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ADMIRALTY PATTERN S.S. 86A.

BOOK OF INSTRUCTIONS FOR

TRANSMITTER 5G.

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TRANSMITTER 5G. (PATT. X2113A).

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BOOK OF INSTRUCTIONS FOR

TRANSMITTER 5G. (Pat. X2113A).

CHAPTER I.

DETAILS AND GENERAL DESCRIPTION OF TRANSMITTER.

1. GENERAL.

Date of Design:- 1940.

Frequency Range:-
(a) 2.9 - 6.5 mc/s.
(b) 5.5 - 12.5 mc/s.
(c) 11.7 - 22 mc/s.

Power Input:- A.C., 50 cycles at 100, 110, 130,
200, 225 or 250 volts.
For some purposes a petrol driven
generator will be supplied as an
alternative source of supply.

Valves Employed:- Crystal Oscillator - 6V6G.
Amplifier/Doubler - 807 or VT60.
Rectifier - 5Y3.

Character of Transmission:- C.W., Crystal Controlled.

Weight:- (a) Transmitter Box - 30 lbs.
(b) Accessories & Spares Box - 23 lbs.

2. DESCRIPTION OF CIRCUIT.

Transmitter 5G is a lightweight portable general purpose H/F Transmitter.

Transmissions are crystal-controlled, and the power output is of the order of 30 Watts when working on the crystal's fundamental frequency, or 15-20 watts when doubling the crystal frequency.

The set may be operated from 100, 110, 130, 200, 225 or 250 volts, 50 cycles A.C. mains, the voltage being selected by means of the rotary switch (5).

Two 0.01 mfd. condensers (44)(45) are connected across the mains supply, with their centre point earthed. This is for noise suppression.

The supply is fed through two 2-amp. fuses (39)(40) to the rotary switch (5).

A 5Z3 valve (3) operates as a full-wave rectifier, the H.T. supply at 700 volts being smoothed by a 1-henry choke (7) and 6 mfd. condenser (16).

The anode and screen grid supplies for the crystal-oscillator valve (1) are obtained from a potentiometer (consisting of three 30,000-ohm resistances in parallel (41)

(42) (43) in series with one 30,000 ohm resistance (30) connected across the H.T. supply). These supplies are decoupled by a 0.01 mfd. condenser (21). The screen-grid supply is fed via a 20,000 ohm series resistance (29) and is decoupled by a 0.002 mfd. condenser (19).

The crystal (27) is connected between the grid of the 6V6G crystal-oscillator valve (1) and earth, in parallel with the grid leak (33) of 50,000 ohms. Grid bias is provided by a series cathod resistance (32) of 500 ohms by-passed by a 0.002 mfd. condenser (17). The anode circuit of the crystal oscillator consists of a tapped coil (9) and variable condenser of maximum capacity 65 mmfd. (13). The tapping point on the coil is selected by the "Crystal Oscillator Range Switch" (12), and resonance is indicated by a neon bulb (35) connected to the high potential end of the tuned circuit.

Coupling between the crystal-oscillator and amplifier valves is effected by a 30 mmfd. condenser (22). The 807 valve (2) operates as a Class C amplifier or frequency-doubler depending on whether its anode circuit is tuned to the crystal frequency or the second harmonic of the crystal-frequency. The grid leak (34) is of 20,000 ohms and is connected in series with a radio-frequency choke (8). Further grid bias is provided by the 500 ohm series cathode resistance (31) which is by-passed by a 0.002 mfd. condenser (18). Keying is carried out in the cathode lead of the 807 amplifier/doubler valve, the necessary connections being brought to the keying jack (26) on the front panel.

The screen-grid supply is obtained from the H.T. potentiometer (41) (42) (43) (30) and is decoupled by a 0.002 mfd. condenser (20).

The tuning coils in the amplifier anode circuit (10) and aerial tuning circuit (11) are wound on the same former. Three sets of coils are provided to cover the frequency range. The amplifier coil is tuned by a variable condenser of 100 mmfd. maximum capacity (14). A 0.01 mfd. condenser (24) has been placed in series with this tuning condenser as a precaution against short-circuiting the H.T. supply in the event of a breakdown between the plates of the variable condenser.

The H.T. supply for the amplifier valve (2) flows through a 1500-ohm resistance (28) and the tuning coil (10); and the end of the coil at earth potential to R/F is by-passed by a 0.004 mfd. condenser, (23).

