MEISSNER
Pre-War Signal Shifter
Composite Military Manual

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Monterey California
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INSTRUCTION BOOK

FOR

OPERATION and MAINTENANCE

OF

MEISSNER SIGNAL SHIFTER

(Standard and DeLuxe Models)

MANUFACTURED BY

MEISSNER MANUFACTURING COMPANY

MT. CARMEL, ILLINOIS

RESTRICTED

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LIST OF ILLUSTRATIONS

I. DESCRIPTION OF UNIT

GENERAL

CIRCUIT: The Meissner Signal Shifter is an electron coupled oscillator unit designed to permit variable frequency control of a separate transmitter. The unit employs a single 6F6 metal tube in a high-C electron coupled oscillator circuit capacitively coupled to the grid of a single 6L6 metal tube. The 6L6 may be used either as a frequency doubler-amplifier or a neutralized buffer amplifier.

POWER SOURCE: The Signal Shifter has a self-contained power supply and is designed to operate from a 115 volt, single phase, 50/60 cycle, AC power source.

COILS: One complete set of coils for continuous coverage of the frequency range 2.5 to 12.0 megacycles is supplied with each unit. Three coils are used for each band and are so designed that each band is spread over approximately 90% of the dial scale.

POWER OUTPUT: The Signal Shifter delivers a fundamental signal of approximately 7.5 watts.

STABILITY: An extremely high order of frequency stability in the exciter unit is achieved by using the 6F6, a tube which has a minimum of thermal frequency-drift, in a high C circuit, using sturdy, high-quality components, together with temperature-coefficient condensers and a STAND-BY circuit for maintaining constant tube currents under both operating and STAND-BY conditions.

TUBE COMPLEMENT:

Commercial Type	Function	Signal Corps Type
6F6	Oscillator	VT-66
6L6	Amplifier	VT-115
5X4G or 80	Rectifier	VT-80
VR-105-30	Regulator	VT-200
VR-150-30	Regulator	VT-139

II. INSTALLATION

INSPECTION: The exciter unit should be carefully unpacked and inspected for any damage which might have occurred in transit.

ADJUSTMENTS: The exciter unit is thoroughly tested and inspected before shipment. However, it is recommended that the Signal Shifter be re-adjusted and re-aligned before installation is made.

The following procedure should be followed:

Make sure that all tubes are firmly seated in their respective sockets. (See Fig. 2, 4 or 6.)

Turn the AC switch (left side of the panel) to OFF. Plug in the line cord to an AC outlet of suitable voltage and frequency.

A telegraph key, connected to an ordinary phone plug, is plugged into the key jack found on the back side of the chassis. This jack is a closed circuit type and for A3 (phone) emission the plug is removed. This eliminates the necessity of an extra switch or strap to close the keying circuit.

NOTE: For the Standard Model and the Deluxe Model (old), connect the telegraph key or a shorting strap to the keying terminals. If a key is used, connect the key frame to the grounded terminal which is the screw terminal nearest the front of the Shifter. Open the key or shorting strap. (The key terminals must be connected together for A3 (phone) emission.

The Deluxe Model (new) (Figures 1, 5 and 6) has a five terminal strip mounted on the back side of the chassis. This terminal strip enables the operator to select the desired method of keying the Signal Shifter. For oscillator keying, connect terminal 1 to terminal 2 and connect terminal 2 to terminal 3 and connect terminal 4 to terminal 5.

Place one complete set of coils, preferably that of the highest frequency band to be used, in their respective sockets. CAUTION: THE SIGNAL SHIFTER SHOULD NOT BE TURNED ON UNTIL COILS ARE INSERTED. THE ABSENCE OF COILS PLACES A HEAVY LOAD ON THE FILTER CIRCUIT.

Turn the operating switch (SWI) to STAND-BY, turn the selector switch (below tuning control) to ECO and turn the power switch (SW2) to the ON position. This permits the tubes to warm-up and places the unit in operating condition, but does not allow the oscillator to start.

NOTE: The two position selector switch, located directly below the tuning control on the Deluxe Model (new), is provided to permit the use of a crystal oscillator, the Meissner Signal Spotter. When the crystal unit is used with the Shifter, this switch enables the operator to instantly select the type output desired; either crystal or ECO output. When the Shifter is not used with the Signal Spotter, the selector switch should always remain in the ECO position.

After a warm-up period of fifteen minutes, turn switch SW1 to the ON position and rotate the tuning knob to scale setting "90." Adjust a calibrated receiver, monitor or frequency meter to the high frequency edge of the band corresponding to the set of coils in the Shifter. Adjust the band-setting condenser (C4 in Figures 2, 4 and 6) until the output of the Signal Shifter corresponds to the edge of the band. If a superhetrodyne receiver is used to locate the frequency of the Shifter, the receiver may give best notes at several different points, however, there should be no difficulty in identifying the CORRECT signal, as it will be much stronger than the spurious signals caused by beats between harmonics. Before the Signal Shifter is actually placed in service, a calibrated frequency standard should be used to accurately determine the operating frequency.

Depress the key or short the keying terminals and adjust the trimming condensers C5 and C6 to give maximum output. The best indicator of Shifter output is a grid milliammeter located in the grid circuit of the amplifier stage to which the unit is connected. This meter will indicate the amount of grid driving power supplied by the Signal Shifter. Trimming condensers C5 and C6 should be adjusted to provide MAXIMUM READING on the grid Milliammeter. If no amplifier is used and the output is connected directly to an antenna, a small neon bulb held against the antenna feeder, or a flashlight bulb connected in series with one of the feeders, can be used to indicate Signal Shifter output. Trimming condensers should be adjusted to provide maximum glow.

It is customary practice to "peak" the Signal Shifter to provide maximum output on the highest frequency band employed. These adjustments made on the highest frequency band will be found satisfactory on the lower frequency bands.

NEUTRALIZATION: Before installing the Signal Shifter, the 6L6 buffer-amplifier stage should be neutralized in the following manner:

Turn the front panel switch SW1 to STAND-BY: then carefully adjust the neutralizing condenser C15 for minimum glow in a small neon bulb held against the top lug of main condenser, Section 3. This lug is indicated by an arrow in Figure 6 and is labelled point "N."

