OPERATING INSTRUCTIONS

for

MAGNETOS

Types AG4-6, AG4-8, AG4-10
and
Type ZI-1 Impulse Starter

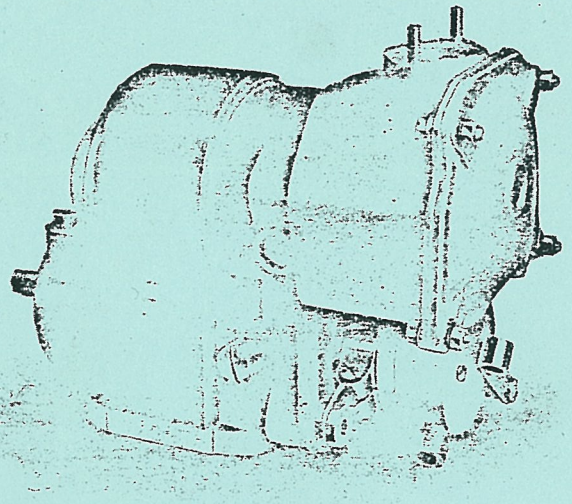

Fig. 1. Type AG4-8 Magneto.

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IB. 1663 Ed. B, AL. No. 1, January, 1957

Information contained in this book affecting safe operation, maintenance, and overhaul, has been verified and approved by the Air Registration Board in accordance with Chapter A6-2 of British Civil Airworthiness Requirements.

The BRITISH THOMSON-HOUSTON Co., Ltd.

COVENTRY, ENGLAND

Edition B.
*Cancels Edition A.

January, 1954

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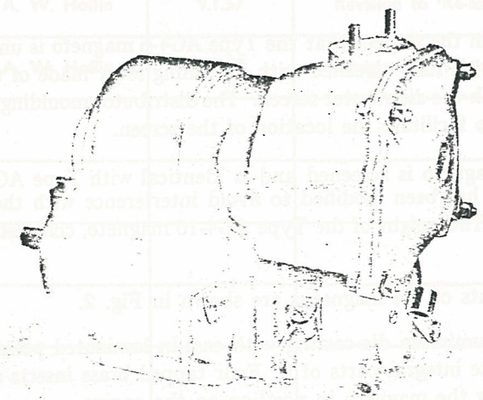

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Chapter 1

DESCRIPTION

These magnetos are of the rotating armature type and are fitted with a horseshoe-type magnet giving a strong magnetic field which remains constant over an extended period. A high-tension distributor is incorporated in the magneto, which gives four sparks every two revolutions of the magneto armature. On the brush-holder spindle of the magneto is fitted a bonded fabric gear which is driven by a steel gear mounted on the armature shaft. The steel gear is known as the full speed gear, and the bonded fabric gear is known as the half-speed gear, owing to their relative speeds. The magnetos are base-mounted and are supplied with the spindle centres at a height of 38 mm. above the base.

The weight of the Type AG4-6 magneto, complete with impulse starter, is 10 lb. (*4·54 kg.*) approximately; and the weight of the Type AG4-8 magneto complete with impulse starter is 10½ lb. (*4·76 kg.*) approximately.

The magnetos differ in the respect that the Type AG4-6 magneto is unscreened while the Type AG4-8 magneto, shown in Fig. 1, is fully screened with its timing lever made of thinner-section material to give the required clearance with the distributor screen. The distributor moulding of the Type AG4-8 magneto has a slightly longer spigot to facilitate the location of the screen.

The Type AG4-10 magneto is screened and is identical with Type AG4-8, with the exception of the distributor screen, which has been modified to avoid interference with the engine mounting structure in certain types of aircraft. The weight of the Type AG4-10 magneto, complete with impulse starter is 10½ lb. (*4·76 kg.*) approximately.

The major components of the magnetos are shown in Fig. 2.

The housing is an aluminium die-casting with cast-in laminated poles and with the distributor endplate and driving endplate integral parts of it. Four tapped brass inserts are cast in position in the base of the housing for bolting the magneto in position on the engine.

The armature comprises an 'H' type laminated medium-resistance iron former on which are wound primary and secondary windings, and to the ends of the former are attached two endcheeks. One of these endcheeks contains the capacitor and the other incorporates the driving spindle. On the driving spindle is fitted the slip-ring and the driving-end bearing, while on the contact-breaker end is fitted the full-speed wheel and the contact-breaker end bearing. Both bearings are of the semi-thrust type specially designed for adjustment of endfloat.

The contact-breaker is of the usual design for this type of magneto, i.e., a brass base on which is mounted an insulated contact block carrying an adjustable contact, the other contact being carried on a bell-crank lever. This lever is made of duralumin, into which is pressed an insulated brass bush. This bush is the bearing of the lever and operates on a hardened and polished steel pivot pin, located in the base. Both the adjustable and the lever contacts are made of 25 per cent iridium platinum.

The contact-breaker rotates inside a ring type cam. The heel of the contact-breaker lever is of bonded fabric and is lubricated by an oil-soaked wick in the cam ring.

The cam ring is positioned inside a brass tube, and over this cam ring cover tube is fitted a brass timing lever, by means of which the moment of ignition is varied by 25° (measured on the magneto driving spindle). This 25° variation is determined by a timing stop screw, fitted in the contact-breaker endplate, locating in a cutaway portion of the cam ring cover tube.

The distributor brush holder is connected to the secondary winding of the armature by means of a collector moulding located in the housing above the slip-ring. This brush holder is revolved inside the distributor moulding by the half-speed wheel and is mounted on semi-thrust ball-bearings for free running.

