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# R. A. E.

## RADIO DEPARTMENT

## TECHNICAL NOTE

No. RAD. 228

PART. 2.

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Technical Note No.RAD.228
Part 2

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Part 2
October,1944

ROYAL AIRCRAFT ESTABLISHMENT, FARNBOROUGH

# REPORT ON GERMAN RADIO COMPONENTS

## ILLUSTRATIONS AND DATA

by

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File Ref: Radio/S.6057/HKH/96

## PLATE 1

Fig. 1. Various types of ceramic dielectric capacitors

A. Single unit (straw type)

B. Single unit (tubular type)

C. Parallel assembly of units

D. Parallel assembly of units

Fig. 2. Base plate showing method of connecting units

The connections are not made by wires but solder is run into grooves between connections.

## PLATE 2

Fig. 1. Protected assemblies of straw type units

Each tube contains an assembly of the type shown in Plate 1, Fig.1, "C". The connections between units are as shown in Plate 1, Fig.2. The outer tube serves as a protection for the inside units.

Fig. 2. Protected Capacitor Unit

## PLATE 3

Ceramic trimmer capacitors

Fig. 1. Typical ceramic trimmer with silvered stator and rotor plates. The capacitance is varied by varying the overlapping area of silver.

Fig. 2. Variable Capacitor shown in Fig.1.

PLATE 1.

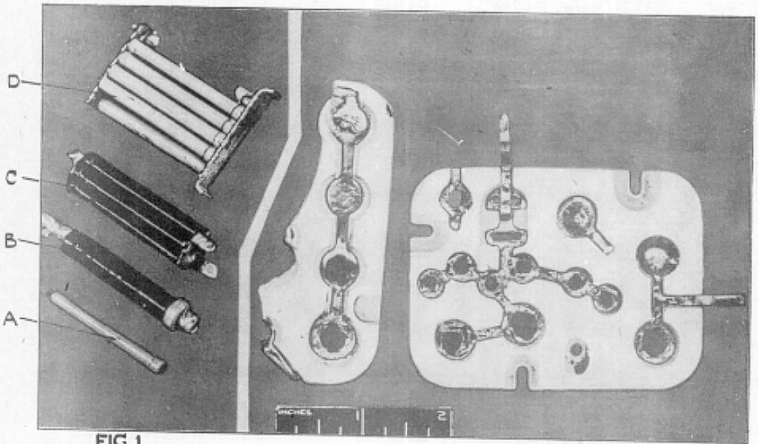



FIG. 1.

STRAW & TUBULAR TYPES

FIG. 2.

BASE PLATE WIRING.

PLATE 2.

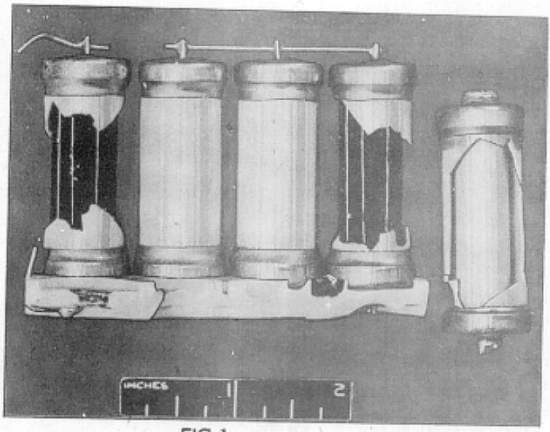



FIG 1. FIG. 2.

PROTECTED TYPES.

PLATE 3.

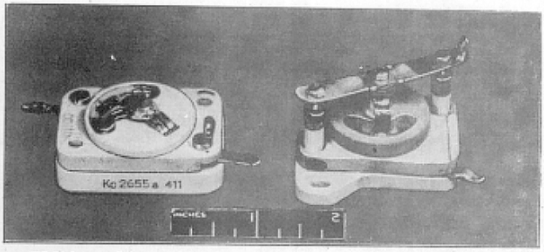



FIG. 1. A FIG. 2. B

PRESET TYPE

PLATE 4

1. Side view of die-cast chassis

2. Front view of die-cast chassis

The whole chassis is neat and well finished. No machining process is evident.

2.1 Ceramic grommets screwed into chassis.
2.2 Fixing holes to locate adjacent section of chassis.

3. Bakelite Switch

The switch has a very low capacity and the switching procedure is effected by the cuts in the bakelite in which the metal contacts ride.

3.1 Bakelite strip with grooves.
3.2 Spring contacts.
3.3 Ceramic base covered with metal for protection and screening.

4. Coil on Ceramic former

The former is furnished with an excellent glaze.

4.1 Inserts of metal soldered on to silvered ceramic.
4.2 Electrolytically deposited coil in silvered groove on former.
4.3 Ceramic former showing glazed finish.

5. Part of Air Capacitor

The vanes of the capacitor consist of ceramic material coated with silver.

5.1 Silvered surface of ceramic.
5.2 Two silvered ceramic surfaces soldered together.
5.3 Ceramic spindle.

6. Metallised paper Capacitor

Note the small size - unit contains 1 mfd.

