Aero Has Short Wave Radio Telephone Transmitter

Surprising Distances Covered with Low Power Sets Under Average Conditions

ATTRACTED to a recently opened new field of radio telephony on the higher frequencies, many broadcast listeners and those experimentally inclined are beginning to exhibit a great deal of interest in short wave radio phone transmission. Much of this interest is being fostered because of the fact the government has recently released a few short wave channels on which transmission by voice is allowed. In the past there were restrictions on voice transmission on the lower waves and all of the work which has been carried on has been by telegraphic means rather than telephonic.

Covers Great Distances

This field is naturally attractive because of the remarkable records that are being established by amateurs all over the world. To supply the demand created by this growing enthusiasm, several well known parts manufacturers have co-operated in the design of a short wave radio phone transmitter, which may be built for approximately the same cost and with the same facility as a good broadcast receiver. While this design is necessarily of a low power type, it has been repeatedly demonstrated that low power is sufficient to carry on conversation over surprising distances.

Built on Two Decks

Referring to the photograph in Figure 1, it will be noted that the manner of construction in this particular transmitter permits the isolation of all parts carrying radio frequency currents to the upper shelf, while all of the circuits associated with the power or voice currents are on the lower deck. This form of construction insures that the masses of metal contained in power devices such as transformers, condensers and other metallic objects will not be in the field of any of the radio frequency coils introducing losses therein. Corresponding to the arrangement of the circuits in decks, the front controls are also grouped. Thus on the upper front panel the reader will find controls for the tuning condensers and the antenna current meter, together with the plate current meter for the oscillator tube. On the lower deck will be found the plate current meter for the modulator tubes, the molulator C bias control, switch for changing from telegraphy to telephony and the necessary binding posts for the key, microphone and battery.

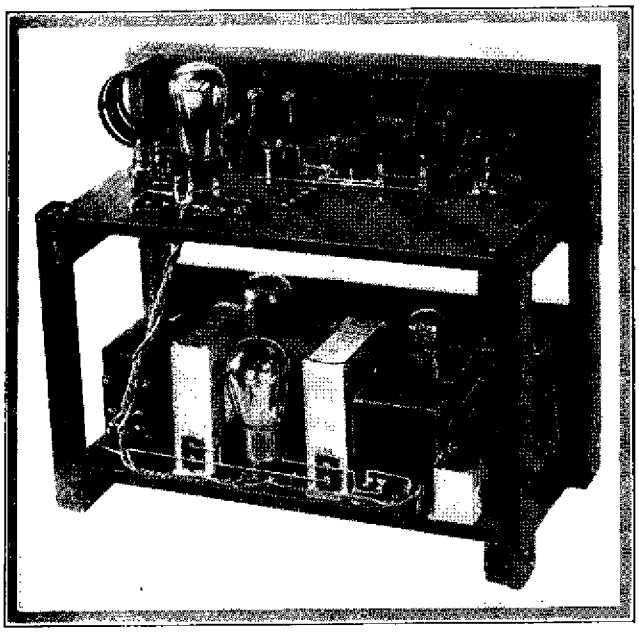

Figure 1. In this illustration is shown the rear view of the Aero short wave phone transmitter, which is built on two shelves, the power apparatus being on the lower and the actual transmitter itself on the upper

