R.F 6
~~R49~~

TYPE 37 S

TRANSMITTER 3K, L/F.

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

Transmitter 3K is the main L/F transmitting set in Type 37S. The circuit is described in Admiralty Handbook of W/T (1931) paragraph 631.

H.T. Supply. The H.T. supply is from the main rectifying circuit and is connected direct to the anode of the L/F valve (3) by the H/F – L/F C.O.S. (6).

Filament supply. The A.C. filament supply is from the 1½ kW. alternator (38). It is connected to the filament transformer (29) by two contacts of the H/F – L/F C.O.S. (6). Rheostat (25) controls the filament voltage of the L/F transmitting valve (3) the voltage being indicated by the voltmeter (36). Two chokes (34) are fitted to protect the secondary of the filament transformer (29) from stray oscillatory currents.

Oscillatory Circuit. The grid and filament of the transmitting valve (3) are connected to two fixed tappings on the tapping coil (13). A 30,000 ohm grid leak resistance (19) and 4 jar condenser (20) are joined in the grid lead, and an ammeter (21) is connected in series with the grid leak resistance (19).

Two change over links (10) connect the aerial circuit either to the tapping coil (13) or to the aerial coupling coil (156) for the spark attachment. When the links are in the "valve" position the aerial circuit is connected to the upper variable tapping (11) and lower variable tapping (12) on the tapping coil (13). The upper and lower tappings are varied by handles which project through the front of the panels.

The aerial is connected to the L/F or H/F set by one contact of the L/F – H/F C.O.S. (6). The aerial circuit consists of the aerial coil (7) variable tapping coil (13) fine tuning coil (14) and aerial ammeter transformer (15). An aerial condenser switch (9) is used to connect a series condenser (8) of 0.25 jars in series with the aerial in lieu of the aerial coil (7). The condenser is used when transmitting on frequencies above 800 kc/s. The aerial circuit is tuned by adjusting the variable tap on the aerial coil (7) and the two variable taps on the tapping coil (13); all three are adjusted by handles on the front of the panels.

Fine tuning adjustments of the aerial circuit are made on the fine tuning coil (14) the handle of which is fitted with a veeder counter gear which records the number of turns and the degrees in use. The fine tuning coil (14) is connected between the link (10) and the aerial ammeter transformer (15) the latter being earthed via the operating switch (18).

Mechanically linked to the key C.O.S. (103), on the board 2K controlling, is a switch which changes the L/F receiving instruments to the aerial in use. Type 37 is used with the main aerial, and 4H with the auxiliary aerial.

When the set is fitted in a main W/T office and special arrangements are made for two operators, this mechanically linked switch is not used. The main aerial is connected direct

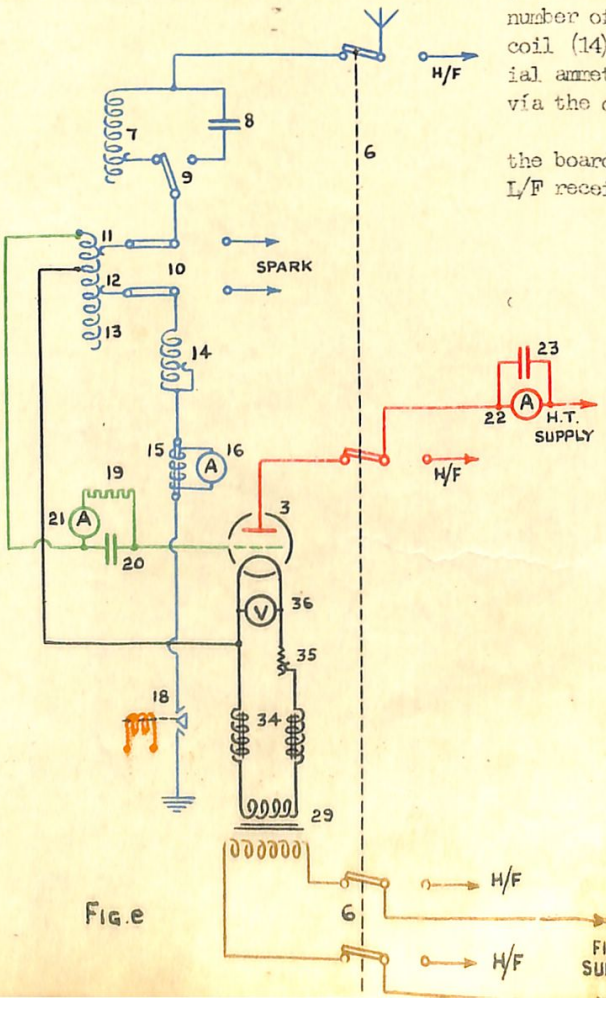


Fig.e

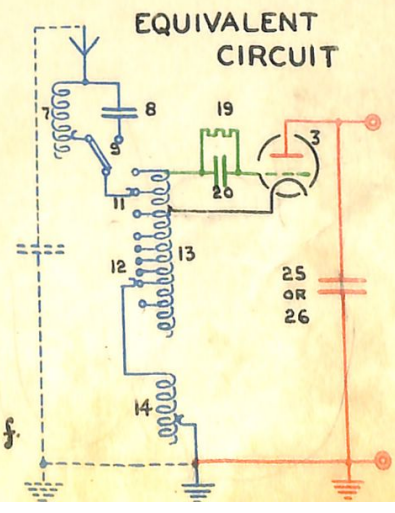


Fig.f.

TYPE 37S

TRANSMITTER 3K, L/F (CONT.)

to the receiving instruments in the main bay and the auxiliary aerial to the receiving instruments in the second bay. In this case the morse key circuit is also modified as described under D.C. auxiliary circuits (Page ~~R50~~ RF11)

Tuning. A tuning chart, applicable to each set, tuned with an approximate ~~0.002~~ 0.5 jar aerial, is supplied. Set the aerial circuit adjustments given on this chart to the required frequency. Place the wavemeter mutual near the aerial coil (7) and after obtaining aerial current, readjust the aerial circuit for the required frequency.

Rough tuning adjustments are made on the aerial coil (7) and fine tuning on the fine tuning coil (14).

The filament tapping is fixed, but variations of its relative position are made by the upper tap (11) and lower tap (12) above and below, keeping the total inductance constant. This should be adjusted to give maximum aerial current and minimum anode current. The former is indicated on the aerial ammeter (16) and the latter on the anode ammeter (22).

Tuning should be carried out with decreased input voltage.

