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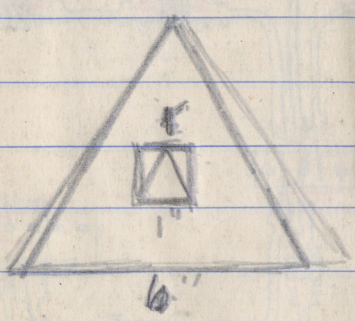
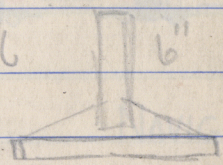
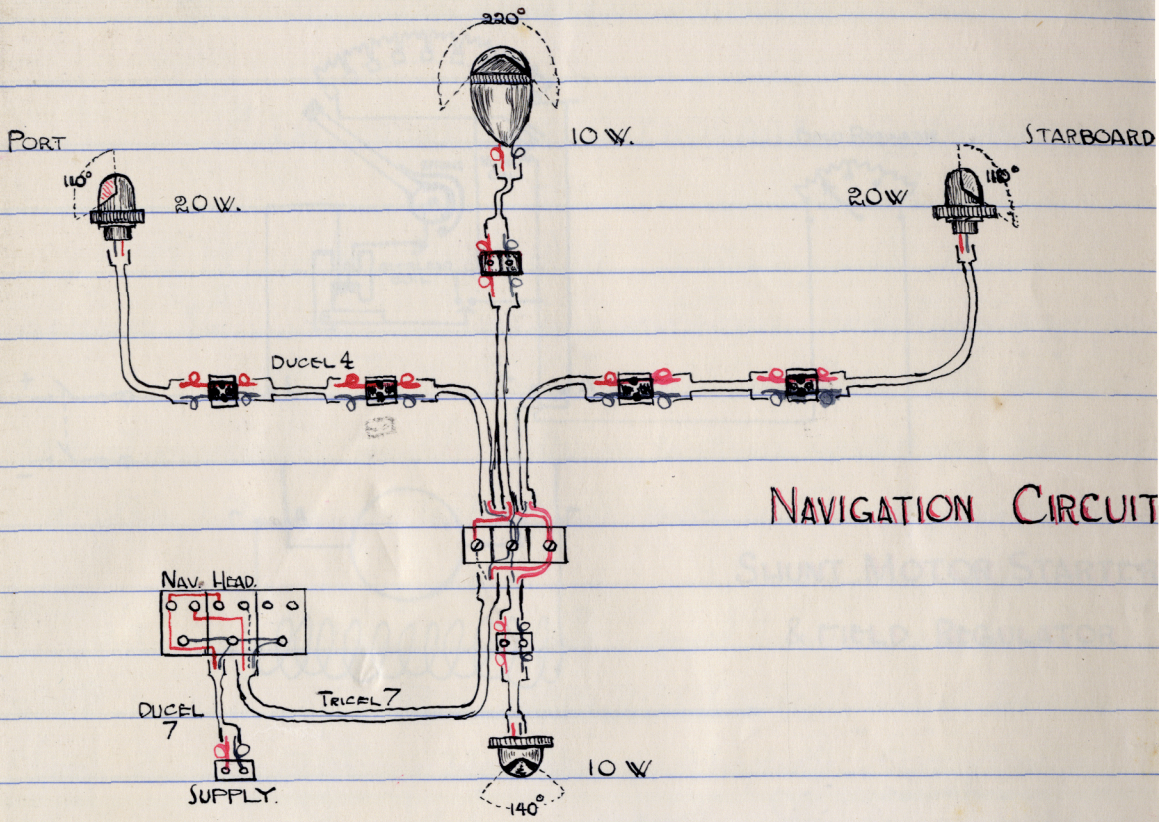
Colin Hinson

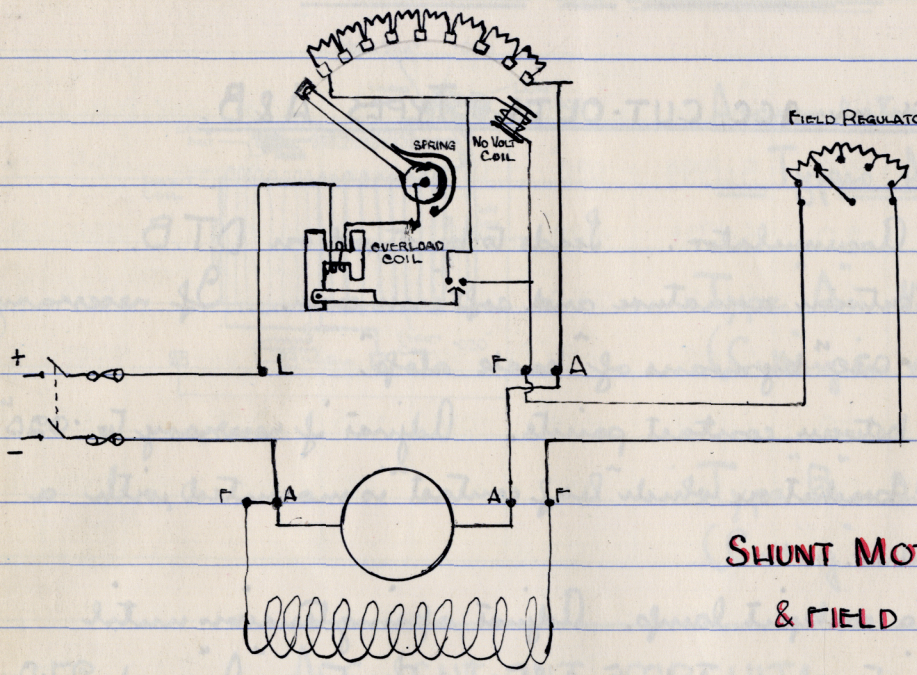
In the village of Blunham, Bedfordshire, UK.

187 D G. COX 1311377 Hut 34

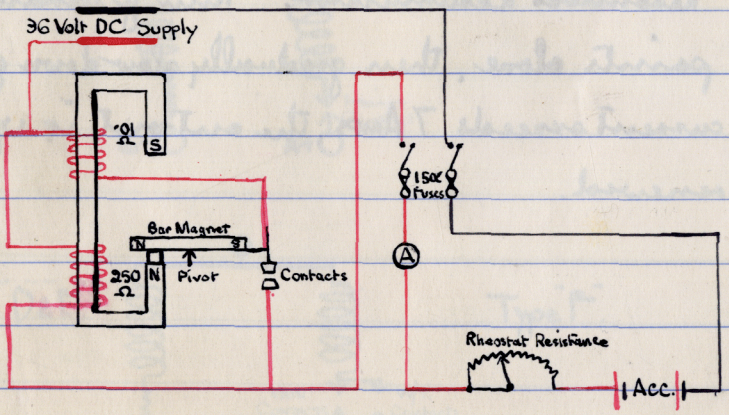





220°
PORT
10 W.
STARBOARD
140°
20 W.
20 W
DUCEL 4
NAVIGATION CIRCUIT
NAV. HEAD.
DUCEL 7
TRICEL 7
SUPPLY.
10 W
140°



SHUNT MOTOR STARTER & FIELD REGULATOR



TYPE "B" CHARGING BOARD

36 VOLT

1 CIRCUIT 10 AMPS.

R.A.F. Generators.

Adjustments on Acc. Cut-outs Types A & B.

(1) Disconnect Accumulator. Leads to be stowed on D.T.B.

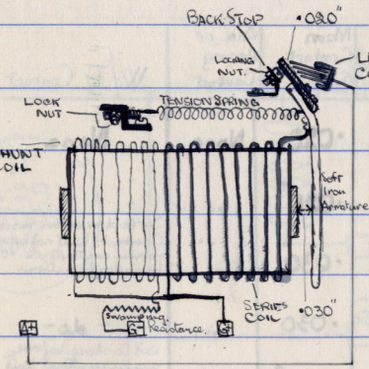
(2) Check gap between armature and soft iron core. If necessary adjust to .030" by means of "back stop".

(3) Check gap between contact points. Adjust if necessary to .020" by bending bracket on which "leaf contact" is mounted with a G B.A. Spanner.

(4) Switch on a cockpit lamp. Adjust spring tension until cut-out points close at 13.5 volts for the type "A" and 27.0v. for the type "B". (Cockpit lamp will light immediately contacts close).

(5) Replace cover. Reconnect accumulator. Run generator up until cut-out points close, then gradually slow down generator. If the discharge current exceeds 7 Amps, the cut-out is u/s and must be renewed.

R.A.F. Generators.



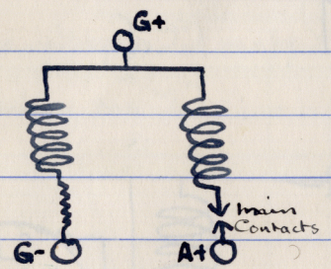
Accumulator Cut-outs Types A & B

Type "A". 12 Volt Systems (Cutting in volts 13.5)

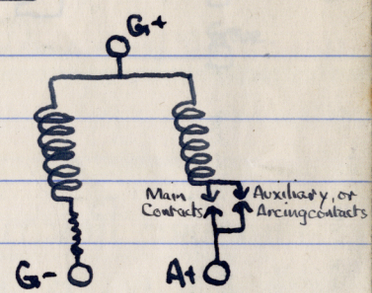
Type "B". 24 Volt Systems (Cutting in volts 27.0).

Acc. Cut-out Circuits.

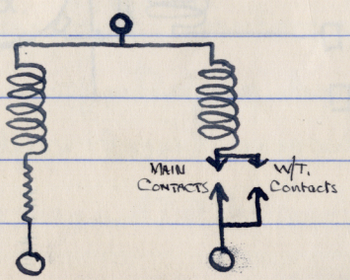
Types "A & B".



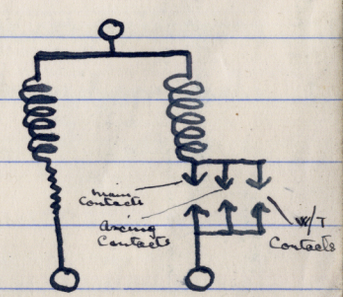
Type "C".



Types "D & E".



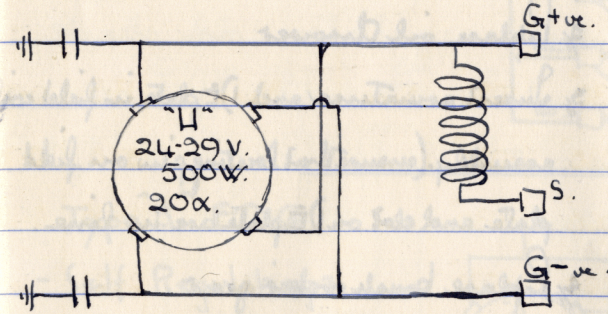
Type "F".

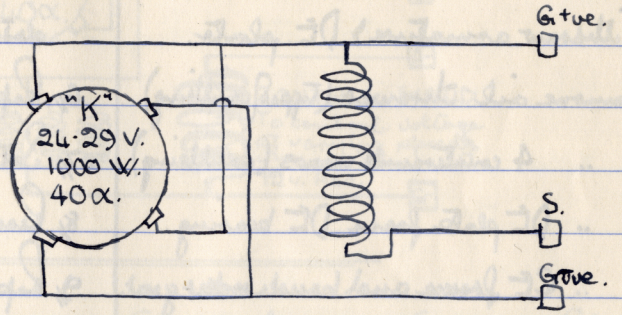


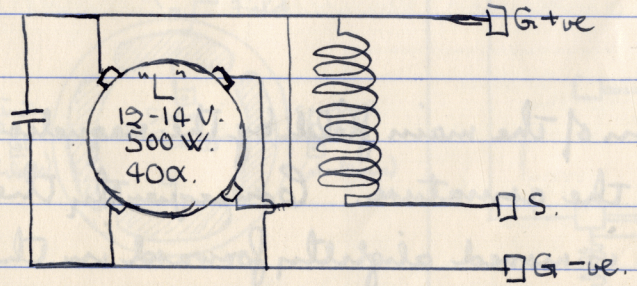
CUT-OUT ADJUSTMENTS.

Type	Volts	Amps	Ref. No.	Magnetic Gap at Pole centre	Main Contact Gap	Aux. or Arcing Contact	W/T Contact	Pull in Volts	Limits for reversed Current
A	12	20	5c/594	·030"	·020"	None	None	13·5	0-7α
B	24	20	5c/721	·030"	·020"	..	"	27·0	0-7α
Modified C to D.	12	60	5c/1615	·060"	·030"	..	Set to close before main Contacts but not before main contacts are ·005" from closed position	13-13·5	5-10α
-do-	24	60	5c/1616	·060"	·030"	..	-do-	26·27	-do-
F	12	20	5c/1478	·050"	·020"	·015	set to close before main contact but not before auxiliary	13-13·5	0-8α
F	24	20	5c/1479	·050"	·020"	·015	-do-	26-27	-do-

SHUNT WOUND E.D.G's. TYPES 'H' 'K' and 'L'







Dismantling Type "L" EDG's.

1/ Remove C.E. air jacket (locking wire)
2/ .. C.E. plate (4 c/sunk screws) (Shakeproof washers)
3/ .. C.E. inspection cover. (locking wire)
4/ .. Brushes & disconnect field leads (spring washers)

DO NOT BEND FIELD LEADS.

5/ Remove C.E. bearing cap. (caulking)
6/ .. 4 Drawbolts (caulking & spring washers)
7/ Withdraw armature & D.E. plate.
8/ Remove oil thrower (Type) (caulking)
9/ .. 4 countersunk screws (caulking)
10/ .. D.E. plate from D.E. bearing.
11/ .. C.E. frame and brush rocker gear.

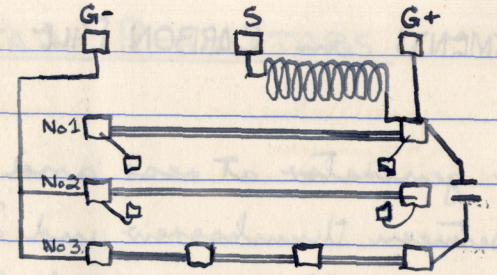
Assembling Type "L" E.D.G's.

1/ Reassemble armature & D.E. plate.
2/ Replace oil thrower
3/ Insert armature and D.E. plate in field coil assembly. (ensure that locating pin on field plate and slot on D.E. plate are in line.
4/ Replace brush rocker gear.
5/ .. C.E. frame. (see that locating pin & slot are in line.) Secure the 4 draw bolts)
6/ Replace brushes
7/ Set brush rocker in correct position (previously marked)
8/ Reconnect brushes and field.
9/ Replace C.E. inspection cover and C.E. plate
10/ .. C.E. air jacket.

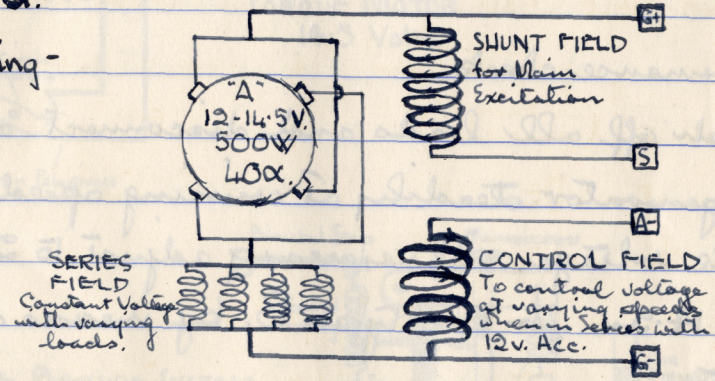
Armature Reaction.

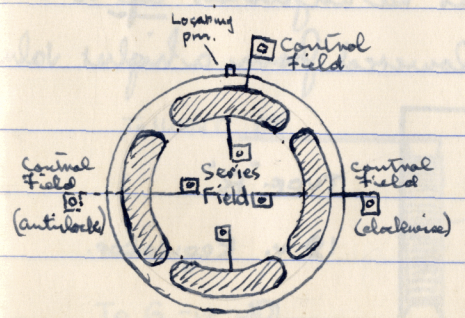
This is due to distortion of the main field by the magnetic field produced on rotation of the armature. Consequently the electrical neutral axis is moved slightly forward in the direction of rotation from the geometrical neutral axis, and the brushes must therefore be moved to this new position for the greatest efficiency.

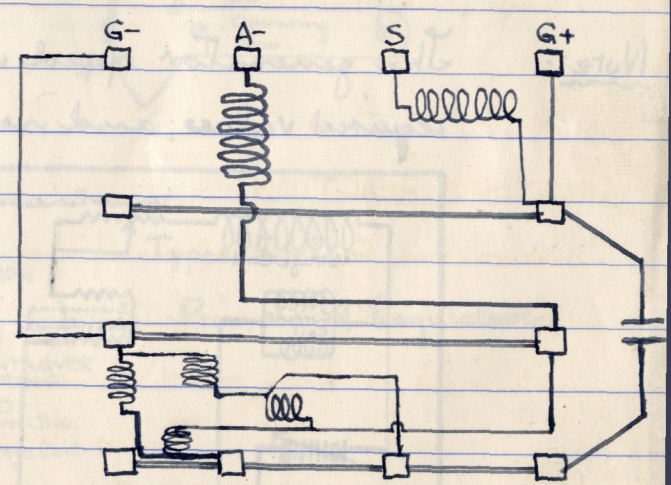
Type "L" Generator. Internal Connections.



