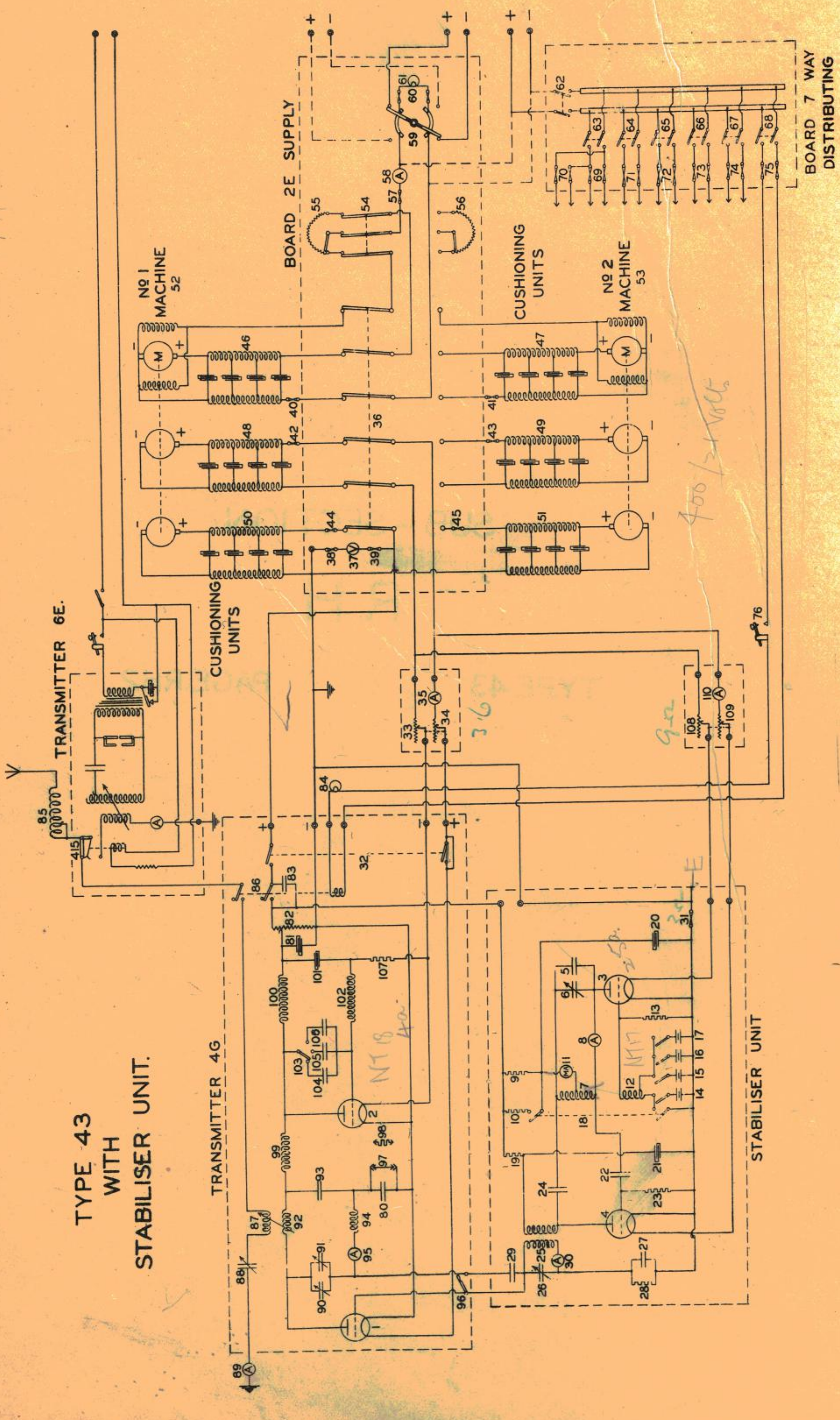
SUB – SECTION

R H

TYPE 43

PAGE RH2

TYPE 43



TYPE 43
WITH
STABILISER UNIT.

FIG. 4

Auxiliary Wave set.

TYPE 43

RH 3
~~R67~~

Transmitter	4G	8E	Stabiliser Unit
Date of design	1925	1929	1931
Frequency range	1785 – 2500 kc/s.	1785 – 2500 kc/s.	1700 – 2900 kc/s.
Power supply	Motor Generator 300 w. 400 v.	20 v. battery	Motor Generator 300 w. 400 v.
Valves used	Two NT18	–	Two NT17
Associated wavemeters	G8	1492B or G9	G31, G7 and G8
Approximate range in miles.	50	10	–
Reference page	~~R46~~ RH5	OB3	~~R71~~ RH7

Type 43 is a low power valve transmitting set consisting of transmitter 4G and stabiliser unit, with an emergency spark transmitter 8E. The transmitters and stabiliser are contained in separate boxes and are supplied as separate instruments. Figures a, d, and f, h, i, show the transmitter 4G and stabiliser in their respective boxes. It has its own power board, the storekeeping title of which is Board 2E supply (see figures a. and b.)

Type 43 is fitted in auxiliary W/T offices of heavy ships and cruisers and as special cases in second W/T offices of depot and repair ships.

POWER SUPPLY.

D.C. Supply. When Type 43 is fitted in a separate W/T office the D.C. supply to Board 2E supply is from each side of the ring main to a ring main C.O.S. (59). Connected across this C.O.S. are a pilot lamp (81) and fuses (80). The whole is fitted on Board 2E supply. The board, distributing, 7 way, is connected across the C.O.S. (59). The dotted lines in figures b. and k. show these connections.

When fitted in a W/T office with other sets (i.e., Type 45, Type 71 etc.) (see page ~~R30~~ RA4), the supply to Board 2E is from Board 2D change over. A.D.P. switch (118) on Board 2D connects the D.C. supply to one side of the C.O.S. (59). As there is a ring main C.O.S. (112) on Board 2D the C.O.S. (59) is not required and one side only is connected. Board, distributing, 7 way, is connected to the supply side of Board 2D change over, and its supply is therefore controlled by its own switch (82).