The aerial circuit is tuned by a 100 mmfd. variable condenser (15); and there is an R/F ammeter (25) in series with the aerial lead.

The filament supplies for the directly-heated rectifier valve (3) (5 volts), and the indirectly-heated crystal-oscillator valve (2) (6.3 volts) are provided from secondary windings on the mains transformer (6).

The aerial and earth connections (36) and (37) respectively are brought to the front panel.

A circuit diagram of the transmitter 5G is given in Fig. 1 and the wiring diagram is given in Fig. 2. Figs. 4, 5 and 6 show the appearance of the transmitter.

(Note:- The apparatus contained in Transmitter 5G is fragile and SPECIAL CARE SHOULD BE TAKEN WHEN HANDLING THE SET, AND WHEN USED IN THE R.C.O. OF A SHIP IT MUST BE SECURED TO THE OPERATOR'S BENCH, PREFERABLY ON A SORBO RUBBER MOUNTING).

3. TYPICAL TUNING ADJUSTMENTS.

Frequency in Kc/s		Oscillator Tuning		Amplifr. & AE Coil.	Amplifr. Tuning Condr.	AE Tuning Condr.
Transmission	Crystal	Range Switch	Tuning Condr.			
3800	3800	1	8	A	3	2
5600	5600	3	7	A	7	6
6000	6000	3	8	B	2	2
7700	7700	5	2	B	4	3
10000	10000	6	3	B	6	5
12000	6000	3	8	B	8	6
12000	6000	3	8	C	1	2
15000	7500	4	8	C	3	2½
20000	10000	6	3	C	6	4½

4. NOTE ON USE OF AERIAL AMMETER IN CHECKING VOLTAGE OUTPUT FROM GENERATOR.

The aerial ammeter (25) may be used to check the voltage of the generator set (119-volt) in the following way:-

- (i) Unplug the morse key.
- (ii) Clip the crocodile clips at one end of the test lead (supplied with the generator set) to the mains fuses (39)(40).
- (iii) Plug in the other ends of the test lead to the aerial and earth sockets (36)(37).
- (iv) Start the generator and switch on the set.
- (v) Adjust the output from the generator so that a current of 290 mA. is shown by the aerial ammeter (25).
- (vi) Stop the generator before dismantling the test lead.

It is important that the morse key should not be pressed during the test.

CHAPTER II.

OPERATION OF THE TRANSMITTER.

1. FIXING OF AERIAL AND EARTH.

The aerial should preferably be cut to about a half wavelength for frequencies above 5,000 kc/s. For lower frequencies than this the whole of the 100 feet of aerial wire provided should be employed. (See Fig. 3).

The aerial should be erected as high and clear of surrounding objects as possible.

Besides the aerial wire and insulators, the Accessories Box contains an aerial lead-in tube and six stand-off insulators, which may be employed in the event of the transmitter being used inside a building. The length of aerial wire inside the building should be kept as short as possible and free from sharp bends.

The method of securing the free end of the aerial will differ widely according to circumstances, but generally a tree or building will provide a suitable point.

Sufficient wire is provided to make an earth connection, which should be kept very short. Earthing clips are provided for use on pipes, and there is also an earthing mat. In the event of difficulty in finding a suitable earthing point the earth connection may be dispensed with on the higher frequencies.

2. TUNING THE TRANSMITTER.

- (a) BEFORE PLUGGING THE MAINS LEAD INTO A LAMP SOCKET OR 5-AMP SOCKET (alternative plugs are supplied on the mains lead) ASCERTAIN THAT THE SUPPLY IS 50 OR 60 CYCLES A.C.

Where a screened mains lead is used the brass clip attached to the screening should be connected to the earthing terminal (46) adjacent to the mains plug (38).

- (b) TURN AND LOCK the Mains Voltage switch (5) to the appropriate mains voltage. (This may usually be obtained by reference to the electric supply meter, or the lamps in use).

- (c) Insert the appropriate coil in the output stage. (Make certain that the set is switched off before touching this coil).

Note that the coil to be inserted is that covering the desired frequency of transmission, not necessarily the crystal frequency, e.g., if transmission were desired on 16,000 kc/s, coil C would be used, although the crystal frequency would be 8000 kc/s.