Type "A" E.D.G. - Self Regulating -







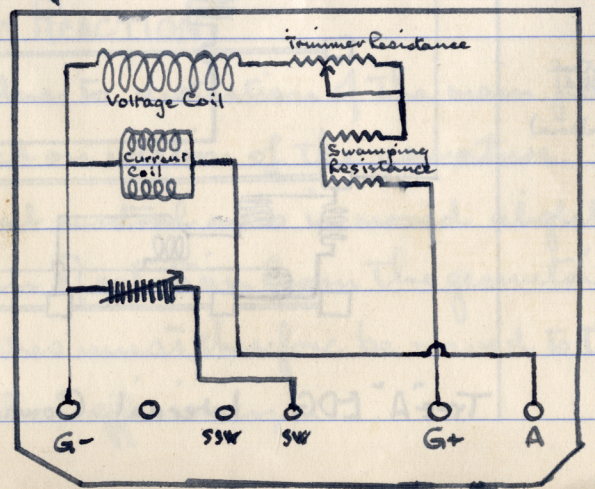
Type "A" E.D.G. Internal Connections.

Adjustments on Carbon Pile Voltage Regulators - Types A & B.

1/ With generator at rest and regulator cold check gap between thumbscrew and Invar rod. If necessary adjust to .0015" by means of the feeler gauge provided.

2/ Performance check.
Switch off all loads and disconnect accumulator.
Run generator steadily at cruising speed (4,000 R.P.M.).
Check voltage. If necessary adjust to 29 v. for Type A. and 14.5 v. for the Type B. by means of the trimmer resistance.

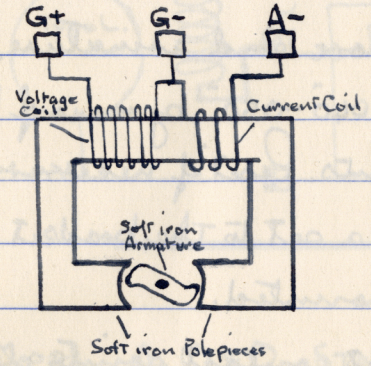
Note:- The generator speed must be adjusted up to the required values, and not lowered from a higher value.



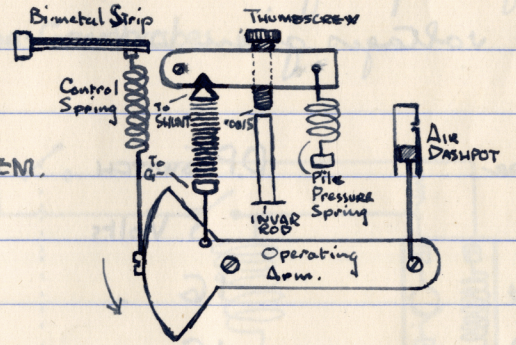
Type "B"
12 v. Regulator.

Carbon Pile Voltage Regulators.

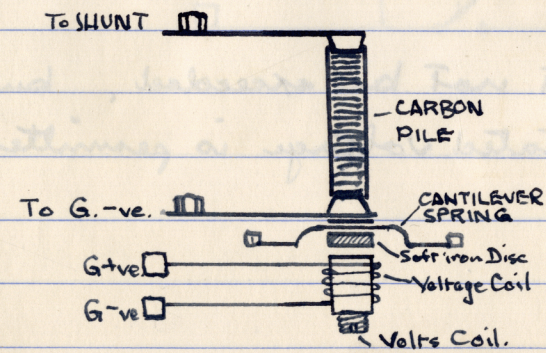
Types A & B.



Torque Motor.
14.5 Volts.



Pile Pressure System.



Types C & D.
Principle of Regulator.

Adjustments on Starters - Types A, C & D.

1/ Disconnect Accumulator

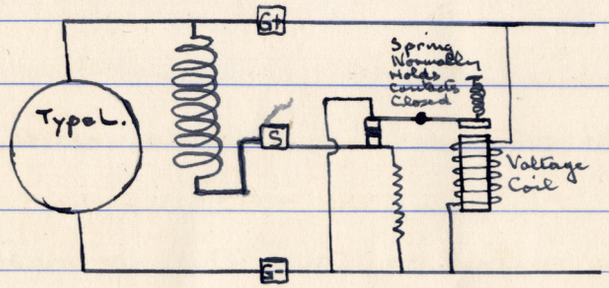
2/ Check gap between soft iron core and armature. If necessary adjust to between ·040"-·050" by means of back stop.

3/ Check gap between contact points. Test if necessary to between ·025"-·030", by giving a set to the bracket on which the leaf contact is mounted.

4/ Adjust spring tension so that contact points close at the voltages given below.

Type.	D.P. Switch	S.P. Switch
A.	8 Volts	6 Volts
C	16 "	12 "
D.	16 "	13 "

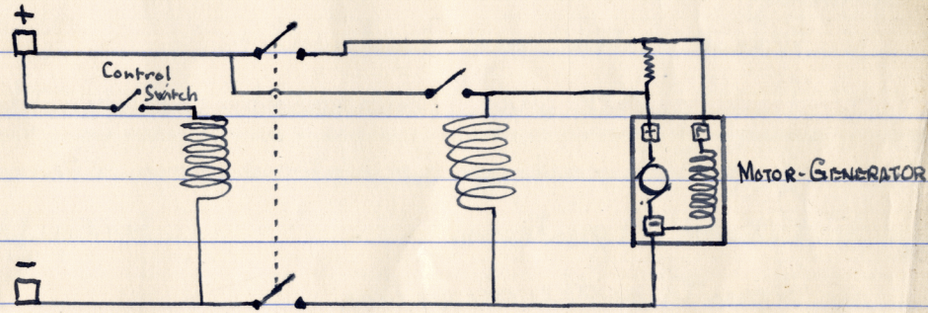
The above figures must not be exceeded, but 10% less than the stated voltage is permitted.



"Tirril" System of Voltage Control.

Types A, C & D Starters.

Used for starting Motor-Generators.



PETROL SETS.

Preparations for running.

1/ Fill with correct grade of oil to level shown on dipstick.
2/ Fill with petrol. Funnels must be used, with filters. No naked lights within 10yds. Utensils must be clean.
3/ Fill radiator to level of overflow with rain water. During these operations, ensure that all drain cocks are "off".

Starting

1/ Check petrol oil and water.
2/ Turn petrol on. Prime carburretor with pump lever if fitted.
3/ Retard Ignition.
4/ Open throttle slightly.
5/ Switch ignition on.
6/ Swing starting handle. Only use choke when necessary.

When Started

1/ Advance Ignition.
2/ Open choke as soon as engine will run without it.
3/ Check oil pressure
4/ Open throttle to normal running position.
5/ Switch on load when engine has warmed up.

Whilst running.

1/ Check voltage frequently.
2/ Check oil pressure frequently.
3/ Ensure that engine and generator are not overheating, and there is no undue vibration.

Stopping

1/ Switch off load (Except beacon).
2/ Close throttle and switch off ignition
3/ Turn off petrol.

Cold weather precautions.

1/ Fill radiator with anti-freeze liquid if available. If not, empty radiator at night.
2/ Cover engine and radiator with tarpaulins, etc. when not running.

Starting.

1/ Fill radiator with warm water if not using anti-freeze.

2/ Use choke, or hold petrol soaked rag over air intake whilst swinging engine.

3/ Remove sparking plugs and warm them.

4/ In extreme cases, remove plugs and put a few drops of petrol into cylinder.

Faults.

Engine will not start.

1/ Check that petrol is reaching carburettor. If not, check petrol feed to find blockage.

2/ Check for spark at plug terminal. If no spark, check distributor and contact breaker, and switch leads.

3/ If above are correct, remove plugs and inspect for moisture, dirt and adjustment. Gaps should be .014" to .016", adjusted by earth electrode.

4/ Inspect jets if easily accessible. If engine still will not start, report to N.C.O. i/c section.

Engine runs unevenly and does not develop full power.

1/ Check plugs.

2/ Check ignition leads.

3/ Check jets and petrol system for partial blocking.

TURRETS & AIRSCREWS.

BOULTON PAUL TURRET. MARK 2 TYPE "A".

To Operate: (1) "Free and Engage" lever to "Engage". (2) Fairing switch. (3) Master switch. (4) Centraling control column. (5) Grip armature grip-switch.

POWER CIRCUIT

When motor is switched off, surge of current from inductive field circuit is dissipated in 150Ω resis. in series with lamp which would otherwise be "blown". Test field circuit by opening master switch. Induced field current should make lamp flash bright momentarily before going out.

GUN FIRING CIRCUIT.

Spring loaded ball bearing contacts: to give pin-point contact, and to prevent tracking. Will not chip if moving upward when interrupter drum is rotating.

General.

(1) Source of power. 24 v. 1000 W Generator, supplying gen. service accs. and elect. services in turret, including a 24 v. shunt wound motor.

(2) Transmission of power, is electro-hydraulic.

(3) Control of turret is effected at one point only, by a control column.

(4) Guns are fired by solenoids.

Distributor Electrical supply is brought into the turret by 12 brass slip rings insulated from each other, which rotate with the turret. Connections are taken from the slip rings to a circular terminal block in the base of the turret and immediately above the distributor. The rings rotate inside a metal case which is fixed to the fuselage of the aircraft. The brushes feeding the slip rings are bolted to this case.

Sequence of operation

(1) "Free & engage" lever in "engage" position
(2) Fairing lever moved over.
(3) Motor (master) switch on.
(4) Centraling control column.
(5) Operate grip switch.

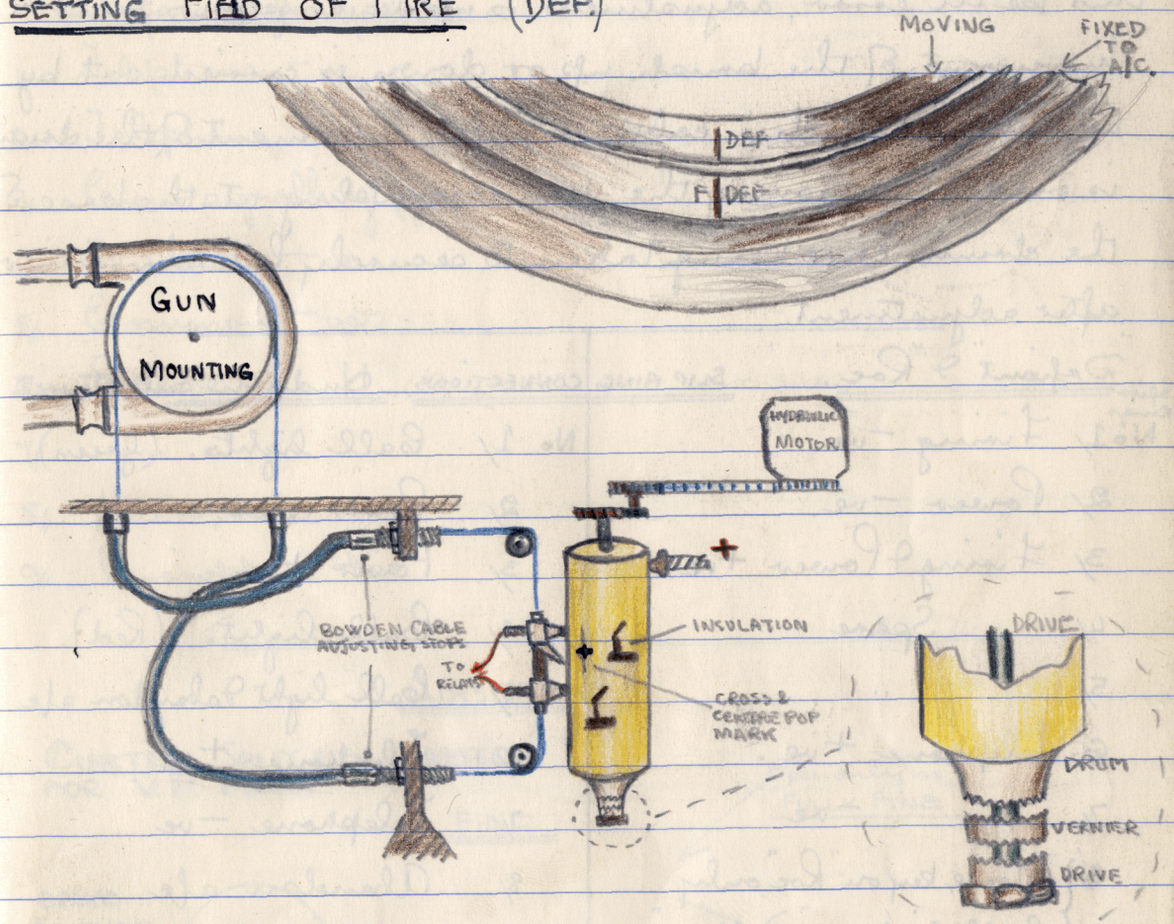
Firing circuit Guns fire by electric solenoids, controlled in pairs by relays which pick up their supply from two brushes bearing on the brass interrupter drum. These brushes move up and down with the gun movement. Also bearing on the drum is a fixed brush which is energised only when the "f. & e." lever is in the "engage" position with firing button pressed and selector sw. to "Gunner" for gunners use, or "Pilot" for pilots use. The guns can

be controlled by the pilot by moving sw. to "pilot" position, but guns should point forward for this operation. The brass drum rotates in the same direction and at the same speed as the turret under all conditions. The drum has insulated inserts on it which correspond in shape to certain parts of the aircraft. When the guns cover any of these parts a corresponding insert on the drum will come under the movable brush and cut off supply to the relays and guns will stop firing. The insulated inserts are staggered so that if only one pair of guns cover an obstruction only that pair of guns will stop firing. Brushes are spring loaded steel ball bearings to ensure a minimum of surface contact on the drum and so obtain an immediate cut-off of the gun.

Safety devices

1/ Firing lever.
2/ Free & engage lever.
3/ Grip switch
4/ Interrupter drum.
5/ Stirrup
6/ Mechanical stop.

SETTING FIELD OF FIRE (DEF.)



Fit DEF. interrupter drum. Rotate turret until marking DEF on movable ring lines up with the mark DEF. | F. on the fixed ring. Then fully depress guns, and lock turret. The pointer underneath the top brush on the interrupter drum should exactly coincide with the cross and dot (⊕) on the brass drum. Should

this be in error, adjustment is made as follows:-
Movement of the brush up or down is carried out by adjusting Bowden cable nipples. Movement of the drum is made by moving the vernier coupling at the base of the drum, care being taken to securely lock the vernier after adjustment.

SLIP RING CONNECTIONS

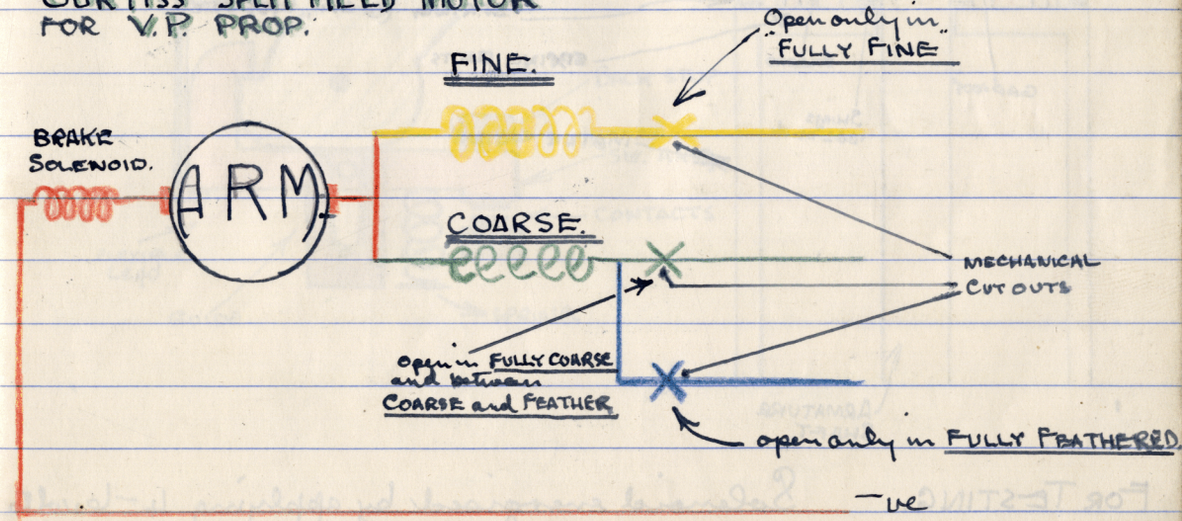
slip ring	"Defiant" & "Roc".	Hudson centre turret.
No 1/	Firing -ve.	No. 1/ Call lights. (Green).
2/	Power -ve.	2/ Power -ve.
3/	Firing & Power +ve.	3/ Power +ve
4/	Spare	4/ Call light. (Red).
5/	"	5/ Call light & abandon a/c.
6/	Telephone +ve	6/ Telephone +ve
7/	" -ve	7/ Telephone -ve
8/	Morse key on "Roc" only	8/ Abandon a/c
9/	Call lights on "Defiant"	9/ — do —
10/	Pilots firing switch	10/ — do —
11/	Microphone -ve	11/ Microphone -ve.
12/	Microphone +ve.	12/ Microphone +ve.

