

SECTION  
T  
R/T TRANSMITTERS

TYPE 81

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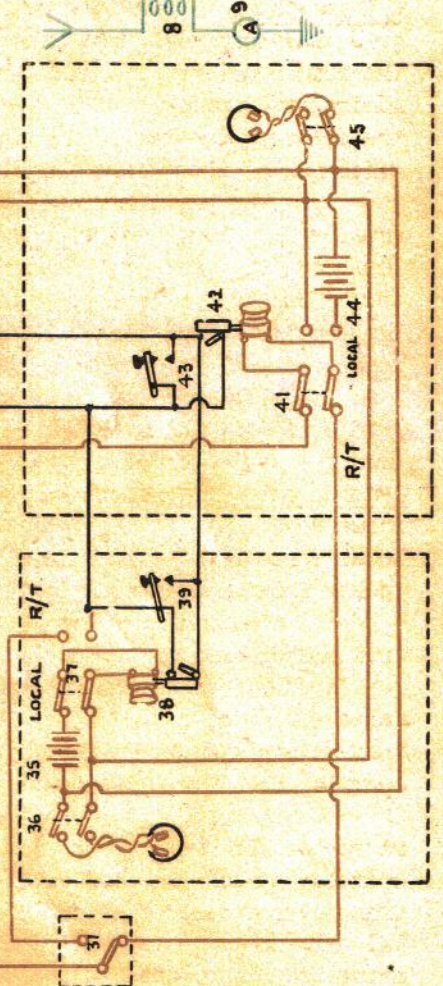
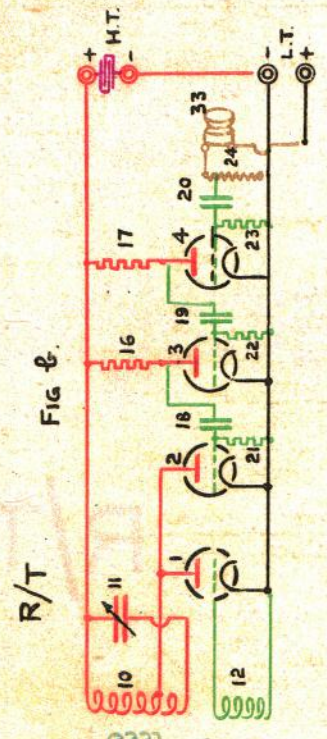
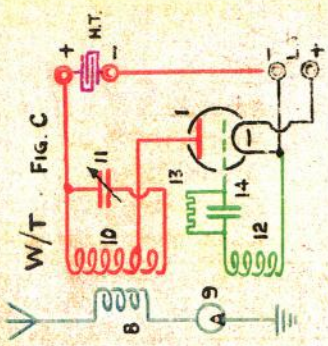
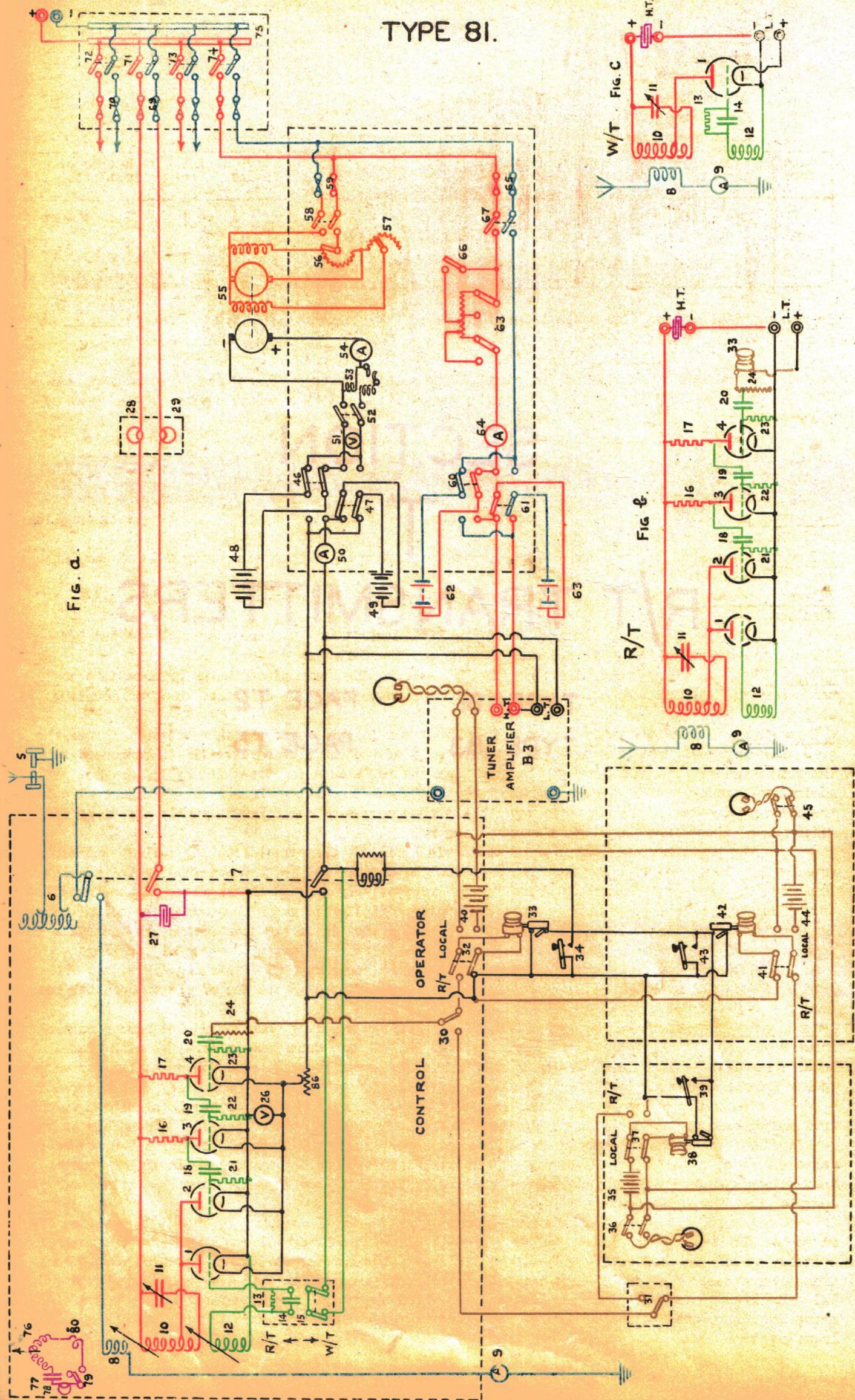
TYPE 83