Frequency of Transmission	Coil
2900 - 6500	A
5500 - 12500	B
11700 - 22000	C

- (d) Insert the required crystal in the crystal holder (27) and plug in the morse key (socket 26).
- (e) Make the "Mains Switch" (4).
- (f) Select the appropriate range on the "Oscillator Range Switch" (12) as follows:-

Frequency of Crystal	Range
2900 - 3800 kc/s	1
3800 - 4500 "	2
4400 - 5700 "	3
5300 - 7500 "	4
7300 - 9700 "	5
9300 - 11000 "	6

- (g) Rotate the "Oscillator Tuning" control (13) until the neon indicating bulb (35) strikes. The correct operating point is that which gives almost maximum brilliancy of the indicator (35).
- (h) Press the key and tune the "Amplifier Tuning" control (14) until a maximum reading is obtained in the ammeter (25).
- (j) Tune the "Aerial Tuning" control (15) until a maximum reading is obtained in the ammeter (25). The "Amplifier Tuning" control (14) may now require

slight readjustment, and consecutive small adjustments of the controls (14) and (15) should be made until the highest reading is obtained on the ammeter (25).

(Note:- If it is necessary to "Listen-through" on the frequency of transmission the Oscillator Range Switch (12) may be moved to another position. This stops the crystal oscillating but the set is ready for immediate transmission by re-setting the switch. The set should not be left running for long periods when transmission is not required especially when operating from the petrol generator. .

With certain crystal frequencies it may be possible to tune the output and aerial stages to both the crystal frequency and its second harmonic on the one coil: or alternatively to tune both the second and third harmonics of a certain crystal frequency on the same coil. Care should therefore be taken to tune the correct frequency of operation, checking with a wave-meter is available, especially when the output valve is being used as a "frequency-doubler". The condenser vanes will be further "out" on the second harmonic than on the fundamental crystal frequency, and further "out" on the third harmonic than on the second harmonic).

(Note:- It is very dangerous to change the output stage coil (10) with the set switched on. ALWAYS SEE THAT THE SUPPLY IS BROKEN BEFORE INSERTING OR REMOVING THIS COIL).

CHAPTER III.

ACCESSORIES BOX

Besides the accessories necessary to the working of the set, viz:- aerial wire and earth fittings, mains connections and morse key, the Accessories Box contains three spare valves, a set of spare resistances, condensers, and the tools necessary to effect minor repairs, as follows:-

1. Soldering iron.
2. Length of resin-cored solder
3. Length of 20 S.W.G. tinned copper wire
4. Length of "Systoflex" sleeving.
5. 1 oz. reel of insulating tape.
6. Pair of pliers
7. Screwdriver.

To facilitate connection of the aerial to the set, stand-off insulators and a lead-in tube are provided, together with a gimlet and rat-tail file for piercing window-frames etc.

Apart from the above items, the Accessories Box accommodates the Handbook, aerial insulators, the tuning coils and crystals required for operation on other frequencies and a pea-lamp and clips to take the place of the ammeter (25) should this instrument become damaged. In this latter event, the procedure is to clip the lamp bulb across the meter terminals and tune for maximum brilliancy.

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A dozen spare 3-amp. fuses are also included in the Accessories Box.

(Note:- A number of different crystals are available for use with Transmitter 5G. Crystals appropriate to the special service required will be supplied as requisite).

The appearance of the Accessories Box is shown in Fig. 7.

LIST OF IDENTITY NUMBERS.

1. Crystal Oscillator Valve, 6V6G Patt. W2077
2. Amplifier/Doubler Valve, 807 Patt. VT60.
3. Rectifier Valve, 5Z3, Patt. W2078
4. Mains switch
5. Mains voltage switch.
6. Mains transformer.
7. L/F Choke, 1 henry
8. R/F Choke
9. Crystal Oscillator tuning coil.
10. Output stage tuning coil
11. Aerial tuning coil
12. Oscillator range switch.
13. Oscillator tuning condenser.
14. Output stage tuning condenser.
15. Aerial tuning condenser.
16. Condenser, fixed, 6 mfd. Patt. 8887
17. " " 0.002 mfd. Patt. X2555.
18. " " " " "
19. " " " " "
20. " " " " "
21. " " 0.01 mfd. Patt. W2709
22. " " 30 mmfd. Patt. W2711.
23. " " 0.004 mfd. Patt. W2710
24. " " 0.01 mfd. Patt. W2813
25. Aerial ammeter.
26. Key jack, Patt. W2977.

LIST OF IDENTITY NUMBERS (Contd.).