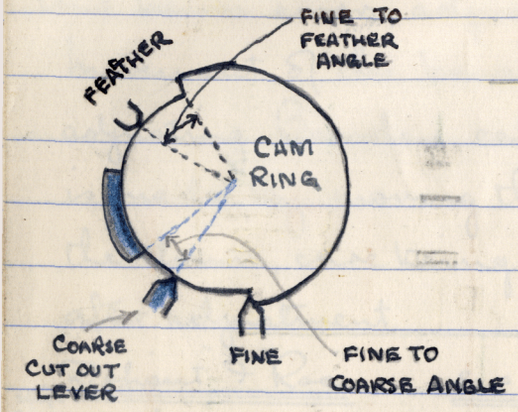
Halifax Nose type "C"

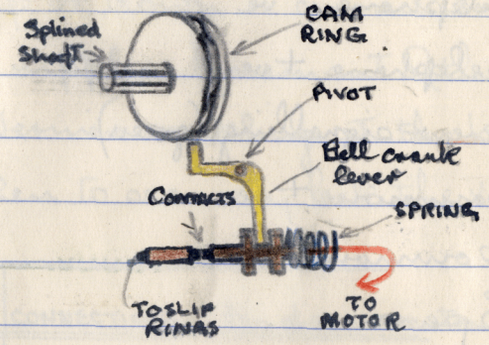
1/	Telephone -ve
2/	Telephone +ve
3/	Crew signalling (green)
4/	Common +ve.
5/	Common -ve.
6/	Spare
7/	"
8/	Microphone -ve
9/	Microphone +ve.

AIRSCREWS.

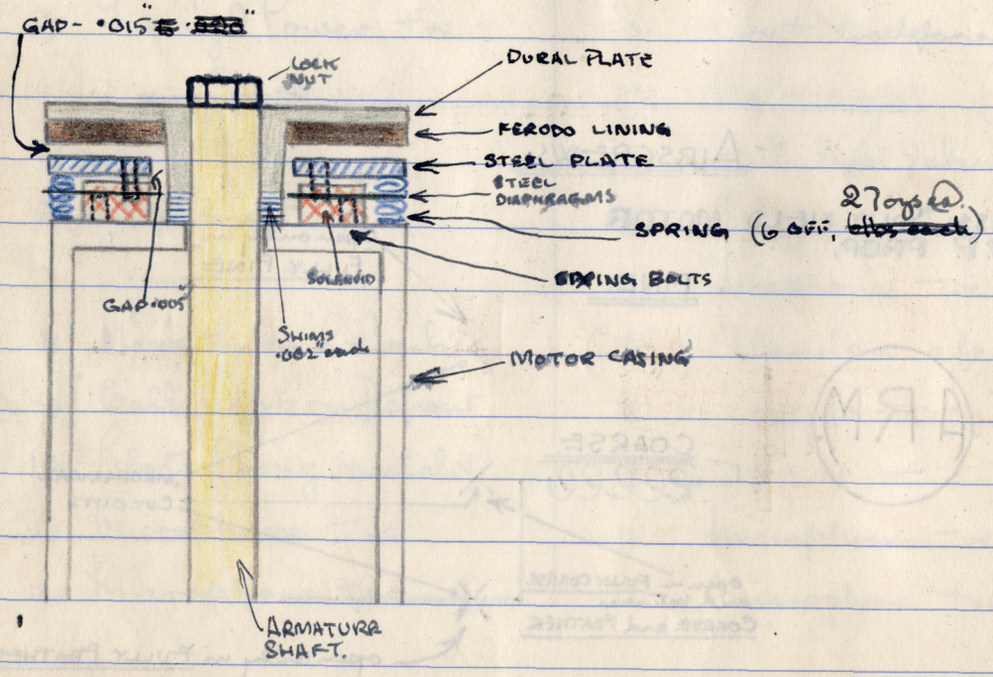
CURTISS SPLIT FIELD MOTOR FOR V.P. PROP.







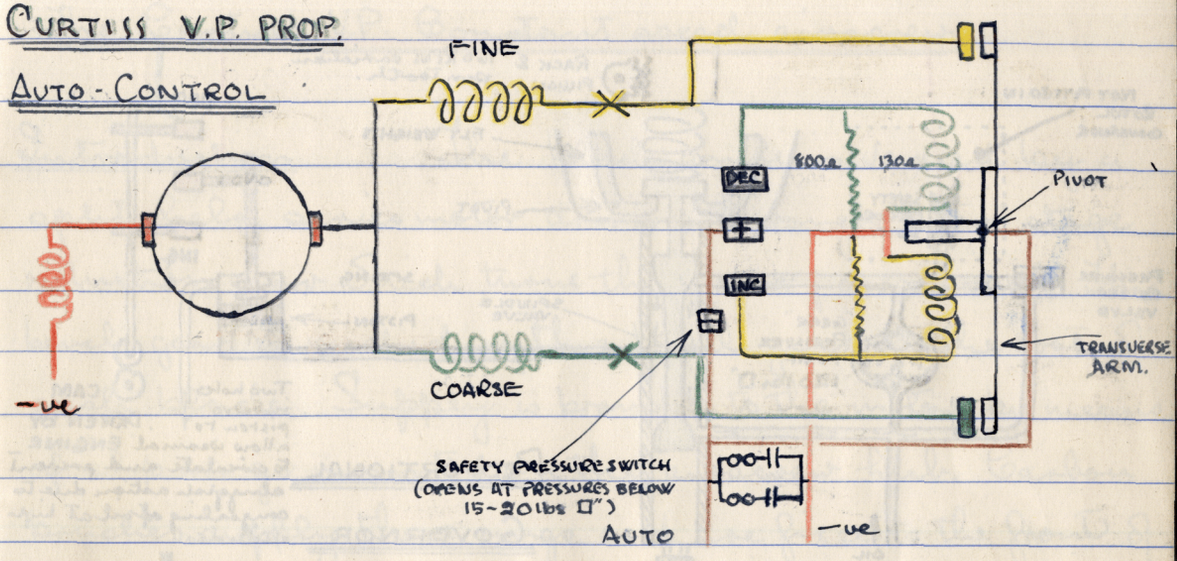
BRAKE ASSEMBLY (Shown energised)



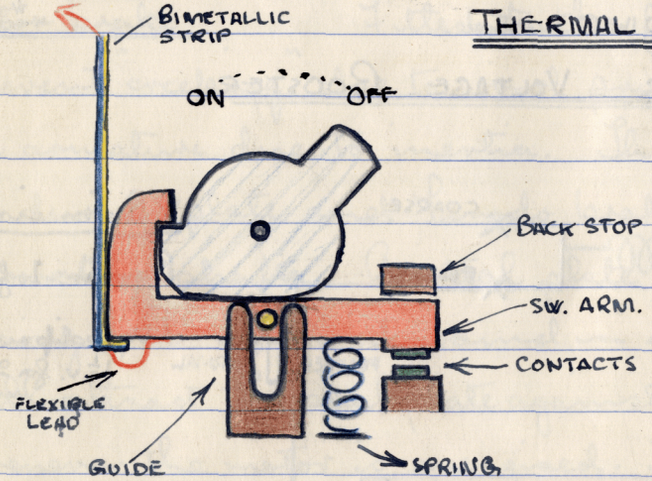
FOR TESTING. Solenoid energised by applying 4-6 volts to solenoid terminals.

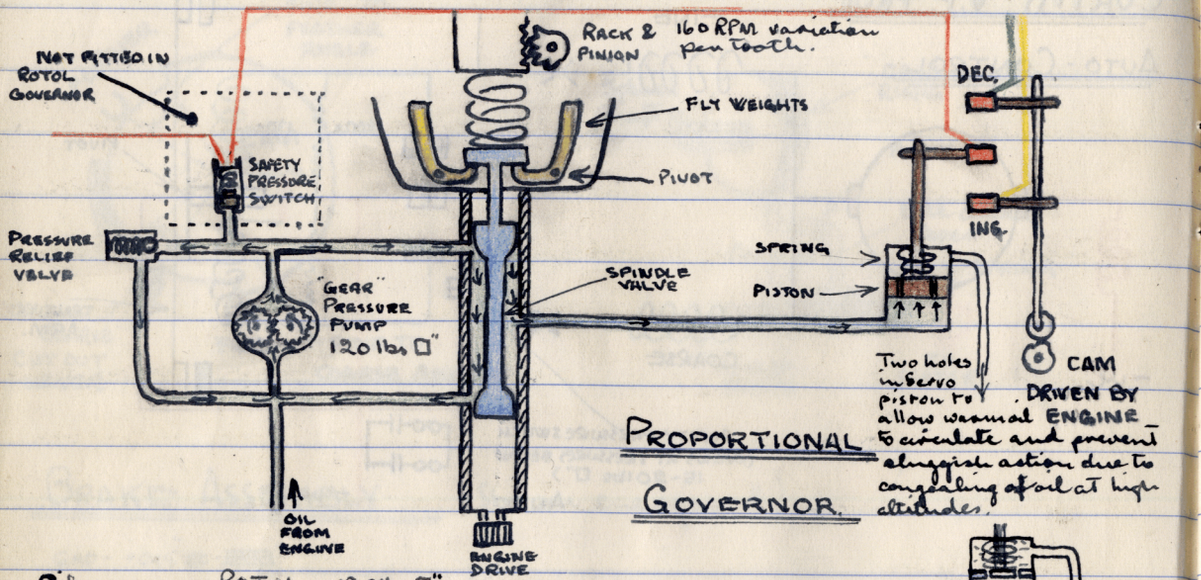
CURTISS V.P. PROP.

AUTO-CONTROL



THERMAL THROW-OUT SWITCH



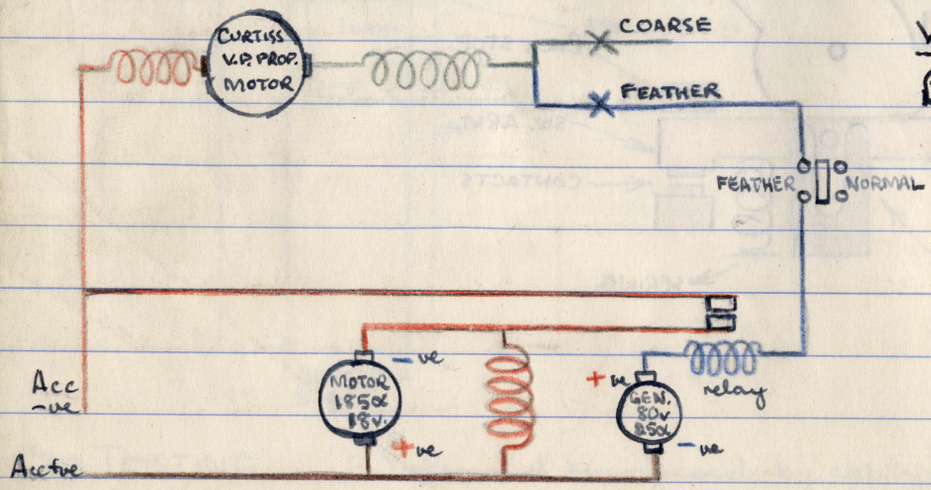


PROPORTIONAL GOVERNOR.

Oil pressure ROTOL. - 130 lbs □"

" " CURTISS:- 45 old. 80 lbs □" new type.

FEATHERING VOLTAGE BOOSTER.



V.D. in circuit.

Booster:- 1v for 135Ω
min/164

Up to slip rings
1½ v. for 20Ω.
min/19

The Curtiss V.P. Constant speed airscrew.

Introduction The blade angle is varied by a split field series motor driving through a two stage reduction gear which turns the main power bevel. This bevel gear is meshed with a bevel gear at the root of each blade. Supply is brought to the motor by means of slip rings mounted on the airscrew hub. Carbon brushes supply these rings and are fixed to the front of the engine.

motor brake Fitted to the front of the motor to prevent "creeping" due to wind pressure, and overrun of the armature due to inertia. The brake consists of a dural. plate and ferodo brake lining keyed to the armature shaft. A steel plate is fixed to the motor casing. A solenoid wound in series with the motor will attract the steel plate against the tension of 6 springs whenever the motor is energised. The brake is always on when the motor is de-energised. A spring steel diaphragm is fitted between the steel plate and the motor casing. This will take the initial shock when the brake is first applied.

motor.

This is a 6 poles, split field, series machine. 3000 RPM approx. current 8 ∝. The armature has a radial commutator.

Limit switches 3 switches are provided in the hub end of the power unit. 2 of the sws. will keep the blades within the flight range, the 3rd will stop the pitch change at "fully feathered" position. These sws. are operated by bell crank levers which bear on the edge of a cam ring. The shape of this ring will determine the minimum angle (fine pitch) and the maximum angle (coarse pitch) of the prop. blades.

Mechanical "fine pitch" stop. This stop is fitted to prevent the blades creeping past fully fine pitch if the motor brake is slipping. Important:- This stop must always be removed when operating the power unit off the airscrew hub.

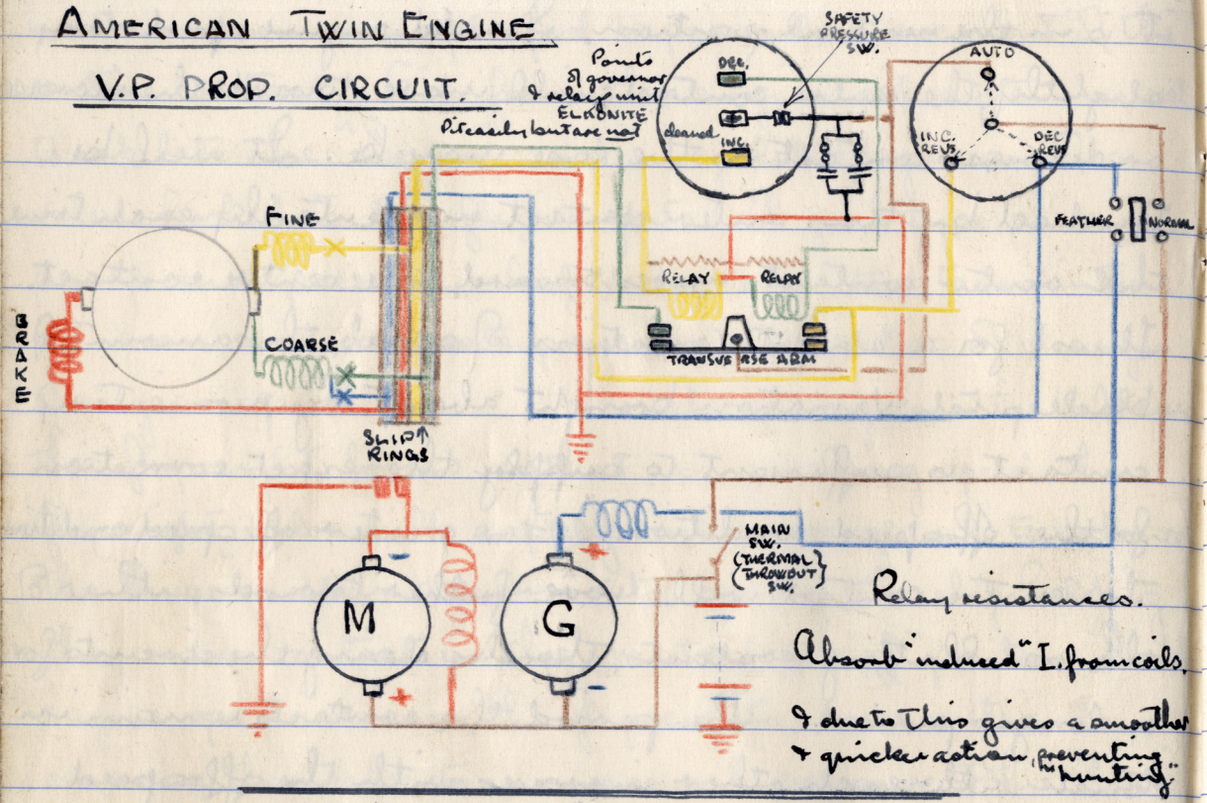
Control system 3 switches are provided to control the airscrew. (1) Master switch. This is also a thermal throw-out switch, and will trip out ~~the~~ to the "off" position should an overload develop in the circuit. It can be reset after allowing approx. 30 secs. for the bimetallic strip to cool. (2) "Feather" and "Normal" switch. With this sw. in the normal position the airscrew will operate normally, but when placed in the feather position, the normal circuits are disconnected and a voltage booster brought into circuit. This consists of a shunt motor and a separately excited generator, both armatures mounted on a common shaft, and with a common field. The booster will allow the prop. to be feathered in approx. 8 secs. (3) Manual selector switch. This is a triple throw 4 position switch. "Off", "Auto", "Increase RPM", "Decrease RPM". In the "off" position the prop. circuits are broken and the setting of the blades remains fixed. By holding the switch in the "increase" or "decrease" rev. position, the desired change in blade angle setting is effected. Upon being released, the switch "dolly" will return to the "off" position. With the selector sw. in the "auto" position a governor unit will maintain engine speed constant at a figure selected by the pilot.

