SECTION C-5
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LUCAS

Quality

EQUIPMENT

VOLUME 2

WORKSHOP INSTRUCTIONS

DISTRIBUTORS

MODELS
D3A4 AND D3A6

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DISTRIBUTORS

MODELS D3A4 AND D3A6

1. GENERAL

The coil ignition equipment comprises a high tension induction coil and a combined distributor, contact breaker and automatic timing control assembly driven at half engine speed via the camshaft. Current flowing through the primary or low tension winding of the coil sets up a strong magnetic field about it. This current is periodically interrupted by a cam-operated contact breaker, driven from the engine, and the subsequent collapse of the magnetic field across the secondary winding of the coil induces a high voltage in it. At the same time, a rotor arm in the distributor connects the secondary winding of the coil with one of a number of metal electrodes, from which cables lead to the sparking plugs in the engine cylinders. Thus, a spark is arranged to occur in the cylinder under compression at the exact moment required to produce combustion of the mixture.

Mounted on the distributor driving shaft, immediately beneath the contact breaker, is an automatic timing control mechanism. It consists of a pair of spring-loaded governor weights, linked by lever action to the contact breaker. At low engine speeds, the spring force maintains the contact-breaker cam in a position in which the spark is slightly retarded. Under the centrifugal force imparted by high engine speeds, the governor weights swing out, against the spring pressure, to advance the cam and thereby the spark, to suit engine conditions at the greater speed.

Specially designed for use where exposure is encountered, the D3A4 distributor incorporates a metal dust-excluding plate, which fits over the cam spindle. In its central hole is a felt sealing ring, thus affording a moisture and dust-proof enclosure for the contact breaker mechanism and automatic timing control.

