H.265.

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NOTES ON TRANSMITTER FOR BERMUDA W/T STATION.

1. General.

This is an I.C.W. transmitter for radio-frequencies between 21,428 and 6,000 kc/s. (14 and 50 metres), also between 1,364 and 272.7 kc/s. (220 and 1100 metres).

The H.T. power supply is taken from the 8 kVA. motor alternator and a Patt.No.7205B transformer. An H.T. C.O. switch, Patt.No.5050 (modified) is inserted in the anode supply lead to enable the supply to be applied either to the long-wave transmitter or to the anode of the short-wave transmitting valve.

The A.C. supply for heating the valve filaments is taken from a Patt.No.6597D, 3 kVA. motor alternator through Patt.No.6278 transformers. A single-pole 2-way switch is inserted in the secondary supply from 2 Patt.No.6278 transformers in parallel to enable either the NT4A valve (in the long-wave panel) or the NT23B (in the S/W panel) to be used, leaving the rectifier filaments alight in both cases.

The supply leads from the 8 kVA. motor alternator are taken through safety switches, Patt.No.1790 on the doors of both the S/W and L/W transmitters, to render either set safe when making adjustments. The D.C. supply leads operating the filament switch are also taken through safety switches on the doors, so that should either door be opened the supply to both the H.T. and filament transformers is broken.

The terminals marked 2, 4, 5 and 7 in the S/W lower panel are joined to the corresponding terminals on "Board, distributing with safety and control circuits". Terminals 1, 3 and 6 on "Control board" to corresponding terminals on "Board, distributing, etc.".

The oscillatory circuits are shown in Fig.2.

2. Short-wave 21,428 to 6,000 kc/s. (14/50 metre) set.

The generating circuit consists of the Inductance (2) and the Grid anode capacity of the NT23B valve. For tuning purposes the variable condenser is used. For the higher frequencies (14/26 metres) the variable condenser is placed in series and for the lower frequencies (25/50 metres) in parallel. The change-over is effected by the D.P. C.O. switch (4). A blocking condenser is placed at (5), this, however, is of comparatively large capacity and has negligible effect on the tuning. The grid leak resistance (6) is connected directly between the grid and filament of the valve. Coupled to the generating circuit is the aerial circuit (7) [illegible] in aerial.

Arrangements will have to be made at the station to change over the aerial from the S/W set to the L/W set.

Oscillations will be set up in the aerial system whenever it is tuned to any odd multiple of quarter waves.

In practice it will not be found necessary to tune the aerial circuit by means of inductances or condensers, sufficient tuning being obtainable by slightly varying the degree of coupling between the local and aerial circuits. The reason for this is that with an aerial having a fairly long natural wave, the number of quarter waves excited in it on the waves generated by the S/W transmitter will be comparatively large, and as the tuning is not critical, only a very slight adjustment of the coupling will be necessary to obtain maximum current reading in aerial ammeter.

3. Operation of the transmitter.

When preparing to transmit on high frequencies the following procedure is to be observed:-

(a) Put the filament supply switch and H.T. supply switch to the correct position.

(b) Connect the aerial lead to the S/W transmitter.

(c) Adjust the local circuit inductance and condenser, and also the aerial coupling for the wave required.

(d) Start up and adjust the machines.

(e) Press the key and measure carefully the transmitted wave.

It will be necessary to check the wave every time any change of frequency is made, as any slight misadjustment of coupling or condenser setting will cause a considerable wave error. Even if no alterations have been made to the circuits it is advisable to check the wave frequently. Small adjustments of tuning can be done by the closed circuit condenser only.

The method to be observed when retuning the transmitter to any frequency within its range is as follows:-

(a) Disconnect the aerial circuit.

(b) With reduced anode voltage tune the generating circuit roughly to the required frequency by the inductance (2) and the variable condenser (3), first seeing that D.P. C.O. switch (4) is in the right position.

(c) Connect up aerial circuit and adjust the coupling until maximum reading is obtained in the aerial ammeter at the base of the aerial; this will correspond to a reduction of the current in the generating circuit.

(d) Accurate setting of the circuits to the required frequency can now be made by adjusting the variable condenser (3).