Frequencies between 800 kc/s. and 1385 kc/s. a range higher than that for which the set was designed (i. e., 870 kc/s.) can be obtained by combining the upper tap (11) and lower tap (12) at a common point. The input voltage should not exceed 120 volts when using 800 kc/s. and 70 volts at 1384 kc/s or damage may be done. A full explanation and description of this will be found in the Admiralty Handbook of W/T (1931) paragraphs 713 and 714.

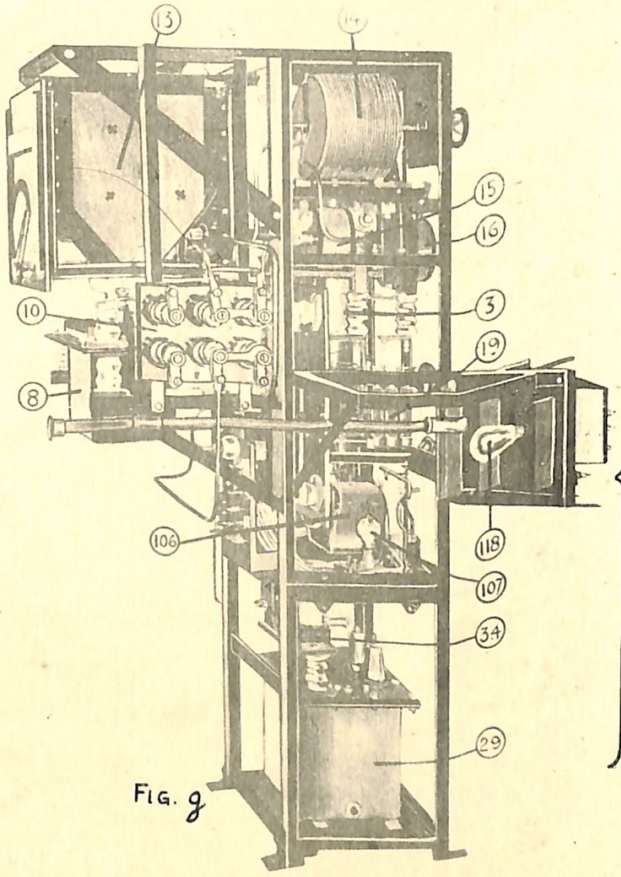


Fig. g

TRANSMITTER 3K, H/F.

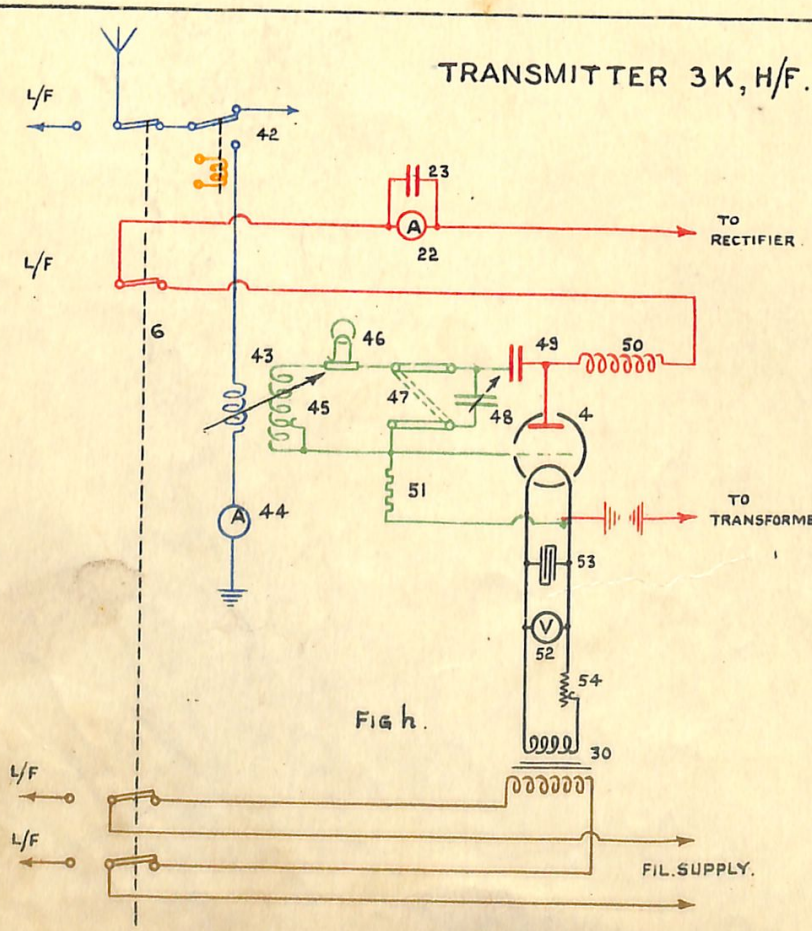


Fig h.

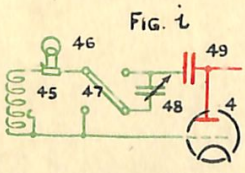


Fig. i

CONDENSER AND COIL IN SERIES.

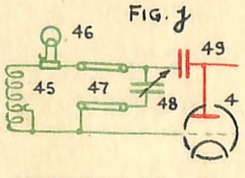


Fig. j

CONDENSER AND COIL IN PARALLEL

TYPE 37 S

TRANSMITTER 3K, H/F.

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 capacitive	Parallel	Mutual inductive	Anode

Reference -- Admiralty Handbook of W/T (1931) paragraph 712.

Transmitter 3KS is the H/F attachment fitted with Type 37. The transmitter is mounted in a separate panel adjacent to the rectifying panel (see figure g) and is marked Panel 3KS.

H.T Supply. The H.T. supply is from the main rectifying circuit and is connected to the 3K H/F oscillatory circuit by the L/F -- H/F C.O.S. (6) through a 350 mic anode choke (50) to the anode of the H/F transmitting valve (4) and anode blocking condenser (49). As a single NT4A valve is used the power supply to the transmitter should not exceed 1 kW. The primary voltage therefore should not exceed 100 volts.

Filament Supply. The A.C. filament supply is from the 1½ kW. motor alternator (88). It is connected to the filament transformer (90) by two contacts of the H/F -- L/F C.O.S. (6). The filament voltage is controlled by a 2 ohm adjustable resistance (54). A voltmeter (52) is connected across the filament to indicate the voltage on the valve. The condenser (53) is connected across the voltmeter (52) to act as an R/F by pass.