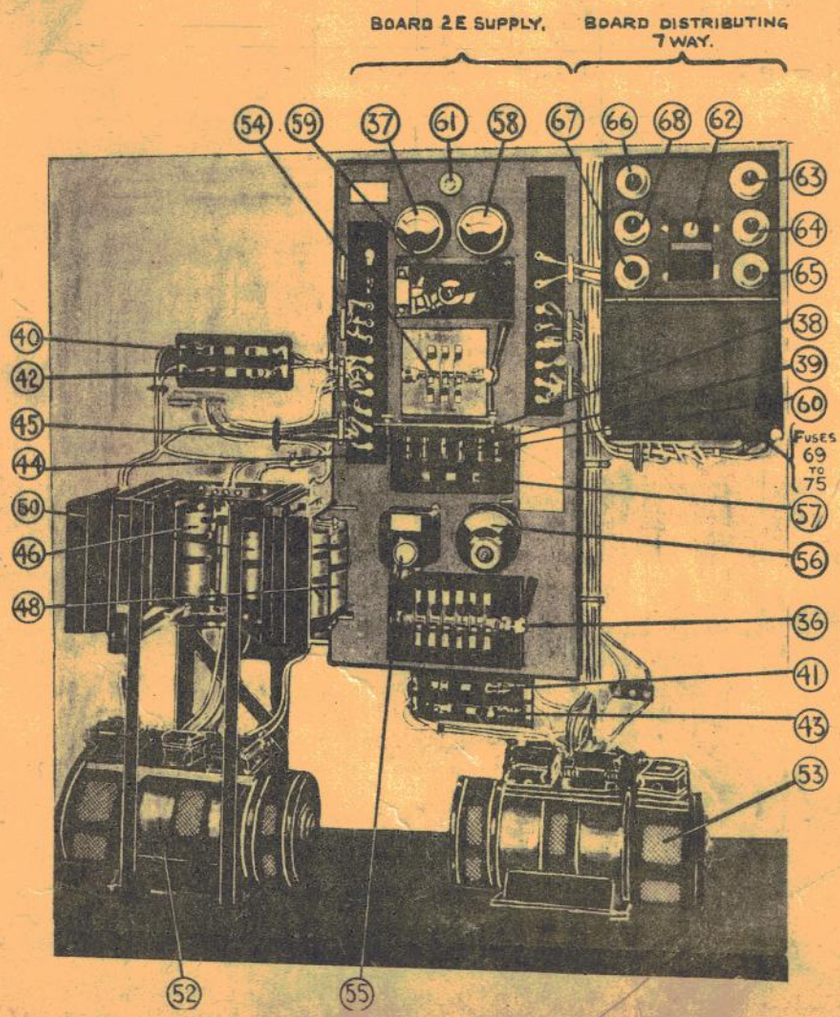


FIG. a.

RH4
~~R68~~

TYPE 43

POWER SUPPLY (CONT.)

Motor Generator. Type 43 is fitted with duplicate machines (52) (53) and starters (55) (56). The starters, indicating instruments and switching arrangements are fitted on Board 2E supply.

The motor generator supplies both the H.T. and filaments. It has two separate windings, one giving 300 watts at 400 volts for H.T. and the other 220 watts at 22 volts for the filaments.

Cushioning units (46) (47) are connected in the positive lead to the armature and common negative of the D.C. supply to the motors, with fuses (40) (41) in the negative leads. Cushioning units (48) (49) (50) (51) are connected in the filament and H.T. supplies respectively, with fuses (42) (43) (44) (45) in the positive leads.

Each unit consists of two chokes with four condensers connected in parallel across them, and are each contained in a separate tin box.

These units are provided to prevent commutation noises from the machines interfering with reception.

The 3 pole, two way C.O.S. (54) for starters (55) (56) is connected to the ring main C.O.S. (59) via a fuse (57) and ammeter (58). This enables either starter to be used for either machine. The ammeter (58) indicates the input current.

A 6 pole two way C.O.S. (36) changes over the machines. The three poles changing over the motor or input end of the machines are supplied from the C.O.S. (59) through the starter in use.

The other three poles connect the filament and H.T. output from the machine in use to the transmitter and stabiliser unit.

Both supply leads from the filament or 22 volt supply are changed over by the C.O.S. (36) but only the positive H.T. or 400 volt supply is changed over by this switch. The negative H.T. leads from the generators are permanently connected together.

It will be noted that the 6 poles of the C.O.S. (36) change over the following:--

Input		Output	
Armature		+	H.T.
Field		+	L.T.
Common	—	—	L.T.

This change over arrangement ensures that the output is automatically connected to the machine in use.

A voltmeter (37) and a pair of fuses (38) fitted on Board 2E supply are connected across the H.T. supply. The voltmeter (37) indicates the H.T. voltage output from the generator in use.

