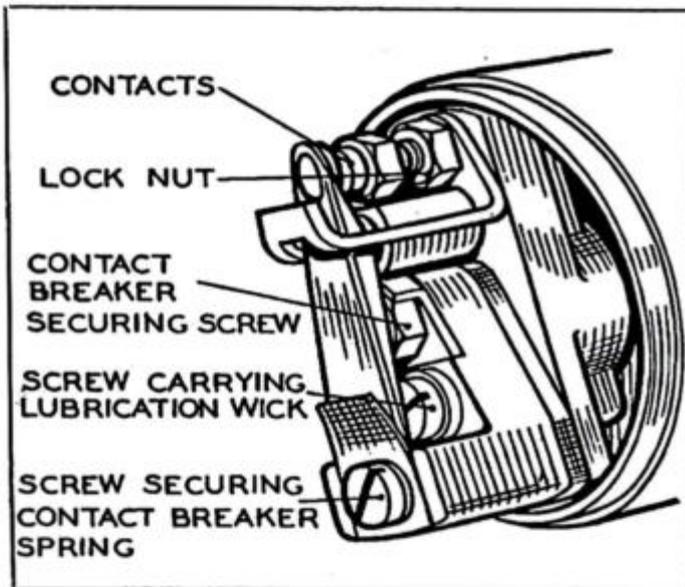
The gap to which the contact breaker contacts must be set when they are fully opened is about 12 thousandths of an inch; a gauge of this thickness is provided on the side of the spanner supplied with the magneto. It is inadvisable to alter the setting unless the gap varies considerably from the gauge.

If the contacts need adjustment, turn the engine round slowly by hand until the contacts are fully opened. Then slacken the locknut and rotate the contact screw by its hexagon head until the gap is set to the thickness of the gauge. Finally tighten the locknut.

Lubrication.

Ring Cam Type. The cam is lubricated from a length of felt which is contained in the contact breaker housing.

A small hole in the cam fitted with a wick, enables the oil to find its way on to the surface of the cam. About every 5,000 miles, withdraw the cam ring and add a few drops of thin machine oil to the felt. At the same time, push aside the locating spring, prise the rocker arm off its bearing and lightly smear the bearing with Mobilgrease No. 2.



Face Cam Type. The cam is lubricated by a wick, which is contained in the contact breaker base. Add a few drops of thin machine oil to the wick about every 5,000 miles. To render the wick accessible, remove the spring arm carrying the moving contact and then withdraw the screw carrying

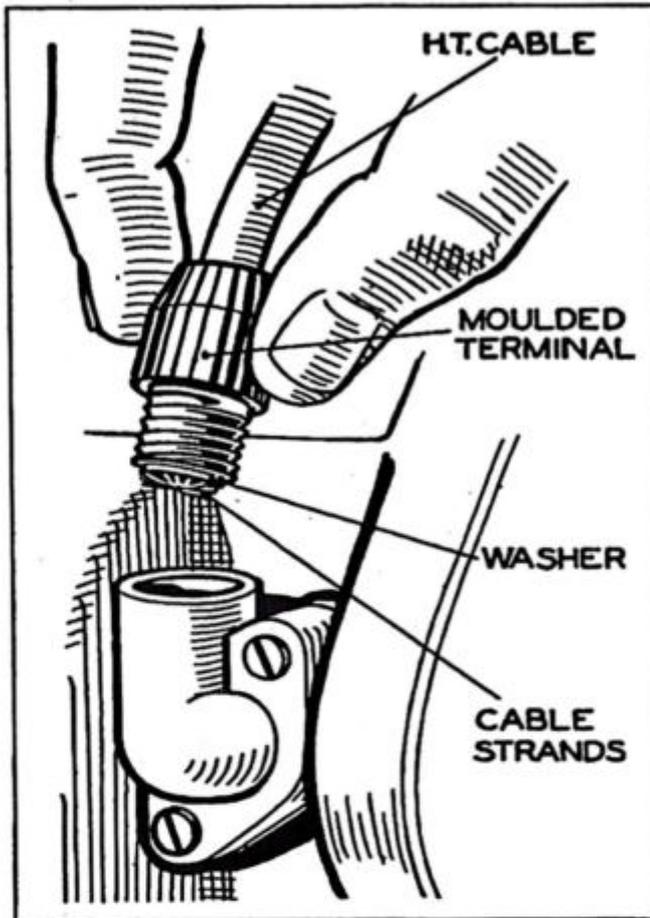
the wick. At the same time, remove the tappet which operates the contact breaker spring and lightly smear it with thin machine oil. When replacing the arm see that the small backing spring is fitted in its original position, i.e., immediately after the securing screw and spring washer and with the bent portion facing outwards.

