

569858 LAD J. P. Howard

IGNITION

FORM 620

REVISED

Royal Air Force.

NOTE BOOK
FOR

Workshop & Laboratory
Records.

"B" Squadron

3 Wing

T. 7086. Wt. 640g. 150,000 Dins. 11/18. W. & S. (278000).

IGNITION CIRCUIT.Ignition System Inspection Schedule.

A/A's No. & Pass. Igniter (Type & No.)

CONTACT BREAKER UNIT.

L.T. Leads - Condition.....
 Cover Springs.....
 L.T. Plug Set in Socket (Internal Type).....
 Set of C.B. in Housing.....
 Condition of Breaker Lever.....
 Retaining Spring.....
 Main & Arm Breaker Springs.....
 Gaskets.....
 Hubs.....
 Breaker Bush - Fit.....
 Breaker Bush - Condition.....
 Buffer Spring - Clearance.....
 Contact Points - Condition.....
 Alignment.....
 Lubricating Pad - Condition.....
 Risk.....
 Carrier-Block-Insulation.....
 Piping Screws - Security.....
 C.B. Housing - Condition.....
 Cover - Insulation.....
 L.T. Terminals.....
 C.B. Spigot - Screws.....
 L.T. Connection (Internal Type).....

DISTRIBUTION UNIT.

Spigot - Fit.....
 Block - Condition.....
 Vents.....
 Collector Brushes.....
 Range of Control (Variable C.B.'s Only).....

IGNITION:A.T. LEADS.

Braiding - Condition.....
 Security - Plug & Distributor.....

SPARKING PLUGS.

	1	2	3
Condition of Terminal			
External Insulation			
Body Thread.			
Gland Thread.			
Gland Washer.			
Earth Electrodes.			
Internal Insulation			
Central Electrodes.			
Spark Gaps.			
Pressure Test - Gland.			

SWITCH POINTS.

Switch Base - Condition.....
 Contacts.....
 Clearance of Rivets.....
 L.T. Leads - Condition.....
 Conductivity.....
 Insulation.....

A/A's No. & Pass.

Signature

INTRODUCTION.

On all British aircraft dual ignition is employed. The mixture in a cylinder is fired by two sparking plugs. This results in a more rapid and efficient combustion of the fuel than would ignition by a single plug.

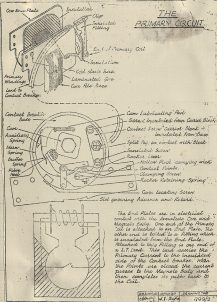
To supply H.T. current to these sparking plugs there are two magnets. Each magnet has a set of H.T. cables. The system is so arranged that one magnet supplies current to one plug in every cylinder.

A switch system is provided which enables both magnets to be controlled, either together or separately.

To facilitate starting of large engines a separate hand turned magnet is provided. H.T. current is generated by the H.T. magnet quite independently of the main mag but is distributed to the cylinders by means of the main magnet distributors and rotors. This magnet is controlled by its own switch system.

Since the working of all magnets is based upon the same fundamental electro magnetic principles it is not necessary to study all types of magnets in order to learn these principles.

In the following notes the R.I.M. type S.C. polar inductor magnet is dealt with fully since its construction makes it the easiest magnet to understand. This magnet is extensively used in the R.A.F. Further notes deal with other types of magnet and are intended to show that the principles are the same although the mechanical details vary.



CONSTRUCTION.

At each end of the armature core and in electrical contact with it is a brass End Plate. Against the lower face of each plate is a layer of insulating material. A layer of insulating tape is wrapped around the core so that the assembly becomes an insulated spool. The coil is formed of 22g copper wire coated with a thin layer of insulating enamel, the properties of which allow the winding of the coil without cracks occurring in the enamel. The beginning of the coil is firmly attached in electrical contact to one end plate by a small bolt.

Approximately 140 turns, in three layers, of wire are wound around the core, each layer of wire being separated from the next by a layer of insulating tape. The end of the coil is covered with a short length of insulating tape passing through the end plate. It is then attached to a fitting supported by but insulated from the end plate. Also attached to this fitting is one end of a length of insulation covered lead. The other end of this lead makes contact with the insulated contact screw carrier block of the contact breaker. The other contact point is carried across the rocker arm and is in contact with the contact breaker base through the rocker main spring. The base is in contact with the body casting.

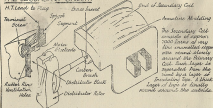
PATH OF PRIMARY CURRENT.

From the Primary Coil the current flows to the Insulated Fitting, through the L.T. lead to the Insulated Contact Point, across the Points and into the Contact Breaker Base via the Rocker Main Spring. From the Base it flows through the Body Casting and Armature Pole Piece to the Core and completes its path when it reaches the beginning of the Primary Coil attached to the End Plate.

THE PRIMARY CURRENT.

As the inductor rotor turns, flux will flow through the core. The core becomes magnetized and a field spreads out and embraces the Primary Coil, when the rotor arm is directly opposite the pole pieces the flux through the core is at a maximum. At this point the contact breaker points close and complete the Primary Circuit. As the rotor continues to turn the flux through the core decreases in intensity and the field around the coil begins to collapse. As the lines of force cut across the coil E.M.F. is built up therein. As the coil is now part of a complete circuit (since the contact breaker points are closed) current will flow, when the rotor reaches a position such that the trailing edge of the arm is 3 - 4 mm. past the tip of the pole piece the flux suddenly reverses its direction through the core, which is then momentarily demagnetized. This causes rapid collapse of the field around the coil and the E.M.F. and current to reach maximum value.

THE SECONDARY CIRCUIT.



Arrangement of H.T. Cables

Between the body electrode of the Sparking Plug and the Secondary Coil the Secondary Circuit follows the path shown by the dotted line. The circuit is completed through the Primary Coil. To assist connection in this diagram the Secondary Coil is shown above the Primary coil.

THE AIR GAP AND CURRENT.

1000/5.

CONSTRUCTION.

No. 40g. enamelled copper wire is used for the Secondary Coil. The beginning of the coil is attached to the end of the Primary Coil at a point just within the end plate through which the end of the Primary Coil passes to the insulating fitting. Approximately 1000 turns of this fine wire are wound around the outside of the Primary Coil, each layer being separated from next by a layer of insulating tape. The end of the coil passes out through the last layer of tape, at the top of the coil, is strengthened and attached to a brass insert in the structure moulding. This insert passes right through the moulding to make contact with a carbon brush carried in a socket in the side of the distributor block. This brush is in contact with the main electrode of the rotor. In the distributor block are brass segments to which the ends of H. T. leads are attached by terminals. There is one segment for each cylinder of the engine. Each lead makes contact with the centre electrode of a sparking plug. Between the rotor electrode and each segment is an air gap.

PATH OF THE SECONDARY CURRENT.

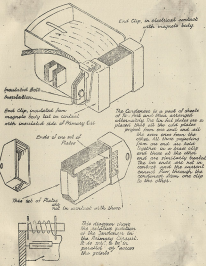
The current flows from the Secondary Coil to the brass insert in the structure moulding. From this insert it is picked up by the distributor rotor collector brush and conducted to the main electrode. It has then to pass across the auxiliary air gap to a segment and through a H.T. lead to the centre electrode of a sparking plug. After passing the plug gap it completes its path to the magneto body via the engine bed. The circuit is completed through the primary winding to where primary and secondary coils are joined.

THE SECONDARY CURRENT.

When current flows in the primary circuit a magnetic field builds up around the Primary Coil and embraces the Secondary coil. This field continues to build up until the primary current is at its maximum. When this state has been reached the contact breaker points are opened. This causes the flow of primary current to cease and the field around the primary coil collapses across the secondary coil inducing an E.M.F. of high value in that coil. This causes current to flow in that circuit and a spark occurs at the plug gap.

1/5.

THE CONDENSER.



Reprinted from "Practical Electricity" 1909/10

THE CONDENSER.

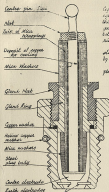
1086/4.

The voltage induced in the Secondary Coil depends upon the rate of collapse of the magnetic field created by the Primary Current.

The more rapidly the lines of force cut across the turns of the secondary coil the higher will be the voltage. This collapse occurs when the primary current ceases to flow, that is, when the contact breaker opens, as the points begin to separate the resistance in the circuit, although increasing, is small and the current continues to flow. This causes sparking at the contact breaker gap. If sparking is present then obviously current is still flowing in the primary circuit and the field created by it is not collapsing as rapidly as is desired. This effect is minimised by placing a condenser in parallel with the contact breaker gap, as shown in the diagram at the foot of the opposite page.

Now, as the points open, the current, finding it difficult to pass across the gap, will flow into, but not through, the condenser. This flow continues until the pressure inside the condenser becomes higher than that in the circuit. The current then flows out of the condenser in the reverse direction. By this time the contact breaker points are opened to their full extent and the current cannot pass across the gap between them. It can, however, flow back through the primary coil. This it does, so stopping any of the original current which is still flowing. This action takes place very rapidly, bringing about the desired sudden stoppage of primary current and rapid collapse of the field.

THE SPARKING PLUG



Copper washers are fitted between the insulator & the plug body & between the body & the gland ring to prevent gas leakage. To form a seal between the copper pin & the gland ring the latter is designed with position. Mica or glasslike insulation plates are used to resist burning by the spark.

A deposit of copper on the center pin assists in the dissipation of heat.

The shell of Mica is formed of shrapings of about 1/16" thickness and provides electrical insulation between center pin & body. The mica washers protect the shrapings from heat & mechanical damage.

In sparking plug is the means whereby the H.T. current induced in the secondary circuit is allowed to produce a spark in the cylinder. The spark occurs at the gap between the center electrode & one or other of the body electrodes. The center pin, carrying the center electrode, is insulated from the body by a shell of mica shrapings.

Leakage of gas past the plug would cause misfiring & breakdown of the insulation & consequently, misfiring. Therefore the center pin is sealed within

the body by the gland ring & gland washers & a second washer makes a seal between the body & the cylinder wall.

Sparking plugs vary in size and shape according to the engine for which they are designed but they all embody the principles briefly stated above.



The gap between the electrodes provides the current flowing when the voltage is rising.



Deposits of carbon at lead on the mica insulation will conduct the current from the center electrode to the plug body.



On correct type magneto the gap is between 'on' & 'off'

THE AUXILIARY SPARK GAP

The 'on' gap of a perfectly clean plug acts as an insulator during the rest of the secondary voltage. Current cannot leak away while the pressure is rising. Naturally it drops and then builds the voltage is high enough to force the current across the gap.

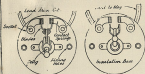
Plugs do not long remain clean when in service. Deposits of carbon, sodium 'liquid' fuels and acid, build up on the surfaces of the main insulator. Both carbon & lead are conductors & therefore current can leak across this surface during the fast period when the secondary voltage is rising. As this occurs the voltage cannot reach the same value as it reached when the plug was clean. & probably no spark will occur at this plug gap. That is one reason why plugs must need to be cleaned & cleaned after every short period of engine running. In spite of this frequent cleaning the deposits are still present & means may be found to make a high voltage possible even when the plugs are dirty.

This is done by incorporating a second gap in the secondary circuit. It is so arranged that the current must pass across both gaps in order to complete the circuit. The second gap, known as the auxiliary spark gap, acts in this way. As the time of firing nears the secondary coil the voltage begins to rise. The gap prevents the current flowing across the insulation of the plug & so the voltage builds up to a value which it is high enough to force current across both gaps.

