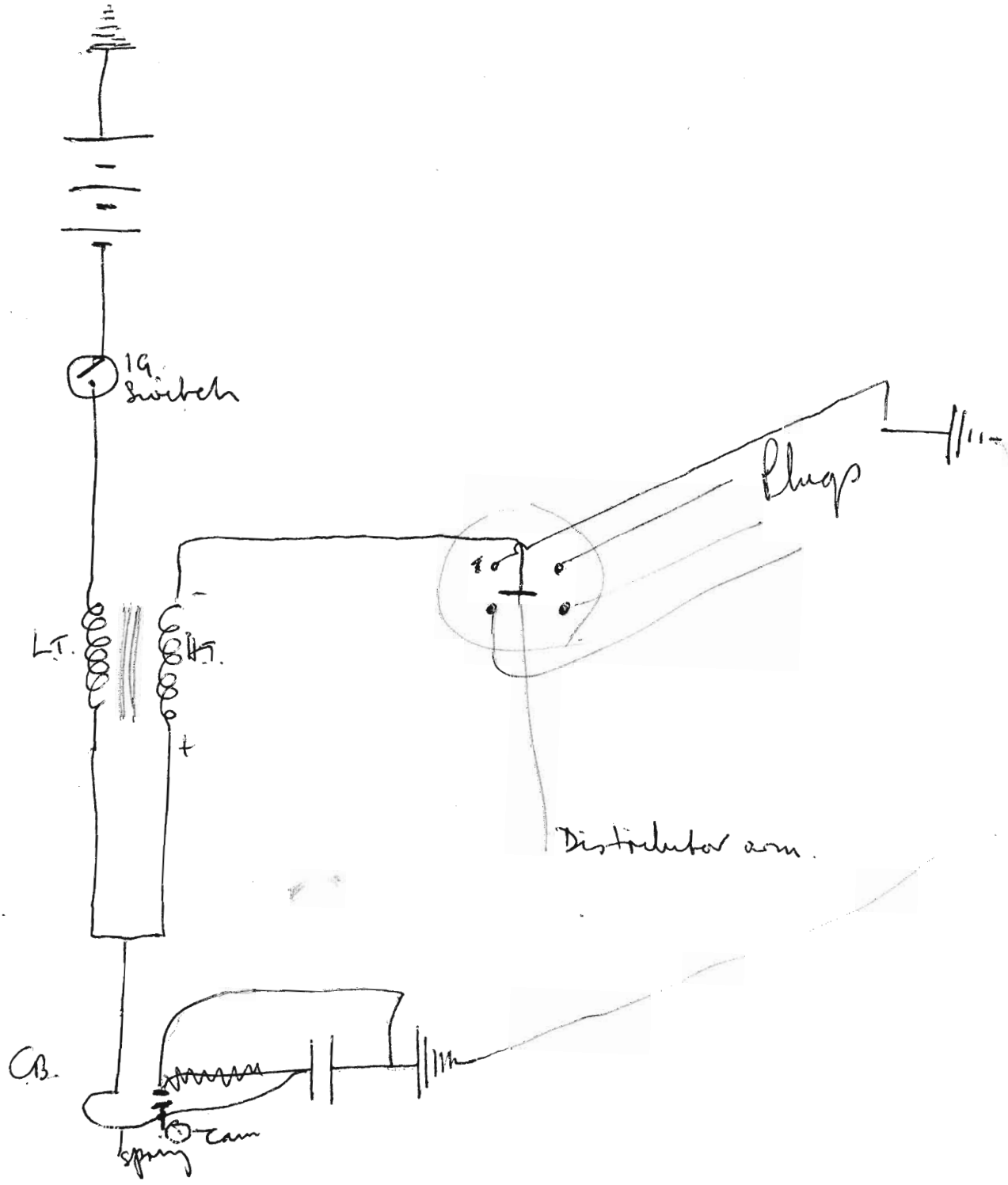
SECTION B

IGNITION SYSTEM

Section No. B.1	Description
Section No. B.2	Adjustments in the vehicle
Section No. B.3	To test in the vehicle
Section No. B.4	Ignition coil
Section No. B.5	Distributor
Section No. B.6	Distributor driving spindle
Section No. B.7	Sparking plugs
Section No. B.8	High-tension cables
Section No. B.9	Fault diagnosis



1. Points open. Voltage across condenser & points
2. Points closed. Condenser discharges. Battery to earth.

So (a) When pts closed current through L.T. to earth, condenser discharged.
(b) Points open, condenser charges; H.T. induced current flows
H.T. leaves high voltage condenser.