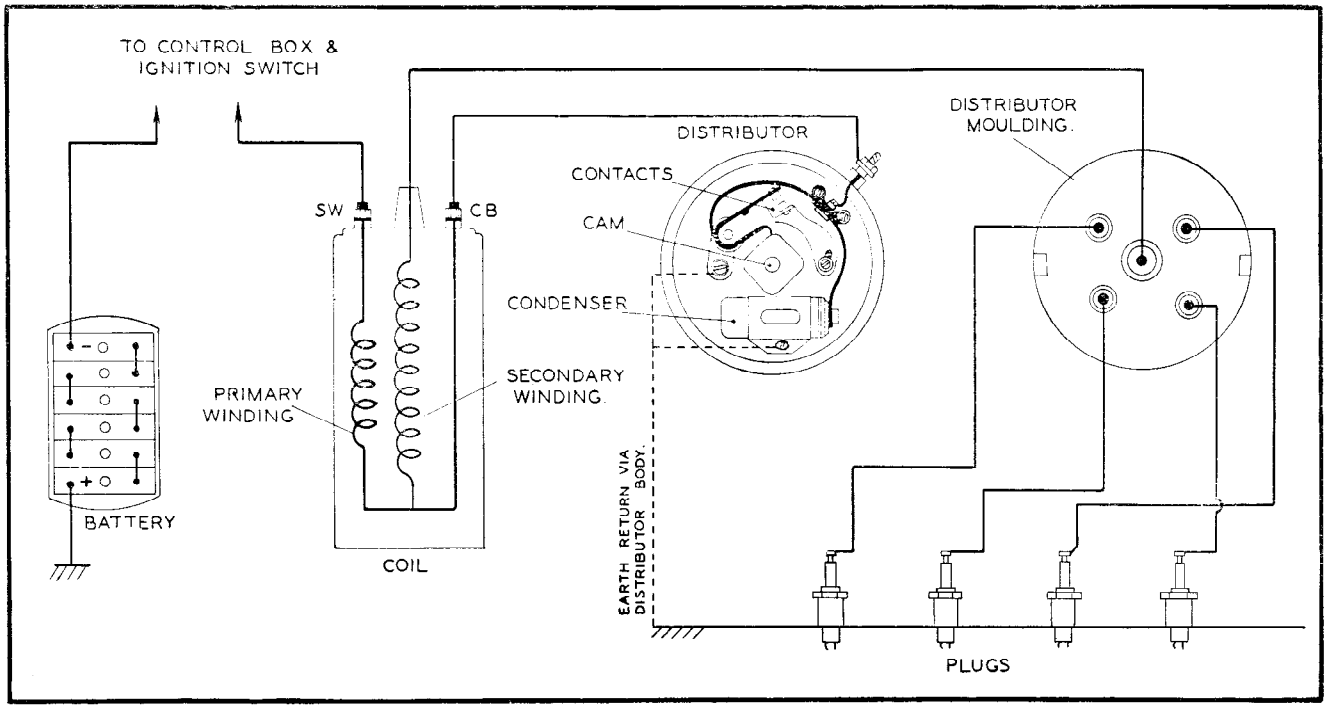

Fig. 1.
A typical coil ignition circuit

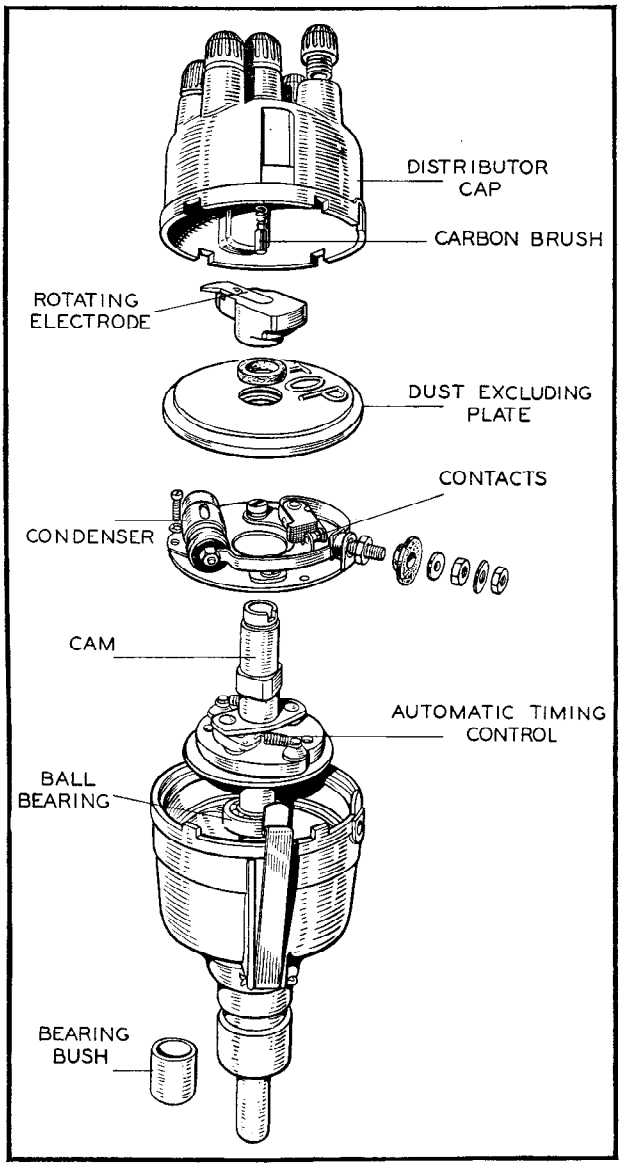

Fig. 2.
Distributor

2. ROUTINE MAINTENANCE

In general, lubrication and cleaning constitute normal maintenance procedure.

(a) LUBRICATION — EVERY 3,000 MILES OR 100 HOURS' RUNNING

Take great care to prevent oil or grease from getting on or near the contacts.

Lift off the rotor arm by pulling vertically and apply to the spindle a few drops of thin machine oil to lubricate the cam bearing. It is not necessary to remove the exposed screw, since it is either drilled or affords a clearance to permit passage of oil.

Lift off the dust-excluding plate. Lightly smear the cam with a small quantity of Mobilgrease No. 2, or clean engine oil, and apply a drop of oil to the top of the pivot on which the contact-breaker lever works. A few drops of thin machine oil should be applied, through the hole in the contact-breaker base through which the cam passes, to lubricate the automatic timing control mechanism. Replace the dust-excluding plate.

Replace the rotor arm carefully, locating its moulded projection in the keyway in the spindle and pushing it on as far as it will go, in order to avoid the risk of the moulded cap being burned or tracked.

(b) CLEANING — EVERY 6,000 MILES OR 200 HOURS' RUNNING.

Thoroughly clean the moulded distributor cap, inside and out, with a soft dry cloth, paying particular attention to the spaces between the metal electrodes. Ensure that the small carbon brush moves freely in its holder.