When tubes are replaced in the Signal Shifter, the instrument MUST be re-neutralized.

FREQUENCY CALIBRATION:

A. GENERAL: A substantial warm-up period of 30 minutes is recommended before calibration is started. Whenever coils are changed, the coils and coil shields should be firmly seated to prevent mechanical shift of the oscillator frequency. Actual calibration can be made by any standard frequency checking procedure as outlined in radio technical handbooks, using a hetrodyne frequency meter of known accuracy or a precision type frequency standard.

B. STANDARD and DELUXE MODELS (OLD): A complete calibration curve (see Figure 8) should be drawn for each band to be used. Points should be drawn on graph paper using known frequencies at the ends of each band, and at as many other points as can be accurately recorded using a frequency meter or frequency standard.

It should be possible to draw a smooth curve (not necessarily a straight line) through all of the points. If no frequency marking points are available at the ends of the band, the approximate band edges may be taken from the projected curve drawn from known frequencies inside the band.

C. DELUXE MODEL (NEW): Assuming the Signal Shifter has been allowed to warm-up for 30 minutes, the actual process of dial calibration can begin. First, REMOVE panel screws "A" and "B" and LOOSEN panel screws "C" and "D." These screws are clearly shown in Figure 7. Now remove the transparent sheet of "plastacelle" which covers and protects the scale. Removal is accomplished by pulling the sheet upward and out from its position between the scale and front panel. When the transparent sheet is removed, replace panel screws "A" and "B" and tighten all four screws (A-B-C-D) firmly in place. In tightening these screws, make certain the dial scale is

properly centered in normal position behind front panel cut-out.

Any one or all of the five bands may be calibrated on the dial scale in their indicated respective positions. Since the calibration process is the same for all bands, the 20-meter band is used in the following paragraphs as a typical example of calibration procedure.

First, carefully tune the STATION RECEIVER to the low frequency edge of the 20-meter band (14,000 kc.). It is highly advisable NOT TO DEPEND UPON THE CALIBRATION OF THE RECEIVER itself but to insure the accuracy of the 14,000 kc point by using a good hetrodyne frequency meter or crystal controlled frequency standard.

Second, tune the SIGNAL SHIFTER to ZERO BEAT with the 14,000 kc setting of the receiver. If the adjustments made in both the receiver and SIGNAL SHIFTER were carefully made, the Signal Shifter pointer indicates "14,000 KC" and this point may now be marked on the dial scale. Ordinary black fountain pen ink or pencil may be used to mark the scale. Extreme care should be used in marking the scale. If a line is drawn to mark a point, the line should follow the angle of the pointer line. See Figure 7, NOTE: If the scale is slightly "oily," it will not "take" ink readily. For this reason, the points where the marker lines are placed should be cleaned with ordinary "art gum," obtainable at any stationery store. Use care in cleaning with art gum and do not rub over the printed scale markings. CLEAN ONLY THE CLEAR SPACES WHERE PERSONAL MARKS ARE TO BE MADE. If an error is made in marking, erase with an ordinary pencil eraser. DO NOT RUB OVER THE PRINTED SCALE LINES.

The procedure employed to locate the "14,000 KC" point on the SIGNAL SHIFTER scale may be used to locate all other desired points over the 20-meter band. Namely, tune the station receiver to the desired frequency, making certain that the receiver point is accurate, tune the Signal Shifter to zero beat with the receiver and mark the indicated point on the dial scale. Any number of points may be marked on the scale; Band edges, 100 KC points, 50 KC points, 10 KC points, phone band edges, etc. The points may be identified by appropriate figures or wording, CAREFULLY printed on the scale. When the calibration process is completed and the ink has been permitted to dry, the scale and transparent covering may be re-mounted behind the panel. This process is to see that the scale occupies EXACTLY THE SAME POSITION as it did while being calibrated. Calibration should be rechecked at frequent intervals and must positively be checked whenever tubes are changed or replaced.

COUPLING TO THE TRANSMITTER: After the Signal Shifter has been adjusted, aligned and calibrated, it is then ready to be coupled to the transmitter.

The exciter unit may be coupled to the transmitter by means of a good low impedance transmission line, such as a pair of No. 14 rubber-covered wires twisted loosely. The inherent line loss will determine the length of line which can be used satisfactorily. Due to the relatively high output of the Signal Shifter, standard transmission lines can be used up to 25 feet without seriously reducing the input to the associated transmitter.

The transmission line should be connected between the output terminals of the Signal Shifter and the terminals (or connector) marked ECO on the transmitter. Figure 9 on page 13 shows various methods of coupling.

CONTROLS: There are four controls on the front panel of the Deluxe Model (New) Signal Shifter, the AC "On-Off" switch (left hand side of the panel), the "Selector Switch" — the "Operating Switch" (right hand side of the panel) and the main Tuning Dial. A standby relay (RL) is incorporated in the Signal Shifter, to permit automatic standby of the oscillator when the amplifier is turned off in the transmitter. This means the operator can control the SIGNAL SHIFTER merely by operating the "On and Off" switch of his transmitter.

In the "Automatic" position of the switch, the relay is connected to the twin terminal-strip near the rectifier socket at the rear of the chassis. For automatic operation these terminals should be connected across any line in the transmitter where 110 volts AC is controlled by the transmitter "standby" switch. This is usually the line to the primary of the high-voltage power supply. Thus, the "send-receive" switch simultaneously controls the transmitter and the "Signal Shifter."

In the "Automatic" position of the switch the relay contacts are open when the "final stage" is

on, thus permitting the oscillator to function. In the "ON" position, the relay is held down (contacts open) by the 110 volts obtained from the power-line cord of the EXCITER UNIT. With the switch in this position continuous operation of the oscillator is maintained regardless of whether or not the remainder of the transmitter is operating. This feature is very useful in calibrating the EXCITER UNIT locating its position in the band and in furnishing a local signal for use as a frequency standard.

The oscillator alone will furnish a weak signal in a receiver placed nearby.

In the "Standby" position, the relay contacts are closed, thus short-circuiting the oscillator in the SIGNAL SHIFTER. Due to circuit balance, the current flowing in the 6F6 tube remains practically constant whether the tube is oscillating or not, thus preventing drift during the "Standby" period. The tube is thus kept at a constant temperature permitting instantaneous use of a desired frequency without warm-up or re-setting of the frequency control.

