

INSTRUCTION BOOK

No. 1407.

11 JUNE 1936

TYPE AG4 MAGNETOS

AS USED ON

DE HAVILLAND GIPSY ENGINES.

MAGNÉTOS TYPE AG4

EQUIPANT LES

MOTEURS DE HAVILLAND GIPSY.

MAGNETOS TIPO AG4

TALES COMO SE EMPLEAN EN LOS

MOTORES DE HAVILLAND GIPSY.



THE BRITISH THOMSON-HOUSTON Co., LTD.,

COVENTRY, ENGLAND.

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**IMPORTANT.**

The apparatus described in this Instruction Book was designed, manufactured, and tested with care and, with proper attention, should give the purchaser the service which he may reasonably expect.

The purpose of this Instruction Book is to explain the functions of the apparatus, and the manner in which it should be adjusted and maintained.

If these instructions are not clear, or appear incomplete in any particular, and you desire further information, this will be promptly supplied upon request.

Please address such enquiries to the Company's nearest District Office, or Local Representative, mentioning the particulars stamped upon the apparatus.

**AVIS IMPORTANTE.**

L'appareil décrit dans ce livret d'instructions a été soigneusement étudié, construit et essayé, et, s'il est convenablement entretenu, doit pouvoir rendre à l'acheteur les services qu'il est raisonnablement en droit d'en attendre.

Ce livret d'instructions a pour objet d'expliquer les fonctions de l'appareil et la manière de le régler et de l'entretenir.

Si ces instructions ne sont pas claires ou paraissent incomplètes en quoi se soit et qu'on désire de plus amples renseignements, ils seront fournis promptement sur demande.

Prière d'adresser toutes demandes de cette nature à la plus proche succursale ou au représentant local de la Compagnie, en fournissant les indications frappées en creux sur l'appareil.

**AVISO IMPORTANTE.**

El aparato descrito en este libro de instrucciones ha sido cuidadosamente proyectado, construído y probado y, con tal de ser entretenido con los debidos cuidados, debería prestar al comprador los servicios que puede razonablemente esperar de él.

Este libro de instrucciones tiene por objeto explicar las funciones del aparato y el modo de regularlo y entretenerlo.

Si estas instrucciones no son claras o parecen incompletas en cualquier respecto, enviaremos inmediatamente informes más detallados a quien nos los pida.

Sírvanse dirigir tales consultas a la sucursal más cercana de la Sociedad o al representante local de ésta, dando los datos estampados en el aparato.

**MAGNETOS FOR GIPSY AERO ENGINES.****GIPSY ONE**

fitted with

- 1—AG 4-2, Left-hand rotation, Base Mounted Magneto, bare shaft extension—height of armature centre = 38 mm.
- 1—AG 4-2, Right-hand rotation, Base Mounted Magneto, with Type A Impulse Starter and half Simms Coupling—height of armature centre = 38 mm.

**GIPSY TWO (or as alternative on GIPSY ONE).**

fitted with

- 1—AG 4-4, Left-hand rotation, Base Mounted Magneto, bare shaft extension—height of armature centre = 38 mm.
- 1—AG 4-4, Right-hand rotation, Base Mounted Magneto, with Type L-2 B Impulse Starter and half Simms Coupling—height of armature centre = 38 mm.

**GIPSY THREE**

fitted with

- 1—AG 4-4, Left-hand rotation, Base Mounted Magneto, bare shaft extension—height of armature centre = 38 mm.
- 1—AG 4-4, Right-hand rotation, Base Mounted Magneto, with Type L-2B Impulse Starter and half Simms Coupling—height of armature centre = 38 mm., arranged for running in an **inverted** position.

## TYPE AG4 MAGNETOS.

These magnetos are of the standard rotating armature type with a strong magnetic field which remains constant over an extended period. The magnetos are base mounted and are supplied with height of centres of spindle above the base, of 38 mm.

### DESCRIPTION.

#### HOUSING.

The housing is die-cast ; with the distributor endplate and driving endplate integral parts of it, thus making an exceedingly rigid mechanical structure.