Oscillatory Circuit. The oscillatory circuit consists of the anode condenser (49) indicating lamp and adjustable shunt (46) primary coupling coil (45) and a variable tubular condenser (48). The circuit can be connected either in series or parallel by means of links (47). With the links in the parallel position (figure j) the 0.05 jar variable condenser (48) is connected across the 9 mic adjustable primary (45) of the coupling unit. In the series position (figure i) the variable condenser (48) and primary coil (45) are connected in series. The indicating lamp and adjustable shunt (46) take the place of an ammeter in the circuit. The two types of oscillatory circuit are used to obtain a greater frequency range. In parallel the frequency range is approximately 5770 to 18750 kc/s and in series 10,350 to 26,000 kc/s. A grid leak of 10,000 ohms is connected between the grid and filament to earth.

Aerial circuit. The main Type 37 aerial is used for this transmitter, and is connected to the transmitter by one contact of the H/F -- L/F C.O.S. (6). A send--receive magnetic switch (42) is connected in the aerial circuit. The circuit is untuned and consists of a two mic fixed coil (43) and ammeter (44). The fixed coil (43) is the movable portion of the coupling unit, the degree of coupling is obtained by altering the distance between the fixed coil (43) and the primary coil (45).

D.C. Auxiliary Circuit. The D.C. auxiliary circuit is described on page R55.

Tuning. Set the links (47) to the series or parallel position according to the frequency required, as described above. The wavemeter in use (See page ~~R47~~ RF2 should be placed near the primary coil (45). Coarse tuning adjustments are made on the primary coil (45) and final adjustments are made on the variable condenser (48). The aerial coupling should be adjusted to give maximum aerial current, and then slightly reduced for the best position.

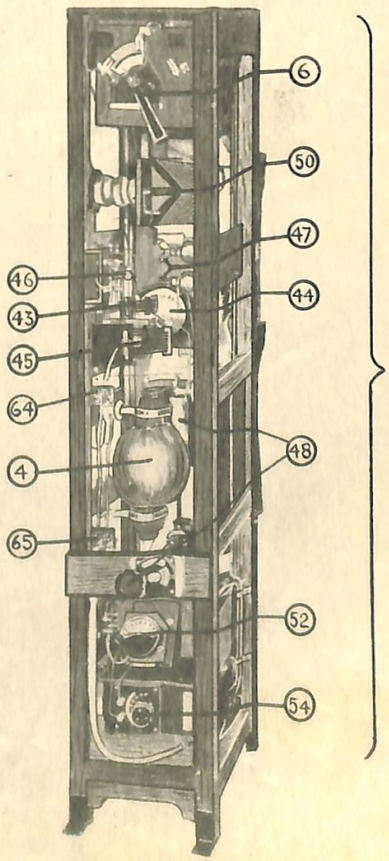


FIG. f.

TRANSMITTER 6F.

Transmitter 6F is a spark attachment and in special cases is fitted with Type 37. The circuits and description of this transmitter are found on page OR5.

RFB
~~R52~~

TYPE 37S

TRANSMITTER 4H

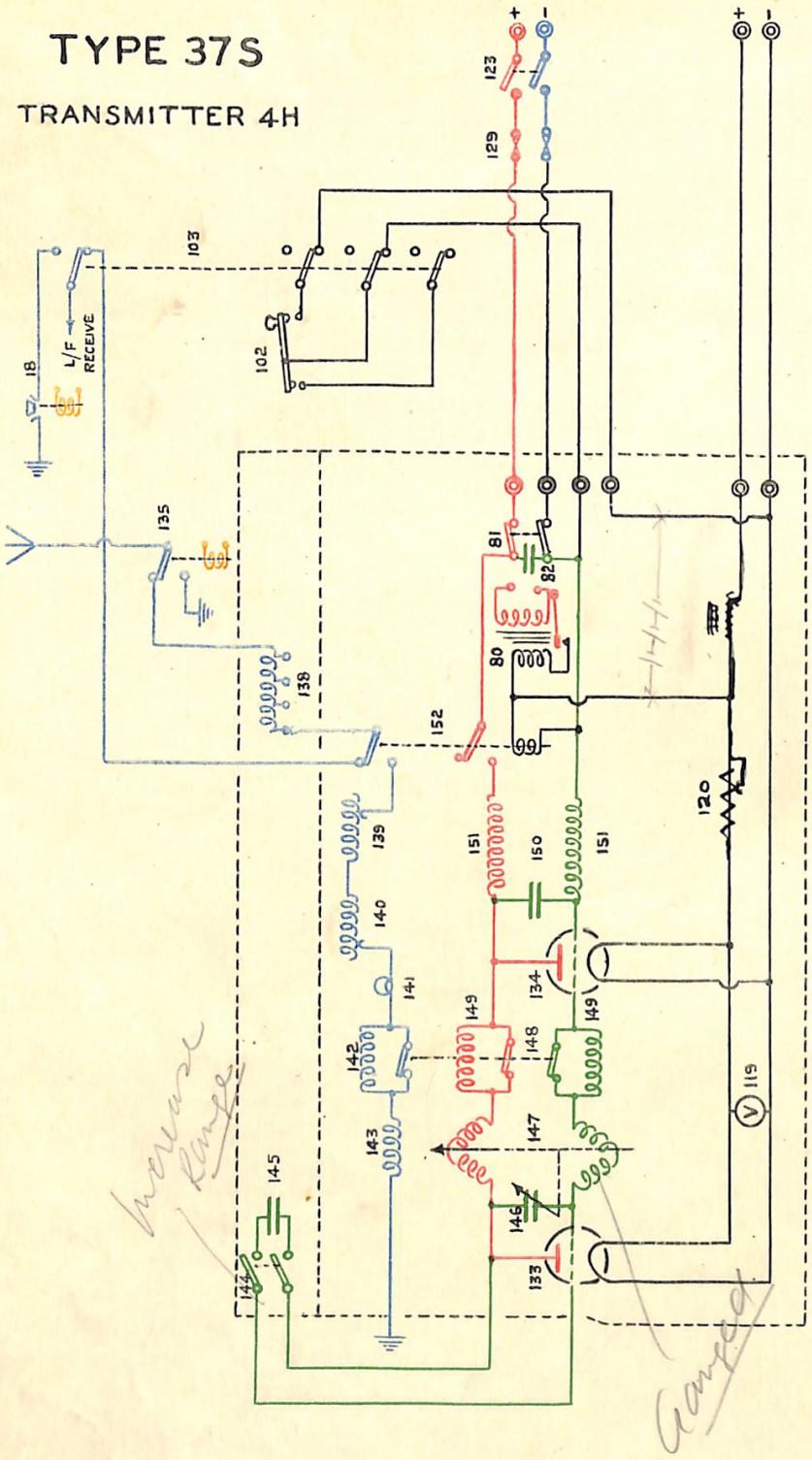


Fig. m.

