SUB - SECTION

R J

TYPE 45 PAGE RJ2

TYPE 45

Transmitter:- 4K
Date of design:- 1927
Frequency range:- 500 - 1429 kc/s.
Power supply:- Alternative double purpose Motor Generators.
H.T. 800 volts. L.T. 21 volts.
Valves used:- Two NT1
Associated wavemeters:- 1492B or G9
Approximate range in miles:- 30 to 70 miles.

Type 45 is a low power valve set fitted in the auxiliary W/T office of battleships and cruisers.

POWER SUPPLY

Power supplies and starting arrangements are controlled from Boards 2A, 2B, 2C and 2D. (Figures a. Page RA4, d. and e.).

D.C. Supply. The D.C. supply is from a ring main C.O.S. (112) on board 2D Change Over (figures a. and c. pages RA4 and RA5). This board supplies the four subsidiary switches (114)(115)(116)(117). The ammeter (113) is connected in the main supply from Board 2D and indicates the D.C. current output of the entire W/T office.

The switch (114) controls the supply to the automatic starter (129) and hand starter (119). A pair of fuses (124)(118) is connected in the respective starter supplies.

Motor Generator. The motor generator has two outputs, one supplying 1.5 kW at 800 volts for H.T., the other 1.25 kW at 21 volts for the filaments of Transmitter 4K. Duplicate machines (121)(122) are fitted with a W or Z size automatic starter (129) (see pages MA3 or MA9) and hand starter (119). A C.O.S. (123) enables one machine to be controlled by the automatic starter (129) the other by the hand starter (119) and vice versa.

The ammeters (120)(127) indicate input current to the generator controlled by the hand starter (119), and automatic starter (129) respectively. The ammeter (120), starters (119)(129) and C.O.S. (123) are fitted on Board 2A, and ammeter (127) on Board 2B.

The start-stop switches (125)(126) for the automatic starter (129) are fitted on Board 2B.

The C.O.S. (130) on Board 2B connects the 800 volt and 21 volt outputs from the machine in use to the H.T. - L.T. switch (134) on Board 2C. The voltmeters (131)(132) indicate the 800 volt and 21 volt outputs respectively, and are fitted on Board 2B.

Board 2C also contains the filament fuses (135) (see figure 1, page RJ6.)

BOARD 2A.

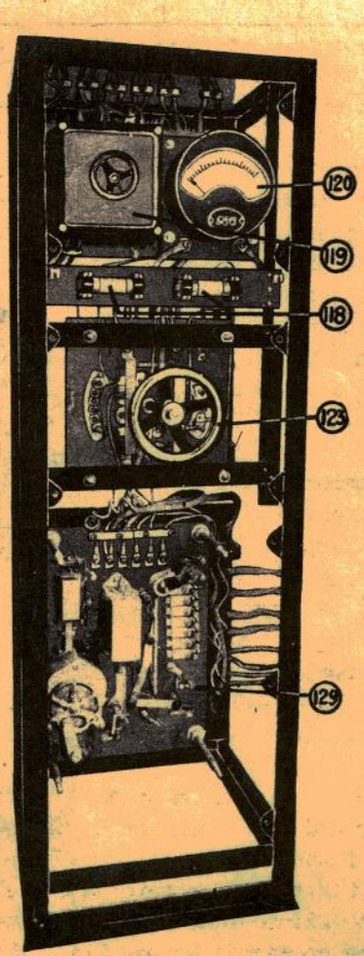


Fig. d.

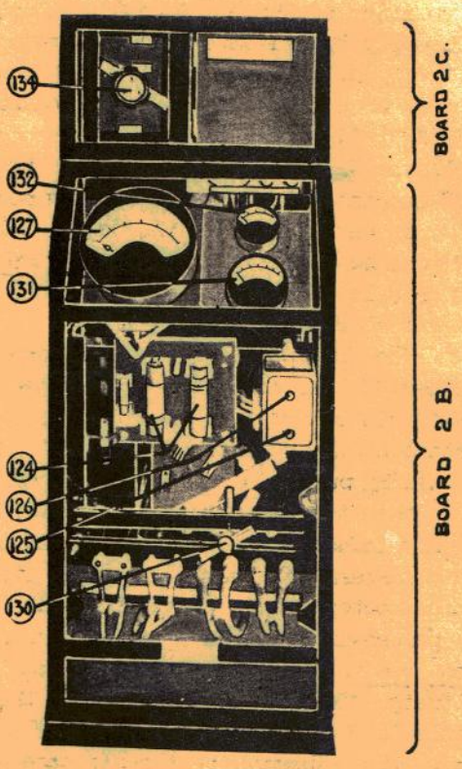


Fig. e.

