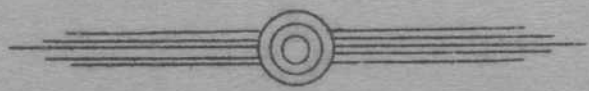


100 W4

DEPARTMENT OF TRANSPORT
RADIO DIVISION

REFERENCE DIAGRAM
AND
OPERATING INSTRUCTIONS
FOR

MARCONI 100 WATT RADIO TRANSMITTER,
TYPE 100 W4 C.W. I.C.W.



Halifax
P. O. Box 217
Mar 21/42

Dear H.A.B. :-

Check up on your diagrams
in that large folder - Examinations
See if you have an auto alarm
MST 1 MST mA 500 Watt +
emergency 50W. I can find no
record of receiving them here
If say they were supplied
over a period of two or three years

Let me know immediately
Yr's
W.H.

Inst. and op. Inst. T. C. I. 100/10/

INSTALLING AND OPERATING INSTRUCTIONS FOR
100 WATT. SHIP TELEPHONE, C. W. and I.C.W.
TRANSMITTER EQUIPPED WITH TWO WAVE SELECTOR
SWITCH 600 - 800 METRES.

Installing Transmitter.

The transmitter should be fastened to the operating bench sufficiently clear of bulkheads etc. to permit easy access to all parts and in such a position that the meters may be read and control switches manipulated by the operator from his seat. It is suggested that the transmitter be placed to the left of the operator, the receiver directly in front and the send-receive switch to the right of the receiver either on the wall or on the operating bench and near the transmitting key. The aerial lead should be placed so that the internal lead is as short as possible.

Setting Up Motor-Generator.

The motor-generator should be firmly bolted to the deck and when possible, enclosed in a silence chamber of ample dimensions to facilitate reception with the machine running. The motor starter and field rheostat should be mounted in an accessible position. It is important that the field rheostat be easily accessible in order that the operator may have full control of the filament voltage as it may be found frequently necessary to readjust owing to variations in the supply voltage.

Wiring H. T. Circuit.

The positive H. T. line is to be wired with the special H. T. lead covered cable supplied for this purpose. All lead covering should be well grounded, but not connected to the earth lead used for the receiver. The negative H. T. line can be wired with ordinary #14 lead covered wire as this lead is earthed on the transmitter.

Wiring L. T. Circuits.

The 12 volt filament circuit should be made as short as possible and as there is considerable current flowing in this circuit, #10 L. C. wire should be used when the total length of wire does not exceed thirty feet. If a greater length is required it is advisable to use #8 L.C. wire to avoid too much voltage drop.

For the six volt microphone and tone wheel battery, #14 L. C. wire may be used as the current in this circuit is low.

Wiring H. F. Circuit.

The aerial circuit from the aerial terminal on the transmitter to the change-over switch and from there to the lead-in should be wired with standard 31.7/29 transmitting flex or #6 tinned bare copper wire and mounted on porcelain wall insulators.

The earth lead should be wired with #6 stranded wire and should be made as short as possible. Particular care should be taken to obtain a good contact to the deck plating or beams. The standard earth bolt and washer is satisfactory for this purpose.

Wiring Keying Circuits.

Ordinary twin flex is suitable for wiring both the C.W. and Tonic Train Key leads, which may be fastened with insulated staples provided no moisture is present. If there is danger of moisture the wires should be mounted on porcelain. One key is provided for both C.W. and Tonic Train transmission, a D.P.D.T. switch enabling a change from one circuit to the other.

High Tension Control

The high tension magnetic switch control on the aerial change over switch should be wired with twin flex and mounted on porcelain or wooden cleats.

Checking Up Connections and Circuit.

First check over all connections to see that no errors have occurred in wiring. See that all fuses are inserted. The high tension fuse is a piece of #40 copper wire between the terminals mounted on lower back terminal board, close to the positive high tension lead in insulator.

Next push in switch buttons controlling filaments and tonic train, leaving anode supply switch open. This latter switch is in series with contactors on aerial change-over switch and unless same is placed in the transmit position, the anode supply switch remains inoperative. Consequently, it is advisable to put aerial change-over switch in the transmit position and control the transmitter by the push button switches until all adjustments are completed.

With valves out of the sockets, start up motor-generator and check polarity if the low tension voltage by the correct reading of the D. C. voltmeter which should read about 13 volts on no load. Now press a note control switch when the tonic train motor will start up and high tension will be applied to the circuit for a straight breakdown test. Failure of the tonic train motor to start may be caused by the contactor on the H. T. magnetic switch not closing properly or the speech-tonic train switch in the wrong position. If due to the former, the contactors require slight bending or the eccentric back rest required turning slightly to make a smaller gap. Before touching any gear inside transmitter, be sure and stop the motor-generator and discharge the smoothing condenser by means of the push button provided, otherwise a dangerous or even fatal shock may be received.

Tuning.

The type 100 W4 transmitter is provided with a two wave selector switch enabling any two wavelengths to be selected within the band from 500 to 800 metres. This switch is manually operated and is mounted on top of the transmitter. It changes the anode, aerial, earth and grid taps and also the counterpoise tap, but this latter is not used on ship installations.

To obtain approximate adjustments for the 600 metre setting, place the earth tap about three quarters of the way along the inductance towards the grid end. Count down still further four turns and connect the grid tap. Next count up from the earth tap 18 turns and place the anode tap and lastly, count up 20 turns from the earth and connect the aerial tap. These settings will be only approximate and may require considerable changing before the set is finally tuned up.

For the 800 metre adjustment the earth tap is placed 8 turns from the grid end of the inductance, the grid tap at the extreme end or 8 turns down from the earth tap, the anode tap up 18 turns from the earth and the aerial up 28 turns from the earth.

Next place two U. V. 203-A valves in the valve sockets and adjust modulator bias battery to 45 volts negative on the grid for testing. 30 volts negative is the standard voltage for operation. Start motor-generator and adjust field rheostat and filament adjusting handle to reach 10.8 volts on the D. C. voltmeter with both valves lit. Place aerial change-over switch in transmit position. Press anode control buttons when tonic train motor will start up and the set should oscillate as indicated by a reading on the aerial ammeter.

A wavemeter reading should now be taken and the set tuned to 600 metres. Adjust the anode and grid taps to obtain maximum output with complete stability. This will be indicated when the aerial amperes are at a maximum with a feed of approximately 150 milli-amperes to the oscillator valve, the anode of which will be running slightly red.