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

Renewing High Tension Cables.

When high tension leads show signs of cracking or perishing they must

be replaced; 7 m.m. rubber-covered ignition cable must be used for high tension leads with the exception of some magnetos which are arranged for 9 m.m. cables.



The method of fitting the cable to some terminals is as follows:— Thread the knurled moulded nut over the lead, bare the end of the cable for about $\frac{1}{4}$ in., thread the wire through the metal washer provided and bend back the strands. Finally screw the nut into its terminal.

With other types of terminals, cut the cable flush to the required length. Remove the pick-up and from it withdraw the carbon brush. Slacken the pointed screw and push the cable hard home. Secure by tightening the screw which will pierce the insulation and make good contact with the cable core.

Use of Ignition Timing Control.

The ignition control should be retarded for starting, but advanced as soon as the engine is running at speed. For normal running, the control should be kept in the advanced position and should be retarded only when the engine is pulling slowly on full throttle, *e.g.*, when hill climbing.

IGNITION EQUIPMENT

Contact Breaker.

Cleaning.

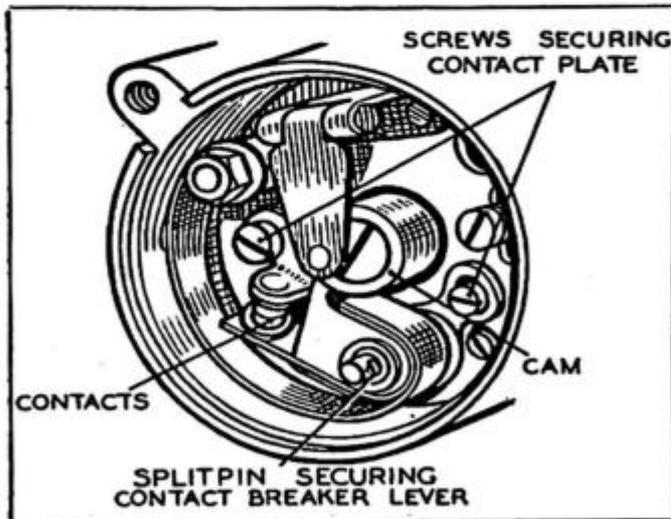
Occasionally remove the moulded cover and examine the contact breaker; it is important that the contacts are kept clean and free from oil or grease. If they are burned or blackened, clean with fine carborundum stone, or if this is not available fine emery cloth may be used; afterwards wipe with a cloth moistened with petrol. If the contacts have been allowed to get into bad condition remove the rocker arm from its housing as follows:—

Unscrew the nut securing the end of the contact breaker spring. Remove the nut together with the spring washer. Remove the metal bush. Lift the contact breaker lever off its bearing and also remove the split pin securing the rocker arm. Lift the rocker arm from its housing.

After cleaning, refit the rocker arm and split pin, contact breaker lever, metal bush and spring washer, and then replace and tighten nut.

Adjustment.

The contact breaker gap is carefully set before leaving the Works and will only need adjustment at very long intervals. To test the contact breaker gap, slowly turn the engine over by hand until the contacts are seen to be fully opened. Now insert the gauge provided in the gap; if it is correct the gauge should be a sliding fit. It is not advisable to alter the setting unless the gap varies considerably from the gauge. If adjustment is necessary, proceed as follows: When the contacts are fully opened, slacken the locking screws so that the plate carrying the stationary contact can just be moved. Adjust the position of the plate until the gap is set to the thickness of the gauge. Tighten the locking screws and re-check the gap.

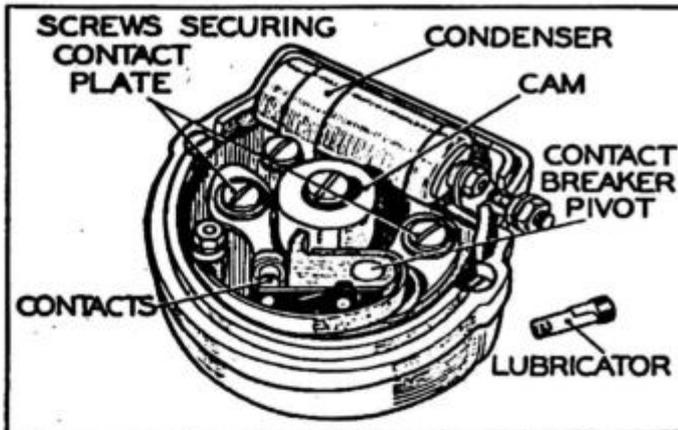


With contact breakers which have the condenser mounted in the moulded cover the hinged spring blade on the contact breaker must make good contact with the condenser case when the cover is fitted in position. If the blade does not press firmly against the case, there will be excessive sparking and burning away of the contacts.