27. Crystal.
28. Voltage dropping resistance, 1500 ohms. Patt. W2712.
29. Screen voltage dropping resistance, 20,000 ohms.
Patt. W2714.
30. H.T. potentiometer resistance, 30,000 ohms.
31. Biasing resistance, 500 ohms. 15 Watt, Patt. W2713.
32. " " " " " 2 Watt, Patt. W2716.
33. Grid Leak, 50,000 ohms. Patt. W2715.
34. " " " 20,000 ohms. Patt. W2714.
35. Neon Tuning Indicator, Patt. 6712.
36. Aerial socket.
37. Earth socket.
38. Mains plug.
39. Fuse, 3-amp, Patt. 5342.
40. " "
41. H.T. potentiometer resistance, 30,000 ohms. Patt. W215.
42. " " " " "
43. " " " " "
44. Condenser, fixed, 0.01 mfd. Patt. W2709, 300V. Working
45. " " " " "
46. Earthing terminal for screened cable.

TRANSMITTER 5G.
CIRCUIT DIAGRAM.

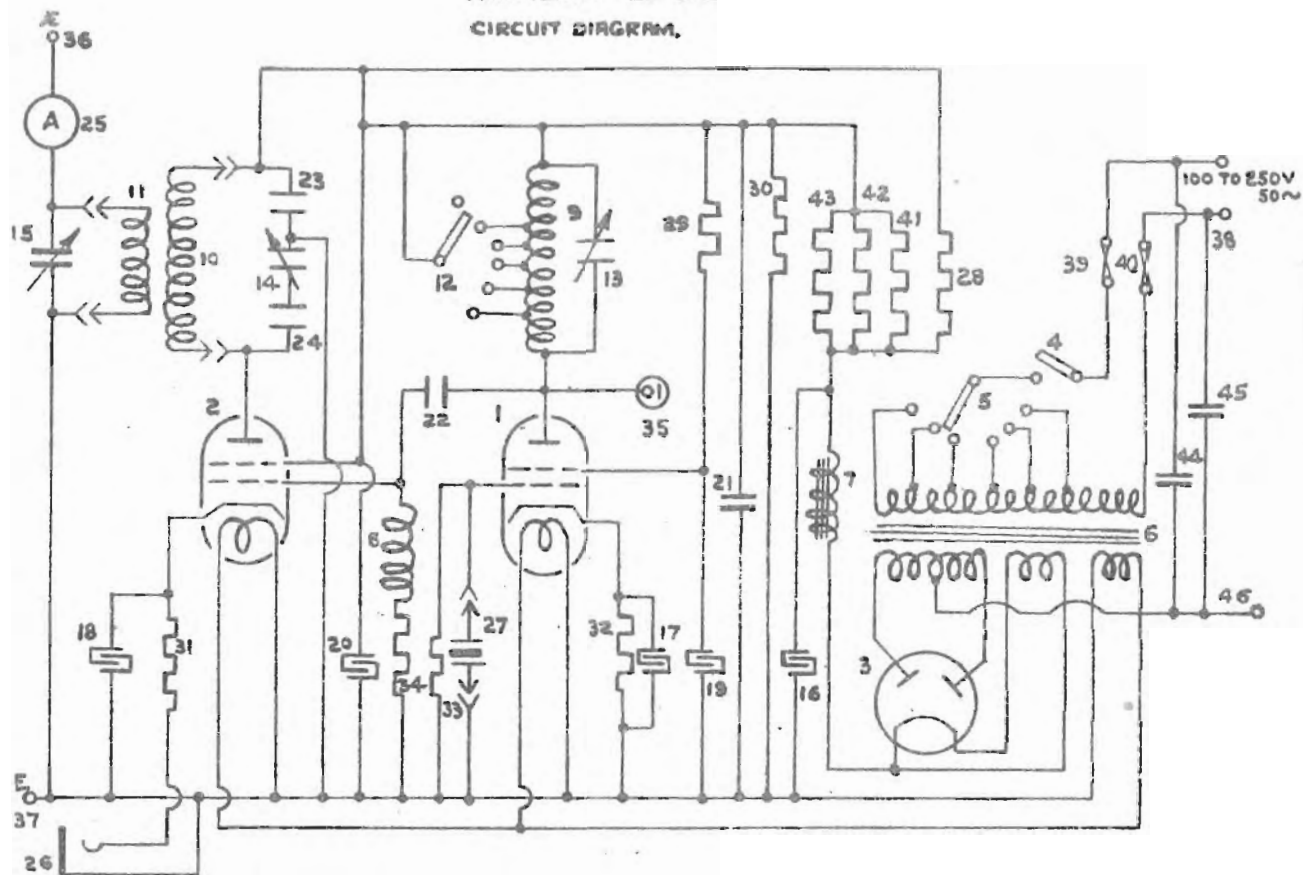
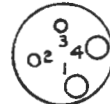


FIG 1

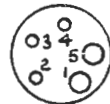
ADMIRALTY PATT. X 2113 A TRANSMITTER 5G.

