B.R. 33057/16
D.T.S. 14

BRITISH RAILWAYS - WESTERN REGION

M.6. GANTRIES - ELECTRICAL EQUIPMENT

Diesel Training School,
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NOTES FOR STUDENTS ON THE THEORY AND APPLICATION OF ELECTRICAL EQUIPMENT ON M.6. GANTRIES

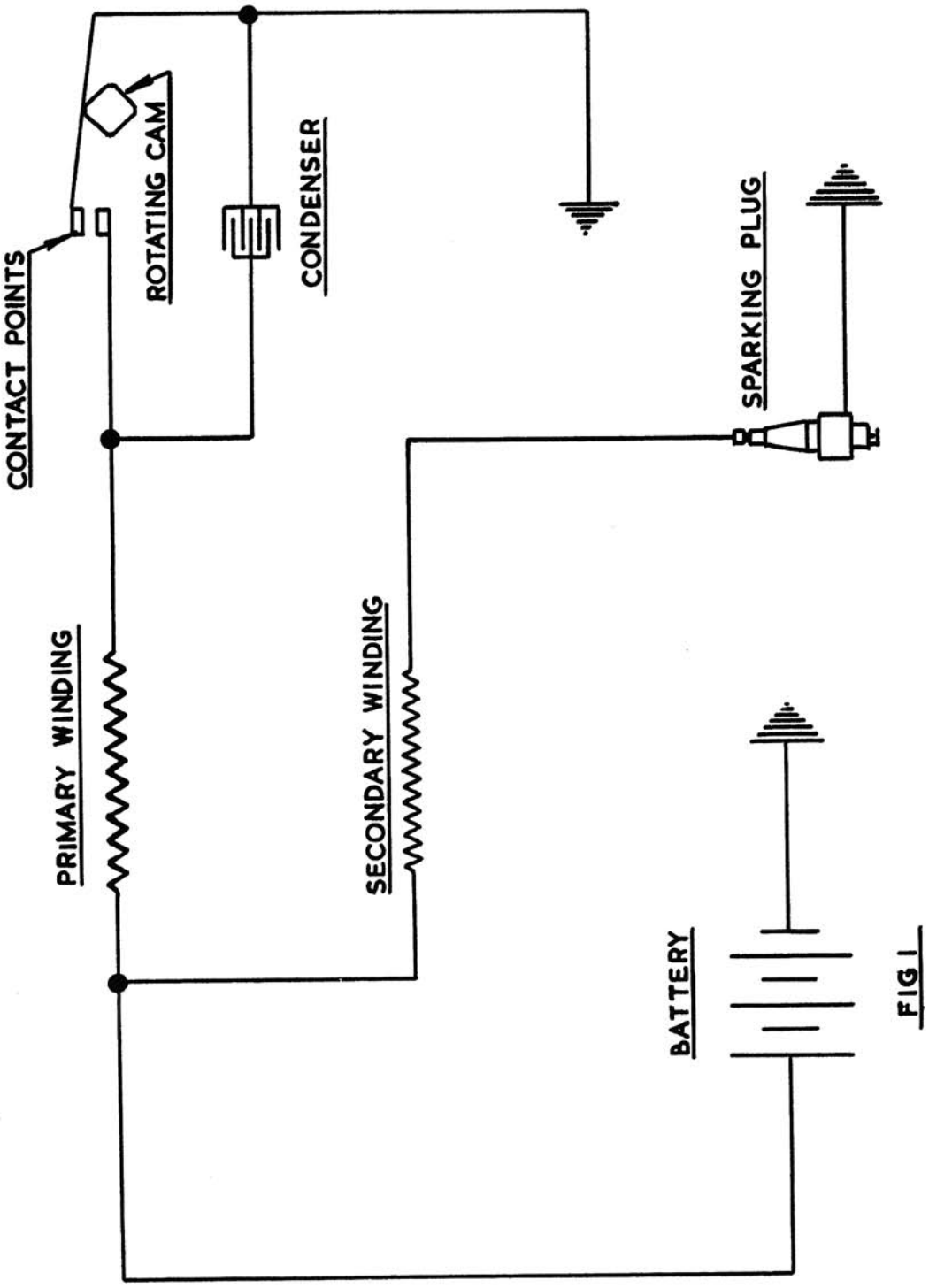
CONTACT POINTS
ROTATING CAM
CONDENSER
SPARKING PLUG
PRIMARY WINDING
SECONDARY WINDING
BATTERY