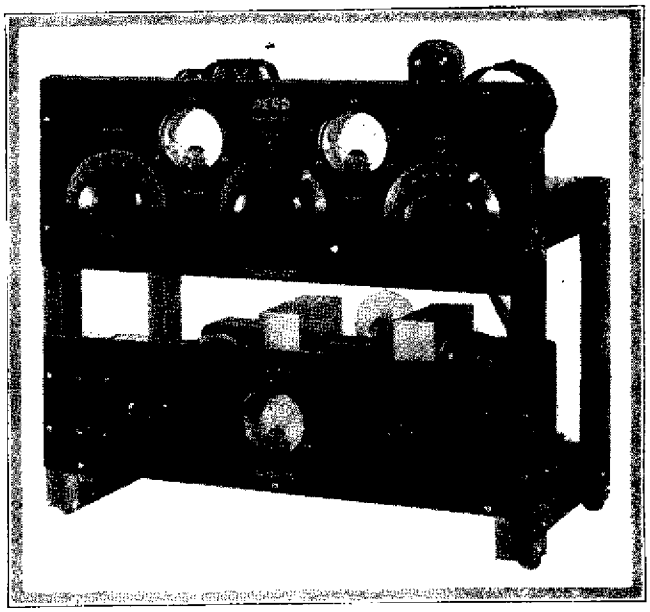

Figure 2. All controls of the short wave transmitter described in this article are grouped on the upper front panel so that tuning of the set is quite simple. The modulation indicator is located at the center of the lower panel

The circuit diagram is illustrated in Figure 3. The radio frequency portion of the circuit (on the upper deck) is the well known tuned-grid tuned-plate circuit that has been used for several years by amateurs, this preference being based on the fact that it is perhaps the simplest of all transmission circuits to tune and control. The only point of difference which might be noticed is the fact that where in most of the tuned-grid tuned-plate circuits the plate feed is in shunt, in this particular form of transmitter the series feed for the plate has been adopted in order to simplify the circuit and to prevent losses previously encountered in the choke coil when using shunt feed. On account of the high voltages developed between the plate coil and the ground by this method, it is necessary to use two condensers in series as a radio frequency bypass, these condensers being of .0005 mfd capacity.

The Power Supply

The power supply consists of a Silver-Marshall 328 transformer, which supplies the plate current, as well as lighting the filaments of the oscillator and modulator tubes. In order to secure a direct current, which is necessary for telephone operation, the high voltage of the 328 transformer is rectified by means of a No. 2721

(This transmitter constructed, tested and all illustrations made in our laboratory)