WIRING DIAGRAM, (VIEWED FROM UNDERSIDE.)

VALVE SYMBOLS



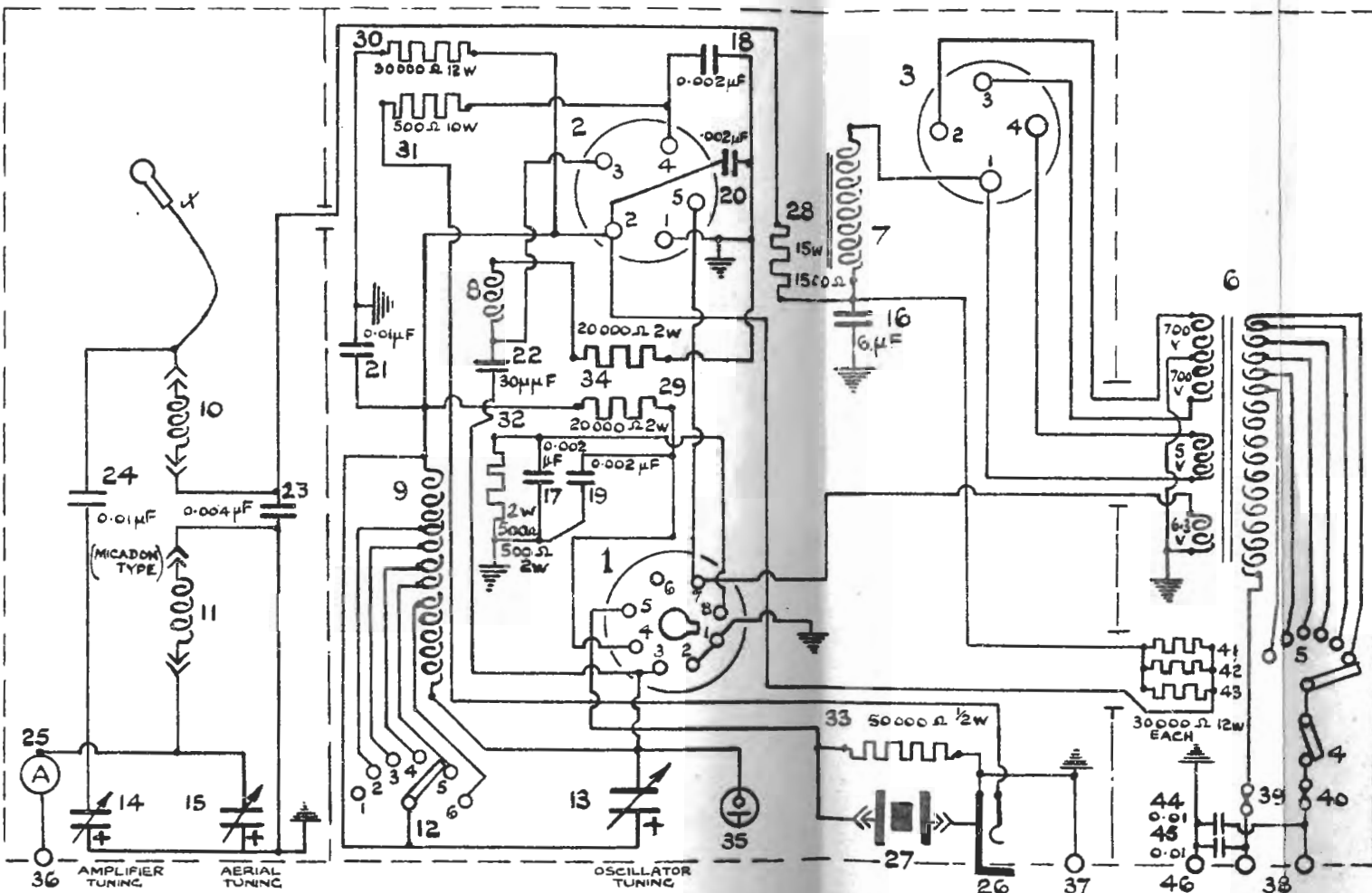
- 1 FILAMENT
- 2 ANODE
- 3 ANODE
- 4 FILAMENT



- 1 HEATER
- 2 SCREEN GRID
- 3 GRID
- 4 CATHODE
- 5 HEATER



- 1 METAL SHIELD
- 2 HEATER
- 3 ANODE
- 4 SCREEN GRID
- 5 GRID
- 6 BLANK
- 7 HEATER
- 8 CATHODE.



