# TYPE 49

## DETAILS OF COMPONENTS

| Transmitter | 3T L/F | | 3T, Low Power | 3T H/F | Spark Transmitter |
|---|---|---|---|---|---|
| | Master | Self | | | |
| Frequency range kc/s. | 100 - 500 | 100 - 500 | 100 - 1700 | 3000 - 20000 | 100 - 500 |
| Power supply and Filament supply. | 8 kW Motor alternator with auto-voltage control. | 8 kW Motor alternator with auto-voltage control. | 100 watt motor alternator supplied from ship's 20 volt mains. | 8 kW Motor alternator with auto-voltage control. | 8 kW Motor alternator |
| Valves used - See Section J. | 1 NT45A<br>1 NT48<br>2 NU2 | 1 NT48<br>2 NU2 | 1 NT18 | 1 NT45A<br>2 NU2 | - |
| Wave form. | C.W. or I.C.W. | C.W. or I.C.W. | I.C.W. | C.W. or I.C.W. | Spark. |
| Associated wavemeters. | G57 | G57 | G57 | G57 | G57 |
| Approximate range in miles. | 600 | 600 | 30 | World wide at times. | 100 |
| Date of design. | 1934 | 1934 | 1934 | 1934 | 1934 |
| Reference page. | RN7 | RN9 | RN13 | RN10 | OB5 |

Type 49 has been designed to replace Types 37 and 38 in the Main W/T offices of destroyers, sloops, netlayers etc., and in second W/T offices of capital ships, cruisers, aircraft carriers and depot ships. The most important improvements in the new set are greater frequency stability and the provision of screening arrangements to reduce the interference to receivers in the same office.

| Transmitter 3T Low Power | Transmitter 3T L/F Master | Transmitter 3T, L/F | Transmitter 3T, H/F |
|---|---|---|---|
| Panel 3T Low Power | Panel 3T L/F Master Oscillator | Panel 3T L/F Transmitting Upper | Panel 3T H/F Transmitting |
| Transmitter 3T L/F | | Rectifying Panel | |
| Panel 3T L/F Transmitting, Lower. | | Panel 3T Rectifying. | |

The transmitting circuits are contained in panels which are bolted together and fitted in a position to allow the operator easy access to the handles for adjusting the set. The storekeeping titles of the panels are shown here as well as the name by which the various panels will be referred to in these notes.

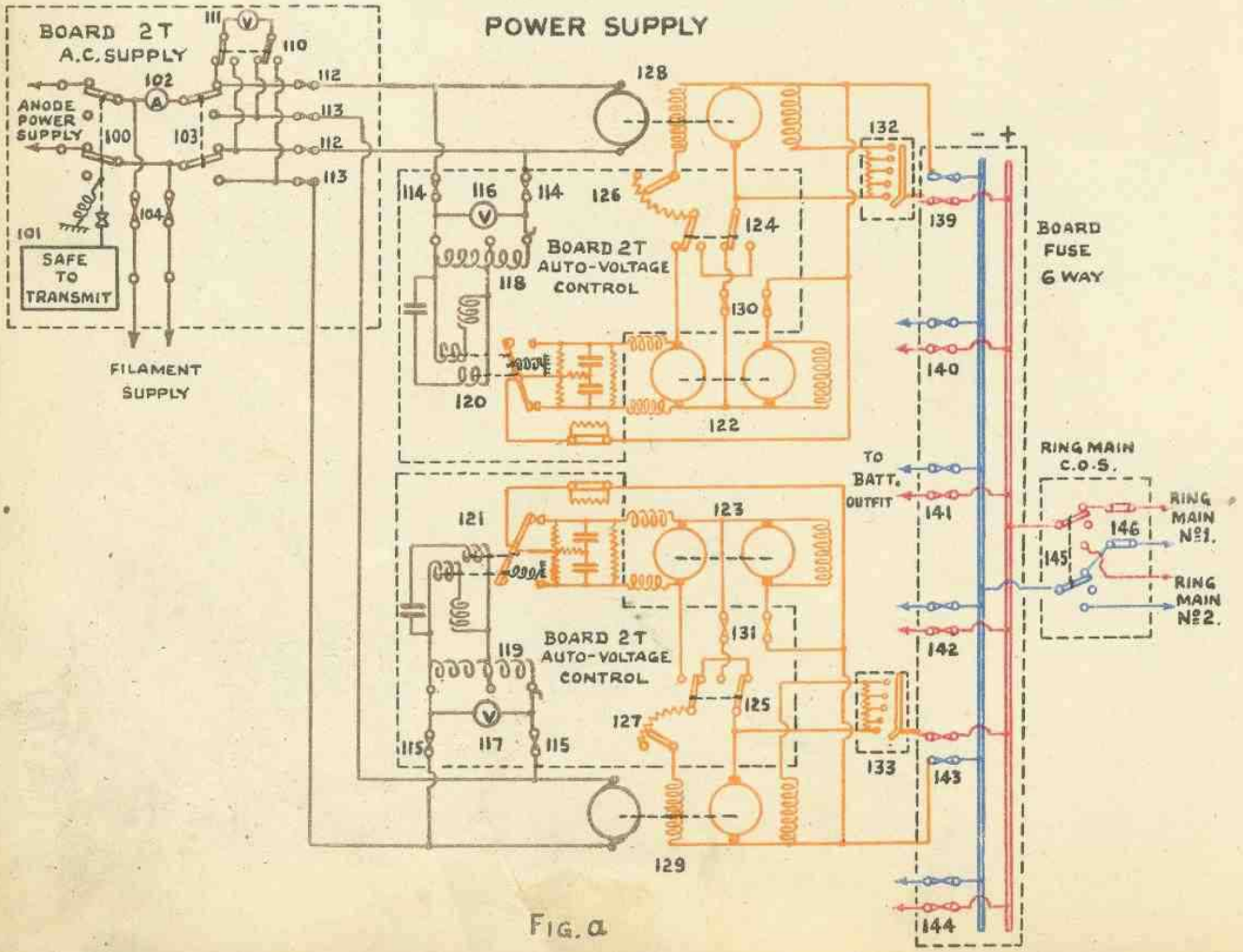


FIG. a

## POWER SUPPLY

D.C Supply. A diagrammatic sketch of the power supplies is shown in figure a. The D.C. supply is taken from branch breakers on opposite sides of the ring main or from separate supplies on the main switchboard, to a ring main C.O.S.(145) inside the W/T office. The D.C. supply is duplicated except when the W/T office is in close proximity to the main switchboard. In all cases the supply cables are connected to the ring main C.O.S.(145), using this switch as change-over or single way switch according to whether the supply is duplicated or not. The above supply is taken to a Board, fuse, 6 way which distributes power to the automatic starters for the 8 kW alternators, battery charging circuits and the Board,fuse, 7 way. A pair of links (146), to allow for an emergency supply, is provided on the No.1 ring main side of the ring main C.O.S.(145).

BOARD 2T. AUTO-VOLTAGE CONTROL

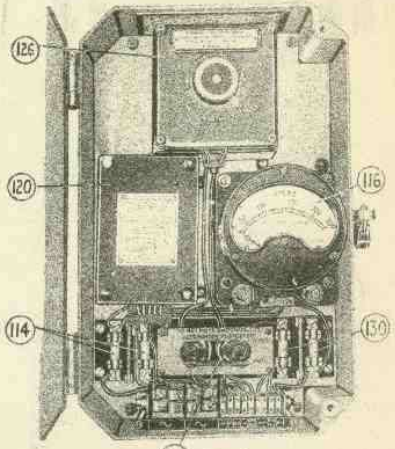

Fig B

Automatic voltage control is obtained from reversing boosters (122)(123) and contactors (120)(121). (For detailed explanation of this system of control see Admiralty Handbook of W/T (1931), paragraph 251).

The 8 kW motor alternator and booster are duplicated except in second offices of ships other than aircraft carriers. The 8 kW motor alternators (128)(129) and auto-starters (132)(133) are fed through two pairs of fuses (139)(143) in the Board, fuse, 6 way. Two other pairs of fuses (130)(131) supply the booster motors. There are no change over arrangements, each alternator being controlled by its own starter and booster. "Y" size automatic starters are used (see pages MA6 and MA7). The remote control switches for operating the starters are fitted on the front of the rectifying panel. The contactors (120)(121), hand-auto switches (124)(125), alternator field regulators (126)(127), voltmeters (116)(117), booster fuses (130)(131) and contactor fuses (114)(115) are assembled in Boards, 2T, auto-voltage control, which are fitted near the alternators they control. Each board is enclosed in a metal box which is normally kept locked. A photograph of the board is shown in figure b.

A.C.Supply. The A.C. output from the 8 kW alternators is connected to fuses (112)(113) on "Board 2T, A.C.Supply" and to the transformers and bobbins of the contacts in the auto-voltage control boards. Board 2T, A.C.Supply is fitted in the W/T office or lobby. A photograph of the board is shown in figure c. The A.C. supply fuses (112)(113) are connected to the A.C. C.O.S.(103). A voltmeter (111) can be connected across the output of either alternator by means of a voltmeter C.O.S.(110).

BOARD 2T. A.C. SUPPLY

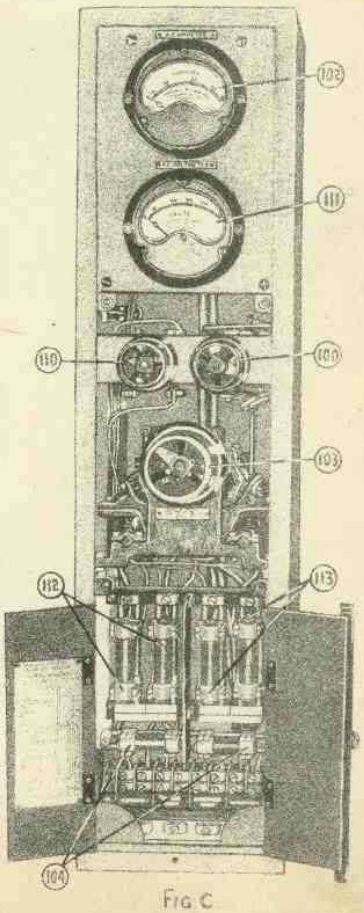

Fig C

From the output side of the A.C. C.O.S.(103) the supply is taken to the "Man Aloft" switch (100); an ammeter (102) being connected in one lead (See figure d.)

The "Man Aloft" switch (100) is fitted with a safety device consisting of a plate engraved "Safe to transmit on M/F". When hands are aloft or the ship is ammunitioning this plate is removed and retained by the Officer of the Watch. The plate can only be removed when the switch is broken. When the plate is not in position a spring plunger prevents the switch being made.

When the "Man Aloft" switch (100) is made the A.C.supply is connected to two terminals on the bottom of the Board 2T, A.C.Supply marked "Anode Power Supply". These terminals are connected to gate switches (96)(97) main magnetic key (98), an auto-transformer (95) and thence to the primary of the main H.T. transformer (86). See figure d.

The auto-transformer(95) is connected across the A.C supply. It is provided with four tappings giving an output of ¼, ½, ¾ and the full supply voltage. These tappings are connected to the auto-transformer tapping switch (94), fitted on the front of the L/F transmitting panel (lower).

The full supply voltage, when using auto-voltage control, is 180 volts so that the four voltages which can be supplied to the main transformer (86) are approximately 45, 90, 135 and 180 volts.