TRANSMITTER ADJUSTMENT: After coupling the exciter to a transmitter an adjustment should be made in the transmitter to provide efficient energy transfer from the EXCITER UNIT. While the basic idea of the SHIFTER is to provide single-dial, bandspread control of transmitter frequency, it is obvious that complete single-dial control (with all circuits in the transmitter and antenna network tracking) is impossible due to the wide variations in transmitter and antenna. It has been found that with the proper coupling from the SIGNAL SHIFTER to the stage which is being excited it is possible to operate over a wide frequency range in a given band without readjustment of the grid circuit of the stage under excitation. The plate circuit naturally must be returned in the transmitter to provide maximum efficiency. The use of "flat lines" in connecting the transmitter to the antenna will greatly eliminate tuning variations in the amplifier stage itself when operating over a wide frequency range.

The output of the EXCITER UNIT is practically constant over the entire frequency range of each band. The exact decrease in power at the EDGES of the band (when the transmitter is tuned to the center of the band), is a function of the number of circuits following the SHIFTER and the degree of coupling between circuits.

III. APPENDIX

SIGNAL SHIFTER AS FREQUENCY STANDARD: In using the Meissner SIGNAL SHIFTER as a frequency standard, care should be taken to accurately calibrate the various frequency bands. Extreme care should be taken in RESETTING the dial to the calibrated point. The accuracy of the unit will be increased if care is taken to prevent mechanical vibration of the UNIT, especially while being used as a frequency standard. Adequate warm-up should be provided for before attempting to use the unit as a frequency standard.

SIGNAL SHIFTER AS A TRANSMITTER: This UNIT may be used as a low-powered or emergency transmitter by connecting the output terminals to a tuned circuit as shown in Fig. 9. Also, the output can be connected directly to a twisted pair feeder line, which in turn is connected to the center of a double antenna. The twisted pair can be of any normal length, without loss. This circuit is shown in Fig. 9.

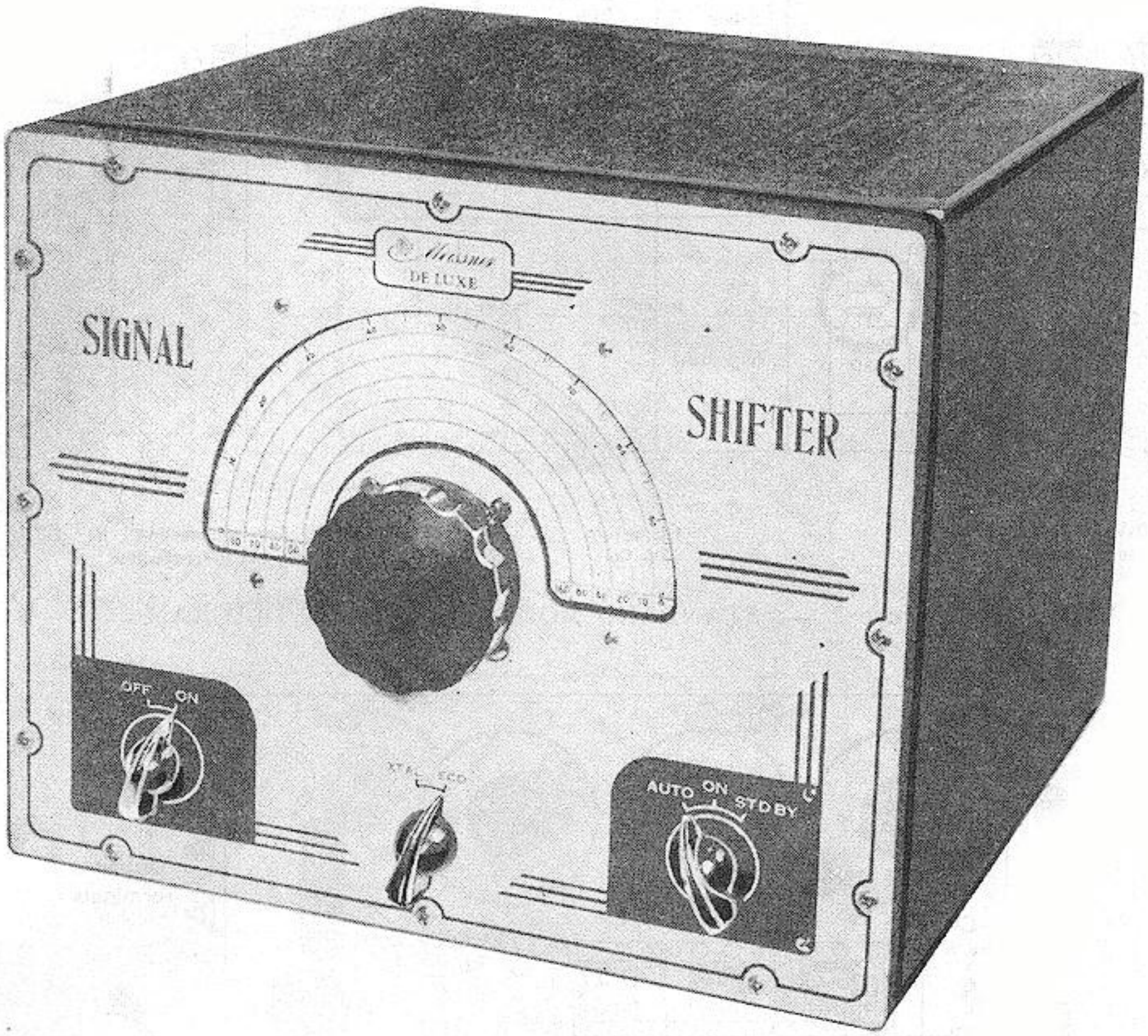

Figure 1 — SIGNAL SHIFTER (Deluxe Model (New)