Examine the contact-breaker. The contacts must be quite free from grease or oil. If they are burned or blackened, clean them with very fine carborundum

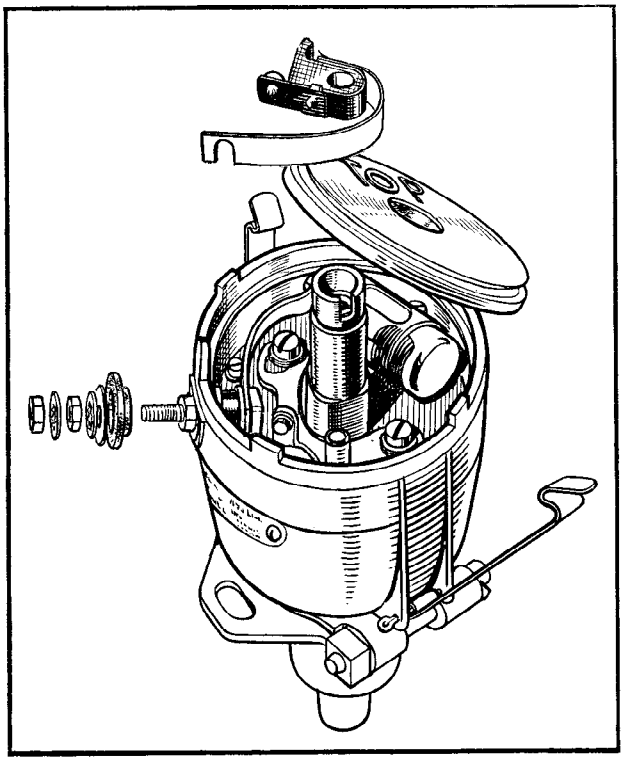

Fig. 3.
Removal of moving contact

stone or emery cloth, then wipe with a petrol-moistened cloth. Cleaning is facilitated by removing the contact-breaker lever. This can be done by slackening the nuts on the terminal post and lifting off the spring, which is slotted for this purpose. With later distributors, it is necessary to remove the two outer nuts on the terminal post, together with the spring washers, plain washer and rubber grommet ; a 2 B.A. box spanner can then be used to slacken the third securing nut, and the spring lifted off.

After cleaning, check the contact breaker setting. Turn the engine by hand until the contacts show the maximum opening. This should measure 0·010″ to 0·012″. If the measurement is incorrect, keep the engine in the position giving maximum opening, slacken the two screws securing the fixed contact plate and adjust its position to give the required gap. Tighten the screws. Recheck the setting for other positions of the engine giving maximum opening.

On the latest four-cylinder models a new type asymmetrical cam is fitted, the purpose of which is to minimise "clicking" when the contacts close. As the number of degrees for which the contacts are fully open is smaller with this type of cam, it is important when checking or adjusting the gap on these distributors to ensure that the rocker heel of the contact breaker is actually at the highest point of the lobe on the cam.

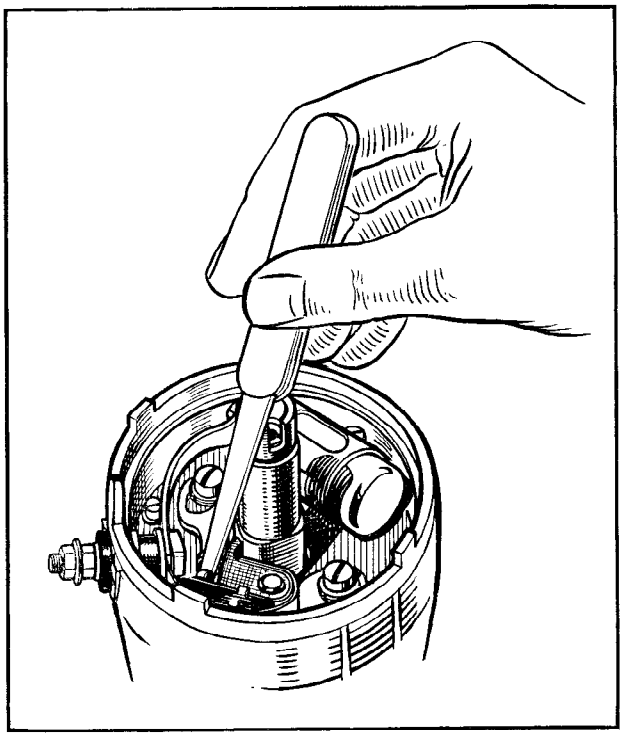

Fig. 4.
Checking the contacts

3. DESIGN DATA

(a)