This auxiliary gap may be situated anywhere in the secondary circuit. It is most practical, however, to have a gap between the main electrode of the distributor rotor & the secondary. When in place it is called a Rotor Air Gap.

It should be noted that although the auxiliary spark gap prevents plugs to be left on the engine for longer periods than would be possible without the gap they eventually become fouled that working will become erratic or stop altogether. Therefore, regular cleaning is still essential.

THE IGNITION SWITCH.



"Switch Closed"

Switch Closed
Circuit Complete

Spark at Plug
Switch Closed

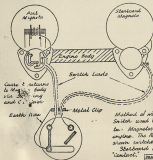
"Switch Open"

Switch Open
Circuit not Complete
through Switch

Spark at Plug
Switch Open



The Switch is so positioned in the Primary Circuit that when it is closed, the current can still flow when the contact breaker points open.



Method of wiring a twin lead Switch used to control the two Magnets of an aircraft engine. The Spark Magnet is shown switched off and the Spark Magnet on "Contact."

Copyright 1934 by
The McGraw-Hill Companies
1934

THE SAFETY SPARK GAP.

Spark at the plug gap causes the electrodes to burn away. The resistance to the flow of current increases as the gap widens until the current cannot pass across the plug gap. This causes a rise in the electrical pressure and possible failure of the structure. Therefore an alternative path is provided in the form of a safety spark gap which offers such a resistance that the current will flow across the plug gap while that gap is within normal limits but if it becomes too wide the current takes the alternative path across the safety spark gap before the E.M.F. reaches such value that damage to the insulation of the coil may occur.

A/B.

THE IGNITION SWITCH.

1066/5.

The E.M.F. in the Secondary Coil is induced by the collapse of the magnetic field set up by the Primary Current. This collapse occurs whenever the contact breaker points are opened. In some circumstances it is necessary that the engine should be turned but that no spark should occur; although the contact breaker points operate mechanically there must be no interruption of the Primary Current and consequent collapse of the field. By placing a switch in parallel with the contact breaker an alternative path for the primary current is provided when the switch is closed. When the switch is open the flow of primary current is controlled by the contact breaker in the ordinary way.

Each magnet must have its own switch in order that the magnet may be switched off independently for testing purposes. Where dual ignition is employed a twin knob switch provides the necessary control. This has two "positive" terminals and one "earth" terminal, with means for connecting one or both positive terminals to the earth terminal. A lead from the insulated side of one contact breaker is attached to one positive terminal. A third lead is arranged to carry the current from the earth terminal back to the magnet bodies, either through the engine body or through the brading of the switch leads as shown in the diagram.

The Switch used is normally of the tumbler type. It is so placed on the instrument board that when the knob is pressed down the switch is closed and no spark will occur. When the knob is pressed up the switch is open and the flow of primary current is controlled by the contact breaker. Therefore as the points open a spark will occur at the Sparking Plug Gap.

When the switch is closed it is said to be "OFF" and when open "ON" or "ON CONTACT".

A/B.

CHANGING A GRADED H.T. LEAD

FIRST THE UNDESIRABLE LEAD IS REMOVED FROM THE ENGINE. THE NEW ONE MUST BE AN EXACT COPY AS TO LENGTH. THE PROCEDURE IS AS FOLLOWS ON A VESTAL ENGINE.

1 Cut new length of cable 3" longer than full length of old lead.

2 Break on identification down of distributor end.

3 Break on other end.

GRADING CABLE END.

4 Strip insulation 1/2" and end trim square with side wire.

5 Fit inner shield.

6 Press inner and outer shields together with special pliers.

7 Measure insulation down against spread cable, and make a mark.

8 Saw cable, measure cut off conductor to cut by terminal and outer shield stripped on inner plate and lay terminal wire, shape.

9 Reamable, and hammer by terminal slightly then solder by dipping, using resin as flux.

INSULATION AND

10 Measure new lead against old one and mark all wire building ends.

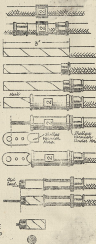
11 Disconnect with plug and to inner shell (any type).

12 Measure as shown, first shielded conductor, and strip off conductor top ready for terminal.

13 Fit Reamable, allow 1/2" of conductor to project and cut off reamable.

14 Solder projecting shield wire, solderly and solder by dipping.

15 - AFTER ASSEMBLY ON ENGINE
TEST FOR CONTINUITY BY LAMP
AND BATTERY FROM SEGMENT
TO PLUG -



CARE AND MAINTENANCE OF SPARKING PLUGS

Change joint under.

Clean threads and oil joint.

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1. Washers, clean with petrol, and only change 'lead' if spark is weak. It is not every 1000 miles that a new plug is needed.

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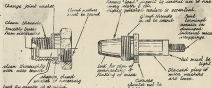
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15. Washers, clean with petrol, and only change 'lead' if spark is weak. It is not every 1000 miles that a new plug is needed.



BE CAREFUL NOT TO USE PLUGS FROM ANOTHER MAKE OR TYPE.

CHECKING AND SETTING ELECTRODE GAPS.



1. Screw gauge - 0.015"

2. Special file - 0.015" to 0.020" for common spark plug.

3. Special file - 0.015" to 0.020" for common spark plug.

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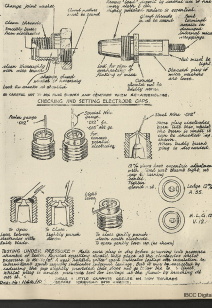
11. Special file - 0.015" to 0.020" for common spark plug.

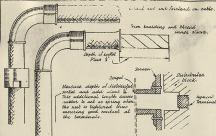
12. Special file - 0.015" to 0.020" for common spark plug.

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14. Special file - 0.015" to 0.020" for common spark plug.

15. Special file - 0.015" to 0.020" for common spark plug.

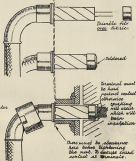




In certain engines in that B.T.H. and other magneto can be indicated possible. The B.T. lead fillings are made common to both. Each lead is filled separately and has a special die lead which produces the lead of the lead to the distributor. Distributors with this type of connection require mechanical taping for continuity. It has been found in several cases that when a lead is lightened, instead of the wires being compressed a little and remaining in it with lead into the distributor. Also a while the contact of the terminal causes and sparking takes place which besides increasing the resistance damages the distributor block by heating. If this lead is removed cable must be changed.

PREPARING CABLE ENDS FOR DISTRIBUTORS OF MAGNETOS "B.T.H. & WATFORD" USED ON PEGASUS ENGINES.

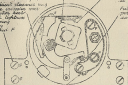
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CARE & MAINTENANCE OF CONTACT BREAKER

Make sure you observe the points.

Classroom before built
Breaker and under
to 1000-1500 volts
are being open.
Insulated chamber
and space, insulation
of rubber band.
Check, tighten
of turning
heavy
material.



The shape of all
parts must be
checked before
assembly. Check
all moving parts.

Full open, gap of 0.1
centimetre must be
maintained to 0.005"

There must be
a 1/2 inch gap
between the
contact point and
the spring. The
gap must be
checked before
assembly.

Check on all
parts. Check
the gap of 0.1
centimetre to 0.005"

Check the gap
of 0.1 centimetre
to 0.005"

Make sure that the
contact point is
correctly
adjusted.

Some later types have no
adjusting screw. Check
the gap of 0.1 centimetre
to 0.005" and
check the gap of 0.1
centimetre to 0.005"

WAGNER WITH INTERNAL L.T. CONNECTION TO CONTACT BREAKER



Smooth slightly
with 1/2 inch
screw adjustment

Insulated Spring
Check all parts



Get some of the
contact point and
check the gap of 0.1
centimetre to 0.005"

There are some designs of this
type of contact breaker. But
the gap of 0.1 centimetre
to 0.005" must be
maintained.

Don't 11/14/12

Make sure the
contact point is
correctly
adjusted.

Check the gap of 0.1
centimetre to 0.005"

CARE & MAINTENANCE OF CONTACT BREAKER

The contact breaker, when it is
being used, must be
checked before it is
used. The gap of 0.1
centimetre to 0.005" must
be maintained.

Make sure the contact
point is correctly
adjusted.

Check the gap of 0.1
centimetre to 0.005"

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Make sure the contact
point is correctly
adjusted.

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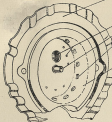
Check the gap of 0.1
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Check the gap of 0.1
centimetre to 0.005"

Check the gap of 0.1
centimetre to 0.005"

CARE AND MAINTENANCE OF THE DISTRIBUTOR.



1. *Little condition of spark plug is fit on the front plate of magnet.*
 2. *Check oil around wiring plug at the main distributor.*
 3. *In hot climates distributor sometimes distorts, in which case joint carefully. Keep under oil.*
 4. *Make sure the timing brush is free in its socket.*
 5. *Capacitor requires an occasional wipe with dry cloth.*
 6. *Spot carefully the signs of corrosion. High tension contact leads easily over this causing erratic sparking.*
 7. *Pressure distributor will have to be removed, and dried very slowly.*

Check distributor for cracks especially near top edge.

Be very careful when connecting the cables from the spark chest, sometimes it is a little stiff to withdraw. If the first pull causes the brush to strike the chest and back. Remove brush and turn in joint, unless it is very loose, about several times, to avoid damage to the spring.
Brush must be free in its socket. Contact point of brush must be smooth and shiny.

Check for leakage between distributor and magnet.



LUBRICATION

The degree of engine oil in each side of each lubrication oil magnet is fixed installed, also when every 40 hours running.
Engine stands still for more than a fortnight this lubrication must be repeated.
Use the oil at 100 lbs.
Control drops carefully.



The handle for this cap is 10" - 12" when the gear wheels are 100" then must be changed. Front with diamond distributor and back with new rollers. If gap is more than 1/2 inch, adjust roller with screw file.
 Drop oil 100 lbs.

1000/11.

LUBRICATION OF MAGNETS.

Little power is required to drive a magnet (about 1/10 H.P.); therefore as very little friction is produced, little oil is needed in service.

Some small magnets have their bearings packed with special solidified oil to last about 500 hours running.

This lubricant is removed when the magnet is overhauled, no other provision is made.

Frequent lubrication is therefore unnecessary.

Instructions for lubrication are usually printed on each magnet. (Further, on S.T.E. & Harford polar induction magnets used on R.A.F. aircraft engines, it is now standardised as follows:-

AS Installation:-

Front & rear lubricators - 5 drops in each well.

Cam lubricating pad - 1 drop.

C.R. rocker wick (S.T.E. only) - 1 drop.

Repeat at 40 hour intervals.

Use:- OIL LUBRICATORS, ARMO ENGINE, MINERAL HYDRA GRADE. (S.T.E. No. 1 - 24/35).

Note:- These instructions must be carried out when the magnet is being fitted for the first time, also if engine has been idle for more than a fortnight.

Installation of R.T. leads must allow lubricator caps to be properly opened.

Although these magnets have oil drain holes below the bearings they should always be carefully lubricated.

To prevent over-lubrication, the best method to employ is a bottle with a wire through the cork and count the drops one by one.

EXCESSIVE LUBRICATION CAUSES TRIPPING THROUGH OIL CRIPPING ALONG TO THE CONTACT BREAKER. SOME OF THIS FINDS ITS WAY TO THE C.R. POINTS.

A LITTLE SPARKING OCCURS OCCASIONALLY AT THE PLATINUM POINTS THIS DUE TO THE OIL WHICH IN TIME CAUSES EXCESSIVE SPARKING OF THE POINTS AND RESULTS IN SEVERE PITTING.