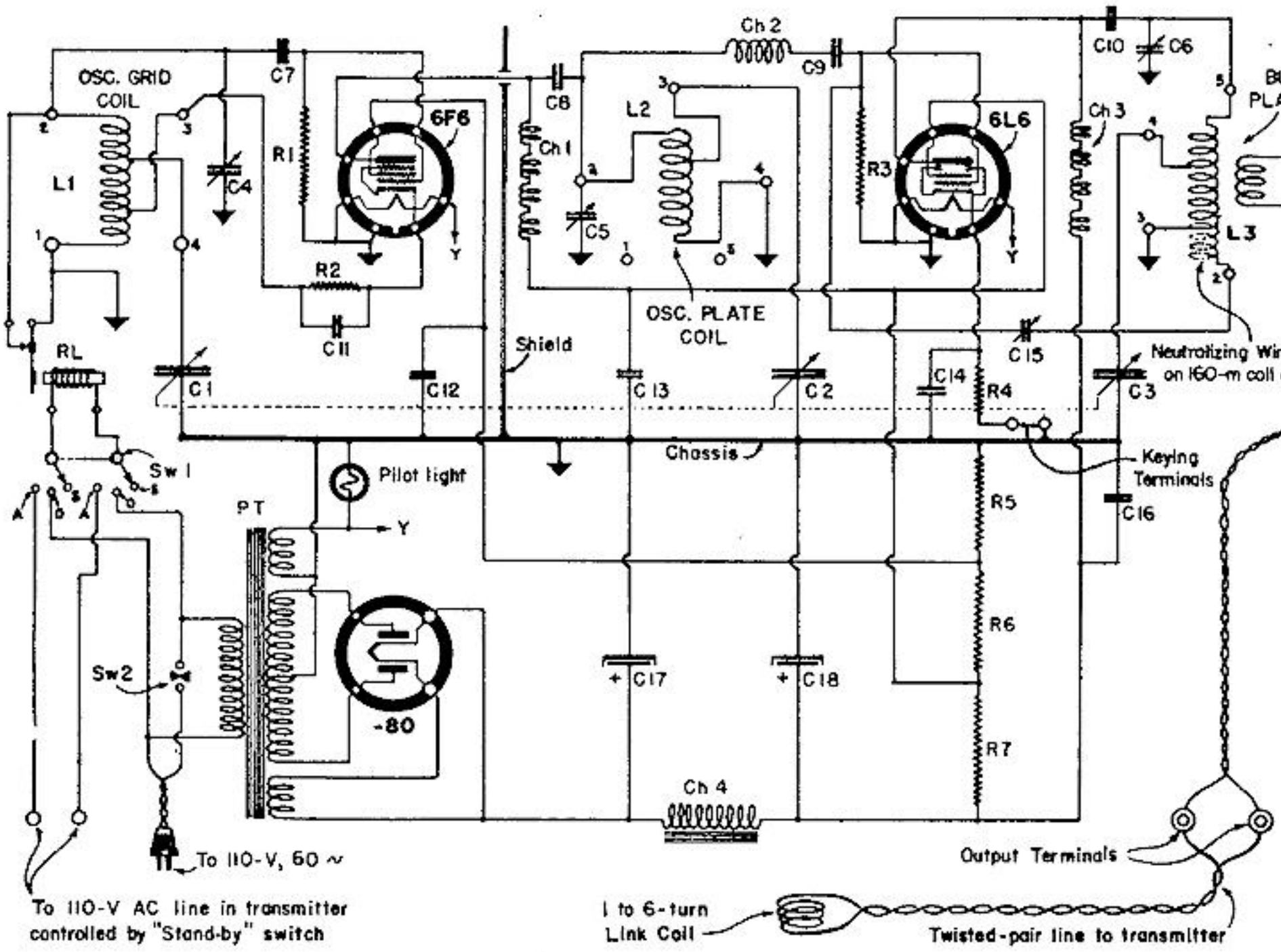

Figure 2 — STANDARD MODEL — CIRCUIT DIAGRAM

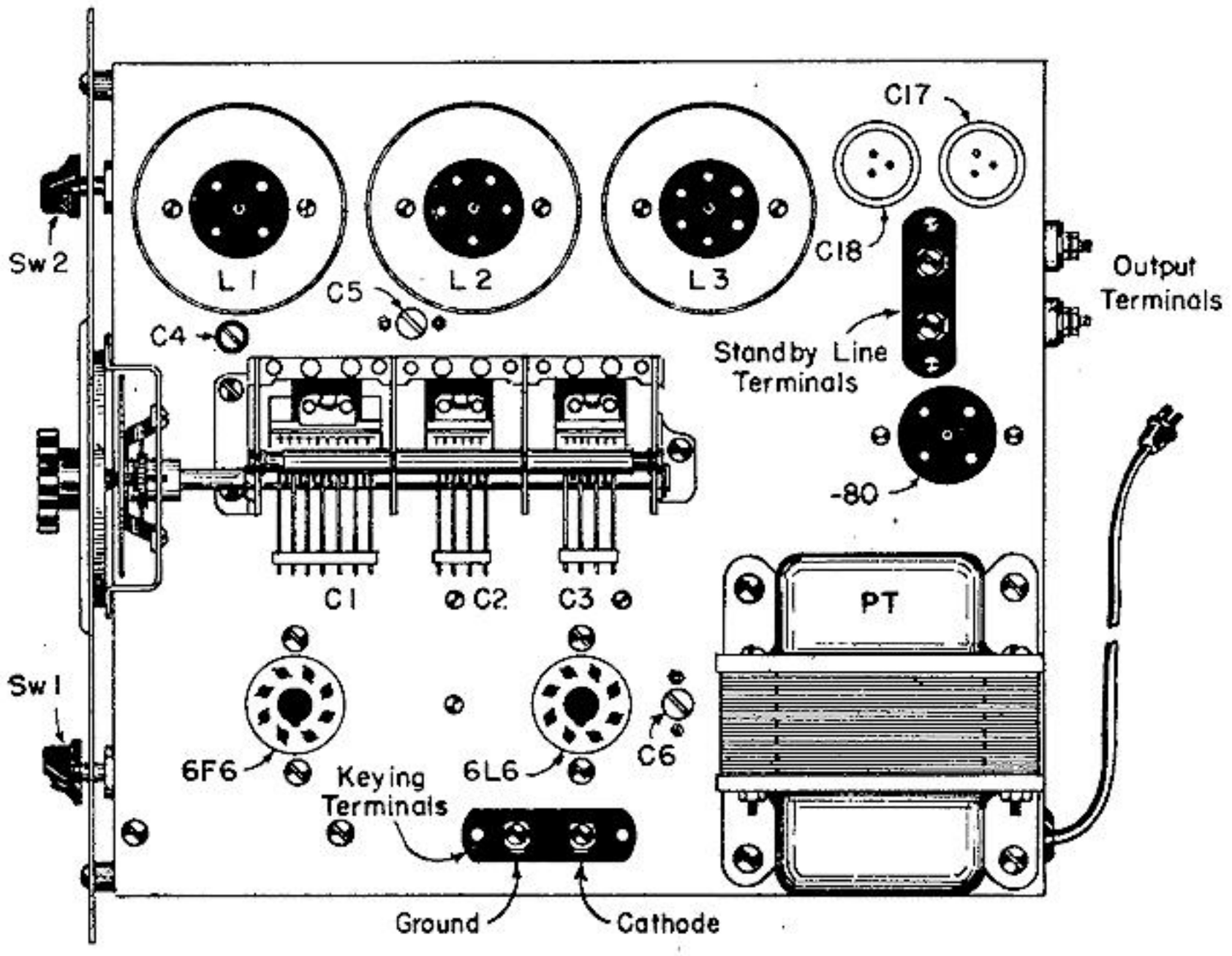