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# TYPE 49

H.T. AND FILAMENT SUPPLIES

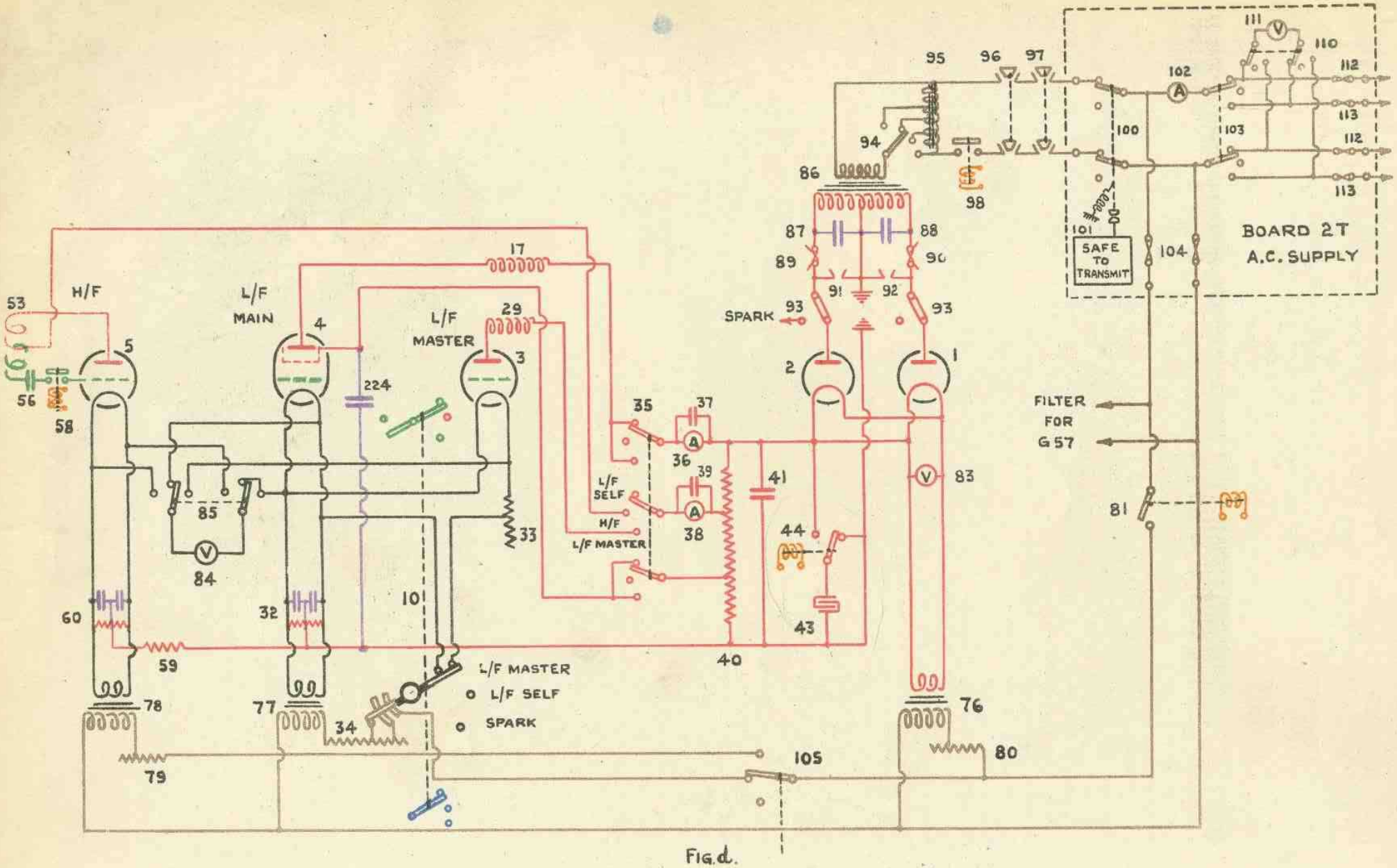


Fig.d.

# TYPE 49

## H.T. AND FILAMENT SUPPLIES

H.T.Supply. (See figure d.) The H.T. supply to the main transmitter (L/F or H/F) is taken from the secondary of the main transformer (86) through horn break fuses (89)(90) and links (93) to the anodes of the two rectifying valves (1)(2). The transformer secondary has its centre point earthed. Two 1 jar condensers (87)(88), connected one across each half winding, protect the secondary from stray oscillatory currents. Safety horns (91)(92) are fitted across the complete secondary winding. Links (93) are used to connect the H.T. supply to the spark transmitter or the anodes of the rectifying valves (1)(2). A 1 mfd smoothing condenser (43) is used for C.W. transmissions and is connected to the rectifier filaments by a magnetically operated C.W. - I.C.W. switch (44) controlled by the C.W. - I.C.W. C.O.S.(42) on the front of the rectifying panel. A 20 jars condenser (41) is permanently connected between the rectifier filaments and earth to protect the filament transformer (78) from R/F currents (see Admiralty Handbook of W/T (1931), paragraph 656 (22)). A potentiometer resistance (40) of 180,000 ohms is connected between the rectifier filaments and earth, tappings being brought out at 20,000 and 160,000 ohms from the earth end. The tapping at 20,000 ohms provides the voltage for the screen of the main L/F valve (4) and that at 160,000 ohms the H.T. to the L/F master or H/F circuits. The H.T. C.O.S.(35) connects the rectifier supply to the L/F master, L/F self excited or H/F circuits as required. When taking the full voltage from the auto-transformer (95) this arrangement supplies approximately 7000 volts to the L/F main circuit, 3500 volts to the L/F master or H/F circuits and 450 volts to the screen of the main L/F valve (4). As the H.T. supply to the H/F valve (5) is taken from a tapping on the potentiometer resistance (40) the full 180 volts supply from the auto-transformer (95) can be used for H/F transmissions.

Filament Supply (See figure d.) The main A.C. supply is used for filament lighting in the main set. The supply for the filament transformers of the main rectifying valves (1)(2) and the L/F valves (3)(4) or H/F valve (5) is taken from the machine side of the man aloft switch (100)through fuses (104) on the A.C. supply board. From thence one lead is taken to the filament switch (81) and the other lead to one side of the filament transformers (76)(77)(78). When the filament switch (81) is made the supply is completed to the rectifier filaments transformer (76) and to one contact of the auxiliary circuits C.O.S.(105) which connects the supply to the L/F or H/F filament transformers (77) or (78) as required. Semi-adjustable resistances (34)(79)(80) are connected in the supply to the primaries of the transformers (76)(77)(78) and one (33) is connected in series with the supply from the secondary of the transformer (77) to the filament of the L/F master valve (3). The tappings on these resistances are adjusted when the set is tested in Signal School and should not require alteration if the A.C. supply is maintained at 180 volts. The filaments of the L/F main and master valves are supplied from one transformer (77). When the L/F circuit C.O.S.(10) is set to "L/F Master" a portion of the filament resistance (31) is short circuited to compensate for the difference in load when changing from "L/F Self" (one valve) to "L/F Master" (two valves), or vice versa. The supply to the L/F master valve (3) is broken when the L/F circuit C.O.S.(10) is set to "L/F Self" or "Spark". A voltmeter (84) with a C.O.S. (85) is fitted in the L/F transmitting panel (Upper) to indicate the filament volts of the L/F master, L/F main or H/F valve (3)(4) or(5). The rectifier filament voltmeter (83) is fitted in the same panel.

PANEL 3T, RECTIFYING

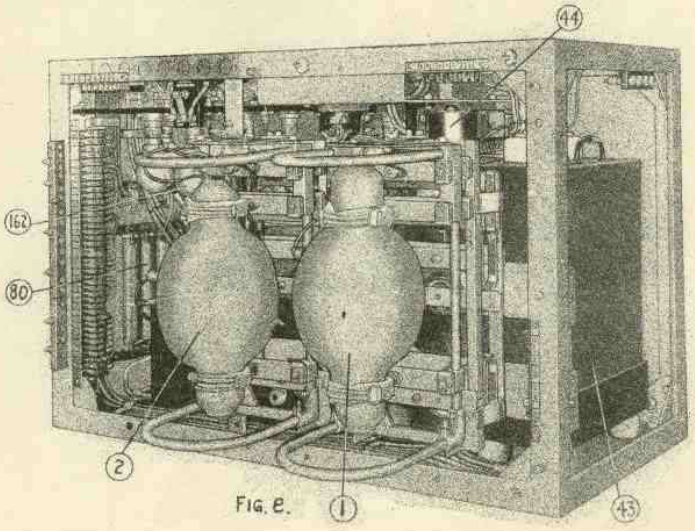


FIG. E.

# TYPE 49

## TRANSMITTER 3T, L/F, MASTER CONTROLLED

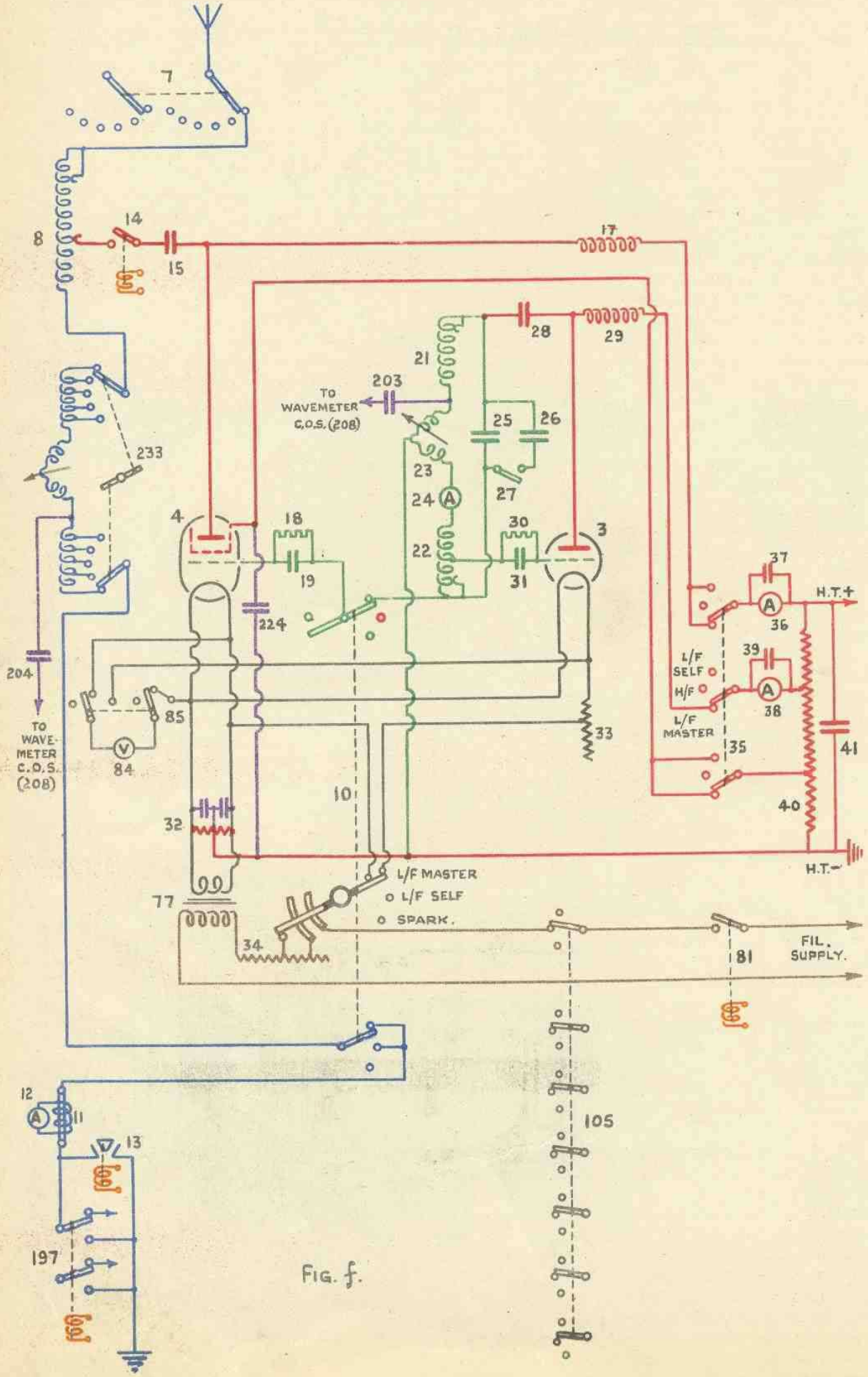


FIG. f.

