SECTION 'E' - PART II

THE IGNITION SYSTEM

TYPE

COIL IGNITION

The distributor has two sets of contact breakers in staggered relationship, automatic retard and advance by centrifugal governor in bottom of distributor body and vacuum control from inlet manifold.

MAINTENANCE SCHEDULE

FIRST 500 MILES (805 kms)

Check and set spark plug gaps
Check and set ignition distributor contact breaker gaps

EVERY 5,000 MILES (8,050 kms)

Check and set spark plug gaps
Service the distributor cap
Check and set ignition distributor contact breaker gaps
Lubricate the ignition distributor cam.

EVERY 10,000 MILES (16,100 kms)

Renew spark plugs
Clean, check and set ignition distributor, contact breakers and gap.

EVERY 20,000 MILES (32,200 kms)

Renew ignition distributor contact breakers.

THE IGNITION COIL

DATA

Model	HA.12.
Type	Earth return.
Primary resistance	3.1 - 3.5 ohms.
Current consumption at 1,000 r.p.m.	1.4 amps
Current consumption stationary.	3.3 amps

DESCRIPTION

The ignition coil consists of two inner coils completely insulated from one another by oil. The first coil (the primary) is wound on an iron core and is completely insulated from earth while the second coil (the secondary) is of thinner wire around the primary coil but insulated from it. one end of this coil is connected to earth.

The primary coil is the low tension coil and produces the primary current, it is connected to the battery through the ignition switch and distributor. The secondary coil is the high tension coil producing the high voltage current, it is connected to earth at one end and at the other to the centre contact of the ignition distributor. Both coils are mounted in an oil filled cylinderical shaped container which must be earthed to the engine unit.

The purpose of the ignition coil is to convert the L.T. voltage current of the battery to the H.T. voltage current which will jump the spark plug electrodes in the shape of a spark or ignition arc. This is effected by switching on the battery voltage at the ignition switch and passing it through the ignition primary coil and the contact breakers of the ignition distributor to earth.

The camshaft of the engine is rotated and in turn, revolves the ignition distributor cam opening the contact breakers. The opening of the contact breakers cuts the L.T. voltage to the primary coil and its collapse induces a H.T. voltage in the secondary circuit causing the ignition arc across the spark plug electrodes. Further rotation of the camshaft closes the contact breakers completing the primary circuit and allowing it to build up primary current ready for the next opening of the contact breakers.

The ignition coil is a sealed unit and in the event of failure it must be replaced, no repairs can be effected.

MAINTENANCE

The ignition coil will require no maintenance, apart from seeing that all mounting points and connections are tight.

REMOVAL AND REPLACEMENT

IGNITION COIL

1. REMOVAL

Detach the earthing lead from the battery, remove and identify the two L.T. leads from the side Lucar connections and withdraw the H.T. lead from the centre of the ignition coil by unscrewing the terminal nut. Remove the ignition coil from the rear engine bulkhead and earthing strip by withdrawing two bolts.

2. REPLACEMENT

The replacement of the ignition coil is the reversal of the removal sequence but particular attention must be given to the following points:-

(i) That the earthing strip is secured under one of the ignition coil attachment lugs.

(ii) That the L.T. cable from the L.T. terminal on the ignition distributor body is attached to the ignition coil Lucar connection marked "CB" (Contact Breaker).

(iii) That the second L.T. cable from the fuse block or control box is attached to the ignition coil Lucar connection marked "SW" (Switch).

TESTING THE IGNITION COIL

Clean and examine the ignition coil and terminals. Examine the body of the ignition coil for oil leakage both when the ignition coil is cold and also when warm, i.e. after a long run.

To check the secondary circuit (H.T. circuit) remove the H.T. cable from the centre of the ignition distributor cap. Hold the bare end of the cable approximately 0.250" (6.350 mm) from the cylinder block and turn the engine over with the ignition turned on. When the arc occurs the ignition coil can be considered to be satisfactory, when no arcing occurs the ignition must be switched off and the ignition coil removed from the car and both the primary and secondary coil windings given an ohm. resistance test.

NOTE The ignition switch must never be left "on" without the engine running, this allows the battery voltage to energise the primary coil. Failure to observe this instruction will cause the ignition coil to overheat resulting in premature failure.

THE IGNITION DISTRIBUTOR

DESCRIPTION Fig. E23.

To ensure the utmost engine efficiency at high speed, the engine is equipped with an ignition distributor having two sets of contact breakers. This type of distributor permits a longer "build up" period for the primary circuit thus ensuring a greater arc across the spark plug electrodes than a distributor having only one set of contact breakers.

The distributor is driven by a spiral gear machined toward the rear end of the camshaft meshing with a similar gear fitted to the distributor drive shaft and its purpose is to time and

distribute the L.T. and H.T. current to the ignition coil and spark plug respectively. The two sets of contact breakers time the ignition by opening and closing the primary circuit between the battery and the ignition coil at a specified time and distributes the H.T. current to the eight spark plugs through the rotor arm electrode and the contacts moulded in the distributor cap as the pistons almost complete their rise on the compression stroke.

Two automatic devices are incorporated in the distributor to advance or retard the ignition timing according to the speed of the engine and the load placed upon it. The first is a centrifugal governor, built up on the distributor drive shaft below and connected to the distributor base plate, causes the latter to rotate and so advance or retard the ignition timing when the engine speed increases or decreases. The second is a vacuum chamber attached to the distributor body, the outer end of which is connected to the inlet manifold by a small bore pipe and at the second end by a mechanical linkage to the distributor base plate causing the latter to rotate and so advance or retard the ignition timing according to the load placed upon the engine by movement of the accelerator pedal effecting the partial vacuum of the inlet manifold.

As the contact breakers open the primary circuit to the ignition coil is broken and this causes the magnetic field to collapse so inducing the high voltage in the secondary winding of the ignition coil and this voltage causes the arc across the two spark plug electrodes. The intensity of the high voltage depends directly on the quantity of primary current present in the ignition coil at the instant when the contact breakers open.

The primary current commences to build up the moment the contact breakers close and the longer they remain closed, the greater the build up of the primary current. Unfortunately, this period will decrease with an increased number of engine cylinders and faster engine speed but by fitting two sets of contact breakers this inconvenience is overcome.

The two sets of contact breakers are connected in parallel between the ignition coil and earth, their position being staggered in relation to the eight lobe distributor cam. This overlapping results in a longer closed period, hence greater primary circuit saturation and as the contact breakers are in parallel the build up will commence immediately one set of contact breakers close but the ignition arc will not occur until both sets are open. By design the position of the two sets of contact breakers are so arranged that as the second set open the first set are already closing.