Ignition Timing Control.

On some motor cycles, the ignition is provided with an automatic timing

mechanism which automatically varies the firing point according to the requirements of the engine.



Contact Breaker incorporates Automatic Timing Control.

When the equipment is not fitted with an automatic timing mechanism retard the hand ignition control for starting, but advance it as soon as the engine is running at speed. For normal running the control should be kept in the advanced position and should be retarded only when the engine is pulling slowly on full throttle, e.g., when hill climbing.

Lubrication.

About every 1,000 miles lightly smear the surface of the steel cam with Mobilgrease No. 2. Do not give any excess.

Every 5,000 miles remove the split pin securing the spring, lift the rocker arm off its pivot and lightly smear with Mobilgrease No. 2.

When an automatic timing control is provided, this must be lubricated about every 3,000 miles. Remove the contact breaker cover, and lift off the contact breaker base after withdrawing its two securing screws. Lubricate the moving parts of the mechanism with a good grade medium engine oil. Take care to refit the contact breaker base in its original position. With this type of contact breaker add a few drops of thin machine oil to the lubricator on the contact breaker shank every 1,000 miles.

The Coil.

The coil requires no attention whatever beyond keeping its exterior clean, particularly between the terminals, and occasionally checking that the terminal connections are tight.

Renewing the High Tension Cable.

When the high tension cable shows signs of perishing or cracking it must be replaced by 7 m.m. rubber covered ignition cable. To connect the cable, thread the knurled moulded nut over the lead, bare the end of the cable for about $\frac{1}{4}$ -inch, thread the wire through the metal washer provided and bend back the strands. Finally screw the nut into its terminal.

Warning Light.

The ignition warning lamp gives a red light when the engine is stationary and the ignition is switched on, in order to warn the rider to switch off. It will also light up when the engine is idling. After long service the bulb may burn out. However, 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.

When the lamp is mounted in an instrument panel it is sometimes necessary to remove the panel front, when the bulb may be unscrewed from its holder. With other types the bulb can be removed when the glass front is unscrewed.

If the warning light is combined with the ammeter in the headlamp, remove the lamp front and reflector to render the bulb accessible.

The bulb used is a Lucas No. C252A (2.5 volts 0.2 amp.).

ELECTRIC HORN

These 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 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. In particular ascertain that the horn push bracket is in good electrical contact with the handlebars.

It is also possible that the performance of a horn may be upset by its mounting becoming loose.

If the cause of the trouble cannot be found, do not attempt to dismantle the horn, but return it to a Lucas Service Depot for examination.

WIRING OF EQUIPMENT

Before making any alterations to the wiring or removing the switch from the headlamp or instrument panel, disconnect the positive lead at the battery to avoid the danger of short circuits. The lead (about 1ft. long) from the positive battery terminal is connected to the lead from the switch by means of a brass connector. The connector is insulated by a rubber shield which must be pushed back to enable the connector to be unscrewed. Care must be taken that it does not touch any metal part of the frame as this will short circuit the battery. When connecting up again, do not forget to pull the rubber shield over the connector.

All leads to type DU headlamps are taken direct to the switch, which, together with the ammeter is incorporated in a small panel. The panel can be withdrawn when the three securing screws are removed.

The ends of all the cables are identified by means of coloured sleeveings. The colour scheme and the diagram of connections are given on the wiring diagram. When making a connection to the switch, 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 a good electrical connection.

To make a connection to the dynamo or regulator terminals, slacken the fixing screw on the terminal block and remove the clamping plate.

Withdraw the metal sleeves in each terminal. Pass about 1 in. of cable through the holes in the clamping plate and bare the ends for $\frac{3}{8}$ -inch. Fit the metal sleeves over the cables, bend back the wire over the sleeves and push them well home into their terminals. Finally screw down the clamping plate.

The leads connected to the "D" and "F" terminals of the dynamo or regulator units must not be reversed. To prevent this occurring, the screw in the dynamo terminal block is off-centre and the screws which secure the regulator terminal clamping plate are of different size.

How to locate and remedy trouble with Compensated Voltage Control Dynamo Equipment.