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# TYPE 81.

FIG. d.



Date of design:- 1921.  
 Frequency range:- 750 - 1500 kc/s.  
 Power supply:- Ship's D. C. mains.  
 Valves used:- Four MFE.  
 Approximate distance range:- Two miles.  
 Associated Wavemeters.- Pattern 1492B or G9.

Wave form	Method of producing oscillation	Nature of circuit	Grid excitation	Feed	Aerial excitation	High oscillating Potential electrode	Method of modulation
R/T and I.C.W.	Self	Tuned circuit between anode and filament.	Mutual inductive.	Series	Mutual inductive	Anode	R/T by absorption I.C.W. by self quenching.

Type 81 is a low power valve set which was originally designed as an R/T transmitter but is now modified and has a separate attachment fitted for transmitting on I.C.W. Simplified diagrams of the equivalent circuits for R/T and W/T are shown in figures b and c respectively.

The H.T. supply is obtained from the ship's D.C. mains which may be either 220 or 100 volts. In the case of the latter the range of the set is considerably reduced. Two 50 c.p.lamps (28) (29) are connected in the supply from the distribution box as a safety device in the event of a short circuit developing across the H.T. supply in the set.

The filament supply is obtained from 6 volt secondary batteries (48) (49) which also supply the filaments of the valves in the receiver (Tuner Amplifier B3, page C2) and the bobbin of the magnetic key (7).

The magnetic key (7) has three contacts which carry out the following duties:-

Send-receive contact. Connects the aerial circuit either to the receiver or to the aerial coupling coil (8) of the transmitter.

H.T. contact. Makes and breaks the H.T. negative supply for signalling when using W/T and completes the H.T. negative supply when using R/T.

Filament contact. Completes the filament supply when the R/T - W/T switch (15) is in the R/T position.

The W/T attachment consists of a grid leak resistance (13) condenser (14) and the R/T - W/T change over switch (15). The latter carries out the following duties.

R/T position. In the R/T position the R/T - W/T switch (15) short circuits the grid resistance (13) and condenser (14) and connects the grid of the oscillator valve (1) direct to the grid coupling coil (12).