	Open Period	Closed Period	Firing Angles
6-cylinder models	22° ± 2°	38° ± 2°	0°, 60°, 120°, etc., ± 1°
4-cylinder models: Symmetrical Cam	45° ± 4°	45° ± 4°	0°, 90°, 180°, 270°, ± 1°
4-cylinder models: Asymmetrical Cam	41° ± 4°	49° ± 4°	0°, 90°, 180°, 270°, ± 1°

(b) Contact breaker gap : 0·010″—0·012″

(c) Contact breaker spring tension : 20—24 oz., measured at contacts.

(d) Condenser capacity : 0·2 microfarad.

(e) Automatic timing control : the operating range of the mechanism varies with each engine model, and is given in the Test Data section of the appropriate C.E. list. The performance of the control may be checked against these figures if the requisite equipment is available.

(f) For current consumption, etc., of ignition coils, see SECTION C-8.

4. SERVICING

Before starting to test, make sure that the battery is not fully discharged, as this will often produce the same symptoms as a fault in the ignition circuit.

(a) TESTING IN POSITION TO LOCATE CAUSE OF UNEVEN FIRING

Run the engine at a fairly fast idling speed.

Short circuit each plug in turn with, say, the blade of an insulated screwdriver, or a hammer head, placed across the terminal to contact the cylinder head. Short circuiting the defective plug will cause no noticeable change in the running note. On the others, however, there will be a pronounced increase in roughness.

Having thus located the defective cylinder, stop the engine and remove the cable from the sparking plug terminal.

Restart the engine and hold the cable end about $\frac{3}{16}$″ from the cylinder head. If sparking is strong and regular, the fault lies with the sparking plug, and it should be removed, cleaned and adjusted or a replacement fitted.

If, however, there is no spark, or only weak irregular sparking, examine the cable from the plug to the distributor for deterioration of the insulation, renewing the cable if the rubber is cracked or perished.

Clean and examine the distributor moulded cap for free movement of the carbon brush. If tracking has occurred, indicated by a thin black line, usually between two or more electrodes, a replacement distributor cap must be fitted.

(b) TESTING IN POSITION TO LOCATE CAUSE OF IGNITION FAILURE

Spring back the clips on the distributor head and remove the moulded cap. Lift off the rotor, carefully levering with a screwdriver if necessary. Remove the dust-excluding plate.

Check the contacts for cleanliness and correct gap setting as described in Para. 2(e).

If an ammeter is fitted, switch on the ignition and turn the engine. Observe the reading, which should rise and fall with the closing and opening of the contacts if the low tension wiring is in order. When the reading does not fluctuate, a short circuit, or contacts remaining closed, is indicated. No reading indicates a broken or loose connection in the low tension wiring or badly adjusted or dirty contacts.

(c) LOW TENSION CIRCUIT — FAULT LOCATION

If it is determined that the fault lies in the low tension circuit, switch on the ignition and turn the engine until the contact breaker points are fully opened.

Refer to the wiring diagram (published in the appropriate C.E. list) and check the circuit with a voltmeter (0 — 20 volts) between the following points (which refer to a normal ignition layout — individual systems may vary slightly) AND A GOOD EARTH.
If the circuit is in order, the voltage reading should be approximately 6 or 12 volts, according to the system. No reading indicates a damaged cable or loose connections, or a breakdown in the section under test.

(*i*) BATTERY TO STARTER SWITCH

Connect the voltmeter between that terminal of the starter switch which is connected to the battery, and earth. No reading indicates a faulty lead or a loose connection.

(*ii*) STARTER SWITCH TO IGNITION SWITCH

Connect the voltmeter between earth and the terminal of the ignition switch to which the lead from the starter switch is connected.

(*iii*) IGNITION SWITCH

Connect the voltmeter between earth and the other terminal of the ignition switch. No reading indicates a faulty switch.

(*iv*) IGNITION SWITCH TO IGNITION COIL

Remove the lead from the ignition coil "SW" terminal, and connect the voltmeter between the free end of the cable and earth.

If the correct reading is obtained, remake the connection to the coil.

(*v*) IGNITION COIL

Disconnect the lead from the "C.B." terminal of the coil and connect the voltmeter between the "C.B." terminal and a good earth. No reading indicates a fault in the primary winding of the coil, necessitating coil replacement. If, however, the correct reading is obtained, remake the cable connection to the coil terminal.