FIG 1

IGNITION SYSTEM

The coil system of ignition has one outstanding advantage as it is able to produce a strong high tension spark at low engine speeds. This is due to the fact that the voltage supplied by the battery to the primary winding of the coil is fairly constant and does not vary with engine speed. When a magneto circuit is employed the high tension spark is weaker at low engine speeds.

The basic component of the coil ignition system is the induction coil. This coil consists of two windings known as the Primary and Secondary. The circuit of the Primary winding is broken by the contact breaker points which are opened and closed by the rotating cam. When the circuit is broken a high voltage is induced in the Secondary windings. See Fig. 1.

The rotating cam is set in relation to the position of the crankshaft so that the primary winding circuit is broken only when the rotating distributor contact is opposite one of the contact segments in the distributor cover. The centrifugal advance mechanism will advance or retard the ignition timing according to the increase or decrease of engine speed.

The mechanism for breaking the circuit of the primary windings is termed a contact breaker. The high voltage induced in the secondary windings of the coil is passed via the distributor rotor arm to the plug leads and sparking plugs. The resulting high tension spark at the plugs igniting the fuel in the cylinder. There is a danger that sparking may occur at the contact breaker points and this is prevented by the introduction of a condenser into the circuit.

The S.E.V., Ducellier and Paris Rhone type of ignition distributor may be used on the M6 gantry Renault engine. These distributors are all interchangeable with one another but normally S.E.V. or Ducellier are fitted.

ADJUSTING THE CONTACT GAP

S.E.V. (Fig. 2)

Set the gap between the contact points to 0.4 mm (.0157 in.) by turning the adjusting screw 1 after having loosened screw 2 on the distributor. Tighten screw after adjustment and recheck measurement.

DUCELLIER (Fig. 3)

To set the gap on this distributor slacken set screw 3 and adjust gap to 0.4 mm (.0157 in.) Tighten screw 3 and recheck setting.