Whenever a new NT23B valve is inserted in the transmitter it will be necessary slightly to retune the generating circuit to compensate for the small variation of electrode capacity of individual valves. When inserting new valves, care should be taken in cases where the leads to the seals are coiled, that they should be straightened out and kept as short as possible, otherwise it will be found that the maximum frequency of the transmitter will be considerably decreased.

A table of measurements taken in Signal School on each turn of the inductance (2) with condenser (3) about half in are given in Table 1. These may be taken as a rough guide on first tuning the set. The above notes on retuning the transmitter can then be adhered to.

21.428 TO 6.000 kc/s. (14/50 METRE) SET.

Components.

H.T.Transformer (1).	Patt.No.7205B transformer, 350/14000-19250 volts, 12 kVA. This transformer will have to be carefully placed in the lower panel and care taken to ensure that it is filled with oil before lifting on the upper panel. The position can be plainly seen in Photograph No.3.
Coil, inductance, variable, 15 mics and coil, coupling (2).	Used for tuning generating circuit in conjunction with (3). The coupling coil has a value of about 5 mics and is connected directly in the aerial circuit. Care should be taken when varying the coupling of this coil that it does not touch the local circuit tuning coil.
Condenser, T. air, adjustable, 0.05-jar, 10000 volts (3).	Patt.No.8364 condenser, mounted in rear of upper panel and adjusted by means of extension handle in front.
Switch, D.P., C.O., 20000 volts. (4).	Patt.No.5434. Used for putting condenser (2) in either series or parallel with inductance (3).
Condenser, 0.25-jar, 25 amps., 6 k/c. (5).	Used as blocking condenser.
Resistance, 5000 ohms. (6).	Patt.No.7625 grid leak resistance.
Filament transformers (7).	These are Patt.No.6278 transformers, one being used for filaments of the rectifiers and two in parallel for the filaments of the transmitting valves.
Condensers, 1-jar, 18000 volts (8).	Patt.No.1779. Two placed in series with centre point earthed across secondary of Patt.No.7205B transformer to protect end turns from any H.F. currents that might be induced in the leads due to stray coupling. One placed between filaments of rectifying valves and earth in order to carry the H.F. component of the valve current impulses.

H.T. tension C.O. switch (9).	This is a Patt. No. 5050 switch which has had the Patt. No. 1133 insulators replaced by Patt. No. 4669A. It is used to change over the H.T. from one set to the other.
Ammeter, H.W., 0-1.2 amps. (10).	Patt. No. 4530A. One placed in the local circuit and one as aerial ammeter. Both are shunted and do not read actual amps.
Switch, magnetic, 2-1/4-ins. break (11).	Patt. No. 7299. Used as filament switch.
Blower, 20 cubic feet (12).	Patt. No. 7392. Used for blowing draught of cool air on seals of silica valve. Care must be taken that blower is always working when transmitting with silica valve.
Safety switch, auxiliary (13).	Small safety switch in D.C. circuit. Ensures that filaments and switch relay are switched off whenever doors are opened.
Voltmeter, filament, (14).	Patt. No. 5420. Reads volts across transmitting valve filaments.
Valve, transmitting. (15).	Valve, wireless, NT23B.
Valve, rectifying. (16).	Valve, wireless, NU2.
Resistance, filament. (17).	Patt. No. 6512, 0.5 ohm, 25 amps. For regulation of transmitting valve filaments.
Switch, single pole, 2-way (18).	This is for changing over the secondary of the filament transformer to the transmitting valve required.

1.364 TO 272.7 kc/s. (220/1100 METRE) SET.

1. General.

This transmitter is designed to enable transmissions to be made on radio frequencies between 1.364 and 272.7 kc/s. (220 metres and 1100 metres). The same rectifying unit is used as with the short-wave transmitter and the same power and filament generator, the change over from one set to the other being a simple matter by changing over switches (9) and (12) as shown in Fig. 2.

A divided circuit is used for the local generating circuit which is coupled to the aerial circuit. The capacity of the aerial should not if possible exceed about 0.7-jar. A series condenser, capacity 0.5-jar is inserted for the higher frequencies and a similar condenser is used across the inductances to allow the lower frequencies to be obtained.