AMENDMENT RECORD SHEET

A.L. No.	SIGNATURE	DATE	
1	H. A. W. Hoflin	9.1.57	Revision to 'Contents'
2	H. A. W. Hoflin	9.1.57	Revision to 'Re-assembly'
3	H. A. W. Hoflin	9.1.57	Revision to 'Testing'
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THE BRITISH THOMSON-HOUSTON CO., LTD.
COVENTRY, ENGLAND

PRINCIPAL PARTS

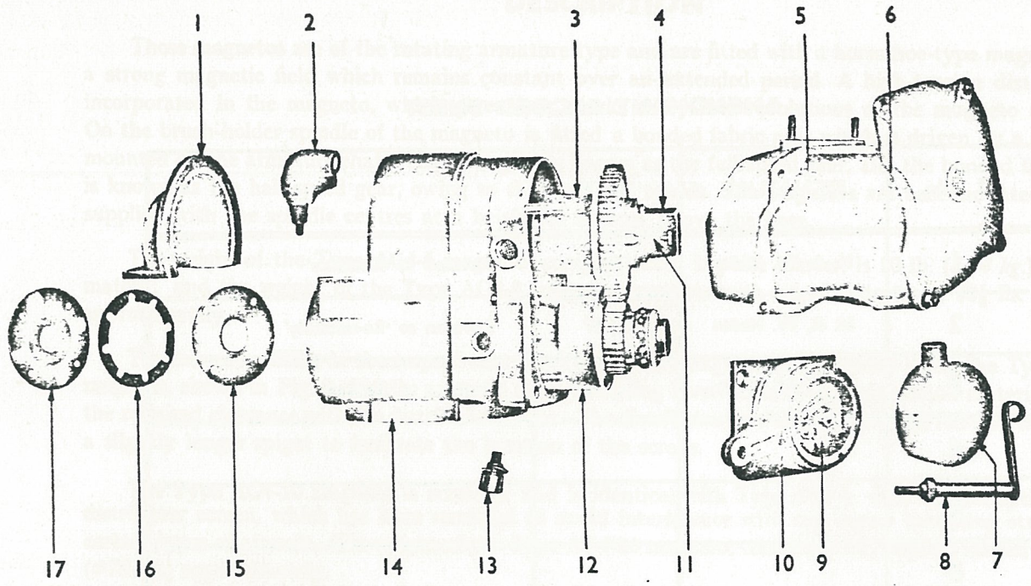

Fig. 2. Principal parts of Type AG4-8 magneto.

1. Driving-end cover.
2. Collector moulding.
3. Gearwheel assembly.
4. Brush holder.
5. Distributor moulding.
6. Distributor screen.
7. Contact-breaker cover.
8. Pillar and spring for cover.
9. Contact-breaker.
10. Cam ring assembly.
11. Safety gap.
12. Armature assembly.
13. Earthing brush unit.
14. Main assembly.
15. Washer.
16. Bearing adjusting washer.
17. Bearing cover plate and washer.

To prevent the armature windings being damaged in the event of an interruption of the external high-tension circuit, a safety gap is provided in the form of a point gap, one point being located on the distributor brush holder and the other being screwed into the metal boss of the bonded fabric half-speed wheel.

Each magneto is arranged for one direction of rotation only and bears an arrow stamped on the driving end, which indicates the direction for which the particular machine is designed. The driving speed of these magnetos is crankshaft speed.

Chapter 2

PRINCIPLE OF OPERATION

This magneto is of the rotating armature type. The permanent magnet is of U-shape and has two poles. By rotation of the armature, the flux passing through the armature core is reversed twice per revolution of the armature shaft.

By this means, a current of alternate polarity is built up in the primary winding during the periods when the contacts connected across it are closed. At the moment when maximum energy is stored in the magnetic circuit, the contacts are separated by one of the cam lobes striking the heel of the contact-

breaker lever, thus breaking the primary circuit, causing a rapid dying away of the primary current and a sudden flux change in the magnetic circuit. An extremely high-voltage oscillation is thus induced in the secondary winding by the rapid change of flux, the wound armature being in effect a transformer.

One end of the primary winding is connected to earth, while the other end is connected to an insulated path through the breaker contacts to earth. The capacitor, which is of the mica and tinfoil type, is connected in parallel with the contact points to limit the voltage across the contacts and so prevent excessive arcing, which may result in burning and pitting of the contact faces.

The start of the secondary winding is connected to earth, while the end of the secondary winding is brought out to the slip-ring.

The H.T. voltage then passes through the collector moulding to the rotating brush holder, which feeds the distributor electrodes, and thus through the H.T. cables to the sparking plugs.

Chapter 3

IMPULSE STARTER

The general design of the Type Z impulse starter is similar to earlier models. The device consists essentially of two members (see Fig. 3), the driving member, which is coupled to the magneto driving shaft of the engine (through a "Simms" coupling) and the hub member, which is rigidly secured to the magneto spindle. The driving member and the hub member are linked together by a stout helical spring. The relative movement between the two members is controlled by means of weighted pawls and stops.

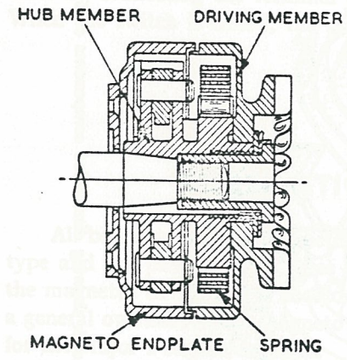

Fig. 3. Sectional view of Type Z1-1 Impulse-Starter.

The two pawls A, Fig. 4, are carried in slots in the two arms B that form part of the hub member, and each moves on a hardened steel pivot which passes through both sides of the slotted arm—thus eliminating any tendency for the pawl to tip during operation.

The two stops are riveted to the inside of the magneto endplate as shown at C.

On the driving member are two arms D which are hardened at the tips and project laterally on either side of the arms on the hub member.

Hardened faces on the hub member take any endthrust from the driving member, and ensure that such endthrust does not impair the operation of the starter.