6.1 Fixing base rivetted to case.
6.2 Poor insulating material between terminals.

7. Ceramic Capacitor (Ref.5)

7.1 Metal end pieces.
7.2 Protective case of ceramic around ceramic unit.
7.3 Ceramic unit.

8. Metallised paper Capacitor

8.1 Ceramic terminals.
8.2 Fixing lugs.

9. Metallised paper Capacitors

9.1 Ceramic terminals.
9.2 Method of mounting.

10. Assembly of Ceramic Capacitors

10.1 Ceramic base.
10.2 Capacitor units.

11. Assembly of compensating Ceramic Capacitors

11.1 Different colours denote different temperature coefficients.
11.2 Ceramic base.

12. Concentric Air Trimmer

12.1 Ceramic frame.
12.2 Fixed cylinder.
12.3 Moving cylinder

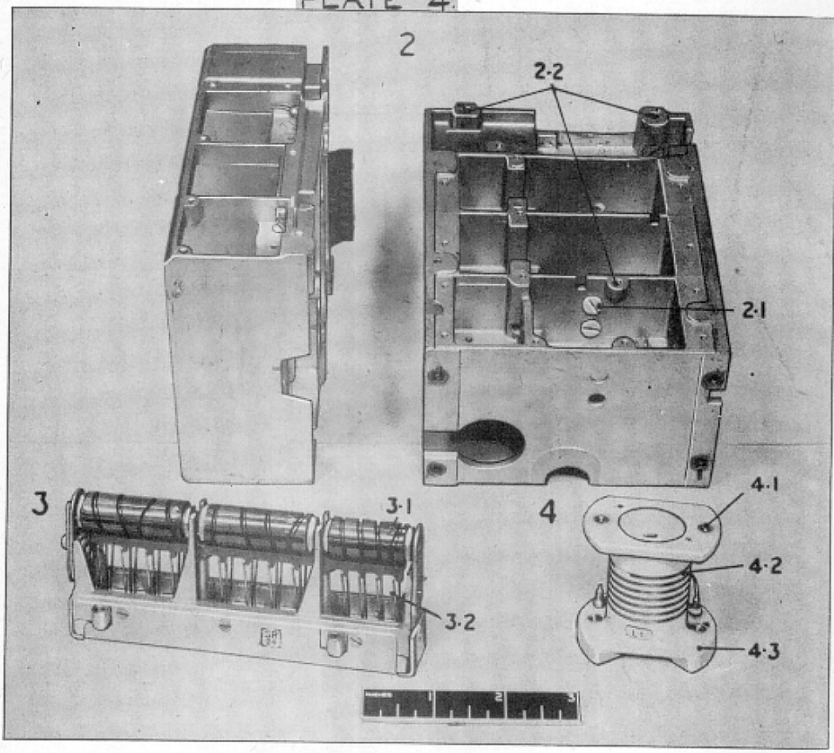
13. Parallel Plate Air Trimmer

13.1 Ceramic frame. 13.2 Parallel plates

14. Ceramic Trimmer

14.1 Silvered ceramic plate[illegible]

PLATE 4.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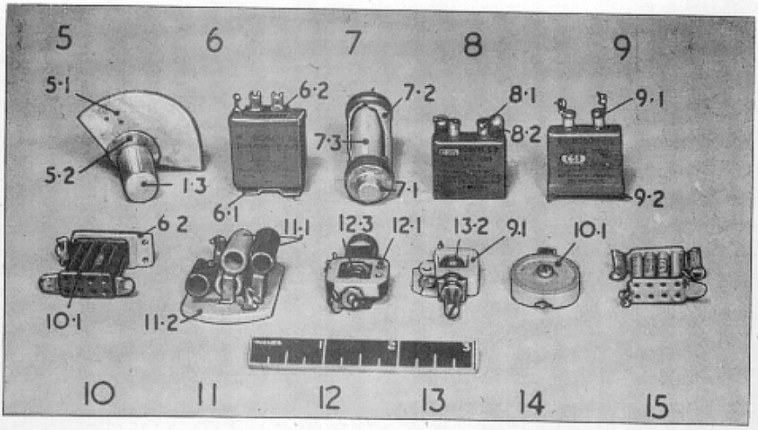
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PLATE 5

1. Variometer

1.1 Ceramic Frame
1.2 Wire wound round ceramic former
1.3 Dust iron core in moving coil
1.4 Driving handle

2. Sealed assembly (3750 c.p.s. high stability oscillator)

The assembly consists of capacitors and coils contained inside a hermetically sealed case, the various leads emerging by means of ceramic insert terminals.

2.1 Ceramic terminals
2.2 Ceramic trimmer capacitor fitted to case

3. High voltage capacitor

Origin - Italian
3.1 High voltage terminals
3.2 Rolled seam construction

4. High voltage insulator (for use at H.F.)

Straight ceramic rod

5. Paper dielectric capacitor

5.1 Glass sealed terminals
5.2 Soldered seam

6. Paper dielectric capacitor

6.1 Multiple capacitor unit, bakelized fabric insulation

7. Paper dielectric capacitor

7.1 Asymmetric position of fixing holes
7.2 Ceramic terminals inserted in the metal case

8. Paper dielectric capacitor

8.1 Ceramic end piece completely forming end of unit
8.2 Metal terminals inserted in ceramic

9. Paper dielectric capacitor

9.1 Stud mounting
9.2 Ceramic end seal with metal terminal

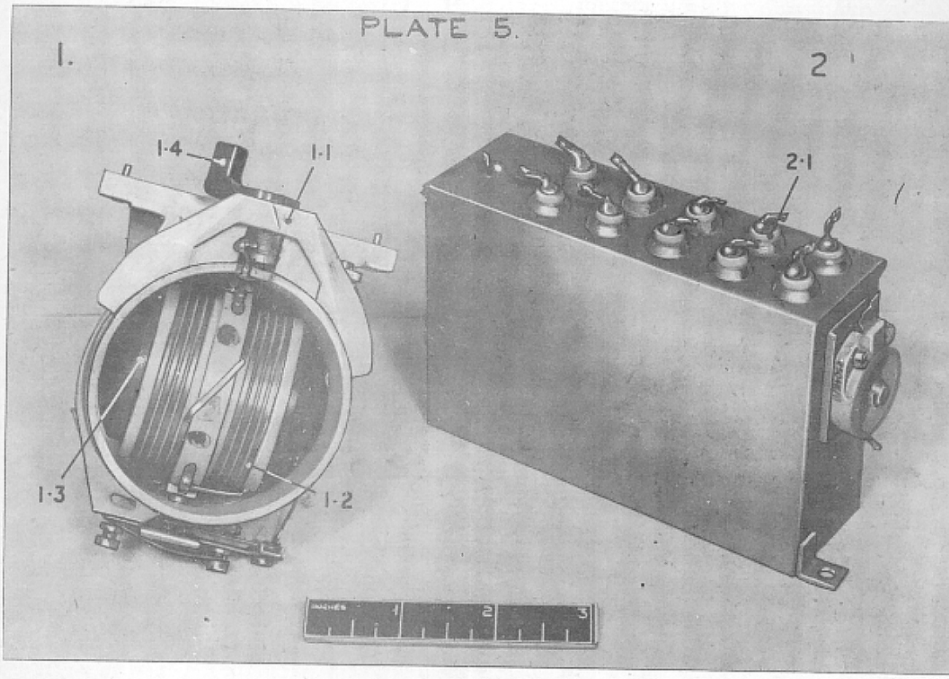
10. Paper dielectric capacitor (Multiunit)

10.1 Ceramic end piece with multi-unit connections

11. Retaining clip for 10

11.1 Spring clip
11.2 Drilled and tapped holes in base for connections

# PLATE 5.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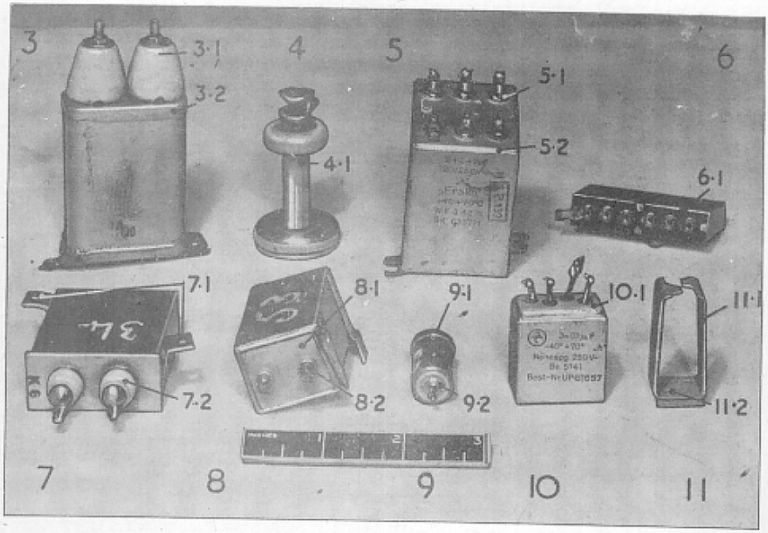
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PLATE 6