Governor unit. Basically the governor is a single pole - double throw switch. An oil "Servo"

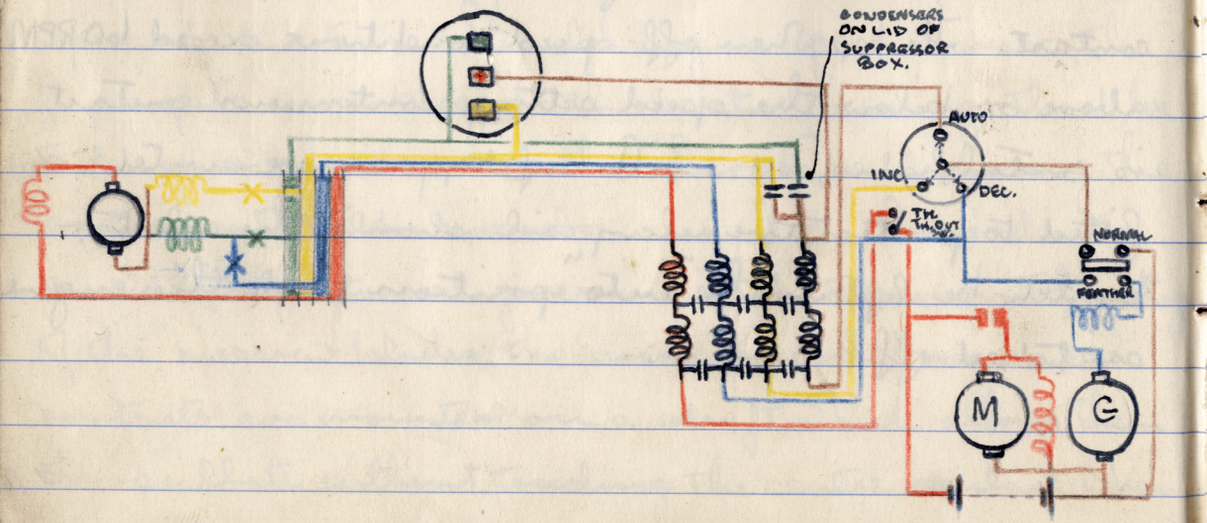
mechanism is employed to provide movement of the centre contact. Oil from the engine oil system is used to operate the "Servo" and is regulated by means of a valve linked to two flyweights. A gear type pressure pump and pressure relief valve are fitted to maintain an even, and accurate pressure, irrespective of changes of engine speed. A spring counter-balances the flyweight forces so that, at governing speed the flyweight valve will supply only enough oil to balance the "Servo" piston against its spring, thereby holding the centre contact in the neutral, or "off" position. Should engine speed increase, the flyweights move outwards causing the valve to increase oil pressure to the "Servo" and thereby moving the centre contact in an upward direction. Should engine speed decrease, the flyweights move towards the centre causing the valve to decrease oil pressure to the "Servo", and moving the centre contact downwards. In order to provide proportional governing and to prevent hunting of the airscrew blades, the increase and decrease rev. contacts are mounted on a shaft which allows them to oscillate without touching the centre contact when it is in the neutral position. Should engine speed vary slightly, the centre contact will move towards the increase or decrease contact as the case may be. It will be touched by this outer contact momentarily each time the outer contact moves toward the centre contact. Thus, for a slight variation of speed, the amount of blade pitch variation brought about by momentary contact is sufficient to supply the exact correction for the off-speed condition. For greater off speed conditions the centre contact will move further towards either of the oscillating contacts, thereby closing the circuits for a longer period. The period the contacts remain in touch with each other increases with the off-speed condition, until the two finally make continuous contact. Thus, when off-speed conditions exceed 60 RPM above or below the speed setting, continuous contact is established. A safety pressure switch is fitted to protect the relay coil should the selector switch be left in the "auto" position and the engine switched off.

American Twin Engine

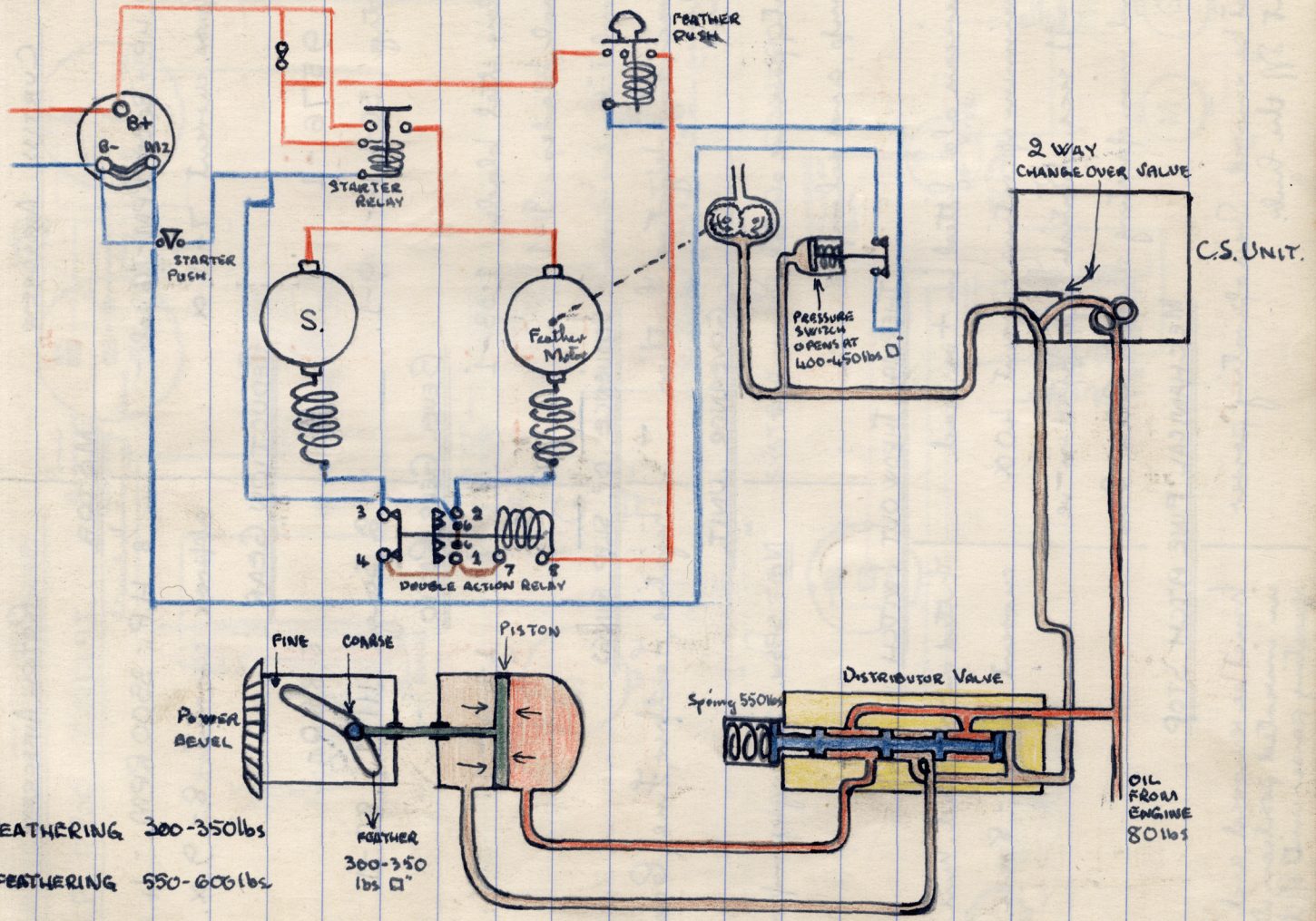
V.P. Prop. Circuit.



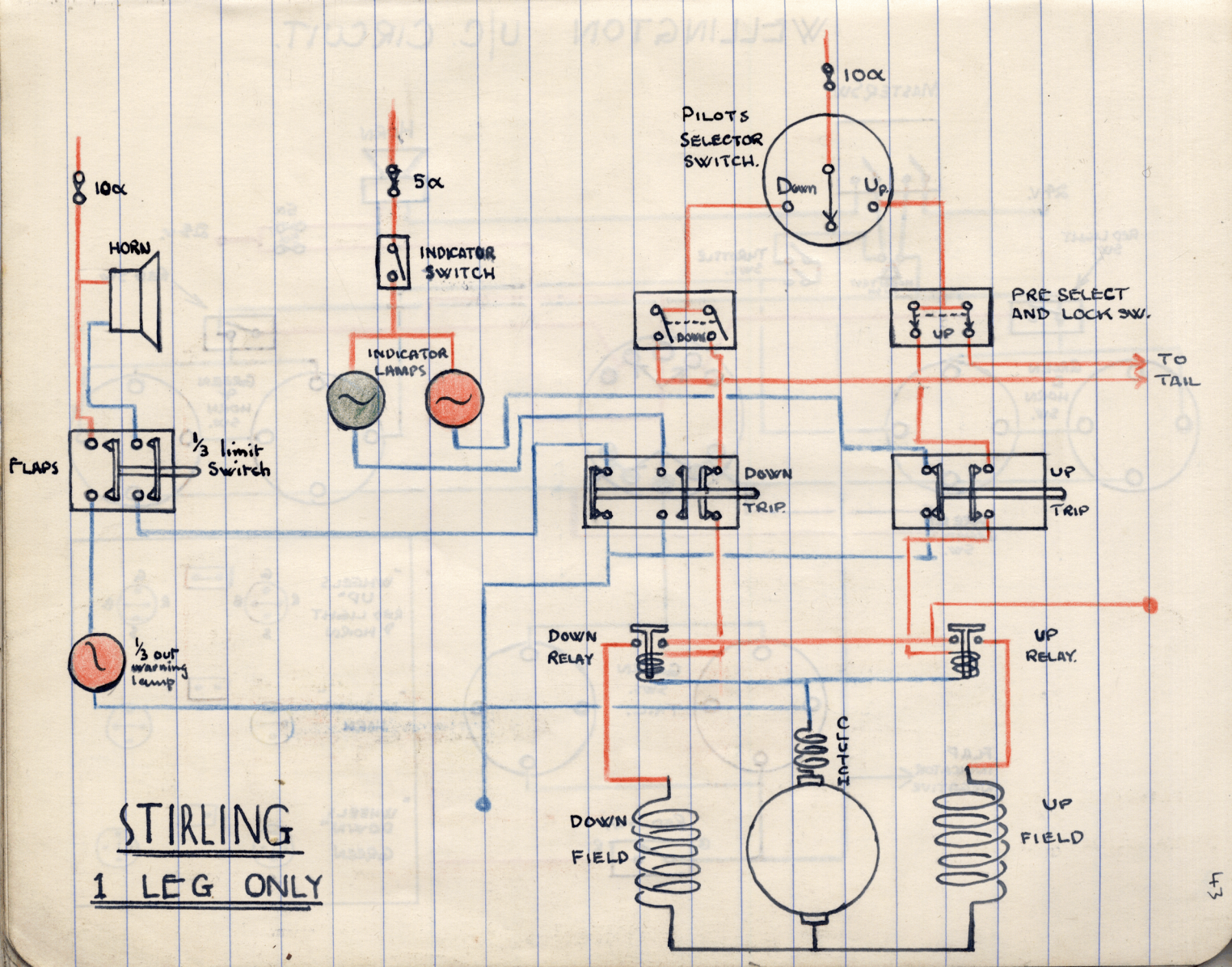
"Rotol" System V.P. Prop. Control.



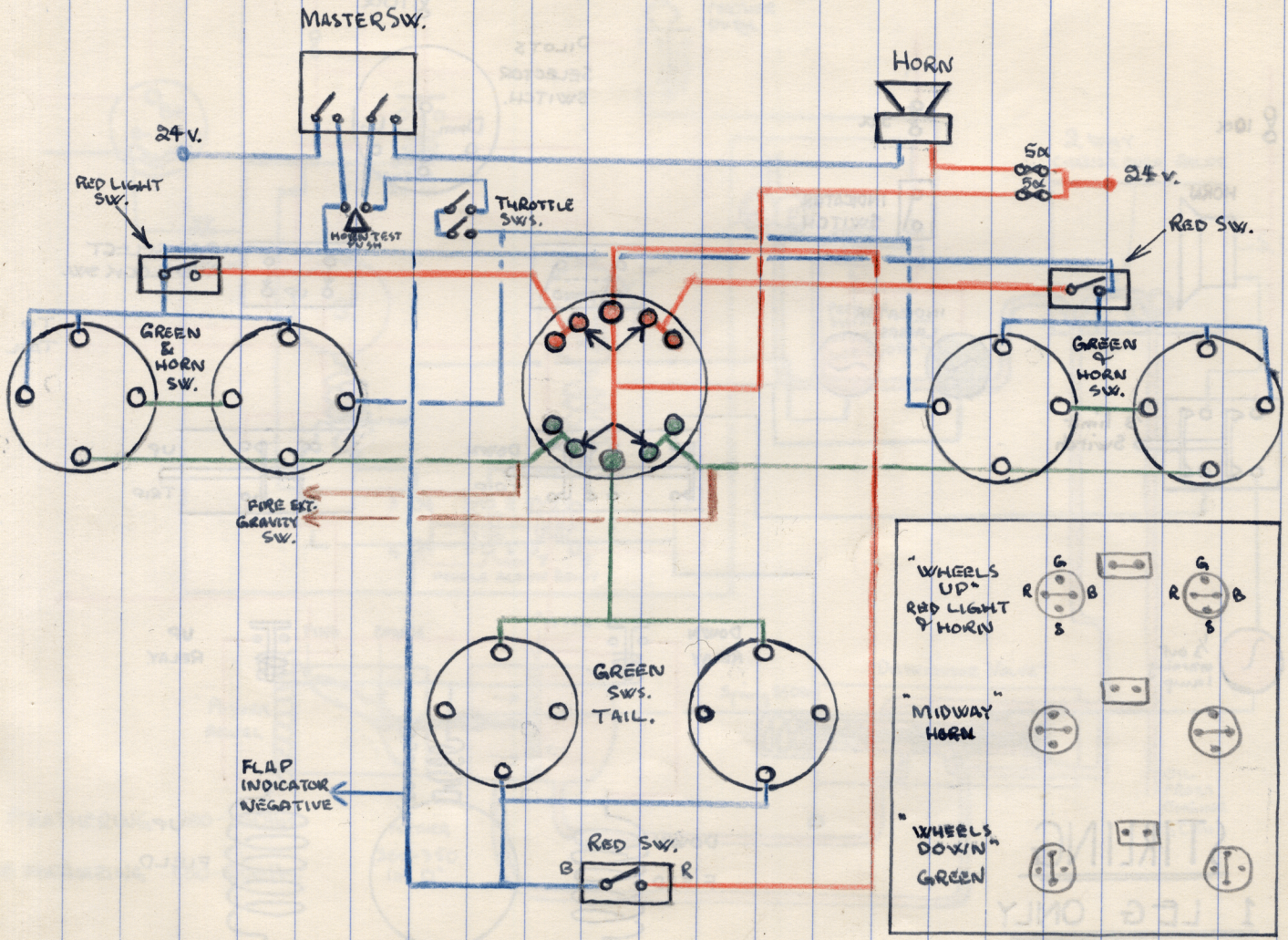
Curtiss Airscrew	Rotol Airscrew
Motor	
1/10 H.P. - 3000 R.P.M. - 6 pole - approx. current 7 - 8 α	1/8 H.P. - 3500 R.P.M. - 4 pole approx. current 8 - 9 α.
Reduction Gear	
9576 - 1	8,880 - 1
3 stage, 56-1, 19-1, 9-1.	2 Stage 111-1, 80-1
Bevel Gear Ratio	
Hollow steel blades. 1·33 ~ 1	1·49 ~ 1
Dural. blades. 1-1	
Sequence of Slip Rings	
Coarse, Fine, Negative, Feather.	Negative, Feather, Fine, Coarse.
Governor Unit	
Safety pressure switch, Scavenger pump, and relay.	No S.P.Sw. Scavenger pump, or relay.
Thermal Throw Out Switch	
American ala. fitted in +ve lead. minimum operating current 40 α for 11 secs. British ala. fitted in -ve lead, min. operating current 60 α - 8 secs.	fitted in -ve lead. min. operating current 60 α - 8 secs.
Mechanical Fine Pitch Stop	
must be removed, when operating power unit on the hub.	must be removed and replaced in inverted position when operating power unit on the hub.


FEATHER PUSH
B+
B-
M2
STARTER RELAY
STARTER PUSH
S.
Feather Motor
3
2
4
1
7
8
DOUBLE ACTION RELAY
2 WAY CHANGE OVER VALVE
C.S. UNIT.
PRESSURE SWITCH OPENS AT 400-450lbs □"
FINE
COARSE
PISTON
POWER BEVEL
DISTRIBUTOR VALVE
Spring 550lbs
FEATHER 300-350 lbs □"
OIL FROM ENGINE 80lbs
FEATHERING 300-350lbs
DE FEATHERING 550-600lbs

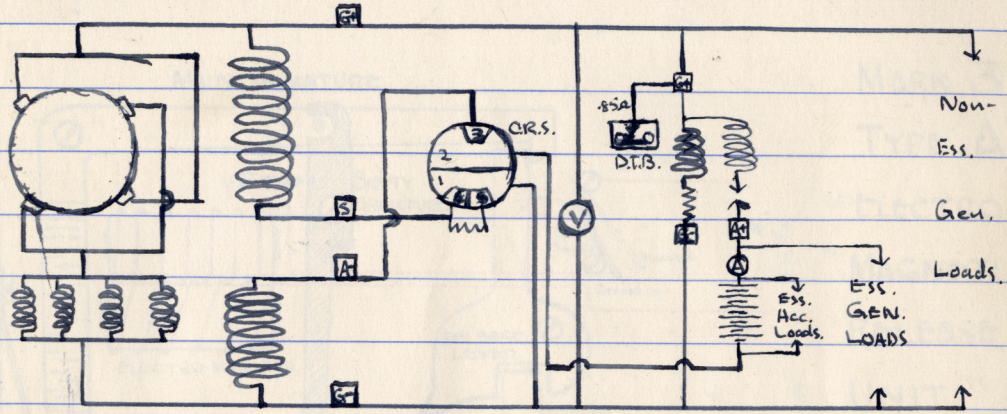
D.H. AIRSCREW.