W/T position. In the W/T position the R/T - W/T switch (15) takes off the short circuit across the grid resistance (13) and condenser (14) and the grid of the oscillator valve (1) is connected to the grid coupling coil (12) through the grid leak and resistance for transmitting I.C.W. (See Admiralty Handbook of W/T (1921) paragraph 706). In the W/T position the switch (15) short circuits the filament contact of the magnetic key (7) and thus completes the filament supply and keeps the filaments of the valves alight when transmitting W/T.

The aerial circuit consists of the aerial coil (6) the aerial coupling coil (8) and aerial ammeter (9). Rough and fine tuning adjustments on the aerial coil (6) are obtained by two handles (81) and (82), marked "Tuning" and "Fine Tuning" respectively, fitted on the front of the transmitter. Coupling between the aerial circuit and tuning coil (10) is varied by moving the aerial coupling coil (8) along its axis. A clamp (83) fitted inside the top of the transmitter box secures a guide rod (84) which is used to move the coupling coil (8) when adjusting the aerial coupling.

The grid coupling is varied by moving the grid coupling coil (12) along its axis. The grid coil (12) is moved by revolving an adjusting nut (85) fitted in the top of the transmitter box near the aerial coupling guide rod (84).

Remote Control. The set can be remote controlled from two separate positions. Two remote control morse keys (39) (40) and microphone finger switches (38) (42) are connected in parallel with the local morse key (24) and local finger switch (23). The morse keys are used for operating the magnetic key when transmitting on W/T and the finger switches for making the magnetic key when using R/T.

The grid circuit of the first modulator valve (4) is connected to the local or remote control microphones by the control-operator switch (20). In the "operator" position the modulator valve (4) is connected to the microphone (32) fitted at the set. In the "control" position the modulator valve (4) is connected to a single pole C.O.S. (31) which enables the microphone in either remote control position to be used. The single pole C.O.S. (31) is fitted in a convenient position near the operator but is not on the transmitter.

Each of the microphones is connected to an R/T - local switch. In the "R/T" position the microphone in use is connected to the grid circuit of the modulator valve (4) provided the control-operator switch (20) and single pole C.O.S. (31) are in the correct positions. In the "local" position the microphone is connected in the telephones circuit in series with a 4½ volts dry battery. All telephones are connected in parallel and the three operators are therefore able to converse using the microphones and telephones by switching the R/T - local switches (22) (37) (41) to the local position.

TYPE 81.

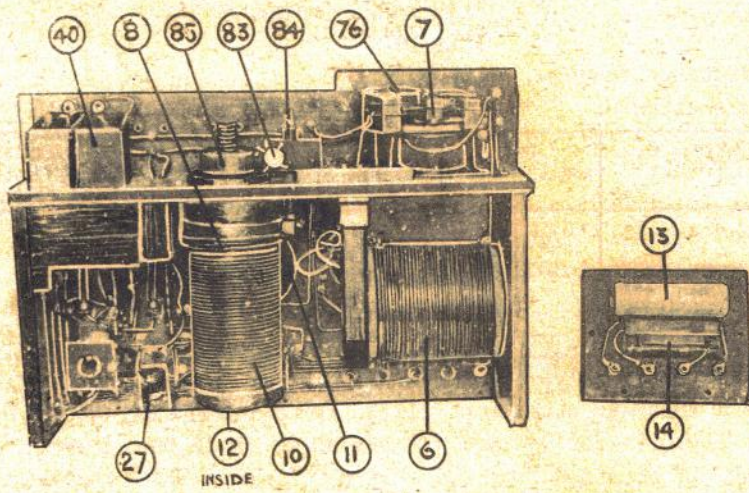


FIG. d.