When the engine crankshaft is rotated slowly, the hub member and the driving member move together until one of the pawls A on the hub member comes up against one of the stops C on the magneto endplate. Any further rotation of the driving member causes the spring to be wound up, during which time the magneto rotor remains stationary. Rotation of the driving member continues until, at a predetermined position, one of the arms D releases the pawl from the stop, and the magneto rotor then receives a sudden impulse from the energy stored in the spring, causing an intense spark to be produced. At a very low running speed the pawls are thrown out of action by centrifugal force, and the two members of the starter then rotate as a single spring drive unit.

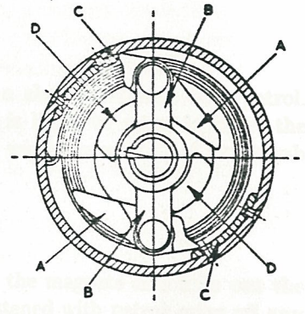

Fig. 4. Principal parts.

EXPLODED VIEW

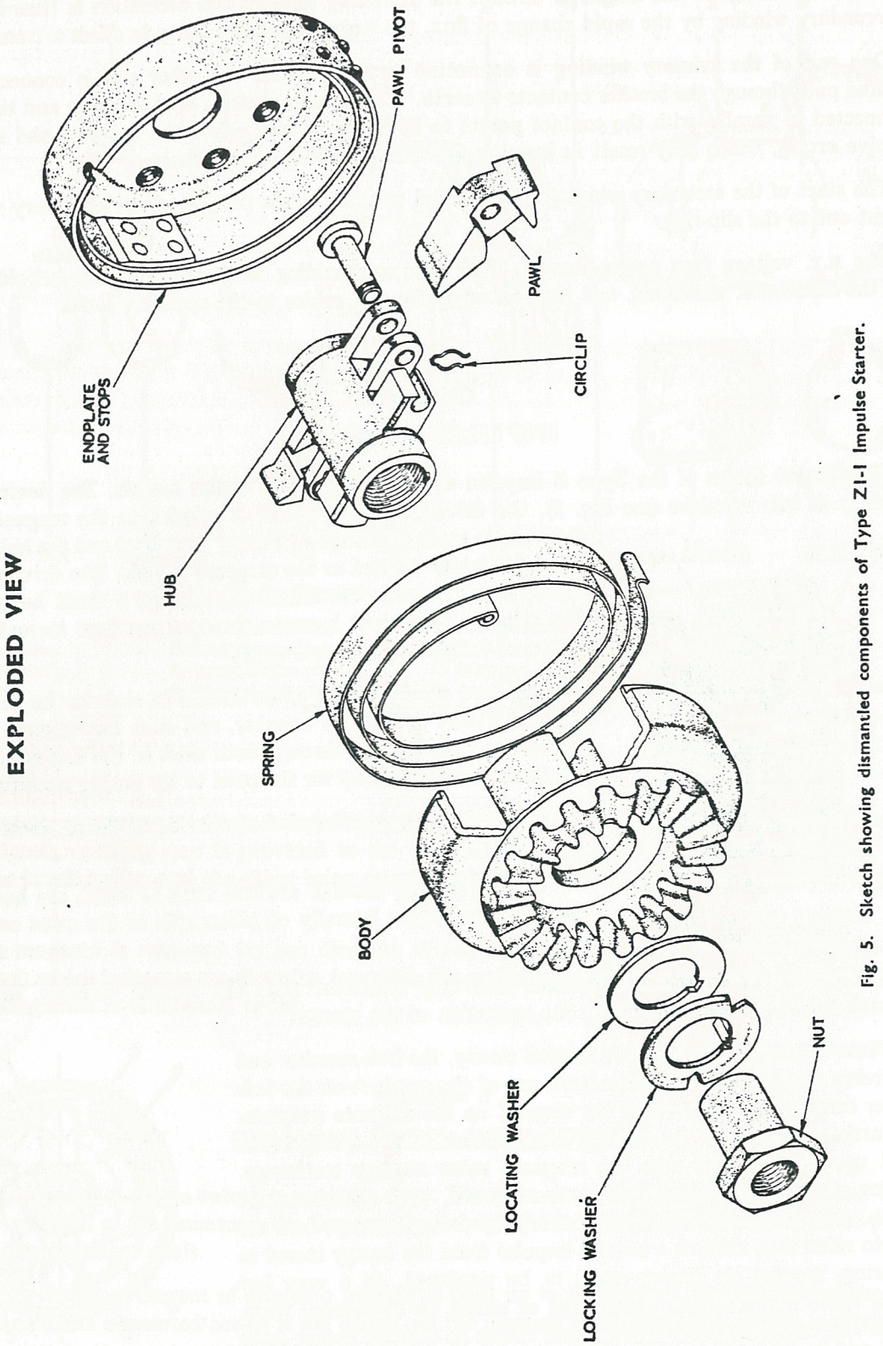

Fig. 5. Sketch showing dismantled components of Type Z1-1 Impulse Starter.

The Type Z impulse starter is practically frictionless, and the spring pressure has been reduced to a minimum to eliminate wear when the hub member recoils against the driving member. Further, spring pressure is so arranged that there is very little variation of the ignition timing when the pawls have disengaged and the starter is running as a spring drive.

Should the spring of the impulse starter break, the ignition is automatically retarded to the extent of the impulse starter movement, and the engine runs with this amount of retard, but does not cut out completely.

Chapter 4

INSTALLATION

Set the engine to the correct firing position of No. 1 cylinder and turn the magneto armature in the direction indicated by the arrow until the distributor brush approaches the No. 1 segment of the distributor. The contact-breaker should be in the fully advanced position and the contacts just separating. This position can be readily checked with a BTH Type CL4/1 timing indicator. The magneto driving member can then be engaged with the driving member on the engine and the magneto fastened in position.

The magneto may be cut out of action by short-circuiting the primary winding, and this is easily done by connecting the terminal on the contact-breaker cover through a switch to the frame or earth. When the switch is closed, the magneto will be inoperative.