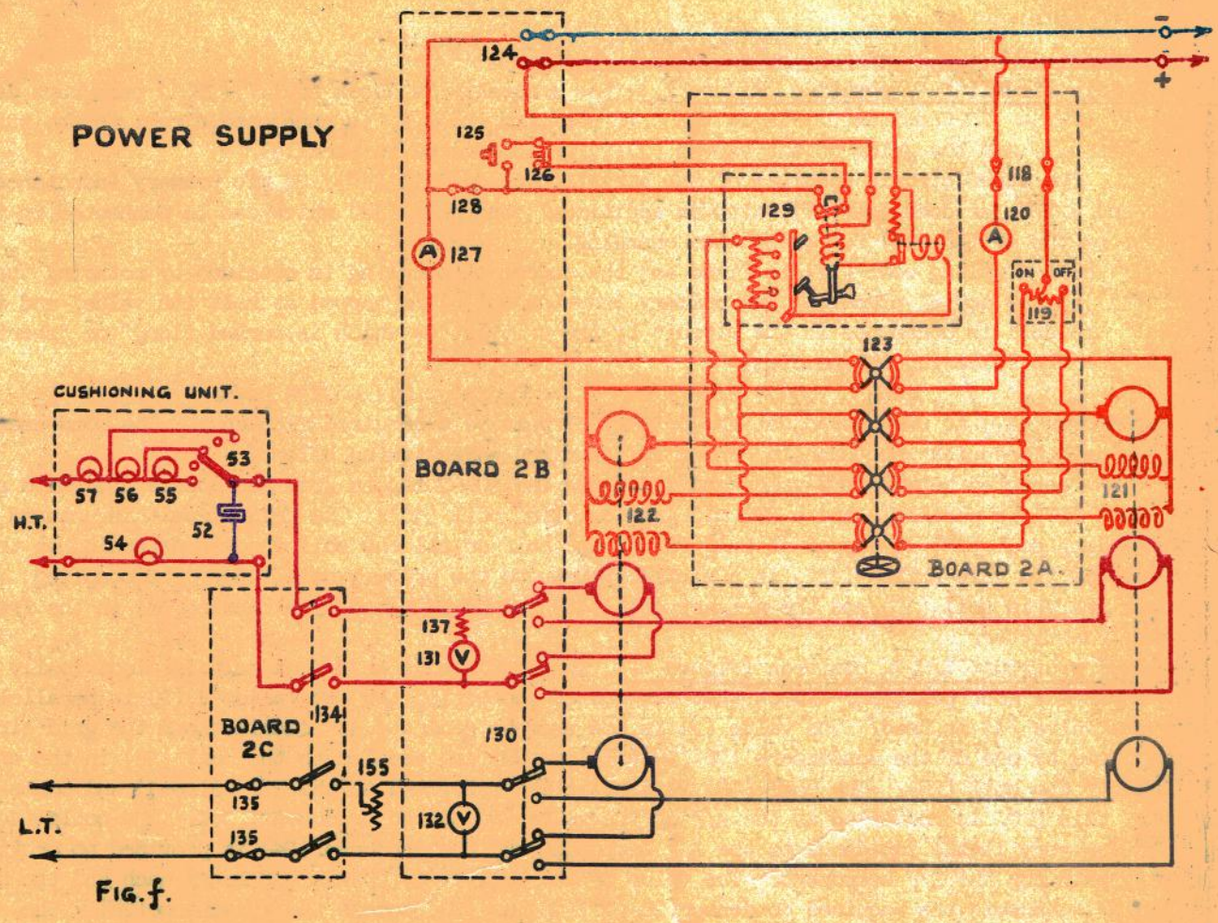


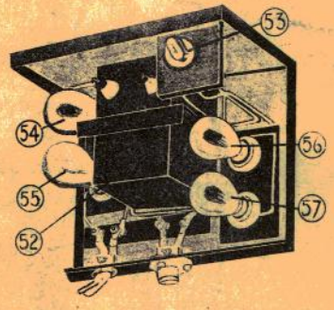
FIG. f.

TRANSMITTER 4K.

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 filament.	Mutual inductive	Series	Mutual inductive	Anode.