# TRANSMITTER 3T, L/F, MASTER CONTROLLED

| Wave form | Method of producing oscillations. | Nature of circuit | | Grid excitation | | Feed | | Aerial excitation | High oscillating potential electrode |
|---|---|---|---|---|---|---|---|---|---|
| | | Master | Main | Master | Main | Master | Main | | |
| C.W. or I.C.W. | Master controlled. | Tuned circuit between anode & grid. | Tuned circuit between anode & filament | Direct inductive | Direct inductive from master circuit. | Parallel | Parallel | Direct inductive | Anode |

Reference:- Admiralty Handbook of W/T (1938) Vol II. Sect K. Para. 39. ~~(1931), paragraphs 629 and 630~~

The L/F master controlled circuit consists of a single valve master oscillator coupled to a screen grid amplifying valve. The components of the master oscillator circuit are contained in Panel 3T, Master Oscillator and those for the main transmitting circuit in Panels 3T, Transmitting, Upper and Lower. The arrangement of the panels is shown in figure y.

A diagram of the complete L/F master controlled circuit is shown in figure f.

H.T. Supply. The H.T. supply is connected to the main and master circuits by the H.T. C.O.S.(35) which connects the anodes of the valves (3)(4) and the screen of the main valve (4) to tappings on the potentiometer resistance (10). Anode ammeters (36) and (38) indicate the anode current of the main valve (4) and master valve (3) respectively. The anode of the main valve (4) is connected to the anode tapping point on the main aerial coil (8) by a 5 jars anode blocking condenser (15) and anode key (14).

Master Circuit. The master oscillatory circuit consists of a coil (21)(22) with a variometer winding (23) and the primary condensers (25)(26). The inductance of the coil (21)(22) is varied an equal amount on each side of the earthed electrical centre of the variometer (23) by an 8 position tapping switch (235)(see figure y). The variometer (23) has a slow motion dial for fine tuning. The primary condenser is mounted as a single unit and consists of a 0.5 jar condenser (25) and a 2 jars condenser (26), controlled by the L/F master condenser switch (27). When this switch (27) is set to position "2" "1" the 0.5 jar condenser (25) only is used and in position "2" "1" the two condensers (25)(26) are connected in parallel.

An ammeter (24) indicates the current in the master oscillatory circuit. The grid of the master valve (3) is connected to a fixed tapping on the master coil (22) via a 30000 ohms resistance and 4 jars condenser (31).

The wavemeter G57 is coupled to the master circuit by means of a 75 cms fixed condenser(203) which is connected to one side of the fine tuning variometer (23).

Amplifying Circuit. The grid of the main valve (4) is connected to the master oscillator circuit by one contact arm of the L/F circuit C.O.S.(10) when the latter is set to "L/F Master". Two other contact arms on this switch (10) complete the filament circuit to the master valve (3), short circuit a portion of the filament resistance (34) of the main valve (4) and connect the aerial circuit to the L/F aerialammeter transformer (11) and operating switch (13).

The aerial circuit consists of the aerial C.O.S.(7), main aerial coil (8), fine tuning coil (9) and aerial ammeter transformer (11). The aerial and anode tappings on the main aerial coil(8) are adjusted by the 8 position aerial coil tapping switch (234)(see figure y.) The inductance of the fine tuning coil (9) is varied an equal amount on each of the two fixed windings by a five position tapping switch (233) and fine adjustment is obtained by a fine tuning variometer (9).

The wavemeter G57 is coupled to the aerial circuit by means of a 75 cms fixed condenser (204) which is connected to one side of the variometer (9).

Tuning. Set the aerial C.O.S.(7) and auxiliary circuits C.O.S.(105) to "L/F" and the H.T. C.O.S. (35), L/F circuit C.O.S.(10) and wavemeter C.O.S. (208) to "L/F Master". Set the aerial and master circuits to the approximate adjustments for the frequency required by reference to the table given in the Book of Instructions. Press the transmitting key. Adjust the master circuit fine tuning coil (23) and, if necessary, the master coil tapping switch (235) until the aerial current is a maximum and the anode current a minimum. Measure the frequency on the wavemeter G57. If incorrect, set the G57 to the required frequency and slowly adjust the main fine tuning coil (9) and master fine tuning variometer (23), keeping the two circuits in step, until the correct frequency is obtained.

## PANEL 3T, L/F, MASTER OSCILLATOR

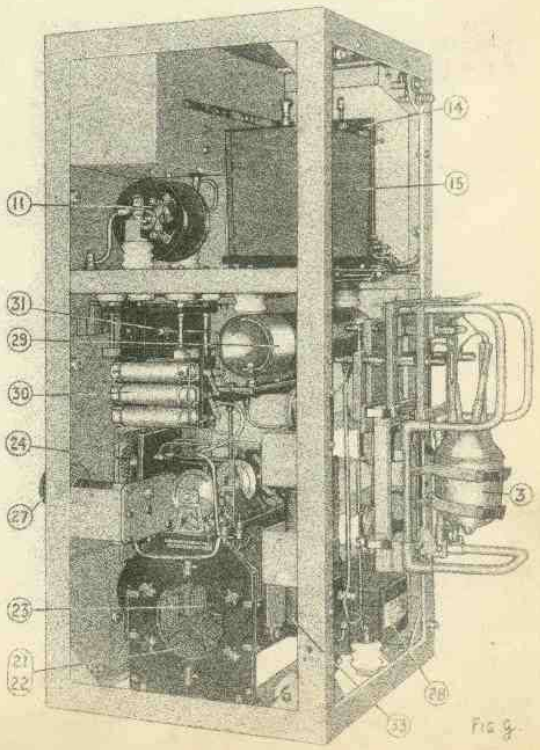

Fig 9.

RN8

# TYPE 49

## TRANSMITTER 3T, L/F, SELF EXCITED

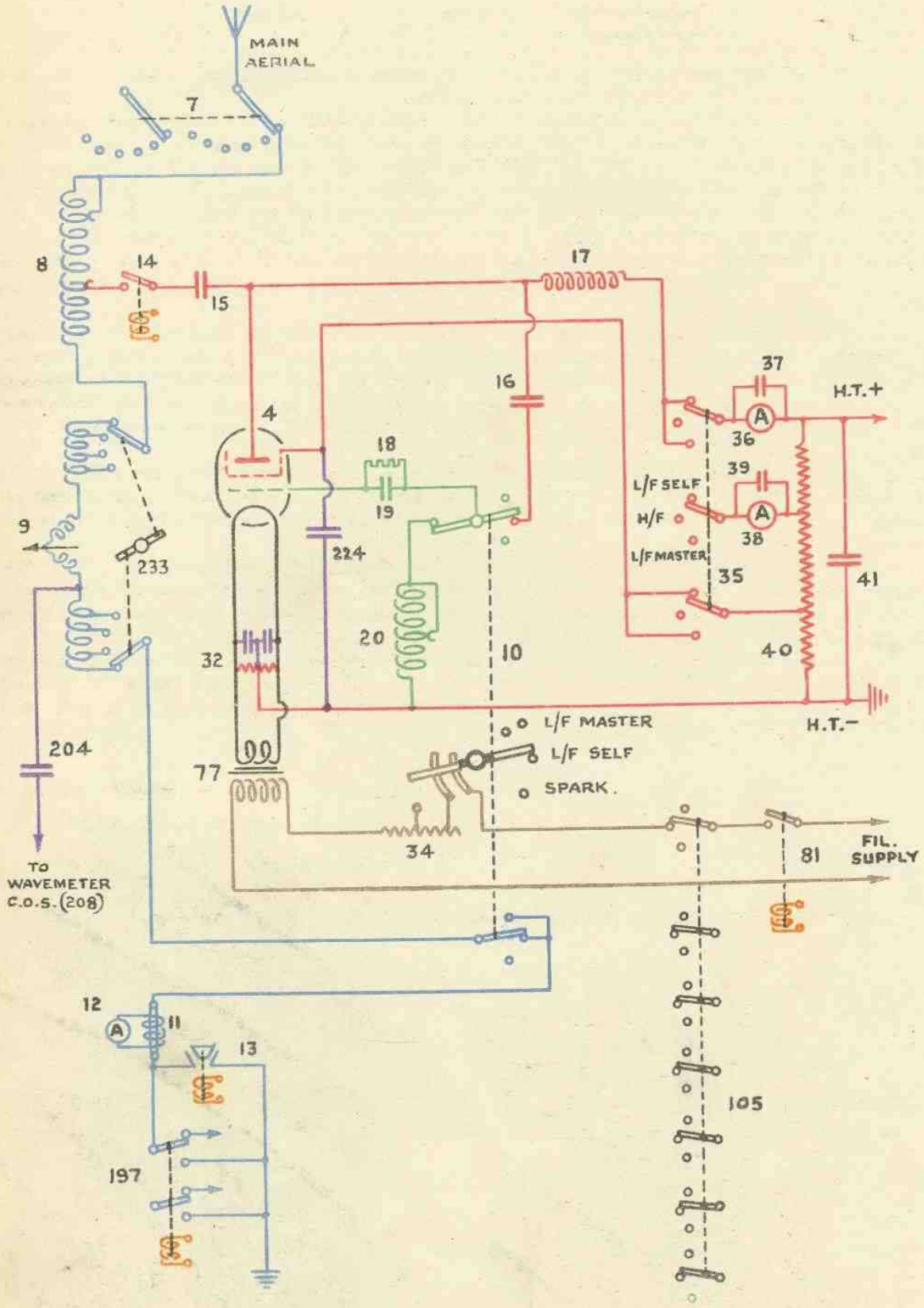


Fig. h.

# TYPE 49

## TRANSMITTER 3T, L/F, SELF EXCITED

| Wave form | Method of producing oscillations. | Nature of circuit | Grid excitation | Feed | Aerial excitation | High oscillating potential electrode |
|---|---|---|---|---|---|---|
| C.W. or I.C.W. | Self | Tuned circuit between anode and filament. | Direct capacitive | Parallel | Direct inductive | Anode |

The L/F self excited circ it is used in the event of failure of the master control circuits. A diagram of the complete circuit is shown in figure h.

The H.T. and filament supplies to the main valve (4), using the self excited circuit, are the same as those used for master controlled transmissions. The main valve (4) is self excited by setting the L/F circuits C.O.S.(10) to "L/F Self Excited". With the switch (10) in this position the grid of the main valve (4) is disconnected from the master circuit and connected through the grid resistance (18) and condenser (19) to the anode lead by a 0.04 jar condenser (18) and to the filament and earth by a 15,000 mic grid coil (20). The grid coil (20) has 8 tappings by means of which the current flowing in the circuit between anode and filament can be adjusted to produce the correct potential, in the right phase, at that point in the circuit to which the grid of the valve (4) is connected.