The position of the transmitter with relation to the S/W transmitter can easily be seen in the accompanying photographs. As an aid to the re-erection and rewiring of the components, a stereoscope and slides are supplied with the set, which will enable the run of the leads to be seen distinctly.

2. Tuning.

The tuning adjustments are shown in Table 2. These were made on an aerial of 0.7-jar approximately. When tuning after installation these adjustments can be used as a first approximate setting: final adjustments for maximum aerial current will of course depend upon the local aerial. It should be noted that on the higher frequencies the switch (W) should be in the vertical position so as to disconnect the aerial coil entirely otherwise its capacity will be in parallel with the aerial capacity.

The method of tuning this set is as follows:-

(a) Disconnect aerial circuit.

(b) Put on adjustments on grid and anode coils and No. 40 condenser as given in Table 2.

(c) With reduced anode voltage tune the local circuit to the required wave by the No. 40 condenser and take notice of its setting.

(d) Connect up aerial circuit and adjust until maximum current is obtained in the aerial ammeter.

(e) Accurate adjustment to the desired wave can now be made by means of the variometer and No. 40 condenser and altering coupling to obtain maximum radiation.

1,364 TO 272.7 kc/s. (220/1100 METRE) PANEL.

Components.

Choke coil (A). This choke coil is mounted in the upper panel of the S/W transmitter and is common to both sets.

Anode coil (B). This has a total value of 90 mics and is divided into three tappings.

Local tuning condenser (C). This is in parallel with the grid-anode capacity of the valve and is used for fine tuning the local circuit. It is an oil filled condenser No. 40, Patt. No. 6282A. The anode of the NT4A valve should be joined directly to the nearest H.T. terminal of this condenser.

Loading condenser (D). This is a Patt. No. 6376 condenser, 1-jar, 25 amps., 12000 volts. It is placed in parallel with the local tuning condenser to enable the lower frequencies to be obtained.

Switch, S.P., C.O. (E). This is a Patt. No. 5136, and is used to put the Patt. No. 6376 condenser in parallel with the Patt. No. 6282A No. 40 condenser.

Grid coil (F). This is a similar coil to (B) but is divided into seven tappings. Coupled to it is the aerial coupling coil.

Grid leak resistance (G). This is a resistance, Patt. No. 7624, 600 ohms, and is shunted by a Patt. No. 7343 condenser, 0.0078 mfd.

Condensers, 1 mfd. (H). These are Patt. No. 4977, Helsby condensers acting as a blocking condenser in the D.C. supply.

Valve (I). This is an NT4A valve, Patt. No. 5199A.

Ammeter (J). This is a Patt. No. 453CA ammeter, H.W., 0-1.2 amps. for indicating current in the local circuit. It is shunted.

Ammeter (K). Similar to (J). It is connected to the aerial circuit by a transformer which has a ratio of approximately 6/1.

Condenser (L).	This is a Dubilier condenser, 0.0055 mfd., used as aerial series condenser.
Condenser (M).	Similar to (L). It is placed in parallel with the aerial coil, coupling coil and variometer to enable the frequency of 272.7 kc/s. (1100 metres) to be obtained.
Variometer (N).	This is a modified variometer, Patt.No. 3095 used for fine tuning the aerial circuit.
Switch. 3-pole. 2-way (O).	This switch has been arranged to put in or out of circuit condensers (L) and (M) as required. For convenience in compiling table of adjustments of frequencies used they are marked by an ivorine label. Arms are marked X, N, and W for convenience in making table of tuning adjustments.
Switch. safety (P).	These are Patt.No.1790 switches, safety, Type 4, and are placed in the primary leads to the H.T. transformer.
Aerial coil (Q).	This is coil, inductance, Patt.No.5195, 150 mics, 25 amps.

NOTES ON GUIDANCE WHEN ERECTING SET AT BERMUDA W/T STATION.