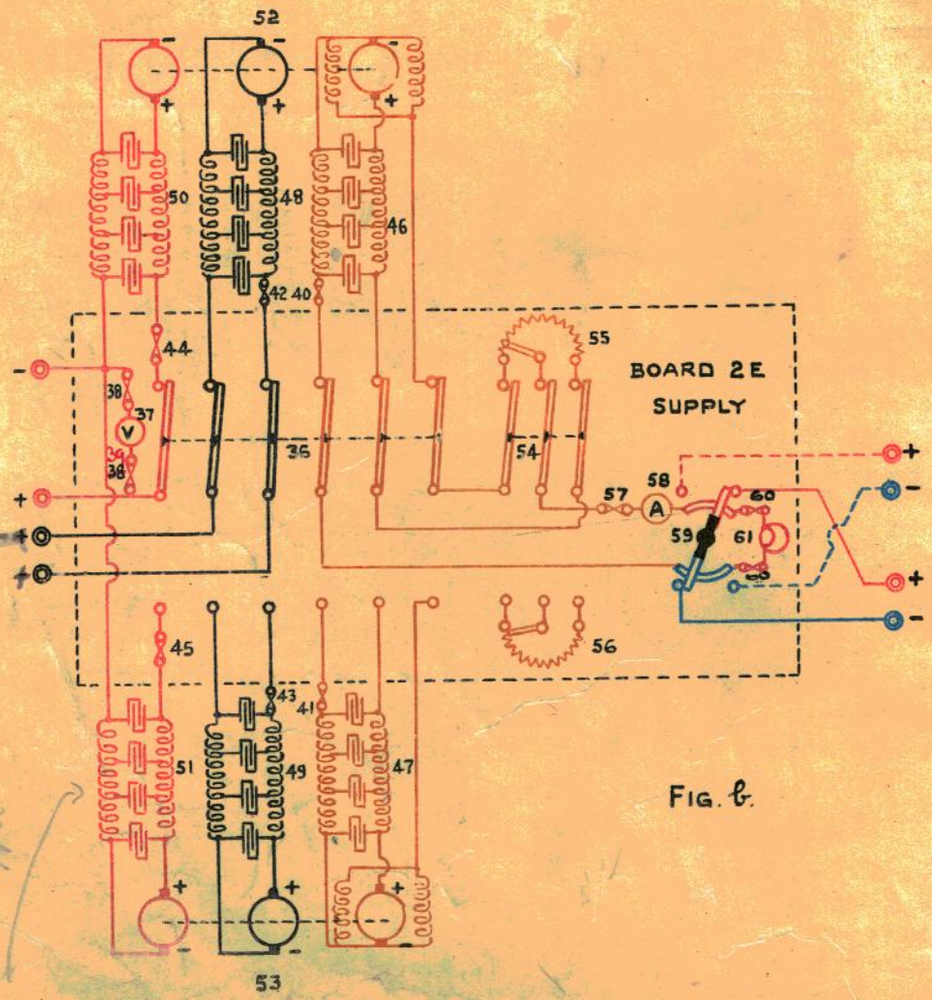


FIG. 6.

TYPE 43

TRANSMITTER 4G.

RH5
30/9/35.

Wave form	Method of producing oscillation	Nature of circuit	Grid excitation	Feed	Aerial excitation	High oscillating potential electrode.
I.C.W.	Self	Tuned circuit between anode and grid.	Direct inductive	Series	Mutual inductive	Anode

Transmitter 4G is the low power I.C.W. valve transmitter fitted in Type 43. It is fitted complete in a box as shown in figures c. and d.

H.T. Supply. The H.T. supply is from the 400 volt windings of the motor generator in use (52) or (53) (see fig. The negative H.T. leads of both machines are connected together after passing through their respective cushioning units (50) (51), and then connected to the negative H.T. terminal of the transmitter 4G. This terminal is earthed.

The positive H.T. supply is connected from one of the centre contacts of the C.O.S. (36) to the positive H.T. terminal. It will therefore be noted, that the C.O.S. (36) only changes over the positive H.T. supply.

A voltmeter (37) and fuses (38) (39), fitted on board 2E supply are connected across the H.T. supply. The voltmeter indicates the H.T. voltage output.

One contact of the main D.P. switch (32) on transmitter 4G controls the H.T. supply, and one contact of the magnetic key (83) makes and breaks it for signalling purposes. The key condenser (82) is connected across the make and break.

Connected across the H.T. terminals of transmitter 4G is a potentiometer (82), which enables an H.T. voltage range of 100 to 400 volts to be used.

The H.T. is connected to the anode of the valve (2) through a 0.1 henry choke (100); the negative is connected to a centre point between the valves (1) (2) filaments. The by-pass condenser (81) ensures that no oscillatory voltages are built up across the potentiometer (82).

Filament supply. The filament supply is from the 22 volt windings of the generator in use (52) or (53). A resistance board is connected in the supply between the transmitter 4G and two of the centre contacts of the C.O.S. (36) (see figure k). This board contains two variable resistances (33) (34) of 3.9 ohms and an ammeter (35). The resistances (33) (34) control the filament current of the valves (1) (2) and the ammeter (35) indicates the filament current of both valves. The filament rheostat fitted in the 4G is now locked so that all the resistance is cut out; it was used in original designs before NT1 valves were replaced by NT18.

The filaments of the valves (1) (2) are connected in series. The L.T. contact of the main D.P. switch (32) is short-circuited.

The negative of the H.T. which is joined to a centre point between the valve filaments, is earthed.

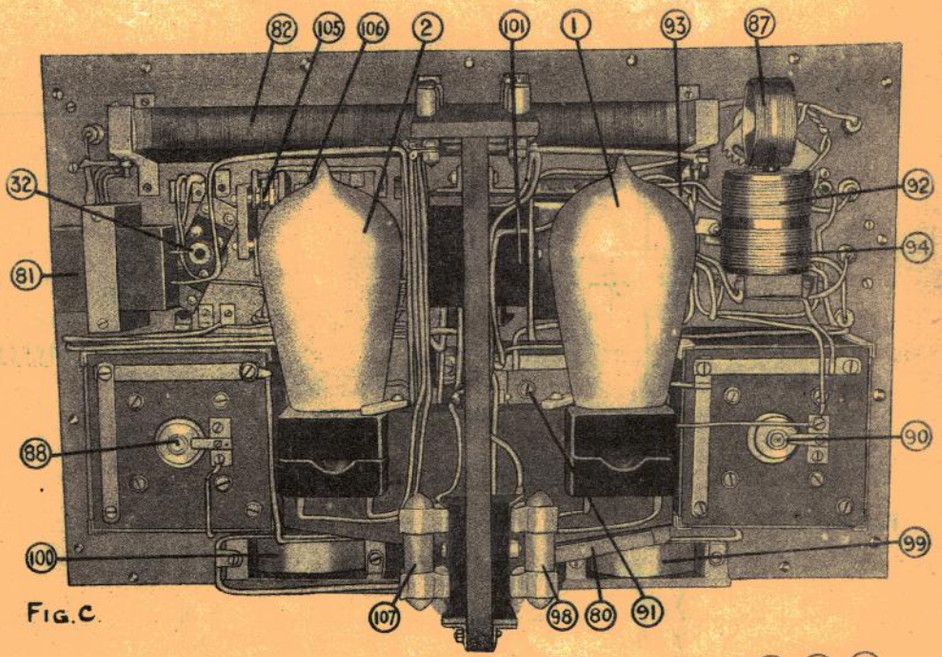


FIG. C.