With the exception of the grid connections described above the main oscillatory circuit is the same as that used in the main amplifying circuit for master controlled transmissions (see page RN7). The aerial circuit forms the tuned circuit to which the anode of the valve (4) is connected by the anode tap through the 5 jars anode blocking condenser (15) and anode key (14). The wavemeter G57 is coupled to the aerial circuit by a 75 cms fixed condenser (204) when the wavemeter C.O.S (208) is set to "L/F Main".

Tuning. Set the aerial C.O.S.(7) and auxiliary circuits C.O.S.(105) to "L/F"; the H.T. C.O.S.(35), L/F circuits C.O.S.(10) and wavemeter C.O.S.(208) to "L/F Self". Set the aerial coil (8) and grid tapping coil (20) to their estimated positions for the frequency required by reference to the approximate adjustments given in the Book of Instructions.

Press the key. The aerial ammeter (12) should now register aerial current. Re-adjust the grid tapping coil (20) until the aerial current is a maximum and oscillations in the aerial circuit are stable. The anode current, as indicated by the anode ammeter (38) should read minimum current when the aerial current is maximum.

Measure the transmitted frequency by means of the wavemeter G57. If incorrect readjust the tapping on the aerial coil (8) and fine tuning coil until the approximate frequency is obtained, re-setting the grid tapping coil (20) as necessary. The correct frequency can then be obtained by slow motion adjustment of the aerial fine tuning coil variometer (9).

PANEL 3T, L/F, MAIN TRANSMITTING, LOWER

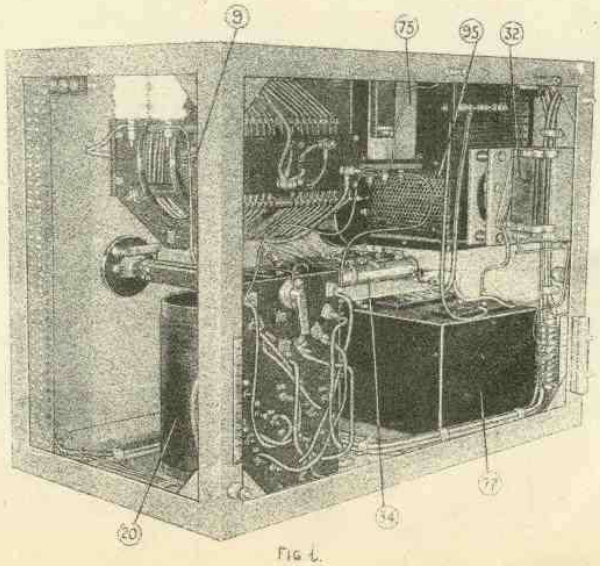


Fig t.

PANEL 3T, L/F, MAIN TRANSMITTING, UPPER

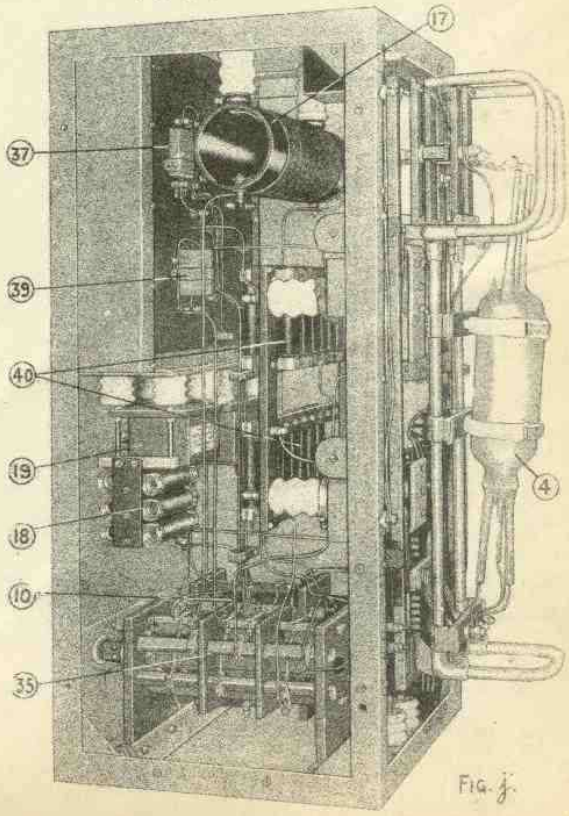


Fig. j.

RN10

# TYPE 49

## TRANSMITTER 3T, H/F.

| Wave form | Method of producing oscillations | 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 (1938) Vol II. Sect K. Para 47. Fig 44A. ~~(1931) paragraph 698, figure 359.~~

Transmitter 3T, H/F is mounted in a separate panel adjacent to the L/F transmitting panel. Space considerations do not allow master control of the H/F circuits and a self excited circuit is used with special precautions to give the best frequency stability obtainable. These include the use of specially designed plug-in coils in the primary circuit, careful screening between the primary and aerial circuits, tilting the valve (5) at a small angle to assist in limiting internal vibration of electrodes, loose coupling between the primary and aerial circuits and a symmetrical assembly of the components about a centre earthy point.

A diagram of the H/F circuit is shown in figure k.

H.T. Supply. The H.T. supply is from the main rectifying circuit and is connected to the H/F valve (5) by the H.T. C.O.S.(35) via the centre tap on the H/F tuning coil (53).

Filament Supply. The filament supply is obtained from a transformer (78) which has a semi-adjustable resistance (79) connected in series with the primary. The supply to the primary is completed by the filament switch (81) and one contact arm of the auxiliary circuits C.O.S.(105) when the latter is set to "H/F"

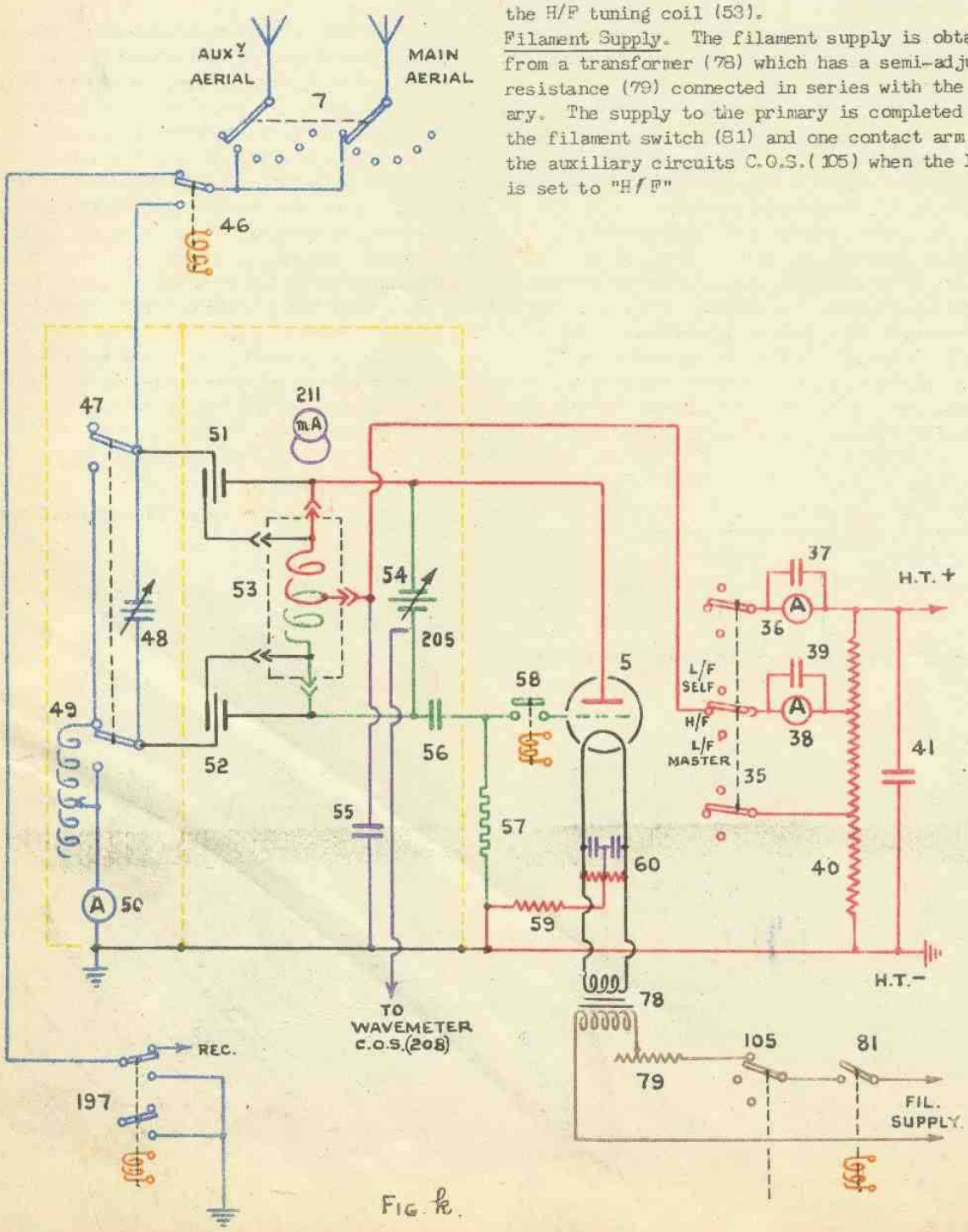


Fig k.

## TRANSMITTER 3T, H/F (CONT)

Oscillatory Circuit. The oscillatory or primary circuit consists of a plug-in coil (53) and a variable tuning condenser (54). Five plug-in coils are supplied with each set to cover the frequency ranges as shown below:-

| Frequency range. | Coil. | No. of Turns. |
|---|---|---|
| 3000 - 5000 kc/s. | 14 A | 14 |
| 5000 - 7000 kc/s. | 9 A | 9 |
| 7000 - 10000 kc/s. | 6 A | 6 |
| 10000 - 13000 kc/s. | 4 A | 4 |
| 13000 - 20000 kc/s. | 2 A | 2 |

The tuning condenser (54) has a maximum capacity of 140 cms and is fitted with a slow motion dial for fine adjustments. The grid of the valve (5) is connected to the primary circuit by a 0.8 jar grid condenser (56) when the grid signalling key (58) is made. The grid of the valve (5) is isolated by the grid signalling key (58) during spacing periods of signalling.

With this type of grid signalling there is a tendency for an intermittent rise of anode current through the valve immediately the grid is connected to the primary circuit by the grid signalling key (58). When this occurs the anode becomes over-heated and the primary circuit may fail to oscillate. (See Admiralty Handbook of W/T (1931), paragraph 532, page 489). This effect is minimised, as far as possible, by a 2500 ohms grid bias resistance (59), connected between the valve filament and the grid leak resistance (57), and by that part of the potentiometer resistance (40) which is connected in series with the H.T. supply to the anode. A sudden rise of anode current produces a voltage across the grid bias resistance (59) raising the potential of the filament above that of the grid (i.e., making the grid negative to the filament). At the same time the anode current is reduced by the potential rise in the portion of the potentiometer resistance (40) in the H.T. supply. "Blocking" in the valve is thereby prevented.

Current in the primary circuit is indicated by a milliammeter (211) which is coupled to the primary coil (53) by a short length of wire connected between the milliammeter terminals.

The aerial is coupled to the primary circuit by means of two fixed condensers (51)(52). These condensers have three elements viz., inner, centre and outer. For the higher frequencies the inner and centre elements only are used and the capacity is then 3 cms. When using the lower frequency coils 6A, 9A and 14A studs on the coil holder depress contacts in the coil mounting which connect the inner and outer elements of the condensers in parallel and the capacity is then 8 cms. With this arrangement over-coupling between the primary and aerial circuits cannot occur on any frequency within the range of the set.