SYMPTOMS.	PROBABLE FAULT.	REMEDY.
Battery in low state of charge.	Dynamo not charging, indicated by ammeter failing to show charge reading when running with no lights in use, due to: Broken or loose connection in dynamo circuit, or regulator not functioning correctly.	Examine charging and field circuit wiring. Tighten loose connection or replace broken lead. Particularly examine battery connections. If trouble persists, have equipment examined by a Lucas Service Depôt.
	Commutator greasy or dirty.	Clean with soft rag moistened in petrol.
	Dynamo giving low or intermittent output, indicated by ammeter showing low or intermittent charge reading, when running steadily in top gear, due to:	
	Loose or broken connections in dynamo circuit.	Examine dynamo wiring. Tighten loose connections or replace broken lead. Particularly examine battery connections.
	Commutator or brushes greasy.	Clean with soft rag moistened with petrol.
	Brushes worn, not fitted correctly, or wrong type.	Replace worn brushes. See that brushes "bed" correctly. Fit correct type brushes.
Battery over-charged, shown by burnt-out bulbs and frequent need for topping up.	Regulator not functioning correctly.	Have equipment examined by a Lucas Service Depôt.
	Dynamo giving high output, indicated by ammeter giving high charge reading when lights are in use, due to:	
	Regulator not functioning correctly.	Have equipment examined by a Lucas Service Depôt.

If, after following the above table, the trouble cannot be rectified, have the dynamo, regulator and battery examined by a Lucas Service Depôt.

How to locate and remedy trouble with Third Brush Control Dynamo Equipment.

SYMPTOMS.	PROBABLE FAULT.	REMEDY.
Battery in low state of charge.	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 charge position. Possible causes of dynamo trouble are:—	
	Loose connections at headlamp switch, dynamo or battery.	Tighten loose connections.
	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 charge position, and then press cut-out contacts momentarily together.
Battery over-charged by burnt out bulbs and frequent need for topping up.	Control brush position altered.	Have control brush adjustment reset at nearest Lucas Service Depôt.
	Control brush position altered.	Have control brush adjustment reset at nearest Lucas Service Depôt.

How to locate and remedy Lighting Trouble.

SYMPTOMS.	PROBABLE FAULT.	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 the bulb until the best illumination is obtained.
	Dirty reflector or bulb.	Clean dirty reflector with chamois leather or a soft cloth.
	Severed or worn cable, or loose connections at headlamp switch, dipper switch, dynamo or battery.	Tighten loose connections and replace faulty cables.
	Faulty earthing of headlamp or reflector.	Tighten loose connections, and replace faulty cable or make sure earthing clip is in good contact with reflector.
	Faulty earthing of battery. The cable from the negative battery terminal must be securely connected to a metal part of the machine.	Tighten loose connections and replace faulty cables.
	Battery exhausted. Take hydrometer readings when acid level is correct 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, or battery charged from independent electrical supply.

How to locate and remedy trouble in Magneto Ignition Equipment.

SYMPTOMS.	PROBABLE FAULT.	REMEDY.
Engine will not fire or fires erratically.	Remove plug and allow to rest on cylinder head. If a spark occurs at plug points when engine is slowly turned over, the ignition equipment is in order.	Look for engine defects and check ignition timing.
	If no spark occurs at plug points remove lead and plug, replace with new length of cable and test independently of plug by holding cable end about $\frac{1}{4}$ in. from metal part of engine. If magneto sparks, H.T. lead or plug is faulty.	Replace H.T. cable if perished or cracked. Clean plug electrodes, adjust gap to about 20 thousandths of an inch.
	If magneto does not spark, possible causes of trouble are:— Contact breaker gap out of adjustment or contacts dirty.	Clean dirty or pitted contacts with fine carborundum stone or fine emery cloth and afterwards with a cloth moistened with petrol. To adjust gap, turn engine slowly until the contacts are seen to be fully opened, then slacken locking nut and rotate fixed contact screw by its hexagon head until the gap is set to thickness of gauge. After the adjustment, tighten locking nut.
	Contact breaker rocker arm sticking (Ring Type Cam).	Remove contact breaker and prise rocker arm off its bearing. Clean steel pin if necessary with fine emery cloth and then, having removed all grit, lightly smear with Mobilgrease No. 2 before replacing the lever.
Pick-up brush worn or broken.	Fit new brush. Before fitting, clean slip ring track.	