It will be noticed that there is a considerable voltage drop on the valve filaments while the tonic train motor is running up to speed. The filament and generator controls should be adjusted so that the voltage does not drop below 8.8 volts. When the motor is running at full speed, the voltage will be about 11 volts with the transmitter not oscillating.

The 800 metre wave may now be tuned and adjusted for maximum output.

To modulate on I.C.W. first switch off the high tension and discharge the smoothing condenser. Switch on modulator battery and adjust bias battery to 30 volts negative on modulator valve grid. Place signalling key in the tonic train position. Check secondary of modulation transformer to see that there are not more than two sections in use. Apply high tension to the transmitter when oscillator mill-ammeter should read approximately 150 milli-amperes and modulator approximately 75 milli-amperes. Now press signalling key. Modulator current will rise slightly to about 90 milli-amperes, oscillator current will fall about five milli-amperes and aerial current will rise about one ampere. These readings are all approximate.

In the event of a flash over occurring in the oscillator valve socket, shut off high tension and cut out one section of the modulation transformer secondary. If this does not cure the trouble the 6 volts modulator battery should be reversed.

It may be mentioned at this point that the oscillator impedance should be at least 7,100 ohms. that is to say, 140 milli-amperes plate current at 1,000 volts. High impedances than this will cause flash-overs in the valve sockets and very much lower impedances will cause overloading of both modulator and oscillator valves. The plate current should therefore be kept between 140 and 160 milli-amperes for the oscillator and the modulator plate current should be adjusted not to exceed 100 milli-amperes on a dash. The modulator anode will be quite hot on a tonic train dash, but on a signalling or speech load will be quite safe.

For speech transmission, plug microphone in jack on lower left hand side of panel and press speech control button. It will now be found that the tonic train motor does not start when high tension is applied.

To signal on C. W. throw speech - C.W. switch to the C.W. position and the signalling key to the C.W. key circuit. On closing the anode control switch both oscillator and modulator milli-ammeters will read practically zero, but when the signalling key is pressed they will both read about 70 milli-amperes.

If the transmitter is to be used on C.W. exclusively a very much greater output can be obtained by adjusting the anode and grid taps so that each valve draws approximately 120 milli-amperes. The transmitter is designed to give approximately 80 watts in the aerial on speech and tonic train and 100 watts on C. W. On this adjustment, the C. W. speech control switch can be worked even though the power is left on, this providing an instantaneous change-over of the two methods of signalling. The wave change switch can also be manipulated while the power is on.

Aerial Specifications.

The aerial should be of the two wire inverted "L" type whenever possible. Down leads from each wire should be carried to the lead-in insulator and fastened to a strain insulator. Insulation throughout to be of glazed porcelain, the standard $1\frac{1}{2}$ by 20" rods being used. On ships with low masts or a very short spread, it may be necessary to erect a three or four wire aerial. In cases where a three or four wire aerial is used, it is advisable to put turnbuckles in the middle wire or wires so as to enable all wires to be set up equally taut. If the wires are allowed to become slack and awing about, variation of wavelength will result when the ship is rolling or in a heavy wind.

Nov. 12th, 1927.

General Description.

This transmitter uses what is commonly known as the "Hartley Oscillatory Circuit" with paralleled high tension supply, making use of one UV 203A Radiotron Valve as an oscillator and one 50 Watt UV 203 or UV 203 A Radiotron Valve as a modulator, when used for telephony or tonic train transmission. The characteristics of the UV 203 Valves are different from those of the UV 203 A, and care should therefore be taken to use only valves of the same type for the modulator and the oscillator. The two valves are operated in parallel for C.W. Transmission. The filaments of the two Valves are heated by a secondary winding on the generator delivering 12 volts at 50 watts. A series regulating resistance is used which permits a very close adjustment of the filament voltage which, for these particular valves, should be exactly 10 V.

Mounted on the lower panel of the angle iron frame is the filament voltmeter, the handle of the filament regulating resistance, the jack for plugging in the carbon microphone for telephony, or the buzzer and key circuit for tonic train, also the microphone battery switch, the high tension condenser shortening device and the modulator change-over switch, which is used for changing over from T.T. to Telephone, also the H.T. and filament current switches.

Behind the lower panel and mounted on the bottom base board are the high tension relay, speech choke (in iron shielding case), modulating transformer, filament regulating resistance and H.T. filter condenser.

Above the lower panel are two small subpanels at right angles to one another and protected by screening. Mounted on the panel, facing the front of the set, are two milliammeters (0-250 M.A.); the meter on the right is connected in the circuit to the plate of the modulator valve and indicates the modulator plate supply current, and the meter on the left indicates the feed current supply to the oscillator circuit. The high tension change-over switch is also mounted on this panel. On the second panel mentioned above is mounted the grid change over switch; the positions of this switch are indicated by engravings on the panel.

Behind the subpanels are mounted the anode blocking condenser, grid leak and grid condensers, the radio frequency choke and the modulator biasing battery.

Directly in front of the A.T.I. and between the two valve sockets and mounted on a small panel is the aerial ammeter. These parts are also protected by screening.

Two terminals boards are mounted on the back of the set. Terminals for high and low voltages, the C.W. signalling key aerial change-over switch and microphone, and T.T. signalling key are mounted on the lower terminal board. On the upper terminal board, directly behind the A.T.I., are five adjustable flexible connections to the A.T.I. unit. These are for aerial, anode, grid, earth filament and counterpoise connections. The aerial, earth and counterpoise connections are carried through to terminals for the necessary external connections.

Connecting the Set.

It is advisable to locate the set where the earth, aerial and counterpoise leads will be as short as possible, and where room can be found to place the motor generator together with the speech amplifier and batteries, if supplied, so as to

The speech amplifier, if supplied, should be separated from the transmitter and the motor generator by at least four feet, in order to avoid pick-up of noises from these instruments. The motor generator should be set upon a level base and fastened with lug screws. If it is found necessary to silence this machine, felt strips can be placed underneath the base before setting up the lug screws care being taken to see that the machine is level otherwise there is a likelihood of one bearing heating up owing to thrust friction on the non-lubricated edge of the bearings.