10∝
PILOTS SELECTOR SWITCH.
Down
Up.
10∝
HORN
5∝
INDICATOR SWITCH
INDICATOR LAMPS
DOWN
UP
PRE SELECT AND LOCK SW.
TO TAIL
FLAPS
⅓ limit Switch
DOWN TRIP.
UP TRIP
⅓ out warning lamp
DOWN RELAY
UP RELAY.
CLUTCH
DOWN FIELD
UP FIELD
STIRLING
1 LEG ONLY

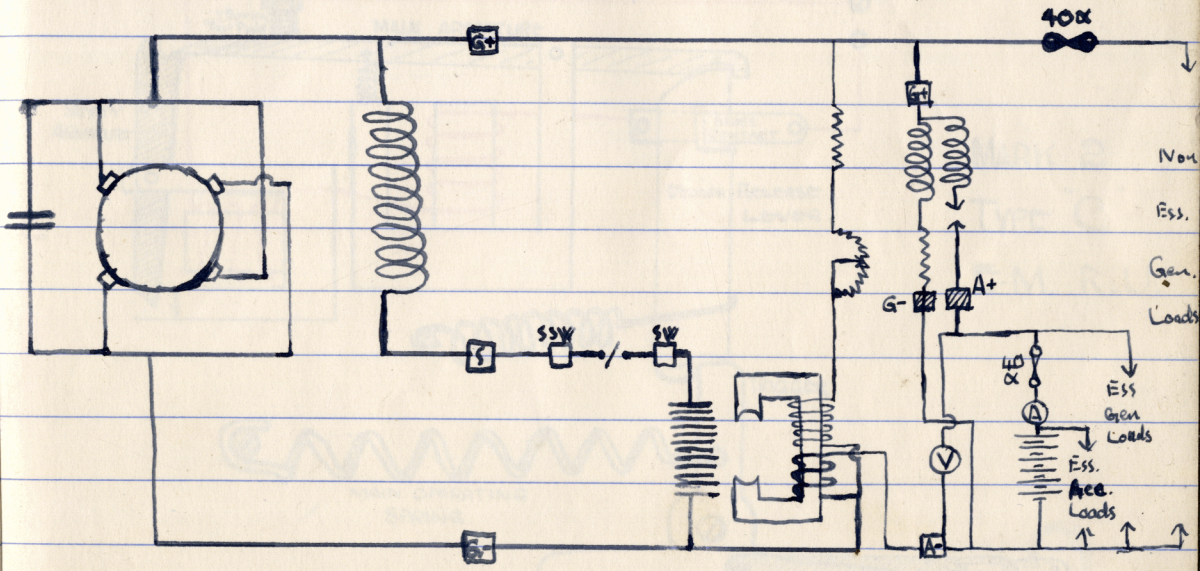
WELLINGTON U/C. CIRCUIT.



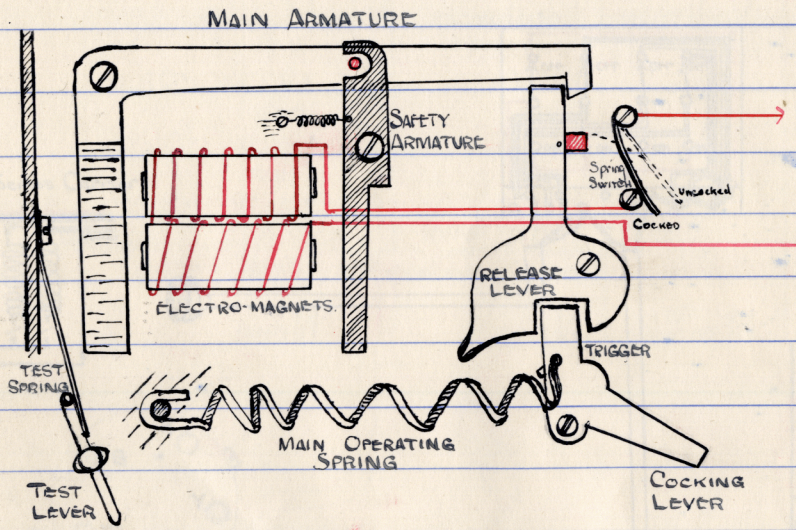
No 1 Installation



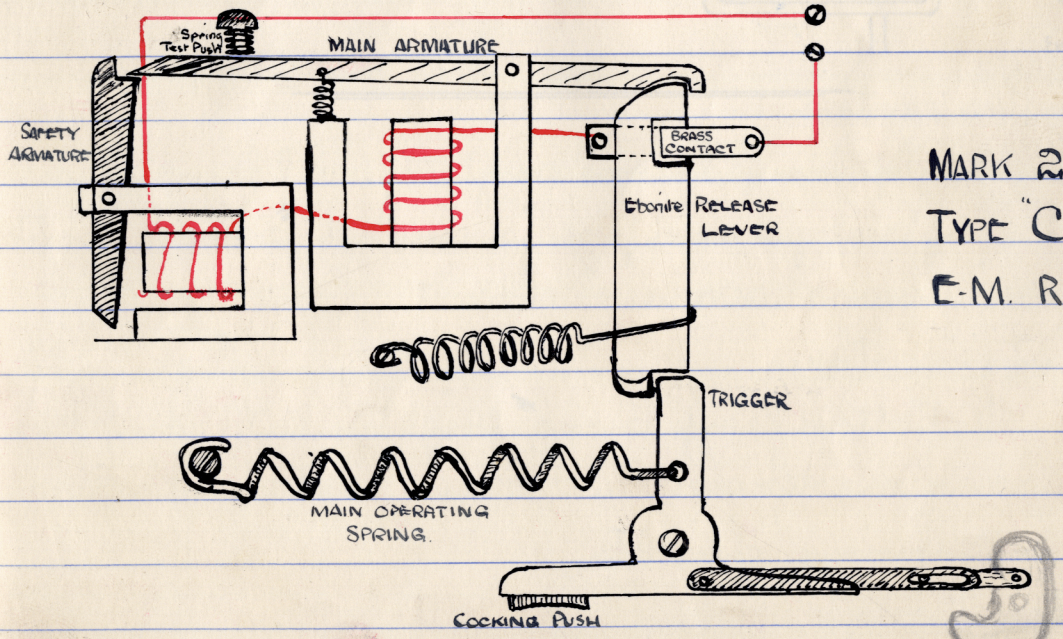
No 5 Installation.



Bomb Gear



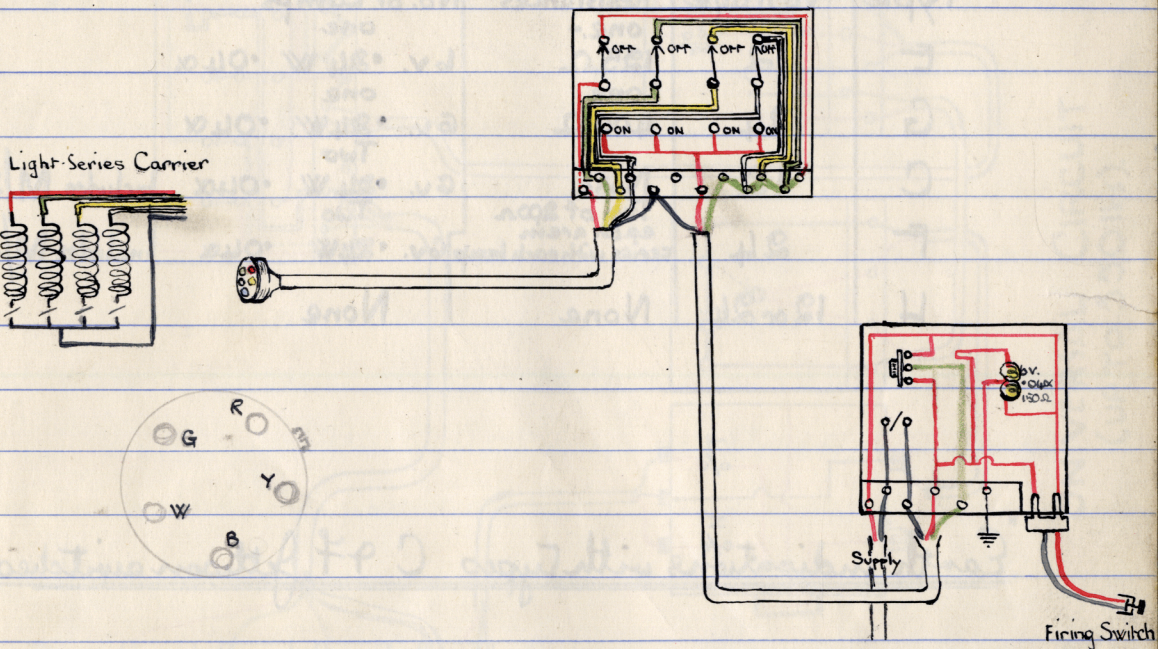
Mark 3
Type "A"
Electro-
Magnetic
Release
Unit.



Mark 2
Type "C"
E-M. R.U.

Light Series Circuit.

UP TO 40 lbs



Types of Jettison Switch Boxes Used.

Type	Voltage	Resistances	No. of Lamps.	
E	12	one.- 125Ω	one 6v. .24W. .04α	
G	24	one 400Ω	one 6v. .24W. .04α	
C	12	None	Two 6v. .24W .04α	Includes M/S
F	24	Two of 200Ω each are in series with each lamp	Two 6v. .24W .04α	Includes M/S
H	12 or 24	None	None	

"Earth" indications with Types C & F Jettison switches.

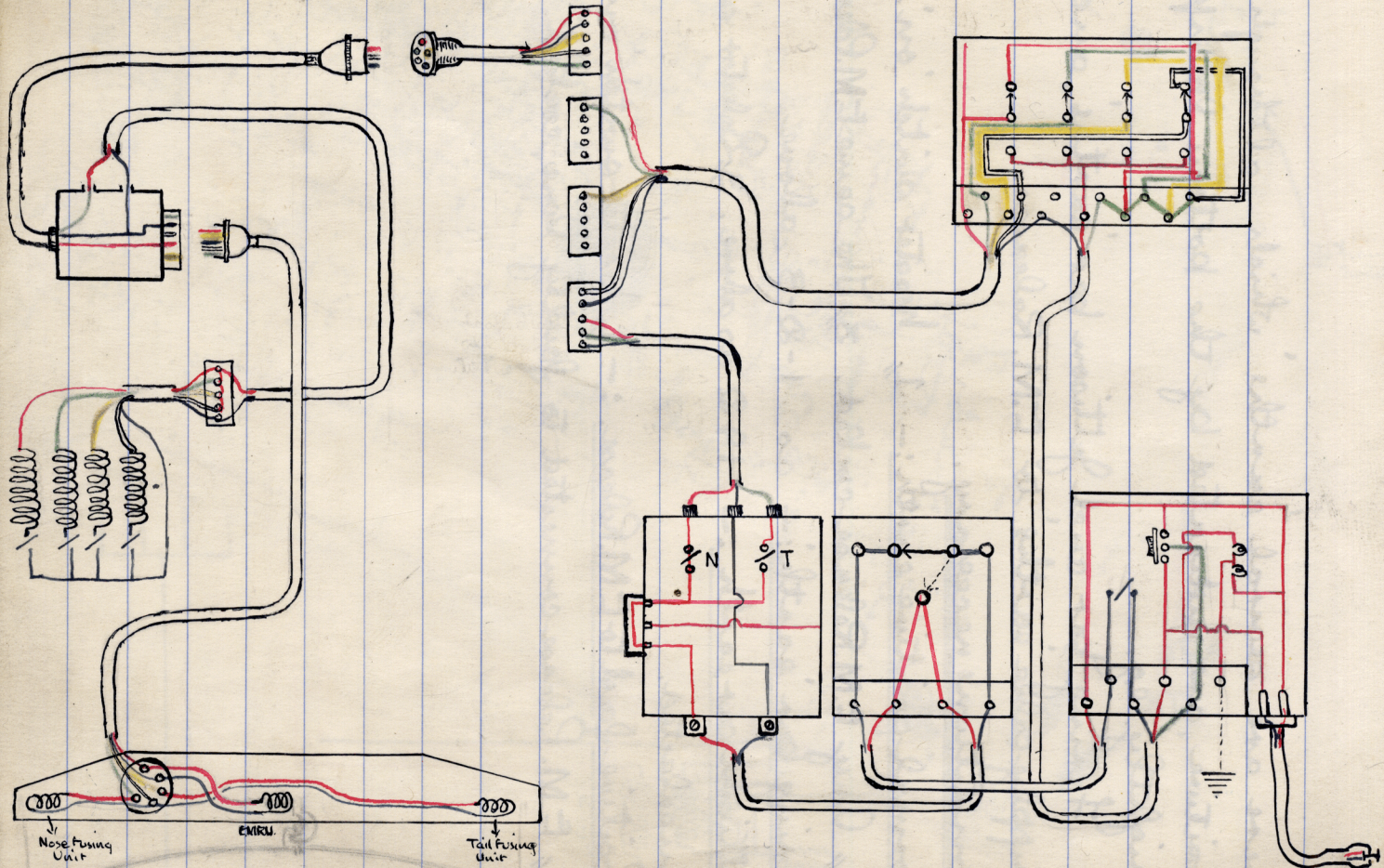
Positive earths.

Top lamp burns brightly. If lamp burns even when bomb gear main fuse is removed, positive earth is on 'general services' circuit

Negative earths.

Bottom lamp burns brightly. If lamp burns even when master switch is open, negative earth is on general services circuit.

Exceptions



UNIVERSAL CIRCUIT
(UP TO 550lbs).

There are several 'earths' which, although being positive, are indicated by the bottom lamps burning brightly. e.g.

Firing bar and Jettison bar 'earths', and positive supply cable 'earths' to E.M. Releases.

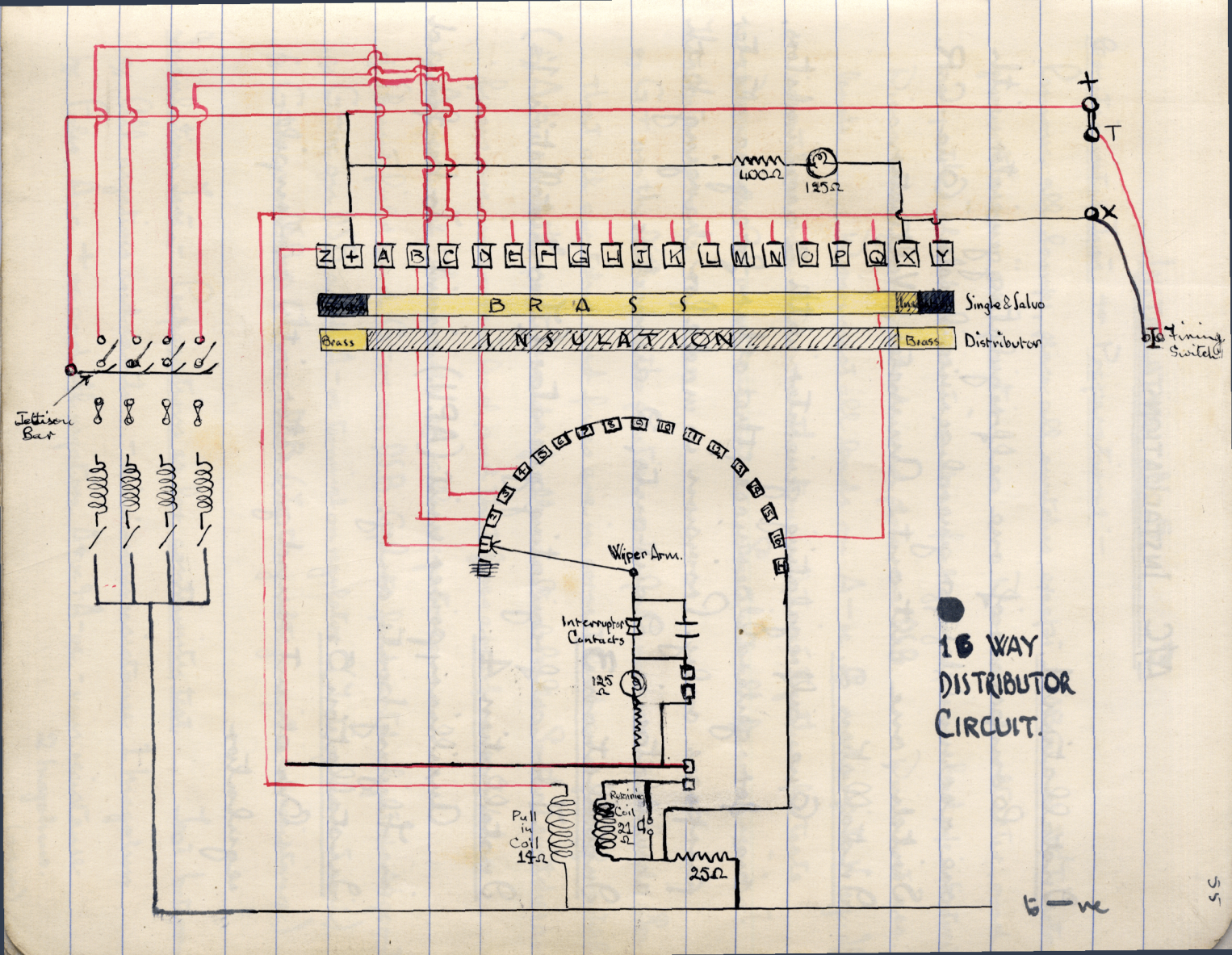
Conditions necessary.

Normal positive earth:- 1/ master switch 'on'.
2/ Any E.M. Release cocked. 3/ The same E.M. Release selected.

Firing bar 'earth':- as 1-2-3. above.

Jettison bar earth :- 1 & 2 as above. 3/ Selector switch unselected.