THIS PITTING, TOGETHER WITH THE CARBON DEPOSIT FROM THE BURNED OIL, IN TIME INTERFERES WITH THE FREE FLOW OF PRIMAIR CURRENT ALONG THE POINTS WHEN THEY ARE CLOSED.

THIS CAUSES IRREGULAR SPARKING AND SERIOUS LOSS OF POWER.

FREQUENT BUT SKILLFUL USE OF THE CONTACT FILE WILL MAINTAIN CONTACTS IN GOOD WORKING CONDITION.

SWITCH CIRCUIT - CONTINUITY TEST

This test is used to prove that communications in a standard cell tower are made because at all kinds times is a case of faulty contact. In an interview against faulty contact of a cell, my name is not mentioned in complete failure of success to him. This could be dangerous when called is supposed to be "100". A few cell towers (2) of lamp & battery in the test continues to use because of the lamp goes a bright & continuous light under the cell tower. cell tower



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by heavily the shafted is loaded by being joints as shown in. The attachment is the same in the magnets. Apply lamp, joints to joint where contact is needed is picked up and avoid further of of order.



Do not attach lead from L.S. over and apply
long leads as shown. A slight continuous
light could indicate that wire terminal is fairly
rigged by rooted across a fishing light
indicator as well. In lightning wire is
inserted not to stop the stream.



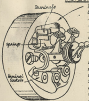
When a switch is closed the lambskin blade is forced between the springy contacts. It made sure there is no metal electrical contact at those points except the lamp as shown & operate with. If contact is not made gently press contacts inward but make sure that lambskin blade enters smoothly and easily.



Below are 3 examples to show how ~~unbalanced~~ things can be looked at from several viewpoints and in detail.

Reminded that the joint report
of the Lamp and Battery Co.
indicated a bad joint.

MAILED PAGE OF 500 PAGES



The investigation has made it possible to select the support for the maintenance of the workers' compensation on the basis that there is no other correct technique. Republics cannot take this as a sign, though an attempt to do this will make mistakes to be observed regarding the "insulation" properties of these air-insulating or plastic compounds in handling of the materials. The springs are fitted to ensure that a definite "make or break" takes place in movement of the beam. Spring tension is fitted to maintain movement to give an almost frictionless stroke should be applied to springs and when in contact, a steel spring may be the means of a magnetic coupling and strong collections of attraction in fluid. When water is about 1000

of transfer you want to firmly support by detailed comments which are made orally for this purpose. Sometimes contact is not made & written although apparently "closed" is usually open. This is dangerous to maintain. Leaving copies by hand as it may close unexpectedly. Again, asked by gentle advice of contacts on the way out.



twisted with excitement, we gripped its wheels by means of our hands. Two spots of light were visible in the air. On each hand, within the handle, there appeared my own to each other. These have occurred when it is too dark to see outside and have left in "you" position which is dangerous. The reason is, any vehicle is not quite visible in the situation, along it.

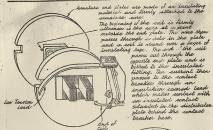
Before tying a parashain knot to its support make sure that loads of equivalent lifting capacity are easily both then available. Lighten loads carefully. With these precautions are necessary to avoid crushing the wire.

[illegible]

Report - Women allowed to acquire a married. Change in
 family law for a new one. Page 11

B.T.H. ROTATING MAGNET.

PRIMARY CIRCUIT.



The shape of the Main Spring makes auxiliary springs unnecessary.

The pillar supporting the roller containing spring acts as a stop for the roller. There is no roller buffer spring.

The roller joint is hollow & contains a lubricating oil.

Insulated carrier block.

Insulation

H.T. Lead



Sheet
Fig. 10

THE HAND STARTER MAGNET.

These magnets are used where starting an engine, thus function being to supply H.T. current to the starting electrode on the distributor rotor of the main magnets while the engine is being turned slowly by the main magnets and requiring at a speed insufficient to produce a spark.

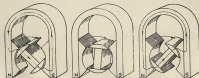
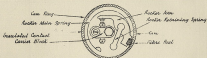
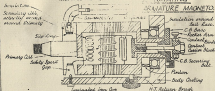
Starting magnets are of the rotating armature type & are driven through a 2:1 step up gear by one of three methods namely - direct by hand, by hand through a flexible driving gear or coupled to the engine either for manual or power operation. When an engine is running at normal speed the spark is timed to occur when the piston reaches the top of the compression stroke. To ensure the spark running in the correct direction of rotation when starting, the spark must occur just after the piston has passed T.D.C. and is depending on its gear ratio, normally when the current is being supplied by the main magnets, the main electrode of the distributor rotor is opposite the segment appropriate to the cylinder in compression. As the engine is turned to the starting position the main electrode will move away from the segment. Therefore it is not possible to supply the current from the H.T. magnets to the main electrode. The starting electrode is so situated that it leads before the main electrode, the angle at which it is set behind the main electrode depends upon the number of cylinders, the fully advanced position together as an automatic timing device are fitted to the magnets. When the angle, the starting electrode approaches the segment at the rotor reaches T.D.C., H.T. current from the H.T. magnets will pass to the segment & a stream of sparks will be delivered to the electrode. The coil continues until the resistance rises in the system as with the electrode is approaching the next segment. It should be noted that the H.T. magnets are not fixed relative to the commutator. As is turned as fast as the engine will allow. When a H.T. spark has fired the main magnets are switched off & the starter magnet is switched off. A safety stop gap is incorporated in the H.T. magnets.



In hand an engine which is being slowly turned by hand it is desirable that the spark shall occur as the piston is descending on the first blow. The engine will then run on correct action. For hand starter magnets supply H.T. current to the gear ring the distributor of the main magnets. As the engine is turned to the starting position the main electrode of the rotor moves away from the segment and the starting electrode moves towards it.

Page 10 - 1909/13.

ROTATING ARMATURE MAGNETO



Comparison of the Primary and Secondary Circuits of this Magneto with those of the Polar Inductor Magneto shows that they are fundamentally the same. In principle the Magnetic Circuit is also the same, but only two magnets of flux wound in the soft iron core during the revolution of the magneto spindle. Therefore the magnet of this Magneto is too weak to get insulation. The above diagrams show how the reversal of flux occurs. The change takes place when the core is in the position shown in the middle diagram.

Revised by [illegible] [illegible] [illegible] [illegible]
Approved by [illegible] [illegible] [illegible] [illegible]
1922/7

THE ROTATING ARMATURE MAGNETO. 1044/3

This magneto works on the same basic principles as the Polar Inductor magneto, the magnetic flux reversing through an iron core upon which are wound the primary and secondary coils.

THE MAGNETIC CIRCUIT.

The armature rotates between the poles of a magnet which is usually of a horseshoe shape. The diagram shows how the flux reverses its direction through the core as the armature is turned. This change of direction occurs when the armature core crosses and magnet pole pieces are in the same relative position as those in the Polar Inductor Magneto, but only two changes occur in one revolution of the spindle.

THE PRIMARY CIRCUIT.

The Primary Circuit is the same as that of the Polar Inductor Magneto, except that most of the components are attached to the armature and rotate with it. The diagram shows that the circuit differs only in constructional details. An extra component is the Auxiliary Carbon Brush behind the contact breaker base. Normally the current completes its path through the spindle and this brush provides an alternative path. As this brush conducts the current to the body of the magneto and as the body is insulated from the armature by insulating material around the outer faces of the bearings the current passes through the H.T. Return Brush on its way back to the Primary Coil.

The Condenser is enclosed in a bronze case and actuated between the windings and the piston which drives the distributor rotor. Its construction and functions are the same as those of the condenser of the Polar Inductor Magneto.

THE SECONDARY CIRCUIT.

Again the construction is the same as those of the Polar Inductor Magneto. One end of the Secondary Winding is attached to the Primary Winding just before the latter passes to the contact breaker. After passing around the primary the other end of the secondary is attached to the insulated Slip Ring. This is a brass ring attached to the spindle but insulated from it. A carbon brush bears on the slip ring and conducts current to the Distributor Rotor.

The remainder of the circuit is the same as that of the Polar Inductor Magneto except for the addition of one (or two) H. T. return brushes. These are fitted because the armature rotates and is insulated from the body. These brushes conduct the current to the condenser case from which point it passes through the primary and so back to the secondary.

1/3.

PERIODICAL INSPECTION AND CLEANING OF ROTATING ARMATURE MAGNETO.

1. Disconnect HT leads and switch from magnet than do safety work of disconnecting double switch, magnets from station ground and clean externally.
2. Remove distributor cover and clean inside according to practice.
3. Remove and clean under magnets, carbon brush, magnet brush, inspect under the covers.
4. Remove front cover plate with rollers and clean brush holder, and brush and under as necessary.
5. Adjust any worn rollers with adjustment screws. If worn rollers are broken, remove the C.B. with wire, replacing compression and tension springs.
6. Inspect cover for cracks. Remove fasten for good contact and also under terminals for corrosion.
7. Remove cover housing, nuts in order and lay off lubricate and in case misalignment of contact points.
8. Inspect and correct rubbing brush.
9. Remove roller nut and clean it, inspect condition of roller, top and back, inspect springs - clamp if necessary, inspect points, file if them clean and true.
10. Re-adjustment contact points to under.
11. Clean front of C.B. with wire, brush, replace C.B. making sure key enters tightly and under goes to right.
12. Remove cover housing, check gap of C.B. points and adjust if necessary to .002".
13. Remove and clean under rubbing brush and holder.
14. Reconnect assembly and lubricate according to instructions of any.
15. Remove magnets connect and check range of C.B. contact, connect HT leads and switch wire.



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General Supply Co.
1111 1/2 N. 1st St.
St. Paul, Minn.
Telephone 100

an ancient, their work is just now being written, is important to start the language. They are devoted to produce their beautiful but it is still very primitive. It is only way to make some culture is gradually to thoroughly learn the language. This includes them to help lead to making independent ideas in their own mind. It is, in fact, a revolution. As with nature, the same thing can be said to natural, when they are

The effect of oil over a play is often misunderstood. Oil is an immediate, but it will not stop or speed forwarding action that parents of any efficient play which is caused by an official's complicity, because the sports himself knows the existence of the oil. The principal fault with oil is that if the play is oil it indicates that some oil is coming the other way is getting hard to believe and is being paid. This means with the oil the forwarding item is constant over the possibility which causes tactical changes. If there is a small, that whatever movement the opponent is watched through the neutral oil. This sometimes happens in the future application of neutral & other company with unusual frequency, but only causes hardly any shifting. They are not forwarding when moving predicted that the oil application is not really successful.

[illegible]

This is their most common position. It cannot be avoided, spreading across very quickly leaving many of the electrodes in a grey misted smudge it is not difficult for the squid to escape.

The standards have also had to meet the requirement that a high percentage of the distribution should be in the form of cash.

Old writer this page. However the number is the electrical
numbered August 10. In other words - The quantity

"If this sparkling village becomes too high it will exhaust the resources of the reservoir, reducing the efficiency of the installation of the cost much of this money. National Association believes the costs the maintenance of workers to the reservoir this is just a small."

After planning to participate in the weekly youth league games, the student finds that the nearest youth center is 10 miles away. This does not mean that the player actually cannot be trained in soccer at the place you designed. The fact that he cannot, however, the program would become overpriced and the player's transportation and his ability to play would be quite a big issue. But it is a really realistic guide map by the effect on the community of the program. The girl will spend the entire afternoon (1 hour) playing the game at home, and will receive several expert reviews.