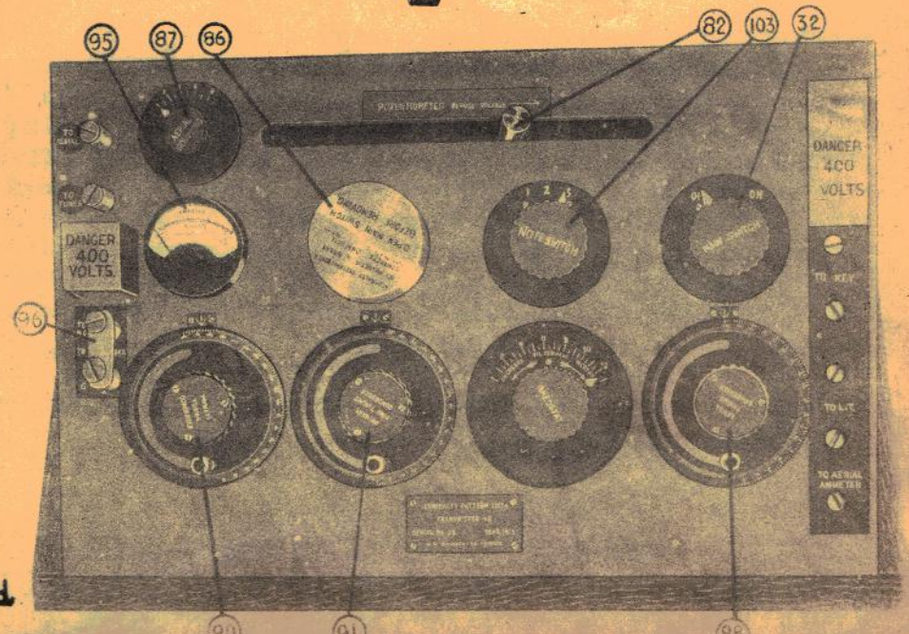


FIG d.

TYPE 43

TRANSMITTER 4G (CONT)

Oscillatory Circuit. The valve (1) has a divided circuit tuned to radio frequency; its H.T. supply is modulated by voltages developed in the divided circuit of valve (2) which is tuned to audio-frequency (see Admiralty Handbook of W/T (1931) paragraph 354). The transmission is therefore I.C.W., the note heard depending on the tuning of the A.F. circuit.

A/F Circuit. A 1 microfarad condenser (101) is connected between the anode and grid of the valve (2), with a 0.1 henry choke (100) connected in the anode lead, and a 0.28 henry choke (102) in the grid lead. A 10,000 ohm grid leak resistance is connected between the grid and negative filament supply.

Any one of the three condensers (104) (105) (106) can be connected directly between anode and grid by a switch (103). These condensers, being of different capacity values, alter the frequency of the circuit. The condenser required is connected in the circuit by the switch (103) (see under tuning).

R/F Circuit. The H.T. supply to the anode of the valve (1) passes through a 0.82 henry choke (99) and a 16 mic tuning coil (92).

A 25 jar condenser (93) is connected between the anode and grid, with a 16 mic tuning coil (92) in the anode lead and a 20 mic tuning coil (94) and ammeter (95) in the grid lead. The coils (92) and (94) are coupled to the aerial coupling coil (87). The ammeter (95) indicates the oscillatory current in the R/F circuit.

Directly connected between the anode and grid of the valve (1) are the primary tuning and fine tuning condensers (90) (91). Their respective values are 0.2 and 0.07 jars. They are connected in parallel.

The grid is taken to two extra terminals on the transmitter 4G for connecting to the stabiliser unit. These terminals are short circuited by a link (96) when the stabiliser is not in use.

A 10 jar condenser (80) shunted by a grid leak of 10,000 ohms is connected between grid and filament. The leak (98) is replaced by a short circuiting piece (97) when the stabiliser is in use.