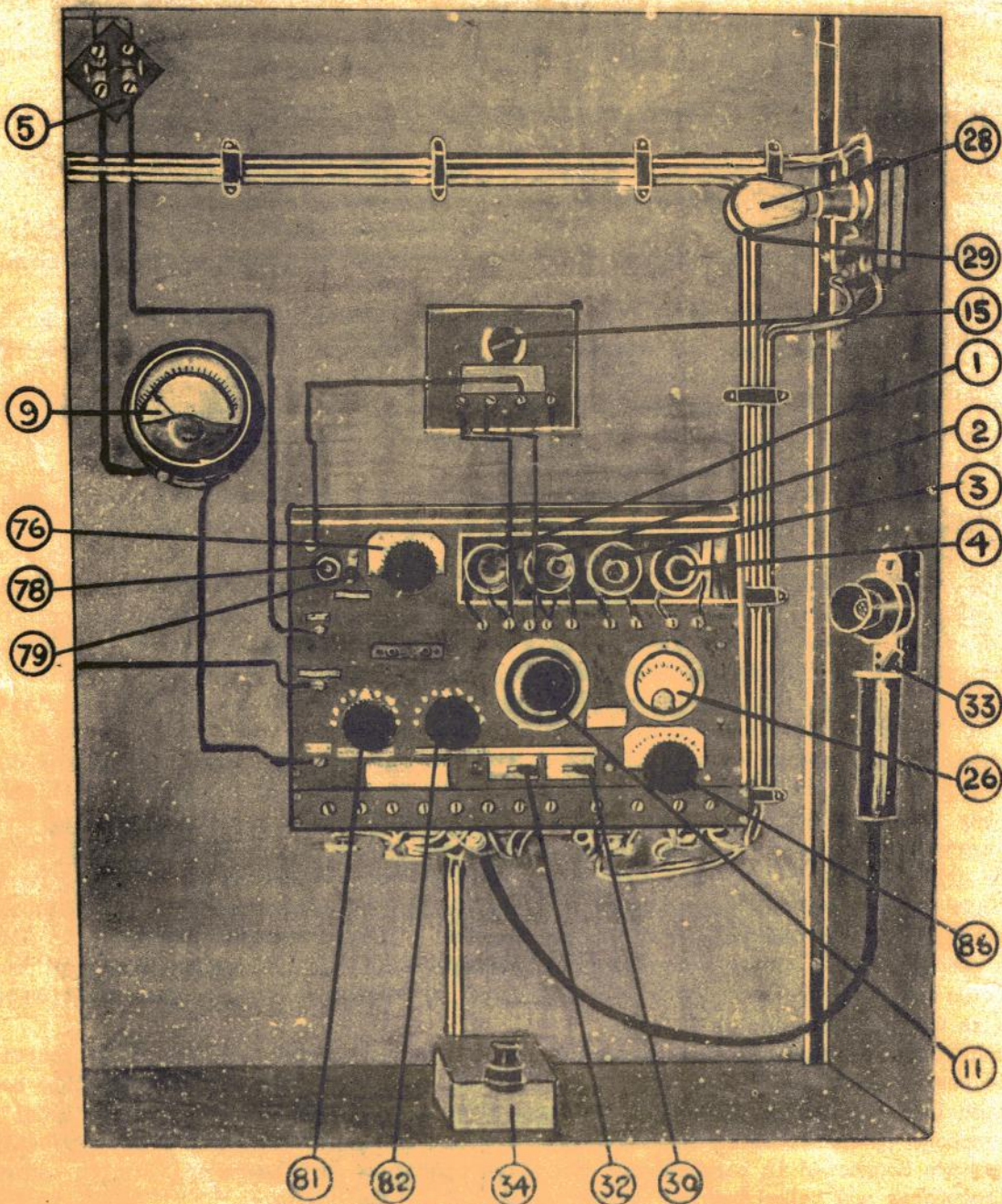


FIG. e.

# TYPE 83.

*Destroyer F.C. set-  
replaced by 51 H*

T 5

Date of design:- 1923.  
 Frequency range:- 2300 -- 5000 <sup>4200</sup> kc/s.  
 Power supply:- 1 kW. double generator. H.T. 2000 volts, L.T. 23 volts.  
 Valves used:- One NT3A. Three NT10.  
 Distance range:- 20 miles.  
 Associated waveneters:- CR or G12.

Wave form	Method of producing oscillation	Nature of circuit	Grid excitation	Feed	Aerial excitation	High oscillating potential electrode	Method of modulation
R/T and I.C.W.	Self	Tuned circuit between anode and filament.	Mutual inductive.	Series	Mutual inductive.	Anode.	R/T by grid modulation I.C.W. by self-quenching.