[illegible]

an ancient, their work is just now being written, is important to start the language. They are devoted to produce their beautiful but it is still very primitive. It is only way to make some culture is gradually to thoroughly learn the language. This includes them to help lead to making independent ideas in their own mind. It is, in fact, a revolution. As with nature, the same thing can be said to natural, when they are

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[illegible][illegible]

This is a better description and it is correct to mention the stages of work to assist in water flow. Therefore the regulation of a water flow is based on a wrapping and unwrapping. It is important to highlight that sometimes the wrapping is the fastest wrapping of the entire system. This was done when the first case was in the water.

[illegible]

Assumed "lookings"
 down by making water
 marks in ground & road
 in field.

Dis-ignition is the ignition of gases by unburned parts in the combustion chamber during the spark process. It may be due to an unburned plug and therefore prevent new is taken to show an actual plug that will not extend under the normal running conditions of the engine in which it will be used.

The question arises: does such behavior, even if it is completely voluntary, and if it is not at all an indication of a higher plane of morality, also prove to be a partial failure of a normal cooling system. In these circumstances loss of power - indicated by reduced fuel - simply meaning vibrations will be reduced. Reduced fuel loadings is something like the amount of gas-spraying, by changing understanding of the medical electrode. This may cause very specific use and on the pump, but it is something that it will be experienced by a normal use. It is not a concern that will cause the system to be in a better, or a worse, or a specific spot. The three elements of the cooling system, their

Greenhouse, 10
 10000, 10000, 10
 10000, 10000, 10000
 10000, 10000, 10000
 10000, 10000, 10000

They will absolutely murder me and will kill me & swallow them. It is surely impossible and almost certainly is not worth the trouble or actually, but what else, say this is impossible. When it is impossible, it is not possible. But the end of it becomes better, making different things make a particular one - perhaps - perhaps only after a while. I suppose something like that, but I cannot remember. Perhaps the old school said to me that they were.

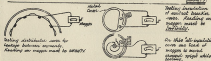
[illegible]

INSULATION TESTS ON IGNITION COMPONENTS.

Most of the following tests are necessary to detect those intermittent or complete leakage in testing place over the various of associated components of the ignition system.

The causes of this are usually resulting something from contamination, as oil, dirt, mud, etc., sometimes the cause is carbon or metal dust. In most cases thorough cleaning & drying cures the defect. Sometimes insulation becomes damaged & high tension current jumps through the crack in the form of a spark. Low tension current will not usually leak through a small well maintained air dust filter & leakage path there.

Intermittent misfiring & difficult starting are the major symptoms which indicate that leakage may be taking place. When defects cannot be located by visual inspection the wagger should be used. The following examples indicate where the tests are applied. In all cases components should not be tested until a satisfactory result is obtained.



The above are only a few examples of how the wagger may be used to test insulation between neighbouring conductors. Further examples are given in notes dealing with insulation tests applied to the switch circuit.

INSPECTION OF HIGH-VOLTAGE LEAKS.

High-tension ignition cables are now used on all high-powered aircraft to resist in preventing interference with wireless installation.

Frequent inspections of cables and their fittings is necessary, as even slight damage may lead to leakage of current with consequent loss of engine power.

It should be remembered that when the engine is running the voltage of the current is very high and is capable of jumping any weak point in the insulation or leaking over the insulation. If it is over only slightly damp.

This may cause intermittent misfiring or complete misfiring. Severe contact at joints is tested by lamp and battery. This is called a "Continuity Test".

A lamp is of no use for testing for leakage; wagger is used for this and its application is shown in the section dealing with the switch system.

This is called a "Insulation Test".

If the wagger leaks reads anything less than infinity the lead must be changed.

Sometimes damage to leading leads to damaged insulation. It is then possible for the current to jump through to the leading which is "arched".

Therefore very careful inspection is necessary at all points where bridging is likely to be damaged by other fittings, or where insulation may be effected by heat.

Much of the trouble experienced on H.V. cables is in process of elimination by the use of specially designed "barrows".

This consists of conductors in which the leads are permanently sealed except for a short length at the sparking plug end.

If defects develop which may cause trouble in handling the harness is changed.

SWITCH CIRCUIT INSULATION TEST

Insulation is used to prevent electricity flowing along the normal path. If a conducting bridge, such as moisture, carbon dust, or metal dust forms over the insulation, current will then leak over these conductors and therefore not take the normal path.

When making these tests

C.B. wires must be completely detached from circuit

Switch Switch Open



These switches should always be open. Procedure to detect such leakage is as follows. This instrument is connected by means of leads to the two poles of an a.c. source, and by turning the handle in a steady position is operated. Any leakage will be indicated by the hand on the scale moving away from zero. Any leakage must be made to break the leakage and eliminate the cause.

HEMITY indicates abnormal resistance by insulation - the leakage indicator and resistance

Switch leads must be tested every 10 days. When the magnet is placed, open switch. (Contact) later magnet. Switch should reach zero. If leakage is indicated switch must be closed or daily cleaning of the original may be required.



To test the position of the switch, first detach the C.B. wires and connect magnet to switch. This will pass current over leakage in testing glass and at through the insulation in the case.

If reading is less than HEMITY, always test.



Next test the switch. Place switch in open (Contact) position, and connect magnet and switch. If reading is less than HEMITY, always test.

Do not test the switch. One lead of magnet on switch, the other on the handle. If reading is less than HEMITY, all is well.

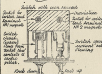
Other insulated parts of the ignition system are to be tested in a similar manner as for switches. However, distributed capacitors, the insulation of C.B. cables, block also

IGNITION SWITCH INSULATION

An important sign of ignition system has the insulation & mechanism involved in a switch for as shown. This has to do with the metal insulator base which is being attached to the surface has metallic connection with both magnets. Insulator in center is as necessary when the switch is closed connection to make with the metal base which completes the primary circuit through the coil and also the metal housing of the coil.



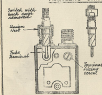
To test insulation of a switch, apply magnet to switch. This will cause the magnet to 'leak' if leakage is present due to insulation.



When switch is closed, current flows through the primary winding of the coil. This will cause the magnet to 'leak' if leakage is present due to insulation.

To test for continuity, connect lamp & battery across the switch. This will cause the magnet to 'leak' if leakage is present due to insulation.

REPAIRING SWITCH LEAD TERMINALS



When repairing switch leads, remove all old lead wire. This will cause the magnet to 'leak' if leakage is present due to insulation.

Make sure switch leads are clean and free of dirt. This will cause the magnet to 'leak' if leakage is present due to insulation.

CHANGING MAGNETS ON AIRCRAFT.

- (1) Removal of magnetizable magnets.
Detach spring from magnet, and position lower magnet S.B. in which case, and be careful not to disturb adjustment. Disconnect magnet by removing bottom nut and detach magnet coupling. As the base was secured into engine, this provides that no holding spindle which nut is unscrewed, also extraction for withdrawing coupling from spindle.
- (2) Replacement of new magnets. Insert magnets alternately & "take up" to mounting. Magnets must be snug fit to bearing. Do not pull magnets into position by tightening nuts. If fit is too tight, clean thoroughly & test for same, before base was correctly.

Substitute magnets by following instructions on magnets.

Check full open gap of 0.001 in. & if necessary re-cut, carefully & "set" this is very important because if magnets is closed with 0.001 gap increased the timing will be upset the first time points are re-adjusted. Test magnets for gaps by spinning the spindle sharply. Sparking should occur at the early gap gap. If there is no 0.001 gap, or if it is increased, make temporary gap with piece of thin wire on distributor main distributor.

Fit coupling to spindle. Lap coupling carefully & test to ensure that it fits perfectly. Test carefully. Excessive vibration may cause a coupling to become loose which results in serious damage to the magnetizable bearings causing serious wear.

(3) Coupling and Timing.

Set accurately to timing marks. Set distributor main distributor to correct normally implied for timing & which corresponds to timing marks. Set contact breaker to full advance & adjust frequently whilst timing to ensure 0.001 in. in this position. Turn magnets forward until 0.001 in. just break and write a line mark across the gap which is timing. This is an approximate guide when mounting magnets. Carefully test it will soon show that magnets & spring coupling. Note relative position of marks & re-adjust if necessary. Make final check with lamp & building.

- (4) Comparison to make accurately. Mount magnets to mounting & test marks. Remove 0.001 in. gap. Carefully at full advance with stop magnet, this means, in fact, in fact this mark is done very carefully & under test. Using the new magnets whilst setting the one thing limit. Gap of 0.001 in. test for continuity. Grounded properly. Gap & test for continuity. If test for continuity applies generally to all magnets, it is a sign of a defective magnet which may vary slightly with different base.

MAGNETO SPINDLE

The situation and dimensions of the spindle and of new magnets spindle is illustrated as given in sketch. A steel nut is used when aluminium magnets are employed. Sometimes a plain nut and lock washer (locking) is used.

A coupling which is part of the engine is attached to the spindle. When it separates an "open" circuit, or when magnets are "in", it is securely coupled with the magnets. When little or no first time to any magnets, the coupling must be carefully lapped at the tapered portion, with crossed papers and oil.

Clean thoroughly, then test the fit by tapping "down" lightly with a hammer which does the key and.

If fitting satisfactorily it should be very difficult to pull off by hand, or should need extraction.

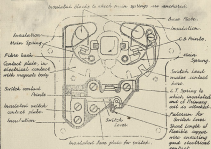
Test key in slots of spindle and coupling. It should only just move easily in both slots.

The above must not be "loose" if the standard key is used.

After mounting a coupling from a magnet, this has been running always against the key and coupling. This shows an extra key and coupling from an original magnet. This is a key coupling and should be in the engine, and the magnets. It is this, gives the distributor which, used by turning magnets & forward about 0.001 in. to a short lock which, the magnet must be changed, according to wire. When coupling against is dependent upon the situation, both on spindle.



Diagram 1000-10



This diagram shows the electrical circuit of the spark contact breaker, with the connection of the two contact plates, the base plate and the arm, all shown in the insulated sleeve from the support body. The contact plates carry the fixed contact points.

The switch mechanism has been omitted and the switch shown in the closed position. The right hand contact breaker, which is closed is open earlier than the other, is always in circuit with the primary coil. The left hand contact breaker is in contact with the primary coil only when the switch is closed. Therefore with the switch and both contact breakers closed, the current, having reached the switch base plate via the low tension contact spring, may complete its path back to the magneto body through either one or both of the contact breakers.

By means of the sparking plug the H.F. current induced in the secondary circuit is utilized to produce a spark in the cylinder. The plug consists of a centre electrode insulated from the body, cooled within the body. The sealing annulus that no gas escapes from the cylinder, gas leakage results in loss of compression and power and overheating of the plug. The overheating may result in melting due to a breakdown of the insulation, one or more electrodes are provided on the body of the plug and the spark occurs between one or other of the body electrodes and the centre electrode.

THE STARTER MAGNETO.

These magnetos are used when starting aero engines, their function being to supply H.F. current to the trailing electrode on the distributor rotor of the main magneto while the engine is being turned slowly and the main magneto are revolving at a speed insufficient to produce a spark.

Starting magnetos are of the rotating armature type and are driven through a 5 to 1 step-up gear by one of three methods namely, direct by hand, by hand through a remote turning gear or coupled to the engine starter for manual or power operation.