How to locate and remedy trouble in Coil Ignition Equipment

SYMPTOMS.	PROBABLE FAULT.	REMEDY.
Engine will not fire.	Battery discharged. Indicated if lamps do not light.	Recharge the battery from an independent electrical supply. In case of emergency, a start can be obtained with 2 flash lamp batteries connected in series (the short terminal strip of the one battery connected to the long strip of the second). Connect the positive battery terminal (usually the short strip) to the coil terminal marked "SW" and the other battery terminal to the frame. As soon as the dynamo begins to charge, the flash lamp battery can be removed.
	Controls not set correctly for starting.	See that ignition is switched on, petrol turned on and everything is in order for starting.
	Contact breaker cover not fitting correctly, preventing circuit from being complete.	The hinged spring blade on the contact breaker should press firmly against condenser body, and brass ring on contact breaker cover should make good contact with the contact breaker housing.
	Remove lead from plug terminal and hold it about $\frac{1}{4}$ in. away from some metal part of the engine while engine is turning over. If sparks jump gap regularly, the coil and contact breaker are functioning correctly. If the coil does not spark, the trouble may be due to any of the following causes:—	Examine the sparking plugs, and if these are clean and the gaps correct, the trouble is due to carburetter, petrol supply, etc.
	Fault in low tension wiring. Indicated if no ammeter reading is shown when engine is slowly turned and ignition switch is on.	Examine all cables in ignition circuit, and see that all connections are tight. See that battery connections are secure.
	Dirty or pitted contacts.	Clean with fine carborundum stone and afterwards with a cloth moistened with petrol.
	Contact breaker out of adjustment. Turn engine until contacts are fully opened and test gap with gauge of 8-10 thousandths of an inch thickness.	Adjust gap to gauge.

(Continued on next page)

Coil Ignition Equipment (Contd.).

SYMPTOMS.	PROBABLE FAULT.	REMEDY.
Engine Misfires.	Contact breaker cover not fitting correctly, preventing circuit from being complete.	The hinged spring blade on the contact breaker should press firmly against condenser body, and brass ring round contact breaker cover should make good contact with the contact breaker housing.
	Dirty or pitted contacts.	Clean with fine carborundum stone and afterwards with a cloth moistened with petrol.
	Contact breaker out of adjustment. Turn engine until contacts are fully opened and test gap with gauge.	Adjust gap to gauge.
	Remove sparking plug, rest it on top of the cylinder and observe whether a spark occurs at the points when the engine is turned. Irregular sparking may be due to a dirty plug, or defective high tension cable. If sparking is regular, the trouble is probably due to engine defects.	Clean plug and adjust the gap to about 20 thousandths of an inch. Replace high tension lead if the insulation shows signs of deterioration or cracking. Examine carburetter, petrol supply, etc.

GUARANTEE.

We stand by all goods of our manufacture. All usual and reasonable precautions have been taken by us to ensure excellence of materials and workmanship, and in the event of any defect in any LUCAS product which is not caused by wear and tear, misuse, accident, or negligence, being disclosed within six months of its being put into use, we will either supply new parts or components in exchange for those defective, or repair such defective parts or components, free of charge. We do not undertake to dismantle or re-assemble, or bear the cost of dismantling or re-assembling any such part or component on the vehicle or chassis. This undertaking shall be deemed to exclude any and every other obligation whatsoever, and all liability for any loss or damage, howsoever or whensoever caused or arising, except the cost of replacement or repair, in accordance with this undertaking.

LUCAS

SERVICE DEPOTS

All owners of Lucas equipment are urged to take advantage of the facilities offered by Lucas Service.

For the benefit of the users of our equipment, we have established Service Depôts in all large towns, which are not only at your disposal for repairs, overhauls and adjustments, but to give free advice. If you experience any difficulty with any part of the equipment, do not hesitate to consult us; we shall be only too pleased to be of assistance. The best course to adopt is to call at our nearest Service Depôt, the addresses of which are given below, when the equipment can be examined as a whole.