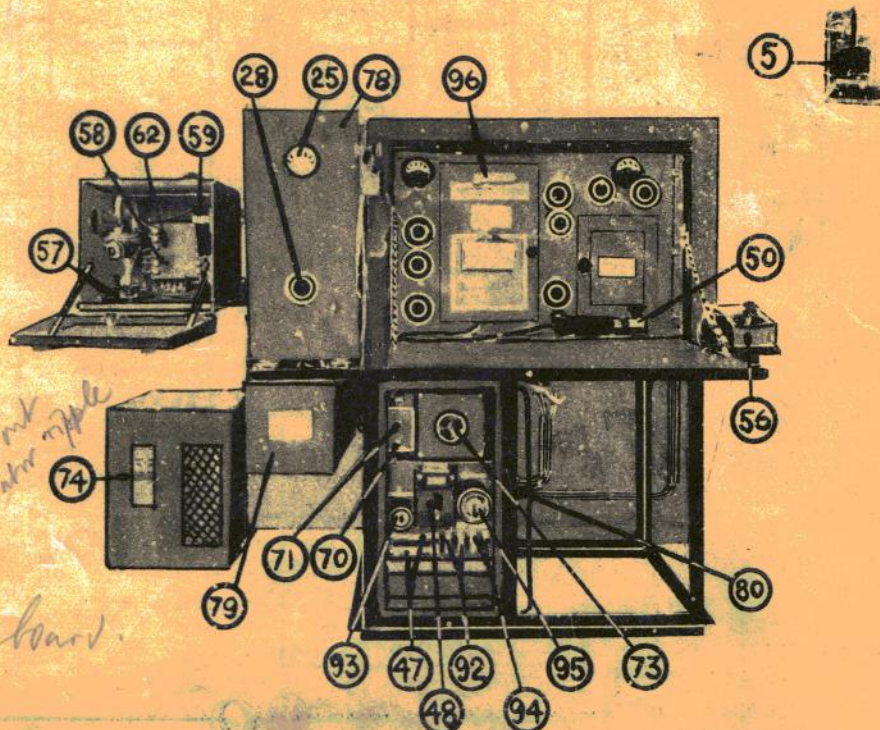
Type 83 is a low power valve set designed for use either as a W/T or R/T transmitter. The complete set, with the exception of the generator and automatic starter, is secured to a metal framework which also supports an inclined board on which the receiving instruments are mounted. Sorbo rubber pads are used to support the transmitter as a protection against vibration and shock of gunfire. Board 2H Supply (80) and Board 2H Output (78) are also secured to the framework supporting the set, the former being fitted underneath and the latter on the left of the transmitter. The Board 2H Supply contains the automatic starter control switches (70) (71) the H.T. voltage regulator (73) the transmitting valves L.T. switch (48) the L.T. fuses (47) and the H.T. and L.T. fuses (92) (94) and switches (93) (95) for the receiving outfit. The Board 2H Output contains the H.T. voltmeter (25) the H.T. switch (23) and the H.T. protecting resistances (26) (27). The controls for the whole set are therefore within easy reach of the operator. The H.T. supply from the 2000 volts generator is connected to two helmsby condensers (29) which are fitted in a box (79) beneath the Board 2H output. The negative side of the H.T. switch (23) is earthed. In order to protect the 2000 volts generator an amature should an accidental earth develop on the positive side of the H.T. switch, or the H.T. supply be short circuited by any other means, two 1000 ohm resistances (26) (27) are connected in the H.T. leads.

The H.T. voltmeter (25) is an electrostatic type instrument and will not, therefore, indicate the polarity of the H.T. supply. This should be borne in mind if the generator is dismantled and, after reassembly, the set will not function. A simple method of testing the polarity is to disconnect the 2000 volt field winding and connect a 0-250 scale voltmeter across the output terminals of the generator.

It is dangerous to handle the microphones or the morse keys if the polarity of the H.T. supply is reversed at the terminals (81) (82) as the switches (54) (55) on the handles of the microphones and the morse keys (53) (57) will then be connected to 2000 volts positive instead of negative and earth.

Safety contacts (37) (39) are fitted on the doors of the transmitter box and one (39) on the door of the Board 2H Output. These contacts are connected in series with the self sustaining switch (11) of the automatic starter. Opening any of these doors will therefore switch off the generator and make the set safe to handle.

The L.T. supply from the generator is connected to a D.P. switch (48) and fuses (47) on Board 2H supply (80). The filaments of the three NT10 modulating valves (1) (2) (3) are connected in series and if one valve burns out all three will go out. In order to test for the defective valve a bridge piece (93), consisting of an ebonite rod on which a 4 ohm resistance is wound and two metal end pieces is constructed. Switch (23) must now be broken and the door opened. This will stop the machine which must be restarted and the "on" push kept pressed. The bridge is placed across the filament terminals of each NT10 valve in turn and when across the broken filament the remaining two valves will light.



*to cut out commutator ripple*  
*Supply from bway board.*



The bobbin of the listening through switch(5) is connected in parallel with the operating switch in the main W/T office. The Type 83 aerial is therefore earthed by the listening through switch(5) and the receiving instruments protected when the main set is in use.

The set can be used to transmit W/T or R/T by means of the W/T - R/T C.O.S. (23), which has two positions.