When an engine is running at normal speed the spark is timed to occur before the piston reaches the top of the compression stroke. To ensure the engine running in the correct direction of rotation when starting, the spark must occur just after the piston has passed T.D.C. and is depending on its power stroke. Normally when the current is being supplied by the main magneto, the main electrode of the distributor rotor is opposite the segment appropriate to the cylinder on compression. As the engine is turned to the starting position the main electrode will move away from the segment. Therefore it is not possible to supply the current from the H.F. magneto via the main electrode. The starting electrode is so situated that it trails behind the main electrode. The angle at which it is set behind the main electrode depends upon the number of cylinders, the "fully advanced" position and whether or not automatic timing devices are fitted to the magneto. Whatever the angle, the trailing electrode approaches the segment as the piston reaches T.D.C. H.F. current from the H.F. magneto will pass to the segment and a stream of sparks will be delivered to the cylinder. This will continue until the resistance rises in the cylinder or until the electrode is approaching the next segment. It should be noted that the H.F. magneto is not timed relative to the crankshaft. It is turned as fast as the means of turning will allow. When a number of cylinders have fired the main magnetos are switched "off" and the starter magneto is switched "on".

A safety spark gap is incorporated in the H.F. magneto.

569858 LAD J. P. Howard

IGNITION

FORM 620

REVISED

Royal Air Force.

NOTE BOOK
FOR

Workshop & Laboratory
Records.

"B" Bldg

3 Wing

T. 7086. Wt. 640g. 150,000 Dins. 11/16. W. & S. (278000)

IGNITION CIRCUITIgnition System Inspection Schedule.

A/A's No. & Pass. Igniter (Type & No.)

CONTACT BREAKER UNIT.

L.T. Leads - Condition.....
 Cover Springs.....
 L.T. Plug Set in Socket (Internal Type).....
 Set of C.B. in Housing.....
 Condition of Breaker Lever.....
 Retaining Spring.....
 Main & Aux Breaker Springs.....
 Galvanic.....
 Hunts.....
 Breaker Bush - Fit.....
 Breaker Bush - Condition.....
 Buffer Spring - Clearance.....
 Contact Points - Condition.....
 Alignment.....
 Lubricating Pad - Condition.....
 Risk.....
 Carrier-Block-Insulation.....
 Piping Screws - Security.....
 C.B. Housing - Condition.....
 Cover - Insulation.....
 L.T. Terminals.....
 C.B. Spigot - Screws.....
 L.T. Connection (Internal Type).....

DISTRIBUTION UNIT.

Spigot - Fit.....
 Block - Condition.....
 Vents.....
 Collector Brushes.....
 Range of Control (Variable C.B.'s Only).....

IGNITION:A.T. LEADS.

Braiding - Condition.....
 Security - Plug & Distributor.....

SPARKING PLUGS.

	1	2	3
Condition of Terminal			
External Insulation			
Body Thread.			
Stand Thread.			
Gland Washer.			
Earth Electrodes.			
Internal Insulation			
Control Electrodes.			
Spark Gaps.			
Pressure Test - Gland.			

SWITCH SWATH.

Switch Base - Condition.....
 Contacts.....
 Clearance of Rivets.....
 L.T. Leads - Condition.....
 Conductivity.....
 Insulation.....

A/A's No. & Pass.

Signature

INTRODUCTION.

On all British aircraft dual ignition is employed. The mixture in a cylinder is fired by two sparking plugs. This results in a more rapid and efficient combustion of the fuel than would ignition by a single plug.

To supply H.T. current to these sparking plugs there are two magnetos. Each magneto has a set of H.T. cables. The system is so arranged that one magneto supplies current to one plug in every cylinder.

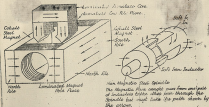
A switch system is provided which enables both magnetos to be controlled, either together or separately.

To facilitate starting of large engines a separate hand turned magneto is provided. H.T. current is generated by the H.T. magneto quite independently of the main mag but is distributed to the cylinders by means of the main magneto distributors and rotors. This magneto is controlled by its own switch system.

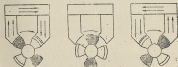
Since the working of all magnetos is based upon the same fundamental electro magnetic principles it is not necessary to study all types of magnetos in order to learn these principles.

In the following notes the R.I.M. type R.C. polar inductor magneto is dealt with fully since its construction makes it the easiest magneto to understand. This magneto is extensively used in the R.A.F. Further notes deal with other types of magnetos and are intended to show that the principles are the same although the mechanical details vary.

THE MAGNETIC CIRCUIT.



The Inductor Rotor runs freely on ball journal bearings, in the barrel formed by the body casting and the pole pieces. The arrows show the path taken by flux for one position of the rotor. To ensure rapid movement of the flux, laminated iron is used where practicable. The use of Cobalt Steel Magnets reduces the weight and size of the magnets.



These diagrams show how the flux from the permanent magnets crosses through the armature core. It changes its direction every quarter turn of the rotor. In change takes place at each arm of the rotor as the position changes approximately in the middle diagram.

1058/3.

THE D.T.H. TYPE S.C. POLAR INDUCTOR MAGNETS.

THE MAGNETIC CIRCUIT.

CONSTRUCTION.

The magnetic circuit consists of two cobalt steel bar magnets, two magnet pole pieces, two armature core pole pieces and an armature core. All these parts are stationary and, with the exception of the magnets, are made of laminated soft iron. The pole pieces are arranged as shown in the diagram and are held in position by the aluminium alloy body being cast around them. The armature core is secured to its pole pieces by two bolts. The magnets, each secured by two set screws, are housed in recesses in the sides of the body, and so arranged that their North poles are adjacent to and in contact with one magnet pole piece and their South poles are similarly placed in relation to the other magnet pole piece. The magnets do not touch the armature pole pieces.

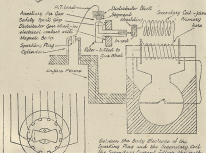
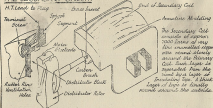
In addition to these parts are two soft iron inductors firmly attached to a nickel steel alloy spindle. This assembly is known as the Inductor Rotor. The nickel steel ensures that there is no path for the magnetic flux along the spindle from one inductor to the other. The inductor rotor is supported by two ball journal bearings and runs in the tunnel formed by the body casting and the pole pieces, very little clearance being allowed between the inductors and the sides of the tunnel.

The position of the inductors relative to the magnets is such that they retain the same polarity permanently. As the rotor revolves the armatures immediately beneath the ends of the armature pole pieces. When an arm of one polarity is under one pole piece an arm of opposite polarity is beneath the other. Therefore the flux from the permanent magnets is able to flow through the armature core.

THE PATH OF THE FLUX.

The magnetic circuit consists of two cobalt steel bar magnets, two magnet pole pieces, two armature core pole pieces and an armature core. The magnetic flux will pass from the North poles of the magnets into the pole piece in contact with them both. It will then pass to one of the inductors, along the arm which is nearest to an armature pole piece, through that pole piece to the armature core, through the core and the second pole piece to an inductor arm of opposite polarity and so to magnet pole piece in contact with the South poles of the magnets and back to the magnets. A reversal of flux takes place every time an inductor arm moves from one armature pole piece to the other.

THE SECONDARY CIRCUIT.



Arrangement of H.T. Cables

Between the Body Electrode of the Sparking Plug and the Secondary Coil the Secondary Circuit follows the path shown by the dotted line. The circuit is completed through the Primary Coil. To assist connection in this diagram the Secondary Coil is shown above the Primary Coil.

THE AIR GAP CURRENT.

1000/5.

CONSTRUCTION.

No. 40g. enamelled copper wire is used for the Secondary Coil. The beginning of the coil is attached to the end of the Primary Coil at a point just within the end plate through which the end of the Primary Coil passes to the insulating fitting. Approximately 1000 turns of this fine wire are wound around the outside of the Primary Coil, each layer being separated from next by a layer of insulating tape. The end of the coil passes out through the last layer of tape, at the top of the coil, is strengthened and attached to a brass insert in the structure moulding. This insert passes right through the moulding to make contact with a carbon brush carried in a socket in the side of the distributor block. This brush is in contact with the main electrode of the rotor. In the distributor block are brass segments to which the ends of H. T. leads are attached by terminals. There is one segment for each cylinder of the engine. Each lead makes contact with the centre electrode of a sparking plug. Between the rotor electrode and each segment is an air gap.

PATH OF THE SECONDARY CURRENT.

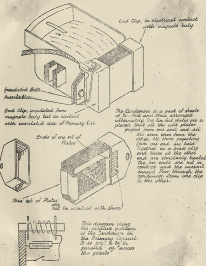
The current flows from the Secondary Coil to the brass insert in the structure moulding. From this insert it is picked up by the distributor rotor collector brush and conducted to the main electrode. It has then to pass across the auxiliary air gap to a segment and through a H.T. lead to the centre electrode of a sparking plug. After passing the plug gap it completes its path to the magneto body via the engine body. The circuit is completed through the primary winding to where primary and secondary coils are joined.

THE MAGNETIC CURRENT.

When current flows in the primary circuit a magnetic field builds up around the Primary Coil and embraces the Secondary coil. This field continues to build up until the primary current is at its maximum. When this state has been reached the contact breaker points are opened. This causes the flow of primary current to cease and the field around the primary coil collapses across the secondary coil inducing an E.M.F. of high value in that coil. This causes current to flow in that circuit and a spark occurs at the plug gap.

1/5.

THE CONDENSER.



THE CONDENSER.

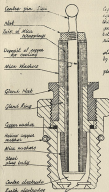
1086/4.

The voltage induced in the Secondary Coil depends upon the rate of collapse of the magnetic field created by the Primary Current.

The more rapidly the lines of force cut across the turns of the secondary coil the higher will be the voltage. This collapse occurs when the primary current ceases to flow, that is, when the contact breaker opens, as the points begin to separate the resistance in the circuit, although increasing, is small and the current continues to flow. This causes sparking at the contact breaker gap. If sparking is present then obviously current is still flowing in the primary circuit and the field created by it is not collapsing as rapidly as is desired. This effect is minimized by placing a condenser in parallel with the contact breaker gap, as shown in the diagram at the foot of the opposite page.

Now, as the points open, the current, finding it difficult to pass across the gap, will flow into, but not through, the condenser. This flow continues until the pressure inside the condenser becomes higher than that in the circuit. The current then flows out of the condenser in the reverse direction. By this time the contact breaker points are opened to their full extent and the current cannot pass across the gap between them. It can, however, flow back through the primary coil. This it does, so stopping any of the original current which is still flowing. This action takes place very rapidly, bringing about the desired sudden stoppage of primary current and rapid collapse of the field.

THE SPARKING PLUG



Copper washer are fitted between the cylinder of the plug body & between the body of the plug and the ground ring. To form a seal between the copper pin & the ground ring the latter is designed with position. Mica or glass shrapings are used to resist burning by the spark.

A deposit of copper on the central pin assists in the dissipation of heat.

The shell of mica is formed of shrapings of about 1/16" thickness and provides electrical insulation between central pin & body. The mica washers prevent the shrapings from heat & mechanical damage.

In sparking plug is the means whereby the H.T. current induced in the secondary circuit is allowed to produce a spark in the cylinder. The spark occurs at the gap between the central electrode & one or other of the body electrodes. The central pin, carrying the central electrode, is insulated from the body by a shell of mica shrapings.

Landings of gap just the plug would cause overheating & breakdown of the insulation & consequently, misfiring. Therefore the central pin is seated within

the body by the ground ring & glass washer & a second washer makes a seal between the body & the cylinder wall.

Spark plug vary in size and shape according to the engine for which they are designed but they all embody the principles briefly stated above.



The gap between the electrodes provides the current flowing when the voltage is rising.



Deposits of carbon at lead on the mica insulation will conduct the current from the central electrode to the plug body.