Section B.1

DESCRIPTION

The ignition system consists of two circuits—primary and secondary. The primary circuit includes the battery, ignition switch, the primary or low-tension circuit of the coil and the distributor contact breaker and capacitor. The secondary circuit includes the secondary or high-tension circuit of the coil, the distributor rotor and cover segments, the high-tension cables and the sparking plugs.

The ignition coil, which is mounted on the right-hand side of the engine, consists of a soft iron core around which is wound the primary and secondary windings. The coil carries at one end a centre high-tension terminal and two low-tension terminals marked (SW) (switch) and (CB) (contact breaker) respectively.

The ends of the primary winding are connected to the (SW) and (CB) terminals and the secondary winding to the (CB) terminal and the high-tension terminal.

The distributor is mounted on the right-hand side of the engine and is driven by a shaft and helical gear from the camshaft. Automatic timing control of the distributor is controlled by a centrifugal mechanism and a vacuum-operated unit each opening entirely independently of each other. The centrifugal mechanism regulates the ignition advance according to engine speed, while the vacuum control varies the timing according to engine load. The combined effect of the two mechanisms gives added efficiency over the full operating range of the engine. A micrometer adjuster is provided to give a fine timing adjustment to allow for the engine condition and the grade of fuel used.

A keyed moulded rotor with a metal electrode is mounted on top of the cam. Attached to the distributor body above the centrifugal advance mechanism is a contact breaker plate carrying the contact breaker points and a capacitor connected in parallel. A cover is fitted over the distributor body and retained by two spring clips attached to the body.

Inside the cover is a centre electrode and spring-loaded carbon brush which makes contact with the rotor. The brush is of composite construction, the top portion being made of a resistive compound, while the lower portion is made of softer carbon to prevent wear of the rotor electrode. Under no circumstances must a short non-resistive brush be used to replace this long resistive type. A measure of radio interference suppression is given by this brush.

Spaced circumferentially around the centre electrode are the sparking plug high-tension cable segments. The distributor is secured in position on the cylinder block by a clamp plate.

The sparking plugs are located on the right-hand side of the engine and have a 14 mm. thread with a $\frac{3}{4}$ in reach.

When the ignition is switched on, the current from the battery flows through the primary circuit, and a magnetic field is built up around the core of the coil. When the contact breaker points are opened by rotation of the distributor cam, the current flow is interrupted, causing a high voltage to be induced in the secondary winding of the coil by sudden collapse and consequent change in the magnetic field. The high-tension current thus generated in the secondary winding of the coil is conveyed by the coil high-tension cable to the centre terminal of the distributor cover. From here the current passes through the carbon brush to the rotor, where the high-tension current passes along the rotor electrode and is distributed to the segments and thence to the sparking plugs via the high-tension cables.

Section B.2

ADJUSTMENTS IN THE VEHICLE

The purpose of the following adjustments is to maintain efficient engine performance and economical running.

(1) Adjust the sparking plugs at the recommended intervals as follows:

The gap of the plug points should be within the limits of ·024 to ·026 in. (·61 to ·66 mm.).

Gap adjustment should be made by bending the side electrode only. Never bend the central electrode. If the plugs are dirty, damaged or excessively burned, see Section B.7.

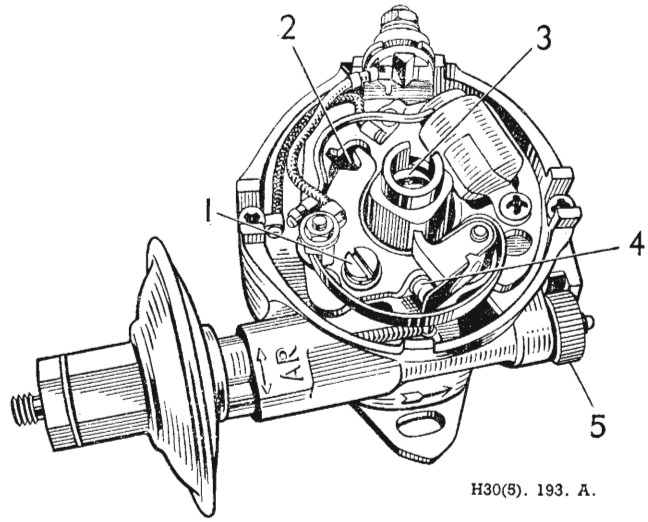


Fig. B.1. Distributor Platform.