Wire up the A.C. line connections using at least #10 R.C. Wire insulated in the approved manner. The starting current of the motor generator is high, and the line should be fused with 35 amp fuses on the starting side of the main switch. Six ampere fuses only are needed on the running side.

High Tension Direct Current Connections.

Great care should be taken in connecting up the high tension plate current supply to see that everything on the positive side is well insulated, as this line carries a potential of 1000 volts above earth. The negative side being earth potential, the same care need not be observed. Use at least # 18 rubber covered wire insulated to carry 2000 volts for all high tension connections.

Microphone & T.T. Buzzer Supply.

This consists of a 6 V 80 A.H. accumulator battery, and is connected to the 6 V terminals marked " " and " - " D.C. on the lower terminal board at the back of the set using # 18 rubber covered wire to make these connections. This line is fused to prevent any injury to the battery through accidental short-circuit in the set.

Smoothing Device.

The smoothing device for this transmitter consists of three 1 Mfd., condensers connected directly across the H.T. α lines after the fuse and before the speech choke. Care should be taken at all times to discharge this condenser by means of the short-circuiting device mounted on the lower panel and before doing so see that the H.T. relay switch is open.

Operating.

The dimensions of the aerial and counterpoise depend on what wavelength it is desired to operate the set on. For a wavelength of from 300 - 500 metres, an "L" type aerial, consisting of four wires 75' long, spaced 3' apart and 65' high, with a counterpoise of the same dimensions and about 8' above the ground, will be found to give very good results.

Insulation on aerial and counterpoise is a very important matter. If possible, procelain insulators should be used throughout. The earth lead should be of heavy flex cable of at least # 6 copper, and when the lead-in is long, it should be insulated throughout its entire length. The radiation that can be expected should be 4.5 amps, for telephone or tonic train transmission, and 6 amps for C.W. transmission.

To Start Up.

First go over all connections, checking with diagram both on the set itself and externally to make sure that all is O K. Place a UV 203 A Radiotron in each socket, set the modulator biasing battery at 45 volts, adjust the field regulating resistance on the H.T. dynamo to the minimum voltage position, and set the filament resistance to minimum. See that the bearings on the motor generator are filled with a good grade of light machine oil.

With the high tension and filament control switches open, start the motor generator, the filaments of the valves lighting at the same time. Now regulate the filament voltage by means of the filament regulating resistance to exactly 10 Volts, as indicated on the meter on the lower panel. Allow the set to run thus for at least an hour to allow the generator and transformer, etc., to warm up and dry out.

Setting A.T.I. Clips for Trial.

Place the earth filament flex clip at the centre of the A.T.I., counting up from the centre ten turns to place the anode flex clip and seventeen turns for the aerial flex clip. Counting down from the centre three turns, place the grid flex clip and fifteen turns the counterpoise clip. The counterpoise flex clip should not be attached if earth only is used.

The low reading hot wire ammeter supplied with the set should be placed in series with the earth lead running to the set; next close the H.T. control switch and note if any readings are obtained on the hot wire ammeter. If no reading is obtained, allow the H.T. switch to remain closed and note the readings of the two milliammeters on the upper panel. The oscillator feed current should never exceed 150 milliamps, for the U.V. 203 Valve and 130 milliamps for the UV 203 A Valve, and the modulator feed current should be around 50 for both types. When using UV 203 Valves, should the oscillator feed current read over 150 milliamps, the set is not oscillating and the plates will get far too hot for safety, consequently it will be necessary to readjust the anode and grid clips until the set oscillates. This will be indicated by a low reading on the oscillator feed milliammeter. It is now necessary to locate the nodal point or position of the various flex clips on the A.T.I., so that very little or no earth current is registered on the low reading hot wire ammeter. This is obtained by moving the earth or counterpoise flex clip one turn at a time until the desired reading is obtained.

If, when the above settings on the A.T.I., the wavemeter shows the wavelength to be too high, move the aerial flex clip two turns nearer the earth filament tape with a corresponding change of the counterpoise flex clip. These changes will throw nodal point off, consequently, after a reading of the wavemeter shows you to be within two or three metres of the required wavelength, a further line adjustment is made while locating the exact nodal point. The grid and anode flex clips should be adjusted to give a reading of approximate 100 milliamps, on the oscillator feed milliammeter. The H.T. voltage oscillator can then be raised to the full 1000 volts. The oscillator feed milliammeter should then read not more than 130 milliamps for the UV 203 A Valves and 150 milliamps for the UV 203 Valves.

Readings when Modulating.

During voice transmission, both milliammeters should vary very little if the set is properly adjusted. If very violent movements are noted, the set is being over-modulated and re-adjustment of the modulator biasing battery should be made. The best modulation is obtained when both the oscillator and modulator feed milliammeters move up and down with a quivering action, and the depth will be noted by a movement of the aerial ammeter which, however, will be very slight.

Signalling on C.W.

Disconnect the D.C., H.T. supply circuit by opening the H.T. relay control switch, then make sure that the condensers are discharged by pressing the H.T. condenser short-circuiting device mounted upon the front of the lower panel; next open the protecting screens on the front of the set and place the H.T. and grid change over switch in the C.W. position. Connect a telegraph key to the terminals marked "C.W.Key" on the lower panel at the back of the set. Close the protecting screens and connect the H.T. supply to the

No readings will be indicated on the metres until the transmitting key is pressed. The anode flex clip should be moved up a turn or two to increase the feed, or until both milliammeters read 130 - 140 milliamps. Always press the condenser discharge switch before handling or making any adjustments on the set, and before doing so see that the H.T. relay control switch is opened.

Location of Troubles.

No High Tension - Test at terminals of machine with ten 110 V Tungsten Lamps in series, leaving them on for a short flash up only. If no H.T. supply is obtained, test the shunt field and the regulating resistance for open circuit and examine for trouble in the armature. If the generator is O K test for open circuit in the speech choke and the R.F. choke. If trouble is in the latter, a reading will be obtained on the modulator milliammeter but not on the oscillator milliammeter provided, of course, that the latter instrument is working properly and is not open-circuited.

Valves do not light - Test filaments with phone and battery for open circuit. Test secondary windings of generator for voltage.

No Modulation - Modulator grid change over switch in wrong position. If on carbon microphone test for open circuits in the battery line, including fuse switch and modulator transformer primary and microphone itself. If on speech amplifier, check for open circuits in the line input transformer secondary. An open circuit in the modulator valve feed milliammeter will be indicated by no current reading when the H.T. switch is closed.