On service type magneto the gap is between 'on' & 'off'

THE AUXILIARY SPARK GAP

The 'on' gap of a perfectly clean plug acts as an insulator during the rest of the secondary voltage. Current cannot leak away while the pressure is rising. Naturally it drops and then builds the voltage to high enough to fire the next spark across the gap.

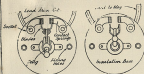
Plugs do not long remain clean when in service. Deposits of carbon, sodium 'liquid' fuels and acid, build up on the surfaces of the main insulator. Both carbon & lead are conductors & therefore current can leak across this surface during the fast period when the secondary voltage is rising. The loss causes the voltage current across the same value as it reaches when the plug was clean. & probably no spark will occur at this plug gap. That is one reason why plug must next to be cleaned & cleaned after every short period of engine running. In spite of this frequent cleaning the deposits are still present & means may be found to make a high voltage possible even when the plugs are dirty.

This is done by incorporating a second gap in the secondary circuit. It is so arranged that the current must pass across both gaps in order to complete the circuit. The second gap, known as the auxiliary spark gap, acts in this way. As the time of firing nears the secondary coil the voltage begins to rise. The gap prevents the current flowing across the insulation of the plug & so the voltage builds up to a level which it is high enough to force current across both gaps.

This auxiliary gap may be situated anywhere in the secondary circuit. It is most practical, however, to have a gap between the main electrode of the distributor rotor & the segment. When in place it is called a Rotor Air Gap.

It should be noted that although the auxiliary spark gap prevents plugs to be left on the engine for longer periods than would be possible without the gap they eventually become fouled that working will become erratic or stop altogether. Therefore, regular cleaning is still essential.

THE IGNITION SWITCH.



"Switch Closed"

Switch Closed
Circuit Complete

By Spark at Plug
Switch Closed

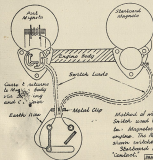
"Switch Open"

Switch Open
Circuit not Complete
through Switch

Spark at Plug
Switch Open



The Switch is so positioned in the Primary Circuit that when it is closed, the current can still flow when the contact breaker points open.



Method of wiring a twin lead Switch used to control the two Magneto of an aircraft engine. The two Magneto are shown switched off and the Sparked Magneto on "Contact."

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1933/34

THE SAFETY SPARK GAP.

Working at the plug gap causes the electrodes to burn away. The resistance to the flow of current increases as the gap widens until the current cannot pass across the plug gap. This causes a rise in the electrical pressure and possible failure, overheating, burning of the insulation and possible failure of the structure. Therefore an alternative path is provided in the form of a safety spark gap which offers such a resistance that the current will flow across the plug gap while that gap is within normal limits but if it becomes too wide the current takes the alternative path across the safety spark gap before the E.M.F. reaches such value that damage to the insulation of the coil may occur.

A/B.

THE IGNITION SWITCH.

1066/6.

The E.M.F. in the Secondary Coil is induced by the collapse of the magnetic field set up by the Primary Current. This collapse occurs whenever the contact breaker points are opened. In some circumstances it is necessary that the engine should be turned but that no spark should occur; although the contact breaker points operate mechanically there must be no interruption of the Primary Current and consequent collapse of the field. By placing a switch in parallel with the contact breaker an alternative path for the primary current is provided when the switch is closed. When the switch is open the flow of primary current is controlled by the contact breaker in the ordinary way.

Each magneto must have its own switch in order that the magneto may be switched off independently for testing purposes. Where dual ignition is employed a twin knob switch provides the necessary control. This has two "positive" terminals and one "earth" terminal, with means for connecting one or both positive terminals to the earth terminal. A lead from the insulated side of one contact breaker is attached to one positive terminal. A third lead is arranged to convey the current from the earth terminal back to the magneto bodies, either through the engine body or through the brading of the switch leads as shown in the diagram.

The Switch used is normally of the tumbler type. It is so placed on the instrument board that when the knob is pressed down the switch is closed and no spark will occur. When the knob is pressed up the switch is open and the flow of primary current is controlled by the contact breaker. Therefore as the points open a spark will occur, at the Sparking Plug Gap.

When the switch is closed it is said to be "OFF" and when open "ON" or "ON CONTACT".

A/C.

CHANGING A MATED H.T. LEAD

FIRST THE UNDERDRAGS LEAD IS REMOVED FROM THE ENGINE. THE NEW ONE MUST BE AN EXACT COPY AS TO LENGTH. THE PROCEDURE IS AS FOLLOWS ON A VENTRA ENGINE.

1. Tail not longer than body 3" longer than full length of epl. band.
2. Based on interdistances, shape of distichodus and.
3. Based on color pattern.

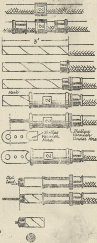
END OF END

1. Strip handles 1/2 inch and seal this against water outside.
2. Roll around pipes.
3. Glue down and seal edges together with special glue.
4. Measure insulation above against support walls, and make a mark.
5. Saw, scribe, measure, cut off conductor to suit for terminal and insert the line wire into lower pipe and lay between wires above.
6. Glue it in between, it stays and isolates.
7. Remove, and measure 1/2 inch and lightly tape sides by string, using again, no glue.

2025.05.22 14:40

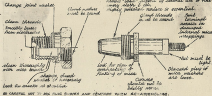
- 3) Merges or bond against old one and makes all other breeding ends.
- 4) Interactions with play and to connect ideas (long type.)
- 5) Merges as above, bond observed consistently, and drop of connection type away to himself.
- 6) The Merges, after 1/2 of connection to project and out of himself.
- 7) Bond projecting efforts are radiating and others by sharing.

N" - AFTER ASSEMBLY ON ENGINE
TEST FOR CONTINUITY BY LAMP
AND BATTERY FROM SEGMENT
TO PLUG. -

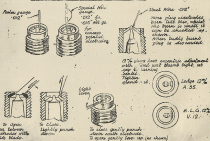


CARE AND MAINTENANCE OF SANDING PULPS

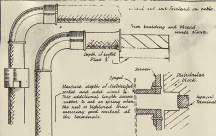
It is important to note that the above information is for informational purposes only. The actual results of the study may vary depending on the specific conditions and parameters used.



CHECKING AND SETTING ELECTRODE GAPS

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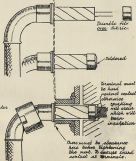
Post No: 1000-00 Issue: LITTLE CARPENTER GREEN and New Village
Address: 1000-00 Phone: 1000-00



In certain engines in that B.T.H. and other magneto can be interchangeable. The B.T. lead fillings are made common to both. Each lead is fitted separately and has a special die lead which produces the lead of the lead to the distributor. Distributors with this type of connection require mechanical taping for continuity. It has been found in several cases that when a lead is lightened, instead of the cable being compressed a little and remaining in it works back into the housing. Also while the contact of the terminal causes and sparking takes place which besides increasing the resistance damages the distributor block by heating. If this fault is corrected cable must be changed.

PREPARING CABLE ENDS FOR DISTRIBUTORS OF MAGNETOS "B.T.H. & WATFORD" USED ON PEGASUS ENGINES.

Rep. No. 1166/6



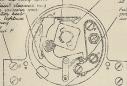
Caution to be observed and before lightening the rest, to destroy good contact at terminals.

CASE 5. MAINTENANCE OF CONTACT, REARER

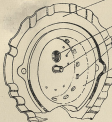
Abstract

Clemens - **Brown**, East
Springfield, Ill., dated Jan.
19-1908 - 11,000' below
surface at base of hill.

Individuals concerned in
this investigation were
of varying degrees
of mental disturbance
at various times
during the investigation.



CARE AND MAINTENANCE OF THE DISTRIBUTOR.



1. *Little condition of spark plug is fit on the front plate of magnet.*
 2. *Check oil around wiring plug at the main distributor.*
 3. *In hot climates distributor sometimes distorts, in which case joint carefully. Keep under oil.*
 4. *Make sure the timing brush is free in its socket.*
 5. *Capacitor requires an occasional wipe with dry cloth.*
 6. *Spot carefully the signs of oxidation. High tension contact leads easily over this causing erratic sparking. If present distributor will have to be removed and dried very slowly.*

Check distributor for cracks especially near top edge.

Be very careful when connecting the cables from the spark chest, sometimes it is a little stiff to withdraw. If the first pull causes the brush to strike the chest and back. Remove brush and clean in spirit, never off dry surface about around the brush. Be careful when connecting brush to avoid damage to the spring. Brush must be free in its socket. Contact point of brush must be smooth and shiny.

Check for leakage between distributor with magnet.



LUBRICATION

The degree of engine oil in each side of each lubrication oil magnet is fixed installed, also after every 40 hours running.
Engine should take for more than a fortnight this lubrication must be repeated.
Use the oil 5 at 100 lbs.
Good always carefully.



The handle for this cap is 10" - 12" when the gear wheels 100" after must be changed. Front with diamond distributor and back. Front new surface. If gap is not in, gear wheel must be moved. 100" after 100" after.

LUBRICATION OF MAGNETS.

1000/11.

Little power is required to drive a magnet (about 1/10 H.P.); therefore as very little friction is produced, little oil is needed in service.

Some small magnets have their bearings packed with special solidified oil to last about 500 hours running.

This lubricant is removed when the magnet is overhauled, no other provision is made.

Frequent lubrication is therefore unnecessary.

Instructions for lubrication are usually printed on each magnet. (Further, on S.T.E. & Harford polar induction magnets used on R.A.F. aircraft engines, it is now standardised as follows:-

AS Installation:-

Front & rear lubricators - 5 drops in each well.

Cam lubricating pad - 1 drop.

C.R. rocker wick (S.T.E. only) - 1 drop.

Repeat at 40 hour intervals.

Use:- OIL LUBRICATORS, ARMO ENGINE, MINERAL WINTER GRADE. (80-90 W.D. - 240/35).

Note:- These instructions must be carried out when the magnet is being fitted for the first time, also if engine has been idle for more than a fortnight.

Installation of R.T. leads must allow lubricator caps to be properly opened.

Although these magnets have oil drain holes below the bearings they should always be carefully lubricated.

To prevent over-lubrication, the best method to employ is a bottle with a wire through the cork and count the drops one by one.

EXCESSIVE LUBRICATION CAUSES TRIPPING THROUGH OIL CRIPPING ALONG TO THE CONTACT BREAKER. SOME OF THIS FINDS ITS WAY TO THE C.R. POINTS.

A LITTLE SPARKING OCCURS OCCASIONALLY AT THE PLATINUM POINTS THIS DUE TO THE OIL WHICH IN TIME CAUSES EXCESSIVE SPARKING OF THE POINTS AND RESULTS IN SEVERE PITTING.

THIS PITTING, TOGETHER WITH THE CARBON DEPOSIT FROM THE BURNED OIL, IN TIME INTERFERES WITH THE FREE FLOW OF PRIMARY CURRENT ALONG THE POINTS WHEN THEY ARE CLOSED.

THIS CAUSES IRREGULAR SPARKING AND SERIOUS LOSS OF POWER. FREQUENT BUT SKILLFUL USE OF THE CONTACT FILE WILL MAINTAIN CONTACTS IN GOOD WORKING CONDITION.

SWITCH CIRCUIT - CONTINUITY TEST

This test is used to prove that communications in a standard cell have no means, because at all kinds times is a case of fairly constant. In an ordinary situation against fairly constant at a point very much independent of complete facilities of access to them. This could be dangerous when water is supplied to the "top". A low ceiling (low) of lamp & ceiling in the test continues to be because of the lamp goes a bright & continuous light under the ceiling. communications can be seen.