The S/W transmitter has been erected in two panels, one above the other. When the lower panel has been placed in position, the first thing to do is to hoist in the Patt.No. 7205B transformer. This transformer must be placed so as to fit as snugly as possible in the corner of the panel, i.e. as far back and as near the side. The lifting bolt should be actually touching the side. The secondary terminals of the transformer should be toward the front of the panel so that the leads from the anodes of the NU2 valves can be joined direct to the outers. After getting the transformer in its place, take care that it is filled with clean insulating oil to the proper level. Join up the leads to the primary of the Patt.No.7205B transformer. Then lift on the upper panel. Place the Patt.No.5054 stand for 2 Patt.No.1779 condensers in the position marked for it and fit in the 2 Patt.No.1779 condensers. Then screw on the aerial ammeter, anode ammeter and filament voltmeter at the places marked for them on front of the blower box, and join up the leads as marked. Screw on the adapter and blower piping to its position under the blower box. Link up the safety circuit by means of the links which have been left on the lower terminals.

Place the long-wave panel in its position alongside the S/W panel as shown in the photographs. Fill the No.40 condenser with clean dry insulating oil and fix it on its insulators. Place in position the Patt.No.6736 condenser and join the leads to these as marked on the labels. Place the two Patt.No.4977 condensers, 1 mfd. in the trays and secure the leads to them as marked on the labels and be sure that the series link is joined up. Put in the valves and join them up. Join up the primary transformer leads to the terminals in the bottom of the panel. Link up the auxiliary safety circuit and the lead from the single pole change-over switch to the single terminal on the side of the L/W panel.

Join up the leads from the "Board, distributing with safety and control circuits" to the main terminal board in short-wave lower panel and control board, put 220-volt, 32 c.p. lamp in lampholder in filament switch circuit.

Screw on all 3 ply covers and glass doors and set should be ready for working. All leads and instruments taken from the panels for transport have been marked with labels to facilitate the re-erection of the set.

To replace the NU2 valves the cover at the back over the transformer must be removed. Before attempting to take off this cover see that both the glass doors on the front of the panel are open and right down.

To replace NT4A, disconnect the lead from the centre of 3-pole switch X to the aerial insulator and the valve can be removed from the front.

NT23B can also be removed easily from the front. NT23B valves are normally supplied in cylindrical holders. The valves will have to be carefully removed from this holder and placed in the open type of holder supplied with the set

21.428 TO 6.000 kc/s. (14/50 METRE) TRANSMITTER.

Rough Adjustments.

Condenser in Series with L.

Turns on Coil.	Condenser.	Frequency kc/s.	Wavelength metres.	Remarks.
2-1/4	RIGHT OUT. MINIMUM.	21.127	14.2	
2-1/4	About 1/3.	18.293	16.4	
3-1/4	"	16.854	17.8	
4-1/4	"	15.000	20	
5-1/4	"	13.636	22	
6-1/4	"	12.397	24.2	
7-1/4	"	11.111	27	
8-1/4	"	10.417	28.8	
9-1/4	"	9.934	30.2	It will be seen from this table that by a suitable arrangement of L and C any frequency from 21,127 to 5,769 kc/s. (14.2 to 52 metres) can be obtained.
10-1/4	"	9.464	31.7	
11-1/4	"	9.091	33	
12-1/4	"	8.824	34	
13-1/4	"	8.571	35	
All in	"	7.792	38.5	

Condenser in Parallel with L.

2-1/4	About 1/2	13.043	23	Where a frequency can be obtained on both series and parallel arrangement, that which gives best aerial current should be chosen.
3-1/4	"	11.538	26	
4-1/4	"	10.000	30	
5-1/4	"	9.009	33.3	
6-1/4	"	8.451	35.5	
7-1/4	"	7.752	38.7	
8-1/4	"	7.177	41.8	
9-1/4	"	6.742	44.5	
10-1/4	"	6.173	48.6	
11-1/4	"	5.693	52.7	

TABLE 1.

1,364 TO 272.7 kc/s. (220/1100 METRE) SET.

Adjustments.