If the set consistently refuses to oscillate, test the grid leak and condenser for short circuits, and check proper values, i.e., 5000 ohms and .002 mfd. Check valves for grid touching filament. Examine all wiring for open or shorts. If, on closing the H.T. control switch, the dynamo seems to labor under heavy load, it would indicate that either the smoothing condensers or the anode blocking condenser have broken down. It is advisable to place a fuse in the H.T. positive lead close to the generator terminal as a precautionary measure. A short length of # 40 copper wire will answer the purpose.

W3

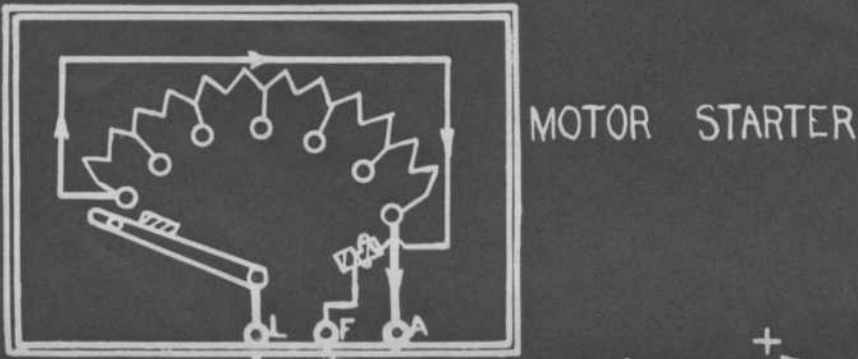
100 WATT TRANSMITTERS (Special) Fitted
with large A.T.I. Units for 1000 Metre operation.

100 Watt Transmitters for operation on 1000 metres wavelength are fitted with 40 turn 15" diameter A.T.I. units and also equipped with a .002 mfd reaction condenser type U.C. 1806 .

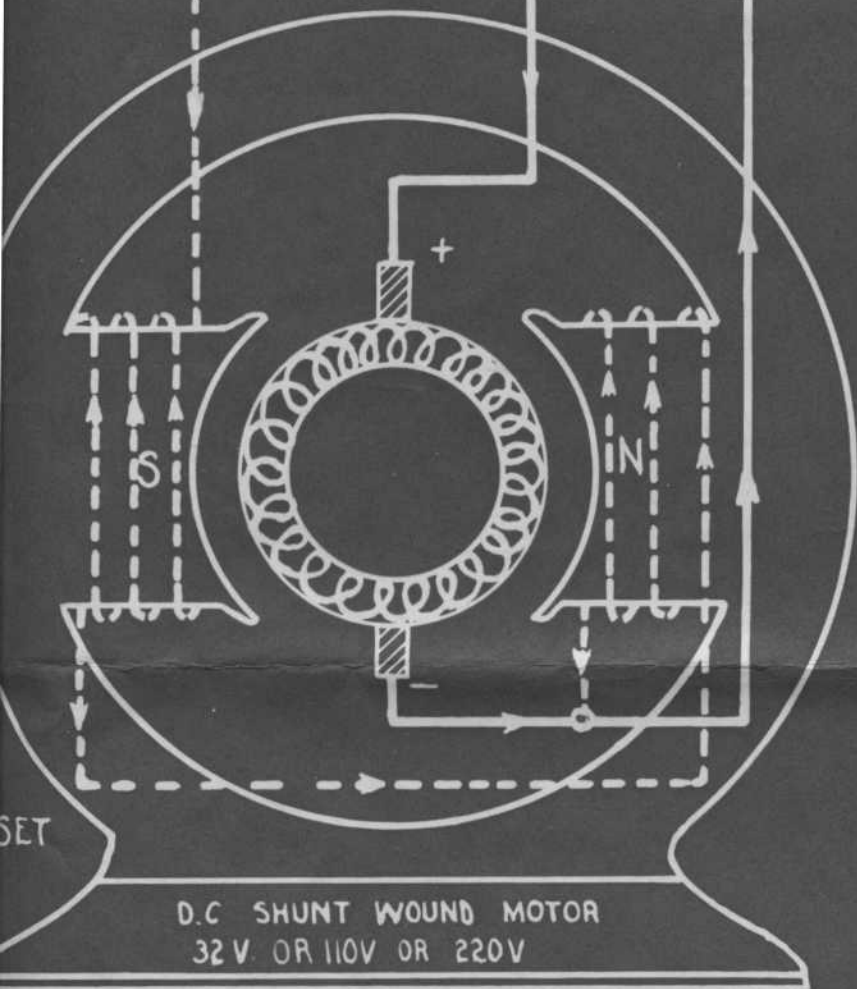
The carrying capacity of this condenser is large enough if the transmitter is used in the normal way for speech or tonic train transmission, i.e., with one valve as modulator and one as oscillator.

If the maximum output of the transmitter is required using the two valves in parallel, a condenser of greater carrying capacity will be required .

OR
(L)