W/T Position. In the W/T position the C.O.S. (23) carries out the following functions:-

- (a) Breaks the H.T. supply to the three NT10 modulating valves (1) (2) (3).
- (b) Breaks the L.T. supply to the NT10 valves (1) (2) (3).
- (c) Short circuits the filament contact of the magnetic key to keep the NTR valve afloat irrespective of the position of the magnetic key.
- (d) Disconnects the anode grid coupling between the modulator valve (3) and the grid leak (20) of the oscillator valve (4).
- (e) Connects the 27 jar condenser(22) in parallel with the two 0.5 jar grid insulating condensers(21).

From the above it will be seen that, in the W/T position the amplifiers and modulator valves(1) (2) (3) are isolated and the oscillator valve (1) only is used. The additional 27 jar condenser(22) across the grid leak resistance(20) causes the grid to run negative at an audible frequency and thus produces an I.C.W. note. (See Admiralty Handbook of W/T (1931) paragraph 706.) The audio frequency note can be altered by adjusting the grid coupling (13). Care must be taken that the grid coupling is not too tight or the set will not oscillate.

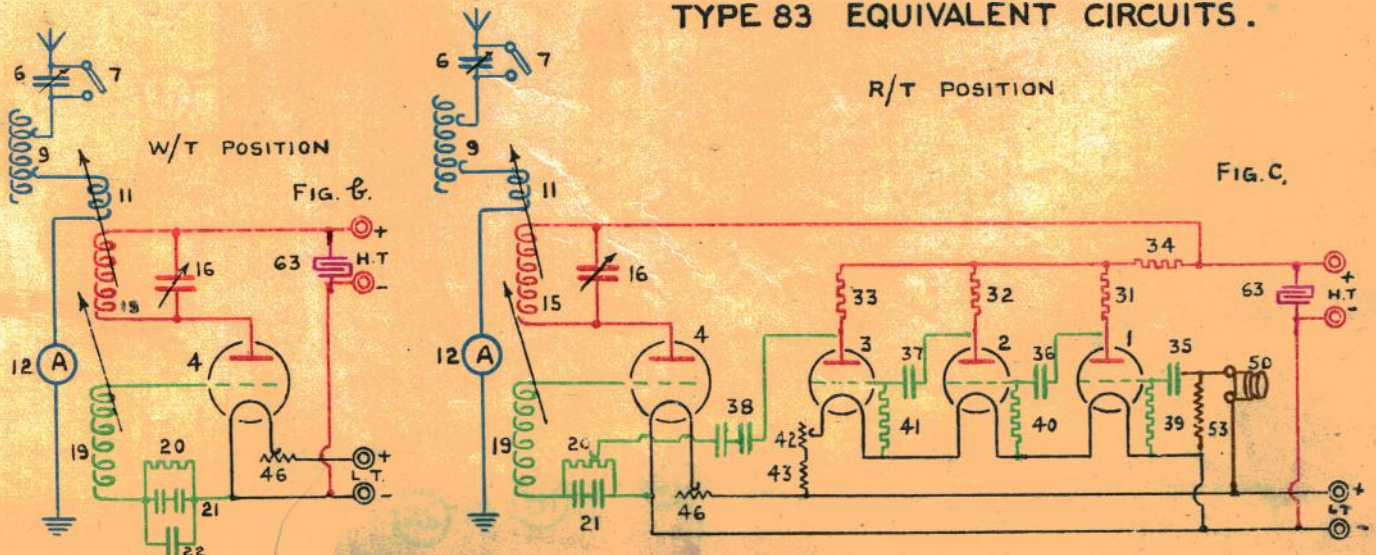
R/T Position In the R/T position the C.O.S. (23) carries out the following functions:-

- (a) Connects the H.T. supply to the three NT10 modulating valves (1) (2) (3) through the 40,000 ohm anode resistance(34) which is used to reduce the H.T. supply to a value suitable for the NT10 valves.
- (b) Connects the L.T. supply to the three NT10 modulating valves (1) (2) (3) through the filament resistance(43) and rheostat (42).
- (c) Takes off the short circuit across the filament contact of the magnetic key (10).
- (d) Connects the coupling condensers(38) to the grid leak resistance(20) of the oscillator valve(4).
- (e) Disconnects the 27 jar condenser(22) from the grid condensers(21) of the oscillator valve(4).