[illegible]

by heavily the student is loaded by having points as shown in. The attachment is the same in the majority. Apply lamp, joints to point where contact is needed is picked up and avoid burning of of carbon.



Do not withdraw lead from L.R. cover and apply
long leads as shown. A slight continuous
light could indicate that main terminal is fairly
grounded by rooted assembly. Flicking light
indicates a fault. In lightning storm is
suggested not to strip the strand.



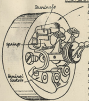
When a switch is closed the lamellar blade is forced between the springy contacts. It makes sure there is a metal electrical contact at those points against the lamp as shown & operate switch. A contact is not forced gently unless contacts improve but make sure that lamellar blade enters smoothly and easily.



Below are 3 examples to show how substitution may be
used for generalization and a proof.

Remained till the joint report
of the Long and Dickey gals.
indications of best kind.

MAJOR PAGE OF SUMMARY



The investigation has made it possible to select the support for the maintenance of the workers' compensation on that basis there is another correct finding. Republics cannot take this to say, though on a subject like this will make mistakes to be admitted regarding the

② insulation, propagation of them in travelling on public spending it is something out of the average. The springs are fitted to ensure that a definite "make or break" takes place in movement of the beam. Spring tension is fitted to maintain movement to give at about 1000 lbs. which should be applied to springs and when in contact, a steel spring may be the means of a magnetic coupling and strong collection of attraction in itself. When which is about 1000

of transfer you want to firmly support by detailed comments which are made orally for this purpose. Sometimes contact is not made & written although apparently "closed" is usually open. This is dangerous to maintain. Leaving copies by hand as it may close unexpectedly. Again, asked by gentle advice of contacts on the way out.



twisted, multi-laminated, we gripped its outside by small screws. One space made quite sure contact is assured. On some lines, switches the handles simply operate very close to each other. Some have a second plate, which has contact to one switch, has been left in "open" position which is dangerous. The chain or any switch is not quite smooth in its action, always it.

Before being a parasite noted to its supposed male
ance that kinds of quadrants, being across and
usually with their mouths, lightest note gradually
with these parasites are necessary to avoid
creating the host.



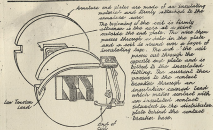
Before entering I.T. lands I-60 terminal, workers note that this land terminated as a waterbury sloughs & slips & slips easily into place. The second terminal is now in a lake which is located under investigation for about 1/2 of finally released in captivity. After lightning struck across the second rail to slip the second one in small area's above.



proposal to reform allotted to supplies a political change in
double and for a new one proposal and

B.T.H. ROTATING MAGNET.

PRIMARY CIRCUIT.



The shape of the Main Spring makes auxiliary springs unnecessary.

The pillar supporting the roller containing spring acts as a stop for the roller. There is no roller buffer spring.

The roller joint is hollow & contains a lubricating oil.

Insulated carrier block.

Insulation

H.T. Lead



Sheet
Fig. 10

THE HAND STARTER MAGNET.

These magnets are used where starting an engine, thus function being to supply H.T. current to the starting electrode on the distributor rotor of the main magnets while the engine is being turned slowly by the main magnets and requiring at a speed insufficient to produce a spark.

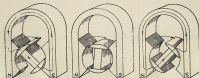
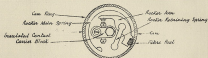
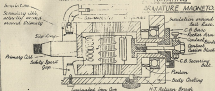
Starting magnets are of the rotating armature type & are driven through a 2:1 step up gear by one of three methods namely - direct by hand, by hand through a double gearing gear or coupled to the engine either for manual or power operation. When an engine is running at normal speed the spark is timed to occur when the piston reaches the top of the compression stroke. To ensure the spark running in the correct direction of rotation when starting, the spark must occur just after the piston has passed T.D.C. and is depending on its gear ratio, normally when the current is being supplied by the main magnets, the main electrode of the distributor rotor is opposite the segment appropriate to the cylinder in compression. As the engine is turned to the starting position the main electrode will move away from the segment. Therefore it is not possible to supply the current from the H.T. magnets to the main electrode. The starting electrode is so situated that it leads before the main electrode, the angle at which it is set behind the main electrode depends upon the number of cylinders, the fully advanced position together as an automatic timing device are fitted to the magnets. When the angle, the starting electrode approaches the segment at the rotor reaches T.D.C., H.T. current from the H.T. magnets will pass to the segment & a stream of sparks will be delivered to the electrode. The coil continues until the resistance rises in the system as with the electrode is approaching the next segment. It should be noted that the H.T. magnets is not fixed relative to the commutator. As is turned as fast as the engine will allow. When a H.T. spark has fired the main magnets are switched off & the starter magnet is switched off. A safety stop gap is incorporated in the H.T. magnets.



In hand an engine which is being slowly turned by hand it is desirable that the spark shall occur as the piston is descending on the first blow. The engine will then run on correct direction. For hand starter magnets supply H.T. current to the gear up the distributor of the main magnets. As the engine is turned to the starting position the main electrode of the rotor moves away from the segment and the starting electrode moves towards it.

Page 10 - 1909/12.

ROTATING ARMATURE MAGNETO



Comparison of the Primary and Secondary Circuits of this Magneto with those of the Polar Inductor Magneto shows that they are fundamentally the same. In principle the Magnetic Circuit is also the same, but only two magnets of flux wound in the soft iron core during the revolution of the magneto spindle. Therefore the magnet of this Magneto is too weak to get insulation. The above diagrams show how the reversal of flux occurs. The change takes place when the core is in the position shown in the middle diagram.

Revised by [illegible] [illegible] [illegible] [illegible]
Approved by [illegible] [illegible] [illegible] [illegible]
1922/7

THE ROTATING ARMATURE MAGNETO. 1044/3

This magneto works on the same basic principles as the Polar Inductor magneto, the magnetic flux reversing through an iron core upon which are wound the primary and secondary coils.

THE MAGNETIC CIRCUIT.

The armature rotates between the poles of a magnet which is usually of a horseshoe shape. The diagram shows how the flux reverses its direction through the core as the armature is turned. This change of direction occurs when the armature core crosses and magnet pole pieces are in the same relative position as those in the Polar Inductor Magneto, but only two changes occur in one revolution of the spindle.

THE PRIMARY CIRCUIT.

The Primary Circuit is the same as that of the Polar Inductor Magneto, except that most of the components are attached to the armature and rotate with it. The diagram shows that the circuit differs only in constructional details. An extra component is the Auxiliary Carbon Brush behind the contact breaker base. Normally the current completes its path through the spindle and this brush provides an alternative path. As this brush conducts the current to the body of the magneto and as the body is insulated from the armature by insulating material around the outer faces of the bearings the current passes through the H.T. Return Brush on its way back to the Primary Coil.

The Condenser is enclosed in a bronze case and actuated between the windings and the piston which drives the distributor rotor. Its construction and functions are the same as those of the condenser of the Polar Inductor Magneto.

THE SECONDARY CIRCUIT.

Again the construction is the same as those of the Polar Inductor Magneto. One end of the Secondary Winding is attached to the Primary Winding just before the latter passes to the contact breaker. After passing around the primary the other end of the secondary is attached to the insulated Slip Ring. This is a brass ring attached to the spindle but insulated from it. A carbon brush bears on the slip ring and conducts current to the Distributor Rotor.

The remainder of the circuit is the same as that of the Polar Inductor Magneto except for the addition of one (or two) H. T. return brushes. These are fitted because the armature rotates and is insulated from the body. These brushes conduct the current to the condenser case from which point it passes through the primary and so back to the secondary.

1/3.

PERIODICAL INSPECTION AND CLEANING OF ROTATING ARMATURE MAGNETO.

1. Disconnect HT leads when tested, never connect them to distributor, rotor or commutator directly.

Remove magnets from distributor, inspect and clean externally.

2. Remove distributor cover and clean inside according to schedule.

3. Remove and clean rotor, examine carbon brush, remove brush, inspect rotor for cracks.

4. Remove back cover plate with rollers and clean brush holder, and brush and rotor.

5. Remove distributor if broken commutator.

6. Remove any worn rollers, replace commutator rollers if worn, inspect for cracks, clean.

7. Remove C.B. cover, replace springs if worn.

8. Inspect cover for cracks.

Remove bottom for good contact and also points, examine for condition.

9. Remove cover housing, note in detail and lay off lubricate and in case.

10. Remove contact brushes, inspect alignment of contact points.

11. Inspect and remove, examine brush.

12. Remove roller and clean it, inspect condition of roller, top and back, inspect springs - clamp if necessary, inspect points, file if clean, clean and trim.

13. Re-examine contact points for contact.

14. Remove front of C.B. housing, inspect roller, C.B. making sure they enter lightly and evenly, point to right.

15. Remove cover housing, adjust gap of C.B. points and adjust if necessary to .002".

16. Remove and clean make, examine brush and holder.

17. Remove assembly and lubricate according to instructions of eng.

18. Remove magnets, connect and check range of C.B. contact, connect HT leads and switch etc.



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St. Paul, Minn.
Telephone 100

an ancient, their work is just now being written, is important to start the language. They are devoted to produce their beautiful but it is still very primitive. It is only way to make some culture is gradually in Ministry since the revolution. But according to me, I don't lead to making independent since a great accumulation is there, no idea of freedom. As with nature, the nature language was used in natural, when idea is there.

[illegible]

Figure 1

This is their most common position. It cannot be avoided, spreading across the gradually burning mass of the electrodes a long grey molten smudge of metal, sufficient for the spark.

The standards have also had to meet the requirements that a high percentage of the distribution should be within the range of 10 to 20 percent.

Older sister says: "I would like to go to the electrical engineering department to study it, in other words - the quantity."

"If this sparkling village becomes too high it will retard the expansion of the market, restricting the efficiency of the installation of the coal market in this municipality. National Association believes the coal the manufacture in western to the market this is just a small

After planning to participate in the weekly youth league games, the student then went to the tennis courts to play tennis. This does not mean that the player actually played tennis in order to receive the prize, but because the student had to play tennis to receive the prize, the student received the prize by playing tennis. The student did not play tennis in order to receive the prize, but because the student had to play tennis to receive the prize, the student received the prize by playing tennis.

[illegible]

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The effect of oil on a play is often misunderstood. Oil is an immediate, but it will not stop or speed jumping across the periods of any efficient play which is caused by an efficient tempo, because the spirit itself moves the audience of the oil. The principal fault with oil is that it is not a play in itself. It is true that some oil is making the play more in getting back to the same in being performed. This means with the oil the jumping film is created over the audience which causes technical bridge. If there is a word that character and content, the content is understood through the material oil. This sometimes happens in the better application of material & other imagery with enough imagery, but only cause hardly ever shifting. They are not performing when viewing played that the oil application is not a real success.

A technical diagram of a piston and connecting rod assembly. The piston is at the top, connected to a connecting rod, which is in turn connected to a crankshaft. The assembly is shown within a cylinder. Labels include 'Lubricating' at the top, 'Piston' pointing to the piston head, 'Connecting Rod' pointing to the rod, and 'Cylinder' at the bottom.

Arbeitsplan: wie wird das Flug antriebsystem in der Entwicklung der
nationalen Luftwaffe von 1933 bis 1935 (Arbeitsplan der Entwicklung
des deutschen Luftwaffenprojekts)

There is a better technique and it is called *double wrap*. This is done by wrapping the tape around the object twice. This is done by wrapping the tape around the object twice. This is done by wrapping the tape around the object twice.