Imagine that one cylinder has just been "fired" so both sets of contact breakers will be open. As the distributor shaft rotates the first set of contact breakers, because of their staggered position, will close as the heel of the free contact completes its run down the back face of the distributor cam lobe and so closes the primary circuit which commences to build up. As the distributor shaft rotates further, the second set of contact breakers close but as the two sets of contact breakers are in parallel the primary circuit remains unchanged. Further rotation of the distributor shaft causes the first set of contact breakers to begin to open as the heel of the free contact runs up the front face of the distributor cam lobe but the primary circuit will remain unchanged as the second set of contact breakers are still closed. This second set of contact breakers is opened, by further rotation of the distributor shaft in a similar manner to that of the first, breaking the primary circuit and so inducing the high voltage in the secondary circuit which in turn produces the ignition arc across the spark plug electrodes.

It will be appreciated therefore from the foregoing that the first set of contact breakers close the primary circuit while the second set opens or breaks the primary circuit, thus permitting a greater time interval to elapse allowing more time for build up of the primary circuit and so inducing a higher H.T. voltage in the secondary circuit even at high engine speeds.

The ignition timing advance is effected by the combination of the two devices centrifugal and vacuum. When the engine is running at idling speed no effect is made on the centrifugal governor or the vacuum unit and so the ignition timing occurs in its timed position. On opening the throttle as in accelerating, the ignition timing will be advanced by the centrifugal governor but as there is insufficient vacuum from the inlet manifold the vacuum unit will fail to operate.

Under normal load conditions or part throttle openings, the ignition timing is advanced by the centrifugal governor in proportion to engine speed also, as sufficient vacuum is created in the inlet manifold and the distributor vacuum unit the diaphragm will move and compress the spring in the vacuum unit. A flexible rod from the diaphragm is connected to the distributor base plate which will rotate giving additional ignition advance and effect fuel economy.

ROTATION OF IGNITION DISTRIBUTOR

As it is usual for the ignition distributor manufacture to refer to its rotation as viewed from the drive end; it must be realised that this is the opposite hand to when viewed as fitted to the engine unit but is truly indicated by and also indifferent to the direction of the arrow stamped on the upper portion of the distributor body.

It is important therefore, when in communication with others concerning the rotation of the distributor that the end to which the rotation refers is clearly stated, i.e. the drive end or the rotor arm end.

MAINTENANCE

In addition to ensuring that the ignition distributor is securely mounted, its maintenance is confined to three headings. Attention should be given to these items as detailed in the MAINTENANCE SCHEDULE on page E37

(i) Cleaning the distributor cap
(ii) Lubrication
(iii) Setting, cleaning and occasional renewal of the contact breakers.

LUBRICATION OF THE IGNITION DISTRIBUTOR Fig. E23.

The distributor cap and rotor arm should be removed from the top of the ignition distributor and the cam lubrication pad moistened with two or three drops of clean engine oil from an oil can.

The centrifugal governor is lubricated by allowing two or three drops of clean engine oil to run around the screw head in the centre of the contact breaker cam when the rotor arm has been removed, where a clearance will allow it to pass downward into the centrifugal governor housed in the ignition distributor body.

NOTE: No lubrication whatsoever must be allowed to foul the contact breaker points.

REMOVAL AND REPLACEMENT
IGNITION DISTRIBUTOR AND ENGINE SPEED INDICATOR DRIVE

1. IGNITION DISTRIBUTOR CONNECTIONS

Disconnect the earthing lead from the battery, withdraw and identify the spark plug leads from the eight spark plug tubes and detach the spark plug leads from the top of the rocker covers. Remove the inlet manifold suction pipe from the vacuum chamber, the L.T. lead from the "Lucar" connection on the ignition distributor body and the H.T. lead from the centre of the ignition distributor cap or the ignition coil.

2. ENGINE SPEED INDICATOR DRIVE

Withdraw the flexible drive of the engine speed indicator drive from the adaptor and bush assembly in the side of the ignition distributor pedestal.

The engine speed indicator driven gear is withdrawn from the ignition distributor bracket after the latter has been removed from the engine unit by slackening the retaining bolt and withdrawing adaptor bush and driven gear. The engine speed indicator driving gear is incorporated in the ignition distributor driving collar and can be removed from the bottom end of the ignition distributor shaft, when the latter has been withdrawn from its bracket by removing the pin.

3. IGNITION DISTRIBUTOR BRACKET

Detach the ignition distributor and bracket from the top face of the tappet block and cover by withdrawing two bolts and lifting the assembly upward.

Remove the distributor bracket from the bottom of the ignition distributor by withdrawing the engine speed indicator driven pinion as described in a previous operation. Identify the ignition distributor clamp plate to the ignition distributor bracket and then withdrawing two bolts

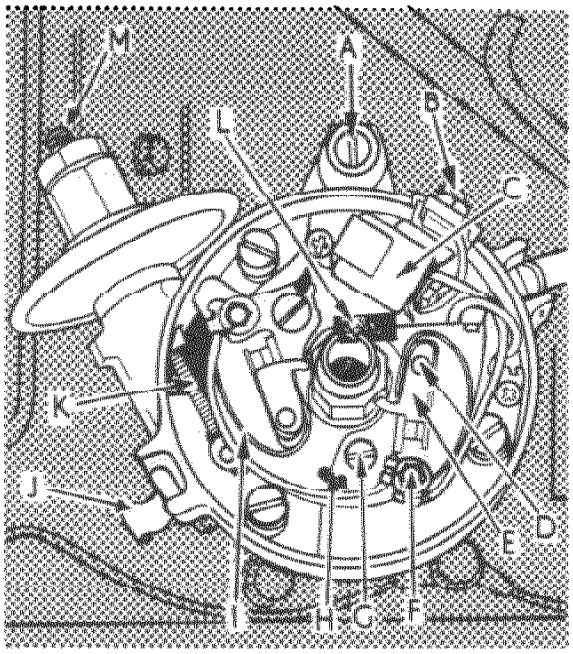


Figure E23.
The ignition distributor with cap removed.

A. Micro-adjuster screw.
B. L.T. Lucar connection.
C. Condenser.
D. Free contact pivot post.
E. Free contact breaker.
F. Base plate post.
G. Fixed contact breaker adjusting screw.
H. Adjusting aperture.
I. Fixed contact breaker.
J. Spring clip.
K. Vacuum chamber rod.
L. Lubricating pad.
M. Vacuum pipe connection.

4. IGNITION DISTRIBUTOR

The ignition distributor driving collar which incorporates the engine speed indicator driving gear is attached to the bottom end of the ignition distributor drive shaft by a pin and need not be disturbed unless the gear is seen to be badly worn.

The ignition distributor clamping plate is attached to the ignition distributor body by a pinch bolt and need not be disturbed. When this necessity arises the clamp plate must be identified to the ignition distributor body before removal, failure to observe this instruction will mean that the ignition timing will require resetting.

5. REPLACEMENT

The replacement of the ignition distributor and engine speed indicator drive is the reversal of the removal sequence but particular attention must be given to the following points:

(i) That when the ignition distributor driving collar has been detached it must be replaced as detailed on page E43.