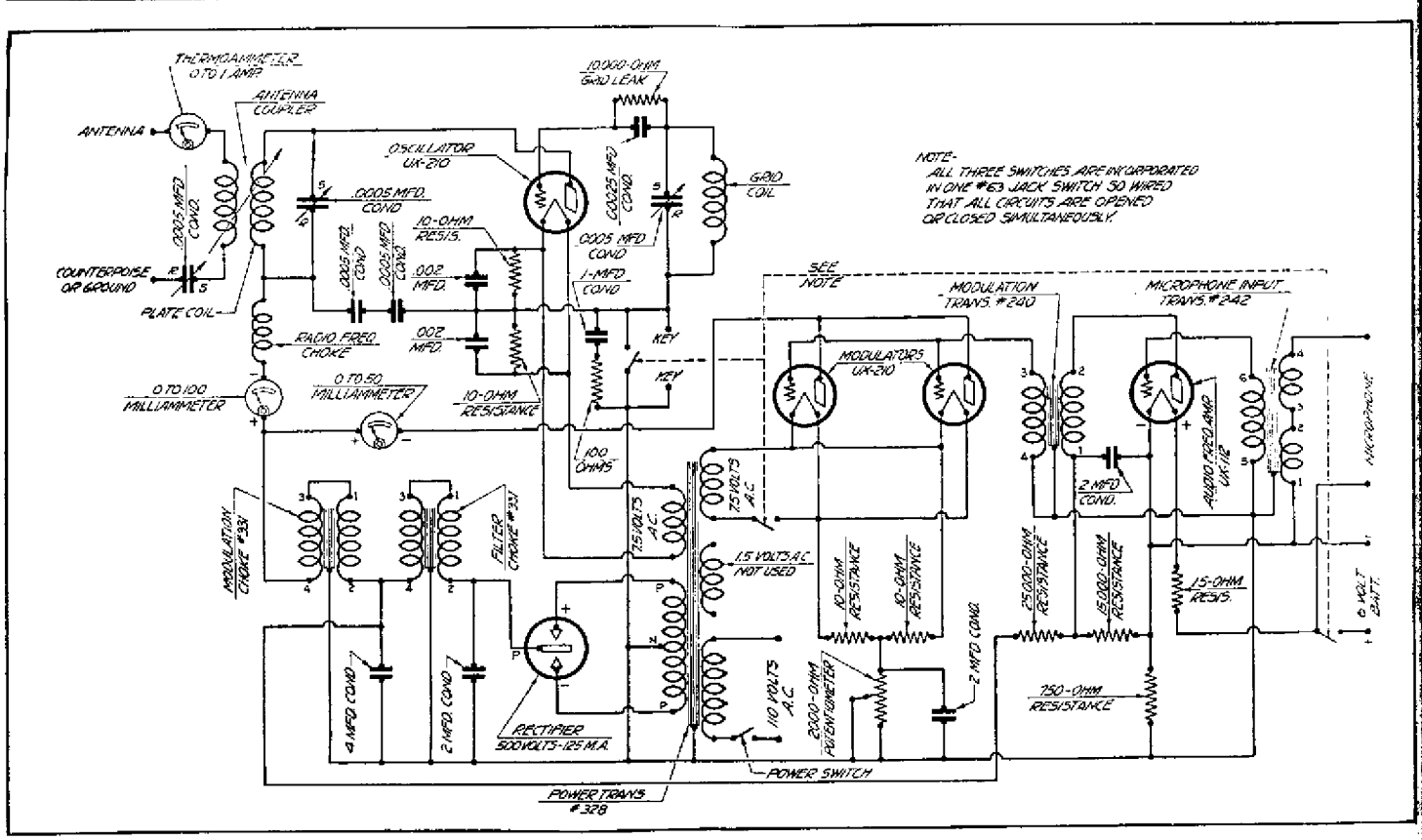

Figure 3. The schematic circuit shown above gives all of the necessary connections for hooking up a short wave transmitter, which may be used for either radio telephony or telegraphy on the higher frequencies

Manhattan gas rectifier, whose output is filtered by a Silver-Marshall 331 Unichoke and Tobe high voltage filter condensers. It will be noted that two modulator tubes are used in conjunction with one oscillator of the same type. This is in accordance with the best practice and while the set is perfectly operable with only one modulator, it is recommended two be used where the best quality of transmission is desired.

Amplifying the Speech

In order to operate the modulator tubes at maximum capacity, it is necessary to amplify the output of the microphone transformer, 242, to bring up the speech volume to the proper level. This amplification is accomplished by means of a 112 audio amplifier tube and a Silver-Marshall 240 modulation transformer. The proper plate voltage for the 112 tube is secured by the drop across the 25,000, 15,000 and 750 ohm resistances, the latter resistance supplying the necessary grid bias for the 112 tube. During the preliminary experimental work a 226 tube was used in place of the 112 and was lighted from the 1½ volt winding on the 328 transformer. However, in view of the fact that a 6 volt battery was necessary for the operation of the microphone, the same battery was finally decided upon as a means of lighting the 112 tube. This brought about a quieter signal from the transmitter. Accordingly the 1½ volt winding on the 328 transformer is not used in this particular transmitter.