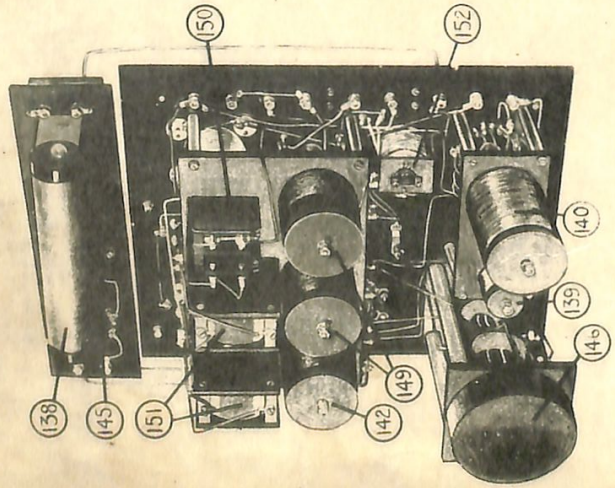


Fig. l

RF 9
~~R53~~

TYPE 37 S

TRANSMITTER 4H.

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 4H is the lower power I.C.W. transmitter fitted in conjunction with Type 37 and Type 44. The transmitter is designed to work from the ship's mains or from a 6 volt battery, when the mains supply is not available. The C.O.S. (81) connects either to the transmitter.

H.T. Supply. Where the transmitter is fitted in conjunction with Type 37 the mains supply is from board distributing 7 way through the switch (123) and fuses(129) to one side of a C.O.S.(81). This switch is marked "100 volt emergency supply". With Type 44 the mains supply is from board 2L. Where the ship's mains do not exceed 100 volts, batteries may be switched in series with them to increase the voltage when extra range is required. The emergency supply is from a 6 volt filament battery (110)or(111)across the morse key(102)and an induction coil(80). The secondary of this coil is connected to one side of the C.O.S. (81).

Emerg Supply

Filament Supply. The filament supply is from one of two 6 volt batteries (110)and (111). The filaments of the valves(133)and(134)are in parallel, and the voltage of both controlled by the rheostat (120). A voltmeter(119)is connected across the supply to indicate the voltage on both valves.

Oscillatory Circuits. This consists of a combination of valve(133) and a divided circuit tuned to the required radio-frequency, and valve(134) with a similar circuit tuned to about 1995 cycles to give the I.C.W. note. These circuits are explained in Admiralty Handbook of W/T (1931) paragraph 654(4). It should be noted that valve(134)is not absolutely essential,and,in emergency, it is possible to transmit without it.

A/F Circuit. The centre contacts of the C.O.S.(81) are connected through two chokes (151) to the anode and grid of the valve(134), the magnetic key(152) making and breaking the circuit. The 15-jar fixed condenser(82) and (150) are connected across the centre contacts of the C.O.S.(81) and the 0.38 henry chokes (151) respectively.

R/F Circuit. The anode and grid of the valve(134)are connected through two variometer 12.65 mic inductances(147) and two 130 mic inductances(149)(if transmitting below 850 kc/s)to the anode and grid of the valve(133). The variable 0.26 jar condenser (146) is connected across them. The condenser (146) and coils(147) are mounted in tandem, and are operated by a single control, which consists of an arm which moves over a quadrant marked in degrees to facilitate setting of any particular wave frequency. Adjustable screwed stops are provided on the quadrant. They can be set to any position so that quick wave changing may be carried out.

A 3 pole range switch(148)connects a 130 mic inductance (149)in each side of the circuit, and a 65 mic inductance in the aerial circuit, when transmitting below 850 kc/s. To further increase the frequency range a 0.25 jar condenser(145) can be connected in parallel with the variable condenser(146) by the switch (144). The condenser (145) and switch(144) are part of the 4H tuning attachment.

Aerial Circuit. The auxiliary aerial is used for transmitter 4H with one contact of the 4H magnetic key(152)used as a "send-receive"switch. The aerial consists of the adjustable coil(138)aerial fine tuning coil(139)aerial tuning coil(140)pea lamp (141)fixed coil(142) and coupling coil(143). The adjustable coil(138)is a 800 mic coil tapped at 100 and 200 mics or it can be shorted. This coil is used to obtain a greater frequency range than that for which the transmitter was designed. It forms part of the 4H tuning attachment. The fixed coil(142)is connected in the circuit by the 3 pole range switch(148)and is used for frequencies below 850 kc/s. The pea lamp(141)takes the place of an ammeter. It should be noted that if this lamp is broken or not screwed home, there will be a break in the transmitting aerial circuit.

Tuning. The tuning of the A/F circuit is fixed. The R/F circuit is tuned by means of the variometer inductance (147)and variable condenser(146). The aerial should be disconnected. The range switch(148)set to the position covering the frequency required and if below 500 kc/s. the condenser(145)and adjustable coil(138)switched into the circuit. After the required frequency is obtained, connect the aerial and adjust the aerial circuit for maximum brilliancy in the pea lamp(141).

Signalling Circuit. A magnetic key(152)is operated by the morse key (102)when the C.O.S.(108)on board 2K controlling is made to the 4H position. The supply for this circuit is from the 6 volt filament battery(110) or (111).