(ii) That when the ignition distributor clamp plate has been detached without an identification mark the ignition timing must be checked as detailed on page E47.

DISMANTLING AND ASSEMBLING
IGNITION DISTRIBUTOR

1. DISTRIBUTOR CAP

Remove the distributor cap from the top of the distributor body by releasing the spring clips. The two spring clips can be detached from their retaining pins by pushing them downward.

2. ROTOR ARM

Lift the rotor arm from the top of the contact breaker cam.

3. CONTACT BREAKERS

Remove the two sets of contact breakers from the top face of the distributor base plate as detailed on page E45.

4. CONDENSER

Remove the condenser from the top of the distributor base plate as detailed on page E46.

5. DISTRIBUTOR TOP BODY

Detach the distributor top body from the bottom body by withdrawing the three spring loaded screws.

6. VACUUM UNIT

Remove the vacuum unit from the side of the distributor top body by springing off the flexible rod from the downward pointing pin in the underside of the distributor base plate.

7. DISTRIBUTOR BASE PLATE

Detach the flexible earthing lead from the distributor top body by withdrawing a screw. Withdraw the distributor base plate and the star shaped washer from the distributor top body by removing the circlip on the underside.

8. CONTACT BREAKER CAM AND CENTRIFUGAL GOVERNOR

Identify and withdraw the contact breaker cam and advancing plate of the centrifugal governor from the top of the distributor drive shaft by removing the centre screw. Remove the two weights, springs and toggles from the centrifugal governor mounting plate at the top of the distributor drive shaft.

9. DISTRIBUTOR DRIVE COLLAR

Identify its position and remove the distributor drive collar and thrust washer from the bottom end of the distributor drive shaft by ejecting the mills pin.

10. DISTRIBUTOR DRIVE SHAFT

Withdraw the distributor drive shaft, distance collar and ball bearing race upward from inside the distributor bottom body, remove the ball bearing race and distance collar from the top of the distributor drive shaft.

11. DISTRIBUTOR BOTTOM BODY

Remove the lip seal and eject the bush bearing from the top and bottom of the distributor bottom body respectively when they are known to be badly worn.

12. MICRO-ADJUSTER ASSEMBLY

Withdraw the peg and spring from the micro-adjuster assembly by removing the circlip from the head of the screw.

13. ASSEMBLY

The assembly of the distributor is the reversal of the dismantling sequence but particular attention must be given to the following points:

(i) That the breather holes in the bottom body are clear of obstructions, the bottom bush bearing is pressed in so it is flush with the bottom end of the body, the lip oil seal is positioned so its lip is toward the bottom end of the body and is retained by the circlip.

(ii) That the drive shaft distance piece is fitted to the top of the distributor drive shaft before the ball bearing race is fitted.

(iii) That the star shaped spring washer on the underside of the top body is fitted so its spring legs abut to the top body.

(iv) That the flexible earthing cable attached to the lug of the cam face lubricating pad assembly is secured to the inside face of the distributor top body.

(v) That the top body is fitted to the bottom portion of the distributor body so that the micro-adjuster peg locates the recess in the body.

(vi) That the thrust washer and distributor drive collar is fitted to the distributor drive shaft as detailed below.

REMOVAL AND REPLACEMENT
DISTRIBUTOR DRIVE COLLAR TO DISTRIBUTOR DRIVE SHAFT Fig. E24

1. REMOVAL

Remove the distributor drive collar from the bottom end of the distributor drive shaft by ejecting the mills pin.

2. REPLACEMENT

Remove the distributor cap from the ignition distributor and lay the distributor body horizontally so that the rotor arm electrode points upward. Fit the distributor drive thrust washer followed by the distributor drive collar so that the offset tongue is toward the L.H. side when looking at the driving end. Fit the mills pin and lightly peen over the ends.

When fitting a new distributor drive collar, the undrilled side will be at the bottom and will need drilling.

When fitting a new distributor proceed as detailed above but ensure that the tongued end of the distributor drive collar is positioned parallel to the centre line of the rotor arm electrode. The distributor shaft and second side of the distributor drive collar are now drilled through and the mills pin fitted as detailed above.

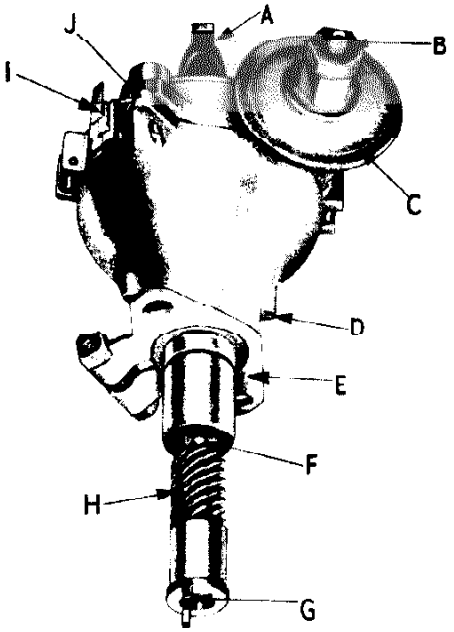


Figure E24
The ignition distributor showing the relationship of rotor arm electrode and the offset tongue of the drive collar.

A. Rotor arm
B. Vacuum pipe connection.
C. Vacuum chamber.
D. Ventilation holes.
E. Clamp plate.
F. Mills pin.
G. Off set tongue.
H. Engine speed indicator drive gear.
I. L.T. Lucar connection.
J. Micro-adjuster.

CLEANING THE IGNITION DISTRIBUTOR CAP

The ignition distributor cap should be removed periodically, by releasing the two spring clips, and cleaned with a soft dry cloth, paying particular attention to the area between the terminals.

Ensure that the spring loaded carbon brush moves freely in its holder, this is situated centrally in the underside of distributor cap; the efficiency of the ignition distribution depends on the contact

between the carbon brush and rotor arm electrode.

It is essential when replacing the distributor cap that the tongue in the distributor cap locates the recess in the rim of the distributor adjacent to the L.T. terminal.

THE IGNITION DISTRIBUTOR RETARD AND ADVANCE MICRO-ADJUSTER

DESCRIPTION

The micro-adjuster is intended for ignition timing adjustments to accommodate the following circumstances:-

(i) The enforced use of a petroleum spirit having a different octane value than that which is normally used necessitating some retarding or advancement of the ignition timing.

(ii) Retarding the ignition timing to avoid "pinking" when it is known that the engine requires de-carbonising.

(iii) To provide adjustment for ignition timing which can be effected during a road test.

The main or bottom portion of the ignition distributor body bears a single line and as this portion of the ignition body is located on the engine unit, this line is used as a datum. The letters "A" and "R" are engraved, one each side of the single line to the L.H. and R.H. sides respectively to indicate the retard and advance positions. The moving top portion of the ignition distributor contains the vacuum chamber and base plate to which the two sets of contact breakers are attached and engraved on its exterior to align with the datum line are several vertical lines.