Positive feed to E.M. Release. :- 1/ master switch 'on'.
2/ E.M. Release connected to faulty line 'cocked'.


+
T
400Ω
125Ω
X
Z + A B C D E F G H J K L M N O P Q X Y
B R A S S
Single & Salvo
Brass
I N S U L A T I O N
Brass
Distributor
To Firing Switch
Jettison Bar
Wiper Arm.
Interruptor Contacts
125 Ω
Retaining Coil 21 Ω
Pull in Coil 14Ω
25Ω
16 WAY DISTRIBUTOR CIRCUIT.
6—we

A/C Installations.

Installation 1.

Comprises of one self-regulating generator with one accumulator for general service loads. One C.R. Switch, one cut-out. Ammeter. Voltmeter.

Installation 2.

One selfregulating generator with 2 accumulators, one for general services, the other for engine starter purposes only. Provision is made for charging both accumulators. ie. 2 cut-outs, 2 ammeters.

Installation 3.

Two self regulating generators (Two Installation 1's)

Installation 4.

Auxilliary power unit (A.P.U.) circuit. To be found in Flying boats only.

Installation 5.

One shunt wound generator with carbon pile regulator.

Installation No. 5.

Continuity Test - Preparations:-

Remove all lamps, place all switches, except EMBG and W/T motor-generator in "on" position. Disconnect voltmeter, and any other "closed circuit", such as fuel gauges, pressure head, ufe indicators etc. Disconnect generator leads and place on D.S.B. Disconnect acc. leads. Disconnect all leads on A-ve of carbon pile V. reg. If more than one lead is on this terminal, twist together for tests. Disconnect G-ve on cut-out. See that all fuses are "in".

Test between:-

a/ G+ on the D.S.B and the positive ends of all non-essential loads. See that all switches and fuses are in correct lead and fuses of correct value.

b/ A+ve and the positive ends of all essential loads. See that switches and fuses are in correct lead, and that fuses are of correct value.

c/ A-ve and the ends of all negatives.

d/ Shunt field and G-ve on D.S.B. Operate field switch - light should go out.

e/ G-ve on D.S.B. and A-ve terminal on regulator. (Testing current coil).

f/ G+ve on D.S.B. to G-ve on D.S.B. (Testing voltage coil and resistance)

Insulation Test.- Preparations as for continuity test. Test between:-

a/ All negatives and earth. - minimum resistance 1 megohm.

b/ Poles, Acc. +ve and all negatives. A+ve & A-ve. - min. resistance 2 megohms.

(over)

A/C. MAINTENANCE (1st. Week)

On receipt of new or reconditioned a/c. proceed as follows:-

1/ Check airframe inventory.

2/ See that all the electrical equipment enumerated on the inventory is in good serviceable condition.

3/ Check that cables are in their correct runs, and are of the appropriate colour and size.

Carry out the following tests:-

1/ Bonding test. 2/ Continuity test.

3/ Insulation test. 4/ Check for modifications.

Bonding test to be carried out on new or reconditioned a/c. and major inspections prior to insulation test. Place 60 ft. lead on W/T earth and with exploring lead press firmly on all bonded parts of the a/c. A reading of .025 Ω is usual.

NOTE:- Ensure that the two contacts on the 6 ft. lead are pressed firmly to the bond.

No attempt at repair to the leads or instrument should be undertaken.

No 5. Installation. Insulation Test continued.

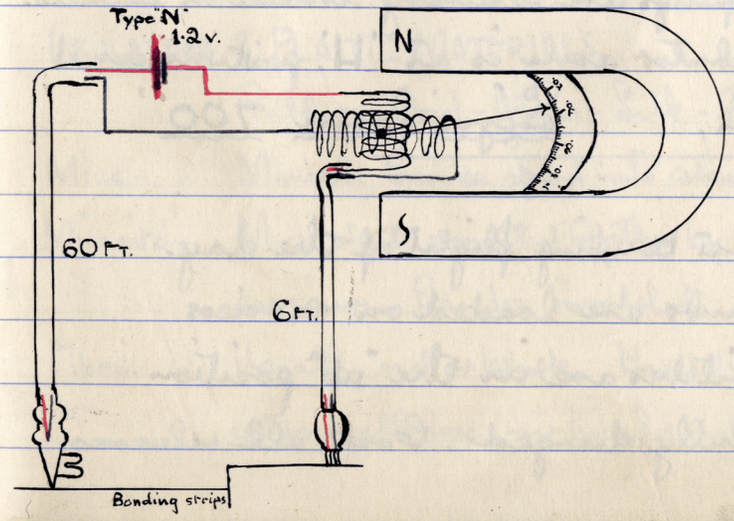
c/ +ve supply to fuse boxes and earth, and each circuit connected to fuse box and earth. Remove all fuses except main fuse and test between each contact of fuse box and earth (min. resis. 2 megΩ)

d/ G+ve, including regulator and earth. Test between G+ve on cut-out and earth. (min. resistance 2 megohms).

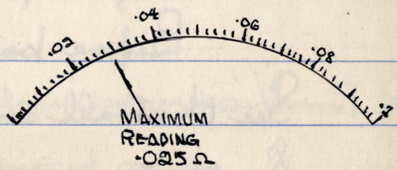
e/ Poles G+ve and all negatives. Test between G+ve and A-ve on acc. cut-out. (min. resistance 2 megohms).

f/ Poles +ve. G+ve and A+ve on acc. cut-out. (min. resis. 2 megohms)

All insulation readings subject to weather and disposal conditions, as with installation 1.



BONDING TESTER.



Installation 1 - Preparation for tests

1/ Remove E.D.G. and place leads on D.I.B.
2/ Remove all lamps.
3/ Put all switches "on". Place C.R.S. in "full charge" position
4/ Check all fuses in. 5/ Disconnect acc. and temporarily connect leads together. (Place on D.T.B and disconnect G+ lead on D.T.B) Disconnect all equipment providing a closed circuit. Isolate bomb gear.

D.I. on Bomb gear (16 Way distributor)

Part 1.

1/ Inspect all components of EMBRG for correctness, cleanliness and security. See that all switches are "up". See that release gear is free from moisture. See that release plugs are securely locked in sockets. See that distributor arm is at 'H' position and that cover is on. Sign form 700

Part 2.

Before first bombing flight of the day.
Before bombs are loaded on carriers
See that all switches are in the "up" position
See that acc is fully charged. Lock all releases.

Lead. Soft and plastic. Almost non-elastic. Unaffected by most acids
Nickel. Hard & ductile. Used chiefly for alloys.
Zinc. Used for formation of brass, and coating iron & steel. (Galvanising)

NON FERROUS ALLOYS.

Brass. Copper & Zinc.
Bronze. Copper & Tin. - Phosphorus added - Phosphor bronze. - 2% Zinc added. Gun metal.
Monel Metals. Composed of nickel & copper. Non-corrodable.

LIGHT ALLOYS.

Duraluminn. Aluminium base, with copper, manganese, magnesium & silicon. Dural.
(Dural, will scratch aluminium. - Alum. will bend through 180°. will break
Alclad. Aluminium coated dural.
Elektron. Lighter than standard aluminium alloy, but is susceptible to corrosion.

INSULATING & PLASTIC MATERIALS.

Rubber - Wood - Glass - Silk - Cotton - Mica. etc.

Mica. Mineral. Can be split into sheets. Used for electrical purposes.
Micanite Mica sheets cemented together by insulating resins under heat & pressure. Can be moulded.
Fibre. Usually red or black. Hard substanced composition of hemp, cotton, cellulose, raw hide & compressed paper.

Asbestos. Fibrous, non-combustible mineral material.

Bakelite. Form synthetic resins with a filler such as, wood dust, flour, powdered slate, china clay.

Ebonite. Vulcanized rubber & Sulphur. Can be moulded.

FILES.

Made of high carbon steel. Blade dead-hard. Tang, tempered.

Cuts. Single, for soft metals, and producing smooth surfaces.
Double, General work.
Rasp. Wood, leather, and soft metals.
Dreadnought. For rough castings & flat surfaces.

Order of coarseness. Rough - Bastard - Second cut - Smooth - Dead Smooth

Classification. (Example) File - 8", half round, smooth.

DRILLS.

Made from cast steel, hardened & tempered.

Parts. Twist Drills. Shank - Flute - Lands - Web. :- Accurate, fast cutting, automatic ejection of cuttings.

Straight Fluted drills. For sheet metals. No ejection of cuttings.

Flat drills. Original. Easily made, poor guidance in holes, no ejection.

Twist Drill Angles. For general work. 12° - 59°, & 130°.

Drilling lubricants.

Cast Iron. Dry for light work. Paraffin for heavy work.

Wrought Iron & Mild Steel. Soapy water, and oil.

Tool Steel. Engine oil, or paraffin.

Copper. Light work, dry. Heavy work, soapy water.

Aluminium. Paraffin.

White Metal & Brass. Dry.

Quenching liquids. eg. Water, brine, mercury, air, etc.

Case-hardening. Process of adding carbon to the skin of a finished job of low carbon steel. Gives hard skin, but does not destroy the mild steel toughness in the bulk of the material.

Annealing. Restoring metals to their original softness.
For ferrous metals this is done by heating to bright red, and then cooling slowly in hot ashes, lime, dry sand, etc.
Longer in cooling, softer in finish.
For brass & copper, heat to red-hot & quench quickly in water.

Hardening. By heating carbon steel above critical temperature and cooling quickly.

Tempering. Done by heating until film of oxidisation is appropriate colour.

Colour film ranges from light straw to dark blue. eg.

Article	Hardening Colour	Tempering Colour	Quenching Liquid
Dividers		Brown	Whale oil
Scribers		Straw	Water
Centre Punch		Dark Straw	"
Screwdrivers	Medium	Deep blue	"
Drills, flat	Red.	Dark straw	whale oil
Taps		"	"
Chisels		Purple	Water
Springs		Blue	"

SOLDERING & BRAZING.

Soft Solder. Grade A. Section. 64% tin, 35% lead, 1% antimony.

Grade B. 47·25% tin, 50% lead, 2·75% antimony.

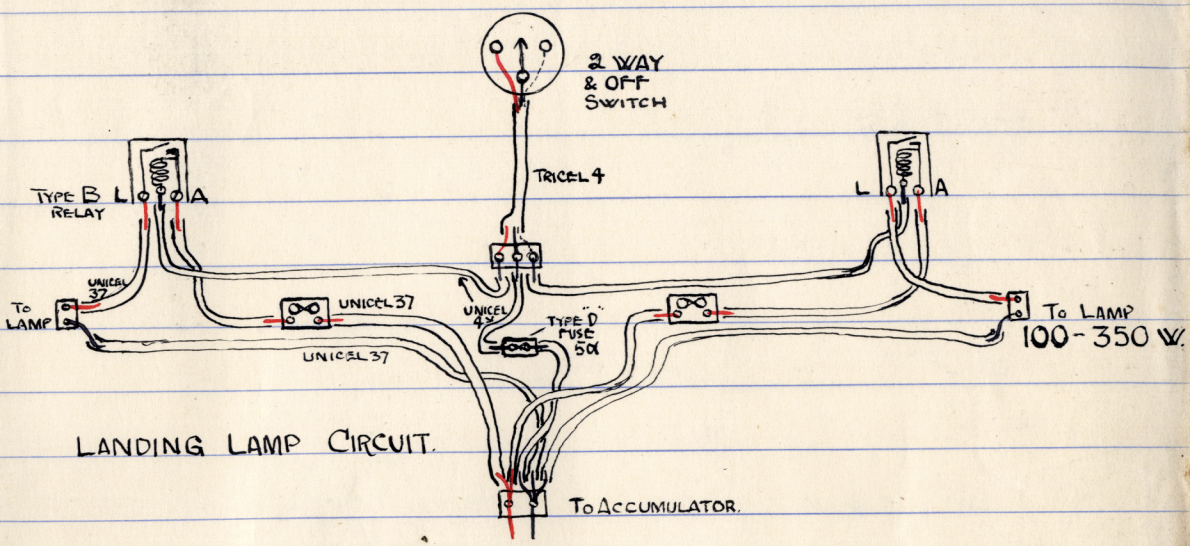
Addition of ~~antimony~~ Bismuth reduces melting point. Antimony toughens & avoids shrinkage in solder joint.

Resin cored. Grade A solder with resin core. Section.

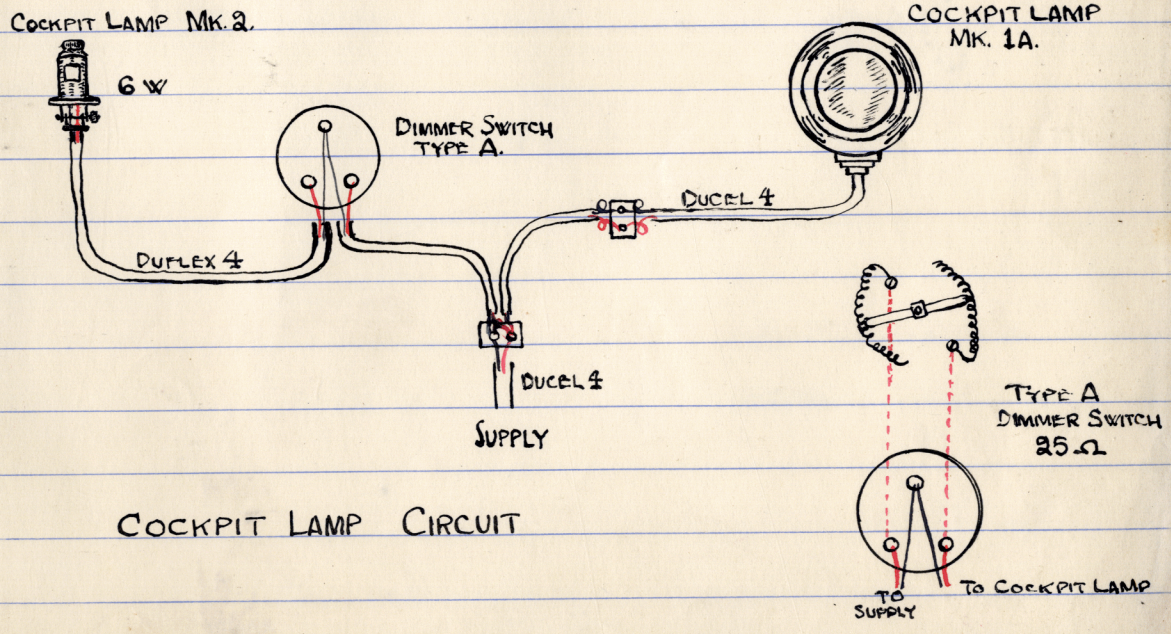
Brazing precautions.

1/ Thoroughly clean metal surfaces. 2/ Boil spelter in borax & water

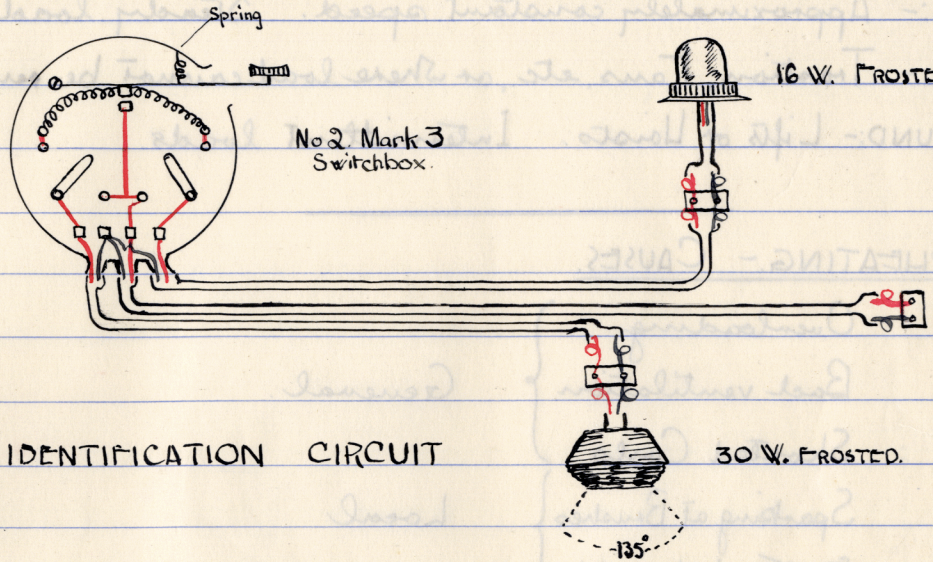
3/ Secure the joint. 4/ Ensure that fire or blow lamp is burning with a clear flame.