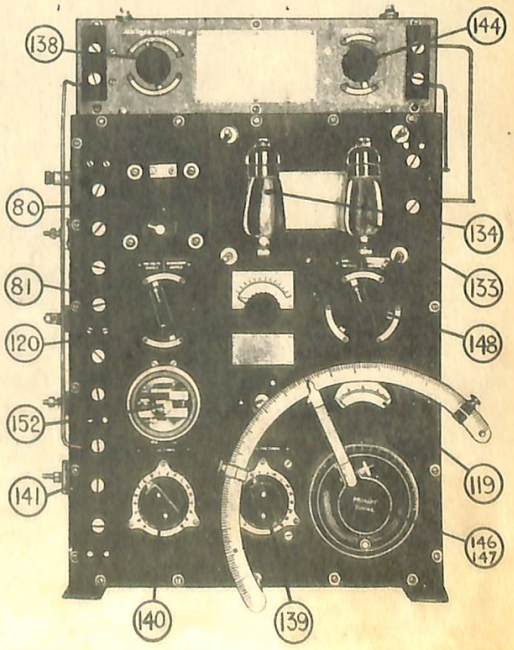


FIG. 11

TYPE 37S

D.C. AUXILIARY CIRCUITS

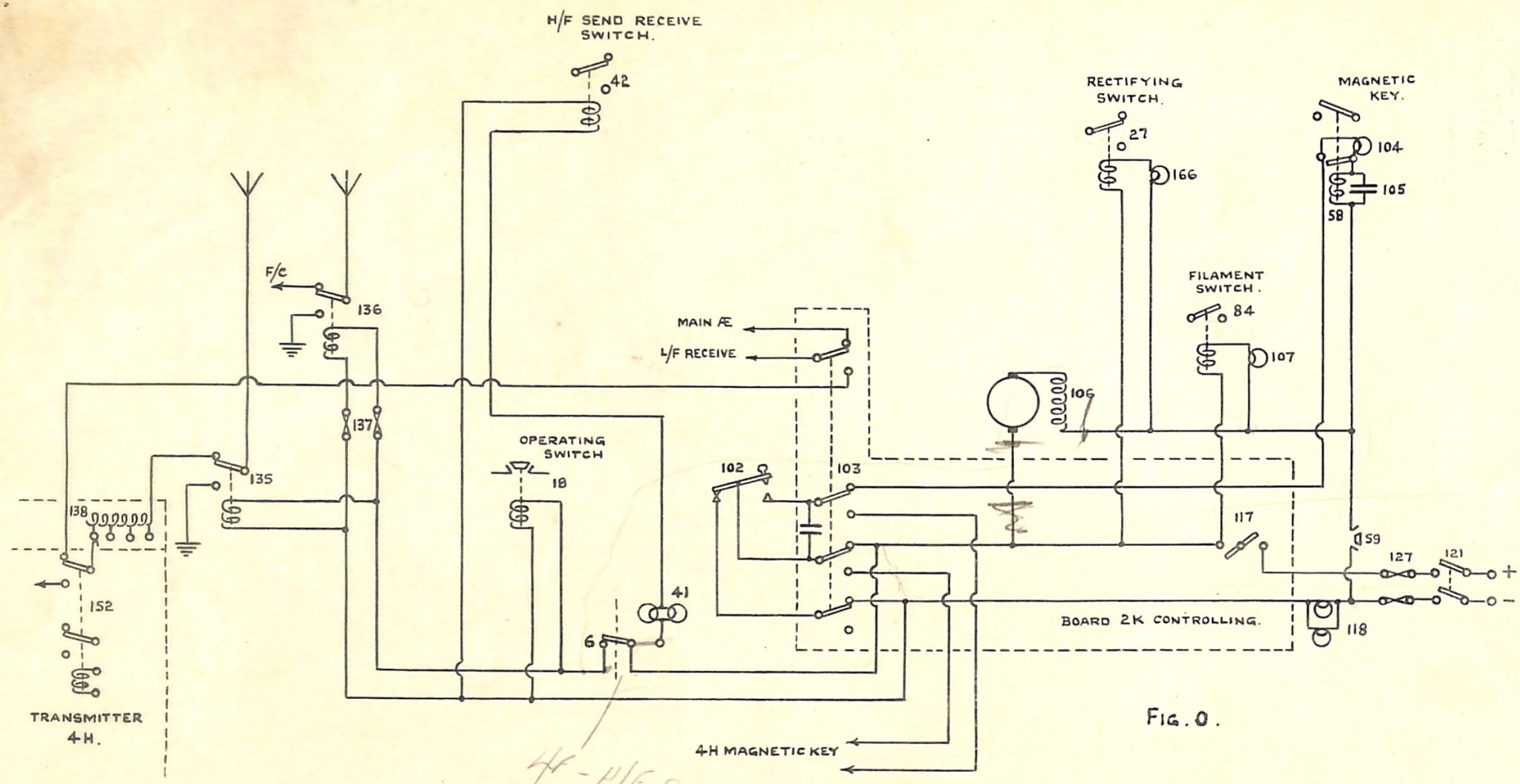


FIG. 0.

TYPE 37 S

D.C. AUXILIARY CIRCUITS.

The supply for the D.C. auxiliary circuits is from the board distributing 7 way. Board distributing 7 way is fed from board fuse 6 way through a pair of fuses (73). A main D.P. switch (153) controls the supply of six subsidiary D.P. switches (121 to 126) see figures a. and p. These switches control supplies to:-

(1) Transmitter.
(2) Signalling Circuits.
(3) Lights.
(4) Circulator and fans.
(5) Radiator.
(6) Charging.

Board 2K controlling is supplied through the double pole C.O.S. (121) and two fuses (127), with a control switch (117) in the positive lead, this switch therefore controls the whole D.C. auxiliary and operating circuits. When the control switch (117) is made and the screen door safety switch (59) closed, the blower motor (106) starts, the rectifying switch (27) completes the secondary supply to the rectifier valves filaments, and the filament switch (34) completes the A.C. supply to the filament transformers (28), and (29) or (30). It also completes the supply to the circuit of the magnetic key (58), the bobbin of which is then energised as soon as the morse key (102) is pressed. The operating switch (18), fire control listening through switch (136), auxiliary aerial switch (135) and the H/F send-receive switch (42) are connected across the back contacts of the morse key (102) and are shorted when the key is at rest. Only the lamps (118) are in the circuit and will therefore burn at full brilliancy.

When the morse key (102) is pressed the back contacts of the key are broken, and the short removed. The circuit is then through the switches (18) (135) (136) which are in parallel, or the H/F send-receive switch (42), according to the position of the L/F - H/F C.O.S. (6). The lamps (118) being in series with the bobbins of these switches, become dim. Where the set is fitted for two operators, the morse key (102) is fitted with a remote control attachment. This consists of a bobbin and armature fitted on the key (102); supply is fed from the board distributing 7 way, through a lamp and tumbler switch, the circuit being completed by an additional morse key fitted in any position from which the set is remote controlled.

An additional pair of fuses (137) is connected in the supply of the F/C listening through switch (136). The switch and fuses are fitted in the fire control W/T office.

A key C.O.S. (103) connects the morse key to either the Type 37 magnetic key (58) or the 4H magnetic key (152). In the latter position the operating switch (18) F/C listening through switch (136) and auxiliary aerial switch (135) are not in the circuit. A switch linked to the C.O.S. (103) automatically changes the L/F receiving instruments to main or auxiliary aerial as the morse key (102) is changed from the main set to the 4H, except in the case where there are two operators.