1. *Contact adjusting screw.*
2. *Contact adjusting slot.*
3. *Cam and drive shaft oiling point.*
4. *Contact points.*
5. *Micrometer adjuster.*

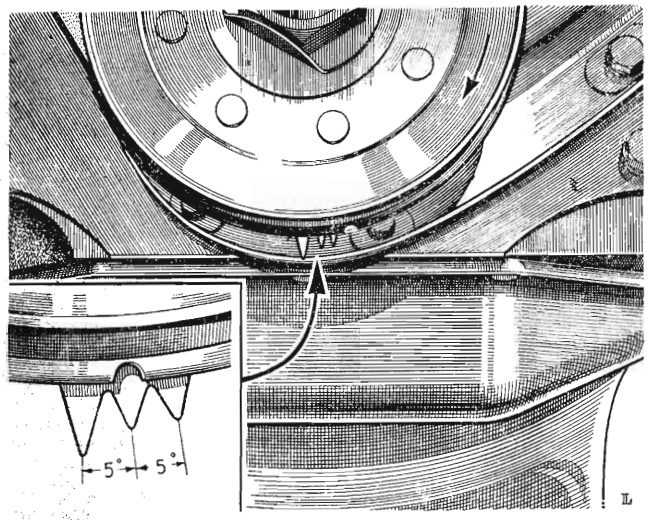


Fig. B.2. The notch in the pulley approaching the T.D.C. positions for pistons 1 and 4. The inset shows the gap of 5° between each timing mark.

(2) Adjust the contact breaker points at the recommended intervals as follows:

Remove the distributor cover and rotor. Turn the engine using a spanner on the crankshaft pulley securing nut until the contacts are fully open. Slacken the fixed contact plate securing screw '1' (Fig. B.1). Insert a screwdriver in the slot '2' and move the plate until the gap gauge is a sliding fit between the contacts (·014 to ·016 in. or ·356 to ·406 mm.) and then fully tighten the securing screw. Recheck the gap. Replace the rotor and cover. If the points are dirty or pitted see Section B.5.

(3) Adjust the ignition timing if the distributor has been disturbed.

Remove the valve rocker cover so that the valve action can be observed. Rotate the engine using a spanner on the crankshaft pulley securing nut until No. 1 Piston is at the top of its compression stroke (i.e. the exhaust valve of No. 4 cylinder is just closing and the inlet valve just opening). Turn the crankshaft until the recess in the crankshaft pulley flange is in line with the largest pointer (TDC) on the timing case cover (Fig. B.2). If the timing cover has been removed, align the timing marks on the camshaft and crankshaft wheels. No. 1 and 4 piston is now at T.D.C. Set the micrometer adjustment on the distributor in its central position. The crankshaft should now be rotated backwards 5° to obtain its correct position before setting the distributor points, this setting is correct for premium grade fuels only. With the cover removed the distributor body should be rotated until the rotor arm is pointing to the position of No. 1 electrode in the cover. With the contact points just opening, tighten the clamp plate bolt.

Finer adjustment can be obtained under road conditions, by means of the micrometer adjustment. **Note:** this adjustment should not be used for initial setting of the ignition; it is only altered if the main setting requires adjustment to meet the characteristics of the grades of petrol being used. There is a considerable amount of latitude for adjustment but only extremely small movements of the adjustment knob should be made at one time.

Replace the distributor cover and cylinder head cover.

Section B.3

TO TEST IN THE VEHICLE

If the ignition system fails, or misfiring occurs, first make sure that the trouble is not due to defects in the engine, carburetter or fuel supply. Faults should be diagnosed by applying the following tests:

(1) Examine the high-tension cables, i.e. the cables from the coil to the distributor, and from the distributor to the plugs. If the rubber insulation shows sings of deterioration or cracking, the cable should be renewed.

(2) Test the plugs and high-tension cables by removing the plugs in turn and allowing them to rest on the cylinder head or other convenient earthing point, and observing whether a spark occurs at the points when the engine is turned by hand. It should, however, be noted that this is only a rough test, since it is possible that a spark may not take place when the plug is under compression. If necessary, clean and test the plugs, using a plug cleaning and testing machine.

(3) To trace a fault in the low-tension circuit, release the instrument panel from the dash, switch on the ignition, and turn the engine until the distributor contacts are opened. Refer to the wiring diagram, Fig. M.24, and, with the aid of a voltmeter (0 to 20), check the circuit as follows:

(*a*) **Cable—Battery to starter switch**
Connect the voltmeter between the supply terminal of the starter switch and an earthing point. No reading indicates a faulty cable or loose connection.

(*b*) **Cable (brown)—Starter switch to two-way fuse unit A.1 terminal**
Connect the voltmeter between the fuse unit A.1 terminal and earth. No reading indicates a faulty cable or loose connection.