#### WINDINGS.

The primary and secondary windings are wound on the usual "H" type armature. The beginning of the primary winding is connected to the core, whilst the end is joined to the insulated side of the condenser and to the beginning of the secondary winding ; the other side of the condenser is connected to the core. The insulated side of the condenser is connected to the insulated platinum contact of the contact breaker, and the insulated end of the secondary is connected to the brass insert in the slip-ring.

#### CONTACT BREAKER.

The contact breaker is of the usual design, 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.

The timing lever, by means of which the moment of ignition is varied, may be moved through an angle of 25°.

#### SAFETY SPARK GAP.

To prevent the armature being damaged in the event of an interruption of the external high tension circuit, safety gaps are provided, and in each case they are fitted on the brush holder and operate between the distributor brush and slow speed wheel.

### CURRENT DISTRIBUTION.

The distributor brush connected to the end of the secondary winding is mounted on the gear wheel and rotates at half armature speed.

The earlier types of AG 4 magnetos were fitted with a bronze distributor wheel meshing with a Textolite armature wheel. In the later types, the distributor wheel is made of Textolite and meshes with a steel armature wheel. Where replacements are necessary for the older type of machine, the armature wheel can be replaced by a steel one and still mesh with the bronze distributor wheel, but the bronze distributor wheel cannot be replaced for a Textolite wheel for meshing with a Textolite full speed wheel ; both must be changed to the later combination.

Type AG 4-2 magnetos are fitted with a plain journal bearing for the slow speed wheel, **and the oiling instructions given under "Maintenance in Service" should be strictly followed.**

Type AG 4-4 magnetos are fitted with a ball bearing for the slow speed wheel and no means of lubrication is provided.

### DIRECTION OF ROTATION AND RELATIVE SPEED.

Each magneto is arranged for one direction of rotation only and bears an arrow stamped in a conspicuous position, which indicates the direction for which the particular machine is designed. The driving speed of all AG 4 types is crankshaft speed.

### MAINTENANCE IN SERVICE.

#### INSTALLATION.

Set the engine to the correct firing position on No. 1 cylinder and turn the magneto armature in the direction indicated by the arrow until the distributing brush approaches No. 1 segment of the distributor. The contact breaker should be in the fully advanced position and the contacts just separating (by not more than .0015"). The magneto driving wheel or coupling can then be engaged with the driving wheel or coupling on the engine drive and the magneto fastened in position.

**CUTTING OUT THE MAGNETO.**

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.

**LUBRICATION.***(a) AG 4-2 Magneto (GIPSY ONE).*

The rotating armature of the magneto is fitted with two ball bearings which are packed with Price's High Melting Point Grease, before the magneto leaves the Works.

The only part requiring lubrication is the distributor gearwheel bearing, and eight (8) drops of light oil poured into the oil well at the distributor end of the magneto, every twenty-five hours running, is sufficient.

Should the magneto stand for two weeks or more, or the oil wick become dry, then the distributor end cup should be filled with oil until the oil overflows through the drain hole seen on the left when facing the distributor.

*(b) AG 4-4 Magneto (GIPSY TWO AND THREE)—*  
or as alternative on Gipsy One.

All bearings in this magneto fitted to both armature and slow speed wheel, are of the ball bearing type and are packed with Price's High Melting Point Grease before the magneto leaves the Works. No provision is made for oiling the magneto at all, and it should not be necessary to disturb the bearings for filling with grease until a general overhaul of the engine, at the end of 450 hours flying, is made.

**NOTE.**—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 platinum points when closed. The current from the magneto may be reduced considerably on this account.

**DISTRIBUTOR AND BRUSH-HOLDER.**

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 BRUSH-HOLDER.**

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

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, 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 which may have accumulated.

Examine the bell crank lever bearing bush and if dry smear with a little light oil. After re-fitting the lever on the bush, it is important that any excessive oil should be wiped off.

Refit the contact breaker, **taking care to locate the key on the contact breaker base in the keyway of the armature spindle.** With the feeler gauge on the spanner supplied with the magneto, check the contact gaps when the heel is on the high part of the cam; this gap should be 0.012" and if necessary should be carefully adjusted to this dimension by the aid of the feeler gauge and the spanner. **Do not adjust the contact gaps unnecessarily.**

### ADJUSTMENT AND LOCATION OF FAULTS.

If the engine is firing irregularly, though some portion of the ignition system is frequently at fault, the magneto is not always the cause of the trouble. The investigator should, in the first place, satisfy himself that the fault does not lie in the plugs, the sparking gaps of which should be about 0.4 mm.