S.S. DIAGRAM N° 28831C/A

FIG. 2

TRANSMITTER 5G

CALCULATION OF AERIAL LENGTHS

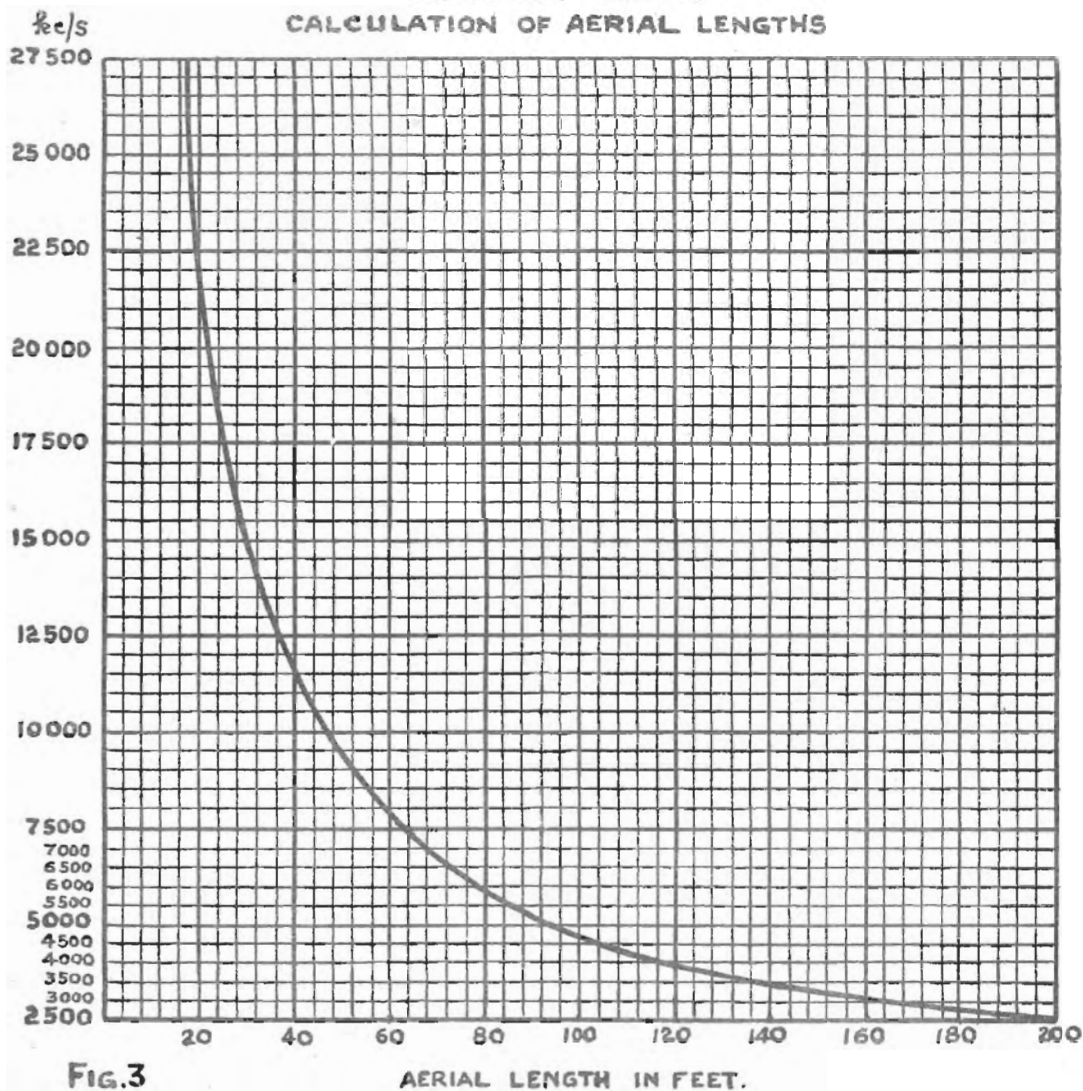


FIG.3

AERIAL LENGTH IN FEET.