(*c*) **Control box**
Connect the voltmeter between the control box terminal (A.1) and earth. No reading indicates a faulty control box.

(*d*) **Cable (brown and blue)—Control box to lighting and ignition switch**
Connect the voltmeter between the lighting switch terminal (A) and earth. No reading indicates a faulty cable or loose connection.

(*e*) **Ignition switch**
Connect the voltmeter between the ignition switch (white cable terminal) and earth. No reading indicates a faulty ignition switch.

(*f*) **Cable (white)—Ignition switch to fuse unit A.3 terminal**
Connect the voltmeter between the fuse unit A.3 terminal and earth. No reading indicates a faulty cable or loose connection.

(*g*) **Cable (white)—Fuse unit A.3 terminal to ignition coil**
Connect the voltmeter between the ignition coil terminal (SW) and earth. No reading indicates a faulty cable or loose connection.

(*h*) **Ignition coil**
Connect the voltmeter between the ignition coil terminal (CB) and earth. No reading indicates a faulty ignition coil.

(*i*) **Cable (white and black)—Ignition coil to distributor**
Connect the voltmeter between the distributor terminal and earth. No reading indicates a faulty cable or loose connection.

(*j*) **Distributor**
Connect the voltmeter across the distributor contacts. If no reading is given, remove the capacitor and test again. If a reading is given, the capacitor is faulty.

(4) If, after carrying out the foregoing tests, the fault has not been located, remove the high-tension cable from the centre terminal of the distributor. Switch on the ignition and crank the engine until the contacts close. Flick the contact breaker lever open while the high-tension cable from the ignition coil is held about $\frac{3}{16}$ in. (5 mm.) away from the cylinder block. If the ignition equipment is in order a strong spark should be obtained. If no spark is given, it indicates a faulty ignition coil.

Section B.4

IGNITION COIL

To remove

(1) Disconnect the high-tension cable from the coil centre terminal.
(2) Disconnect the low-tension cables from the (SW) and (CB) terminals of the coil.
(3) Unscrew the bolts fastening the coil to the generator strap, and remove the coil.

To replace

The installation of the ignition coil is a reversal of the procedure 'To remove'.

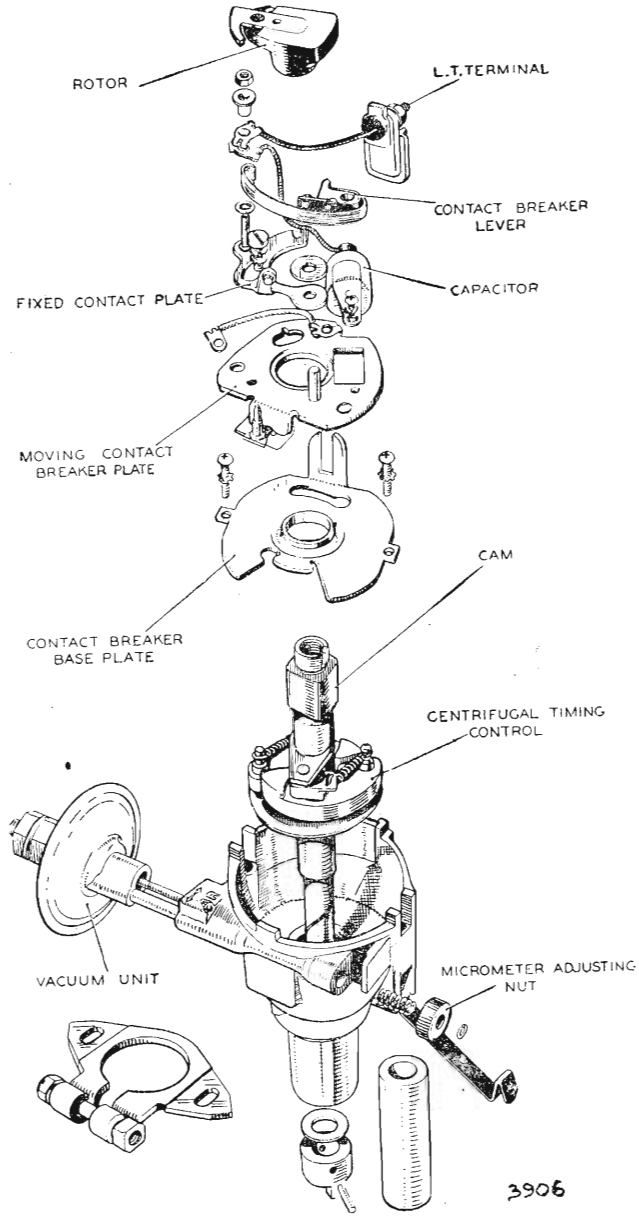


Fig. B.3. The component parts of the DM2 distributor.