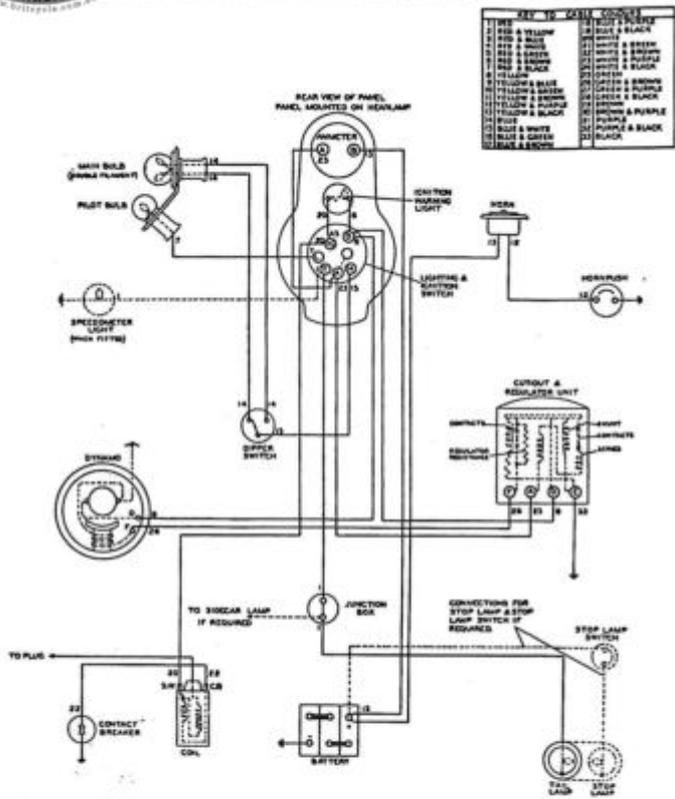
If it is necessary to replace any part, order Genuine Lucas Spares. It is obvious that only the designers and manufacturers of the equipment are in a position to make replacement parts which will give satisfactory and lasting service.

When corresponding with Depôts, or when ordering spare parts, give the make, model and year of the engine; the unit of equipment; and particular part in question. Units of equipment are identified by letters and numbers stamped or moulded on some part of the article. It is essential to quote this marking to ensure that correct replacements are sent.

Illustrated spare parts listed are available on application. State year, make and model of engine.

BELFAST Telephone: BELFAST 25617 (3 lines)	51/55, Upper Library Street Telegrams: "SERVDEP, BELFAST"
BIRMINGHAM, 18 Telephone: CENTRAL 8401 (10 lines)	Great Hampton Street Telegrams: "LUCAS, TELEX, BIRMINGHAM"
BRIGHTON, 4 Telephone: HOVE 1146 (4 lines)	85, Old Shoreham Road, Hove Telegrams: "LUSERV, BRIGHTON"
BRISTOL Telephone: BRISTOL 76001 (4 lines)	345, Bath Road Telegrams: "KINGLY, BRISTOL"
CARDIFF Telephone: CARDIFF 4603 (4 lines)	54a, Penarth Road Telegrams: "LUCAS, CARDIFF"
COVENTRY Telephone: COVENTRY 3068	Priory Street Telegrams: "LUCAS, COVENTRY"
DUBLIN Telephone: DUBLIN 72601 (4 lines)	Portland Street North, North Circular Road Telegrams: "LUSERV, DUBLIN"
EDINBURGH, 11 Telephone: EDINBURGH 62921 (4 lines)	60, Stevenson Road, Gorgie Telegrams: "LUSERV, EDINBURGH"
GLASGOW Telephone: DOUGLAS 3075 (5 lines)	Grant Street (St. George's Road) Telegrams: "LUCAS, GLASGOW"
LEEDS, 8 Telephone: LEEDS 28591 (5 lines)	64, Roseville Road Telegrams: "LUSERDEP, LEEDS"
LIVERPOOL, 13 Telephone: OLD SWAN 1408 (6 lines)	450/456, Edge Lane Telegrams: "LUSERV, LIVERPOOL"
LONDON Phone: SHEPHERDS BUSH 3160 (10 lines)	Dordrecht Road, Acton Vale, W.3 Grams: "DYNOMAGNA, EALUX, LONDON"
LONDON Telephone: LEYTONSTONE 3361 (5 lines)	757/759, High Road, Leyton, E.10 Telegrams: "LUSERDEP, LEYSTONE, LONDON"
LONDON Telephone: PUTNEY 5131 (4 lines)	155, Merton Road, Wandsworth, S.W.18 Telegrams: "LUSERV, PUT, LONDON"
MANCHESTER Telephone: LONGFORD 1101 (5 lines)	Talbot Road, Stratford Telegrams: "LUCAS, STRITFORD"
NEWCASTLE-ON-TYNE, 2 Telephone: NEWCASTLE 25571 (3 lines)	64/68, St. Mary's Place Grams: "MOTOLITE, NEWCASTLE"

IN ADDITION THERE ARE LUCAS OFFICIAL BATTERY SERVICE AGENTS, OFFICIAL SPARES STOCKISTS AND DEALERS IN IMPORTANT CENTRES THROUGHOUT THE COUNTRY. LISTS ON APPLICATION