+
D.C.
LINE
-



SET

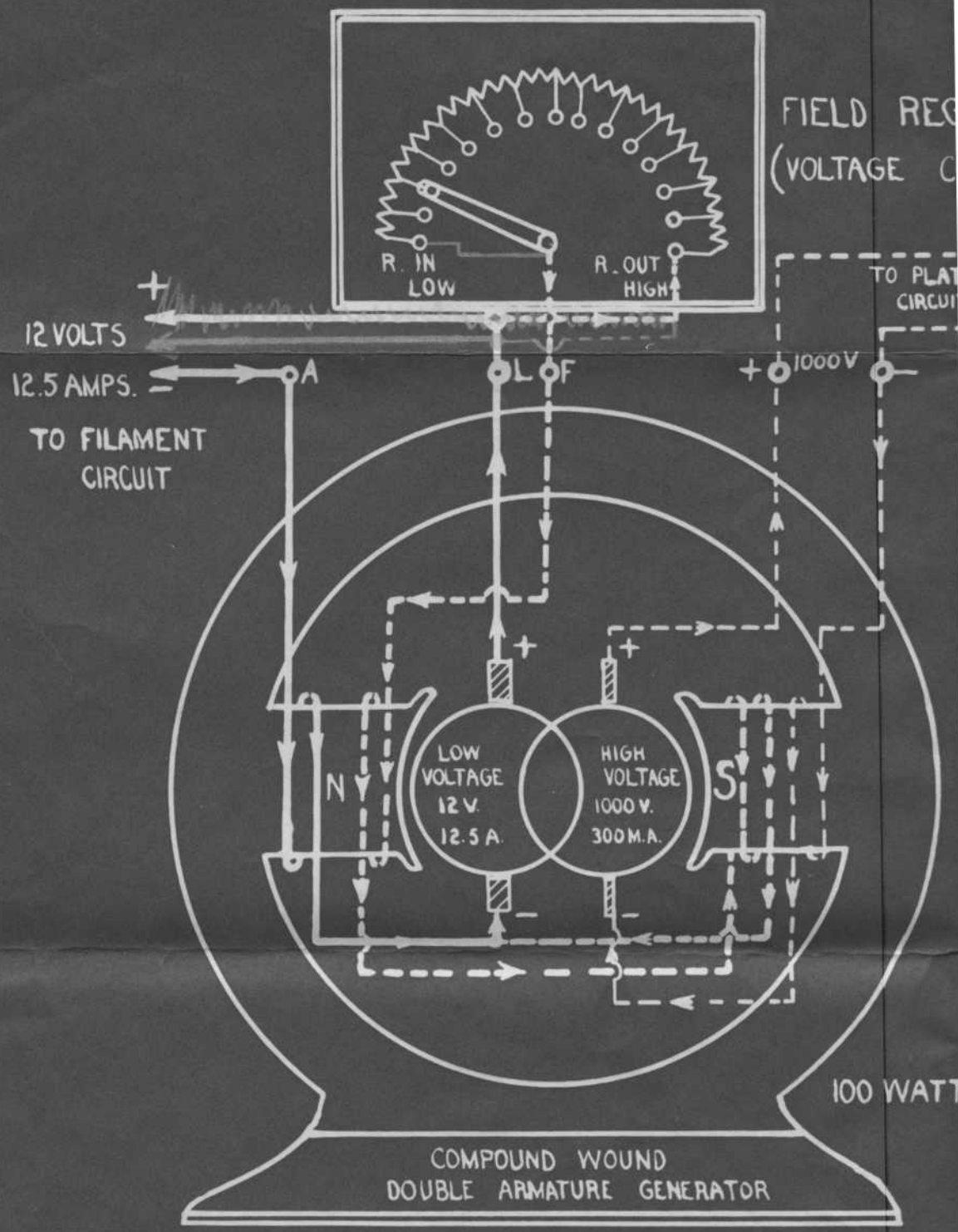
OF 100-WATT M/G SET
SCHEMATIC NO B-20531