Section B.5

DISTRIBUTOR

To remove

(1) The distributor can be removed and replaced without interfering with the ignition timing, provided the clamp plate pinch-bolt is not disturbed.

(2) To facilitate the replacement of the distributor, turn the engine over until the rotor arm is pointing to the segment in the cover for No. 1 cylinder plug lead to provide a datum for replacement. Also, ascertain the approximate position of the vacuum unit in order to facilitate the connection of the vacuum pipe on replacement.

(3) Remove the distributor cover and disconnect the low-tension lead from the terminal on the distributor. Disconnect the suction advance pipe at the union on the distributor.

(4) Unscrew the tachometer drive (if fitted) from its connecting at the rear of the generator.

(5) Extract the two bolts securing the distributor clamp plate to the distributor housing and withdraw the distributor.

To dismantle

The contact breaker plate may be removed as an assembly to give access to the centrifugal weights without completely dismantling the distributor. To do this first remove the rotor arm and then withdraw the slotted nylon low-tension terminal post from the distributor body.

Take out the two screws which sepcure the late assembly to the distributor body, ease up the plate and unhook the flexible actuating link connected to the contact breaker plate.

The following procedure is necessary if the distributor is to be completely stripped. Before dismantling, make a careful note of the positions in which the various components are fitted in order that they may be replaced correctly.

(1) Spring back the clips and remove the moulded cap.

(2) Lift the rotor off the top of the spindle. If it is a tight fit it must be levered off carefully with a screwdriver.

(3) Remove the nut and washer from the moving contact anchor pin. Withdraw the insulating sleeve from the capacitor lead and low-tension lead connectors, noting the order in which they are fitted. Lift the moving contact from the pivot pin and remove the large insulating washer from the anchor pin.

(4) Take out the screw, spring and flat washer, securing the fixed contact plate, and remove the plate.

(5) Take out the securing screw and remove the capacitor.

(6) Extract the two screws securing the base-plate to the distributor body, noting that one also secures the earthing lead, and lift out the base-plate.

Unhook the flexible actuating link connecting the diaphragm in the vacuum unit with the moving contact breaker plate.

Important.—Note the relative position of the rotor arm drive slot in the cam spindle and the offset drive dog at the driving end of the spindle, to ensure that the timing is not 180° out when the cam spindle is engaged with the centrifugal weights during assembly. (See Fig. B.3.).

(7) Take out the cam retaining screw and remove the cam spindle.

(8) Take out the centrifugal weights. These may be lifted out as two assemblies, each complete with a spring and toggle.

(9) To release the suction advance unit, remove the circlip, adjusting nut and spring. Withdraw the unit. Take care not to lose the adjusting nut lock spring clip.

(10) To release the spindle from the body, drive out the parallel driving pin passing through the collar of the driving tongue member at the lower end of the spindle.

(11) Clean the distributor cover and examine it for signs of cracks and evidence of 'Tracking', i.e. a conducting path may have formed between adjacent segments. This is indicated by a thin black line between the segments, when this has occurred the cover should be renewed.

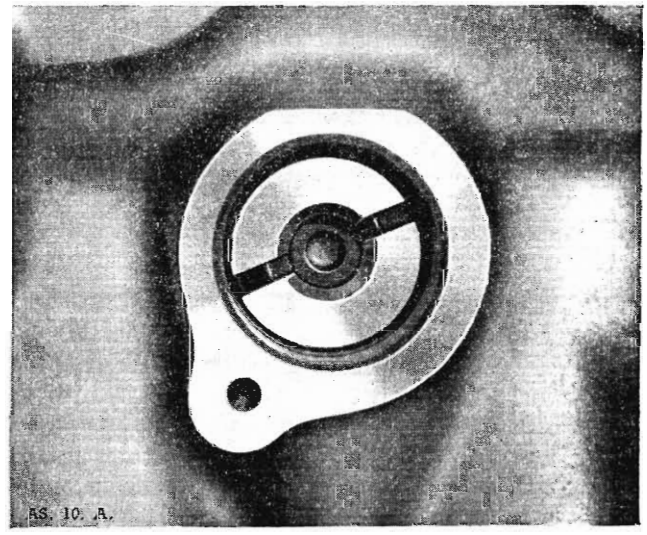


Fig. B.4. Distributor drive, showing the off-set slot in the correct position.

(12) Ensure that the carbon brush moves freely in the distributor cover.