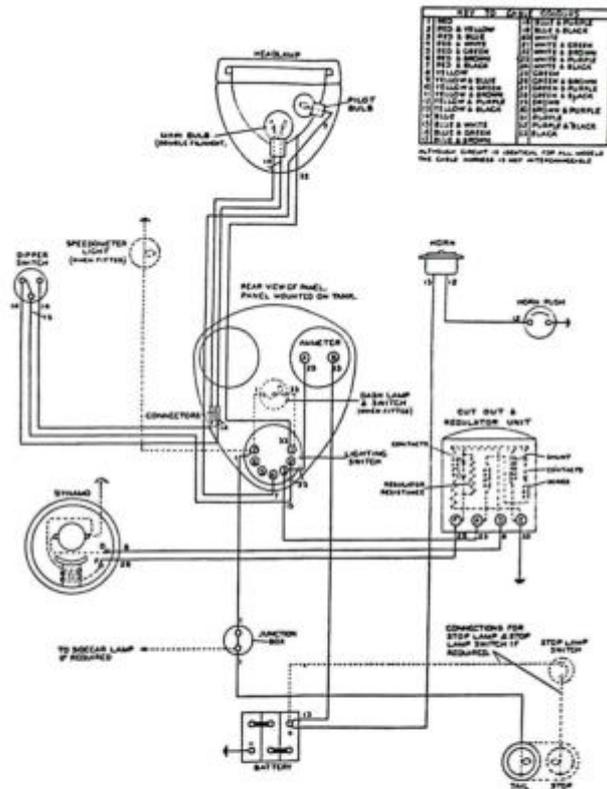
KEY TO CABLE COLOURS	
1 RED & YELLOW	31 BLUE & BLACK
2 RED & BLUE	32 WHITE & GREEN
3 RED & WHITE	33 WHITE & BROWN
4 RED & BROWN	34 WHITE & PURPLE
5 RED & BLACK	35 WHITE & BLACK
6 YELLOW & BLUE	36 WHITE & BROWN
7 YELLOW & BROWN	37 GREEN & BLACK
8 YELLOW & PURPLE	38 BROWN & PURPLE
9 BLUE & WHITE	39 PURPLE & BLACK
10 BLUE & BROWN	40 BLACK
11 BLUE & BLACK	

WIRING DIAGRAM
No. W84881

Numbers indicate cable identification colours. See key above.

ISSUED
SEPTEMBER 1939

LUCAS DYNAMO LIGHTING & COIL IGNITION
COMPENSATED VOLTAGE CONTROL EQUIPMENT
(WITH SEPARATE CONTACT BREAKER & WITHOUT PANEL)
AS FITTED TO 1938, 1939 & 1940 MOTOR CYCLES



KEY TO CABLE COLOURS	
1 RED & YELLOW	31 BLUE & BLACK
2 RED & BLUE	32 WHITE & GREEN
3 RED & WHITE	33 WHITE & BROWN
4 RED & BROWN	34 WHITE & PURPLE
5 RED & BLACK	35 WHITE & BLACK
6 YELLOW & BLUE	36 WHITE & BROWN
7 YELLOW & BROWN	37 GREEN & BLACK
8 YELLOW & PURPLE	38 BROWN & PURPLE
9 BLUE & WHITE	39 PURPLE & BLACK
10 BLUE & BROWN	40 BLACK
11 BLUE & BLACK	