SAINT JOHN
VOCATIONAL
SCHOOL

WIRING DIAGRAM OF
100 WATT M/G SET

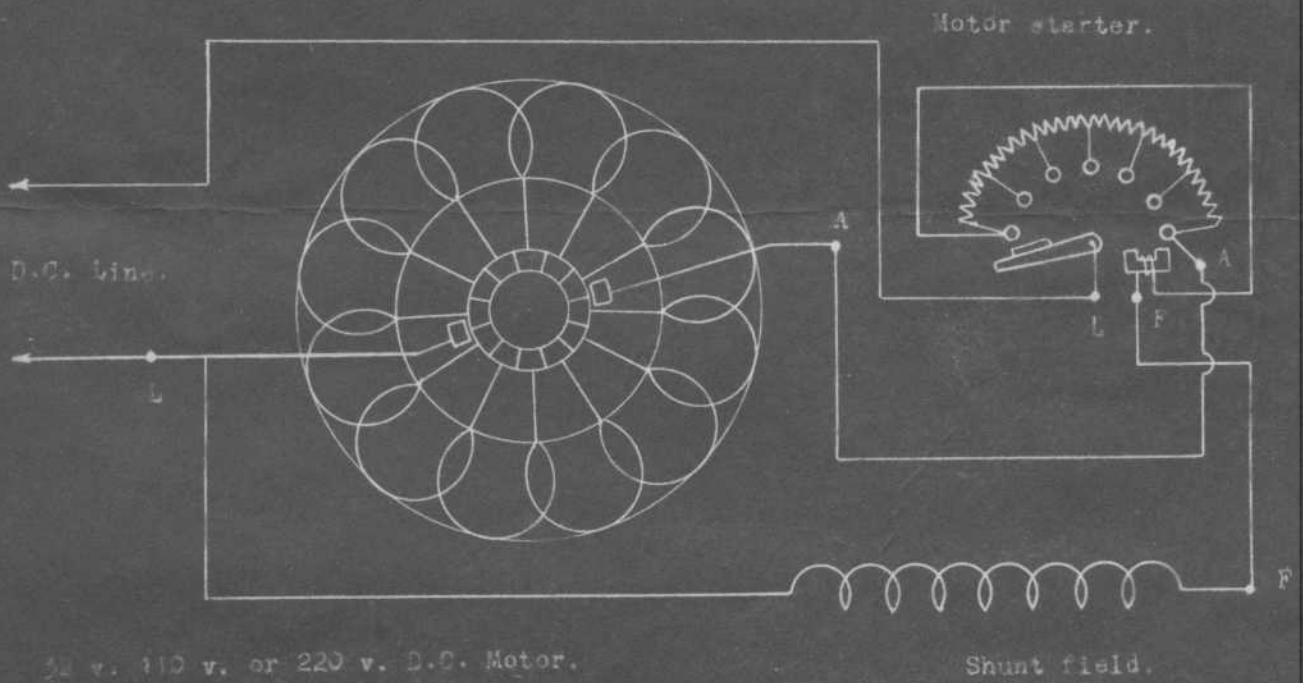
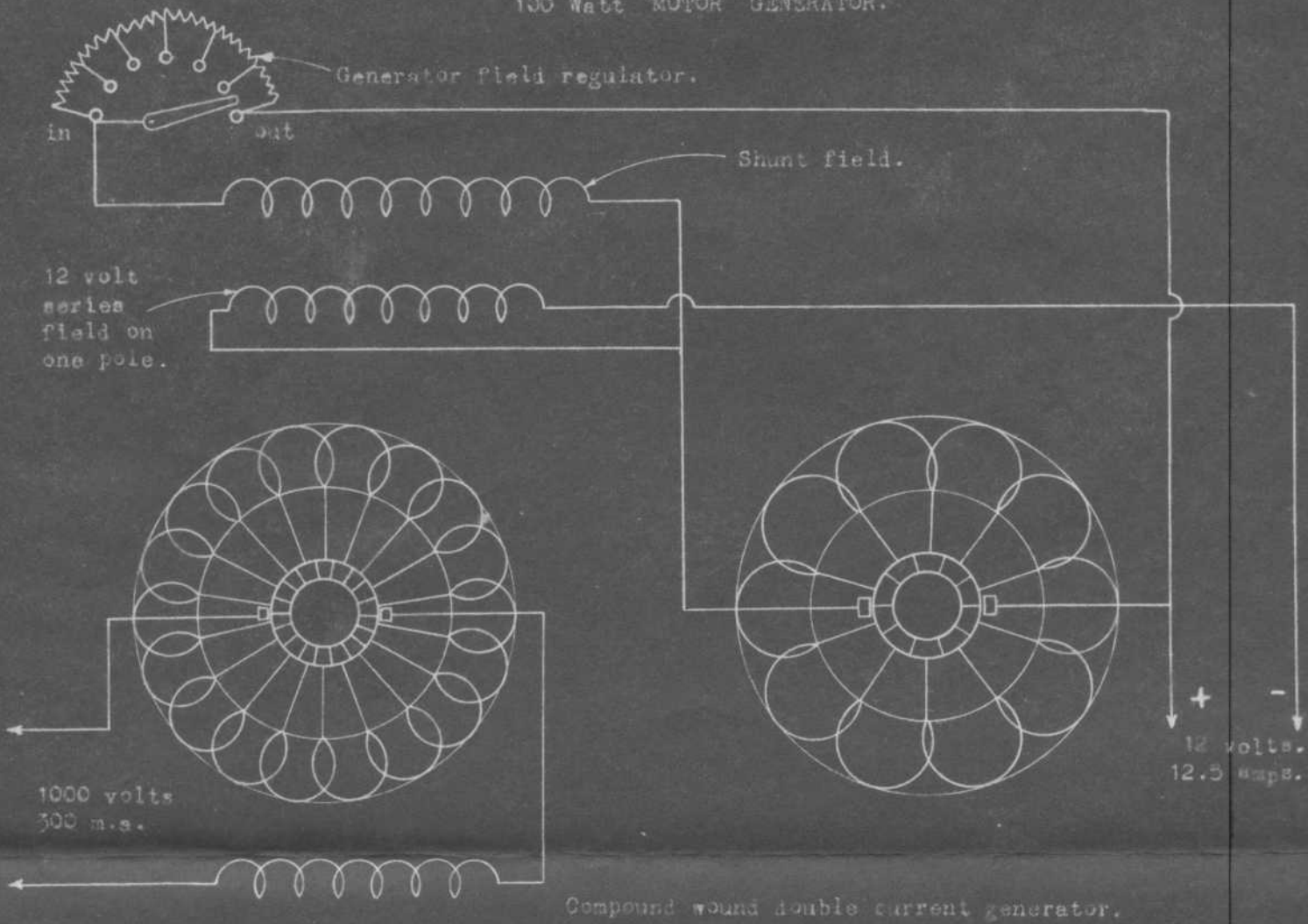
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