Chapter 5

LUBRICATION AND INSPECTION IN SERVICE

All bearings in these magnetos fitted to both armature and slow speed wheel, are of the ball-bearing type and are packed with grease before the magnetos leave the works. No provision is made for oiling the magnetos at all, and it should not be necessary to disturb the bearings for refilling with grease until a general overhaul of the magneto at the end of 1000 hours flying for the Major 10 engine, or 1500 hours for the Major 1 engine, is made.

The lubricant used throughout the magneto, with the exception of the cam lubricator wick and the pivot pin wick, is Caltex Regal Starfak Special grease, obtainable from the American Regent Oil Company, 4 Vigo Street, London, W.1. An alternative lubricant is Esso Aviation High Temperature Grease No. 659 obtainable from Artillery House, Artillery Row, London, S.W.1.

Distributor and Brush Holder

Occasionally remove the distributor and clean the inside of it with a cloth moistened with petrol. Any dust or foreign matter that may accumulate inside the distributor is liable to cause leakage, the symptoms of which are misfiring or poor starting. In a similar manner, wipe the surface of the brush holder.

Slip-ring and Collector Moulding

Occasionally remove the aluminium dust cover at the driving end of the magneto and take out the collector moulding, which is secured by two screws and, with a cloth moistened with petrol, wipe off any dust from the cone. **Do not remove the carbon brush from the collector moulding unnecessarily.**

Clean the flanges of the slip-ring in a similar manner. This can be done by lightly pressing one corner of the cloth between the slip-ring flanges and slowly turning the engine crankshaft, first making sure that the magneto is switched off.

Contact-breaker

The contact-breaker is readily accessible by removing the cover, and can be withdrawn from the magneto after unscrewing the centre fixing screw.

Examine the contacts and if these are dirty, the surface of each contact should be cleaned with a piece of very fine emery cloth or paper, care being taken to remove any emery dust which may have accumulated.

The internal oil wick of the pivot pin and the cam ring should be given one drop only of engine oil every 50 hours flying. It is important to wipe off any excess oil which may be flung on to the contacts.

When refitting the contact-breaker, care should be taken to locate the key on the contact-breaker base in the keyway of the armature spindle.

With the feeler gauge on the spanner CX 52733 supplied with the magneto, check the contact gaps when the heel is on the fully-raised part of the cam. This gap should be 0·012 in. (*0·304 mm.*) ± 0·001 in. (*0·025 mm.*), and if necessary should be carefully adjusted to this dimension by the aid of the feeler gauge and the spanner, the locknut should then be carefully tightened. **Do not adjust the contact gap unnecessarily.**

Note.—It is recommended that the feeler gauge be wiped with a clean cloth moistened with some degreasing liquid such as trichlorethylene before being inserted between the contacts.

The platinum points of the contact-breaker must be kept absolutely free from oil. This is of the utmost importance, because any oil on the contacts will become oxidized and prevent good electrical contact between the contact points when closed. The output of the magneto may be considerably reduced on this account.

Chapter 6

LOCATION OF IGNITION FAULTS

If trouble is experienced with an engine ignition system it does not necessarily follow that the magnetos are at fault, and trouble will be saved if the harness, plugs, wiring and ignition switches are checked first, thus avoiding the removal of the magnetos from the engine.

For speedy diagnosis of ignition installation faults it is recommended that an ignition analyser be used.

The following are some of the faults which can rapidly be diagnosed on an ignition analyser:—

(1) Incorrect plug gaps. (2) Faulty harness leads. (3) Incorrect timing.
(4) Contact-breaker defects. (5) Faulty magneto armature or capacitor.

TRACING OF CONTACT-BREAKER DEFECTS

If it is established that the magneto is faulty the following hints will help in tracing the fault:—

DEFECT	POSSIBLE CAUSES	EFFECT
1. Small contact gaps.	(a) Bad initial adjustment. (b) Wear of lever heel. (c) Wear of cam lobes. (d) Pitting of contact faces.	Timing retarded. Poor low-speed performance. Poor contact operation.
2. Large contact gaps.	(a) Bad initial adjustment. (b) Excessive time since last inspection. (c) Excessive rate of contact wear due to number of possible causes such as those given in (3) below for pitted and blackened contacts.	Timing advanced. Poor high-speed performance in full advance.
3. Contacts pitted or blackened.	(a) Oil or foreign matter on contact faces either:— (i) through use of dirty feelers, or (ii) excess of lubricant on contact-breaker generally. (b) C.B. lever movement sluggish. (c) Weak main spring pressure. (d) Incorrect fit of lever on pivot pin. (e) Contact faces roughened. (f) Contact loose in either lever or contact block. (g) Timing incorrect—too far retarded. (h) Magneto being run continually in retarded position. (i) Primary connection to insulated side of capacitor not satisfactory. (j) Defective capacitor. (k) Contacts badly out of line or not parallel.	Excessive arcing at contacts with resultant poor slow-speed performance. Misfiring at high speeds probable if arcing very bad.
4. Broken spring.	(a) Kinked, badly shaped, or brittle springs. (b) Corrosion of springs.	Usually cuts out magneto completely.
5. Contact lever seizes on pivot pin.	Lack of lubrication.	No spark.

SUMMARY OF IGNITION FAULTS

Faulty Sparking

(1) Contact-breaker gap incorrect.
(2) Contacts dirty or burnt away.
(3) Distributor electrodes burnt away.
(4) Distributor dirty.
(5) Brush-holder electrode burnt away.
(6) Magneto internal timing incorrect.
(7) Capacitor short-circuited or punctured.
(8) Loose or corroded connections inside magneto.
(9) Moisture in the magneto.
(10) Faulty earthing switch.

Magneto fails to spark

(1) Earthing switch closed.
(2) Capacitor short-circuited.
(3) Primary winding open-circuited or earthed.
(4) Secondary winding open-circuited or earthed.
(5) Distributor or brush holder short-circuited.
(6) Contact lever seized on pivot.
(7) Contact lever main spring broken.