Movement of the micro-adjuster screw in the top portion of the distributor body will move contact breakers relative to the distributor cam and so will advance or retard the ignition timing.

The angular amount that the ignition timing is altered when moved from one line to another is equivalent to 4° of crankshaft rotation. It will be readily appreciated that only a small amount of movement of the adjuster screw will be necessary and the normal setting is considered to be when the third line from "A" aligns with the datum on the main portion of the ignition distributor body below.

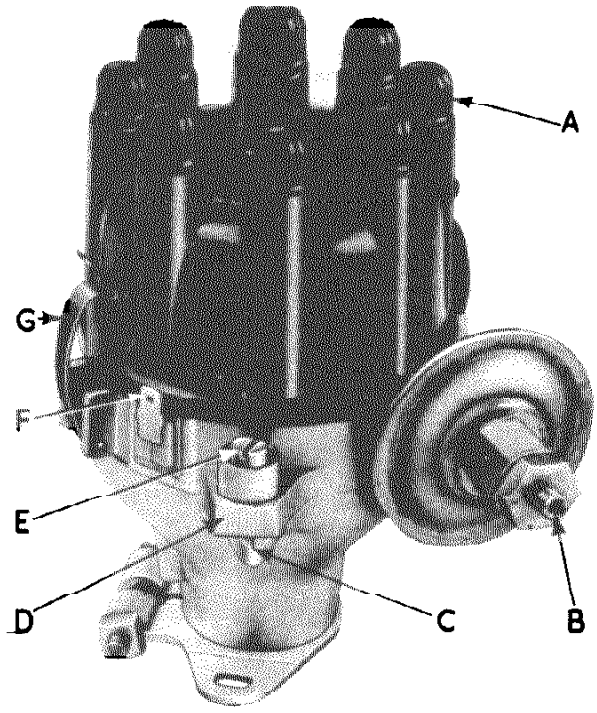


Figure E25.
The retard and advance micro-adjuster.

A. Terminal nuts.
B. Vacuum connection.
C. Micro-adjuster datum line.
D. Micro-adjuster vernier lines.
E. Micro-adjuster setting screw.
F. L.T. Lucar connection.
G. Distributor cap spring clip.

TO SET THE IGNITION TIMING UTILIZING THE MICRO ADJUSTER Fig. E25

With a spanner on the locknut just in front of the distributor body and a screwdriver in the screw head slot, slacken the locknut and turn the screw CLOCKWISE TO ADVANCE and ANTI-CLOCKWISE TO RETARD the ignition.

After adjustment, hold the screwdriver in position and tighten the locknut.

NOTE: When any large adjustment has been made and the ignition setting is observed to be considerably different from normal the ignition timing should be checked as detailed on page

THE CONTACT BREAKERS

SETTING CONTACT BREAKER GAPS Fig. E23.

Remove and clean the distributor cap, detach and clean the distributor rotor arm. Rotate the crankshaft so that the heel of one free contact breaker is positioned on the apex of one of the cam lobes. Release the fixed contact breaker by slackening the clamp screw and utilizing feeler gauges, set the specified gap and tighten the clamp screw.

A mushroom shaped aperture in the distributor base plate and a "nick" in the fixed contact breaker greatly facilitates the opening or closing of the gap.

Rotate the crankshaft so that the heel of the second free contact breaker is positioned on the apex of one of the cam lobes and repeat the gap setting operation.

The crankshaft can be rotated to reposition the heels of the free contact breaker on the apex of adjacent cam lobes and the gap checked and, when necessary, reset. This will give a mean average gap and also arrest any error caused by the movement of the fixed contact breaker when its clamp screw is being fully tightened.

CLEANING THE CONTACT FACES OF CONTACT BREAKERS

During normal use, it may be observed that one contact face has "built up" while the second has become "pitted" and both can be cleaned up by stoning.

The life of the contact breakers is considerable and they will withstand many stonings, but when the thickness of the platinum faces is observed to be thinning, replacement sets must be fitted.

Remove the contact breakers from the ignition distributor as detailed on below.
Clean off the "build up" on the contact face and reduce the depth of the "pitting" utilizing a dry fine grade carborundum stone, ensuring that the faces are kept flat and square.
Clean the contacts of all dust, dirt and grease.

Replace the contact breakers to the ignition distributor and set the gaps as detailed above.

REMOVAL AND REPLACEMENT
CONTACT BREAKERS Fig. E23.

To preserve the efficiency of the engine, the contact breakers must be free from dust, grease and make perfectly flat contact with one another over their entire area when in the closed position. Their appearance must be that of a clean frosty grey colour and when observed to be very dark or blue in colour, it indicates that the contact faces are oily or that a fault has developed in the condenser.

1. REMOVAL

Remove and clean the distributor cap, detach and clean the rotor arm electrode. Withdraw the condenser leads and insulating thimbles from the top ends of the two base plate posts by removing one nut each. Withdraw the two free contact breakers, leaf springs and insulating washers from the four posts by lifting them vertically upward. Detach the two

fixed contact breakers from the distributor base plate by withdrawing one screw each.

2. REPLACEMENT

The replacement of the contact breakers is the reversal of the removal sequence but particular attention must be given to the following points:

(i) That before fitting new contact breakers, they are washed clean of their protective grease coating.

(ii) That none of the insulating washers or thimbles are omitted, particularly the insulated washer under the free contact breaker.

(iii) That the contact faces of the contact breakers are set so they are perfectly square and flat with one another.

(iv) That the contact breaker gaps are set as detailed on page E45.

(v) That when new contact breakers are fitted, they are set to the top limit, thus allowing the heel of the free contact breaker to bed in and the gaps are reset after the first 500 miles (805 kms).

TESTING THE CONTACT BREAKER SPRING TENSION

Remove the distributor cap and position the heel of the free contact breaker so that it is midway between two adjacent cams. Attach the hook of a small spring balance at 90° to the contact breaker face to be tested; take a reading from the spring balance scale immediately the contact breaker faces separate. When the spring tension is above or below the specified figure, the leaf spring can be set to counteract the error but it is more satisfactory to fit replacement contact breakers.

THE IGNITION DISTRIBUTOR CONDENSER

DESCRIPTION Fig. E23.

When the contact breaker points are opened, causing the collapse of the ingition primary circuit, the primary circuit tends to cross the gap between the contact breakers causing an arc. This arcing occurrence which, if permitted, would soon burn away the platinum faces of the contact breakers and cause irregular ignition arcs at the spark plug electrodes resulting in a drop of general engine performance.