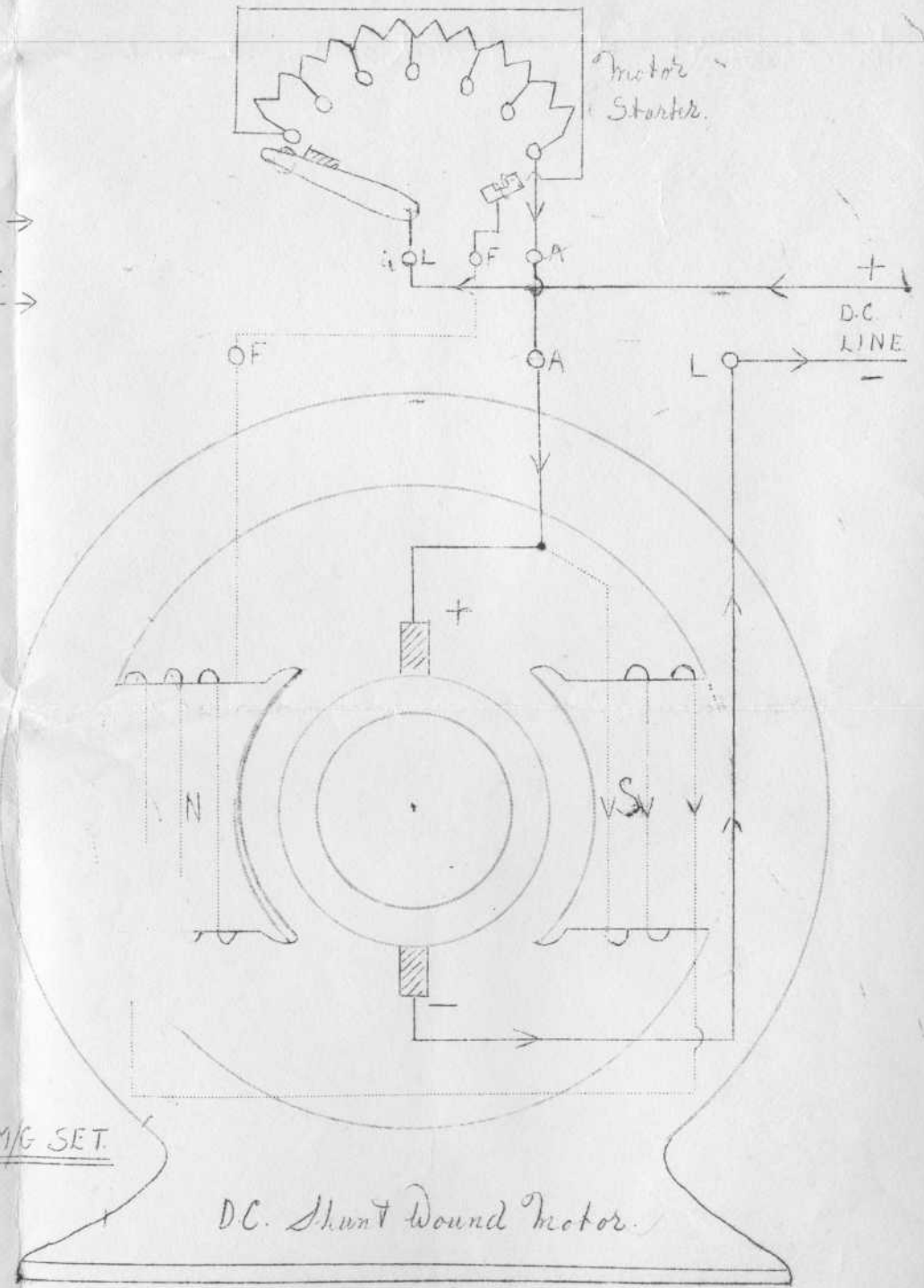
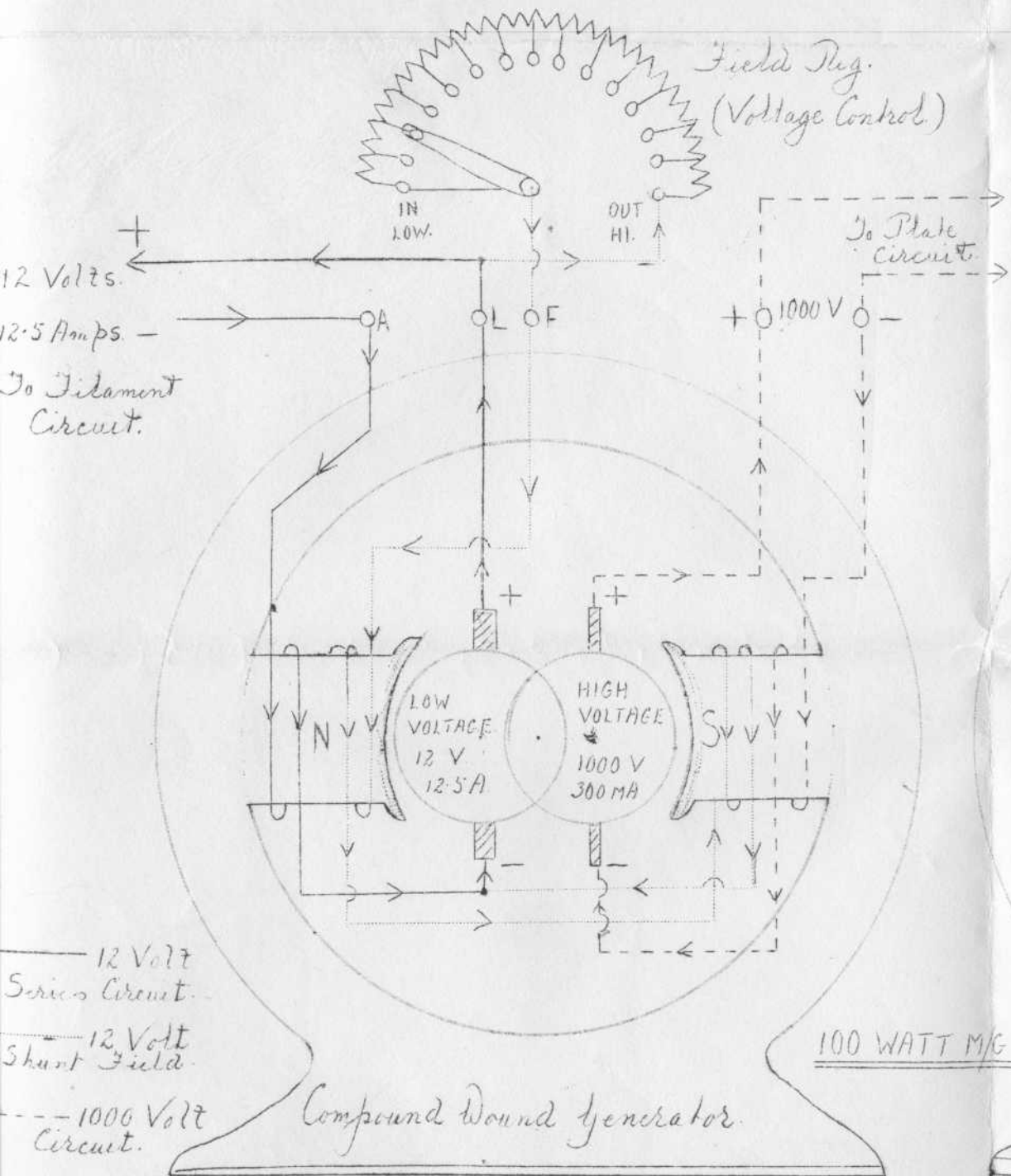
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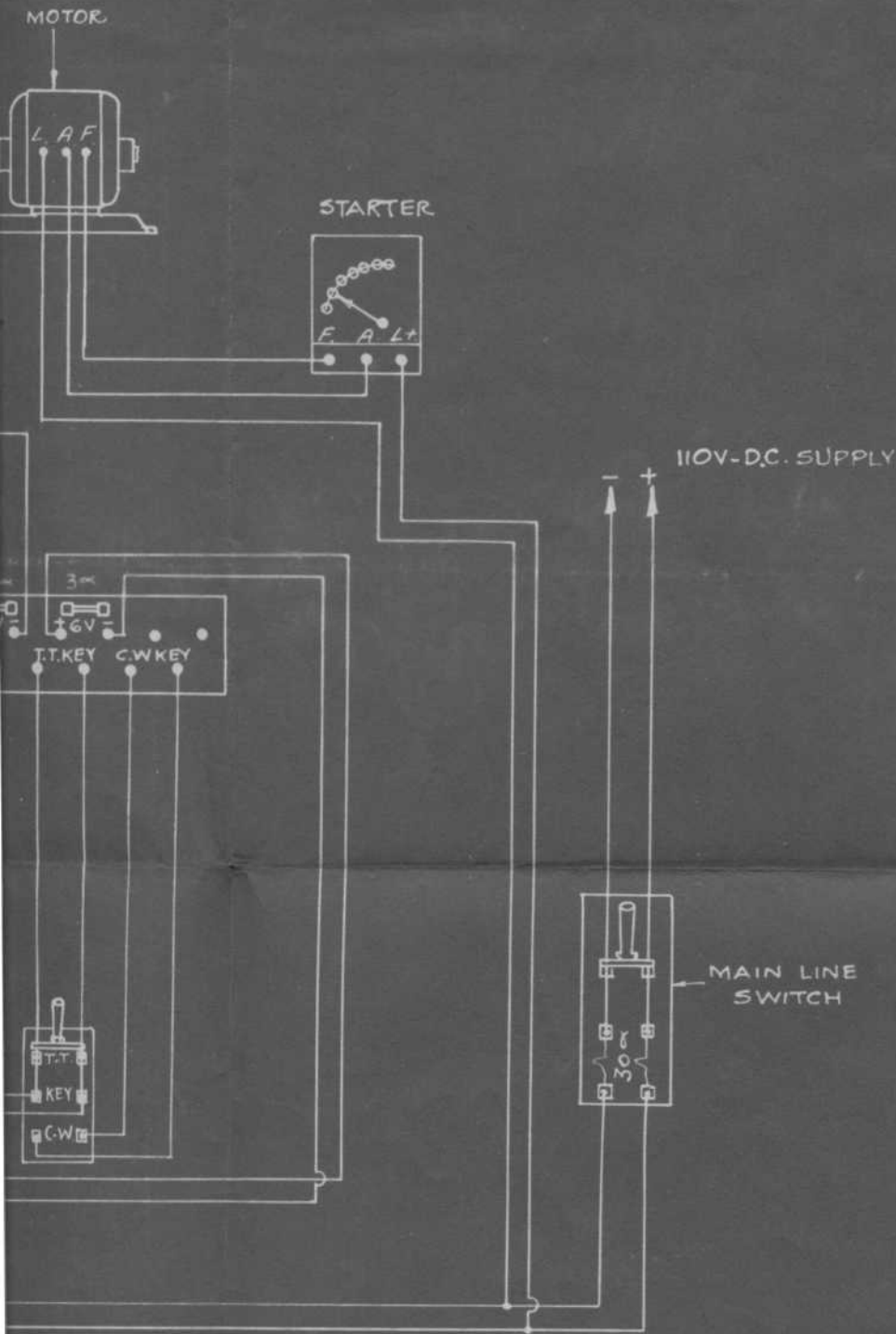