Construction of the transmitter may well commence with the lower deck, layout details of which are shown in Figure 4. After all parts have been placed on the lower deck in accordance with the diagram in Figure 4, this much of the transmitter may be wired and tested before going ahead with the wiring of the balance of the set. This lower shelf is affixed to the frame by means of wood screws, all holes being marked on the template which accompanies the kit. After screwing down all of the parts and wiring them in accordance with the graphic diagram shown in Figure 6, the power unit may be tested separately before proceeding with the remainder of the work. In order to do this the unit is connected as it would be in operation with the microphone, battery, etc., and the switch on the panel is thrown to the "phone" position. Most of the resistance shown in the schematic as a 2000 ohm potentiometer should be turned on. The tubes should all light properly and the modulator meter should jump upwards when the microphone is spoken into. In order to check the quality of modulation, a speaker should be connected across the modulation choke, the one shown at the left in the graphic diagram, Figure 6. The speaker should be connected by means of a long cord and placed in an adjoining room. It may be necessary to close the door between the rooms in order to keep the speaker from transmitting acoustical energy to the microphone and setting up a continuous howling noise. When the equipment on the lower deck is operated properly, the speech as heard by another observer at the speaker should be very clear and distinct. The 2000 ohm potentiometer should be adjusted during the test so that the speech is the clearest, at which time the modulation meter on the lower front panel will indicate current averaging from twenty to thirty milliamperes. This test is only one for modulation efficiency and has nothing to do with the effectiveness of the transmitter itself.