(*vi*) IGNITION COIL TO DISTRIBUTOR

Disconnect the low tension cable to the distributor and connect the voltmeter between the end of the cable removed and earth. No reading indicates a faulty lead or loose connection. Reconnect the cable to the distributor.

(*vii*) CONTACT BREAKER AND CONDENSER

Connect the voltmeter across the contact points. If no reading is obtained, re-check with the condenser removed. If a reading is now given, the condenser is faulty and must be replaced.

Measure the contact breaker spring tension. This should be 20-24 ozs., measured at the contacts.

(d) HIGH TENSION CIRCUIT

If, after carrying out these tests, the fault has not been located, remove the high tension lead from the centre terminal of the distributor. Switch on the ignition and turn the engine until the contacts close. Flick open the contact breaker lever while the high tension lead from the coil is held about $\frac{3}{16}$" from the cylinder block. If the ignition equipment is in good order, a strong spark will be obtained. If no spark occurs, a fault in the secondary winding of the coil is indicated and the coil must be replaced.

The high tension cables must be carefully examined, and replaced if the rubber insulation is cracked or perished, using 7 m.m. rubber covered ignition cable. To fit a new cable to the ignition coil or distributor, pass the cable through the knurled, moulded nut, bare about $\frac{1}{4}$" of the end of the cable, thread the wire through the brass washer (removed from the original cable) and bend back the strands. Finally screw the nut into its terminal.

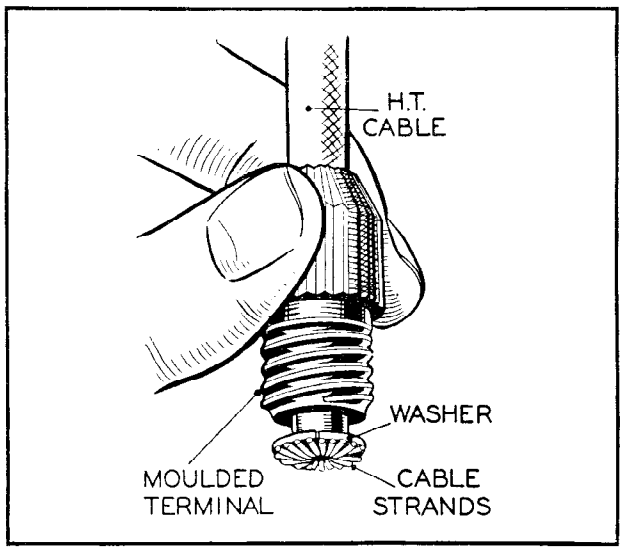

Fig. 5.
Fitting terminal nut to high tension cable (ignition coil and distributor)

The cables from the distributor to the sparking plugs must, of course, be connected in the correct firing order.

(e) CONTACT BREAKER MECHANISM

Check and adjust as described in para. 2 above.

Ensure that the moving arm moves freely on its pivot. If sluggish, remove the arm and polish the pivot pin with a strip of fine emery cloth. Replace the arm and lubricate with a spot of clean engine oil.

(f) DISMANTLING

Before dismantling, carefully note the positions in which the various components are fitted, in order to ensure their correct replacement on reassembly. If the driving member is offset, or marked in some way for convenience in timing, note the relation between it and the rotor electrode, and maintain this relation when reassembling the distributor.

Spring back the securing clips and remove the moulded cap.

Lift the rotor off the top of the spindle. If tight, carefully lever off with a screwdriver. Remove the dust-excluding plate, together with the felt seal.

The method of dismantling the contact-breaker varies slightly with different models of the distributor. In some models, identified by the large rubber grommet insulating the low-tension terminal, the contact-breaker base can be lifted out, together with the lever, contacts, etc., by proceeding as follows :

(*i*) Remove the washer and two nuts on the low-tension terminal.

(*ii*) Remove the insulating grommet.

(*iii*) Slacken and remove the three securing screws, with serrated washers, at the edge of the plate, and lift out the complete contact breaker assembly.

(*iv*) Slacken the remaining nut on the low-tension terminal, and lift off the contact-breaker lever, its insulating washer and the condenser. Slacken the two screws, with spring and plain washers, securing the fixed contact plate, and remove the plate.