1. Paper dielectric capacitor

1.1 Glass seal insert.

2.& 3. Electrolytic capacitors

2.1 Stud mounting
3.1 Rubber seal

4 & 5. Paper dielectric capacitors in ceramic tube

4.1 Ceramic tube
4.2 Metal end caps (brass)

6. Unprotected mica capacitor

6.1 Mica dielectric
6.2 Terminals

7. Unit extracted from metal cased paper capacitor

7.1 Paper
7.2 Foil

8. Interior of paper capacitor with ceramic end pieces

8.1 Ceramic end pieces
8.2 Electrode connection
8.3 Capacitor unit
8.4 Screening plate

9. Ceramic end pieces of 8

9.1 Common electrode

10. Interior of multi-unit capacitor

11. Interior of metallised paper capacitors

11.1 Metallised paper

12. Paper dielectric capacitors with fabric insulation

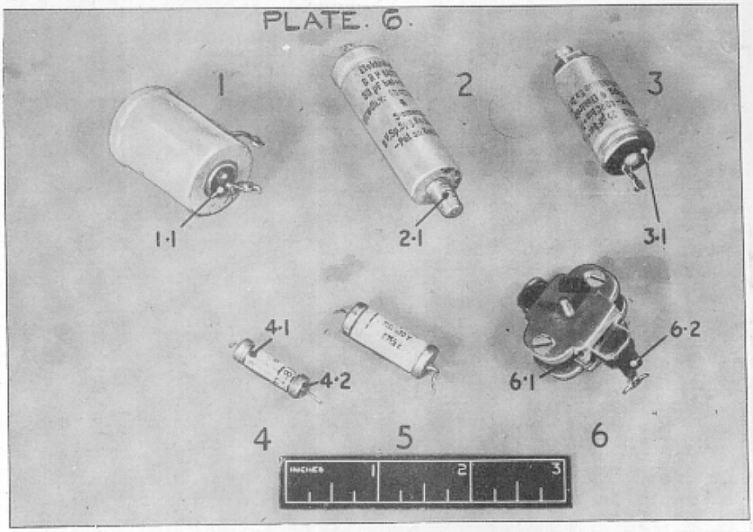
13. Reversible electrolytic capacitor

13.1 Tinned steel case
13.2 Glass seals

14. Multi-unit paper dielectric capacitor

15. High voltage ceramic capacitor (Transmitter)

16. High voltage Bypass Ceramic Capacitor and lead through for Grid of transmitter Valve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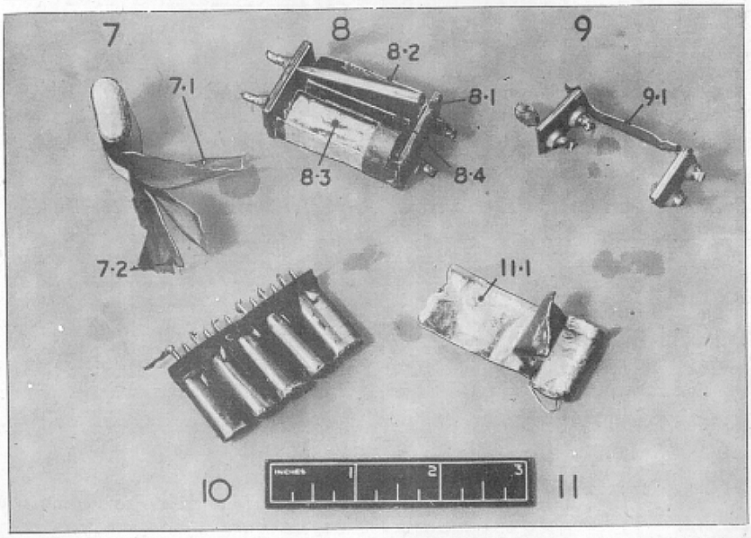
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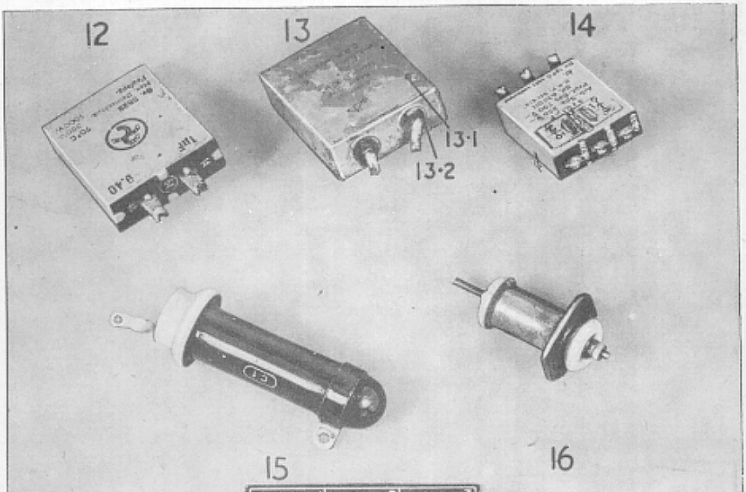
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PLATE 7

1. Paper dielectric capacitor

1.1 Ceramic end pieces and terminal fitting
1.2 Lug connecting to foil
1.3 Base fitting

2. Paper dielectric capacitor

2.1 Ceramic case
2.2 Metal end piece

3. Paper dielectric capacitor

3.1 Asymmetric base fitting
3.2 Common foil emerging
3.3 Ceramic terminal
3.4 Chlorinated wax filling

4. Paper dielectric capacitor

4.1 Metal end piece
4.2 Lacquered paper protection

5. Mica dielectric capacitor

5.1 Metal terminal in ceramic case
5.2 Silvered ceramic end plate with metal terminal insert
5.3 Mica dielectric unit
5.4 Clamp of mica unit

6. Sealed metal rectifier

6.1 Ceramic tube
6.2 Copper oxide discs
6.3 Metal end hermetically sealing unit
6.4 Connecting lugs

7. Top of variable capacitor unit

The assembly is die-cast with no machine operations
7.1 Screening between adjacent units

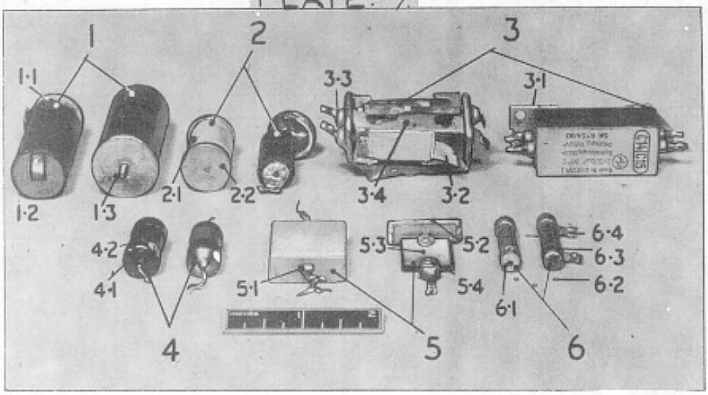
8. View of complete variable capacitor unit

8.1 Ceramic inserts to allow leads to emerge
8.2 Sealing cement
8.3 Driving gear

9. View of variable capacitor with top removed

9.1 Ceramic spindle traversing length of unit
9.2 Rotor vanes on spindle, die-cast in one piece and machined
9.3 Split vanes to allow minor adjustments
9.4 Weak spot where several similar units cracked

PLATE. 7.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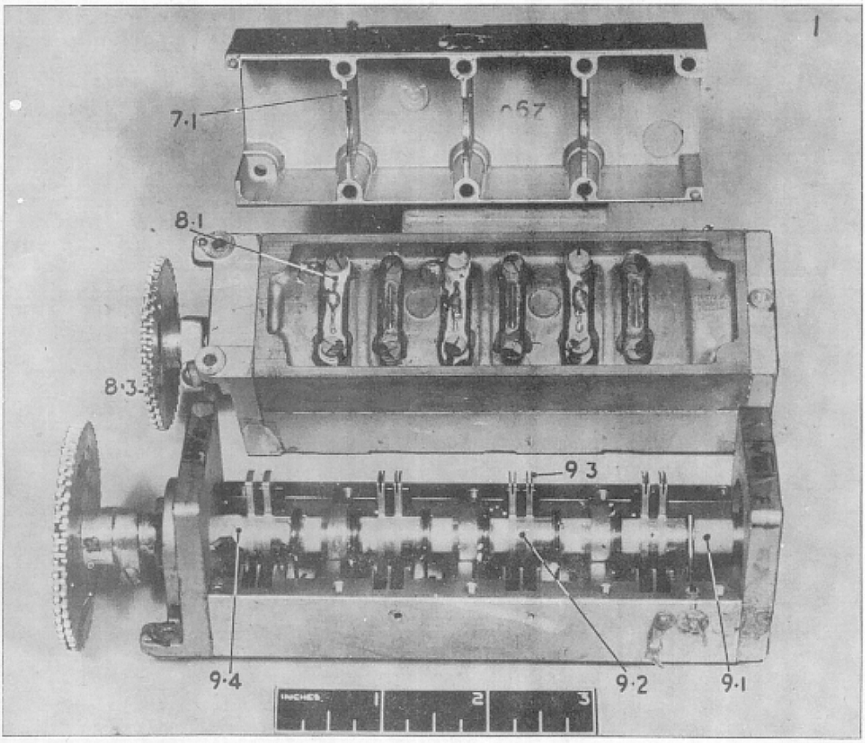
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PLATE 8