Check All Connections

The equipment on the upper deck should now be assembled in the same manner as that of the lower deck, after which the whole frame may be put together with wood screws, attaching the upper panel with its equipment last. Then the remainder of the wiring governing the radio frequency section of the transmitter may be accomplished. It would be well in this section of the set to thoroughly test and check all connections before applying high voltage.

After all the necessary wires have been run and the builder is certain of the accuracy of his connections, the oscillator should be checked to see that it functions properly. The plug is inserted in the 110 volt 60 cycle light socket and the switch on the front panel thrown to the "CW" position. With the switch in this position, only the oscillator tube should light. On shorting the "key" binding posts, current will be indicated in the plate milliammeter. It is possible this current will be almost full scale, but by varying the plate or grid tuning condensers the plate current will drop back to approximately twenty or thirty milliamperes at a certain point, indicating that the tube is oscillating.

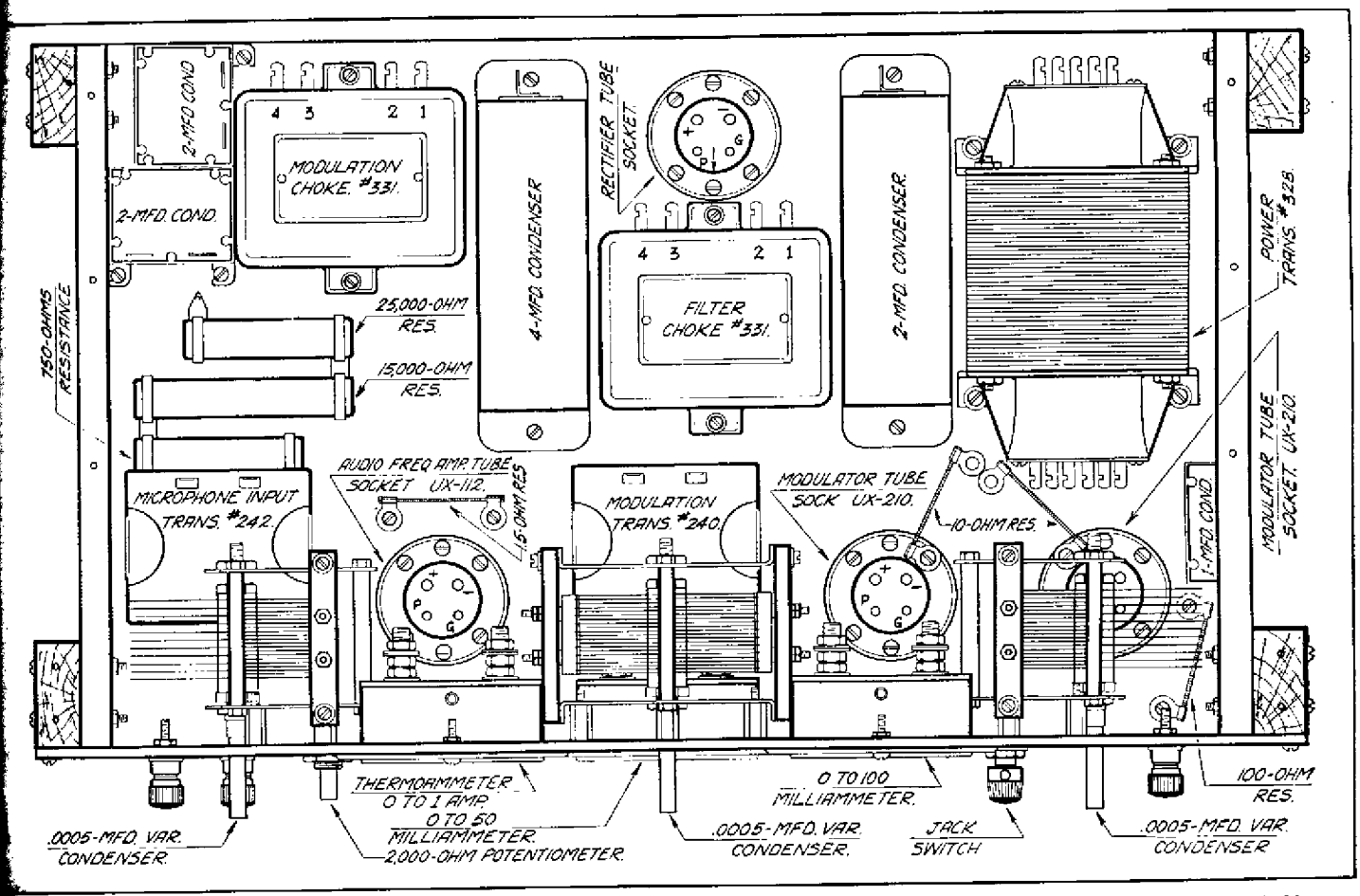

Figure 4. The baseboard layout shown above represents the manner in which parts should be placed on the lower shelf, where all of the power apparatus is located

On connecting an antenna and a counterpoise (or ground) and tuning the antenna condenser, this plate reading will be increased when resonance is established and at the same time some antenna current will be noted. If the coupling between the antenna coil and the plate coil is too close, the tuning of the antenna will have a tendency to stop the tube's oscillation.

Final tuning should always be done with a wavemeter in order that transmission may be within one of the band licensed by the government for such transmission. One of the features of the transmitter described in this article is the fact that through the interchangeable coils made by Aero, the transmitter may be tuned on any wave band between 18 and 180 meters, so that the set is not rendered unserviceable by any slight changes in the wavelengths granted by the government.

Need Government License

It should not be forgotten that the operation of such a transmitter in the United States requires a government license. Details regarding the license and the requirements for securing such a license may be obtained by writing to the Radio Supervisor at key cities such as New York City, Chicago, San Francisco, Atlanta, Washington, Boston, Seattle, Baltimore and New Orleans.