The microphone (50), in conjunction with the 30 ohm resistance (53), modulates the grid of the first NT10 valve (1) which amplifies the speech frequency and is resistance capacity coupled to the second NT10 valve (2). The three NT10 modulator valves(1) (2) (3) are resistance capacity coupled to the succeeding valve thus the modulation on the R/T oscillator valve (4) is obtained by grid modulation. The oscillator valve (4) has a tuned anode circuit consisting of the inductance coil (15) and variable tuning condenser(16), and a mutually coupled grid circuit.

The grid leak resistance (20) of the NTR valve while always completely in the R/T circuit has a variable tap connected through the coupling condensers(28) to the anode of the last NT10 modulating valve. There are six tapings, variable in 5,000 ohm steps, and the modulator coupling from the NT10 is taken to the most suitable tapping point. The effect of the coupling is to impress the speech voltage changes on to the grid of the oscillator valve (4), the amount of the impressed voltage depending on the position of the grid tapping, since the grid leak resistance(20) is to all purposes a potentiometer connected between the grid and filament of the NTR valve. As the amplitude of R/F oscillatory voltage is generally less as the frequency is increased, it may be necessary to lower the modulation tap (towards the filament) on the higher frequencies. This should keep the correct proportion of modulation and avoid distortion.

TYPE 83 EQUIVALENT CIRCUITS.



Remote Control. A remote control box is fitted on the bridge containing a second morse key (57) and microphone switch (55) wired in parallel with those at the set. Should a short circuit occur on either of them when the L.T. supply is made the magnetic key (10) will be permanently made. The "RC - OP" switch (52) enables either the microphone (50) at the set or the remote control microphone (59) to be used to transmit R/T.

Each of the microphones (50) (59) is connected to an "R/T - Local" switch. In the "R/T" position the microphone in use is connected to the grid circuit of the modulator valve (1) provided the "RC - OP" switch (52) is in the correct position. In the "Local" position the microphone is connected in the telephones circuit in series with a 4½ volts dry battery. Both telephones are connected in parallel and the two operators are therefore able to converse using the microphones and telephones by switching the R/T - Local switches (51) (58) to the "Local" position.