Chapter 7

DISMANTLING

Impulse Starter

The tabs of the retaining nut locking tab should be bent up with a suitably shaped sharp-edged tool to enable the retaining nut to be unscrewed by spanner CX 112983.

The impulse starter can then be extracted using extractor No. CX 56549. A $\frac{3}{8}$-in. Whitworth open-ended spanner will fit the hexagons on this extractor.

Contact-breaker

The contact-breaker cover retaining spring should be moved to one side to allow the contact-breaker cover and the cam ring to be removed.

The contact-breaker can then be removed after unscrewing the retaining screw with spanner CX 52733.

Distributor

The distributor screen cover (if fitted) should be removed by unscrewing the four retaining nuts with a screwdriver and spanner CX 78798.

The distributor can then be removed by unscrewing the two retaining nuts with spanner CX 99086.

Collector Moulding

The driving end cover can be removed by unscrewing the two screws. This exposes the collector moulding which can then be removed by unscrewing the two fixing screws.

Brush Holder

If it is required to remove the brush-holder moulding only, this can be accomplished by unscrewing the two hexagon-headed retaining screws and then withdrawing the moulding.

Half-speed Wheel

If it is required to dismantle the magneto completely, the half-speed wheel must be removed.

In order to do this the magnet must first be removed, and a press screwdriver will be necessary to loosen the magnet fixing screws.

A keeper should be placed across the magnet poles if a magnetizer is not available for remagnetizing during the re-assembly operations.

The locking nut on the brush-holder spindle should be unscrewed using spanner CX 99539 after first bending the tongue of the locking tab clear of the slots in the nut. This will expose the bearing nut which should be unscrewed with spanner CX 99540. The half-speed wheel can then be withdrawn.

The half-speed wheel bearing assembly can be removed by unscrewing the four retaining screws located in the distributor moulding spigot recess. The half-speed wheel bearings can then be removed by first removing the locking ring and then unscrewing the retaining nut with spanner CX 99541.

Armature

Prior to removal of the armature, the earthing brush located in the side of the housing on the centre line of the driving shaft should be removed, and it is essential that the collector moulding should also have been removed as described previously.

The contact-breaker endplate should be removed by unscrewing the three retaining screws, and the contact-breaker cover retaining spring removed with a $\frac{1}{4}$-in. open-ended Whitworth spanner. The armature can then be withdrawn from the housing, care being taken to avoid damaging the slip-ring. If the magnet has not previously been removed, a keeper should be placed across the magnet poles or it will be necessary to remagnetize on re-assembly.

Chapter 8

INSPECTION

Before inspection is carried out, all components except the armature should be thoroughly cleaned by washing in lead-free petrol.

The housing should be examined to see that all spigot faces and diameters are free from burrs, and also inspected to see that all tapped holes are clean and undamaged. If there is any evidence of fouling having taken place in the armature tunnel, the high spot should be removed by careful scraping. Care should be taken after scraping to see that the tunnel is thoroughly clean and free from any particles of dirt which might cause fouling.

Particular care should be taken when handling the housing to prevent the magnet attracting any metallic particles which may cause binding of the armature when the magneto is assembled.

The ventilating gauzes should be thoroughly clean and if damaged must be replaced.

The armature should be checked on vee-blocks placed under the ball-race diameters to see that the driving shaft is running true and that the slip-ring is reasonably concentric. The taper and thread on the driving shaft should be examined for signs of damage. The keyway width should be checked and should be 0·124 in. (*3·149 mm.*) low to 0·126 in. (*3·180 mm.*) high.

If the brass insert in the slip-ring is deeply grooved, or if the moulding is cracked or chipped, the slip-ring should be replaced.

The bearings should be checked for roughness and pitting of the race tracks, and if faulty should be replaced.

The full-speed gearwheel should be examined for signs of wear and the backlash should be checked when the half-speed wheel is assembled to see that it conforms to the clearance set down on page 12.

The outer tape on the armature coil should be examined for signs of damage or charring, and the capacitor should also be examined for signs of charring, or cracking round the fixing lugs. If either unit is faulty, it should be replaced.

Contact-breaker Assembly

The contact lever should be removed from the base by moving the retaining spring clear of the lever, and then unscrewing the spring retaining screw. The contact lever should be carefully examined for cracks, particularly around the contact. The contact and the main spring should be tightly secured to the lever, and the spring should be free from corrosion. The bonded fabric heel of the lever should be examined for cracks or deep score marks. The bore of the lever should be checked for diameter.

If the lever or the spring are faulty in any way they should be replaced. The platinum contact should be cleaned with a rag moistened in trichlorethylene, and if necessary the contact face should be carefully faced with a contact stone. It is important that this be carefully done, and it must be borne in mind that the two contact faces must be absolutely parallel when the parts are re-assembled. After facing with the contact stone the contact face should be carefully cleaned with a clean rag moistened with trichlorethylene.

The adjustable contact situated in the contact block should be cleaned and examined, and if necessary should be faced with a contact stone. The thickness of the contact faces after the facing operation must not be less than *0·5 mm.*

The pivot pin should be examined for signs of wear or pitting, and should be checked to make sure it is absolutely tight in the base.

The insulating pieces and bushes should be examined for cracks and if necessary replaced.

The base should be examined to see that the taper, and the raised portion of the taper forming the key, are undamaged.

The collector moulding should be examined for cracks, burning or signs of tracking, and if faulty should be replaced. The brush and spring should be examined and if the brush is worn, it should be replaced.

Half-speed Wheel Bearing and Brush Holder

The bearings should be checked for roughness and pitting of the race tracks, and if faulty should be replaced.

The bonded fabric gearwheel should be examined for wear, and the safety gap electrode should be checked for tightness.

The brush-holder moulding should be examined for signs of cracking, burning or tracking, and if faulty, should be replaced. The safety gap should be in accordance with the fits and clearances on page 12 using gauge CX 99510.