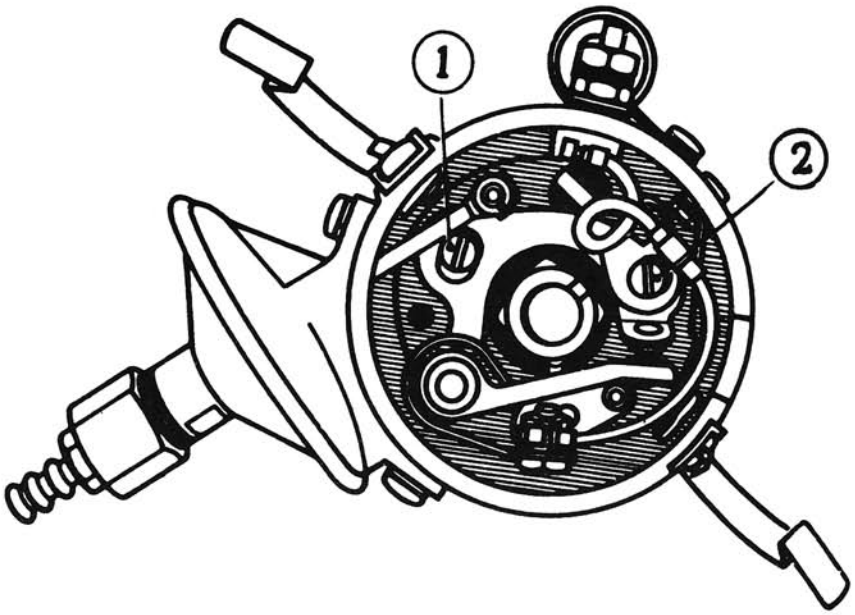

FIG. 2 - S.E.V. DISTRIBUTOR

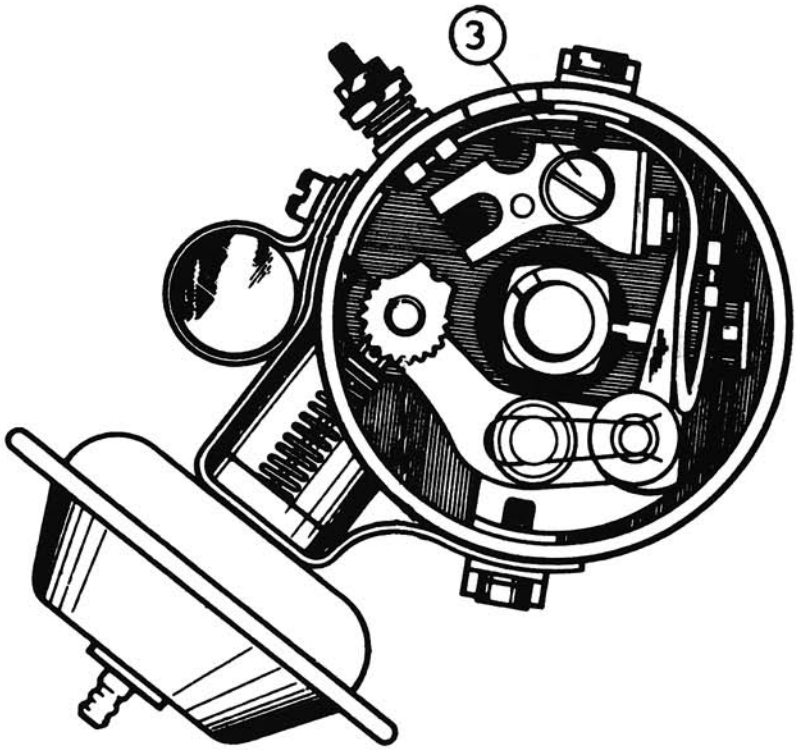

FIG. 3 - DUCELLIER DISTRIBUTOR

SETTING POSITION OF DISTRIBUTOR

Ignition switched off.

Loosen distributor clamp and connect a test lamp between the low tension and the earth wire.

Remove the rocker cover and rotate the crankshaft in a clockwise direction to bring the No. 4 cylinder valves to the rocking position i.e. No. 1 piston moving upwards on compression stroke. Continue to rotate the crankshaft in the same direction until the mark on the pulley is in line with the pointer.

Switch on Ignition.

Turn the distributor in an anti-clockwise direction. As soon as test lamp lights, tighten the distributor in this position.

Firing order 1, 3, 4, 2.

AUTOMATIC ADVANCE MECHANISM

To develop maximum power from the engine it is necessary to advance the ignition timing as engine speed increases. This is done by two methods on the Renault engine.

CENTRIFUGAL ADVANCE

This mechanism comprises a pair of spring loaded balance weights inter-connected to the outer sleeve of the distributor camshaft. See Fig. 31, page 44 of the O.D.M. and Plant Basic Book.

As the engine speed increases the balance weights swing outwards overcoming spring tension and rotating the camshaft against the direction of rotation to advance the ignition timing. This will continue until the balance weights contact their travel stops.

If engine speed decreases the weights move inwards and the springs turn the camshaft in the direction of rotation thus retarding the ignition timing.

VACUUM ADVANCE

This unit is entirely separate to the centrifugal system and operates by depression (vacuum) from the inlet manifold.

With the throttle butterfly valve open and engine running smoothly the inlet manifold depression increases and a vacuum is created in the tube connecting the distributor control diaphragm to the inlet manifold.

The control diaphragm is connected by a rod to the contact plate of the distributor and is spring loaded to the retarded position. As vacuum increases, the diaphragm overcomes the spring tension and moves the rod to advance the contact plate and thus the ignition timing.

A stop is provided on the inner case of the distributor limiting the maximum travel. Any vacuum decrease will cause the spring to return the plate to a retarded position.