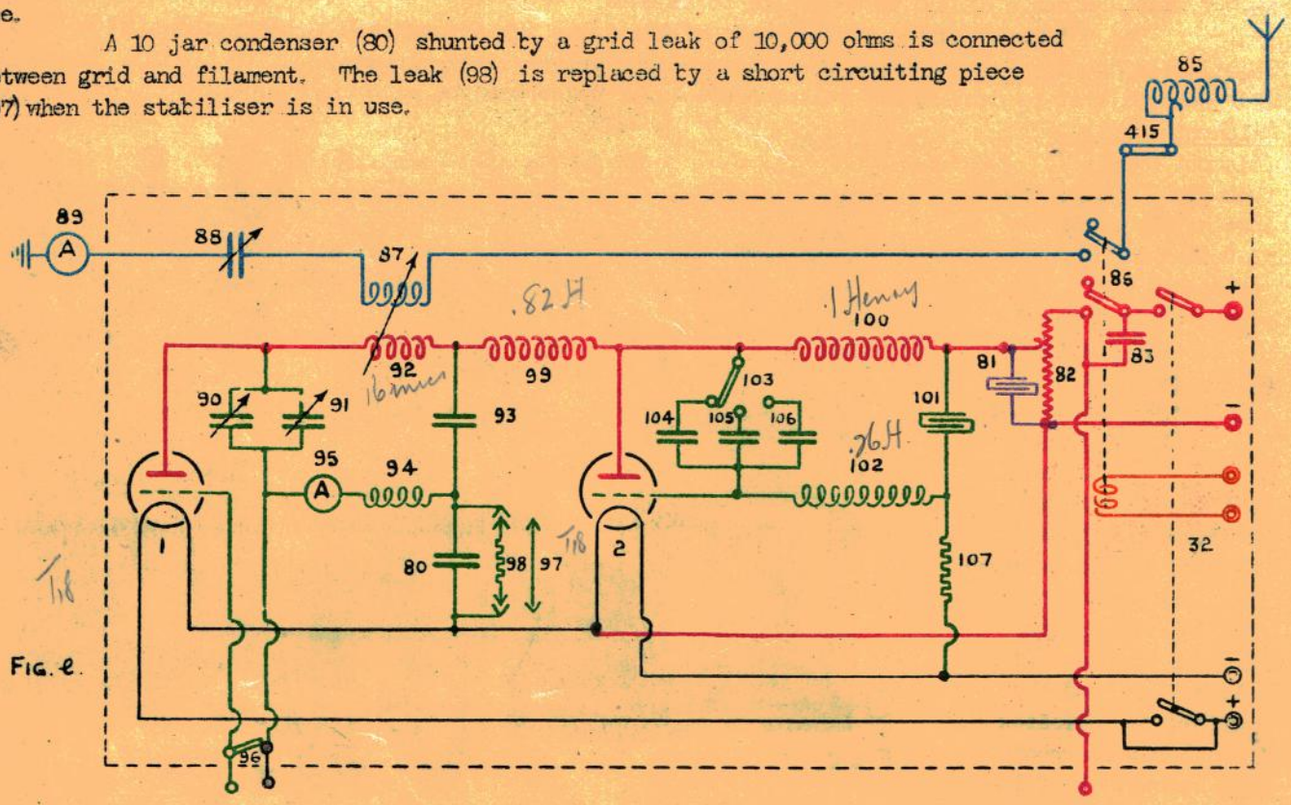


Fig. 6.

Aerial Circuit. The aerial circuit consists of an aerial coil (85), coupling coil (87), aerial tuning condenser (88), and ammeter (89). The aerial coil (85) is connected to a link (415) which enables the aerial coil to be used for transmitter 4G or 8E. The link (415) is connected to the "send-receive" contact of the magnetic key (86). The aerial coupling coil (87) is coupled to the 16 mic coupling coil (92) and the coupling can be varied in ten fixed stages.

The aerial tuning condenser (88) is connected to the coupling coil (87) and aerial ammeter (89). The latter indicates aerial current, and is fitted outside the box of the transmitter 4G.

Tuning. The R/F circuit is tuned to the required frequency by adjusting the primary tuning condenser (90) and fine tuning condensers (91). The aerial circuit is tuned by means of the aerial coil (85) and condenser (88) until maximum current shows in the ammeter (89). Aerial coupling between coils (87) (92) should not normally be tighter than position 4.

The tuning of the A/F circuit is variable in three stages only. The note switch (103) connecting either one of three condensers (104) (105) (106). The different frequencies for each stage are:-

Stage	Capacity	Frequency
1	39 jars.	1304 cycles per second
2	27 "	1413 " " "
3	15 "	1663 " " "

TYPE 43

RH7
R71

STABILISER UNIT.

Method of producing oscillation	Nature of circuit	Grid excitation	Feed	High oscillating potential electrode
Self or Quartz Resonator.	Tuned circuit between anode and filament.	Mutual inductive	Series	Anode

Reference:- Admiralty Handbook of W/T (1931) paragraph 716.

The unit is housed in an aluminium box and comprises a NT17 master oscillator valve (3) and a NT17 amplifying valve (4).

It has been fitted to stabilise the frequency of the radiation from transmitter 4G. Either of the following two methods can be used (See Admiralty Handbook of W/T (1931) paragraph 338 et seq.)

(1) The circuit of the valve (3) is adjusted to oscillate as a "Master Oscillator" on any frequency between ~~1700~~ 1800 and ~~2000~~ 2400 kc/s by putting the switch (18) to the "O" position. The oscillatory voltage variations thus produced are amplified, and finally applied between grid and filament of the R/F valve of transmitter 4G. This valve is now acting as a power amplifier, whose tuned circuit is coupled to the aerial. The grid excitation which caused it to be a self-oscillator, when the stabiliser was not fitted, is now removed by disconnecting the link (93).

(2) A more accurate stabilisation is obtained on any one of four selected frequencies, by introducing a quartz crystal (14) (15) (16) (17) into the grid circuit of valve (3) by the switch (18). When the tuned anode circuit of this valve is adjusted to the value corresponding (very nearly but not quite) to the frequency of the crystal, oscillations are produced at the EXACT natural frequency of the crystal plate. The four crystals fitted are ground so as to be "tuned" to:-

1875, 2000, 2150, 2333 kc/s.

H.T. Supply. The H.T. supply is from the 400 volt windings of the Type 43 motor generator and is connected to extra terminals fitted on transmitter 4G.

The H.T. supply for the valve (3) is connected through the 20,000 ohm resistance (9) when operating with crystal control. In master oscillator conditions another 20,000 ohm resistance (10) is connected in parallel with the resistance (9) by the switch (18), to give a higher anode potential. A D.C. ammeter (11) indicates the anode current. The by-pass condenser (20) is connected between the resistance (9) and the negative H.T. through a 3 amp fuse (31) to the casing of the stabiliser which is at earth potential.

The H.T. supply of the valve (4) is connected through a 5000 ohm resistance (19) and the primary of a tuned R/F transformer (25). Feed back between the transformer (25) and the master circuit is prevented by the neutralising condenser (24) (see Admiralty Handbook of W/T (1931) paragraph 643). A by-pass condenser (21) is connected between the resistance (19) and the negative H.T. and earth.

Filament Supply. The filament supply is from the 22 volt windings of the Type 43 motor generator. A resistance board is connected in the supply between the stabiliser and the two 22 volt contacts of the C.O.S. (36) (see figure k.). This board contains two variable resistances (108) (109) of 9 ohms and an ammeter (110). The resistances (108) (109) control the filament current of both valves (3) and (4) and the ammeter (110) indicates the filament current. It should be noted this resistance board differs from that in the filament supply to the transmitter 4G. The filaments of the valves (3) (4) are connected in series, with the centre point connected through a 3 amp fuse (31) to the H.T. negative and the casing of the unit. It is therefore at earth potential. The fuse (31) prevents damage to the valves (3) (4) should one of the valves (1) (2) in transmitter 4G burn out.