This arcing at the contact breaker gaps could never be tolerated and in consequence a condenser is fitted between the primary circuit and earth. The condenser not only prevents arcing at the contact breaker gap, when they open, but also has the additional advantage of causing a more sudden break in the ignition primary circuit. The primary current, instead of trying to cross the contact breaker gap charges the condenser with electrical power which will assist in building up the primary circuit when the contact breakers close again, thus producing a higher voltage in the ignition circuit when the contact breakers open the next time.

The condenser is fitted on the ignition distributor base plate under the distributor cap and should it ever deteriorate the symptoms will be a drop in engine power, troublesome engine starting and rough slow running. The failure can also be recognised by "blueing" of the contact breaker points.

REMOVAL AND REPLACEMENT
IGNITION DISTRIBUTOR CONDENSER

1. REMOVAL

Remove the distributor cap from the distributor. Detach the condenser and L.T. terminal block from the base plate and distributor body respectively by withdrawing the flexible lead from the rear base plate post by removing a nut and screw. Detach the flexible L.T. cables and the insulating plate from the terminal end of the condenser by removing a nut.

When the condenser is being removed because of failure, it will be necessary in the majority of instances to renew the contact breakers as detailed on page E45.

2. REPLACEMENT

The replacement of the condenser is the reversal of the removal sequence but particular attention must be given to the following point:-

That the insulating plate is fitted to the terminal end of the condenser body, so the angled foot points away from the condenser body and is downward similar to the mounting bracket.

THE IGNITION TIMING

DATA

Static setting 10^{o} B.T.D.C. on compression stroke.

DESCRIPTION

The ignition timing is the instant when the high voltage induced in the secondary circuit of the ignition coil passes across the electrodes of the spark plug, this must occur when the piston is rising on the compression stroke and usually a number of degrees B.T.D.C.

The ignition timing specified is for an engine unit in the peak of condition and for the use of premium grade petroleum spirit. During its normal life, carbon deposits will form inside the combustion chambers lessening the engine's efficiency and the ignition must therefore be retarded to eliminate "pinking", this is effected by rotating the micro-adjuster screw.

Owing to the close proximity of the ignition distributor cam lobes and the use of two sets of contact breakers, visual observation of the ignition point is not a simple and accurate method and the use of a lamp connected between the ignition distributor body and the L.T. terminal is considered more suitable. This lamp will glow, when the ignition is switched on and both sets of contact breakers are open, thus indicating the point of ignition most efficiently.

NOTE: The ignition timing must not be set in advance of the specified setting. Failure to observe this instruction may result in damaging the electric starter pinion and/or flywheel ring gear.

CHECKING THE IGNITION TIMING Figs. E26 and E27.

1. SPARK PLUGS AND LEADS

Withdraw, clean, test and renew any spark plugs that are inefficient and clean the ignition distributor cap and rotor arm electrode. Replace the rotor arm only at this juncture. Inspect and replace any H.T. or L.T. leads which have deteriorated.

2. CRANKSHAFT POSITION

Rotate the crankshaft so that No. 1R piston is at T.D.C. on its compression stroke ascertained by aligning the crankshaft damper mark to the L.H. side of the engine unit and checking that the ignition distributor rotor arm points to the front R.H. H.T. contact of the ignition distributor. Rotate the crankshaft a further one eighth of a turn, when No. 1L piston will begin to rise on its compression stroke, at the top end of which occurs the ignition arc.

3. TEST LAMP INSTALLATION

Connect a 12 volt lamp between the ignition distributor body and its L.T. terminal and switch on the ignition.

4. POINT OF IGNITION

Rotate the crankshaft slowly and stop immediately the lamp glows and switch off the ignition. Determine the co-relationship of the crankshaft damper mark and the R.H. side of

the indicator attached to the front face of the timing chain cover. When the ignition timing is correct, these two should be in alignment. If any mis-alignment is determined the ignition timing is incorrect and must be reset. Any flashing of the test lamp indicates dirty or burnt contact breakers or worn pivot posts.

SETTING THE IGNITION TIMING Figs. E26 and E27

1. CONTACT BREAKERS

Set the contact breakers as detailed on page E45.

2. POSITIONING THE CRANKSHAFT

Rotate the crankshaft so that No. 1L piston is rising on its compression stroke ascertained by the crankshaft damper mark being toward the R.H. side of the engine and the ignition distributor approaching the front H.T. contact of the distributor cap. Continue rotating the crankshaft slowly until the crankshaft damper mark aligns with the R.H. side of the indicator attached to the front face of the timing chain cover.

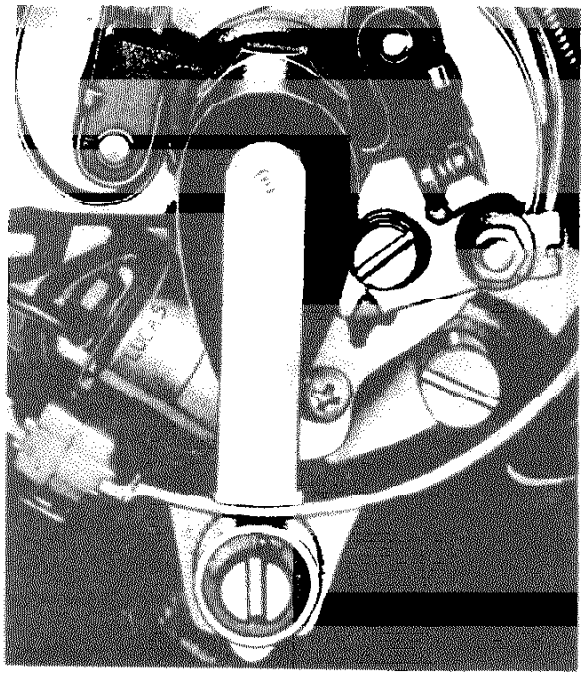


Figure E26

The ignition distributor rotor arm at No. 1L H.T. segment.

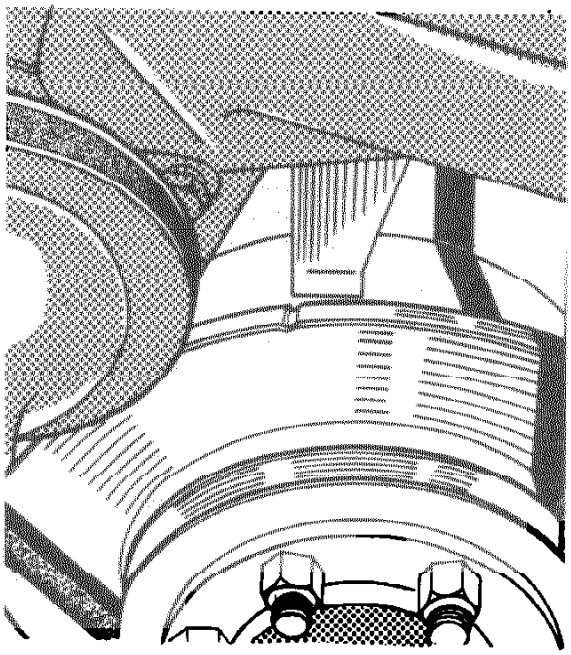


Figure E27

The crankshaft damper mark indicating No. 1L piston is at 10° B.T.D.C. when the distributor rotor arm is position as shown in Figure E26.