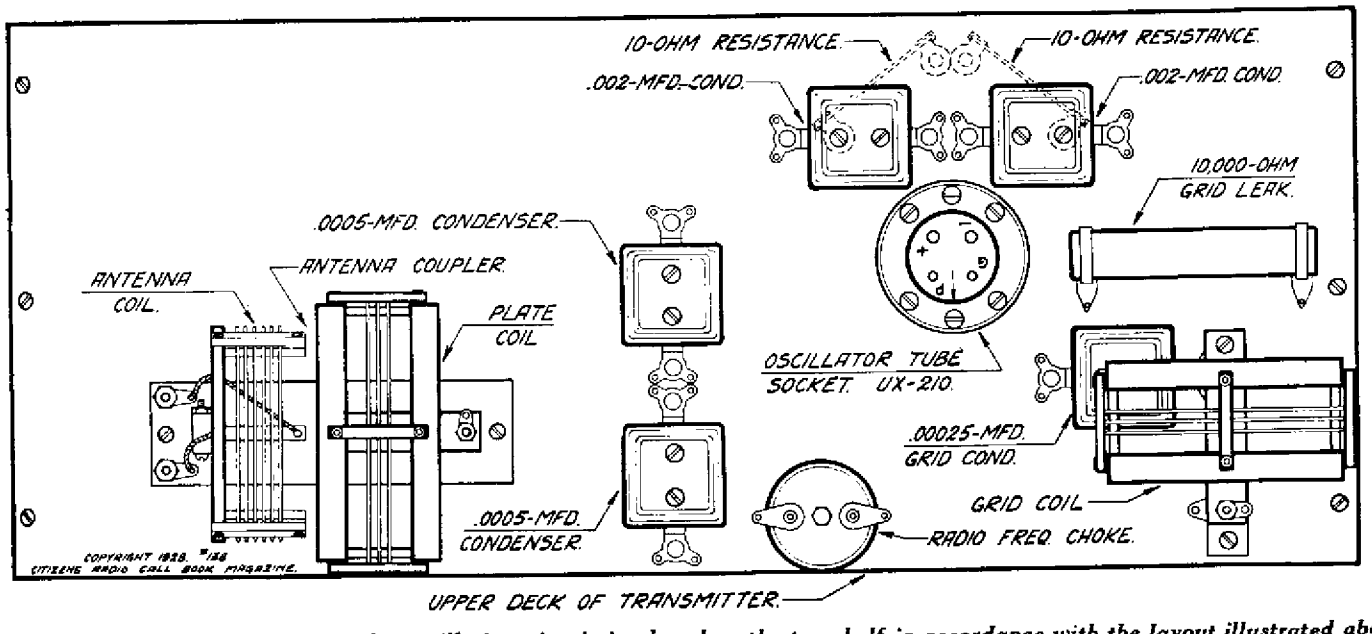

Figure 5. All apparatus involved in the oscillating circuit is placed on the top shelf in accordance with the layout illustrated above

Radiophone transmission is licensed by the government on the following bands: 4.69 to 5.35, 20.68 to 21.4 and 150 to 190 meters.

Little is yet known by the radio enthusiast of the unbounded daylight pleasures awaiting him in the diversion to twenty meter radiophone work. Not that the other wave bands have not their allurements, but the DX worker has always had to wait until after twilight to appease his appetite. This is no longer true when he takes up radiophone work and uses the twenty meter band, which has a wondrful daylight record to give him.

The Laboratories of Aero Products, Inc., report having held a two-hour-runing telephone conversation with Syracuse, New York, on the afternoon of Saturday, January 28. The following Monday afternoon they talked over the telephone with Bristol, Connecticut, and got a signal rating of R-8.

Turning his attention to radiophone work, the DX enthusiast will find Saturday afternoons and Sundays the occasions of his greatest pleasures.

List of Parts

Parts necessary to duplicate this transmitter are as follows:

1—Aero short wave transmitting kit, including r. f. inductances and r. f. choke
1—Aero transmitter foundation kit consisting of Micarta upper front panel, engraved lower front panel, frame kit for making stand
3—SLC Cardwell .0005 mfd variable condensers
2—Polymet .002 mfd fixed condensers
2—Polymet .0005 mfd fixed condensers
1—Polymet .00025 mfd fixed condenser
2—Tobe 2 mfd 300 volt condensers
1—Tobe 2 mfd 1000 volt condenser
1—Tobe 4 mfd 1000 volt condenser
1—Tobe 1 mfd condenser
1—240 Silver-Marshall audio frequency transformer
1—328 Silver-Marshall power transformer
2—331 Silver-Marshall filter chokes
5—511 Silver-Marshall tube sockets
1—242 Silver-Marshall microphone transformer
4—810 Yaxley 10 ohm fixed resistors
1—2000 Yaxley 2000 ohm potentiometer
1—2L Yaxley 1½ ohm resistor
1—8100 Yaxley 100 ohm resistor
1—63 Yaxley 3-pole switch
1—10 watt Polymet 10,000 ohm resistor
1—10 watt Polymet 25,000 ohm resistor
1—10 watt Polymet 15,000 ohm resistor
1—10 watt Polymet 750 ohm resistor
8—Eby binding posts
3—Kurz-Kasch 4-inch plain dials
1—425 Weston thermo-ammeter 0-1 amp.
1—301 Weston milliammeter 0-100 mil.
1—301 Weston milliammeter 0-50 mil.
1—159 Frost desk microphone
40—Ft. Corwico braidite wire
1—Pkg. Kester radio solder
Miscellaneous—lugs, nuts, screws, etc.