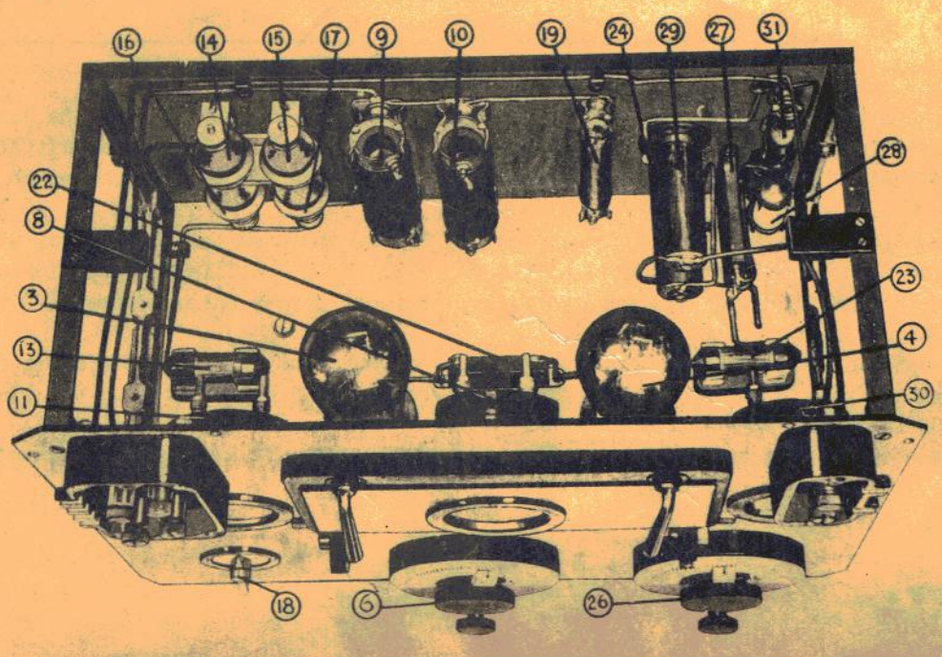


FIG f

RH8
~~R72~~

TYPE 43

STABILISER UNIT (CONT.)

Oscillator Valve (3) circuit. The tuned anode circuit consists of a centre tapped 12 mic inductance, (7) two condensers in parallel (5) (6) and an R/F ammeter (8).

The tuning condensers (5) (6) are of 0.15 jar and 0.5 jar respectively, the latter being variable. The ammeter (8) indicates the oscillatory current of the tuned anode circuit.

The grid coil (12) is provided with a tap, and is connected to the switch (18). This switch is marked 0 to 4 and is so arranged that when in the 0 position for master oscillator conditions, the contact for connecting the resistance (10) in the anode circuit is operated. The positions 1 to 4 connect a crystal of the requisite frequency. It will be noted that the tap is used for the higher frequency crystals (15) (16) (17) and the whole coil for the crystal (14) and master oscillator.

A grid leak (13) of 100,000 ohms is connected between the grid and filament in parallel with the grid coil (12). ~~The coupling between the grid coil (12) and anode coil (7) is adjusted in Signal School and should not be altered.~~

Amplifying Valve (4) Circuit. The anode circuit consists of a ~~100,000~~ 5,000 ohm resistance (19) and the primary of the R/F transformer (25) with a neutralising condenser (24) to prevent feed back between the transformer (25) and the master circuit.

The grid is connected to the anode of the valve (3) with a coupling condenser (22) which insulates the grid of the valve (4) from the anode potential of the valve (3) but passes the R/F potential from the master circuit to the valve (4). A grid leak (23) of 100,000 ohms is connected between grid and filament.

The secondary of the R/F transformer (25) is tuned by a 0.3 jar variable condenser (26). An ammeter (30) is connected in the circuit to enable this stage to be neutralised.