Transmitter 4K is the transmitter of Type 45. It is of low power and is fitted complete in a panel as shown in figures j. and k.

H.T. Supply. The H.T. supply is from the 800 volt winding of the motor generator in use, depending on the position of the C.O.S. (130). A voltmeter (131) with its resistance (137) are connected across the H.T. supply to indicate voltage output. The supply from the machine is connected to two contacts of the H.T. - L.T. switch (134), which connects it to the transmitter 4K through the cushioning unit 2K. The cushioning unit (figure g.) consists of a helsby condenser (52), four 32 c.p. 220 volt lamps (54)(55)(56)(57) and a switch (53). The condenser (52) is connected across the H.T. supply as a by-pass to protect the generator from R/F current and to smooth out any commutator ripple. The lamp (54) is permanently in the negative lead, and the lamps (55)(56)(57) can be connected in the positive lead in a combination of 1, 2 or 3 in series by the switch (53). These lamps therefore are a means of power control.



The H.T. and L.T. negatives are made common in the transmitter 4K. The positive is connected through the cage door contact (7) to one pole of the 5 way C.W. - I.C.W. switch (22) with one contact of the magnetic key (8) making and breaking the circuit for signalling purposes. A by-pass condenser (30) is connected across the H.T. supply at this point.

When the C.W. - I.C.W. switch (22) is in the I.C.W. position the H.T. is connected through a 0.3 henry inductance (23) to the tuned anode circuit, and connected across the inductance (23) is a 5 jar condenser (24) (see figure h.). When the C.W. - I.C.W. switch (22) is in the C.W. position the H.T. is connected direct to the tuned anode circuit (see figure i.). The anodes of the valves (1)(2) are permanently connected in parallel.

Filament Supply. The filament supply is from the 22 volt windings of the motor generator in use. The voltmeter (132) is connected across the supply and indicates the output voltage, and a semi-adjustable 0.75 ohm resistance (155) is inserted in the supply to compensate for the I.R. drop in the leads, which depends on the distance between the motor generator and the transmitter.

The H.T. - L.T. switch (134) connects the filament to the transmitter through a pair of fuses (135). The filaments of the valves (1)(2) are connected in parallel, the rheostat (35) controlling the filament current. The voltmeter (33) can be connected in the circuit by the switch (34) to indicate the filament voltage on both valves.

TRANSMITTER 4K (CONT.)

Oscillatory circuit C.W. position (Figure i.) (See Admiralty Handbook of W/T (1931) paragraph 610). When the C.W. - I.C.W. switch(22) is in the C.W. position the H.T. is connected direct to the tuned anode circuit, and the grids of the valves (1)(2) are connected in parallel.

The tuned circuit consists of the aerial coupling coil (14), 34 mic primary inductance (15), and a 2.5 jar condenser(17), with an additional condenser (19) which can be connected in the circuit by the switch (18) for quick wave changing.

The coupling coil (14) is fixed and the degree of coupling is obtained by rotating the coil (11) in the aerial circuit. The primary inductance (15) is tapped at half its value, and all or half the coil is connected in the circuit by the switch (13) which is marked "long" or "short" and covers the following frequencies:-

"Long" 500 - 938 kc/s "Short" 811 - 1429 kc/s.

The condenser (17) is used to adjust the primary circuit to a required frequency. The condenser (19) is used for quick wave changing which is described under tuning below.

Connected between the grids and filaments is a 0.02 megohm grid resistance (21) with a condenser (20) in parallel, and a 800 mic grid coupling coil (16). The grid circuit is untuned but the coupling coil (16) is tapped at half value, and half or all the coil is used depending on the position of the wave switch (13), in a similar manner to the primary coil (15). The coupling between the grid coil (16) and the primary coil (15) can be adjusted by a handle (86) in the front of the transmitter.

Oscillatory circuit I.C.W. position (Figure h.) The tuned anode or R/F circuit is electrically the same as in the C.W. position, except that instead of connecting the two valves(1)(2) in parallel, only one valve (1) is used. The valve (2) is now used to generate A/F oscillations the grid circuit being tuned by one of the condensers (26)(27)(28) or (29) and coupled to the coil (23) in the anode circuit by the coil (25). The coil (23) is also in the H.T. lead to the R/F valve(1) and consequently this H.T. is modulated at the A/F of the valve (2) and so produces I.C.W. The coils (14) (15) offer very little impedance to the A/F component and the condenser(24) is provided to provide an easy path for the R/F component. The value of the coils (23)(25) is 0.3 henry each and the note switch(30) connects the required condenser(26)(27)(28) or (29) across the inductance(25). The following are the four condenser values and frequencies:-