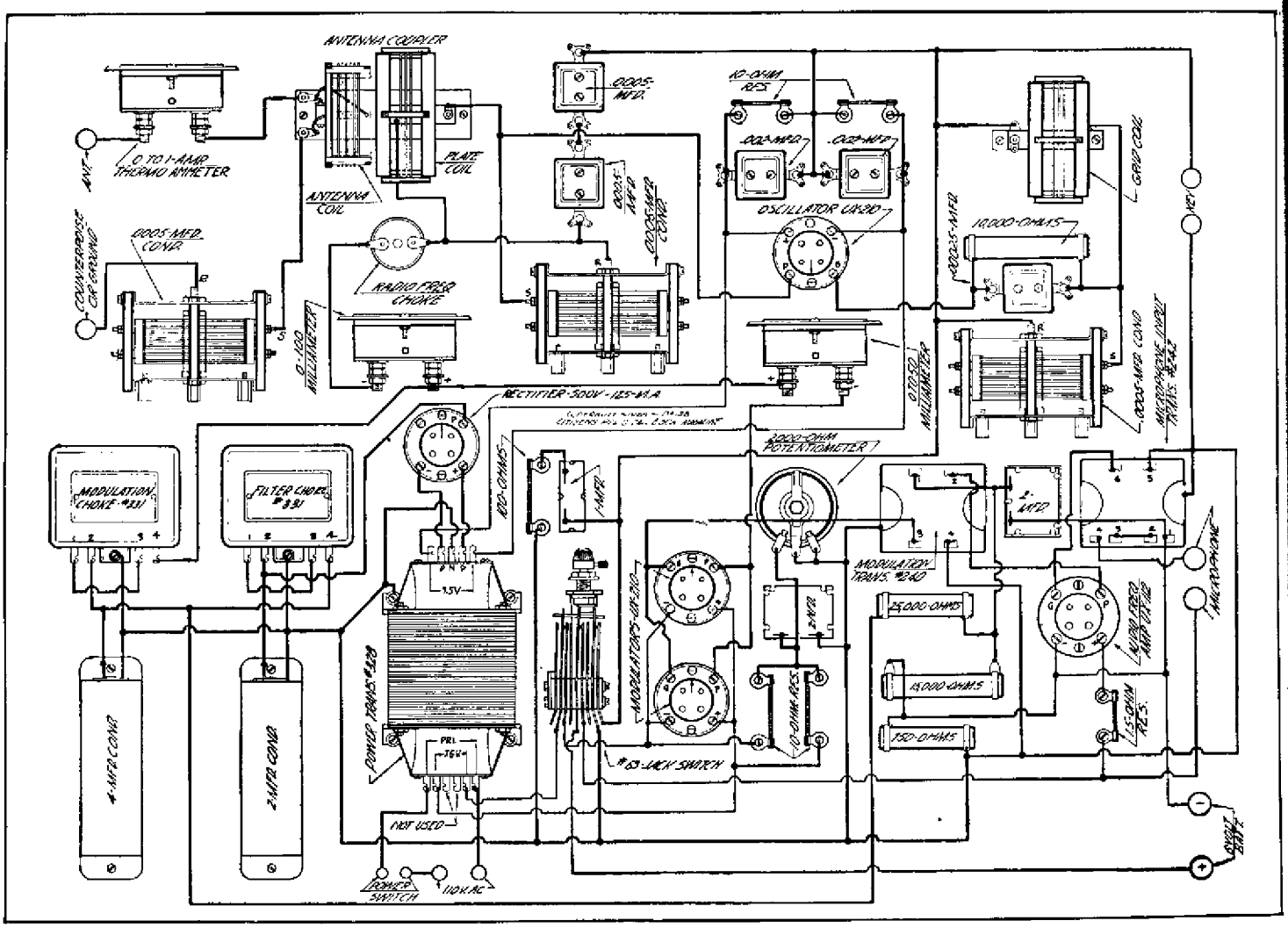

Figure 6. Every connection necessary for the completion of the short wave radio telephone set is shown in the graphic diagram. Parts should be placed in accordance with the layouts in Figures 4 and 5 and the wiring should be performed in accord with the above graphic