The brush-holder electrode diameter should be checked, in the assembled position, using the dummy distributor CX 80532 and a feeler gauge, and should be such a diameter as to give a radial gap in accordance with the clearances given on page 12.

The distributor moulding should be examined for cracks and for signs of tracking between the segments. The electrode track diameter should be checked with gauge CX 99525. If the tracking is very slight and can be removed by careful scraping, the scraped portion should be varnished with BTH No. 93 varnish and allowed to dry for at least 12 hours.

The cam should be examined for scoring and signs of excessive wear, and the fit on the endplate of the magneto should be checked.

Chapter 9

FITS AND CLEARANCES

The following list of fits, clearances and allowable limits should be worked to during the inspection and re-assembly operations.

DESCRIPTION	MINIMUM		MAXIMUM	
	in.	*mm.*	in.	*mm.*
Air-gap between armature core and housing pole faces	0·004	*0·102*	0·0052	*0·13*
Contact-breaker gap	0·011	*0·279*	0·013	*0·33*
Diameter of contact-breaker lever bore	0·1771	*4·498*	0·1778	*4·517*
Diameter of contact-breaker pivot pin	0·1755	*4·458*	0·1763	*4·478*
Endfloat of contact-breaker lever on pivot pin	0·000	*0·000*	0·0075	*0·178*
Radial gap between brush-holder electrode and distributor electrode	0·010	*0·254*	0·020	*0·508*
Endfloat of armature	0·002	*0·051*	0·004	*0·102*
Endfloat of half-speed gearwheel	Nil	*Nil*	0·005	*0·127*
Backlash of half- and full-speed gearwheels	Must be	backlash	0·010	*0·254*
Distance between electrodes of safety gap	0·315	*8·0*	0·335	*8·5*

Chapter 10

RE-ASSEMBLY

The following procedure is recommended for the correct re-assembly of Types AG4-6, AG4-8 and AG4-10 magnetos. New lockwashers, tab washers, sealing washers and packings should be fitted.

Before assembly, the armature laminations and the laminations in the housing bore should be lightly smeared with grease.

It is recommended that the ball-bearing insulations should be replaced, particularly if the magnetos are to be used in tropical climates. Before assembly, the ball-bearing insulations should be painted with BTH 93 or any other air-drying varnish to seal the fibre against moisture. After assembly the edge of the fibre tongues should be also varnished, care being taken to prevent varnish getting on to the ball-bearing track. The varnish will dry in air in about 12 hours, but this can be accelerated by baking in an oven at a temperature not exceeding 90°C for four hours.

Armature Assembly

The outer ball-race, together with the bearing insulation, should be pressed into the driving end of the housing using assembly fixture CX 99526.

The packing washers, cork dust washer and ball-bearing cover plate should then be clamped in position by the four retaining screws.

The full-speed gearwheel has a centre punch mark at the base of one of the teeth; this mark should be exactly opposite the contact-breaker positioning keyway in the end of the armature shaft.

The gearwheel should be secured by the locking nut using spanner CX 99524.

The slip-ring should be placed in position followed by the plain washer and spring washer.

The inner ball-races, complete with ball bearings, should be half-filled with grease and then pressed on to the armature using assembly tackle CX 99509.

The felt washer and the reinforcing ring can then be placed in position on the contact-breaker end of the armature which can then be assembled into the housing.

Half-speed Wheel and Brush Holder Assembly

The half-speed wheel bearings half-filled with grease, together with the distance piece, should be assembled in the bearing housing and clamped in position by the locknut using spanner CX 99541. The locking ring should then be inserted in the groove located inside the locknut.

If a new locknut has been fitted it will be necessary to drill through it with a No. 55 drill using the existing hole in the bearing housing as a jig prior to the fitting of the locking ring.

The bearing unit should be assembled into the housing and the four retaining screws screwed up tightly and locked.

If a new half-speed wheel is to be fitted, it must first be marked with two timing dots, the dots being positioned by the timing gauge CX 99542. The dots are made by carefully 'spotting' the gear face with a 0·030 inch diameter Archimedean drill, and they should be situated at the base of the teeth which lie either side of the face L (for left-hand rotation) or R (for right-hand rotation) of the timing gauge. The half-speed gearwheel spindle can then be threaded through the half-speed wheel bearings, after lining up the dots on the full-speed wheel to lie between the dots on the half-speed wheel, and the endfloat in the bearings can be set by tightening the nut the required amount with spanner CX 99540. This nut should then be locked in position by placing the inner tang of the locking washer in the groove in the half-speed wheel spindle, and then tightening up the locking nut with spanner CX 99539. The outer tang on the locking tab should then be bent into one of the recesses in the outer diameter of the nut, thus locking the nut in position.

The brush holder should then be assembled and its screws, lockwashers and locking tabs fitted, the locking tabs being bent up against the screw heads.

The magnet should now be fitted and its fixing screw tightened under a press screwdriver. If a magnetizer is available, the magnet should now be remagnetized.

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Contact Endplate Assembly

The outer bearing race, together with the ball-bearing insulation should be pressed into the contact endplate, using assembly fixture CX 99535. The contact endplate should then be clamped in position by the three countersunk headed retaining screws and the contact-breaker cover retaining spring, using a screwdriver and ¼-in. open-ended Whitworth spanner respectively. If possible, the three screws should be screwed up tightly in a press type screwdriver, and should be locked by punching metal from the endplate into the slot in the screwhead with a suitably-shaped chisel type punch.

The armature endfloat should now be checked and any necessary adjustment made to the packing washers at the driving end.

Collector Moulding Assembly

The collector moulding with its bush and spring should be fitted into position on the top of the armature tunnel and clamped by the two retaining screws, lockwashers and locktabs. Care should be taken to see that the brush holder, brush and spring are correctly positioned.

Contact-breaker Assembly

The contact block should be assembled in position with the two insulating bushes, together with the insulating strip, and clamped by the fixing screw. This screw should be locked by gently prising the ends of the screw apart with a screwdriver. The adjustable contact screw should be screwed into the contact block and the lockwasher and locknut fitted.