When using H/F one contact of the L/F - H/F C.O.S. (6) connects the magnetic send-receive switch (42) in lieu of the magnetic switches (18) (135) and (136). The parallel lamps (41) are in series with the magnetic switch (42) and are inserted to compensate for the resistance of the switches (18) (135) and (136).

BATTERY OUTFITS AND CHARGING CIRCUITS.

There are various battery outfits and charging arrangements fitted with Type 37S. They depend on:-

(1) Where the set is fitted.
(2) Type of receiving valves used.
(3) Any set fitted in conjunction.

A description of these various arrangements will be found on page NR2.

RF 12
R56

TYPE 37S

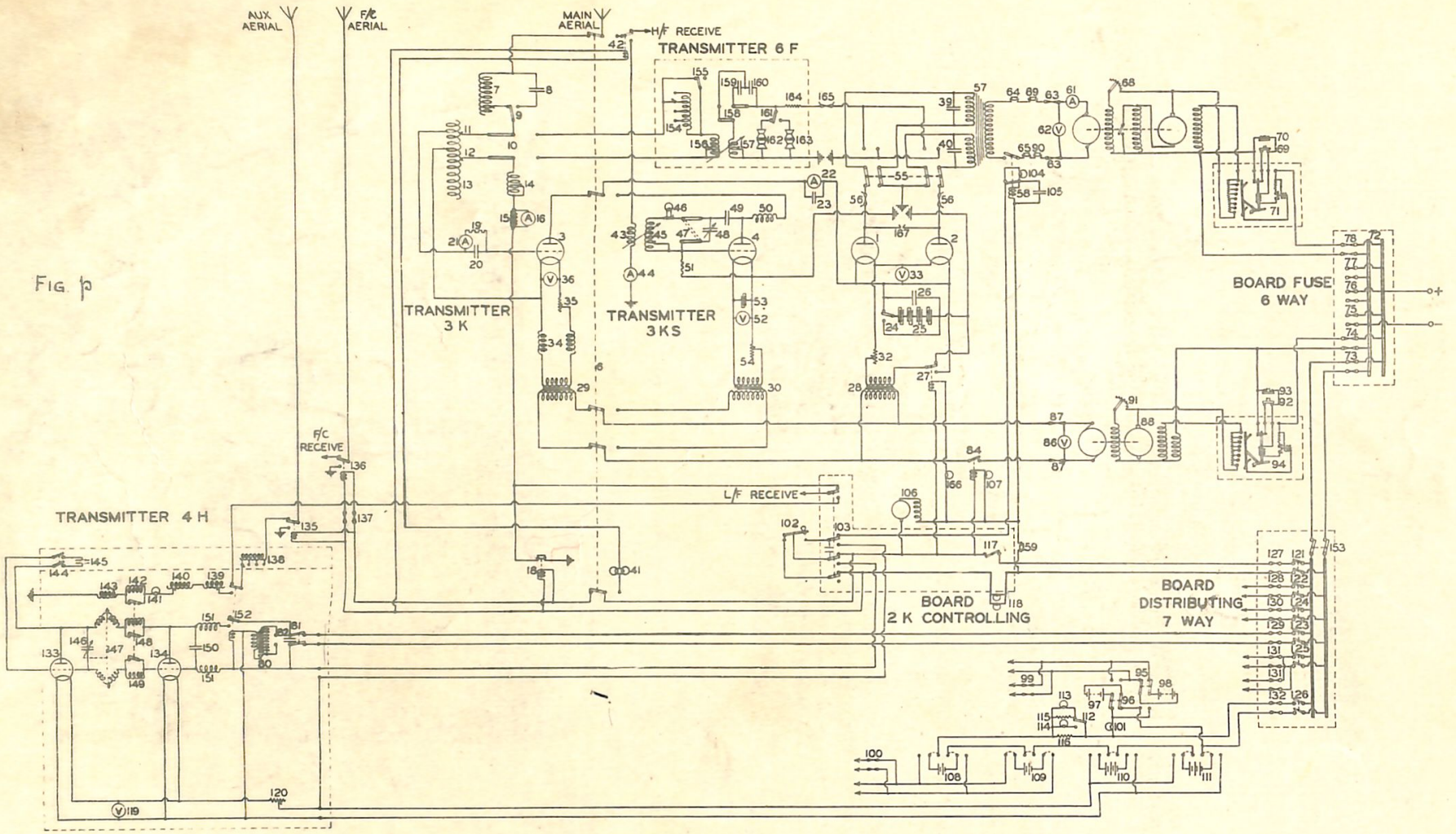
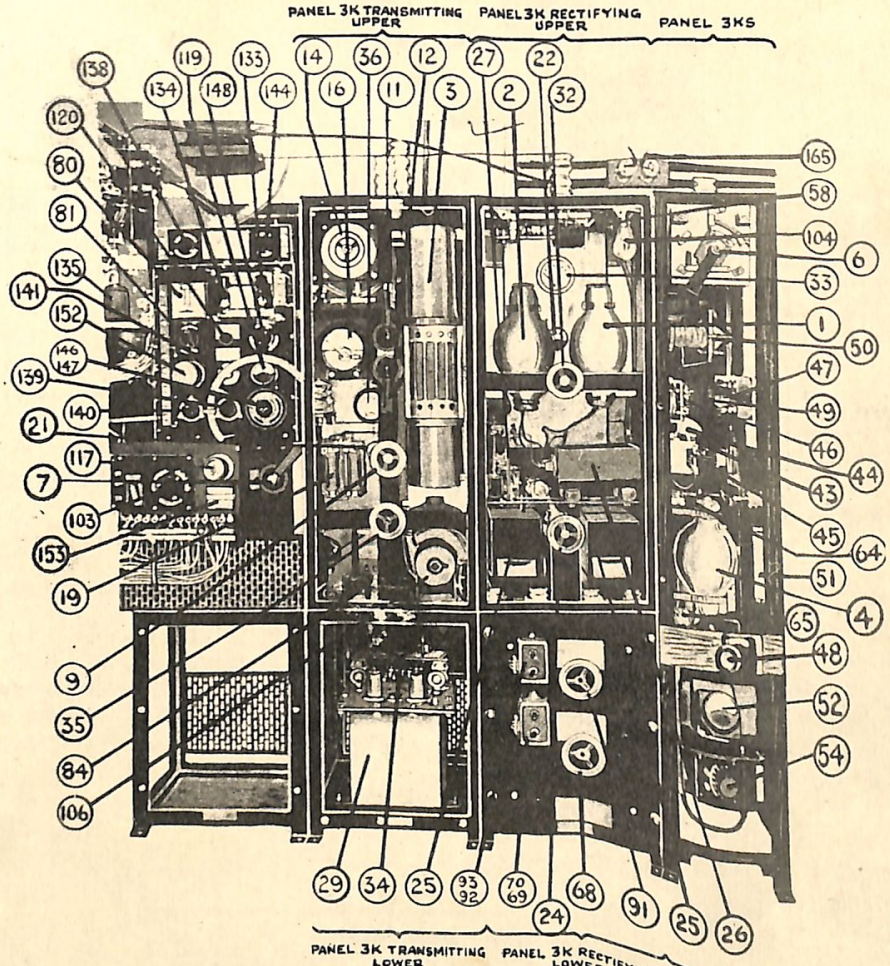