The aerial circuit consists of a tuning coil (49) with 12 tappings, a 40 cms variable tuning condenser (48) and a series-parallel switch (47) which connects them in series or parallel as required. The aerial is connected to the transmitter or receiver by the H/F send-receive switch (46) which is operated by the back contacts of the morse key.

The wavemeter is coupled to the primary circuit by means of a short length of copper tubing (205) fitted near the fixed plates of the primary tuning condenser (54).

Tuning. Set the aerial C.O.S.(7), auxiliary circuits C.O.S. (105) H.T. C.O.S.(35) and wavemeter C.O.S.(208) to "H/F".

Plug in the appropriate tuning coil (53) for the frequency required and set the primary tuning condenser (54) by reference to the tuning curve given in the Book of Instructions.

Press the transmitting key. Current in the primary circuit should then be indicated by the ammeter (211). Set the wavemeter G57 to the required frequency and adjust the primary condenser (54) until the correct frequency is obtained in the primary circuit.

Set the H/F aerial series parallel switch (47) to "series" and the aerial tuning coil (49) to the approximate position. Adjust the aerial tuning condenser (48) from 0 to 50 using the black scale. The correct tuning position is indicated by a maximum reading in the aerial ammeter (50). If no aerial current is obtained the operation should be repeated using other tappings on the tuning coil (49). If no aerial current is obtained with the aerial series-parallel switch(47) in the "series" position repeat the operation using the "parallel" position. Having found the correct aerial tuning position re-check the frequency of the primary circuit by means of the G57, gradually adjusting the primary condenser (54) and aerial condenser (48), in step with each other, until the correct frequency, as indicated by the G57, is obtained. The capacity of the aerial tuning condenser (48) will determine the amount of energy transferred from the primary to the aerial circuit. For a given frequency, therefore, the smallest value of aerial capacity and the largest value of aerial tuning inductance (49) should be used to obtain optimum results.

PANEL 3T, H/F, TRANSMITTING

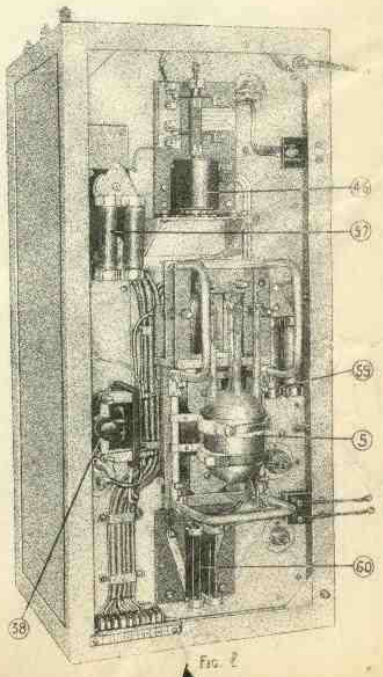


FIG. 2

# TYPE 49

## LOW POWER TRANSMITTER – POWER SUPPLY

Power Supply. The power supply for the low power set is taken from a 100 watt motor alternator which is designed to run from the ship's 20 volt mains or, in the case of sloops, gunboats, etc., from the 22 volt battery when this is fitted in the W/T office as the 20 volt supply.

Board 2T, Supply, 20 volts is used for connecting the 20 volt supply to the low power alternator and the 20 volt auxiliary circuits.

When type 49 is fitted in a second W/T office this board is supplied with the transmitting set and is connected to duplicate supplies from the ship's 20 volt switchboard. In ships where the set is installed in a W/T office which is in very close proximity to the 20 volt switchboard a single 20 volt supply may be fitted. When the set is fitted in the main W/T office the board is supplied as part of the battery outfit and is then used as a battery "charge-discharge" board. Figure m. is a photograph of the board and figure n. a diagrammatic sketch of the 20 volt circuits with duplicate supplies from the low power, 20 volt switchboard.

BOARD 2T. SUPPLY 20 VOLTS

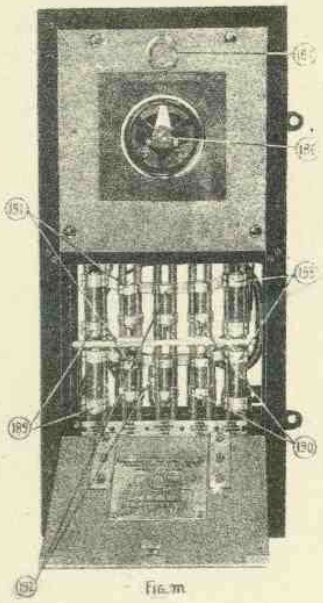

Fig. m

Two pairs of fuses (182)(183), on the low power switchboard, are connected to opposite sides of the change over switch (186). Two contact arms of the C.O.S.(186) are connected to bus bars which carry the fuses (189) to (193) for distributing power to the 20 volt circuits. An additional contact arm on the C.O.S.(186) completes the supply to a warning lamp (184) or (185), fitted in the low power switchboard, to indicate when the low power alternator is running. A lamp (187), fitted above the C.O.S.(186), indicates when the 20 volt supply is made to the bus bars.

Two 10 amp fuses (193) connect the bus bars to the hand starter (195) and motor alternator (194). The starter (195) and field regulator (231) are fitted on the front of the L/F transmitting panel (lower).

A.C.Supply. The A.C. output from the alternator (194) is taken through two safety gate switches (198) to the primary of the H.T. and filament transformer (75). A voltmeter(232) fitted on the L/F transmitting panel (lower), indicates the alternator output voltage which should be adjusted to 100 volts by means of the field regulator (231).

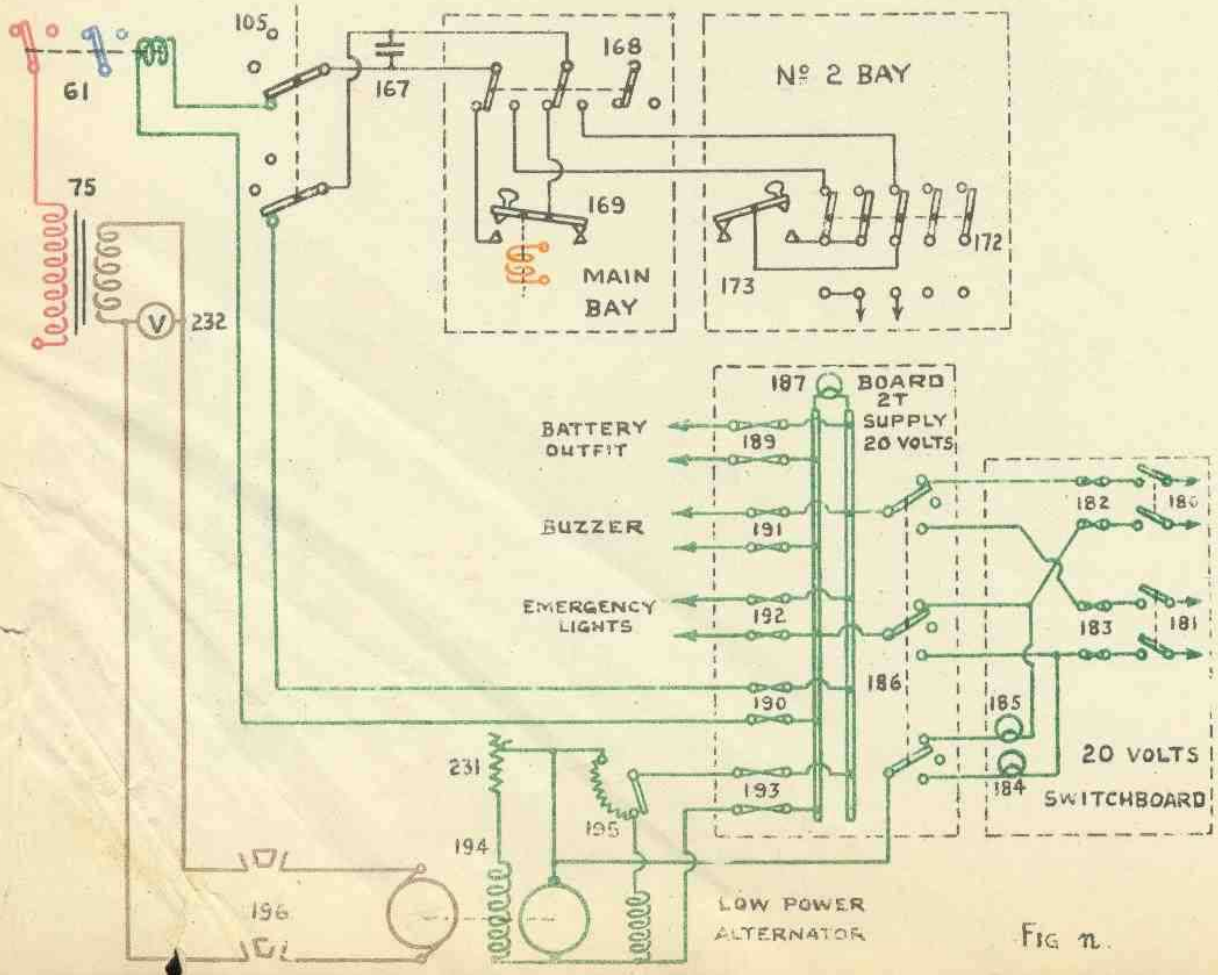


Fig n.

# TYPE 49

## TRANSMITTER 3T, LOW POWER

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

Reference:- Admiralty Handbook of W/T (1938) Vol II. Sect K. Para 23. Fig. 16(b) ~~(1931) paragraph 606, 627 and figure 309(b)~~.

The low power transmitter is fitted in Panel 3T, Low Power.

H.T. and Filament Supplies. The H.T. and filament supplies are obtained from the secondary windings of a single transformer (75) with a step up ratio of 1 - 4. A tapping from the secondary provides the 6 volts supply for the filament. A 10000 ohms compensating resistance (74) is connected across the secondary of the transformer (75) when the magnetic key (61) is at "rest" to keep the load on the transformer as constant as possible during signalling. A 5 jar R/F by-pass condenser (236) is connected across the secondary winding of the transformer (75).

Oscillatory Circuit (see figure o.) The oscillatory or primary circuit consists of a tuning coil (65), a 1 jar variable condenser (67) and three fixed condensers (220)(221)(222) which are connected in circuit as required by the primary range switch (68). The tuning coil (65) has two equal sections symmetrical about a centre earthed tapping point. Each section has two separate windings and is tapped at six points.

When using the four windings, for ranges 1, 2 or 3, tappings are taken from the outer windings and the inductance in use is tuned by the 1 jar variable condenser (67) and two fixed condensers (220)(221) of 0.2 jar and 3 jars capacity respectively (see figure p.)

When using the inner windings, for ranges 4, 5 or 6, the outer windings are isolated and short circuited. Tappings are then taken from the inner windings. The inductance in use is tuned by the variable condenser (67) which is connected in series with the 0.5 jar fixed condenser (222). (See figure q.)

The variable tuning condenser (67) has a slow motion dial for fine adjustment.