1. Local Oscillator for Receiver

Side view, ceramic chassis

2. Indicating unit

2.1 Coil housing

3. I.F. Transformer

3.1 Dust iron core

3.2 Gap

3.3 Adjustable part of core

3.4 Adjustment screw

3.5 Loaded polystyrene casing

4. I.F. Transformer

4.1 Ceramic frame

4.2 Trimmer condenser

5. Indicating unit (dismantled)

5.1 Coil

6. Resistor assembly

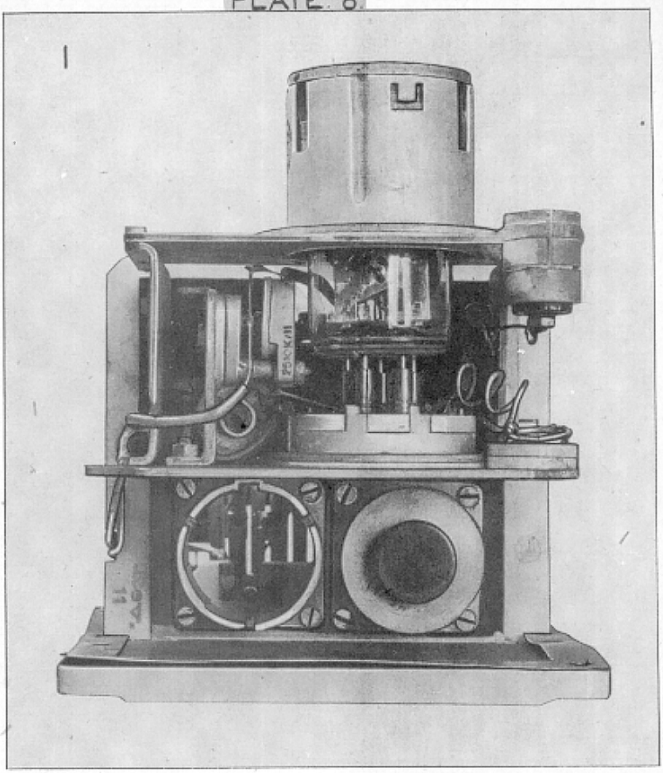
6.1 Wire wound miniature resistors

6.2 Plastic casing

7. I.F. Transformer

7.1 Plastic casing

PLATE. 8



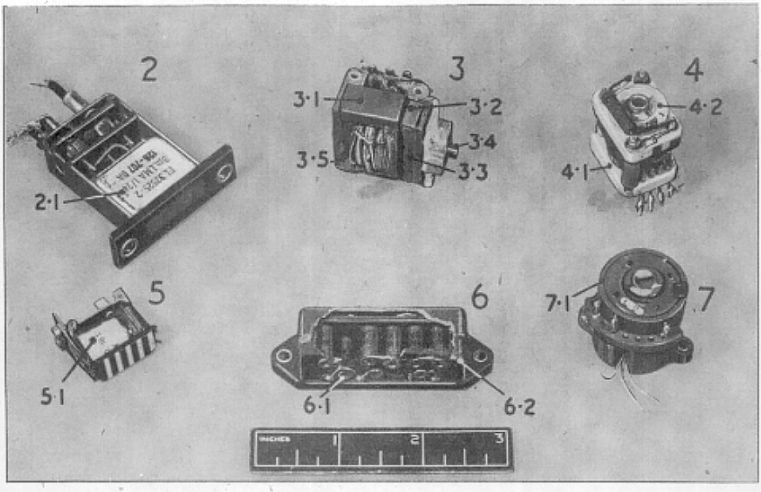



PLATE 9

1. Complete variable capacitor unit

The whole assembly is sealed

1.1 Ceramic inserts with leads emerging

1.2 Sealing cement

1.3 Adhesive tape to complete seal

1.4 Rotating gear

2. Variable capacitor unit with cover removed

2.1 Ceramic spindle traversing length of unit

2.2 Split vanes for minor adjustments

2.3 One set of vanes not split

2.4 Bush and vanes die-cast in one piece

2.5 Earth connection to case

2.6 Spring contact to rotating vanes

3. Wire wound potentiometer

4. Rectangular metal cased capacitor

Typical construction

5. Electrolytic capacitor

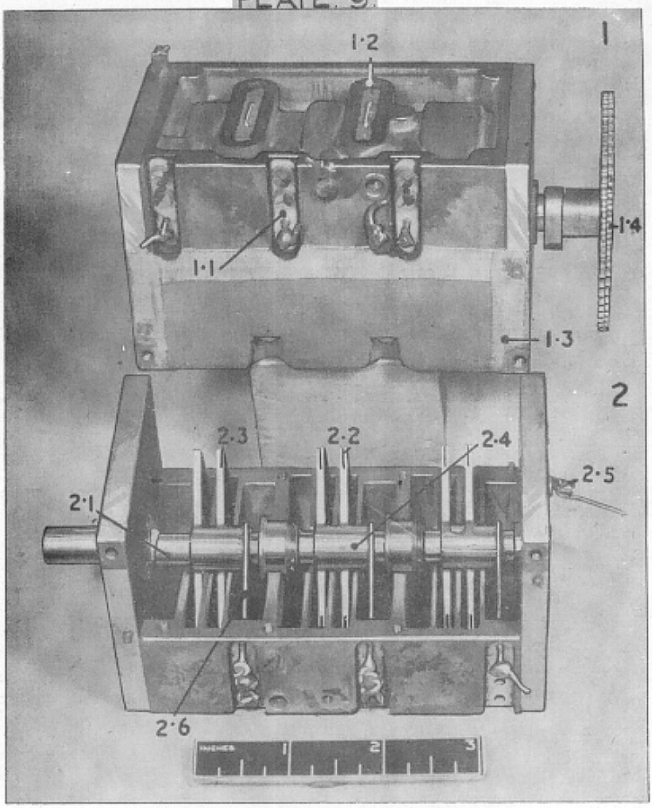
The capacitor has a peculiar end seal. The end piece is sealed to the case by a rubber ring and in addition the terminal is insulated from the end piece by a glass seal.

6 and 7. Selenium rectifiers

8. Non-tropical paper dielectric capacitor

8.1 Bitumen seal

PLATE. 9.



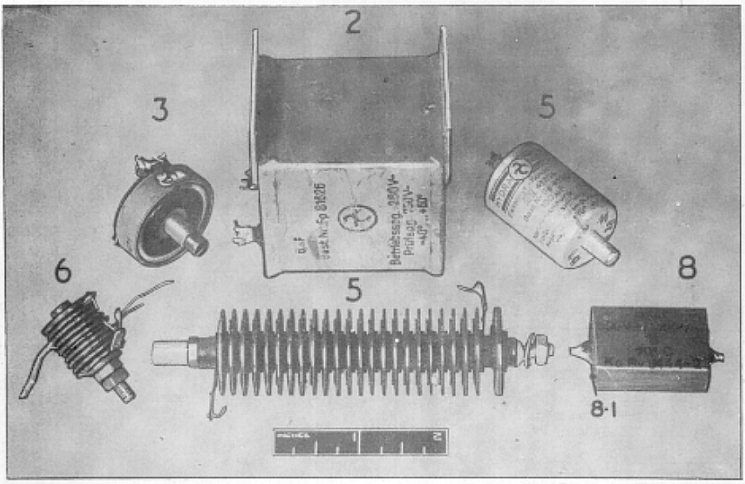



PLATE 10

1 and 2. Wire wound resistors

Note that resistors are comparatively unprotected

1.1 Paper label under sleeve

2.1 Cellulose acetate sleeve

3. View of miniature assembly

The compact nature of this assembly is interesting. The whole unit is self-contained and is connected to associated sections by a plug and socket.