For distributors of the alternative construction, proceed as follows :

(*i*) Slacken and remove the nuts, washers and insulating bush on the terminal post and lift off the end of the contact-breaker spring. Remove the contact-breaker lever and its insulating washer. Take out the two screws securing the fixed contact plate, and remove the plate.

(*ii*) Take out the screw securing the condenser clip and remove the condenser.

(*iii*) The terminal post can now be removed, together with its insulating bush and locating tag, from the inside of the distributor body.

(*iv*) Take out the two screws and spring washers from the edge of the contact-breaker base, which can then be removed from the body of the distributor.

Remove the dog or driving gear from the shaft.

Remove the cam, automatic timing control and shaft assembly from the distributor. Take out the screw from inside the top of the cam spindle. Lift off the cam, affording access to the automatic timing control.

(g) BEARING REPLACEMENT

(*i*) Bearing Bush.

Remove the bearing bush at the lower end of the shank by using a hand press and mandrel of suitable diameter.

Invert the distributor body and press the new bearing bush into the lower end of the distributor shank, using a shouldered mandrel in the hand press, the mandrel being of the same diameter as the distributor shaft.

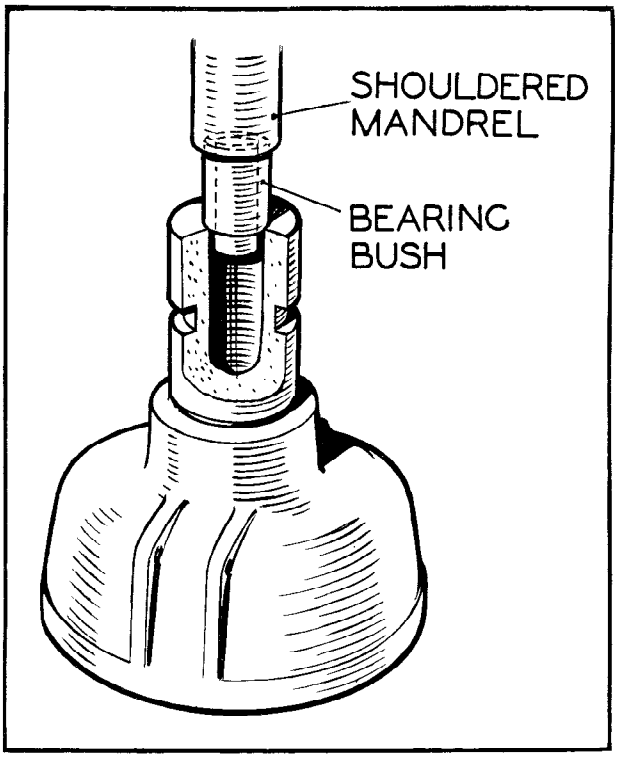

Fig. 6.
Fitting bearing bush

Before the new bush is fitted it must be completely immersed in thin engine oil for 24 hours. In cases of emergency, this process may be shortened by heating the oil to 100°C., when the period of immersion can be reduced to 2 hours.

Under no circumstances should the bushes be overbored by reamering or any other means, since this will impair the porosity and thereby the effective lubricating quality of the bushes.

(*ii*) Ball Bearing

The ball bearing fitted to the distributor shaft can be removed by means of an extractor. The ball bearing can be fitted by means of a sleeve which locates over the distributor shaft and bears on the inner journal of the bearing.

(h) REASSEMBLY

Before reassembly, the automatic advance mechanism, distributor shaft and the cam spindle must be lubricated with thin engine oil. Pack the new bearing on the distributor shaft with high-melting-point grease. Assemble the automatic timing control, taking care that the parts are fitted in their original positions and the control springs not stretched. Two holes are provided in each toggle : the springs must be fitted to the inner hole in each case. Place the cam on the spindle and locate the two pegs on the cam foot in the holes in the toggle levers. Secure the cam by replacing the fixing screw and tightening.

Fit the shaft in its bearings and replace the driving member.

Reassemble the contact-breaker by reversing the appropriate dismantling procedure described above. Adjust the contact-breaker gap to within 0·010″ to 0·012″ when the contacts are fully opened. Replace the dust-excluding plate, carefully locating the felt seal.

NOTE.—If it is necessary to renew the contacts, a set comprising both fixed and moving contacts must be fitted.

Place the rotor on the spindle, locating the register correctly and pushing the rotor fully home.

Fit the distributor cover moulding and secure by means of the spring clips.