WIRING DIAGRAM
No. W8221

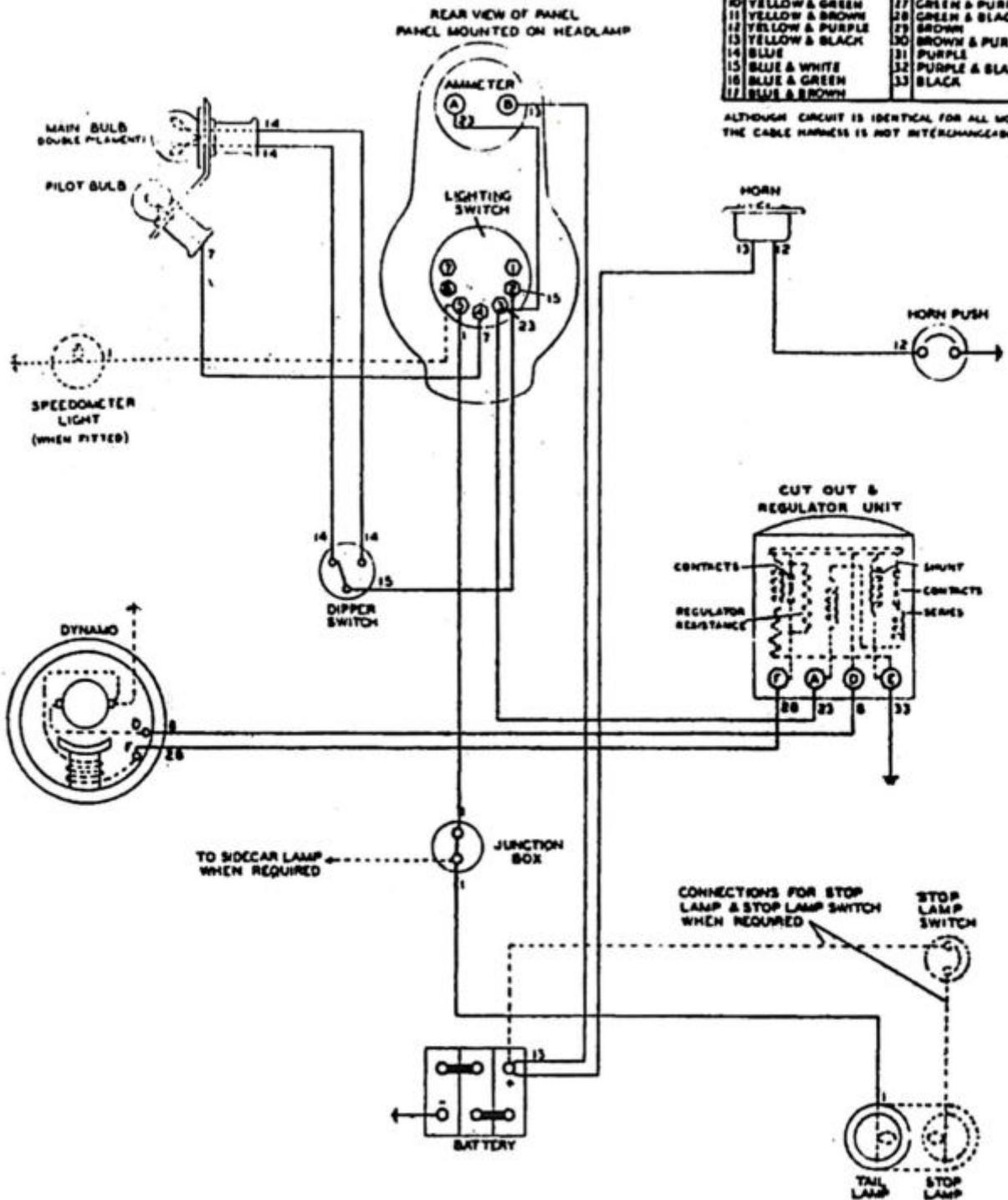
Numbers indicate cable identification colours. See key above.

ISSUED
SEPTEMBER 1939

LUCAS MAGDYNO & SEPARATE DYNAMO
COMPENSATED VOLTAGE CONTROL EQUIPMENT
(WITH INSTRUMENT PANEL)
AS FITTED TO 1937, 1938, 1939 & 1940 MOTOR CYCLES

KEY TO CABLE COLOURS	
1	RED
2	RED & YELLOW
3	RED & BLUE
4	RED & WHITE
5	RED & GREEN
6	RED & BROWN
7	RED & BLACK
8	YELLOW
9	YELLOW & BLUE
10	YELLOW & GREEN
11	YELLOW & BROWN
12	YELLOW & PURPLE
13	YELLOW & BLACK
14	BLUE
15	BLUE & WHITE
16	BLUE & GREEN
17	BLUE & BROWN
18	BLUE & PURPLE
19	BLUE & BLACK
20	WHITE
21	WHITE & GREEN
22	WHITE & BROWN
23	WHITE & PURPLE
24	WHITE & BLACK
25	GREEN
26	GREEN & BROWN
27	GREEN & PURPLE
28	GREEN & BLACK
29	BROWN
30	BROWN & PURPLE
31	PURPLE
32	PURPLE & BLACK
33	BLACK

ALTHOUGH CIRCUIT IS IDENTICAL FOR ALL MODELS THE CABLE HARNESS IS NOT INTERCHANGEABLE



Numbers indicate cable identification colours. See key above.

**WIRING DIAGRAM
No. W84241**

**ISSUED
SEPTEMBER 1939**

**LUCAS MAGDYNO & SEPARATE DYNAMO
COMPENSATED VOLTAGE CONTROL EQUIPMENT
(WITHOUT INSTRUMENT PANEL)**

AS FITTED TO 1937, 1938, 1939 & 1940 MOTOR CYCLES