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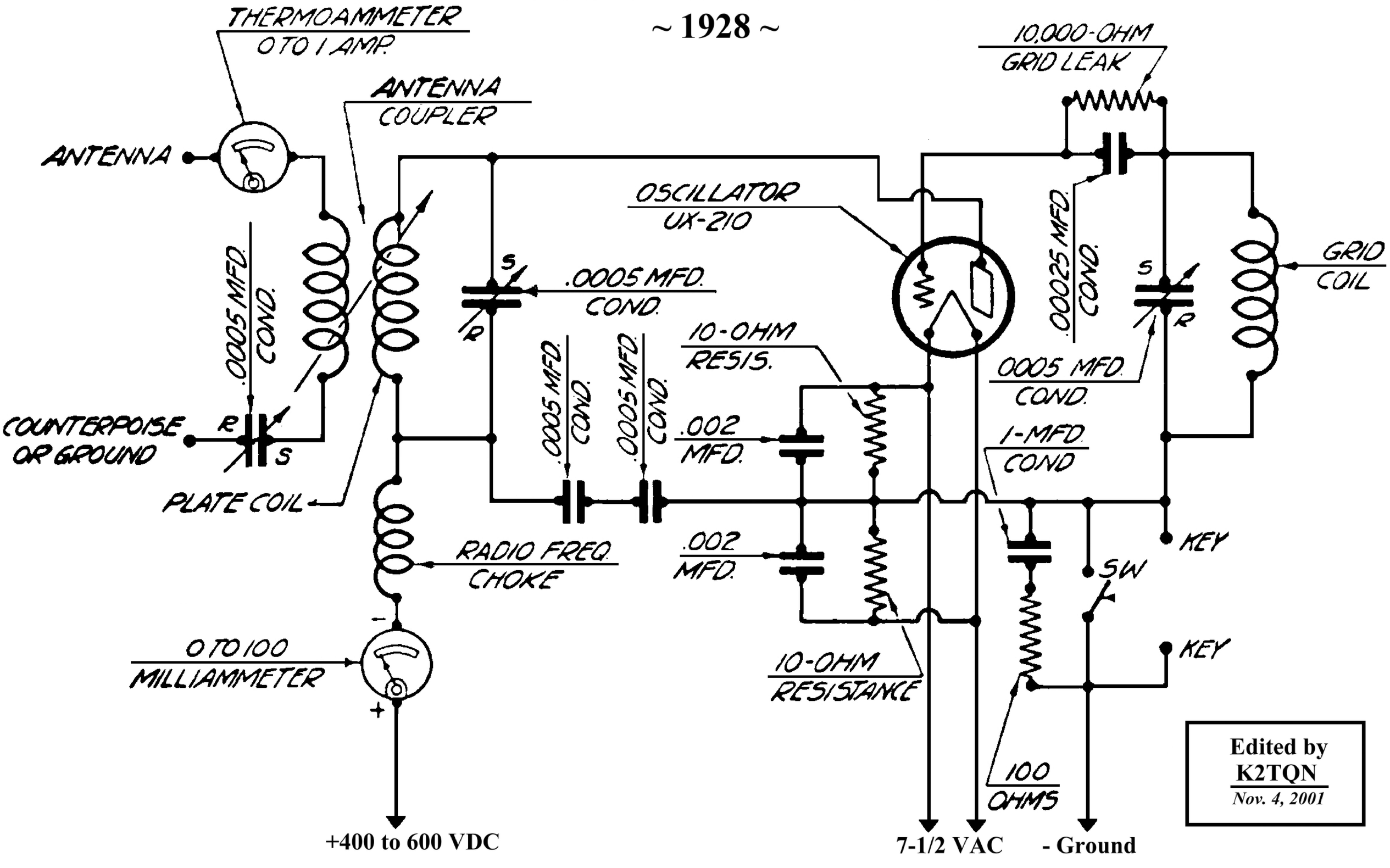

Edited by
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