The oil wick in the pivot pin should be given one or two drops of engine oil before the lever is assembled on to the base. The lever retaining spring should then be moved into position and the contact-breaker control spring, together with the reinforcing spring, should be secured to the base by the retaining screw. In both cases, the reinforcing spring should be so fitted that it is inside and curling away from the control spring.

The complete contact-breaker can now be secured in position on the magneto by the retaining screw, care being taken to see that the key in the contact-breaker base locates in the slot in the armature.

After applying one or two drops of engine oil to the wick in the cam ring, the cam can be placed in position on the magneto endplate and retained by the contact-breaker cover and the contact-breaker cover retaining spring.

Distributor Assembly

If the magneto is fitted with a distributor screen the screen should be positioned on the distributor moulding before the moulding is fitted on to the magneto. The moulding should then be secured by the two retaining nuts and lockwashers using spanner CX 99086. The distributor screen cover should then be secured in position by the four retaining screws, lockwashers, washers and nuts, using a screwdriver and spanner CX 78798.

Earthing Brush Assembly

The earthing brush assembly together with its lockwasher should be screwed into the housing.

Chapter 11

TESTING

Armature Assembly

If a trembler set is available the armature should be operated for five minutes with the secondary winding connected to an annular gap set to discharge at 16 kV. If a trembler set is not available, the satisfactory performance of the magneto during its tests will be an adequate indication that the armature is satisfactory. The armature windings should be checked for continuity.

The insulation resistance of the capacitor should be measured with a 500-volt Megger and a reading of not less than 100,000 ohms should be obtained. If one of the Megger leads is removed from the capacitor while the Megger is delivering full voltage, a spark should be obtained on shorting the capacitor with a length of wire.

Magneto

When the magneto has been re-assembled the following tests will be required by the appropriate authority.

Endurance Run

The magneto to be run at 2500 r.p.m. for a period of four hours if vital parts* have been renewed, the magneto being connected by plain H.T. cable to ball gaps set to discharge at 9 kV (*2·2 mm.*). The contact-breaker should be placed in the full advance position. No re-lubrication, adjustment or artificial cooling should be carried out during this endurance run.

Open-circuit Test

At the end of the endurance run, whilst the magneto is still hot and running under test conditions, one H.T. lead should be disconnected from its spark gap for a period of one minute. The insulation must not fail during this test. At the end of the above test the collector and distributor mouldings should be examined for any signs of damage.

The contact gaps should be checked and should be within the limits 0·012 in. (*0·304 mm.*) ± 0·001 in. (*0·025 mm.*).

Final Test

The magneto to be run for 15 minutes at 2500 r.p.m. with timing fully advanced and spark gap set to discharge at 9 kV.

The speed then to be slowly decreased to 400 r.p.m. when fully retarded and to 350 r.p.m. in full advance, and the magneto run at each of these speeds in turn for one minute, when regular sparking should be obtained at the spark gaps. The speed then to be increased from 350 r.p.m. to 3000 r.p.m. No missing at the spark gaps must take place during this test.

Approved by A.R.B., 2.1.57 (IB. 1663 Ed. B, AL. No. 3, January, 1957)

* The term 'vital parts' means—(i) all mouldings used for H.T. insulation; (ii) housings, armatures and capacitors; (iii) contact levers, main springs, and contacts.

Chapter 12

STORAGE OF COMPLETE MAGNETOS

Magnetos and components must be stored in a dry atmosphere and it is strongly recommended that all parts which are to be stored in a humid atmosphere should be prepacked.

Before putting a stored magneto into service the main cover and distributor should be removed and the interior of the magneto examined for signs of corrosion.

If any corrosion is present the magneto should be dismantled and completely overhauled.

Before putting a stored magneto into service, it is recommended that it be tested as outlined in Chapter 11.

Chapter 13

CONSUMABLE SPARES

The following is a list of the small parts which are required for replacement purposes at each complete overhaul of a Type AG4-6, AG4-8 or AG4-10 magneto:—

DESCRIPTION	DRAWING REFERENCE	NUMBER REQUIRED PER MAGNETO
Earthing brush unit for housing	CX 52814	1
Lockwasher for earthing brush unit	CX 52816	1
Ventilating gauze for housing	CX 52747	2
Retaining ring for ventilating gauze	CX 52748	2
Brush and spring for contact-breaker	CX 52202	1
Contact screw for contact-breaker	CX 52214	1
Lockwasher for contact screw locknut	CX 52205	1
Contact-breaker lever assembly	CX 55170	1
Reinforcing spring for contact-breaker	CX 52200	1
Wick for pivot pin	CX 55201	1
Wick for cam ring	CX 52249	1
Spring assembly for contact-breaker cover	CX 52224	1
Locking tab for screw securing cover spring assembly	CX 77198	1
Packing for contact-breaker endplate	CX 52781	1
Armature ball bearing	CX 52118	2
Ball bearing insulation	CX 52169	2
Felt washer for armature	CX 52237	1
Armature packing washer	CX 71201	Approx. 2 required of each of 4 thicknesses
Dust washer for driving end of armature	CX 52780	1
Brush and spring for distributor brush holder	CX 52802	1
Lockwasher for brush-holder fixing screws	CX 52205	2
Locking tab for brush-holder fixing screws	CX 52801	2
Washer for spark point	CX 52227	Approx. 2 required
Locking tab for spark point	CX 75560	1
Half-speed wheel bearing	CX 52868	2
Locking ring for bearing housing locknut	CX 52871	1
Locking tab for H.S. wheel spindle locknut	CX 52873	1
Brush and spring for collector moulding	CX 70631	1
Lockwasher for collector moulding screws	CX 53310	2
Locking tab for collector moulding screw	CX 53729	1
Locking tab for collector moulding screw	CX 53731	1
Lockwasher for screws fixing driving end cover and also distributor moulding	CX 52530	4