Figure 3 — STANDARD MODEL — TOP VIEW

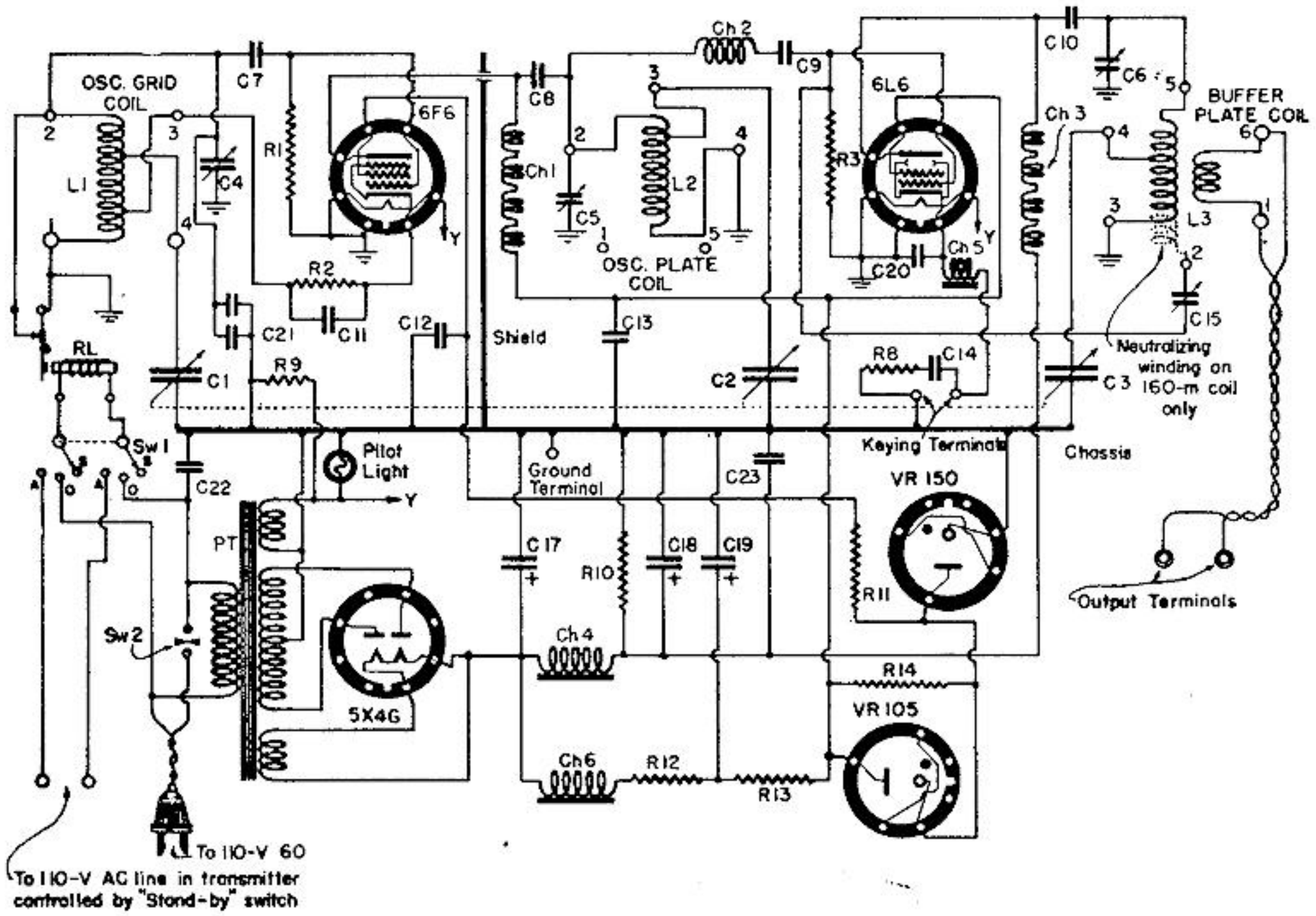

Figure 4 — DeLUXE MODEL (OLD) — CIRCUIT DIAGRAM