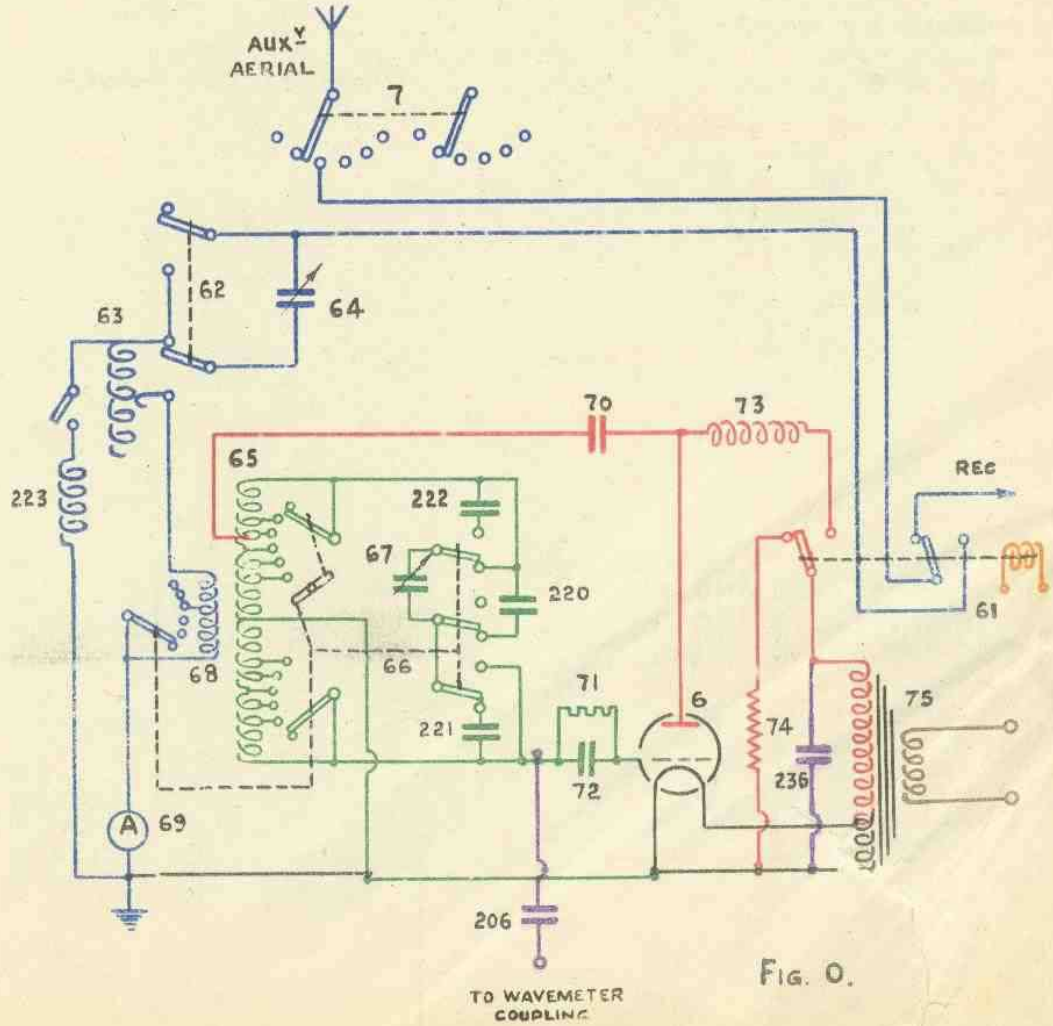


FIG. O.

# TYPE 49

## TRANSMITTER 3T, LOW POWER (CONT)

The aerial coupling coil (68) is fitted inside the primary tuning coil (65) and can be rotated for fine adjustment. The amount of coupling in use is indicated by a dial which has a black and a red scale. Each scale is marked 0 -100 and either can be used to obtain the correct setting for maximum aerial current. One half of the aerial coupling coil (68) is short circuited by one contact of the range switch (66) when using ranges 4, 5 or 6.

A separate aerial tuning unit is fitted and consists of a tuning coil (63) with 10 tappings, a variable condenser (64) and a 20 position L.P. aerial range switch (62). This switch (62) connects the ten tuning coil tappings in series or in parallel with the tuning condenser (64). A dial on the switch (62) has a black and a red scale which indicate the series or parallel positions respectively.

When using range "10 Series" an additional inductance (223) is connected in parallel with the aerial circuit in order to obtain a sufficiently high reading in the aerial ammeter (69) when using a large aerial.

The wavemeter is coupled to the primary circuit by a fixed condenser (208) which consists of two brass strips separated by a strip of ebonite. The condenser (208) is connected between the primary coil (65) and the wavemeter C.O.S. (208).

Tuning. Set the aerial C.O.S.(7), auxiliary C.O.S.(105) and wavemeter C.O.S.(208) to "Low Power". Set the L.P. primary range switch (66) to the position which covers the required frequency and the primary tuning condenser (67) to the positions indicated on the curve which is given in the Book of Instructions.

Press the transmitting key and adjust the primary tuning condenser (67) until the correct frequency is indicated by the wavemeter G57. No ammeter is provided and the only indication that the circuit is now oscillating, at this stage, is the pick-up on the wavemeter.

If the frequency of the primary circuit is incorrect set the wavemeter G57 to the correct adjustment for the required frequency and readjust the primary tuning condenser (67) until the correct frequency is obtained.

Set the L.P. aerial range switch (62) to the position determined from the appropriate curve in the Book of Instructions. Adjust the L.P. aerial tuning condenser (64) and aerial coupling coil (68) until the aerial current is a maximum.

Check the transmitted frequency with the wavemeter G57, making any necessary slight readjustments of the primary and aerial tuning condensers (67)(64) in step.

### RANGES 1, 2 AND 3.

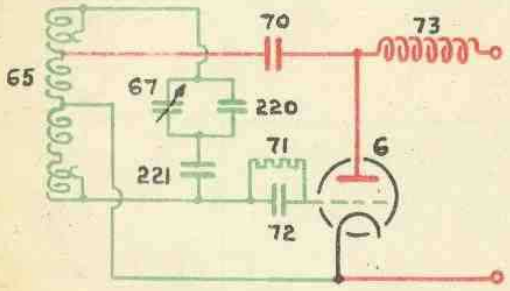


FIG. 1

### RANGES 4, 5 AND 6.

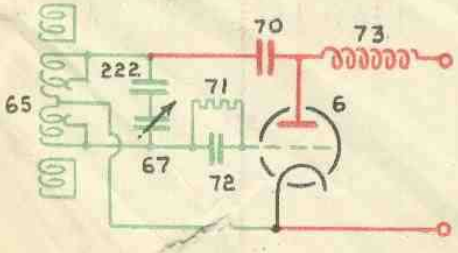


FIG. 9.

### PANEL 3T, LOW POWER

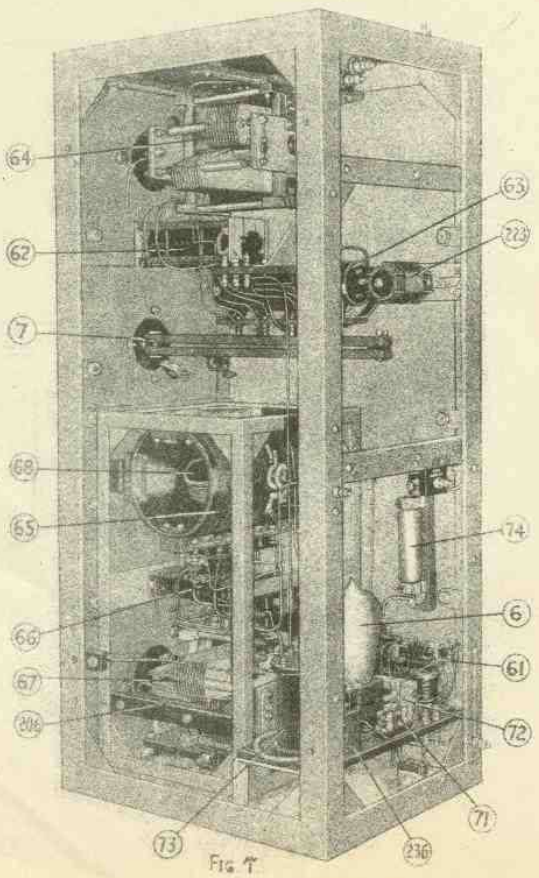


FIG. 7

# TYPE 49

RN15

## AERIAL CIRCUITS

The aerial circuits are connected to the transmitters or receivers by the aerial C.O.S. (7) which is mounted behind the low power panel with its handle projecting through the panel front.

In main office sets of flotilla leaders, destroyers and netlayers, where two aerials, main and auxiliary, are used, the aerial C.O.S.(7) is a two pole, six position, switch with connections as shown in figure s. The switch operates so that when one aerial is connected to a transmitter the other is connected to a receiver and both aerials are isolated or earthed together.

In main office sets of sloops, gunboats, etc., where only one aerial is used, the aerial C.O.S.(7) is a one pole, five position switch.

In second office sets where only one aerial is used the aerial C.O.S.(7) is a one pole, five position switch with auxiliary switches attached which operate the warning circuits from the main W/T office.

In aircraft carriers second office sets, where an alternative aerial can be used, the C.O.S.(7) is connected to the aerial desired by means of hand operated links fitted in a convenient position behind the valve panels.

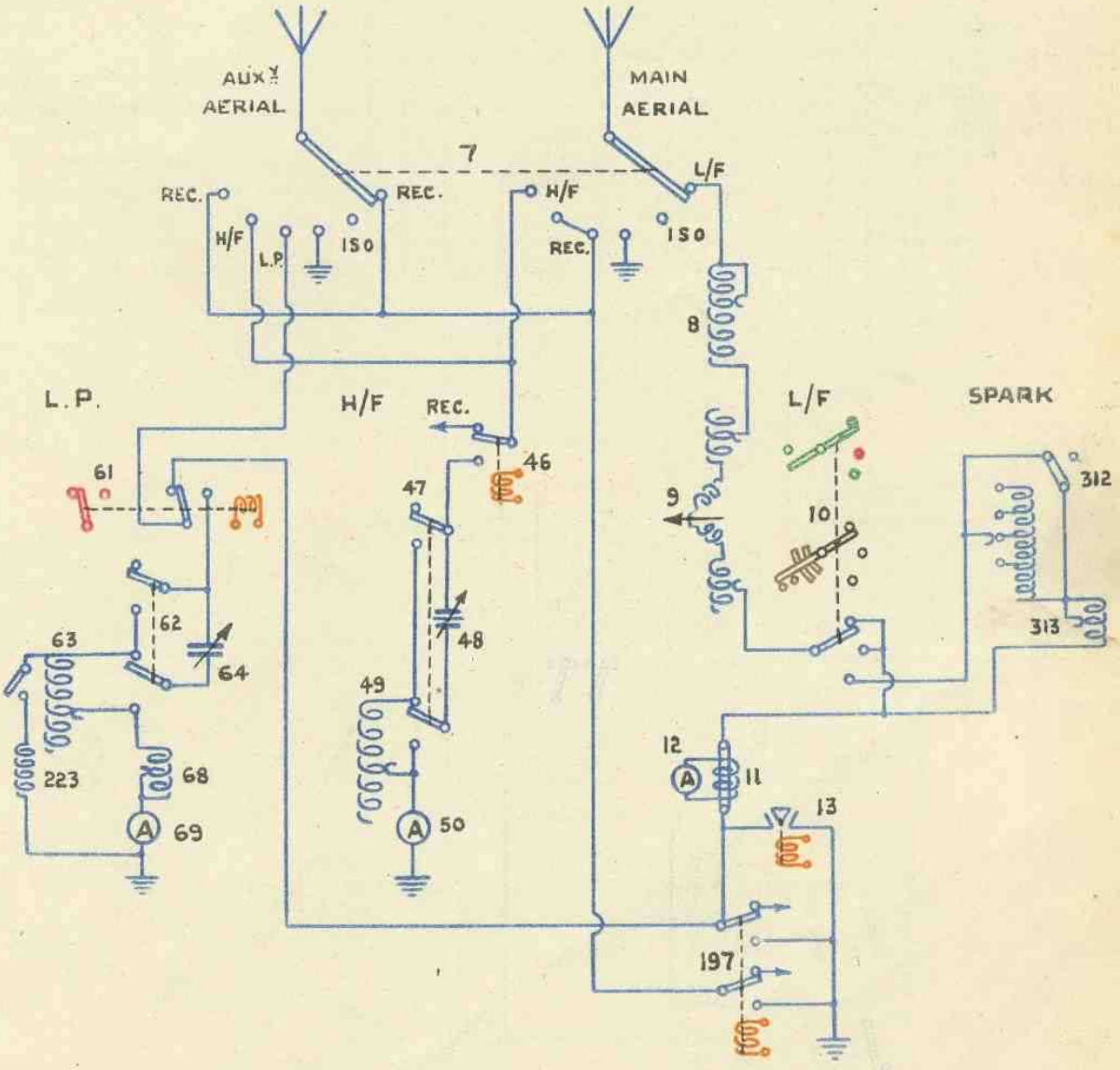


FIG. 5.