3. SETTING IGNITION DISTRIBUTOR

Utilizing the micro-adjuster screw, situated in front of the ignition distributor body, set the third line from "A" on the top half of the ignition distributor body to the single line on the bottom half of the ignition distributor body. Slacken the two clamp bolts in the plate below the ignition distributor body and rotate the ignition distributor a short distance anti-clockwise just far enough to close one set of contact breakers. Ensure that the test lamp is in circuit

between the ignition distributor body and its L.T. terminal and switch on the ignition. Rotate the ignition distributor body very slowly clockwise and stop immediately the lamp glows, as this is the point of ignition and tighten the two clamp bolts. By tightening the clamp bolts while the ignition is switched on, any displacement of the ignition distributor can readily be observed. Switch off the ignition and remove the test lamp. Replace the ignition distributor cap and spark plugs as detailed on pages E44 and E53.

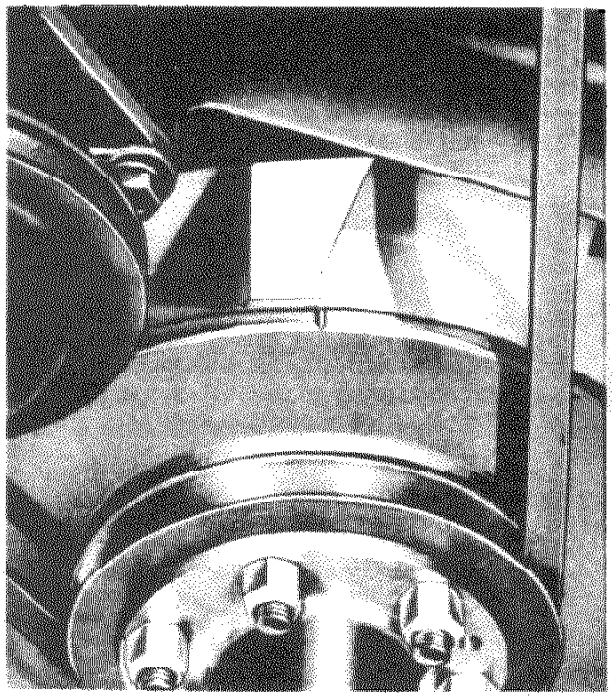
4. ROAD TESTING

Road test the car on a suitable hill which will make the car pull hard in top gear at full throttle. Retard or advance the ignition timing by the use of the micro-adjuster screw until the engine "pinks" and then retard, just sufficiently, to eliminate all "pinking". This will set the ignition timing in relation to the petrol octane value and the condition of the engine.

THE FIRING ORDER

1L. 4R. 2R. 2L. 3R. 3L. 4L. 1R.

By aligning the crankshaft damper mark to the L.H. side of the indicator attached to the front face of the timing chain cover No. 1L and 3R pistons will be at T.D.C. but the ignition distributor rotor arm will point to either the front (1L) or rear (3R) ignition contact. It is by checking the position of the ignition distributor rotor arm that the piston on its firing stroke (both valves closed) is determined.



When the ignition distributor rotor arm points to the rear ignition contact (3R) it will be necessary to turn the crankshaft 360° to align the distributor rotor arm with the front ignition contact (1L) and its piston to T.D.C. on its compression (firing stroke) with both valves closed. Fig. E28.

The engine unit being of the eight cylinder type and having determined which pistons are at T.D.C. it will be necessary to turn the crankshaft 90° to bring the remaining pistons to T.D.C. in their firing order.

Figure E28 (left)

The crankshaft damper mark indicating No. 1L and 3R pistons at T.D.C.

THE OIL PUMP AND IGNITION DISTRIBUTOR DRIVE

DESCRIPTION

The oil pump and ignition distributor drive is taken from the spiral gear machined toward the rear end of the camshaft meshing with a similar gear keyed to the top end of the oil pump driving shaft. The bottom end of the shaft is tongued to engage the drive gear of the oil pump mounted in the engine sump.

The top face of the oil pump spiral gear has an off set machined groove into which the off set tongued end of the distributor drive collar fits; the side face of which is machined as a spiral gear to provide the drive for the engine speed indicator. The distributor drive collar is pinned to the bottom of the distributor shaft so that the off set tongue is parallel to the centre line of the rotor arm electrode but off set toward the R.H. side when the rotor arm electrode is pointing forward toward the micro-adjuster screw on the far side of the distributor body.

The oil pump spiral gear, thrust washer, distributor bracket and distributor drive collar are so machined that adequate clearance is provided between the top face of the oil pump spiral gear and the underside of the distributor drive collar, but it is best checked to ensure its presence when replacement components are fitted as detailed on page

SETTING IGNITION DISTRIBUTOR DRIVE

The oil pump, distributor driving gear and shaft assembly can be withdrawn through the top of the tappet block and cover after the ignition distributor and bracket have been removed by a tool fabricated to grip and lift the spiral gear and shaft assembly.

It can be replaced in the engine unit providing that the camshaft is set in one of two particular positions.

(i) With the timing chain cover in situ. The crankshaft is set so that No. 1L piston is at the ignition point i.e. the crankshaft damper mark aligning with the R.H. side of the indicator on the front of the timing chain cover and both valves of No. 1L cylinder closed. The gear and shaft assembly is fed through the tappet block and cover to mesh with the camshaft gear so that the groove in the top face of the gear is almost parallel to and offset toward the centre of the engine unit. Fig. E29.

(ii) With the timing chain cover removed so that the timing gears are visible. The crankshaft is set so that the two sets of valve timing marks align as detailed in the ENGINE UNIT, SECTION D, VALVE TIMING. The gear and shaft assembly is fed through the tappet block and cover to mesh with the camshaft gear so that the groove in the top face of the gear is almost parallel to and offset away from the centre of the engine unit. Fig. E30.