3.1 Locking lacquer

3.2 Connecting socket with copper-beryllium connections

3.3 Miniature covered wire

4. Current transformer

5. P.V.C. covered, screened cableform

5.1 Multi-core, each wire covered with P.V.C.

5.2 P.V.C. sheath

5.3 Screen

6. Bank of paper dielectric capacitors

Glass seals

7. Mica dielectric trimmer capacitor

7.1 Mica dielectric

7.2 Ceramic base

7.3 Adjusting screw

7.4 Spring plate

8. Paper dielectric capacitor

8.1 Ceramic top piece

9. Paper tubular capacitor

9.1 Cardboard case

9.2 Bitumen end seal

10. Paper tubular capacitor in metal case

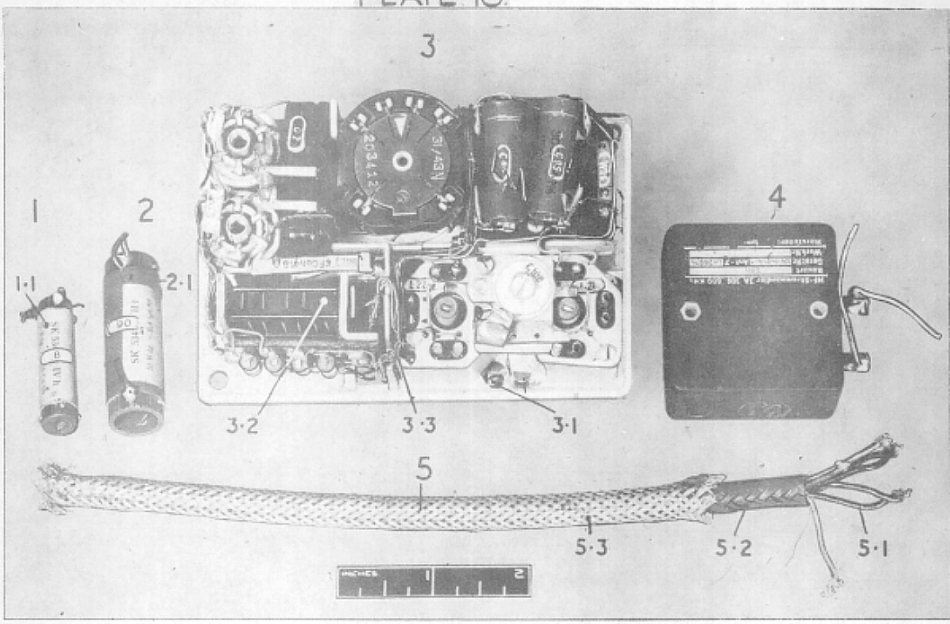
11. Mica dielectric capacitor

11.1 Moulded case

12. Miniature paper-tubular capacitor

12.1 Glass seals

PLATE 10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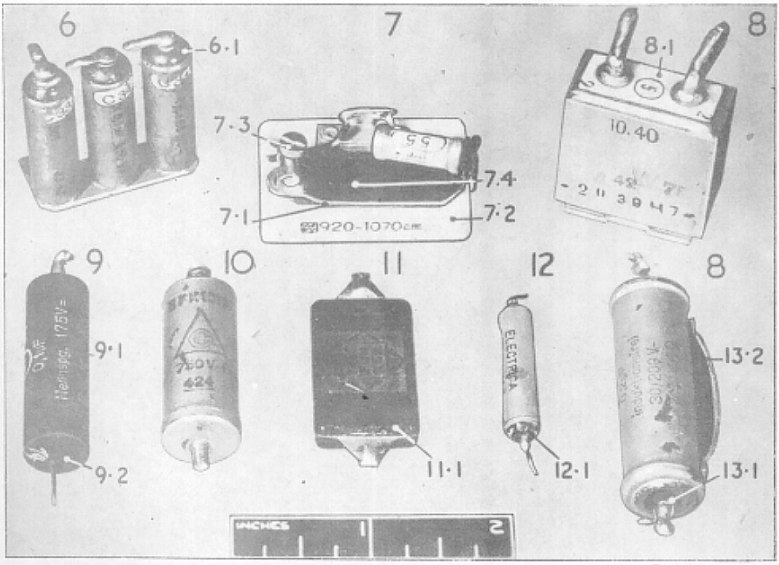
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PLATE 11

1, Vitreous resistors

1.1 Metal tubing

1.2 Clamping spring

2, 3, 4 and 7. Miscellaneous vitreous resistors

5. Unprotected resistor

5.1 Tapping point

6. Unprotected resistor

6.1 Ceramic former

8 and 9. Lacquered resistors

10 - 21 Miscellaneous carbon film resistors

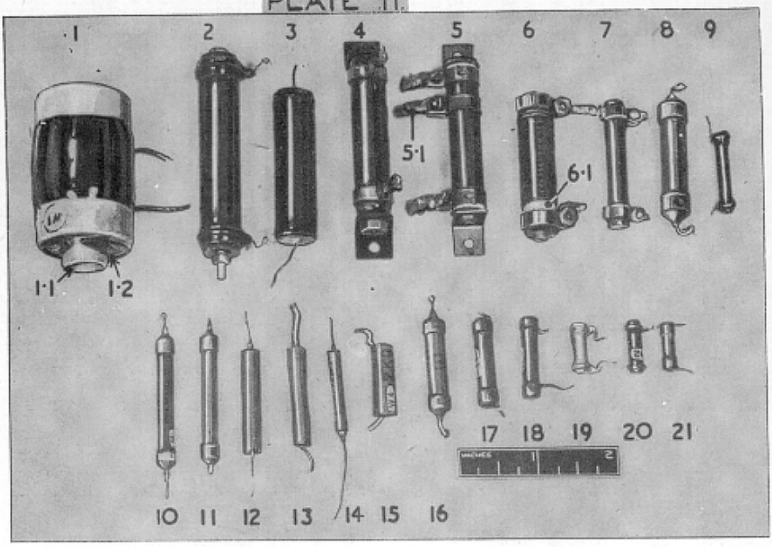
22. Multipin plug - socket (back view)

22.1 Transparent cellulose film

22.2 Covered wire type 'C' ( described in the test.

22.3 Covered wire type 'C' (( the test.

PLATE 11.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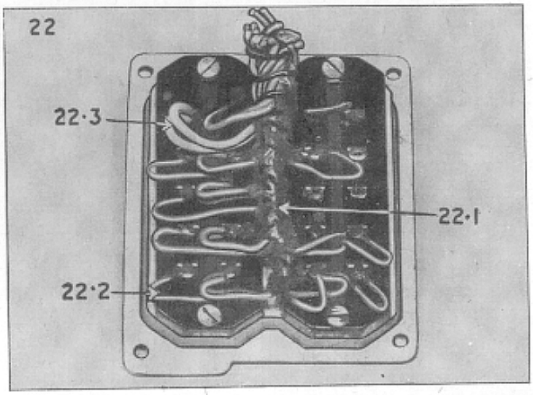
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PLATE 12

1. Paper tubular capacitor

1.1 Ceramic seal

1.2 Mounting strip allowing capacitor to project through chassis

2. Miniature assembly

2.1 Copper oxide rectifiers

2.2 Miniature covered wire

3. 'W' Plug equivalent (back view)

3.1 Back cover

3.2 Terminals

4. Paper tubular capacitor

Similar to 1.