With this system any increase in throttle opening will cause a momentary decrease in vacuum thus retarding the ignition timing and preventing detonation of the fuel.

Detailed settings are listed in the Engine Section, Page 19.

M.6. GANTRIES - ELECTRICAL SUPPLY (Fig. 4)

The type of equipment required has to accept an exceptionally heavy electrical load i.e. four floodlights in addition to the ignition system and it would be difficult to keep the battery charged by the more usual D.C. dynamo arrangement. In these circumstances an alternator Battery/Set is provided and while the floodlights could originally be used direct from the battery, on modified gantries this is NOT POSSIBLE as the floodlights can only be used when the engine and alternator are running.

ALTERNATOR (Fig. 5)

The Lucas 11 A.C. Alternator unit is rated as 12 volts 43 amperes and is designed to produce a rectified D.C. output of 43 amperes at relatively low engine speed, and will probably be producing 10-12 amps in the time which a D.C. generator will take in reaching its cutting in speed. The Electrical system is negative earth connected i.e. with the negative of the battery connected to the framework of the machine.

The alternating current which is produced is unsuitable for battery charging and a rectifier unit is necessary, this comprises 6 diodes (rectifiers) which are mounted in the end bracket and connected in such a manner that the output from the diodes is now direct current (D.C.) when connected to the battery.

Constant output from the alternator is controlled by a transistorised voltage regulator, (Model 4TR) which contains no working parts and makes use of printed circuits.

An alternator has two main parts, a stator and a electro-magnetic or permanent magnet rotor. Where the rotor is made to rotate inside the stator winding, alternating current (A.C.) is produced and the voltage regulator can only be employed when the electro-magnetic rotor is used. When a permanent magnet rotor is used the output is related to engine speed variation.