1.	0.025 microfarad	1340 cycles.	3.	0.1 microfarad	920 cycles.
2.	0.05 "	1300 "	4.	0.25 "	582 "

Aerial Circuit. The aerial circuit consists of a 250 mic aerial coil (9) 22 mic fine tuning coil (10) coupling coil (11) and aerial ammeter (12) connected in series. The tuning coil (9) and fine tuning coil (10) can be adjusted by handles on the front of the transmitter. The coupling coil(11) is a rotating coil, and the degree of coupling between it and the coil (14) is obtained by varying the angle of the coil (11). The ammeter (12) indicates aerial current. One contact of the magnetic key (8) is used in the aerial circuit as a send-receive switch.

Tuning. Loosen the aerial coupling and tune the primary circuit by wavemeter to the frequency required. This adjustment is done by condenser (17); the "Long-Short" switch (13) being in the required position. Adjust the aerial circuit by the tuning and fine tuning coils (9 and 10) for maximum radiation.

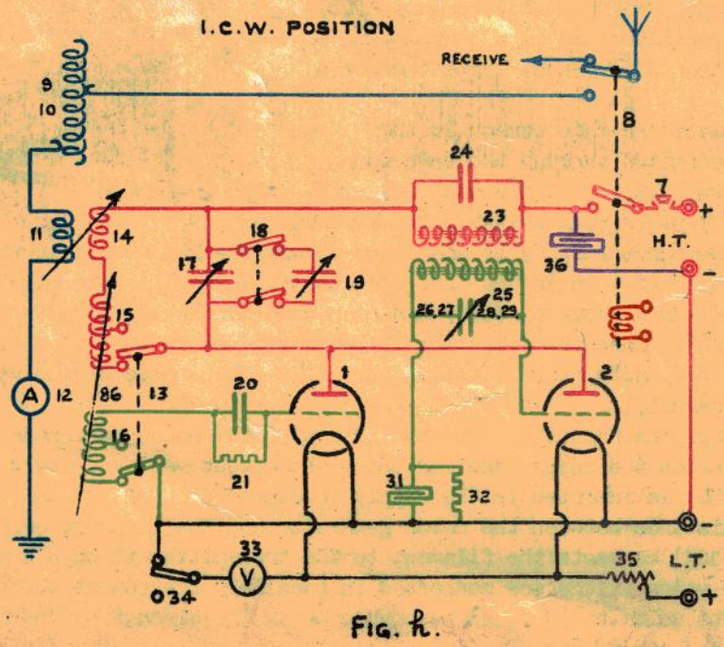


FIG. h.

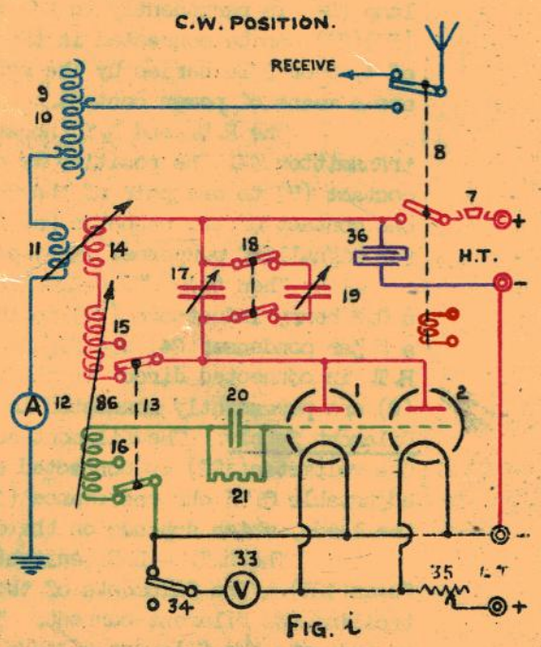


FIG. i

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~~R85~~

TRANSMITTER 4K (CONT.)

The quick wave changing device enables the set to be operated on either of two frequencies by switching the condenser (19) in or out of the primary circuit by the D.P. switch (18). Tuning is then carried out as follows:- First the set is tuned to the mean of the two frequencies, after which the aerial adjustments are not moved any more. Now, with the switch (18) broken, the transmitter is tuned by means of the condenser (17) to the higher of the two frequencies required. The switch (18) is then made and condenser (19) adjusted until the transmitter is tuned to the lower of the two frequencies; condenser (17) not being moved.