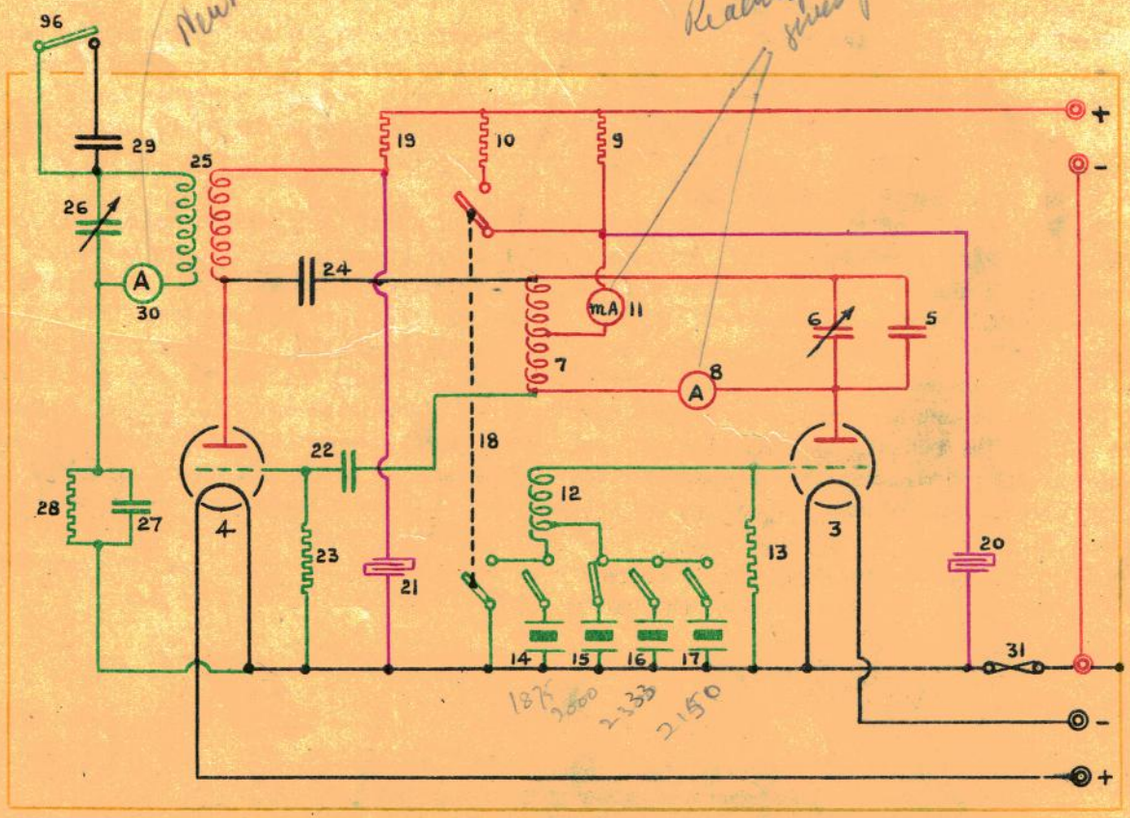


FIG. 9

Between the low potential side of the condenser (26) and the filament is connected a 30,000 ohms grid leak (28) and a 1 jar con enser (27) for the valve (1) in transmitter 4G, the grid leak (98) in 4G being replaced by a link (97) which short circuits condenser (30) when the stabiliser is in use.

The high potential side of the condenser (26) is connected to the terminal of the link (98) marked G, which is connected to the grid of the valve (1). As the filament supplies of the transmitter 4G and the stabiliser are common, voltages developed across the condenser (26) are applied between grid and filament of the valve (1).

A neutralising condenser (29) is connected between the tuned anode circuit of the valve (1) and the tuned transformer system (25) (26) to neutralise energy feed back. The link (98) is connected when the stabiliser is not in use.

The neutralising condensers (24) (29) are adjusted in Signal School and should not be altered.

TYPE 43

STABILISER UNIT (CONT.)

Operation and Tuning. On first fitting the stabiliser, the necessary adjustments are obtained as follows. The valves (1) (2) should be removed from Transmitter 4G, to avoid risk of damage during adjustment. Power is then switched on, and the crystal switch (18) set to position "0". If the key is now pressed, current should show in ammeters (11) and (8), indicating that valve (3) is oscillating and power supply is correct.

Crystal Control Adjustments. Switch (18) is placed in position for the crystal which gives the required frequency, and condenser (6) slowly rotated until current shows in ammeter (8). It will be observed that at this point a fall of current occurs in the D.C. ammeter (11). The master valve is now oscillating (at the crystal frequency) but will only do so over about two degrees of the scale of condenser (6) and the latter should be very carefully adjusted until the current in ammeter (8) is slightly less than the maximum obtainable. The amplifier circuit is next tuned by adjusting condenser (28) to give maximum reading in ammeter (30). The settings so far obtained are recorded and a similar procedure carried out for all crystals. Valves (1) and (2) are now replaced, and the settings already obtained for a particular crystal put on condensers (6) and (28). Having loosened the aerial coupling, the key is pressed and the R/F circuit of Transmitter 4G brought into tune by adjusting condensers (90) (91) to give maximum current in ammeter (95). It will now be necessary slightly to readjust condenser (28) (owing to the introduction of the grid-filament capacity of valve (1)). Finally the aerial coupling is tightened and the aerial tuned for maximum current in ammeter (89). Final adjustment of the condensers (28) (90) and (91) may be made to give better current readings in the ammeter (89).

Master Oscillator Adjustments.

Put switch (18) to position "0". Valve (3) will now oscillate whatever the adjustment of condenser (6). If a G31 is available, it can be used to receive the signals from the master circuit and so determine their frequency. Full instructions for tuning by this method with G31 are given on page GO4. Once condenser (6) has been adjusted to the required frequency, the remaining stages are tuned in exactly the same way as for one of the crystal frequencies. (If no G31 is available, see next page.)

General.

If, owing to a defect in the stabiliser or lack of adjustments, it should be necessary to use transmitter 4G as a self-oscillatory transmitter, the link (96) is replaced so as to provide the necessary grid excitation and the short-circuiting piece (97) is replaced by resistance (98). The R/F circuit is then tuned by wavemeter G8.