5. Polarised relay

5.1 and 5.2 'Make' contacts

5.3 and 5.4 'Make and Break' contacts

5.5 Movable link of magnetic circuit

5.6 Contact working independent of polarity

6. General purpose relay

6.1 Bakelised paper boards

6.2 Heavy duty contacts

6.3 Belts locked with hard lacquer

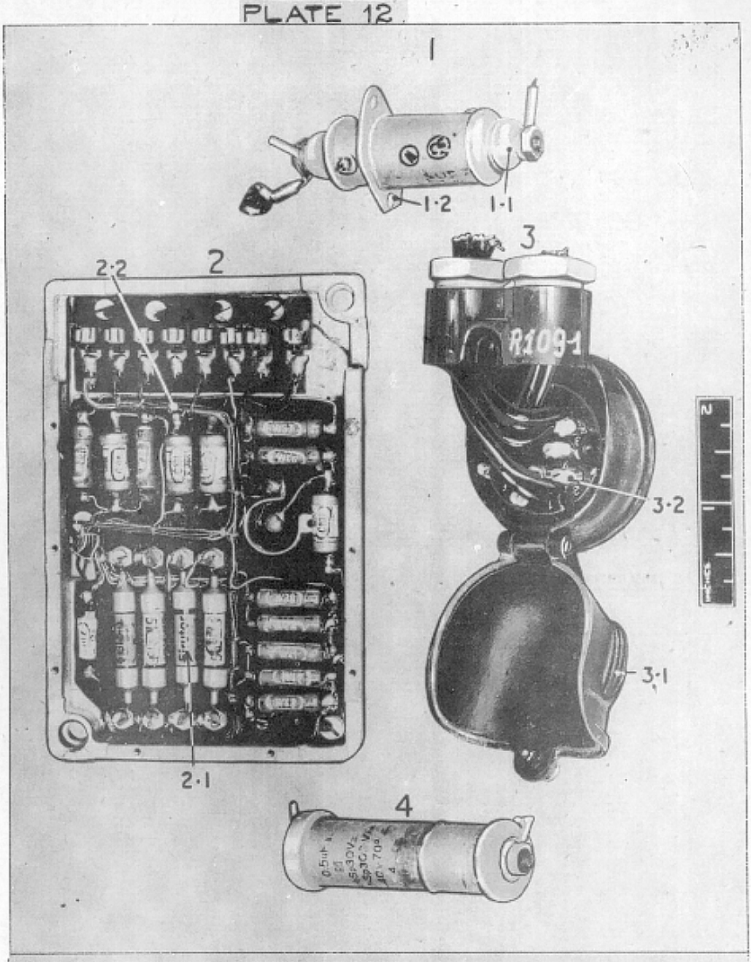
7. General purpose relay (enclosed)

7.1 Core contacts

7.2 Relay contacts

7.3 Locking screw

PLATE 12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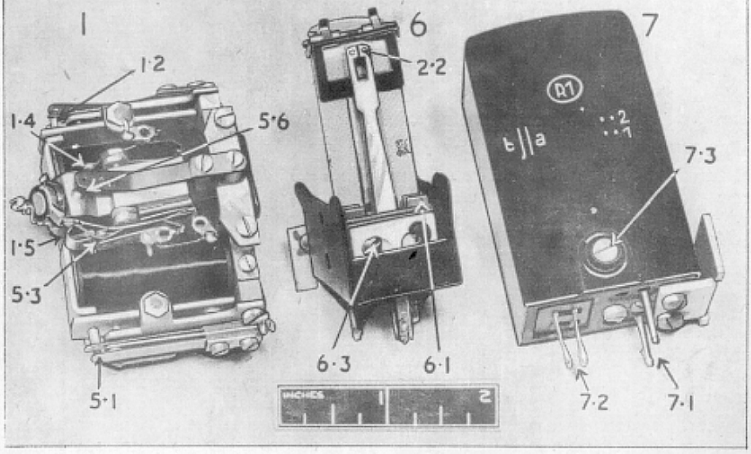
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PLATE 13

1. Polarised relay micro-switch

1.1 Movable link of magnetic circuit

1.2 and 1.3 gaps

1.4 and 1.5 adjustment knobs

1.6 Bakelised fabric board

1.7 Laminated paper board

2. Heavy duty circuit breaker

2.1 Bakelised fabric board

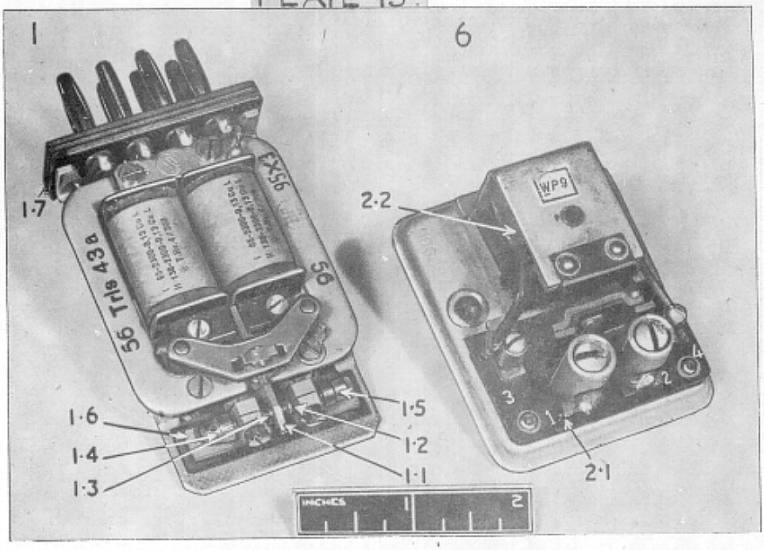
2.2 Relay core

3 and 4. Carbon track potentiometers

5. Wire wound potentiometer

6. Visual indicators

PLATE 13.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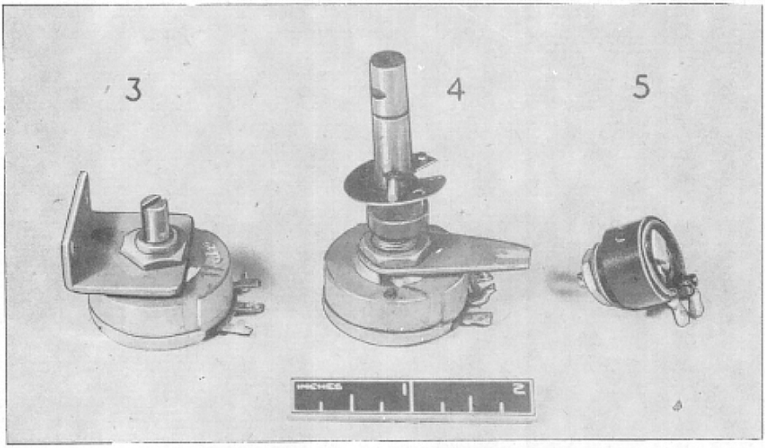
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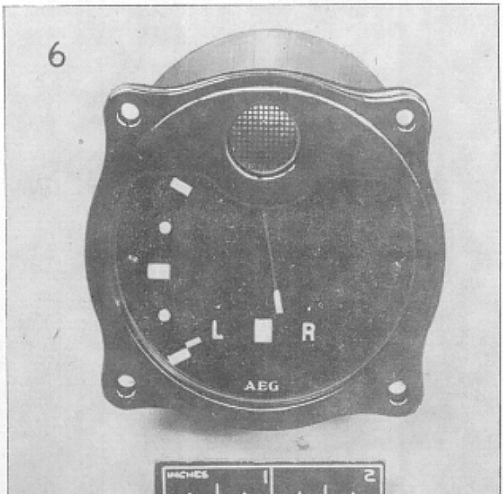
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PLATE 14