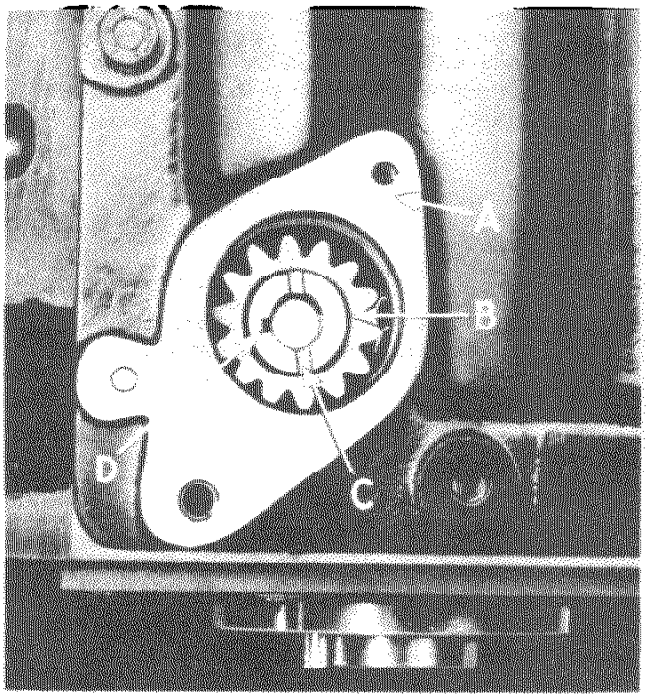


Figure E29

Position of helical gear, viewed through tappet block and cover, when no 1L piston is 10 B.T.D.C. on compression stroke.

A. Fitting face of ignition distributor damping plate.
B. Oil pump and ignition distributor helical drive gear.
C. Off-set slot positioned toward centre of engine unit.
D. Keyway in helical gear. When the crankshaft damper mark aligns with the R H. side of the timing chain cover point, this keyway will point to the bank of cylinders containing the firing cylinder.

It must be realised that the tongued bottom end of the oil pump drive shaft engages a slot in the oil pump drive gear inside the oil pump body. When an obstruction is experienced in fitting the gear and shaft, the oil pump gear should be aligned to the tongued end of the oil pump drive shaft.

Both the camshaft and oil pump/distributor drive gears are of the R.T. spiral pattern and it will be necessary to "retard" the gear groove so that as it meshes with the camshaft gear, it will turn clockwise and adopt its correct alignment.

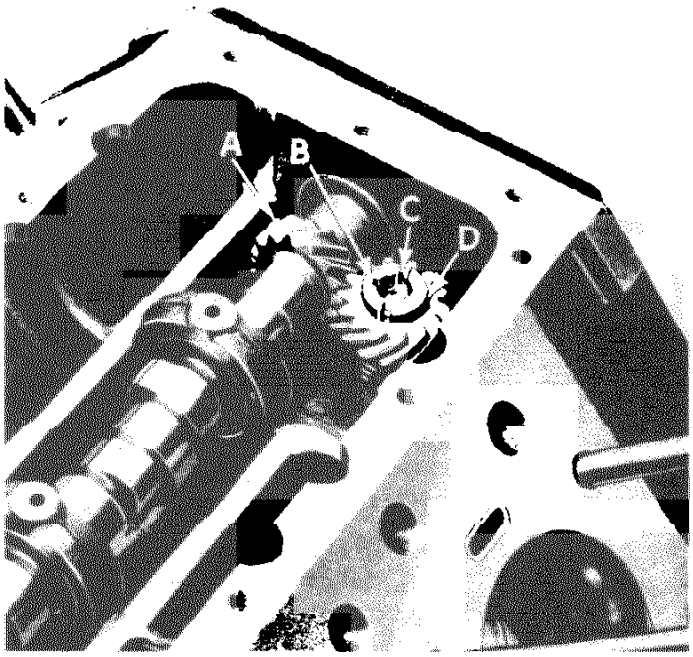


Figure E30

The oil pump/ignition distributor drive shaft fitted to engine unit with No. 3R piston on compression stroke. Note offset of groove toward outside of engine unit and keyway in gear pointing to the bank of cylinders containing the firing cylinder.

A. Helical gear on camshaft.
B. Keyway in helical gear.
C. Offset groove.
D. Oil pump/ignition distributor drive gear.

REMOVAL AND REPLACEMENT

IGNITION DISTRIBUTOR DRIVE Figs. E29 and E31

1. IGNITION DISTRIBUTOR

Remove the ignition distributor from the top of the engine unit as detailed on page E40.

2. OIL PUMP/IGNITION DISTRIBUTOR DRIVING SHAFT ASSEMBLY

Withdraw the oil pump/ignition distributor driving shaft assembly and thrust washer through the tappet block and cover; exercising care not to displace the thrust washer, so that it falls into the camshaft compartment.

The gear and shaft can be partially withdrawn and a smear of grease applied to the underside of the oil pump drive gear and then returned into the engine unit. It can now be withdrawn for a second time when the thrust washer should adhere to the underside of the gear.

3. REPLACEMENT

The replacement of the oil pump/distributor drive is the reversal of the removal sequence but particular attention must be given to the following points:

(i) That the engine satisfies one of the two conditions detailed in SETTING IGNITION DISTRIBUTOR DRIVE on page E50.

(ii) That the gear, shaft and thrust washer is "retarded" approximately 45^{o} to accommodate its rotation due to the spiral form of the two gears.

(iii) That the oil pump driving gear is positioned relative to the tongued end of the oil pump driving shaft including the "retardation" mentioned in the previous paragraph.

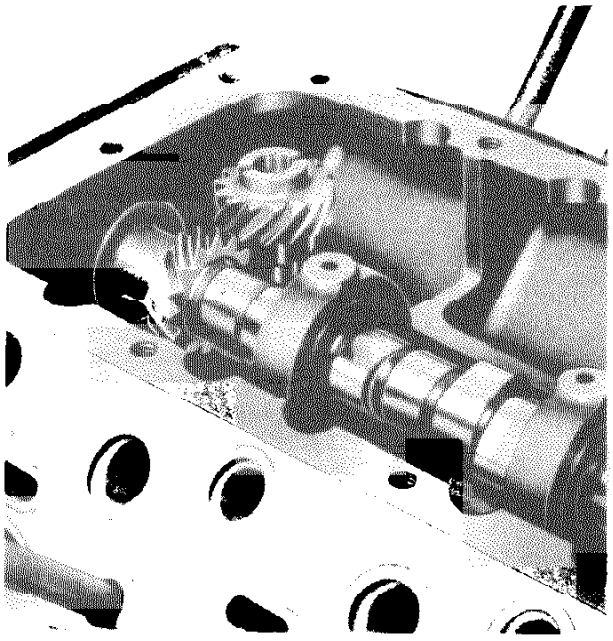


Figure E31
The oil pump/ignition distributor drive shaft being fitted. Note the retardation of the helical gear.

SETTING END FLOAT OF IGNITION DISTRIBUTOR DRIVE

In order to safeguard the bearings and shaft of the ignition distributor it is necessary to ensure that there is sufficient clearance between the top face of the oil pump spiral gear and the underside of the distributor drive collar on the drive shaft. Machining tolerances are such that adequate clearance is provided but it can be checked in the following manner:

Measure and note the thickness of a 0.500" (12.700 mm) internal diameter washer and feed this onto the oil pump drive shaft together with thrust washer and feed it into position; ignition timing is of no consequence at this juncture but the tongued end must locate the oil pump drive gear correctly.