(*Continued*)

CONSUMABLE SPARES *(Continued)*

DESCRIPTION	DRAWING REFERENCE	NUMBER REQUIRED PER MAGNETO
FOR TYPE AG4-6 MAGNETO ONLY—		
Packing for magnet	CX 52808	1
Packing for driving end cover	CX 52812	1
Packing for driving end cover	CX 52841	1
Lockwasher for contact-breaker cover connection	CX 52205	1
FOR TYPE AG4-8 AND AG-410 MAGNETOS ONLY—		
Packing for magnet	CX 95671	1
Packing for driving end cover	CX 95672	1
Ventilating gauze for distributor screen	CX 52834	1
Retaining ring for ventilating gauze for distributor screen	CX 52838	1
Lockwasher for screen securing screw	CX 52205	4
Locking tab for connection screw in contact-breaker cover	CX 78272	1

Chapter 14
SPECIAL TOOLS AND GAUGES

The following is a list of special tools and gauges required for the overhaul of Type AG4-6, AG4-8, and AG4-10 magnetos. The majority of these tools and gauges are illustrated in Fig. 6, Page 18.

DESCRIPTION	DRAWING REFERENCE	Fig. 6
Fixture for assembling bearings on armature	CX 99509	A
Fixture for assembling bearing race in contact endplate	CX 99535	B
Fixture for assembling bearing race into main housing	CX 99526	C
Spanner for half-speed wheel bearing nut	CX 99540	D
Spanner for full-speed wheel retaining nut	CX 99524	E
Spanner for half-speed wheel locking nut	CX 99539	F
Spanner for half-speed wheel bearing housing nut	CX 99541	G
Extractor for armature inner ball race	CX 79087	H
Extractor for armature outer ball race	CX 79086	I
Support block for half-speed wheel bearing housing assembly	CX 99538	J
Extractor for impulse starter	CX 56549	K
Half-speed wheel timing gauge	CX 99542	L
Dummy distributor gauge	CX 80532	M
Distributor electrode diameter gauge	CX 99525	N
Spanner for impulse starter retaining nut	CX 112983	—
Spanner for impulse starter extractor nut	$\frac{3}{8}$ in. open-ended Whitworth	—
Spanner for distributor cover retaining nuts	CX 78798	—
Spanner for distributor moulding retaining nuts	CX 99086	—
Spanner for contact-breaker cover retaining pillar and spring	$\frac{1}{4}$ in. open-ended Whitworth	—
Safety gap gauge	CX 99510	—

Those items in the above table which have not been illustrated in Fig. 6 are of a relatively simple nature.

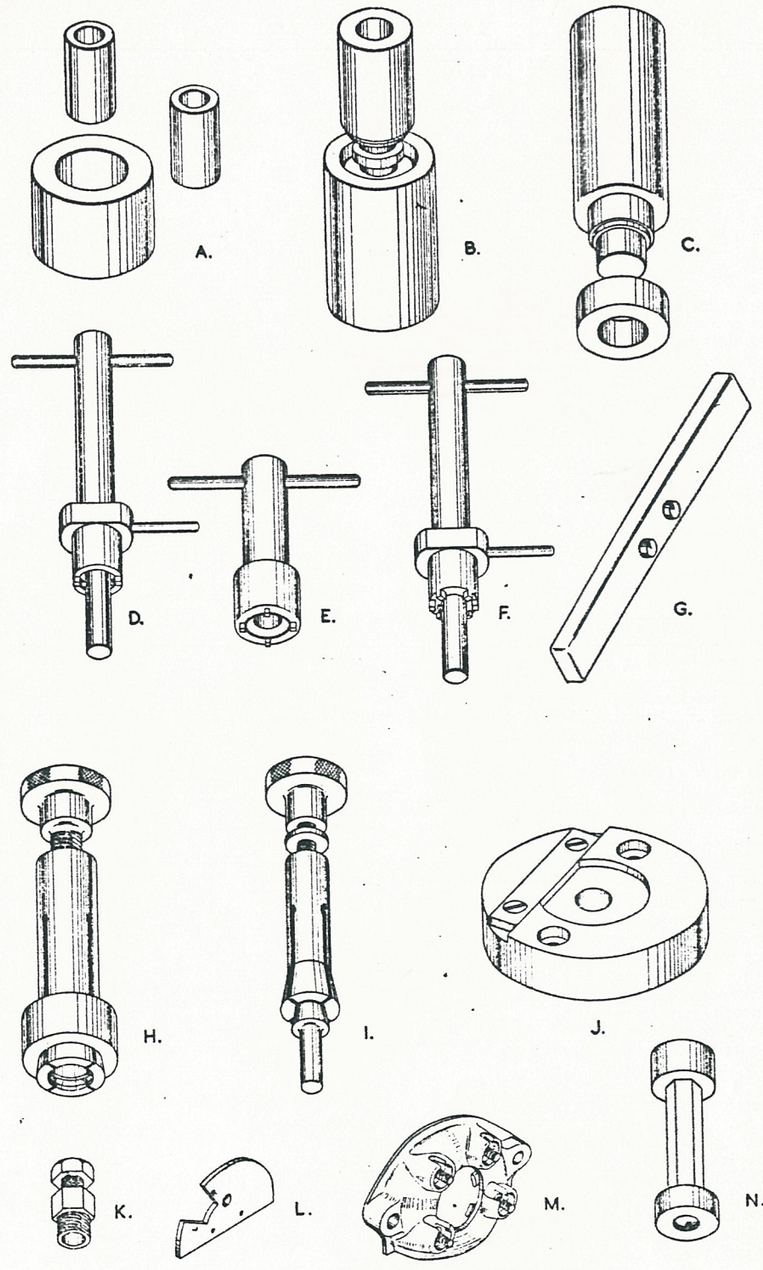

Fig. 6. Special tools and gauges for Type AG4-6, AG4-8, AG4-10 magnetos.
(See Chapter 14)

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