FIG. 9

TYPE 37S


PANEL 3K TRANSMITTING UPPER
PANEL 3K RECTIFYING UPPER
PANEL 3KS
138
119
133
14
36
12
27
22
134
148
144
16
11
3
2
32
120
165
80
58
81
104
6
135
33
141
1
152
50
146
147
47
139
49
140
46
21
44
117
43
7
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103
64
153
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4
65
9
48
35
52
84
54
106
29
34
25
93
92
70
69
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68
91
25
26
PANEL 3K TRANSMITTING LOWER
PANEL 3K RECTIFYING LOWER
PANEL 3KS

FIG. 9.

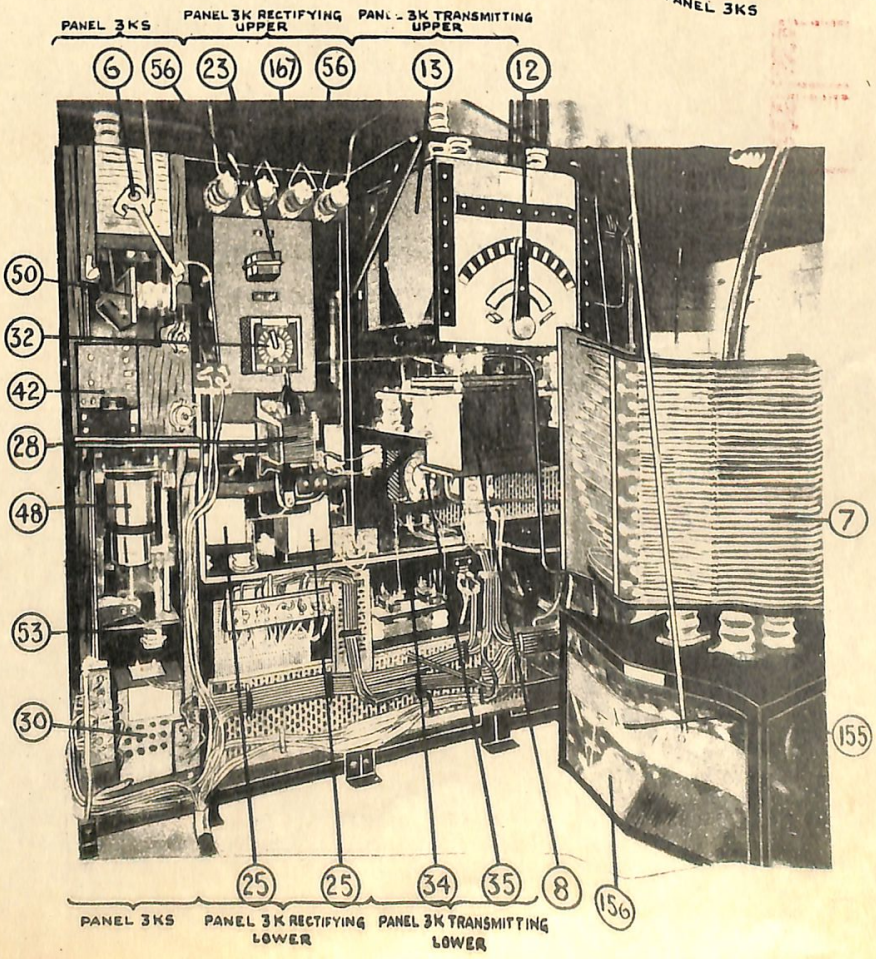
PANEL 3KS
PANEL 3K RECTIFYING UPPER
PANEL 3K TRANSMITTING UPPER
6
56
23
167
56
13
12
50
32
42
28
48
7
53
155
30
25
25
34
35
8
156
PANEL 3KS
PANEL 3K RECTIFYING LOWER
PANEL 3K TRANSMITTING LOWER

FIG. 10.

TYPE 37M

Date of design:- 1933.
Frequency range:- 3000-20000 kc/s.
Power supply:- H.T. 3 kW motor alternator.
Filament. 1½ kW motor alternator.
Valve used:- NT1
Associated wavemeters:- G7 and G8 or G56.
Approximate range in miles:- World wide at times.

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

Reference:- Admiralty Handbook of W/T (1931) paragraph 626.

In order to improve the performance, particularly in the matter of frequency stability, of Type 37S on H/F, panel 3KS has been redesigned. The new panel is called 3KM and occupies the same relative position in the set, which, when so modified, is known as Type 37M.

A terminal board mounted on the panel is so arranged that, with the exception of the H.T. supply, the wiring to the remainder of the set is unaltered.

The modified H.T. supply arrangements are shown in figure cc. As the maximum voltage which can be applied to a NT1 valve is approximately 2000 volts the normal H.T. voltage used for L/F transmissions is reduced by connecting a step down transformer (173) in the A.C. supply to the main transformer (57) when using H/F. This transformer (173) is switched into or out of circuit by an additional contact on the main L/F - H/F C.O.S. (6). The primary of the step down transformer (173) is permanently connected across the A.C. output from the alternator. In the L/F position the secondary is on open circuit and only a small magnetising current will flow through the primary.

MODIFIED POWER SUPPLY

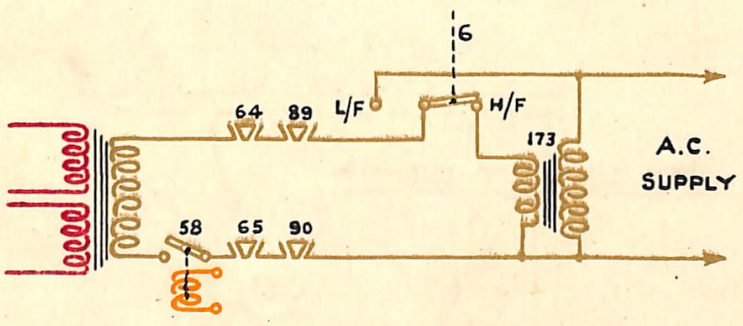

Fig CC.