Position the distributor in the tappet block and cover, locating the offset tongue in the groove in the top of the oil pump gear. Utilizing feeler gauges ascertain the clearance between tappet block and cover top face and the underside of the ignition distributor bracket plate.

Subtract the thickness of the test washer and the resultant will represent the clearance or interference between the top face of the spiral gear and the underside of the ignition distributor drive collar when the test washer is removed.

When an interference or insufficient clearance is determined it will be necessary either to reduce the thickness of the thrust washer or add extra joint washers between the tappet block cover top face and the underside of the ignition distributor bracket.

THE HIGH TENSION CABLES

The high tension cables are the thicker cables between the ignition coil, ignition distributor and the spark plugs. They are of the ignition suppressor type which incorporates a special resistor element to eliminate ignition interference of radio and television, they can be identified by the words "SUPPRESSOR CABLE" moulded in its outer casing. This type of high tension cable is fitted to all cars marketed in the United Kingdom.

It is imperative that the end terminals of these cables are never removed and no additional ignition interference suppressor is incorporated in the cables length. The removal of the end terminal will damage the insulation and the continuity between the resistor element and the end terminal, while the addition of an ignition suppressor can increase the resistance in the H.T. ignition circuit and may adversely effect engine performance.

On no account must the suppressor type high tension cables be replaced with any other, than of the original type. Failure to observe this instruction will result in ignition interference rendering the car owner liable to prosecution in the United Kingdom.

Replacement high tension cables are available as assemblies from The Daimler Spares Department.

The replacement of the high tension cable is the reversal of the removal sequence and their order in the distributor cap is as shown in the illustration Fig. E32.

THE SPARK PLUGS

DATA

Make and Type	Champion NA.8
Gap Setting	0.025" (0.635 mm)

GENERAL

Much of the engine efficiency can be attributed to good spark plugs. When the spark plugs are allowed to remain oily and dirty they will seriously effect the efficiency of the engine.

It is recommended that they are sand blasted clean and compared with that of a new plug on a Champion Spark Plug cleaner and tester, the test being made after the gap has been set with the Champion Spark Plug Gap Setting Tool. Always set the side electrode to the centre and never bend the centre electrode, although the life of the spark plug can be made more efficient by "squaring it up" with the judicious use of a Swiss file.

When removing the spark plug from the engine identify it to the respective cylinder from which it has been removed as it is often a tell-tale of the cylinders condition and hence its efficiency.

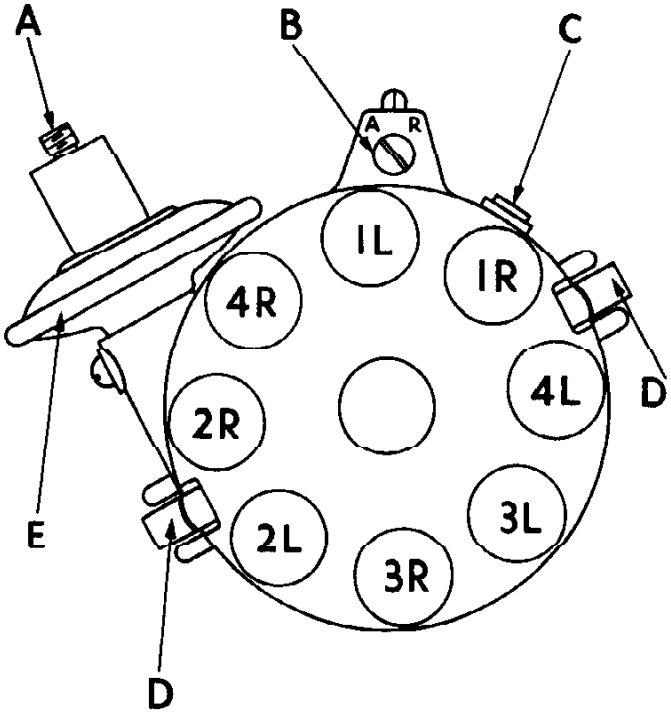


Figure E32
Location of spark plug HT cables in the ignition distributor.

A. Vacuum pipe union.
B. Micro-adjuster screw.
C. L.T. terminal.
D. Spring clips.
E. Vacuum chamber.

THE SPARK PLUG SPANNER

A special tubular spark plug spanner is supplied in the tool kit of each car. A rubber bush having a small centre drilling is fixed inside the tube and the centre drilling will grip the terminal at the top of the spark plug holding it with complete safety to effect the spark plugs removal and replacement.

REMOVAL AND REPLACEMENT, SPARK PLUGS

1. REMOVAL

Withdraw and identify the H.T. cable from the spark plug tube and remove the spark plug utilizing the plug spanner provided. Identify the spark plug to its respective position and repeat the sequence with the remaining spark plugs.

2. REPLACEMENT

The replacement of the spark plug is the reversal of the removal sequence but particular

attention should be given to the following points:

(i) That the plug spanner provided with the car is used, this grips the terminal of the spark plug with complete safety.

(ii) That a new copper and asbestos washer is fitted to ensure a gas tight fit.

(iii) That if there is any doubt as to the identification of the spark plug leads reference is made to the location of spark plug H.T. cables illustration and the cable traced from its position in the ignition distributor cap.

(iv) That the gap is accurately set before fitting new and unused spark plugs to the engine unit.

CLEANING, SETTING GAP AND TESTING SPARK PLUGS

Clean the spark plugs by sand blasting and after setting the gap of the two electrodes by adjusting the position of the outer test the spark plugs on a proprietary spark plug tester utilizing a new spark plug of the same make and type by following the tester manufacturer's instructions.

When any spark plug is found to be inefficient it must be replaced in order to preserve engine efficiency.

Clean the thread of the spark plug body and smear with a graphite based oil or grease before replacing it in the cylinder head.

ANALYSIS OF SPARK PLUG APPEARANCE BEFORE CLEANING

The following notes on the appearance of the spark plug before cleaning will indicate to some extent the efficiency of the cylinder from which it was removed.

1. BLACK - WET AND SHINY

A wet and shiny black deposit on the centre insulator will indicate that a large percentage of the oil is present in the mixture. This can be attributed to the fact that on the intake stroke of the piston, oil vapour from the crankcase is passing the piston and piston rings or that the engine has been operated when the plug has not been firing.

2. BLACK - DULL

A dry black deposit on the centre insulator will indicate that the heat generated is not hot enough for the carbon to be burnt off. This can be attributed to the mixture being too rich.

3. WHITE

A dry white deposit on the central insulator will indicate that the heat generated is too great. This can be attributed to the mixture being too weak, or engine overheating (i.e. due to loss of water etc.).

PINKING

This is a mechanical metallic noise which emits from the engine when the ignition is too far advanced. It can, however, be caused by excessive carbon deposits, too weak a mixture, low octane value petrol, faulty or unsuitable spark plugs.