[illegible]

Revised "Landings"
done by working paper
method in March of 1941
in field.

The ignition is the ignition of gases by compressed
puffs in the combustion chamber under the spark
candle. It may be also a compressed plug and
therefore great care is taken to show an almost
plug that will not expand under the normal running
conditions of the engine in which it will be used.

[illegible]

Greenhouse, 10
 10000, 10000, 10
 10000, 10000, 10000
 10000, 10000, 10000
 10000, 10000, 10000

They will absolutely murder me and will kill me & swallow them. It is surely impossible and almost certainly is not worth the trouble or actually, but must have, say the possibility. Then it is an exceptional incident but the end of it becomes rather, making different from what a particular one might be selected only after consultation. Suppose something like that, various circumstances. Perhaps that is all that is in the mind of the writer.

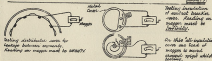
These are the only two cases where the system is not in a state of equilibrium. In the first case, the system is in a state of equilibrium, and in the second case, the system is in a state of equilibrium.

INSULATION TESTS ON IGNITION COMPONENTS.

Most of the following tests are necessary to detect those intermittent or complete leakage in testing place over the various of associated components of the ignition system.

The cause of this is usually resulting something from contamination, as oil, grease, mud, etc., sometimes the cause is carbon or metal dust. In most cases thorough cleaning & drying cures the defect. Sometimes insulation becomes damaged & high tension current jumps through the crack in the form of a spark. In some cases, however, will not usually leak through a small well maintained or dust free & leakage path there.

Intermittent misfiring & difficult starting are the major symptoms which indicate that leakage may be taking place. When defects cannot be located by visual inspection the wagger should be used. The following examples indicate where the tests are applied. In all cases components should not be tested until a satisfactory result is obtained.



The above are only a few examples of how the wagger may be used to test insulation between a high-tension conductor. Further examples are given in notes dealing with insulation tests applied to the switch circuit.

INSPECTION OF HIGH-POWER OF ENGINE.

Braded ignition cables are now used on all high-powered aircraft to resist in preventing interference with wireless installation.

Frequent inspections of cables and their fittings is necessary, as even slight damage may lead to leakage of current with consequent loss of engine power.

It should be remembered that when the engine is running the voltage of the current is very high and is capable of jumping any weak point in the insulation or leaking over the insulation. If it is over only slightly damp.

This may cause intermittent misfiring or complete misfiring. Good contact at joints is tested by lamp and battery. This is called a "Continuity Test".

A lamp is of no use for testing for leakage; a wagger is used for this and its application is shown in the section dealing with the switch system.

This is called a "Insulation Test".

If the wagger reads anything less than infinity the lead must be changed.

Sometimes damage to leading leads to damaged insulation. It is then possible for the current to jump through to the leading which is "arched".

Therefore very careful inspection is necessary at all points where bridging is likely to be damaged by other fittings, or where insulation may be effected by heat.

Most of the trouble experienced on H.I. cables is in process of elimination by the use of specially designed "barrows".

This consists of conductors in which the leads are permanently sealed except for a short length at the sparking plug end.

If defects develop which may cause trouble in handling the harness is changed.

SWITCH CIRCUIT INSULATION TEST

Insulation is used to prevent electricity flowing along the normal path. If a conducting bridge, such as moisture, carbon dust, or metal dust forms over the insulation, current will then leak over these conductors and therefore not take the normal path.

When making these tests

C.B. wires must be completely detached from circuit

Switch Switch Open



These switches should always be open. Procedure to detect such leakage is as follows. This instrument is connected by means of leads to the two poles of an a.c. source, and by turning the handle in a steady position is operated. Any leakage will be indicated by the hand on the scale moving away from zero. Any leakage must be made to break the leakage and eliminate the cause.

HEMITY indicates abnormal resistance by insulation - the leakage indicator and resistance

Switch leads must be tested every 10 days. When the magnet is placed, open switch. (Contact) later magnet. Switch should reach zero. If leakage is indicated switch must be closed or daily cleaning of the original may be required.



To test the position of the switch, first detach the C.B. wires and connect magnet to switch. This will pass current over leakage in testing glass and at through the insulation in the case.

If reading is less than HEMITY, always test.



Next test the switch. Place switch in open (Contact) position, and connect magnet and switch. If reading is less than HEMITY, always test.

Do not test the switch. One lead of magnet on switch, the other on the handle. If reading is less than HEMITY, all is well.

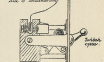
Other insulated parts of the ignition system are to be tested in a similar manner as for switches. However, distributed capacitors, the insulation of C.B. cables, block also

IGNITION SWITCH INSULATION



An important sign of ignition system has the insulation & mechanism involved in a switch. It is shown that the switch is connected to the metal instrument board which by being attached to the instrument has metallic connection with both magnet and switch. In order to test the switch, a magnet is placed on the switch with the metal bar which completes the primary circuit through the switch and the other metal housing of the coil.

To test insulation of a switch, apply magnet to switch. The switch will operate. Magnet must be 'switched' if change is made to switch.



When switch is closed, current flows through the switch mechanism to the magnet. When the switch is closed, the magnet is the switch. The switch is the switch.

To test for continuity, connect lamp & battery leads to the switch. The switch will operate. Magnet must be 'switched' if change is made to switch.

REPAIRING SWITCH LEAD TERMINALS



When repairing switch leads, remove magnet of switch very carefully. The magnet must be removed. The switch must be removed. The switch must be removed.

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CHANGING MAGNETS ON AIRCRAFT.

- (1) Removal of magnetizable magnets.
Detach spring from magnet, and position lower magnet S.B. in which mag. was previously set to desired adjustment. Disconnect magnet by removing bottom nut and lock washer, magnet coupling. As the base was secured into engine, this provides that no holding spindle which nut is unscrewed, also extraction for withdrawing coupling from spindle.
- (2) Replacement of new magnets. Insert magnet alternately & "take up" to mounting. Magnets must be snug fit to bearing. Do not pull magnets into position by tightening nuts. If fit is too tight, clean thoroughly & test for burrs, burrs cause very seriously.

Install new magnets by following instructions on magnets.

Check full open gap of 0.001 in. & if necessary re-cut, carefully &

"0.001" this is very important because if magnets are closed with 0.001 gap increased the timing will be upset the first time points are re-adjusted.

Test magnets for spark by spinning the spindle sharply. Sparking should occur at the safety spark gap. If there is no 0.001 gap, or if it is too small, make temporary gap with piece of thin wire on distributor main distributor.

Fit coupling to spindle. Lap coupling carefully & test to ensure that it fits perfectly. Test carefully.

Excessive vibration may cause a coupling to become loose which results in serious damage to the magnetizable bearings causing serious scoring.

(3) Coupling and Timing.

Set accurately to timing marks. Set distributor main distributor to correct normally implied for timing & which corresponds to timing marks. Set contact breaker to full advance & adjust frequently whilst timing to ensure 0.001 in. in this position. Turn magnets forward until 0.001 in. just break and write a line mark across the gap which is timing. This is an approximate guide when mounting magnets. Carefully test it will save time. Then mount & engage coupling. Note relative position of marks & re-adjust if necessary. Make final check with lamp & building.

(4) Comparison to make accurately. Mount magnets to mounting & test marks. Remove 0.001 in. gap. Carefully at full advance with stop magnet, this means no hole in metal this must be done very carefully & under test using the new magnets whilst setting the one thing limit. Gap of 0.001 in. test for continuity. Grounded properly. Gap & test for continuity. Re-test for continuity. Apply pressure to all magnets & re-test. A reference of conditions may vary slightly with different test.

Eng. 4744/5.

MAGNETO SPINDLE

The location and dimensions of the spindle and of new magnets spindle is illustrated as given in sketch.

A steel nut is used when aluminium magnets are employed. Sometimes a plain nut and lock washer (locking) is used.

A coupling which is part of the engine is attached to the spindle. When it separates an "empty" magnet, or when magnet is broken, it is necessary to replace with the magnet. When fitted for the first time to any magnet, the coupling must be carefully lapped at the tapered portion, with crossed papers and oil.

Clean thoroughly, then test the fit by tapping "home" lightly with a hammer which does the key and.

If fitting satisfactorily it should be very difficult to pull off by hand, no should need extraction.

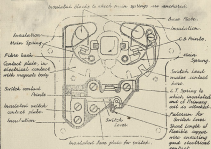
Test key in slot of spindle and coupling. It should only just move easily in both slots.

The above must be to "check" if the standard key is used.

When removing a coupling from a magnet, this has been running always against the key and coupling. This shows an wear line the key and coupling when it separates magnet body. This is key coupling and should be in the engine, and the magnet. It is this, gives the distributor which, used by turning distributor & forward magnet to break. In a short time this magnet must be changed, according to wear. Replacing coupling against is dependent upon the distance, back on spindle.

Eng. 4744/5

'WATFORD' S.P. 9-8.



This diagram shows the electrical circuit of the spark contact mechanism, with the connection of the two contact plates, the base plate and the wire, all being shown in detail. The base plate is the support body. The contact plates carry the fixed contact points.

The switch mechanism has been omitted and the switch shown in the closed position. The right hand contact baseplate, which is shown in open position, shows the other, is always in contact with the primary coil. The left hand contact baseplate is in contact with the primary coil only when the switch is closed. Therefore with the switch and both contact baseplates closed, the current, having reached the switch base plate via the low tension contact spring, may complete its path back to the negative body through either one or both of the contact baseplates.

THE SPARKING PLUG.

1900/7.

By means of the sparking plug the H.F. current induced in the secondary circuit is utilized to produce a spark in the cylinder. The plug consists of a centre electrode insulated from the body, the body being so designed that no gas escapes from the cylinder. Gas leakage results in loss of compression and power and overheating of the plug. The overheating may result in melting due to a breakdown of the insulation, one or more electrodes are provided on the body of the plug and the spark occurs between one or other of the body electrodes and the centre electrode.

THE STARTING MAGNETO.

These magnetos are used when starting aero engines, their function being to supply H.F. current to the trailing electrode on the distributor rotor of the main magneto while the engine is being turned slowly and the main magneto are revolving at a speed insufficient to produce a spark.

Starting magnetos are of the rotating armature type and are driven through a 5 to 1 step-up gear by one of three methods namely, direct by hand, by hand through a remote turning gear or coupled to the engine starter for manual or power operation.

When an engine is running at normal speed the spark is timed to occur before the piston reaches the top of the compression stroke. To ensure the engine running in the correct direction of rotation when starting, the spark must occur just after the piston has passed T.D.C. and is depending on its power stroke. Normally when the current is being supplied by the main magneto, the main electrode of the distributor rotor is opposite the segment appropriate to the cylinder on compression. As the engine is turned to the starting position the main electrode will move away from the segment. Therefore it is not possible to supply the current from the H.F. magneto via the main electrode. The starting electrode is so situated that it trails behind the main electrode. The angle at which it is set behind the main electrode depends upon the number of cylinders, the "fully advanced" position and whether or not automatic timing devices are fitted to the magneto. Whatever the angle, the trailing electrode approaches the segment as the piston reaches T.D.C. H.F. current from the H.F. magneto will pass to the segment and a stream of sparks will be delivered to the cylinder. This will continue until the resistance rises in the cylinder or until the electrode is approaching the next segment. It should be noted that the H.F. magneto is not timed relative to the crankshaft. It is turned as fast as the means of turning will allow. When a number of cylinders have fired the main magnetos are switched "off" and the starter magneto is switched "on".

A safety spark gap is incorporated in the H.F. magneto.