The oscillatory circuit (see figure hh.) consists of a variable condenser (171) with its two halves in parallel giving a maximum capacity of 320 cms, and one of a series of four plug-in coils. The latter are specially designed to prevent frequency drift as the coil becomes heated by the oscillatory current.

The frequency ranges of the four coils are as follows:-

Frequency range.	Coil.	No. of turns.
2,900 to 6,900 kc/s.	9A	9
5,500 to 12,000 "	4A	4
7,500 to 13,000 "	2A	2
15,000 to 21,000 "	1A	1

It may be found that when using Coil 9A the circuit will not oscillate over the whole range of the tuning condenser (171). To obviate these "blind spots" the centre (H.T.) tapping on the coil should be moved one turn nearer the grid end of the coil.

The grid of the valve (4) is insulated from the H.T. supply by the condenser (172) and a grid leak resistance (51) of 10,000 ohms is connected between grid and filament. The primary tuning coil (170) is earthed at its centre point through the condenser (175) which also acts as a R/F by-pass condenser across the H.T. supply. The primary and aerial circuits are coupled by means of the small fixed condenser (169).

The aerial circuit consists of a variable tuning condenser (168), a tapped tuning coil (43) and a series parallel switch (167) which connects them in series or parallel as desired.

A wavemeter coupling bar (153) is fixed near the primary coil (170). The amount of coupling between the primary circuit and the wavemeter is controlled by the variable condenser (154).

Operation and Tuning.

1. Set the L/F – H/F C.O.S. (6) to "H/F".
2. Plug in the appropriate tuning coil (170) for the frequency required.
3. Set the filament voltage to the correct value for the NT1 valve (4) by means of the rheostat (54) and adjust the output from the H.T. alternator to a value not greater than 140 volts.
4. Connect the appropriate wavemeter to the terminals (155) and (156).
5. Press the transmitting key and measure the wave frequency. If incorrect, adjust the primary tuning condenser (171) until the required frequency is obtained. To ensure a suitable current in the wavemeter it will probably be necessary to adjust the wavemeter coupling condenser (154). On the higher frequencies a small value and on the lower frequencies a large value of this condenser will be required.
6. When the correct frequency is obtained in the primary circuit tune the aerial circuit by adjusting the aerial tuning condenser (168) and aerial tuning coil (43) until maximum current is obtained in the aerial ammeter (44).

   The lower frequencies usually require the "series" position of the series-parallel switch (168) but the higher frequencies may require either "series" or "parallel" position according to whether the aerial is electrically equivalent to an even or odd multiple of a quarter wavelength.

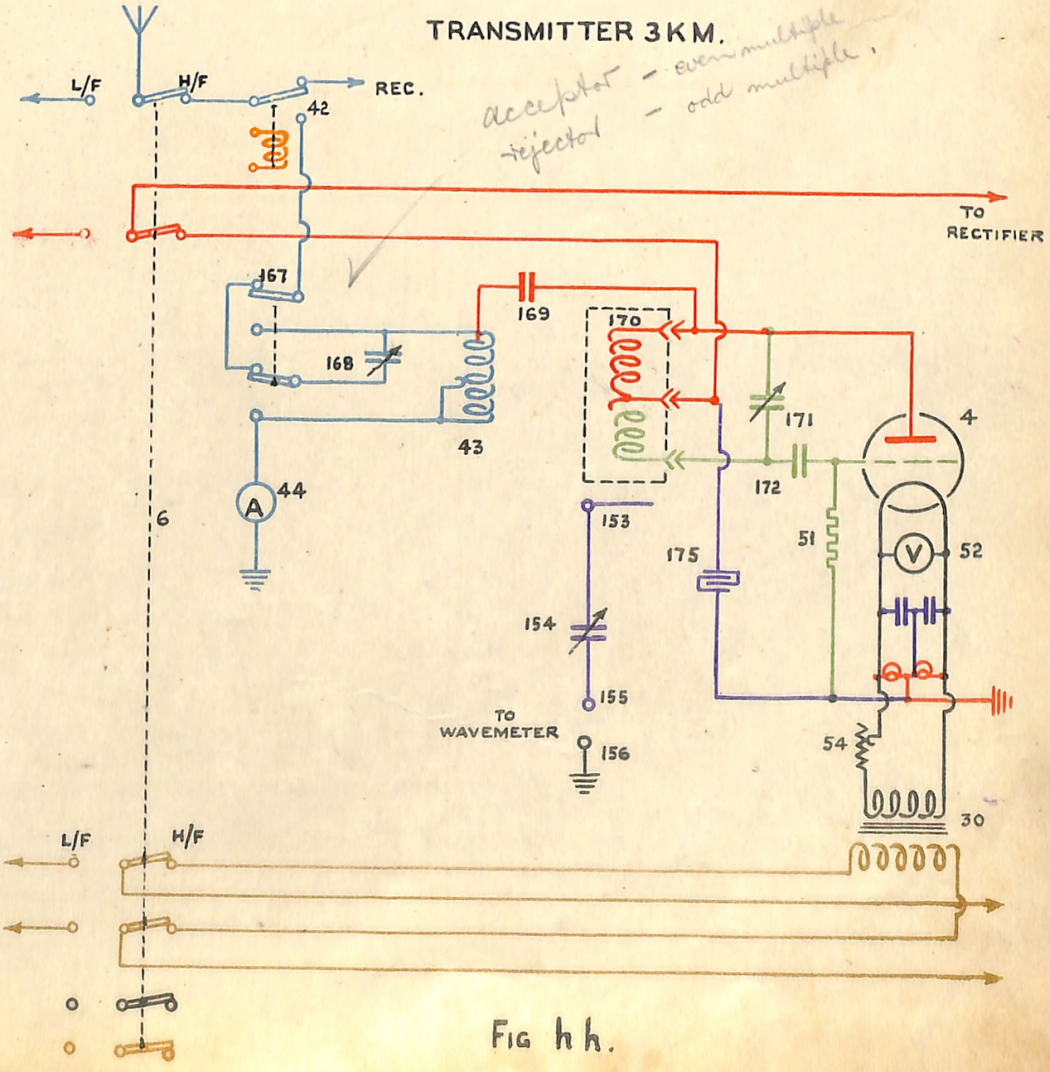

Fig hh.