# TYPE 49

## D.C. AUXILIARY CIRCUITS

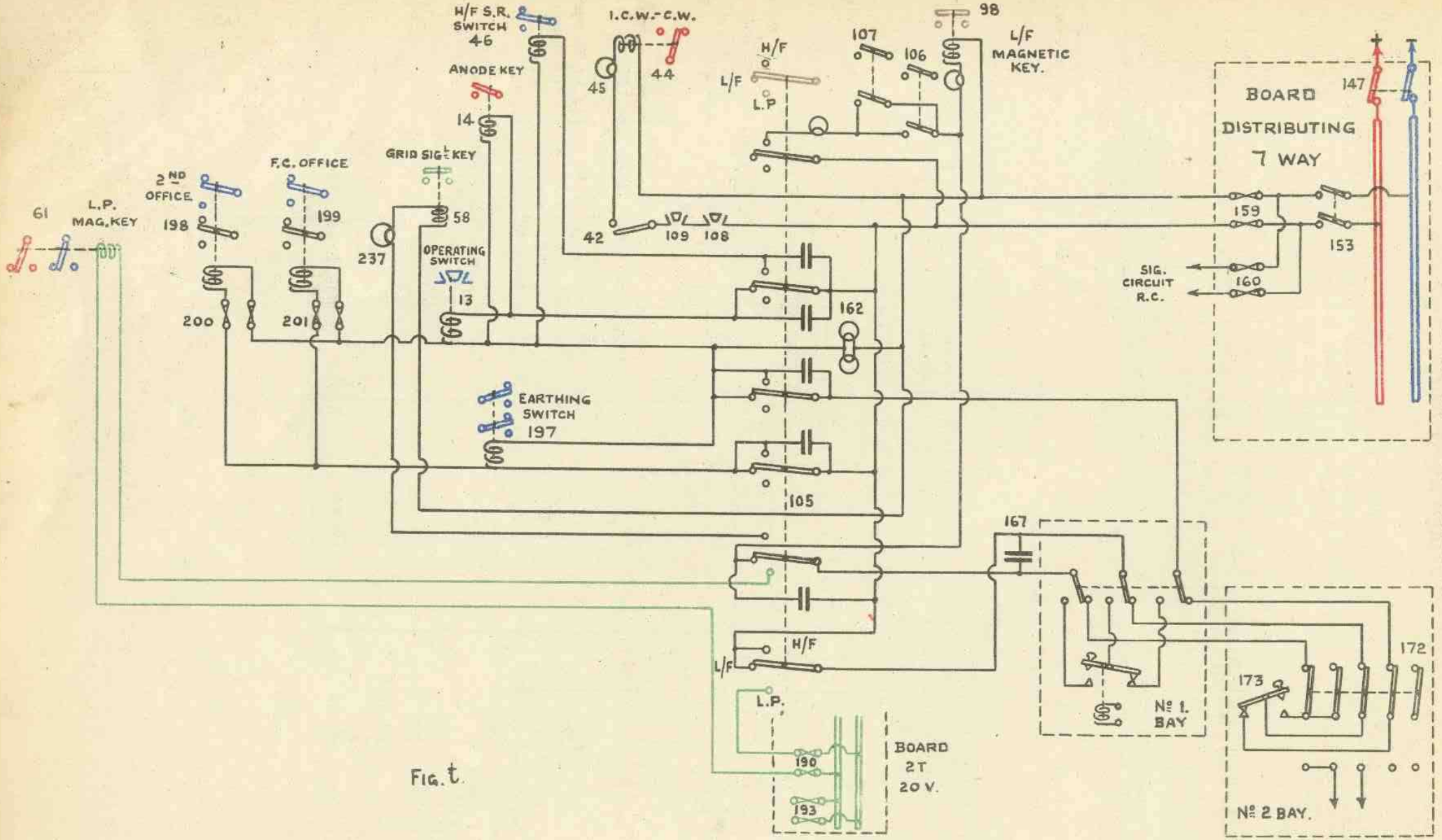


Fig. 1.

## D.C. AUXILIARY CIRCUITS

The supply for the D.C. auxiliary circuits is from the board, distributing, 7 way. A main D.P. switch (147) controls the supply to the six subsidiary D.P. switches (149) to (154) (see figure z.)

These switches control supplies to:-

(i) Lights.
(ii) Fan.
(iii) Filament control.
(iv) Signalling circuit. Signalling circuit (R.C.).
(v) Radiator.
(vi) Battery charging.

The filament control switch (151) and fuses (157) supply the bobbin circuit of the filament switch (81), the supply being completed by one contact of a double pole tumbler switch (107) mounted on the rack in the receiving bay (see figure u.) The other contact of the tumbler switch (107) completes the circuit to the bobbin of the L/F main magnetic key (98) when the auxiliary circuits' C.O.S. (105) is in the H/F position. (See figure t.). In ships where a second operator's bay is fitted a second tumbler switch (106) is fitted on the rack in the second bay and is connected in parallel with the tumbler switch (107) in the main operator's bay as shown in figure u.

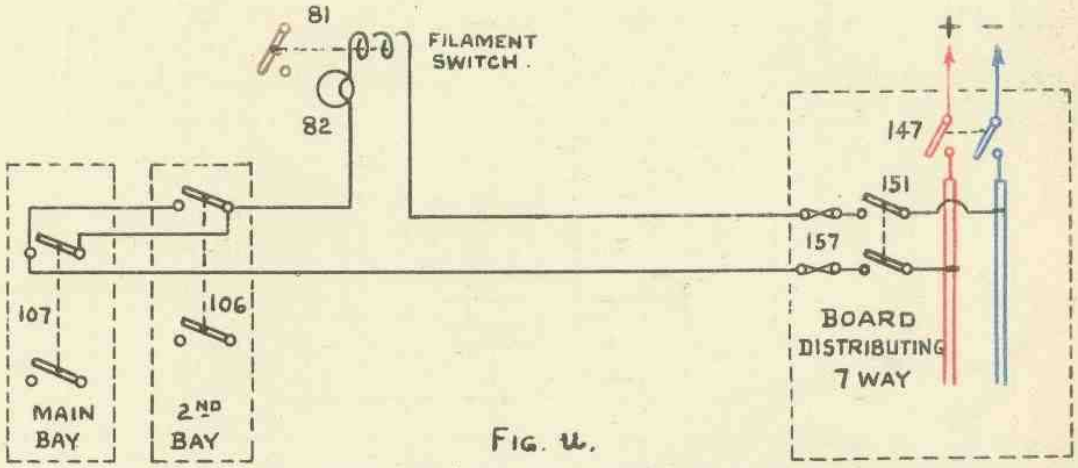


FIG. u.

The signalling circuit switch (153) and fuses (159) (see figure t.) supply the key circuits for operating the I.C.W. - C.W. switch (44), H/F send-receive switch (46), magnetic keys (98)(61), anode key (14), operating switch (13), grid signalling key (58), earthing switch (197) and the listening through keys (198)(199) in the second and F/C offices. The signalling circuits are changed over for the type of transmission required by means of the auxiliary circuits C.O.S.(105) which is mounted on the front of the rectifying panel and can be set to "H/F," "L/F" or "Low Power".

The circuits in use when the auxiliary circuits C.O.S.(105) is made to each of the positions stated above are as follows:-

"H/F" Position. One contact arm of the switch (105) completes the supply to the bobbin of the L/F magnetic key (98) when the tumbler switch (106) or (107) is made. The H/F, send-receive switch(46) earthing switch (197), second office and F/C office listening through keys (198)(199) are connected across the back contacts of the morse key (169) or (173). The grid signalling key (58) is connected across the front contacts of the morse key (169) or (173).

The circuits to the bobbins of the operating switch (13), anode key (14) and low power magnetic key (61) are broken.

"L/F" Position. The anode key (14), operating switch (13), earthing switch (197), second office and F/C office listening through keys (198)(199) are connected across the back contacts of the morse key (169) or (173). The L/F magnetic key (98) is connected across the front contacts of the morse key (169) or (173).

The circuits to the H/F send-receive switch (46), grid signalling key (58) and low power magnetic key (61) are broken.

"Low Power" Position. The back contacts of the morse key (169) or (173) are not used. The low power magnetic key (61) is connected across the front contacts of the morse key (169) or (173) which makes and breaks the 20 volt supply to the low power magnetic key bobbin.

The bobbin of the I.C.W. - C.W. switch (44) is connected in series with a 32 c.p. resistance lamp (45) and two safety switches (109)(109); the circuit being completed by the I.C.W. - C.W. C.O.S.(42) which is mounted on the front of the rectifying panel.

# TYPE 49

## REMOTE CONTROL CIRCUITS

Remote Control Circuits. In ships where remote control is fitted the remote control signalling circuits for operating the morse key (169) in the main receiving bay are supplied from a separate pair of fuses (160) marked "Signalling Circuit, R.C." on the 7 way distributing board.

A remote control attachment is fitted to the morse key (169) in the main bay and is connected to the R.C.O. morse key (177) by making the main bay remote control switch (170) and setting the R.C.O. remote control C.O.S.(176) to "Main Office".

The morse key (173), in No.2 bay, is connected to the main-emergency switch (172) which is fitted under the base of the key (173). When this switch (172) is set to "main" the morse key (173) can be used to operate the main I/F, H/F or Low Power transmitter as required (see figure t.) When the switch (172) is set to "Emergency" the No.2 bay morse key (173) is connected to the remote control switch (179) in the second W/T office and the operator in No.2 bay can then remote control whichever transmitter in the second W/T office is connected to the R.C.switch (179).

The second office transmitters can also be remote controlled from the R.C.O. position by setting the R.C.O. remote control C.O.S.(176) to "second office" and making the remote control switch (174) in No.2 bay.