Irregular firing might result from defective operation of the contact breaker. To determine whether this is the case, the contact breaker cover should be removed with a view to observing if the contact breaker fixing screw is securely tightened.

Special attention should also be given to the platinum screws which should be securely locked in position. The platinum points should be carefully examined, and if necessary, cleaned with very fine emery cloth. When the armature is revolved the maximum contact gap should be set to the feeler gauge provided on the contact breaker spanner. This gap should, from time to time, be checked, and if necessary, the long contact screw should be adjusted.

Examine and, if necessary, clean the high tension mouldings as instructed.

If sparking persistently occurs at the safety gap of the magneto, it is an indication that there is a break in the external high tension circuit, and if the engine stops firing altogether, it is probably due to the conductor from the low tension earthing terminal of the magneto coming in contact with the frame; thus rendering the magneto inoperative.

If the investigation indicated above does not reveal the cause of the faulty ignition, the magneto should be returned to The British Thomson-Houston Company, Ltd., Coventry.

### DISMANTLING THE MAGNETO.

Total dismantling of the magneto should be rarely necessary, but instructions are given below in case this should be required.

In the ordinary way, the only attention which need be given to the magneto is to examine the contact breaker, which is readily accessible, and may be removed and replaced without disturbing any other working part of the magneto.

### DISMANTLING THE MAGNETO (continued).

In dismantling the magneto, the following procedure should be observed:—

1. Remove the contact breaker cover, cam ring, and distributor moulding.
2. Remove dust cover at the back of magnet and collector moulding underneath.
3. Remove earthing brush on left-hand side of housing, looking at the distributor end.
4. For AG 4-2 magnetos, remove the slow speed wheel oil well and wick on right-hand side of housing, looking at distributor end.
5. Remove the contact breaker endplate.
6. Remove the slow-speed bearing assembly.
  - (a) In the case of AG 4-2 magnetos, this is accomplished by removing the locking ring, at the back of the bearing underneath the magnet, which is sprung into a groove in the spindle. It is possible to get at this locking ring by slightly moving the magnet on the pole shoes after having removed the magnet screws. **A soft iron keeper passing under the base of the magneto must be fitted on the poles of the magnet before this is done.**
  - (b) In the case of AG 4-4 magnetos, the bearing assembly is dismantled by unscrewing the four screws fastening the bearing housing into the distributor endplate, and can be removed through a hole in the slow speed wheel from the front of the magneto.
7. The armature may now be withdrawn from the housing, **but in every case before this is done, a keeper must be fitted to the magnet, or else it will be necessary to re-magnetize the magneto on re-assembly.**

NOTE.—When re-assembling the magneto, **great care should be taken** to ensure that the key on the contact breaker base engages with the slot in the armature spindle.

## IMPULSE STARTER.

This device consists essentially of two members, the driving member, which is coupled to the magneto driving shaft of the engine, and the hub assembly which is rigidly secured to the magneto spindle.

The driving member and the hub assembly are linked together with a stout helical spring. The hub carries two pawls, one end of which engages with the cam profile machined on the inside face of the driving member.

A special endplate is fitted to the driving end of the magneto and is provided with a stop.

The action of the impulse starter is as follows:—

1. When the driving member is rotated, one of the pawls will reach the top position and, being free to drop, engages with the stop on the endplate. The armature and hub assembly are thus locked and held stationary.
2. Further rotation of the driving member will cause the helical spring to be wound up, and an angular displacement will take place between the driving member and hub assembly.
3. At a predetermined position the cam on the inside face of the driving member engages with the outer end of the pawl and forces it inwards.
4. This disengages the pawl from the stop in the endplate, and due to the winding up of the spring, the hub assembly, together with the armature, receives a sudden impulse. The magneto is timed so that the contacts separate during this very rapid "flick over" and an intense spark is thus automatically produced.
5. The pawls are so weighted that the heavy ends are thrown out by centrifugal force and automatically clear themselves from a further engagement with the stop on the endplate as soon as the engine accelerates. The speed at which this occurs is about 160 R.P.M. magneto speed.
6. As soon as the pawls cease to engage, the two members, i.e. the driving member and hub assembly, rotate as a single unit.