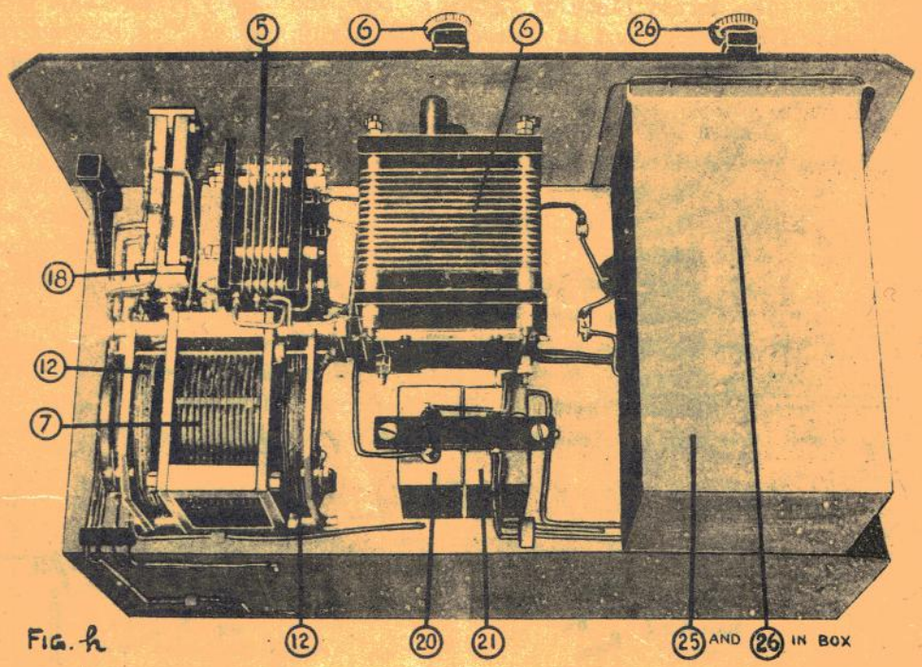


FIG. h

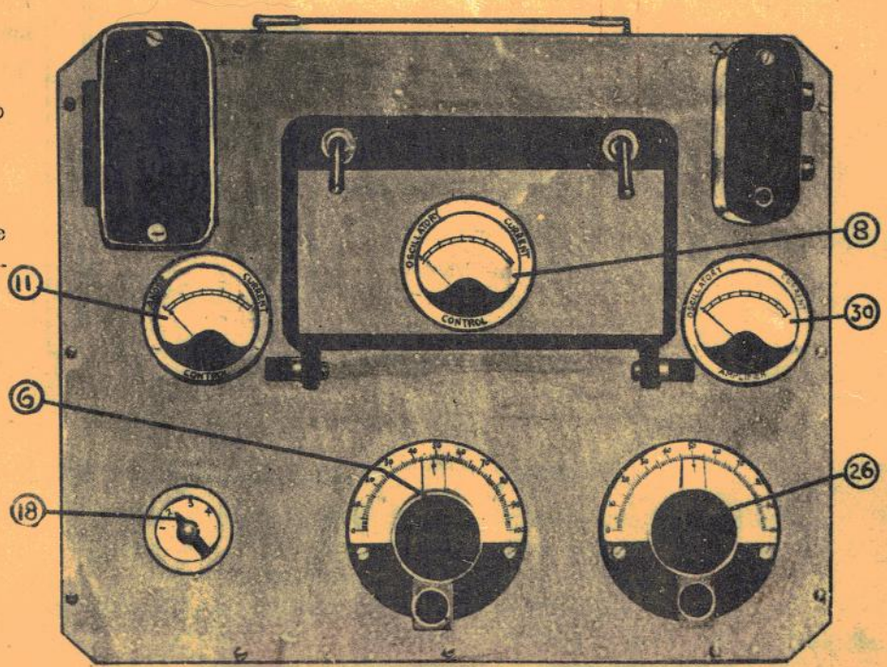


FIG. i

RH 10
R74

TYPE 43

STABILISER UNIT (CONT.)

If master-oscillator adjustments are required and no G31 is available, it is possible to obtain the adjustments by first tuning 4G (without stabiliser), and subsequently introducing the stabiliser and adjusting the circuits of valves (4) and (3) by condensers (28) and (8) respectively until maximum current is obtained in ammeters (30) and (8). The stabiliser is then oscillating at the frequency to which transmitter 4G is tuned.

TRANSMITTER 6E.

Transmitter 6E is fitted as part of Type 43 for use as an emergency set. It uses the same aerial and aerial coil (85) as transmitter 4G, but its own aerial ammeter.

The aerial is connected to the transmitter 6E by removing the link (415) in the send-receive switch.

As the aerial tuning condenser (88) is fitted inside the box of transmitter 4G, it is not included in the aerial circuit for 6E. A readjustment of the aerial coil is therefore involved when shifting over transmitters on the same frequency.

The transmitter 6E is described on page OB3.

D.C. AUXILIARY CIRCUITS.

RA5

The D.C. auxiliary circuits are supplied from board distributing 7 way (figure b. page ~~R81~~ RA5 and figure j. below). This board is similar to that fitted in Type 37S.

The source of supply to this board depends on whether Type 43 is fitted in a separate W/T office or in a W/T office with other sets (i.e., Type 45, Type 71 etc.)

The dotted lines on figure k. show the supply connections when the set is fitted in a separate W/T office, and in this case the switch marked "Transmitter" is not used.

Figure c. on page ~~R81~~ RA5 shows the supply connections when Type 43 is fitted in a W/T office with other sets.

A main D.P. switch (62) controls the supply of six subsidiary switches (63) to (68) these switches are labelled as follows.

1. Transmitter.
2. Signalling Circuit.
3. Lights.
4. Circulator and fans.
5. Radiators.
6. Charging.

Each supply has its own pair of fuses (69) to (75). It will be noted that there are only six switches, but seven supplies. The two supplies which are connected in parallel and controlled by the D.C. switch (63) are for the fan and circulator.

D.C. Signalling Circuit. The signalling circuit is supplied from the board distributing 7 way through a D.P. switch (88) and fuses (75), and is connected to the morse key (78) and bobbin of the magnetic key (86). The bobbin circuit is completed by the morse key (78) through a lamp (84) connected in series.

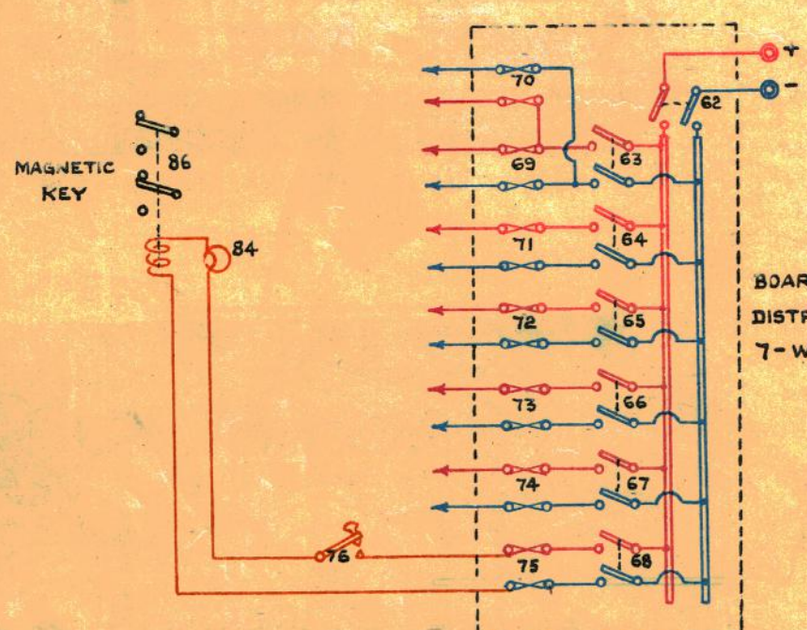


Fig. j.

BATTERY OUTFIT AND CHARGING ARRANGEMENTS.

The battery outfit supplied with Type 43 depends on:-

(1) Whether dull or bright emitter valves are used.
(2) Whether fitted alone or with other sets.

The table on page NB2 indicates the battery outfit supplied under any of the above conditions, and sub-section NB gives a diagram of the outfit applicable.