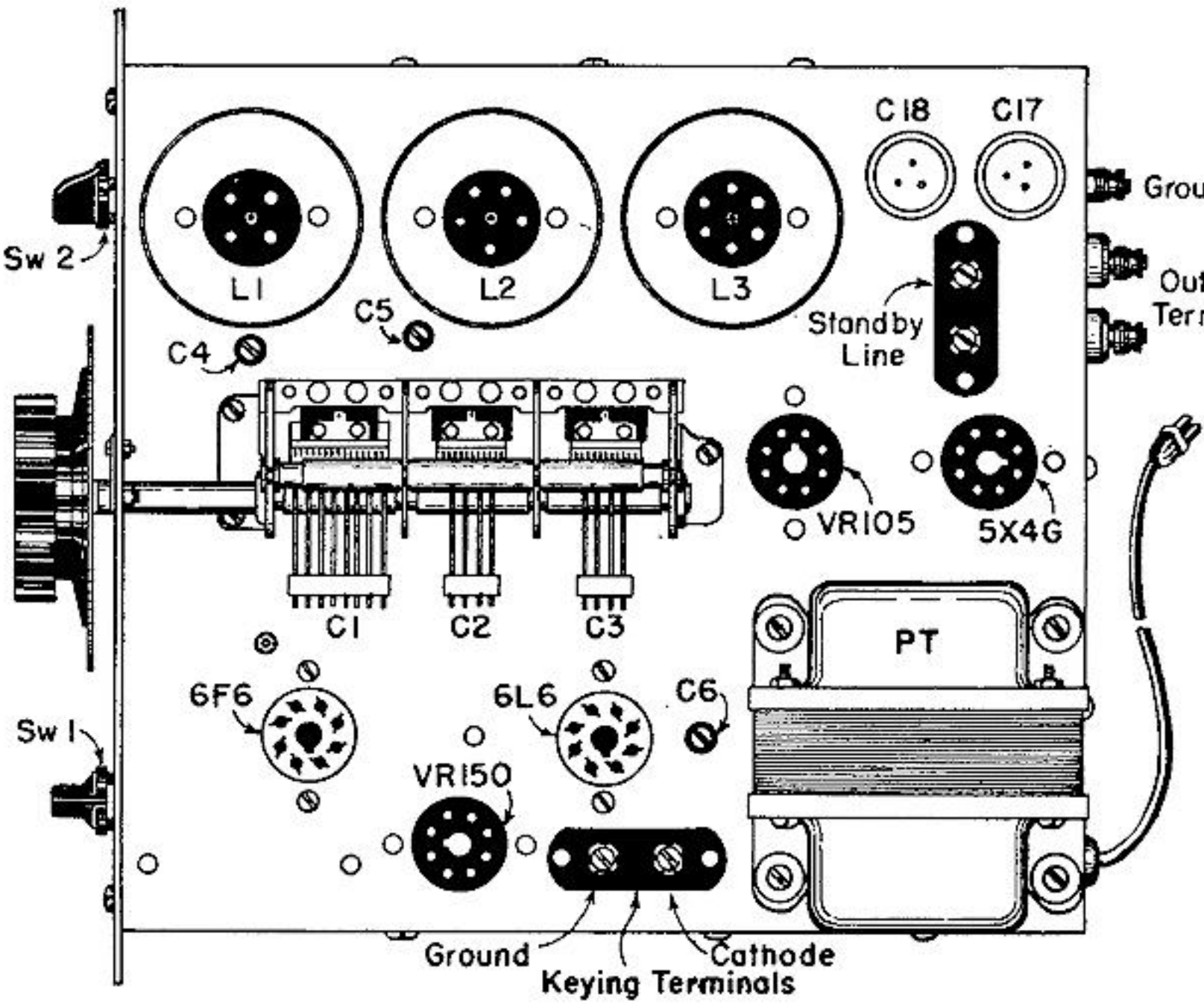

Figure 5 — DeLUXE MODEL (OLD) — TOP VIEW

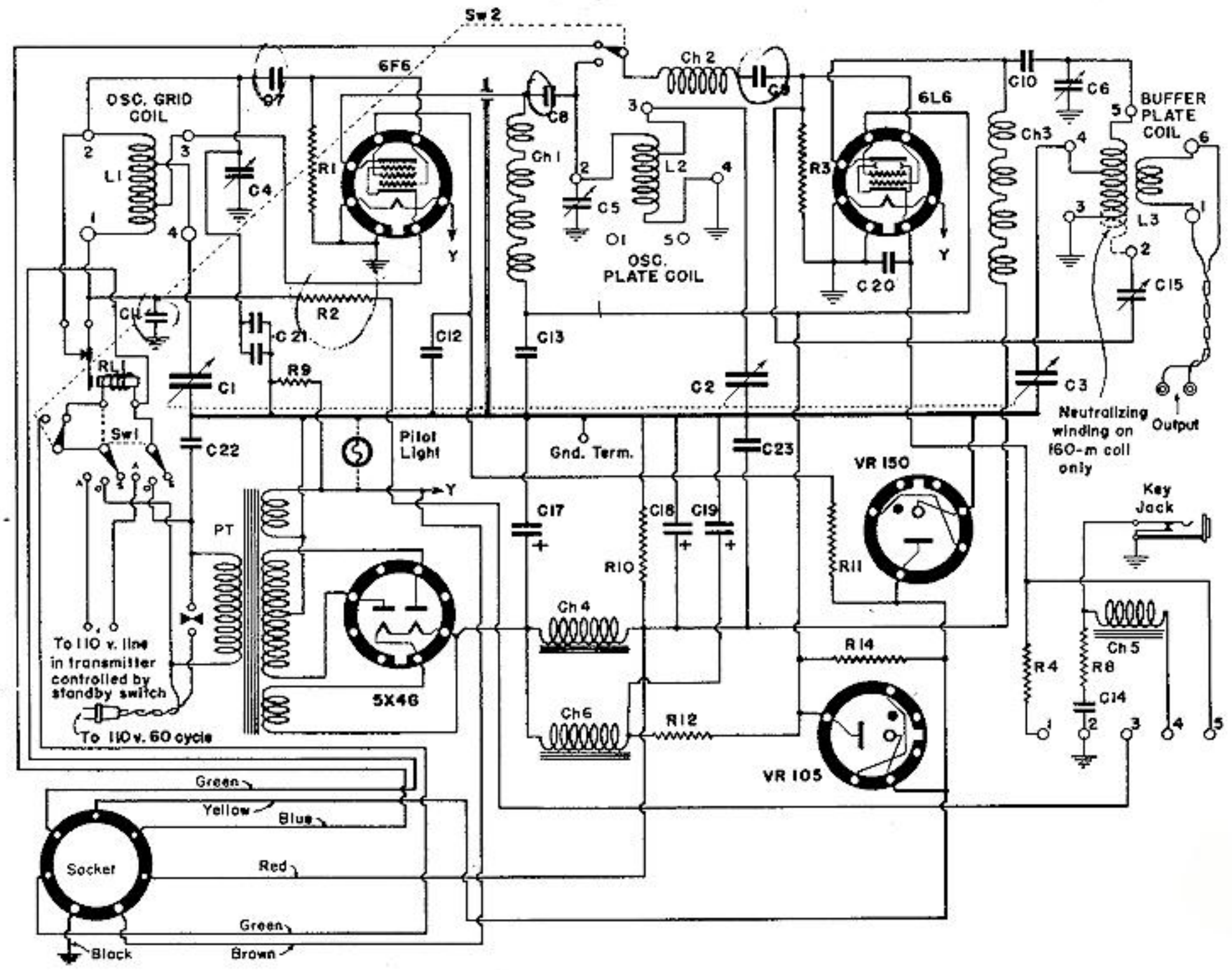

Figure 6 — DeLUXE MODEL (NEW) — SCHEMATIC DIAGRAM