Frequency kc/s.	Wavelength metres.	Anode Coil.	Grid Coil.	No. 40 Condenser.	Switch X.	Switch M.	Switch W.	Vario-meter.	Aerial Coil.	Loading Condenser.
1,364	220	1	3	21	UP	DOWN	CENTRAL	0	NIL	OUT
1,111	270	1	3	35	"	UP	"	-3	"	"
1,000	300	1	3	50	"	"	UP	-1.5	0-5	"
750	400	2	4	40	"	"	DOWN	+9	0-5	"
500	600	3	5	60	"	"	"	-1	12-2	"
375	800	3	5	110	"	"	"	+3	24-1	"
272.7	1100	3	6	105	DOWN	"	"	0	30-1	IN

TABLE 2.

BERMUDA

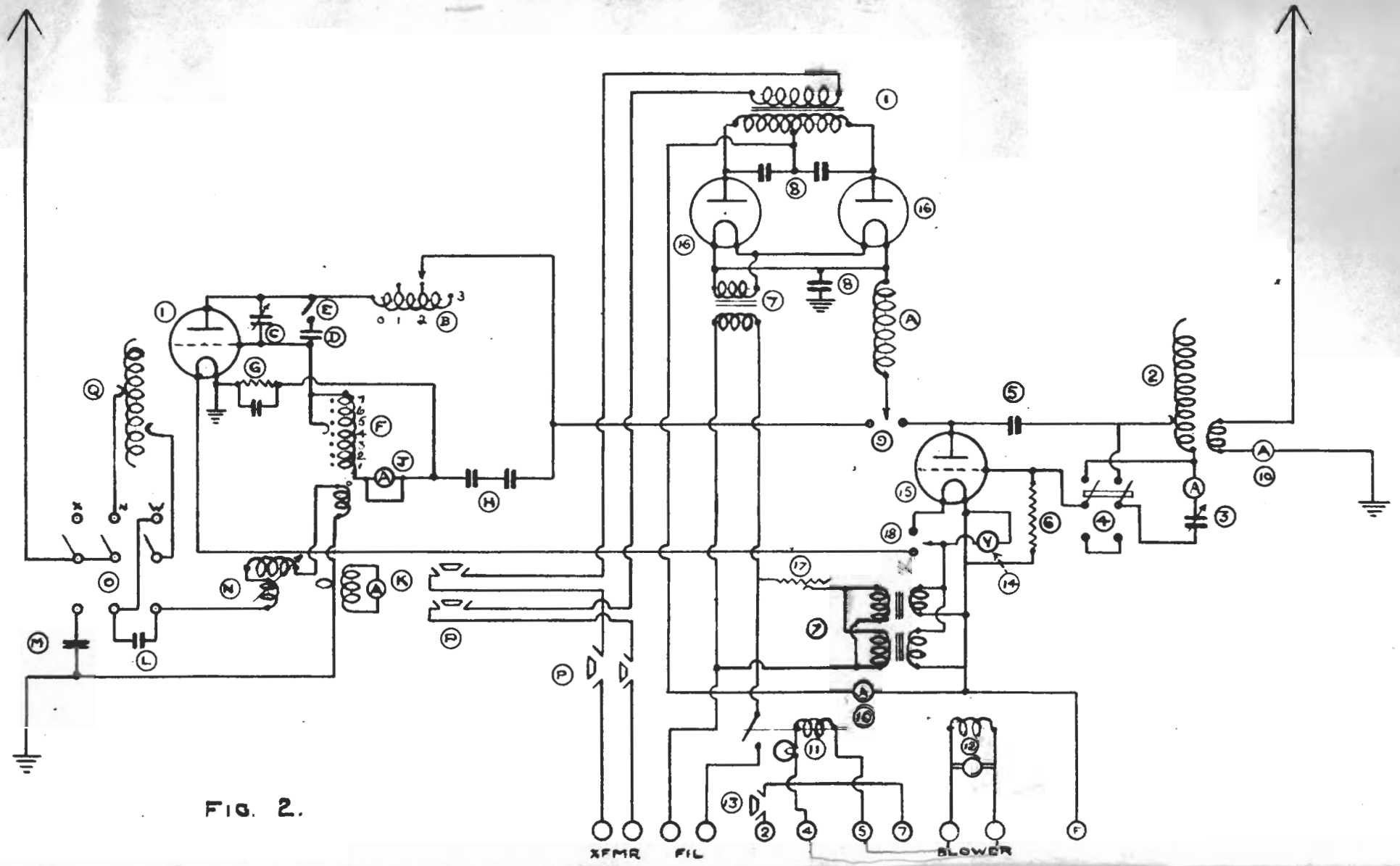
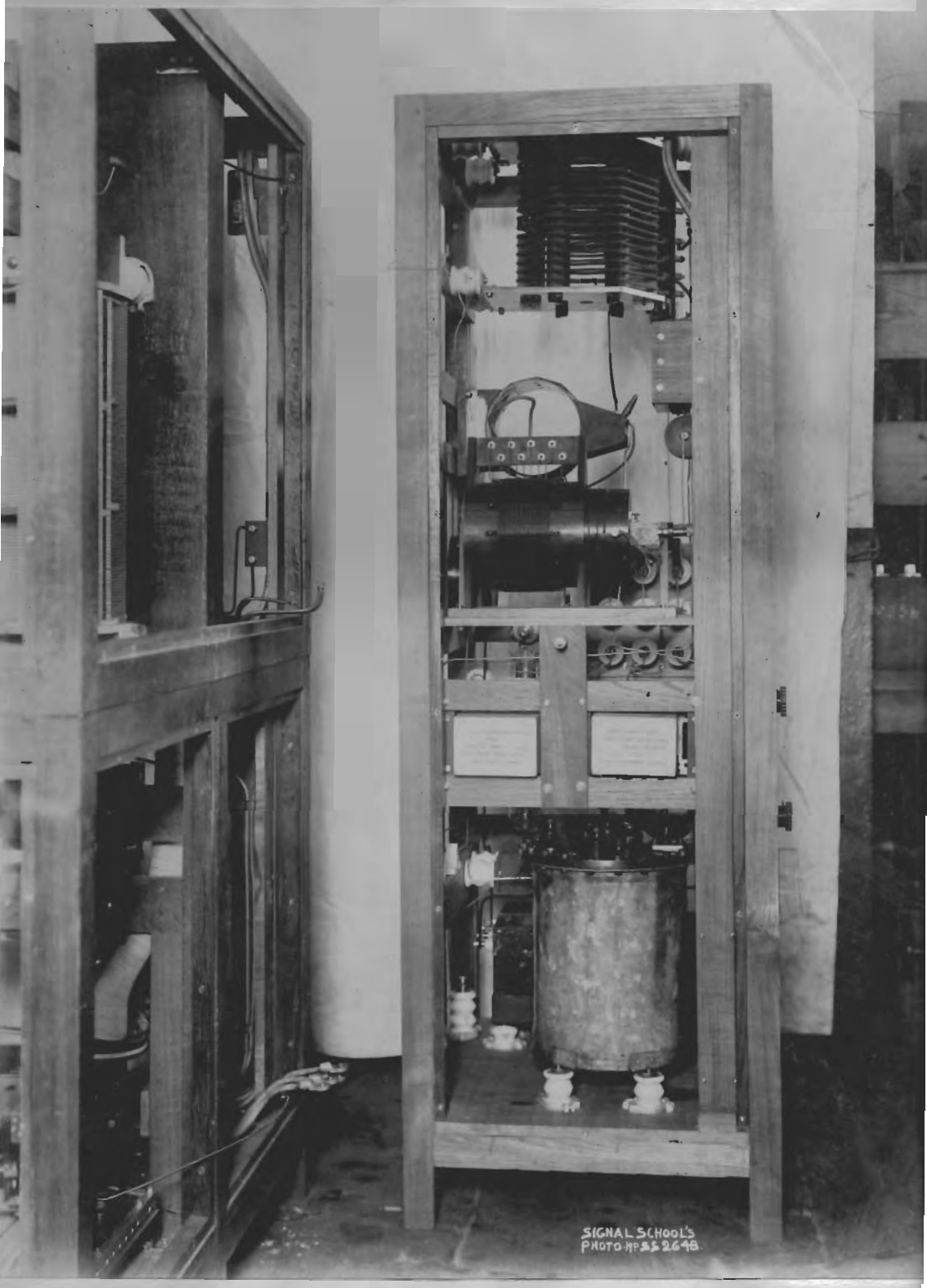