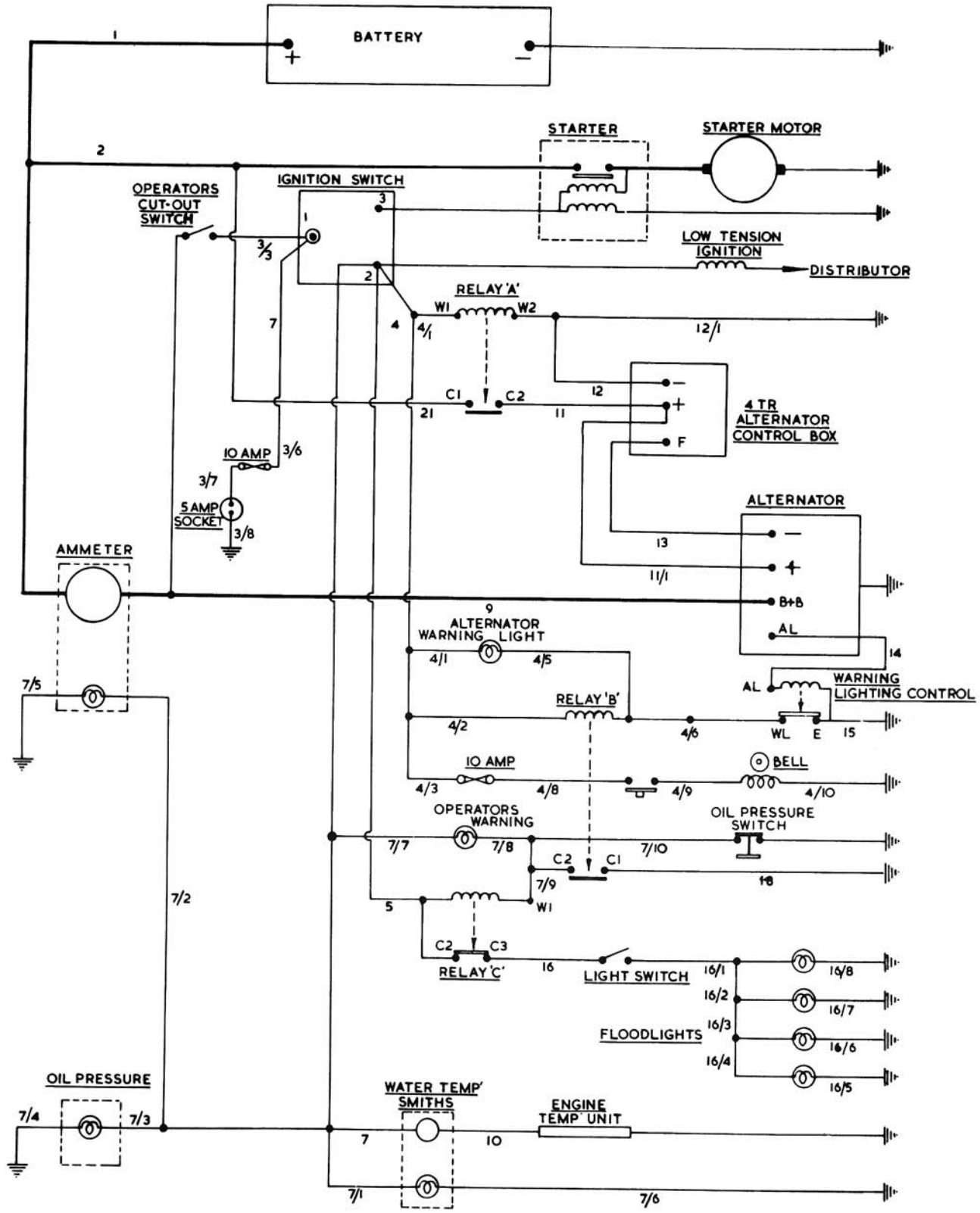

FIG 4 M6 GANTRY ELECTRICAL CIRCUIT

NO OUTPUT OR LOW OUTPUT

BELT DRIVE

Inspect the driving belt for correct tension and wear. A correctly tensioned belt should have ½" to ¾" total play at the mid point on the longest side when moderate hand pressure is applied. Do not over tighten or the alternator bearings may be damaged. A worn belt will bottom in the pulley and should be renewed if this occurs.

If the ammeter should still show a low charging rate after these adjustments, then the faulty alternator must be reported.

DAMAGED OR FAULTY ALTERNATOR

If an alternator is proved to be defective for mechanical or electrical reasons, when on site, then under special circumstances the belt drive can be removed. On modified gantries the four floodlights cannot then be used as there is no direct connection to the battery.

DISCONNECTING THE ALTERNATOR

The battery earth lead (negative) should first be disconnected if the alternator is to be removed. The Brown/Green cable and Brown/White (main output cable) can now be removed from the alternator and strapped back, ensuring that there is no possibility of either making contact with the metal framework. The battery can now be reconnected if the engine has to run.

REPLACING THE ALTERNATOR

First disconnect battery earth lead and accurately check alignment of engine and alternator pulley THIS IS ESSENTIAL. Now reconnect Brown/Green, Brown/White and battery cables.

An electrician should ensure that polarity of the alternator is suitable for the earth polarity of the battery.

Ensure that when fitted there is sufficient movement to allow for adequate belt adjustment.