1. General purpose relay

- 1.1 Damping spring
- 1.2 Projection rod
- 1.3 Relay contacts

2. General purpose relay

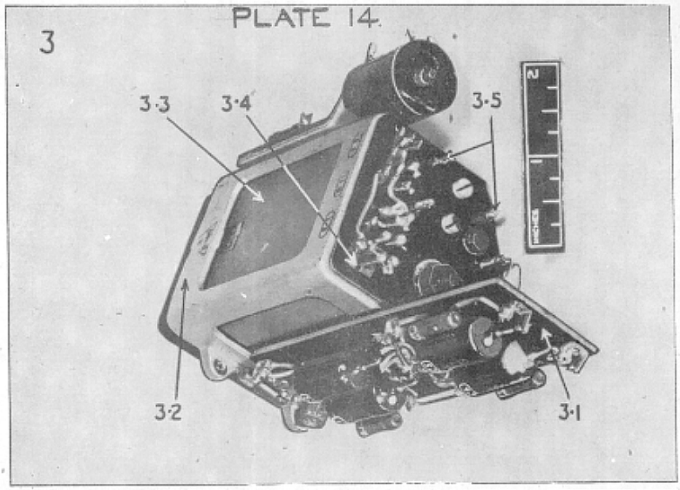
3. Composite relay assembly

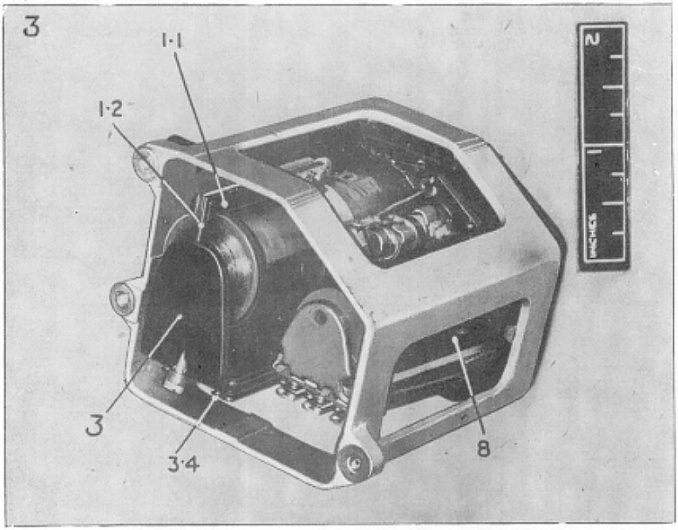
- 3.1 Component mounting board
- 3.2 Die-cast casing
- 3.3 Dust cover
- 3.4 Relay contacts
- 3.5 Coil contacts

4. Indicating unit

- 4.1 Relay coil
- 4.2 Movable link of magnetic circuit

PLATE 14.