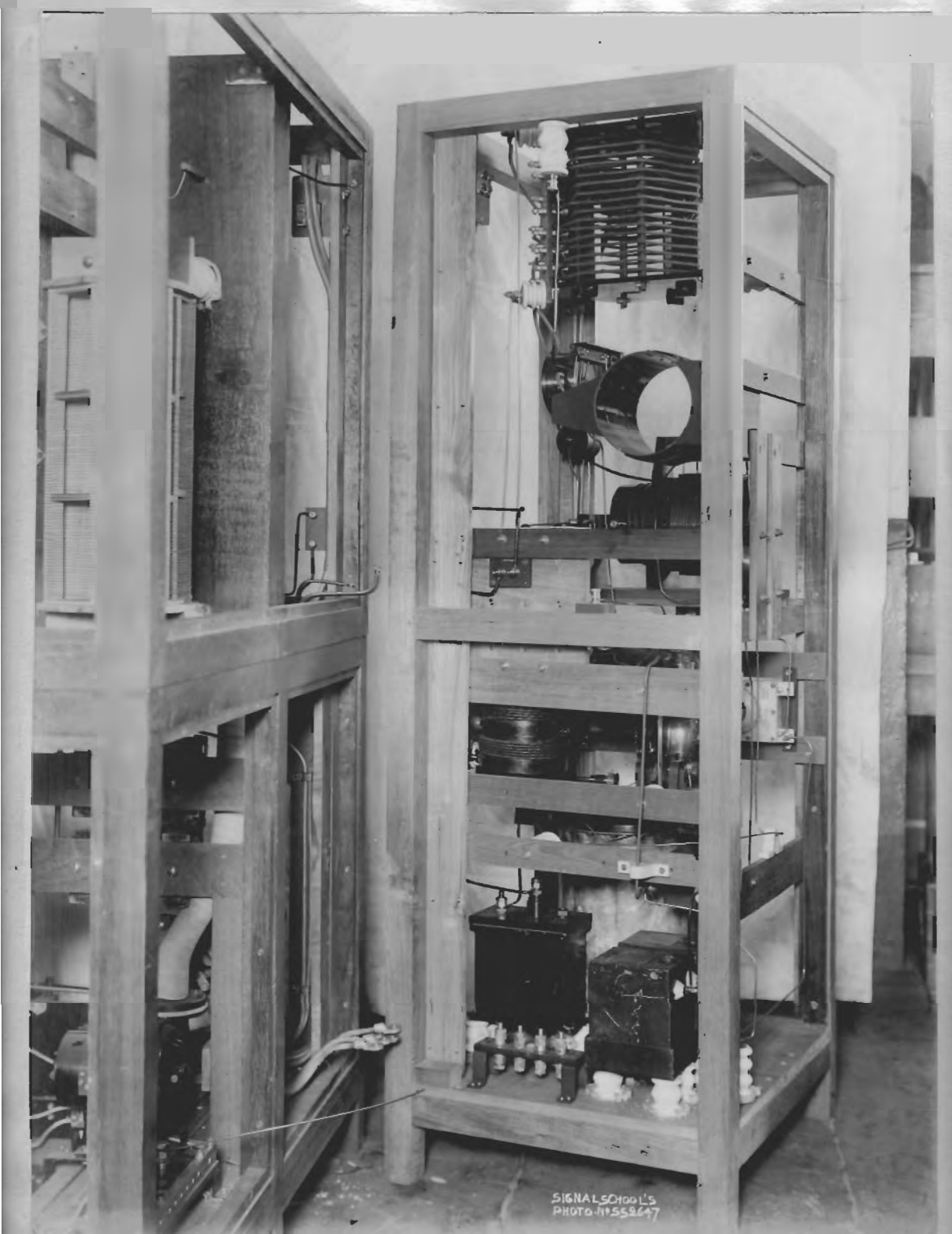
FIG. 2.

SIDE VIEW OF L/W PANEL.



Photograph No. 1.