TRANSMITTER 5G

FRONT VIEW

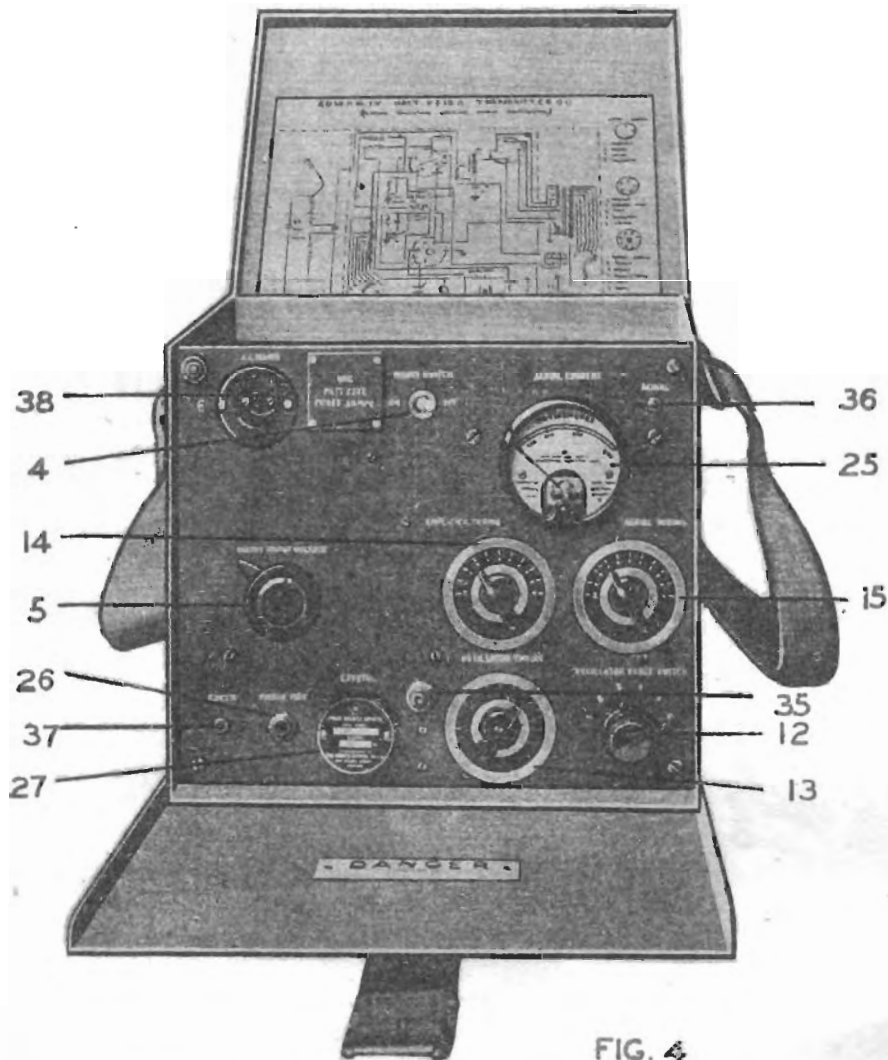


FIG. 4

TRANSMITTER 5G

REAR VIEW

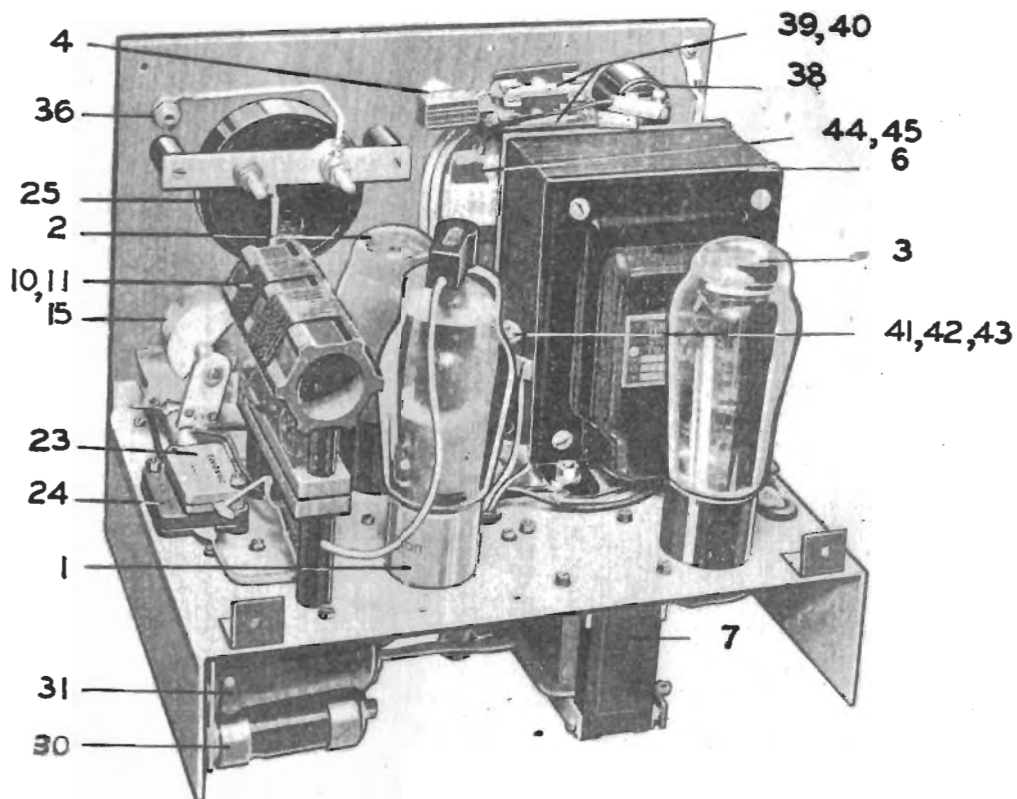