(13) Examine the attachment of the metal electrode to the rotor moulding. If slack or abnormally burned, renew the rotor.

(14) The contact face of the contact breaker points should present a clean, greyish, frosted appearance. If burned or blackened, renew the contact set or polish the contact face of each point with a fine oil stone, working with a rotary motion. Care should be taken to maintain the faces of the points flat and square, so that when reassembled full contact is obtained. Clean the points thoroughly in petrol.

(15) Check that the movable contact arm is free on its pivot without slackness.

(16) Check the centrifugal timing control balance weights and pivot pins for wear and renew the cam assembly or weights if necessary.

(17) The cam assembly should be a free sliding fit on the driving shaft. If the clearance is excessive, or the cam face is worn, renew the cam assembly or shaft as necessary.

(18) Check the fit of the shaft in the body bearing bushes. If slack, renew the bushes and shaft, as necessary.

Press out the old bushes. The new bushes should be allowed to stand completely immersed in thin engine oil for twenty-four hours, or alternatively for two hours in oil which has been heated to 212°F (100°C), before pressing them into the distributor body.

To reassemble

Reassembly is a direct reversal of the dismantling procedure, although careful attention must be given to the following points:

(1) As they are assembled, the components of the automatic advance mechanism, the distributor shaft, and the portion of the shaft on which the cam fits must be lubricated with thin, clean engine oil.

(2) Turn the vacuum control adjusting nut until it is in the half-way position when replacing the control unit.

(3) When engaging the cam driving pins with the centrifugal weights, make sure that they are in the original position. When seen from above, the small offset of the driving dog must be on the right, and the driving slot for the rotor arm must be in the six o'clock position.

(4) Adjust the contact breaker to give a maximum opening of ·014 to ·016 in. (·36 to ·40 mm.).

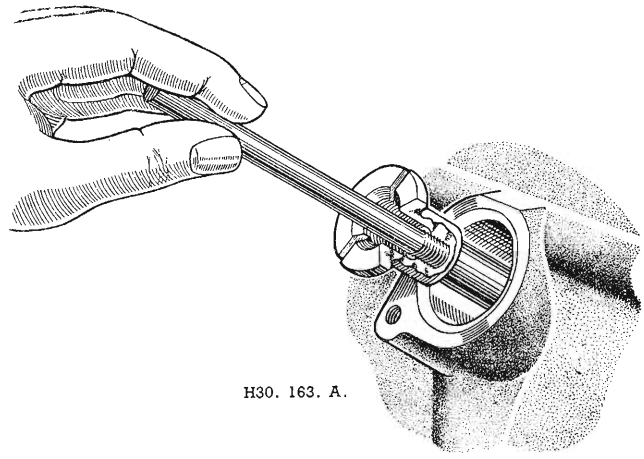


Fig. B.5. Removing the distributor spindle.

To Install

Replacing the distributor is the reverse of the procedure 'To Remove', noting the following points:

(1) Insert the assembled distributor, with its cap removed, into the spindle housing, and turn the rotor arm until the driven dog on the distributor engages with the slot in the housing.

(2) Screw in the two setpins securing the distributor clamp plate to the distributor housing.

(3) Position the distributor so that the vacuum control unit is in the same position as noted before removal.

(4) Check the contact breaker gap and ignition timing as described in Section B.2.

Section B.6

DISTRIBUTOR DRIVING SPINDLE

Removal

(1) Remove the distributor as described in Section B.5.

(2) By using a $\frac{5}{16}$ in. U.N.F. bolt approximately $3\frac{1}{2}$ in. long, screwed into the tapped end of the driving spindle, the spindle may be withdrawn.

(3) Examine the drive gear for worn teeth.

To Replace

(1) Remove the valve gear cover (see Section A).

(2) Crank the engine until No. 1 Piston is at the top of its compression stroke (i.e. the exhaust valve of No. 4 cylinder is just closing and the inlet valve just opening).

(3) Turn the crankshaft until the recess in the crankshaft pulley flange is in line with the (T.D.C.) indicating pointer on the timing chain cover (see Fig. B.2).

(4) Screw the $\frac{5}{16}$ in. U.N.F. bolt into the threaded end of the distributor drive and replace the drive into its housing so that the off-set slot takes up the position in Fig. B.4.
(5) Replace the distributor following the instructions given in Section B.5.

Section B.7

SPARKING PLUGS

Inspect, clean, adjust and renew sparking plugs at the recommended mileage intervals (see **'MAINTENANCE ATTENTION'**).

When sparking plugs are removed from the engine their gaskets should be removed with them and replaced on the plugs, which should be placed in a suitable holder. It is advisable to identify each plug with the number of the cylinder from which it was removed so that any faults revealed on examination can be traced back to the cylinder concerned.