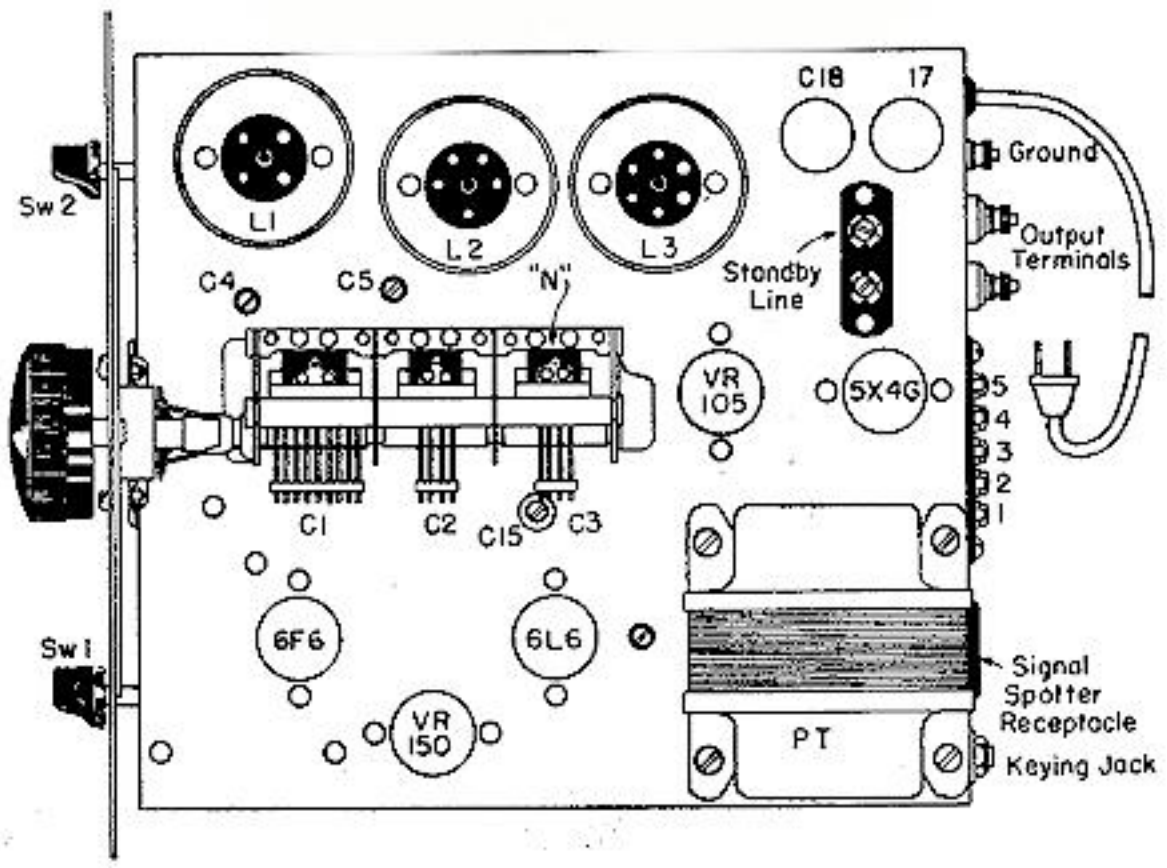

Figure 7 — DeLUXE MODEL (NEW) — TOP VIEW

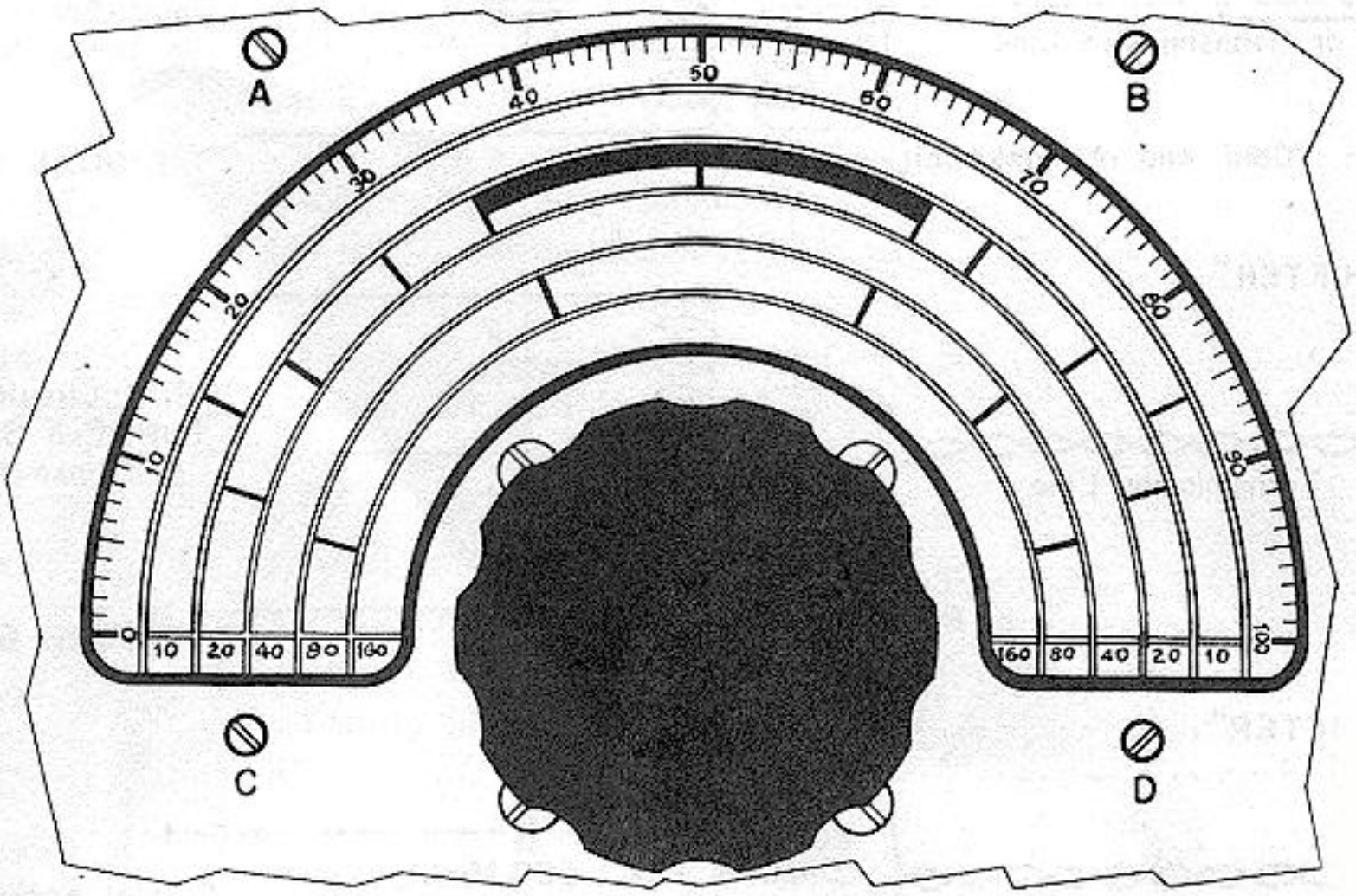