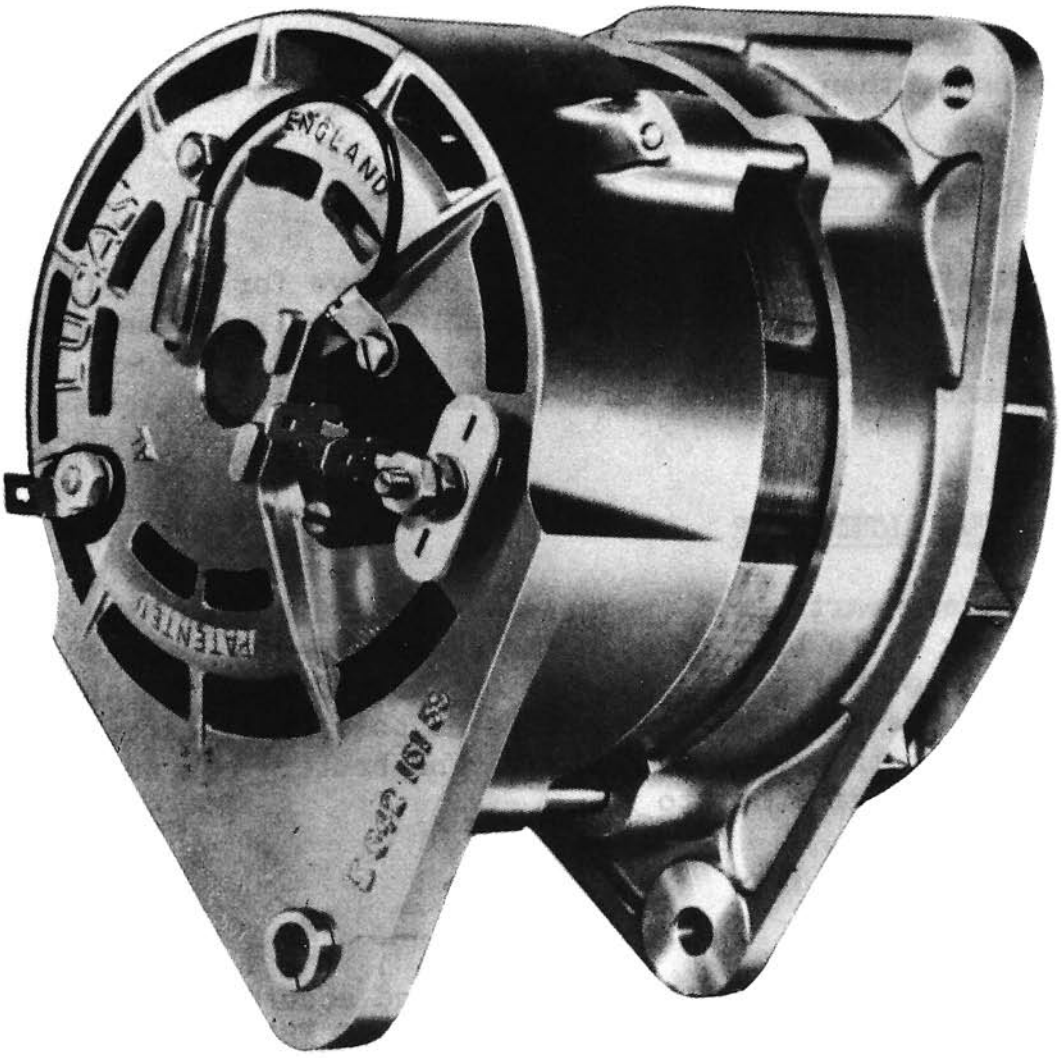

FIG 5 'LUCAS' 11.A.C. ALTERNATOR

WARNING LIGHT FAILURE

Should the warning light fail to illuminate or flicker intermittently, then check the lamp by substitution.

NOISY ALTERNATOR

(a) Alternator loose in mounting brackets.

(b) Worn, frayed or loose belt drive.

(c) Worn bearings, pulleys out of alignment.

(d) Loose pulley.

(e) Damaged alternator rotor.

(f) Pulley fan loose on shaft.

(g) Electrical failure of alternator.

PRECAUTIONARY SERVICE NOTES

REVERSED BATTERY CONNECTIONS WILL DAMAGE THE DIODE RECTIFIERS. Battery polarity should be checked before connections are made, to ensure that they correspond to the earth polarity of the vehicle battery.

THE ALTERNATOR SHOULD NEVER BE RUN WITH THE BATTERY DISCONNECTED AND THE FIELD WINDING ENERGISED, otherwise the control unit will be damaged. Ensure that circuit connections are clean and tight.

WHEN CONNECTING A BATTERY CHARGER ENSURE THAT IT IS CONNECTED CORRECTLY, otherwise the rectifier diodes will be damaged. The polarity of the alternator system should be checked and the charger cables connected to the battery accordingly. It is advisable to disconnect the vehicle battery cables.

CONCLUSION

The Direct Current (D.C.) Generator is still the most economical means of providing current but when currents of over 30 amps are required then the advantages of the alternator become more important.