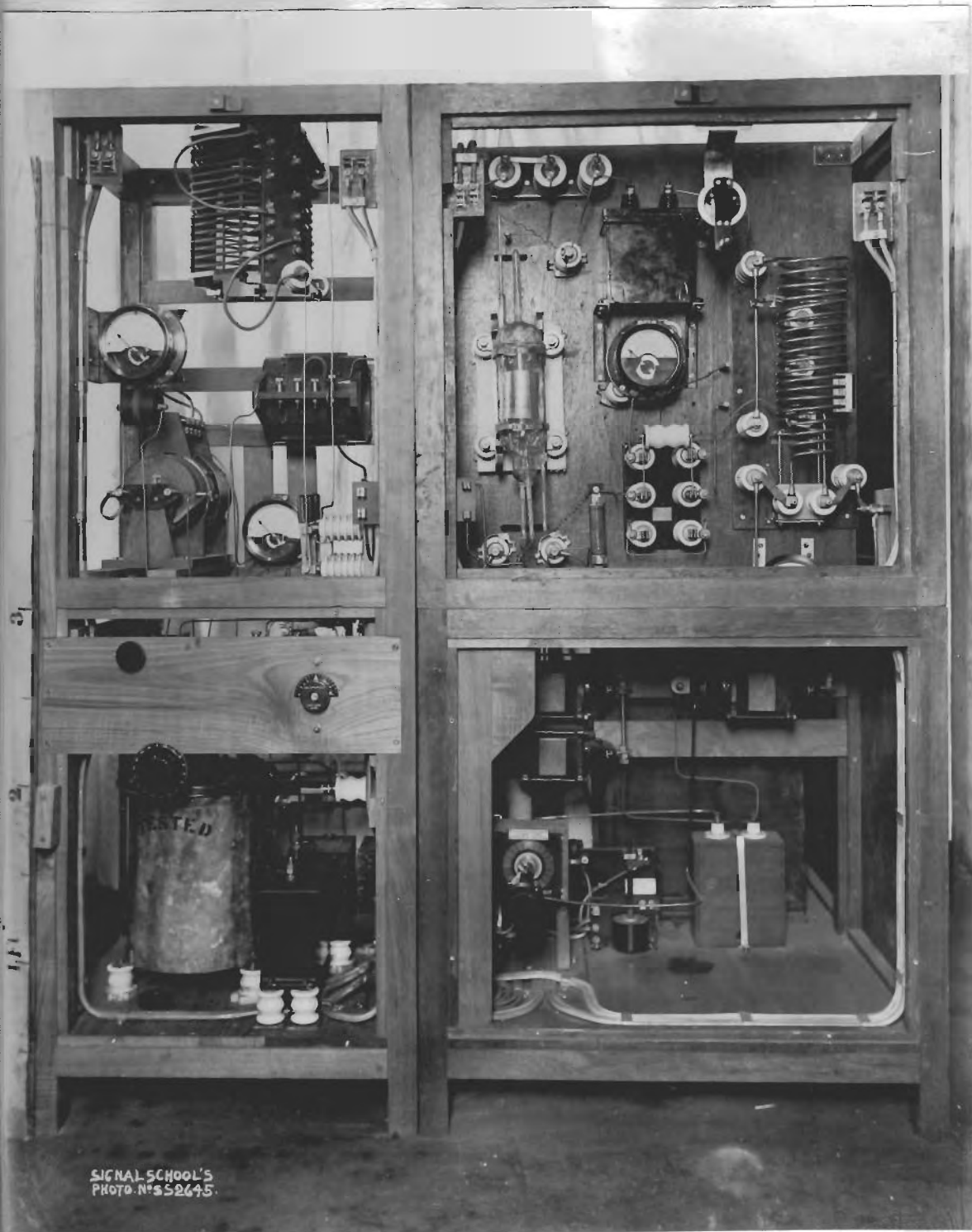
SIDE VIEW OF L/W PANEL.



BACK VIEW OF TRANSMITTER. COVERS REMOVED.
PANELS IN WORKING POSITION.

SIGNAL SCHOOLS
PHOTO No 552646.

FRONT VIEW OF TRANSMITTER. COVERS REMOVED.



SIGNAL SCHOOL'S
PHOTO. Nº S2645.

BACK VIEW, COVERS ON.

SIGNAL SCHOOL'S
PHOTO. NO. SS2644.