The only adjustment now necessary for changing from one frequency to the other is to make or break the switch (18).

A slight loss of aerial current will occur on both frequencies due to the aerial not being quite in tune with either.

D.C. AUXILIARY CIRCUITS.

RA4) The D.C. auxiliary circuits are supplied from the board distributing 7 way (figure b. page ~~R80~~) which in turn is supplied from the busbar of the Board 2D Change Over (figure a. page ~~R80~~). RA4) The supply to the board distributing is controlled by a D.P. switch (62). The six subsidiary switches (63) to (68) control the auxiliary circuit supplies of other W/T sets fitted in the same office and the fans, lights, etc. Each circuit has its own pair of fuses.

D.C. Signalling Circuit. The supply is from board distributing 7 way and is controlled by a D.P. switch (66), and a pair of fuses (73) is connected in the circuit.

The bobbin of the magnetic key (8) is connected to the supply with a resistance lamp (85) in series, and a morse key (76) or (80) completes the circuit, thereby operating the magnetic key (8) each time it is pressed.

The set can be remote controlled by making the switch (78), this connects the remote control key (80) in parallel with the key (76). A pair of fuses (79) is connected in the supply to the remote control key (80).

A key condenser (77) is connected across the morse key (76) and is thus used for either morse key (76)(80).

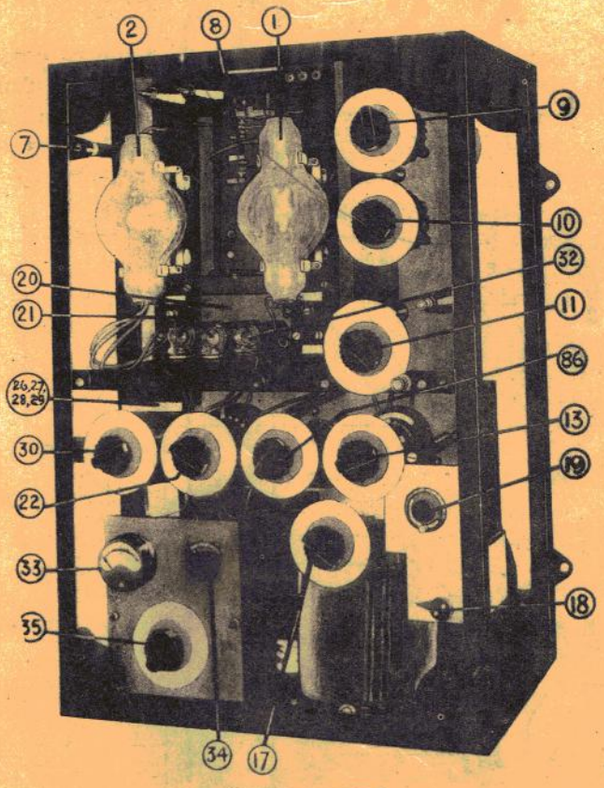

FIG. j

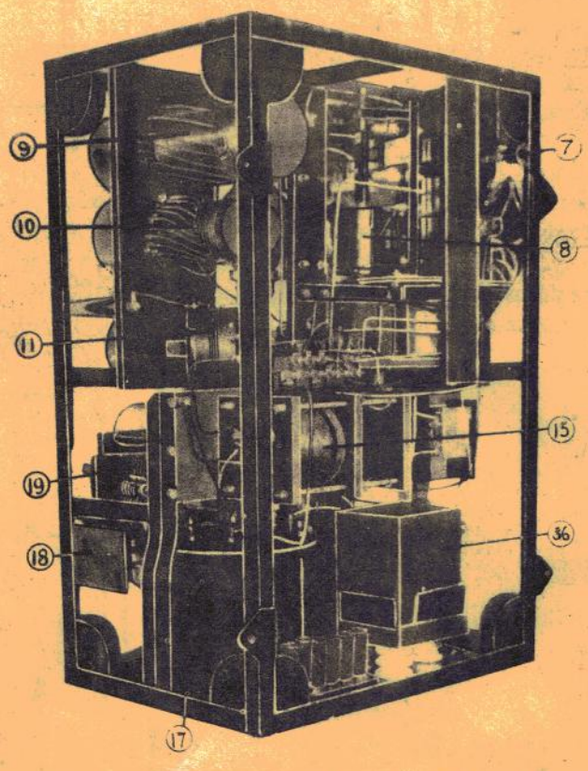

FIG. k.