FIG. 5

TRANSMITTER 5G

UNDERNEATH VIEW

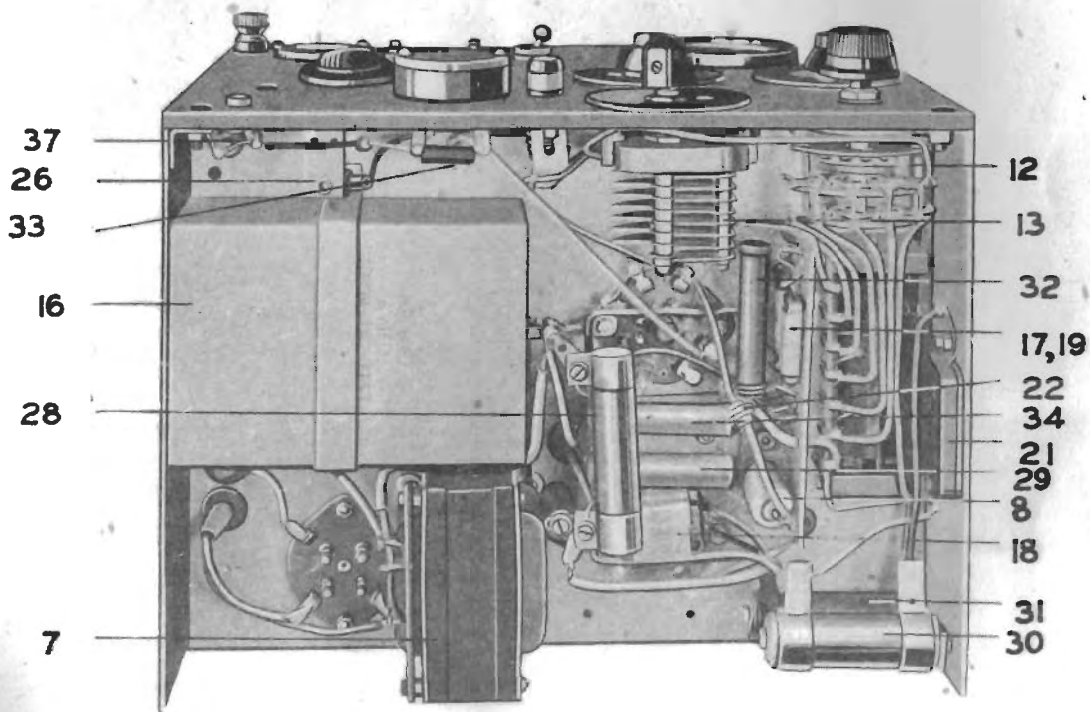


FIG. 6

TRANSMITTER 5G

ACCESSORIES BOX



FIG. 7