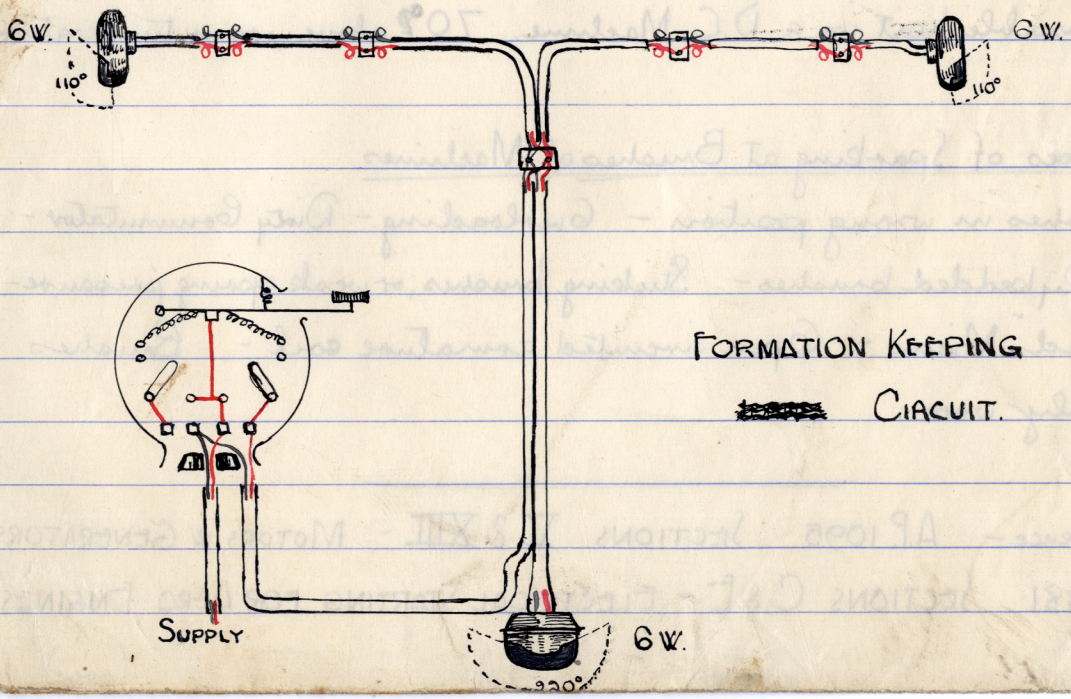
LANDING LAMP CIRCUIT.



COCKPIT LAMP CIRCUIT



IDENTIFICATION CIRCUIT



FORMATION KEEPING

CIACUIT.

MOTORS - USES.

SHUNT:- Approximately constant speed. Steady loads.

SERIES:- Traction, Fans, etc., or where load cannot be removed

COMPOUND:- Lifts or Hoists. Intermittent loads.

OVERHEATING.- CAUSES.

Overloading Bad ventilation Shorted Coils	General.
Sparking at Brushes Faulty Lubrication	Local

Permissible heat in a D.C. Machine. 70° above room temperature.

Causes of Sparking at Brushes of Machines

Brushes in wrong position - Overloading - Dirty Commutator - Badly bedded brushes - Sticking brushes, or weak spring pressure - Proud Micas - Open circuited armature coil - Brushes badly worn.

Reference - A.P. 1095 SECTIONS V & XIII - MOTORS & GENERATORS.
A.P. 1181 SECTIONS C & E - ELECTRICAL STARTING FOR AERO ENGINES.

(over)

1311377 - Cpl. Cox. G. SHQ. Electrical Sect.

Intro - 1st imp. from boat - country appearance - people - town.

My Impressions of Northern Ireland.

If it (had not been / was not) for the past two weeks of remarkably fine weather, I am afraid that my written impressions of Northern Ireland would be too sombrely coloured, and exude a dampness, that would make them dismal reading. However, the backward sun has appeared at last, and seemingly redeemed Ulster from a "watery grave".

The green slopes that I viewed from the deck of the "Empress Queen", were very ~~similar to~~ much like the coastline that was left behind but two hours earlier at Stranraer. If I had the impression that they were greener, it must have been my imagination, or maybe the fact that the sun was now shining on the early

morning countryside. The sober Scottish colouring of farmhouses was replaced by a very white wash, which possibly enhanced the green still further. Otherwise the sun shining on a Wigtownshire coastline would have given much the same impression.

During the train journey from Larne, there seemed to be a subtle difference from the countryside that I had been used to seeing on the mainland; some time had elapsed before I thought of the reason for this feeling of strangeness; the fields were all smaller. The picture was of an English countryside after all, only it was a replica in miniature.

Another unfamiliar feature was the pair of massive turret-like gateposts that stood at the roadside entrances to the fields. The shoulder flash of army units based in Northern Ireland is derived from this common sight I found out afterwards.

The people were much the same

as the Northern Irishmen that I had met elsewhere, only there were ?? more of them this time. They are (quite) friendly, and will (pass the time of day) even though one is a stranger. The cardroys of the traditional Irish navvy are quite common in the villages and country lanes, but bare heads are more b. common than battered trilby hats.

In both country and town, the filth and squalor of some of the dwellings is (rather) pronounced. Ragged and dirty children run barefooted through the main streets in the rain of the big towns, and no passer-by turns to stare. It is not difficult to imagine farmyard animals straying into the living rooms of some of the farmhouses either.

Belfast and 'Derry, as examples v. of the big towns, are not very impressive. To me, they appear to have an air of dejection underlying all the surface activity. 'Derry seems to be

a town that has little scope for a male. She is ambitions. Most prewar jobs were for the women and girls only, so a talkative barber told me. Shins huddle around the main shopping thoroughfares, and it is a very short step from plate glass to grimy panes.

Are these sordid impressions a true reflection of Northern Ireland? If so, what would my impressions be in ten years time?

A very good attempt. The beginning & ending are a trifle weak. Punctuation is good but more care should be given to the general lay-out.

5/ Cover surfaced joint with film of Borax. 6/ Apply heat and sufficient spelter only to fill joint, by means of iron spatular, which guides molten metal into the joint. 7/ Remove heat & allow to cool slowly.

Borax is universal flux for brazing & silver soldering, except for cast iron. Then 6 uprons Oxide is used.

Fluxes for soft soldering. Material.	Flux.	Grade of Solder.
Tinned copper wire } Cables. Electrical work.	Resin.	Grade A. Resin cored
Brass, copper, bronze.	RAF Soldering Solution	Grade A.
Tin plate	Resin or Soldering Paste.	
Galvanised Iron, Zinc.	Hydrochloric Acid	A.
Lead	Resin or tallow	B.
Stainless Steel	Phosphoric acid, undiluted	A.
Aluminium	10% Tin chloride, 10% Lead Chloride, 80% Stearic acid	

Alkaline Accumulators.

Positive plate :- Nickel Hydroxide. (Nickel flakes).

Negative plate :- Cadmium (Iron filings).

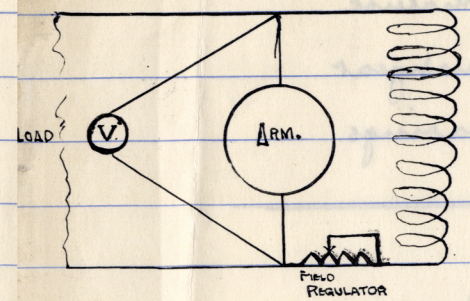
Electrolyte :- Potassium Hydroxide.

Nickel flakes to increase conductivity of positive plates.

Iron filings to maintain porosity of negative plates.

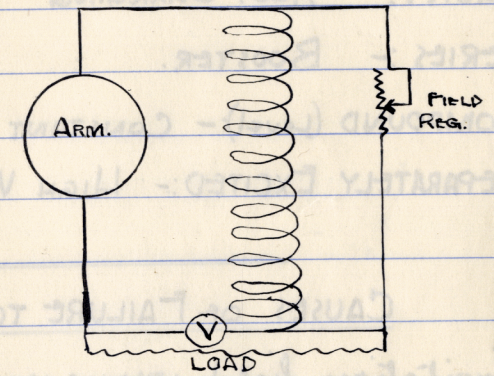
S.G. of Electrolyte is 1190. Average P.D. 1·2 Volts.

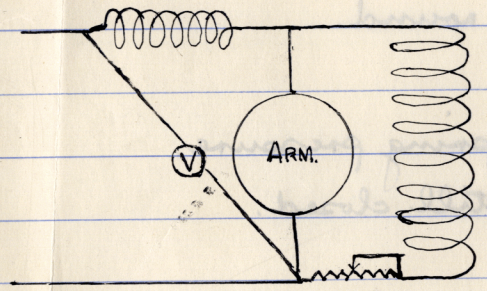
D.C. Machines.



Shunt.

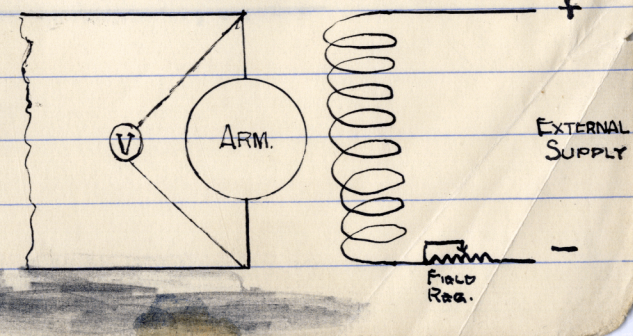
Series





Compound

Separately Excited



Essential Parts of a D.C. Machine.

(1) Yoke and field system. (2) Armature
(3) Commutator (4) Brushgear
(5) End plates and bearings.

Generators - Uses.

Shunt:- Acc. Charging - Steady Loads.

Series:- Booster.

Compound (Level):- Constant Voltage with Varying Loads.

Separately Excited:- High Voltages. e.g. Wireless Purposes.

Causes of Failure to Excite.

Excitation field wrong way round.
Broken field circuit
Sticking brush or weak spring pressure.
External circuit switch still closed.
Loss of residual.

Switch on M/S. Select "single & salvo" on drum switch, select a release, see that indicator lamps are alight, fire release from bomb aimer's position, see that release operates and that indicator lamps go out. Repeat until all releases have been tested in this way. Place all selector switches in "up" position, repeat above procedure but fire releases from pilot's position. See that all selector switches are in "up" position. Select 'distributor' on drum switch, select releases and operate distributor. See that releases fire in correct sequence. See that all switches are "off". Lock all releases. Check releases with test plunger, reset by depressing cocking levers. Switch 'off' main switch.

Sign Form 700.

Line Continuity Tests.

Preparations

Isolate B.R.G. installation at source of supply. If type "C" jettison switch is fitted, the fuse should be removed and master switch "off". Drum switch should be in 'single & salvo' position. Distributor arm on "H" contact. All indicator lamps removed.

All 5 pin carrier plugs must be removed from sockets. Put all selector switches in "up" position. Connect one lead of continuity tester to distributing side of main fuse. Connect other lead of tester to red pin of socket for No. 1 release unit. Select No. 1 release on selector switch box. Press pilots' firing button, see that test lamp lights. Put selector switch "up," operate jettison bar from pilots' position, then from bomb aimers position. See that test lamp lights in each case. Repeat above operation for each release unit. See that all switches are in "up" position. Test from positive of supply to yellow pins in release sockets operating nose fusing selector. Repeat in all green pins operating tail fusing selector. Test between positive of supply and all white pins with type "H" jettison switch depressed.

Testing Negatives.

From negative terminal on type "C" jettison switch box to blue pins on release sockets. From negative terminal on "C" jettison switch box to white pins, with type "H" jettison switch not depressed.

No 1 Installation

Preparations for test.

1/ Remove all lamps, all switches 'on'.
2/ Disconnect all equipment normally providing a closed circuit (Fuel gauges, Pitot head, u/c indicators etc.)
3/ Place C.R.S. in 'full charge' position.
4/ Place EMBG and W/T motor-generator switches 'off'.
5/ Remove acc. leads from D.T.B. and temporarily connect them together.
6/ Disconnect one lead from voltmeter.
7/ Disconnect G- lead on cut-out (general services).
8/ Disconnect Generator leads and place on D.S.B

Tests.

a/ Test between shunt field on D.S.B. and generator negative on D.S.B. (Grey to Blue). Operate C.R.S. and check for (correctness.
b/ Test between G+ and positive end of all non-essential loads. Check switches & fuses to see that they are in correct lead also test to G+ terminal on the acc. cut-out and the terminal on the acc. terminal block which is connected to the .85 Ω resistance.
c/ Test between control on D.S.B. and the positive ends of all essential loads. Ensure that switches & fuses are in correct leads.

d/ Test between blue on D.S.B. and negative end of each circuit

Insulation Test. (with "megger")

Preparations are the same as for the continuity test with two exceptions. The acc. leads are disconnected and left free, whilst C.R.S. is put in 'off' position.

Tests.

a/ Between poles Acc. + to all negatives. Connect "megger" leads to A+ & A−, and measure resistance. If less than 2 megohms it is not satisfactory.

b/ Between positive supply to fuse boxes and earth, and between each circuit & earth. Remove all fuses and test each circuit and positive supply to earth. Replace all fuses. Resistance should not be less than 2 megohms

c/ Generator + supply & earth. Test between G+ Terminal on the acc. cut-out & earth. (Not less than 2 megohms.)

d/ Between poles G+ and all negatives. Test between G+ on acc. cut-out & acc. −ve lead. (Not less than 2 megohms)

e/ Between poles +. Test between G+ve. and A+ on cut-out. (General services) (Not less than 2 megohms.)

f/ Between control field lead & all negatives. Place C.R.S. at "full charge". Insulation resistance between "control" and G−ve on D.S.B not to be less than 2 megohms.

g/ All negatives to earth. Connect "control" & G−ve leads together at D.S.B. Test resistance between these two cores and earth. (Not less than 1 megohm).

All above readings are subject to weather conditions. For an a/c which has flown in wet weather, or stored in a damp building, 25% of above readings are satisfactory A/c. tested under dry dispersal conditions, tests (a) to (f) should be at least 1 megohm, test (g) 250,000 ohms. Under wet dispersal conditions the readings should be:- tests (a) to (f) 200,000 Ω, test (g) 50,000 Ω.

Heated pressure head (Pitot head).

Between +ve and earth resistance should not be less than 3 megohms when COLD.
·5 megohm when HOT.

Tests to be carried out on bomb carriers before fitting on a/c.

From the plug pins test between :- −ve pins and all other Pins (4 tests) Test between all +ve pins separately. (6 tests) Holding the plug against the carrier, test :- each pin and earth on carrier. Minimum resistance of all tests, 10 megohms. Finally, rock all EMR's and ensure that they fire with an application of 8 v. Not more, to the plug pins.

Air Publications.

AP 1095 - The electrical equipment manual.

Volume 1:- contains detailed description, together with illustrations and maintenance of electrical equipment used in the RAF.

Volume 2:- Part 1:- contains modifications in loose leaf form, to the electrical equipment,

Volume 2: Part 2:- deals with inspections and tests to the electrical equipment.

A/C Handbooks (A.P's for the a/c concerned Vol.1.)

Leading particulars of the a/c with sectional diagrams, and the appropriate electrical diagrams.

Vol. II. Part 1. General orders and modifications.

Part 2. Contains the Maintenance schedule

Part 3. Instructions for repairs (mostly for Riggs).

Maintenance Schedule.

1st Minor - 40 hr. Inspect all unstarred operations.

2nd " - 80 " " " " & * "

3rd 120 " " " & ** "

4th 160 " " " * & *** "

5th 200 " " unstarred " only.

6th 240 " " " *&** "

7th 280 " " " only.

8th Major 320 " " " *, ***** , including all items with code reference underlined.

Code Ref:	Assembly Groups.
P.P.	Power Plant
CO	Cockpit
PL	Main plane
FU	Fuselage
UC	Undercarriage
TA	Tail Unit
GT	Gun Turrets
GE	General.

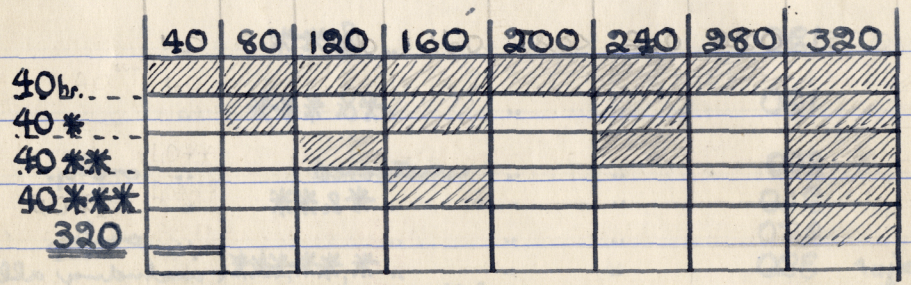
A.P. (for the a/c concerned)

Vol. II. Part II Maintenance schedule.

Sub-section D. Electrician

" " 1D - Between flights & Daily inspections

" " 2D - Minor and major inspections.



Maintenance Schedules.

Column "A" is known as the conditions column, signed by the person doing inspection. A cross in column "A" will indicate any item of equipment requiring attention beyond the scope of Group II. A thick line under the last item inspected indicates "called away before inspection complete".

Column "B" the rectifications column, to be signed by the person carrying out the repairs. The "periodical certificate" should also be signed at the conclusion of the inspection.

TAIL WHEEL TEST.

Wheel on metal sheet - cover sheet with water for good contact. Megger lead to W/T earth, other lead to metal sheet. Resistance not to be above 10 megohms. If reading is higher, put a/c U/S and report to "megger". (T.M.A).

"ECTOR - "DUCTOR"

Aerodrome Equipment.

Glim Lamp.

2 v. 20 AH. Acc. 2 v · 6 W. Filament
2·5 v · 5 W ..
2 v 1·5 W (for coloured glass)

For D.I. Test use on load. - clean glass and reflector (soapy water) if necessary. ("Drem" angle of light 45°, but this is variable)

Aldis Lamp

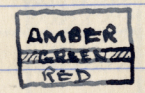
3 glasses. red · green - clear. 31 W or 36 W filament.
Telescopic sight for correct focus when signalling.
Small hooning trigger which tilts reflector, on handle.
Larger trigger on handle for controlling light.

"Drem" System.

Permanent system of airfield lighting to obtain uniformity of procedure for night landings. Worked off mains supply.
Totem poles - two at each end of flare path. Red lamps on approach side - clear, along flare path converging at specified distance. Blue "glims" along perimeter track. Outside boundary (2000 yds) marked by "clear" lights.