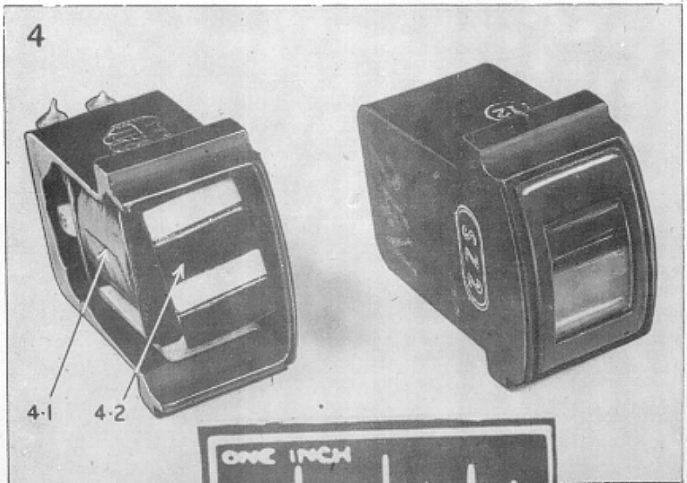



PLATE 15

1. Power supply choke

2. Unprotected transformer

2.1 Laminated paper board

3. Audio transformer and choke

3.1 Laminated paper

3.2 Bakelised fabric

3.3 Clamping device for core

4. Hermetically sealed transformer unit

4.1 Glass terminals and seals

5. Audio transformer

6 and 7 I.F. transformers

6.1 and 7.1 Trimmer capacitor attached to base

8. I.F. Transformer

8.1 Dust iron core

8.2 Adjustment screw

8.3 Loaded polystyrene casing

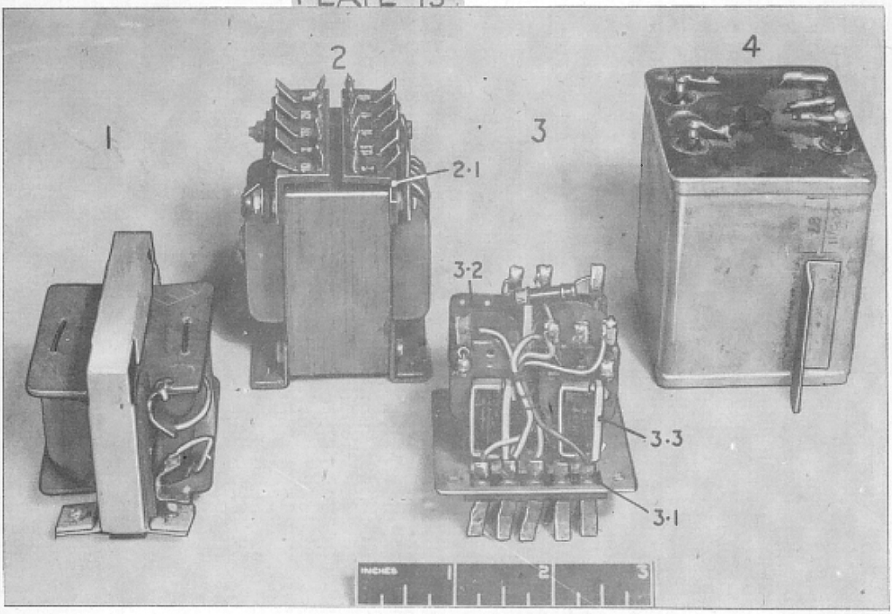
8.4

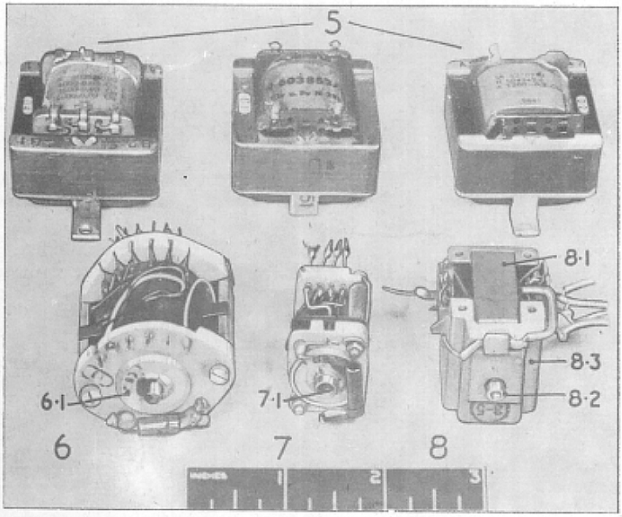
PLATE 16

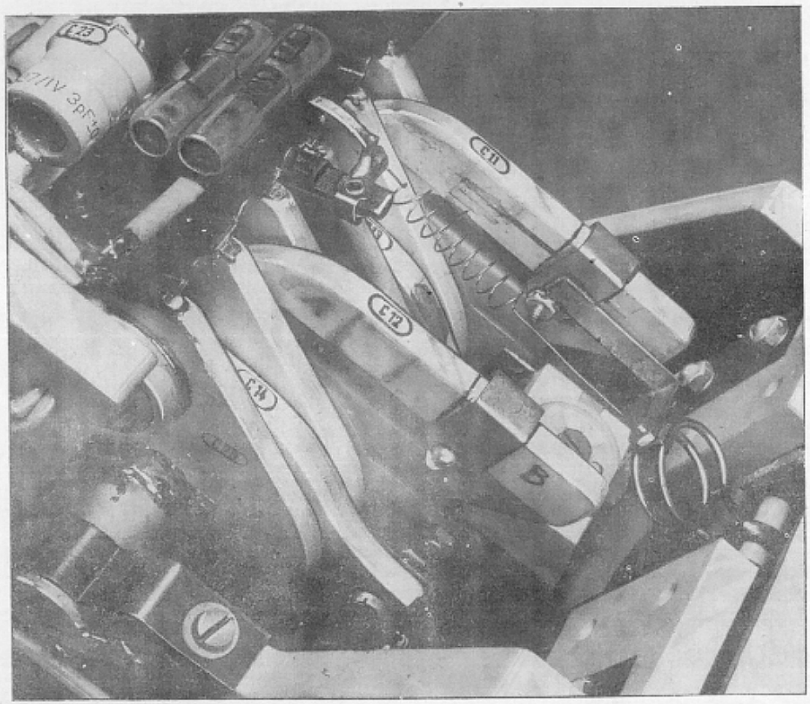
1 and 2 Oscillator Unit (Ref. 15)

This unit is interesting in view of the extensive use of metallised ceramic material.

PLATE 15





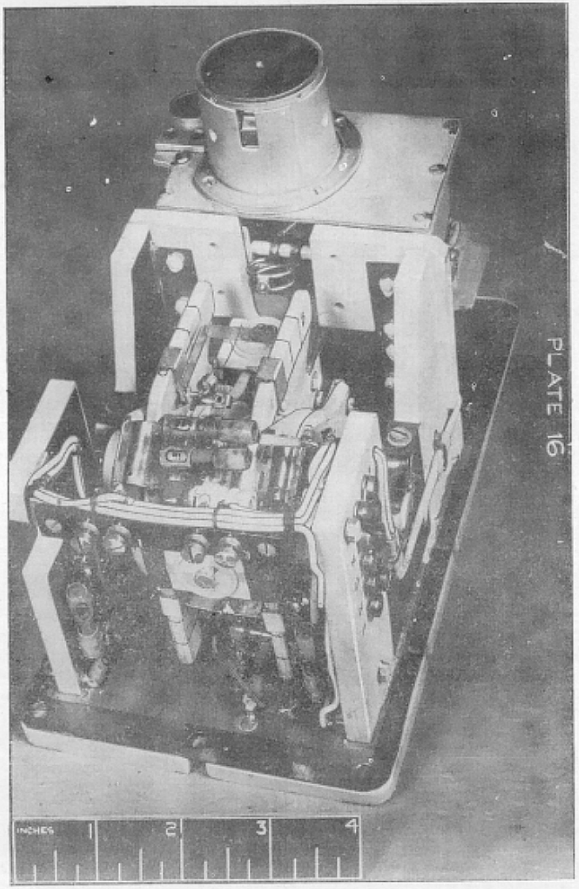
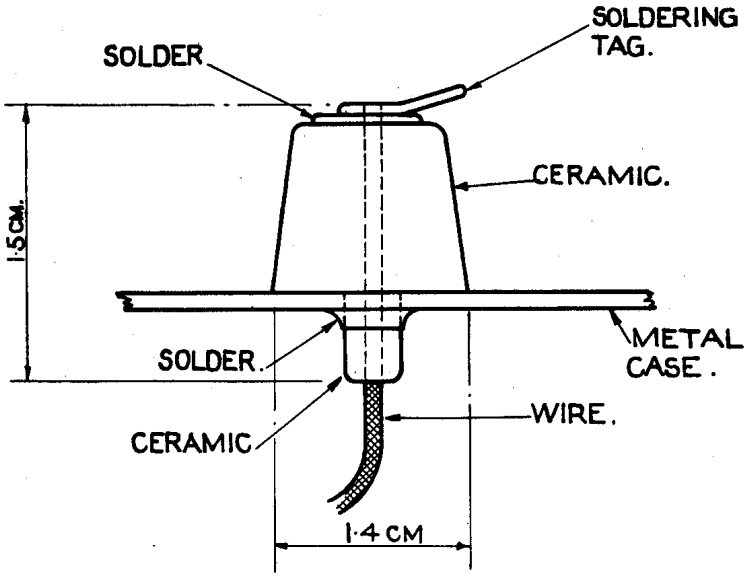




PLATE 16

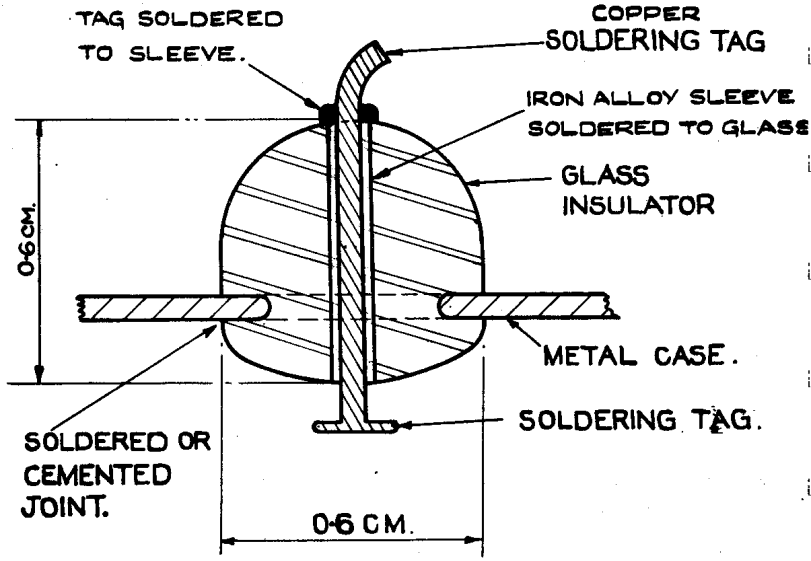
# 13. List of German Manufacturers and Markings.

THE FOLLOWING LIST CONTAINS NAME AND SYMBOLS OF GERMAN COMPONENT MANUFACTURERS AS PRINTED ON ENEMY COMPONENTS. THE DETAILS GIVEN ARE AS FULL AS POSSIBLE FROM INFORMATION OBTAINED FROM VARIOUS SOURCES.

| NAME. | ADDRESS. | TRADE MARKS. |
|---|---|---|
| ROBERT BOSCH. G.m.b.H. | STUTTGART. |  |
| SIEMENS. | SIEMENS APPARATE UND MASCHINEN, G.m.b.H, BERLIN, SIEMENSSTADT. |  |
| SIEMENS HALSKE. | WERNERWERK SIEMENSTADT BERLIN. | |
| TELEFUNKEN. | BERLIN ZELENDORF, I VIERBERG RING, OSETEWEG. |   |
| HYDRAWERK. | A.G. BERLIN N 20. |  |
| HOGES. | | |
| FRAKO | | |
| ELECTRICA | | |
| ERO | | |
| A.G.G. | | |
| R.E.W.D. | | |
| HESCHO. | HERMSDORF THÜRINGEN. | |
| V.T.T. (WIEN) | |   |
| JAROSLAW | | |
| L.B. | |  |
| | |  |
| | |   |
| | |   |
| | |  |
| NÜRNBERGER | | |




CERAMIC TERMINAL.
HERMETICALLY SEALED.




GLASS TERMINAL
HERMETICALLY SEALED.

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DIAG. 9628.