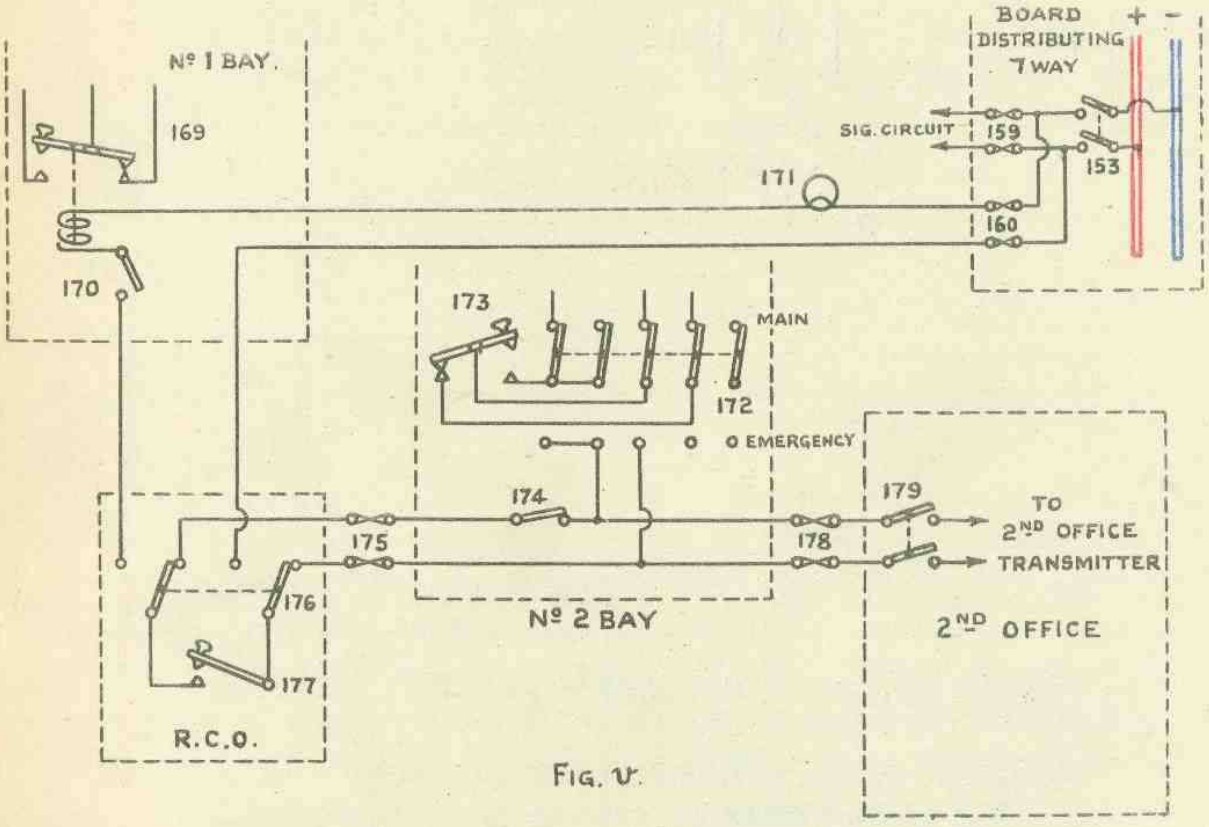


FIG. U.

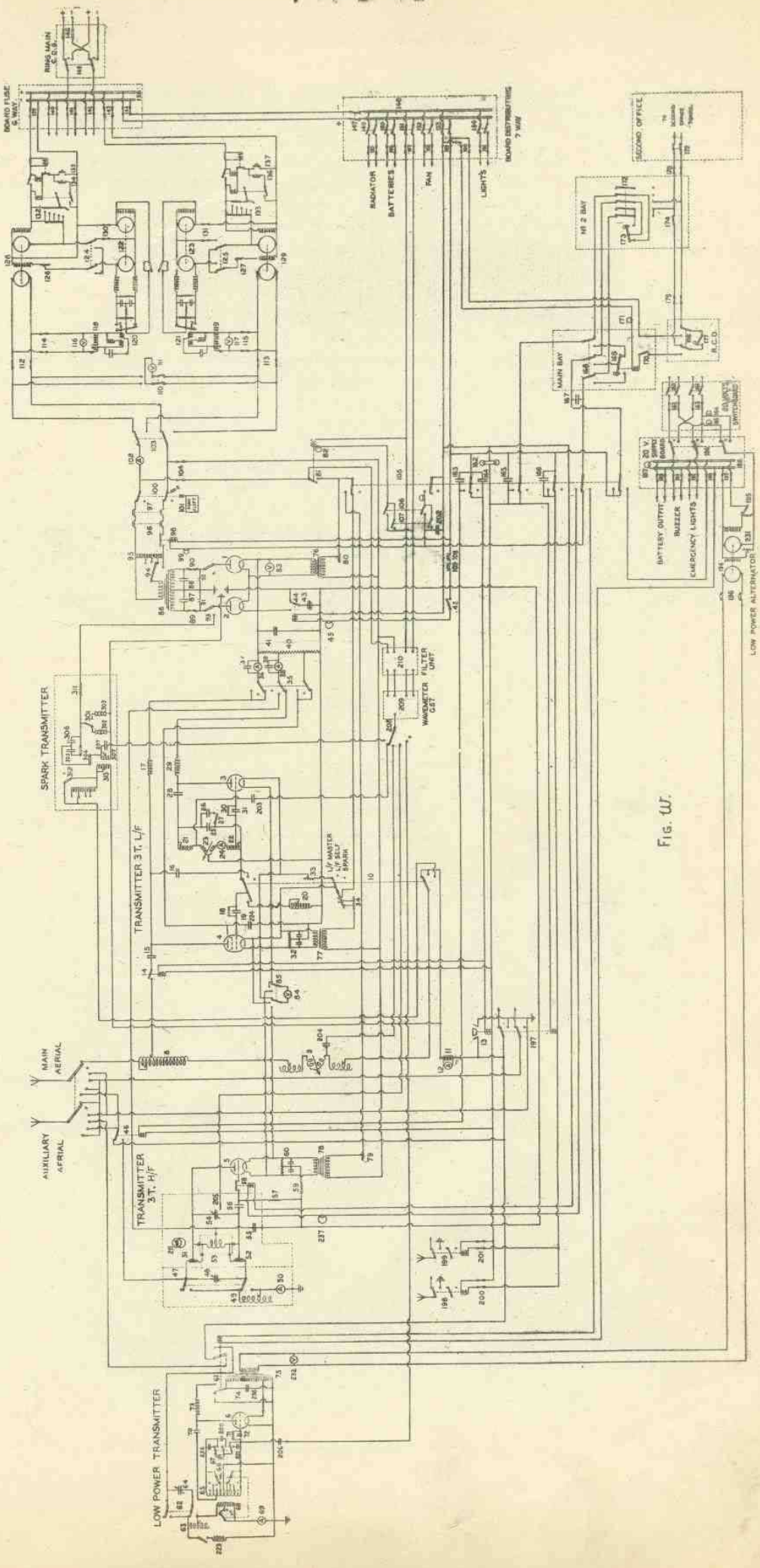
RING MAIN
BOARD FUSE
BOARD DISTRIBUTING
RADIATOR
BATTERIES
FAN
LIGHTS
SECOND OFFICE
H.F. 2 BAY
MAIN BAY
R.C.O.
SPARK TRANSMITTER
TRANSMITTER 3T. L/F
TRANSMITTER 3T. H/F
WAVEMETER FILTER UNIT
L/F MASTER
L/F SELF
SPARK
MAIN AERIAL
AUXILIARY AERIAL
LOW POWER TRANSMITTER
BATTERY CUTOUT
BUZZER
EMERGENCY LIGHTS
LOW POWER ALTERNATOR

FIG. W.

# TYPE 49

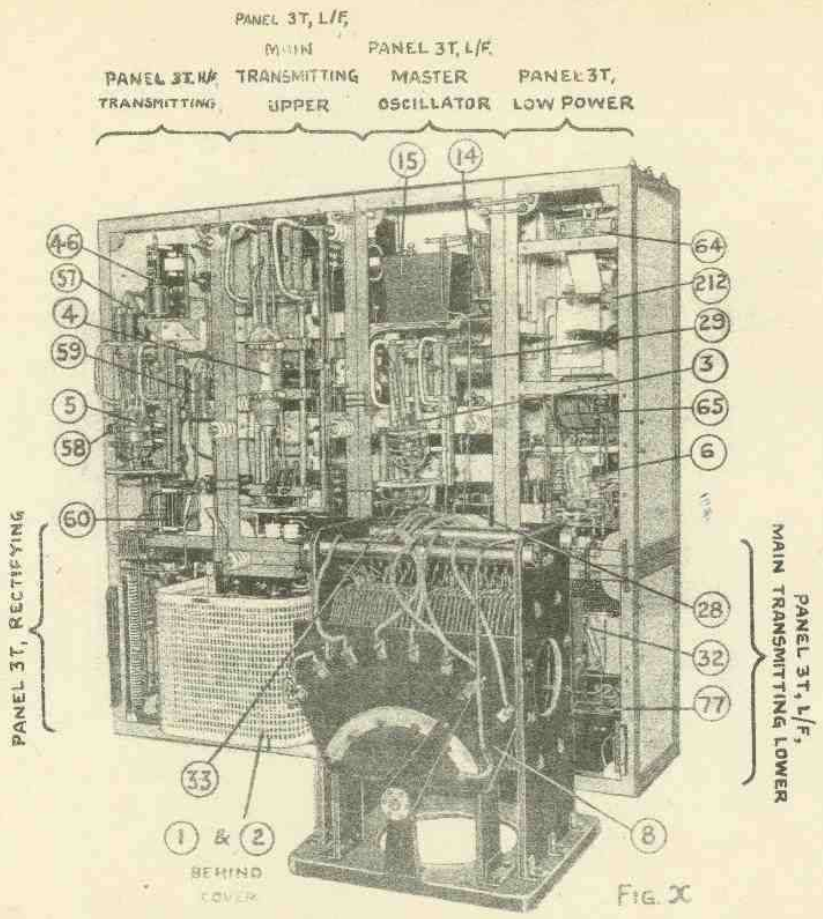


FIG. X

MAIN L/F AERIAL COIL.

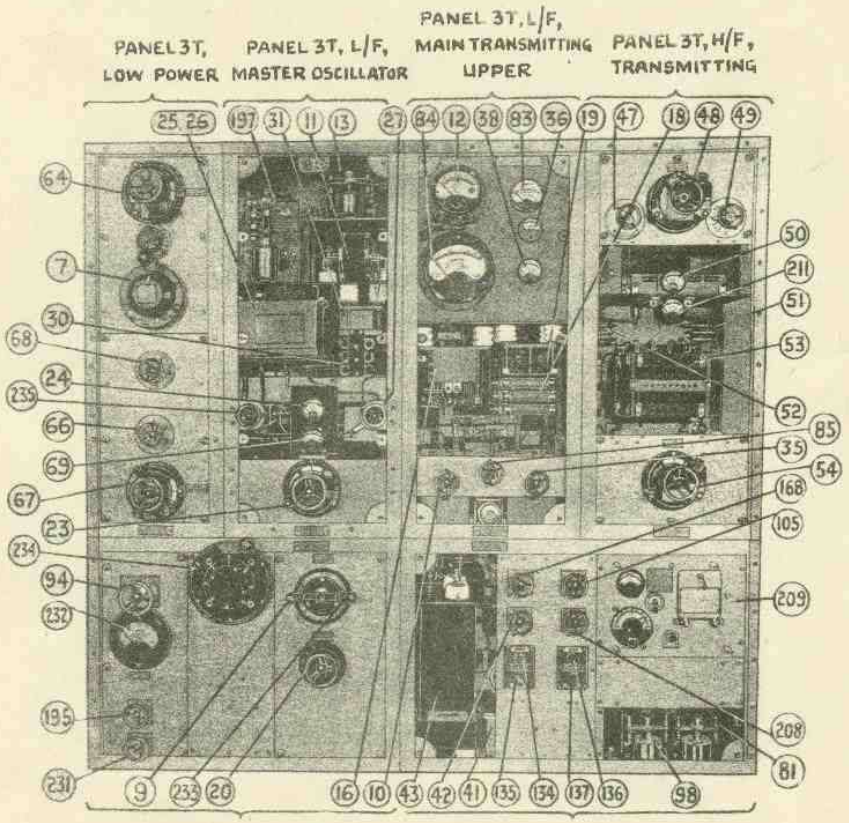


FIG. Y.