## IMPULSE STARTER (continued).

It should be specially noted that as two pawls are fitted, two impulses are obtained every revolution of the magneto driving shaft.

The A-G 4-2 magneto may be fitted with the Type "A" Impulse Starter. This starter is susceptible to end-thrust and it is therefore important that a slight amount of endplay (.02") be allowed when fitting the rubber distance piece in the Simms Coupling. If any endthrust is exerted, the hub, after it has been released from the stop, will remain in this position and the impulse starter is then absolutely inoperative.

If it should be found at any time that the impulse starter is sticking and does not operate, the bolts fixing the magneto to the base plate of the engine, should be released and the magneto moved slightly outward: there is sufficient clearance between the bolts and the bolt holes to allow for this. The impulse starter will then immediately be released.

Two other points should be watched with this type of impulse starter, viz—

- (a) See that the driving pin is free in the guide block.
- (b) See that the pawl is free on its bearing.

If either of these points is suspected, it will be necessary to dismantle the impulse starter by unscrewing the fixing nut; and to do this it is necessary to insert a locking pin in the hole in the impulse starter casing.

The AG 4-4 magneto is fitted with the Type "L-2B" Impulse Starter, which is a smaller and lighter device of the "A" type. Both types are absolutely interchangeable, and therefore, this lighter type can be fitted to magnetos already equipped with the "A" type, if necessary.

The "L-2B" type Impulse Starter is not so susceptible to end-thrust as the Type "A," but although it will not adversely affect the functioning of the impulse starter, it is not advisable to exert endthrust.

AG 4-4 Magnetos, not having any oiling system, can be fitted in an upright or inverted position. If when this is done either of the magnetos is fitted with an impulse starter, the stop on the

**IMPULSE STARTER (continued).**

back member must always be on top since the pawls are gravity-operated. Therefore, in order to distinguish which way up the magneto and impulse starter should be fitted, the word "vertical" or "inverted" is engraved on the back member of the impulse starter. The back member engraved with the word "vertical" indicates that the magneto should be fitted to either a Gipsy One or Gipsy Two engine, and where the word "inverted" is engraved, it denotes that the magneto should be fitted to the Gipsy Three engine.

This engraving on the impulse starter back-plate is applicable to those which have only one stop on this member; where two stops are provided, no special identification will be engraved externally, it being possible to operate these impulse starters either vertically or invertedly.

**TIMING OF IMPULSE STARTERS.***1. Impulse Starters for Magnetos rotating clockwise.*

Rotate the starter in a counter-clockwise direction until the two arrows which are shown one on the starter end-plate and one on the driving member, coincide. At the same time, see that the distributor brush is just overlapping the segment on No. 1 terminal. At this point, the contacts are just open with the timing lever advanced, and the sparking will take place on cylinder No. 1. Crank the engine to the desired firing angle and fix the magneto in this position.

*2. Impulse Starters for Magnetos rotating counter-clockwise.*

Rotate the starter in a clockwise direction until the two arrows coincide, and proceed as in 1.

**ATTENTION DURING RUNNING.**

It is recommended that the impulse-starter is lubricated once a week with oil of not too thin a consistency, for example, D.T.D.109.

**DISMANTLING OF IMPULSE STARTER.**

The impulse starter is dismantled by unscrewing the one fixing nut which holds it to the spindle of the magneto. To do this, it is necessary to insert a locking pin in the hole in the impulse starter casing. This locking pin should be used when assembling the impulse starter to tighten up the fixing nut, **but it is vitally important that it should be removed before assembling the magneto on the engine.**

**NOTICE.**

BEFORE RETURNING APPARATUS FOR REPAIRS OR OTHER REASON, PLEASE COMMUNICATE WITH THE BRITISH THOMSON-HOUSTON Co., LTD., SALES DEPARTMENT, ALMA STREET, COVENTRY, WHO WILL SEND THE NECESSARY INSTRUCTIONS.

COMPLIANCE WITH THIS REQUEST WILL SAVE DELAY AND INCONVENIENCE.