PICTORIAL WIRING DIAG
TO BE STUDIED WITH

100 Watt MOTOR GENERATOR.





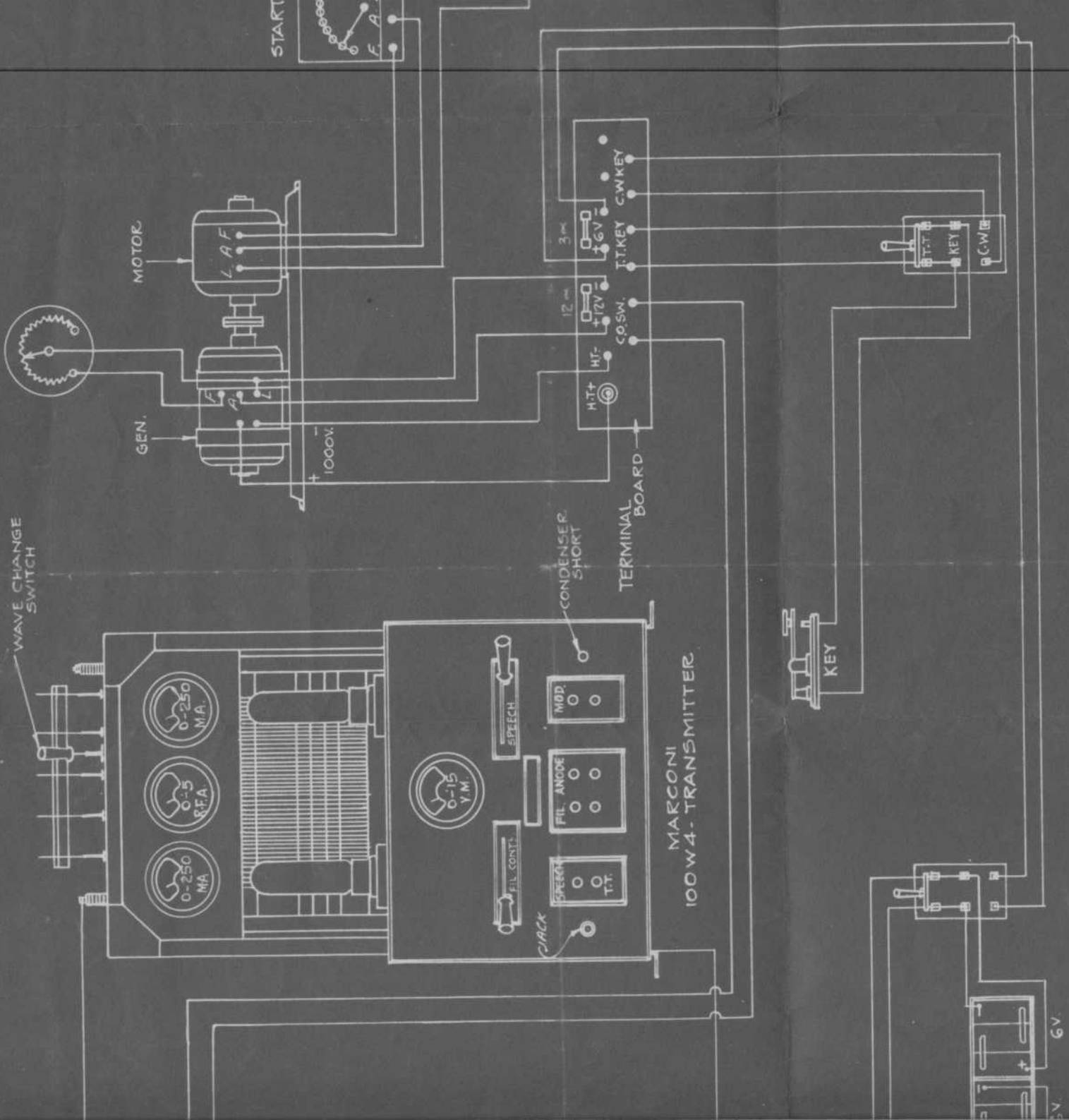


INSTRUCTION SHEET.

W. C.W. AND T. T. TRANSMITTER.

1598

DRAWN BY	gfw
TRACED BY	gfw
CHECKED BY	R. R.
APPROVED	
DATE	NOV. 22-1928



INSTRUCTION SHEET
100 W. C.W. AND T.T. KEY