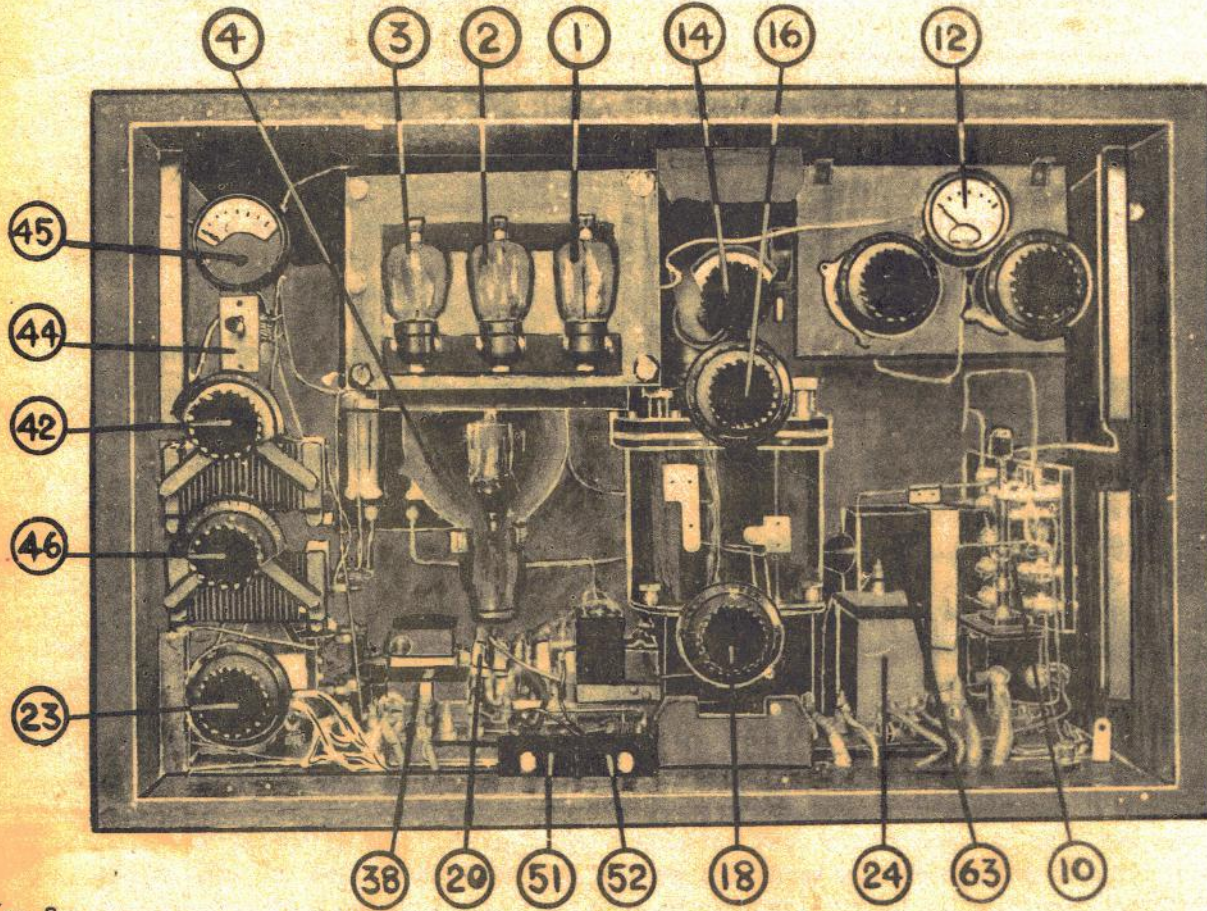


Fig. e.

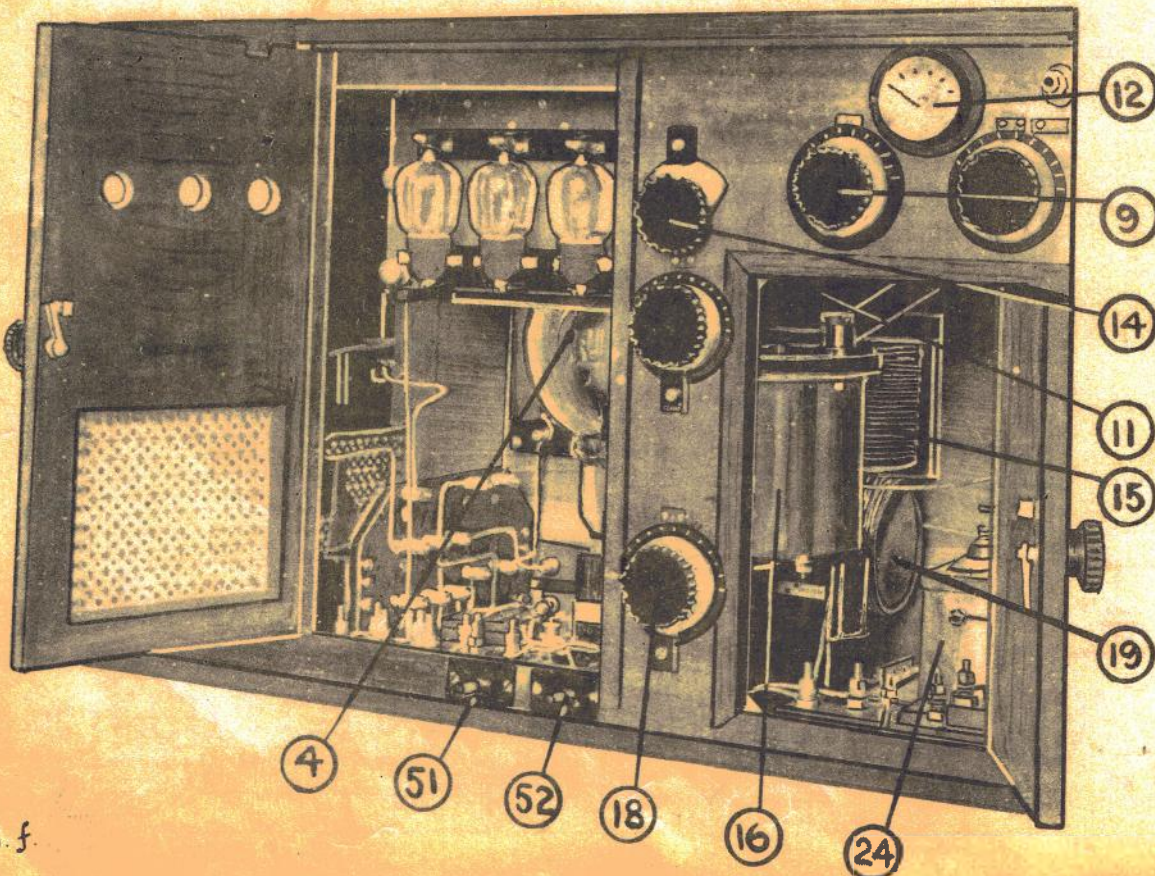


Fig. f.