When examining the plugs, place a new plug of the same type beside the others to afford a ready comparison of the relative condition of the used plugs.

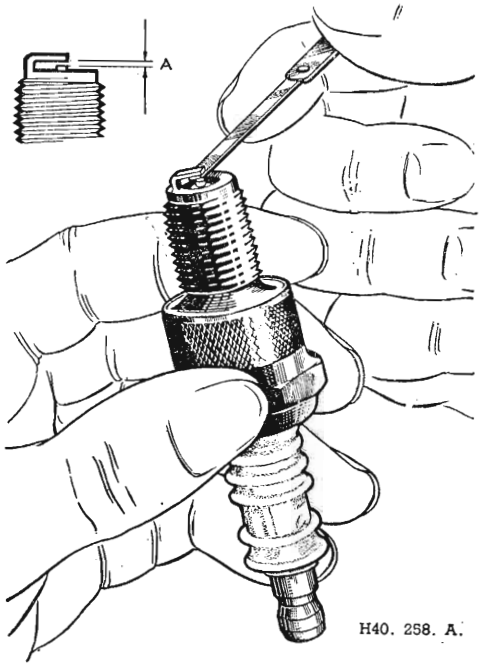


Fig. B.6. Checking sparking plug. Gap 'A' should be ·025in.

Examine for signs of oil fouling. This will be indicated by a wet, shiny, black deposit on the insulator. This is caused by oil pumping due to worn cylinders and pistons or gummed-up or broken rings. Under such conditions, oil from the cylinder walls is forced up past the rings on the suction stroke of the piston, and is eventually deposited on the plugs.

A permanent remedy for this cannot be effected, the only cure being the fitting of a new piston and rings, or, in extreme cases, a rebore may be necessary.

Next examine the plugs for signs of petrol (gasoline) fouling. This is indicated by a dry, fluffy, black deposit which is usually caused by over-rich carburation, although ignition system defects such as a run-down battery, faulty distributor, coil or condenser defects, or a broken or worn-out cable may be additional causes. If the plugs appear to be suitable for further use, proceed to clean and test them.

First remove the plug gaskets and examine them for condition. A large proportion of the heat of the plug is normally dissipated to the cylinder head through the steel gasket between the plug and the head. Plugs not screwed down tightly can thus easily become over-heated so that they operate out of their proper heat range, thus producing pre-ignition, short plug life and 'pinking'. On the other hand, it is unnecessary and unwise to tighten up the plugs too much. What is required is a reasonably good seal between the plug and the cylinder head and the use of a torque wrench is recommended to tighten the plugs to a figure of 30 lb. ft. (4·15 kg. m.).

If the plugs require cleaning it is preferable to make use of a proper plug cleaner of the type recommended by the plug manufacturers, and the makers' instructions for using the cleaner should be followed carefully.

Occasionally a blistered insulator or a badly burnt electrode may be noticed when examining the plugs.

If the plug is of the type normally recommended for the engine and it was correctly installed (down tightly on the gasket), this condition may have been brought about by a very lean mixture or an overheated engine. There is, however, a possibility that a plug of another type is required, but as a rule the recommended plug should be adhered to.

After cleaning carefully, examine the plugs for cracked insulators and wear of the insulator nose due to excessive previous cleaning. In such cases the plugs have passed their useful life, and new plugs should be installed.

Examine the insulator for deposits underneath the side electrode which have possibly accumulated and which act as a 'hot spot' in service.

After cleaning the plugs in a special cleaner, blow all surplus abrasive out of the body recesses, and off the plug threads, by means of an air-blast. Next examine the threads for carbon. Any deposits can be removed and the threads cleaned with a wire brush. A wire buffing wheel may also be utilized, but reasonable care must be used in both methods in order not to injure the electrodes or the tip of the insulator. The thread section of the plug body is often neglected when cleaning the

plugs, owing to the fact that it is not generally realized that, like the gaskets, the threads are a means of heat dissipation and that when they are coated with carbon it retards the flow of the heat from the plug, producing overheating. This simple procedure will also ensure absence of binding on the threads on replacement and also avoid unnecessary use of the plug spanner.

When replacing a plug, always screw it down by hand as far as possible and use the torque wrench for final tightening only. Whenever possible use a socket to avoid possible fracture of the insulator.