Angle of Glide Indicators.

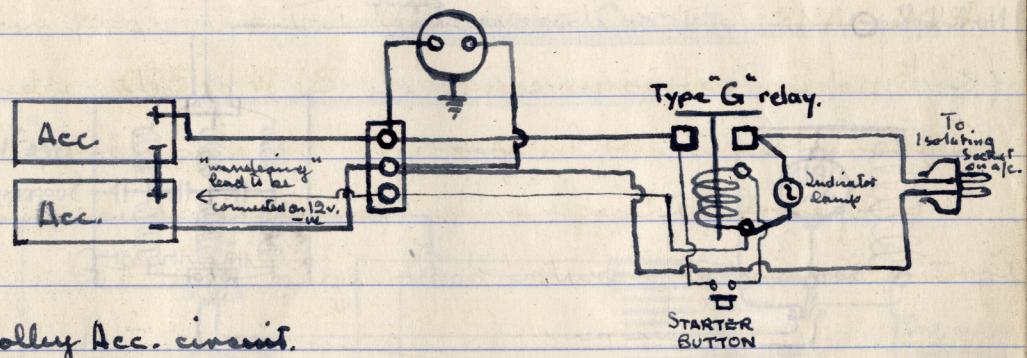
Old type - 60 W Lamp - Acc. supply.
Angle of light adjustable.



new type - used with "Drem" system. 240 W Lamp. mains supply. Similar in appearance to "magic lantern". Clean break between colours, only one of which is visible at once.

Trolley Acc.

Consists of 2 Accs. either 2 x 6 v. x 180 AH. or 2 x 12 v x 90-100 AH
or 1 x 6 v. and 1 x 12 v.
"Chore-horse" petrol set for charging when not in use.



Trolley Acc. circuit.

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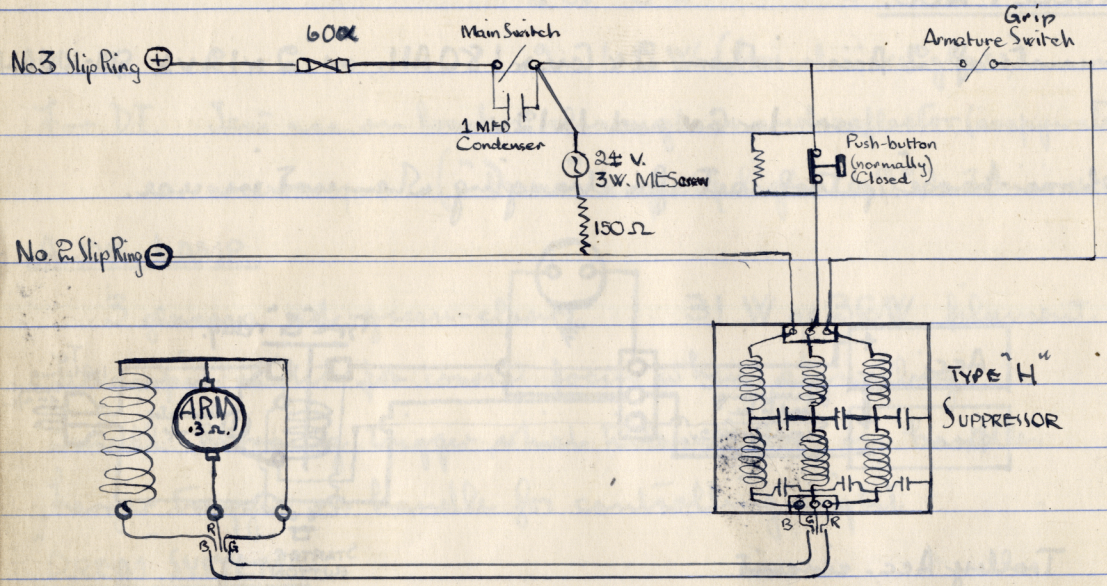
7 KW. Trailer. - 1 Meadows petrol-electric set. 12 HP. O.H. Valves 1500 RPM. Alternator - 230 v. 50 cycles. 30 ∝. single phase. - DC exciter supplies alternator field with 6·7 ∝ 97·5 v. Thermal voltage regulator. (To be switched over every six hours running time). Rectifier for converting 230 v. AC. to 36 v. DC. for battery charging. 2 Type "B" charging boards.
2 external sockets 36 v. DC for trolley acc. charging.
5 external sockets for external loads. 4 x 10 ∝. 1 x 25 ∝.

BOLTON & PAUL. POWER-OPERATED GUN TURRETS.

POWER CIRCUIT.

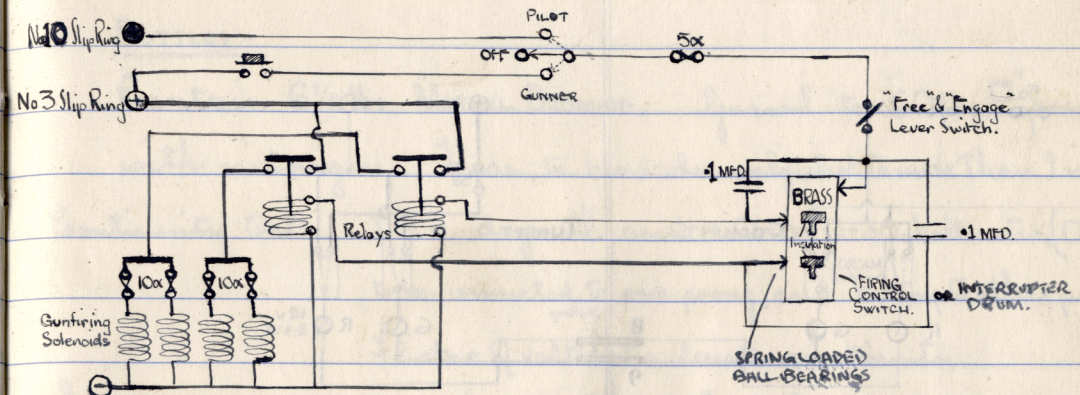


NORMAL SPEED. 17 Amps. - 3000 RPM. - ·35 H.P. - 24° per second.

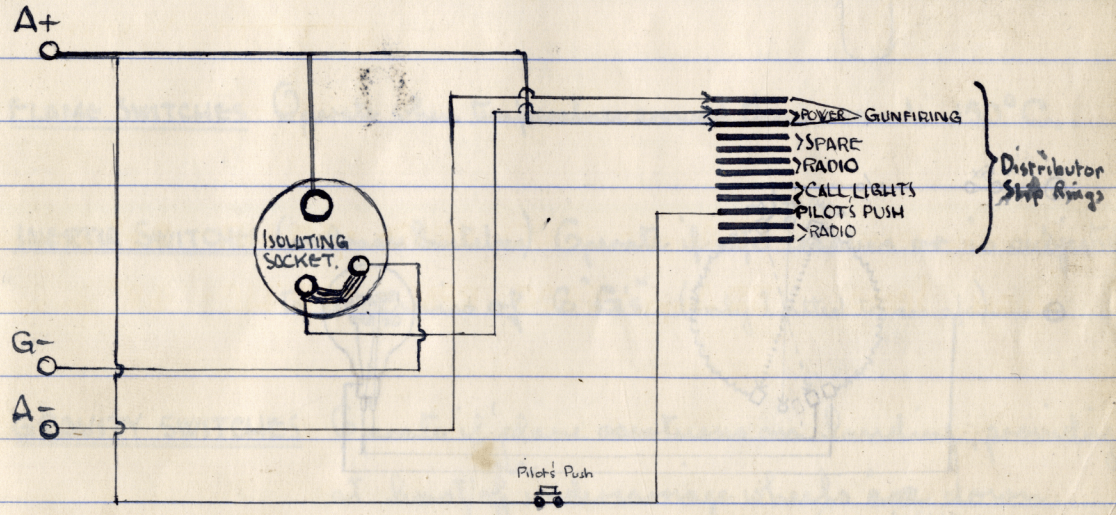
HIGH SPEED. 32 Amps. - 5400 RPM - ·82 H.P. - 48° per second.

Lamp resis. to prevent current surge thro' lamp when inductive field circuit is broken on switching "off" Master sw. High speed resis. varies to suit resis. of motor field. Main sw. on first, then grip sw., to give fully energised field when starting. To test shunt field, sw. on main switch then sw. off. lamp should flash bright before going out

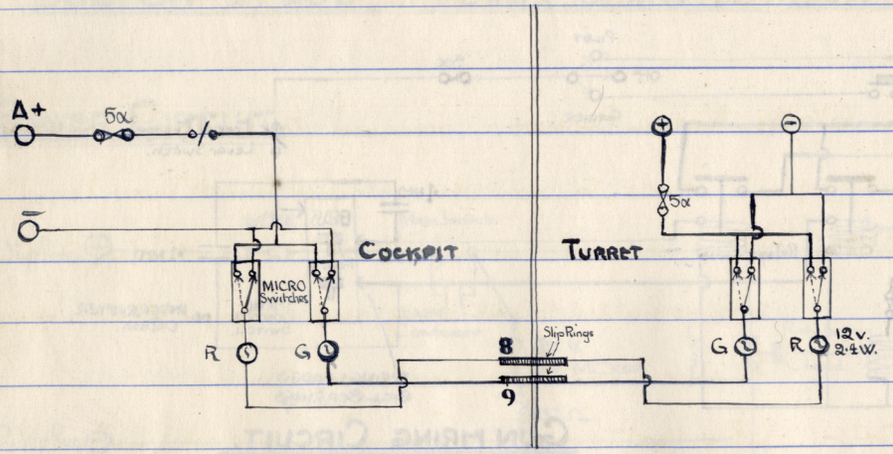
Operation :- Free & Engage lever sw. to Engage. - Firing sw. - Master sw. - control column - armature grip switch.



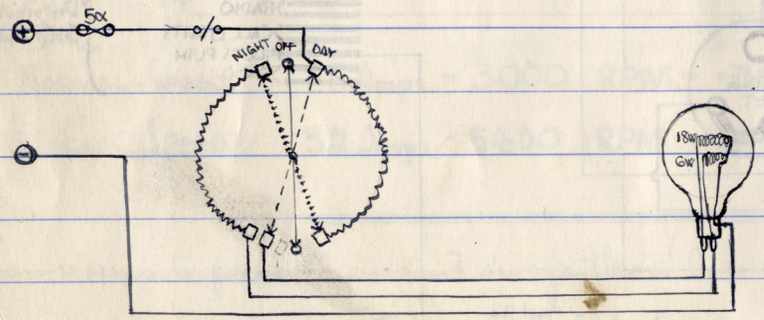
GUN FIRING CIRCUIT.



SERVICE TO TURRET.



CALL-LIGHT CIRCUIT



REFLECTOR GUN SIGHT.

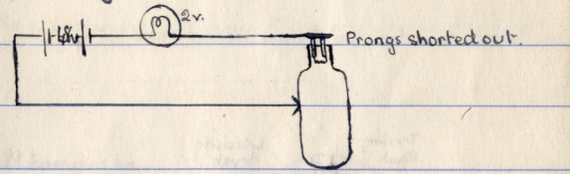
GRAVINER FIRE EXTINGUISHER SYSTEM.

BOTTLES:-

Contain 6½ lbs METHYL BROMIDE. Pressed to 60 lbs □" pressure with nitrogen. Fuse, to blow when subjected to more than 1 millionth.

Continuity test:- 1·5 v. dry cell and 0-3/0-30 Voltmeter. (0-30 terminals to be connected to one prong, and battery to other prong. Flicker of voltmeter denotes continuity.

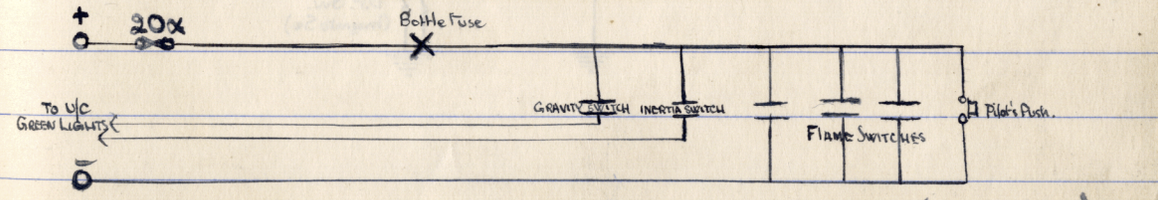
Insulation test:- 48 v. (4×12v accs.) and "Gleim" lamp bulb. (2v.)



FLAME SWITCHES Operate when temperature around them exceeds 150°C.

INERTIA SWITCHES (or Crash Switches) Operate if a/c crashes or is subjected to a strain of 6 "G's". (only 1 fitted to an a/c)

GRAVITY SWITCHES Operate if plane overturns on landing, providing one at least of undercarriage wheels is down. (only 1 fitted to an a/c)

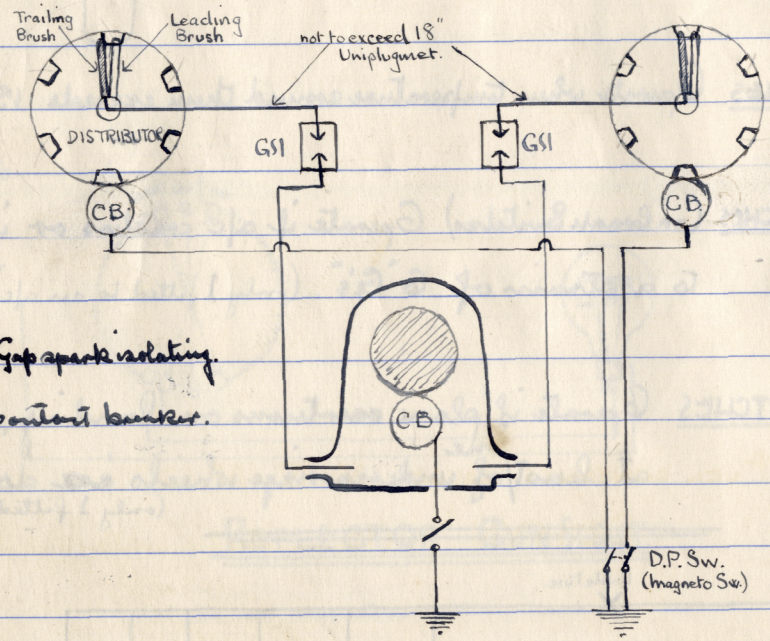


EXTINGUISHER CIRCUIT (theoretical).

IGNITION

Insulation Test :-

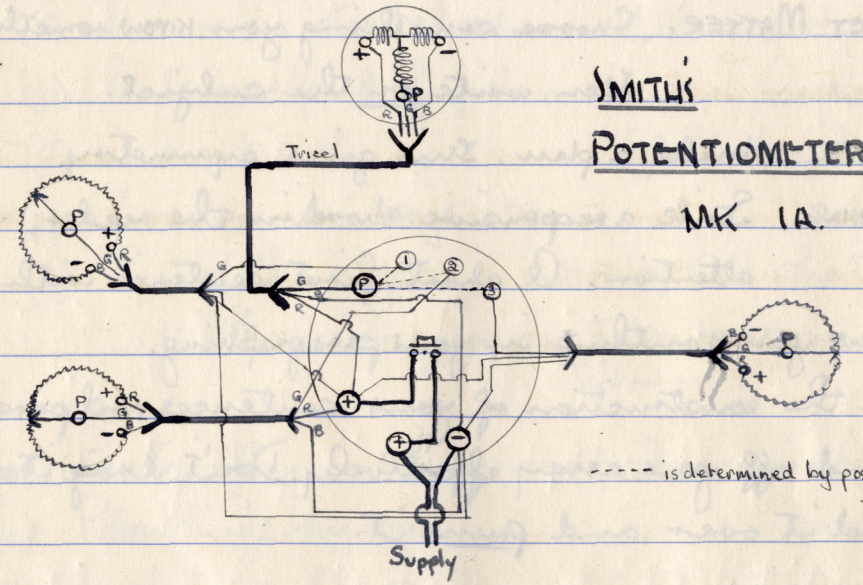
Use hand-spark magneto for H.T. One lead to core of cable, the other to one side of pair of spark contacts which are also connected to cable insulation. If no spark occurs between contacts, cable is U/S.



G.S.I. Gap spark isolating.

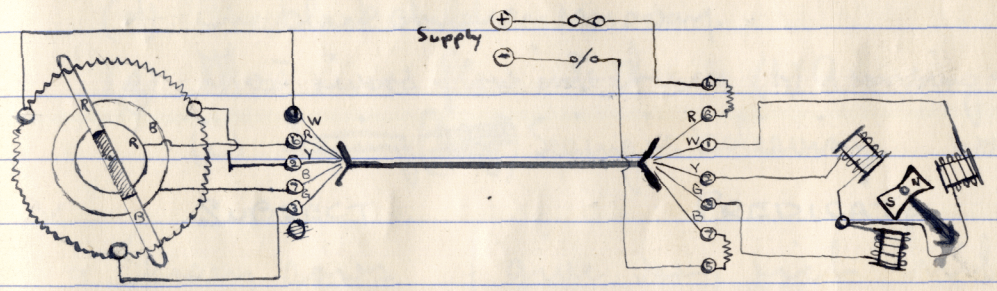
C.B. Contact breaker.

PETROL & FUEL GAUGES.



SMITH'S POTENTIOMETER, MK 1A.

----- is determined by position of selector sw.



Transmitter

Indicator

FUEL CONTENTS GAUGE MK IV AP. 1275

"DESSYN" (1 Transmitter & Indicator to each tank)