BATTERY OUTFITS AND CHARGING ARRANGEMENTS.

The battery outfit and charging arrangements of Type 45 depend on the class of ship, and the other W/T sets which may be fitted in the same office, and also whether bright or dull emitter receiving valves are used.

The table on page NB2 shows the battery outfit applicable to any of the above, and that particular outfit is described in sub-section NB.

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31/1/33.

TYPE 45

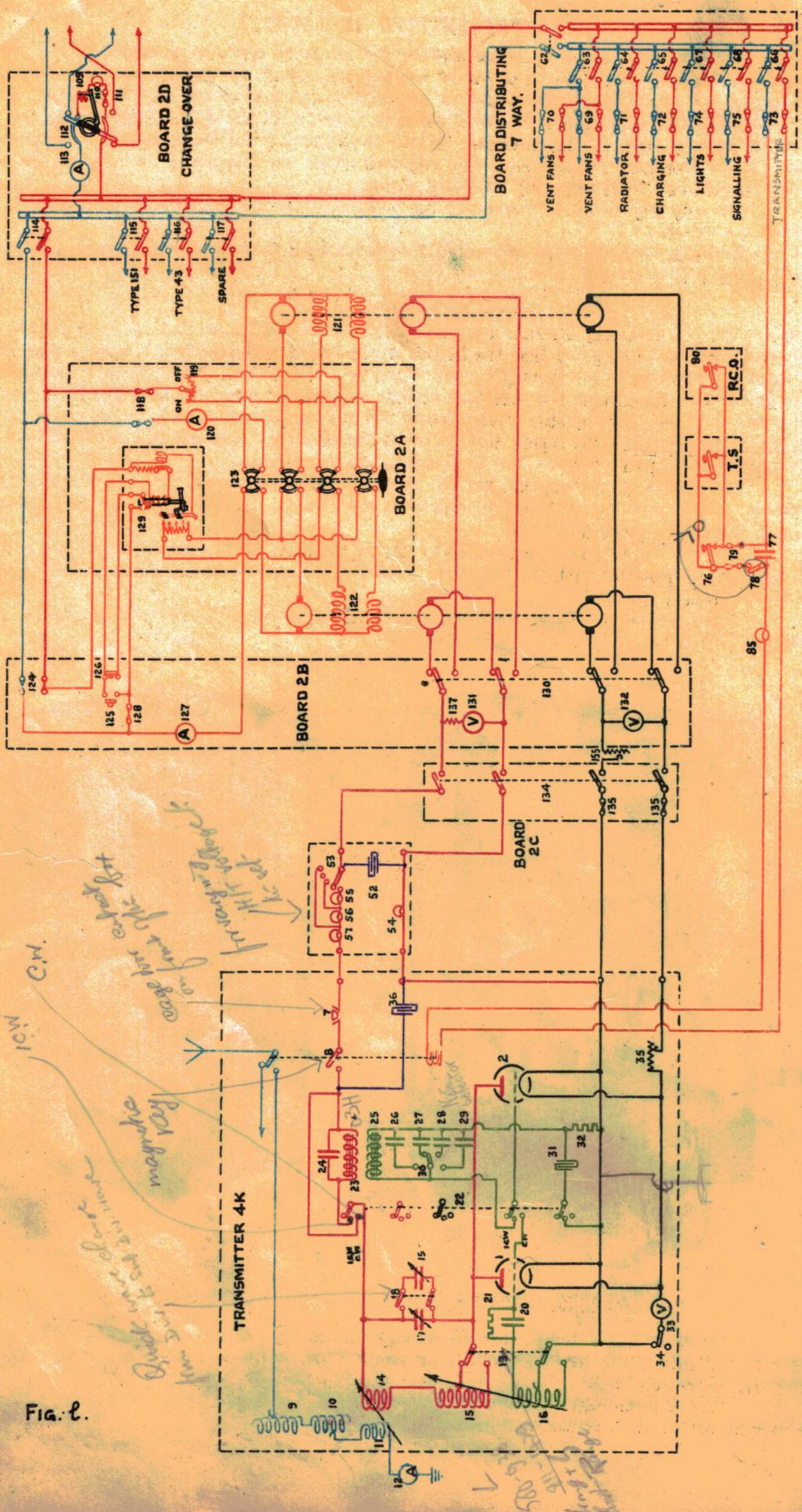

Fig. 1.