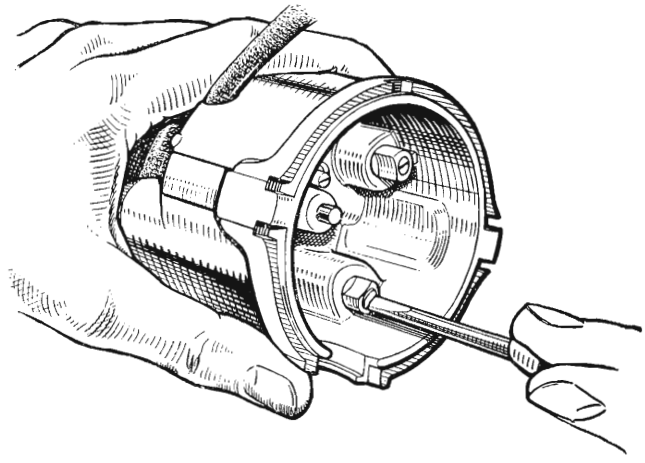
Examine the electrodes for the correct gap. (See 'General Data'.) Avoid an incorrect reading in the case of badly pitted electrodes.

Remember that electrode corrosion and the development of oxides at the gap area vitally affects the sparking efficiency. The special cleaner can remove the oxides and deposits from the insulator, but the cleaner stream does not always reach this area with full effect owing to its location, and cannot necessarily deal with corrosion effectively as this sometimes requires too strong a blast for proper removal.

When plugs appear worthy of further use it is good practice to dress the gap area on both centre and side electrodes with a small file before resetting them to the correct gap. The intense heat, pressure, explosion shock, and electrical and chemical action to which the plugs are submitted during miles of service are so intense that the molecular structure of the metal points is eventually affected. Plugs then reach a worn-out condition and resetting the points can no longer serve a good purpose. When points are burnt badly, it is indicative that the plug has worn to such an extent that its further use is undesirable and wasteful.

Before replacing the plug in the engine, test it for correct functioning under air pressure in a plug tester, following out the instructions issued by the makers of the plug tester. Generally speaking, a plug may be considered satisfactory for further service if it sparks continuously under a pressure of 100 lb./sq. in. (7 kg./cm.^{2}) with the gap between the points set at ·022 in. (·56 mm.). It is essential that the plug point should be reset to the recommended gap before the plug is refitted to the engine. (See 'General Data'.)

While the plug is under pressure in the tester, it should be inspected for leakage by applying oil round the terminal. Leakage is indicated by the production of air bubbles, the intensity of which will serve to indicate the degree of leakage. The leakage gases have a 'blow-torch' effect when the engine is running which rapidly raises the temperature of the plug, raising it above its designed heat range, thus producing overheating, pre-ignition, and rapid electrode destruction.



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Fig. B.7. Securing the high tension cables to the distributor cap.

The top half of the insulator is frequently responsible for poor plug performance due to the following faults: splashes; accumulation of dirt and dust; cracked insulators, caused by a slipping spanner; overtightness of the terminals.

Examine for a cracked insulator at the shoulder and the terminal post and remove any accumulations of dirt and dust.

Section B.8

HIGH-TENSION CABLES

To remove

(1) Obtain access to the high-tension cables by raising the bonnet.
(2) Pull the high-tension cables off the sparking plugs.
(3) Unscrew the moulded terminal to release the cable from the coil.
(4) Straighten out the bare strands of cable, remove the brass washer and withdraw the cable from the moulded terminal.
(5) Release the screw securing the cable in the distributor cover and withdraw the cable.

To replace

(1) Thread the cable through the moulded terminal and brass washer and bend back the bare strands of the cable against the brass washer.
(2) Push the other end of the cable into the distributor cover and secure it with the pointed screw, Fig. B.7.
(3) Install the cables in the coil and distributor cover and onto the sparking plugs in the correct order. The firing order is 1, 3, 4, 2 following round in an anti-clockwise direction.

C

Section B.9 FAULT DIAGNOSIS

Symptom	No.	Possible Fault
(a) Engine will not fire	1	Battery discharged
	2	Distributor contact points dirty, pitted or out of adjustment
	3	Distributor cover 'tracked' or cracked
	4	Distributor carbon brush not in contact with cover
	5	Loose connection in low-tension circuit
	6	Distributor rotor arm cracked
	7	Coil faulty
(b) Engine misfires	1	Distributor contact points dirty, pitted or out of adjustment
	2	Contact breaker spring weak
	3	Distributor cover 'tracked' or cracked
	4	Coil faulty
	5	Loose connection in low-tension circuit
	6	High-tension cables cracked or perished
	7	Sparking plug loose
	8	Sparking plug insulation cracked
	9	Sparking plug gap incorrect
	10	Ignition timing too far advanced