Figure 8 — DeLUXE MODEL (NEW) — CALIBRATION DIAL

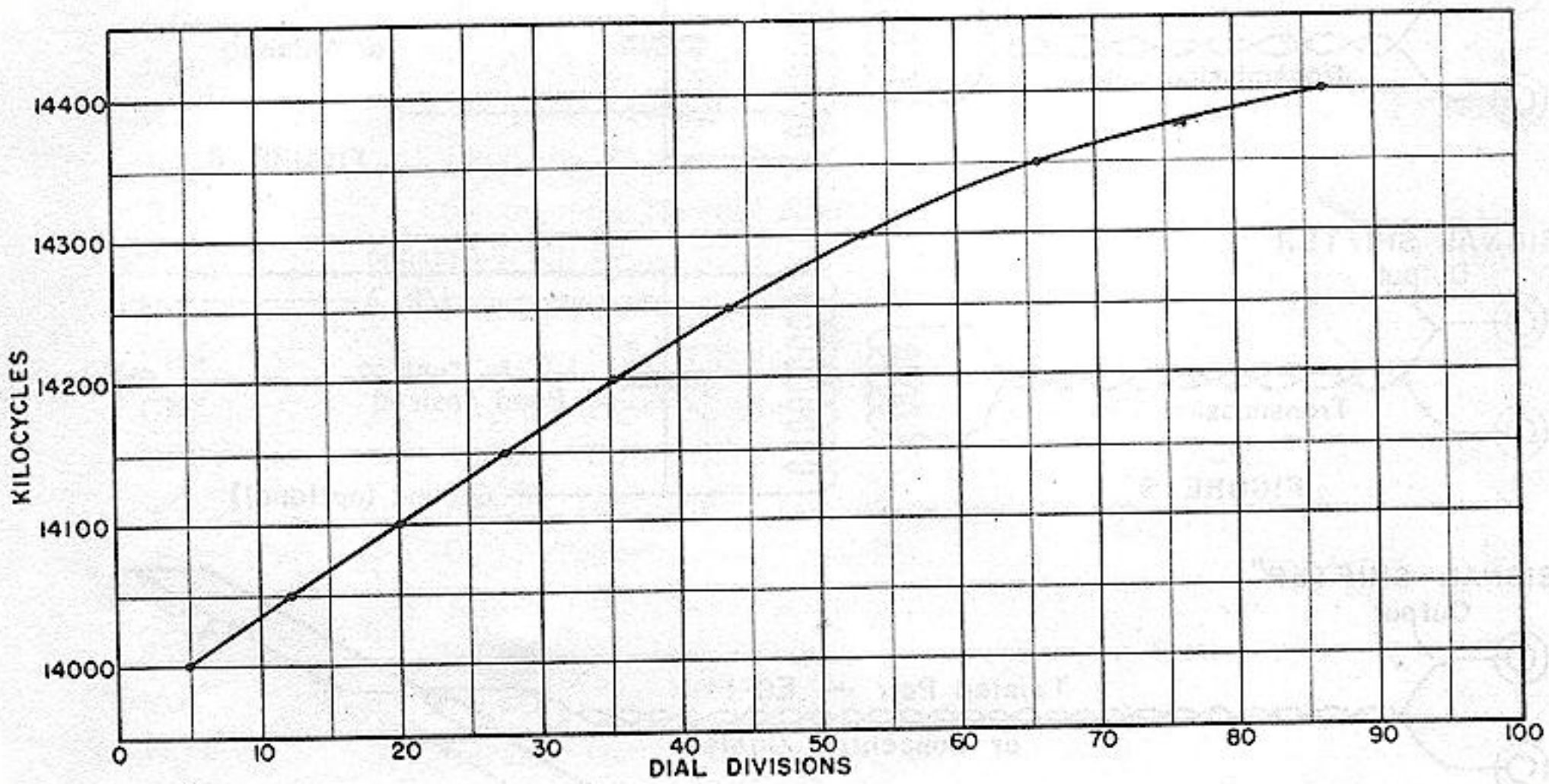

Figure 9 — TYPICAL CALIBRATION CURVE

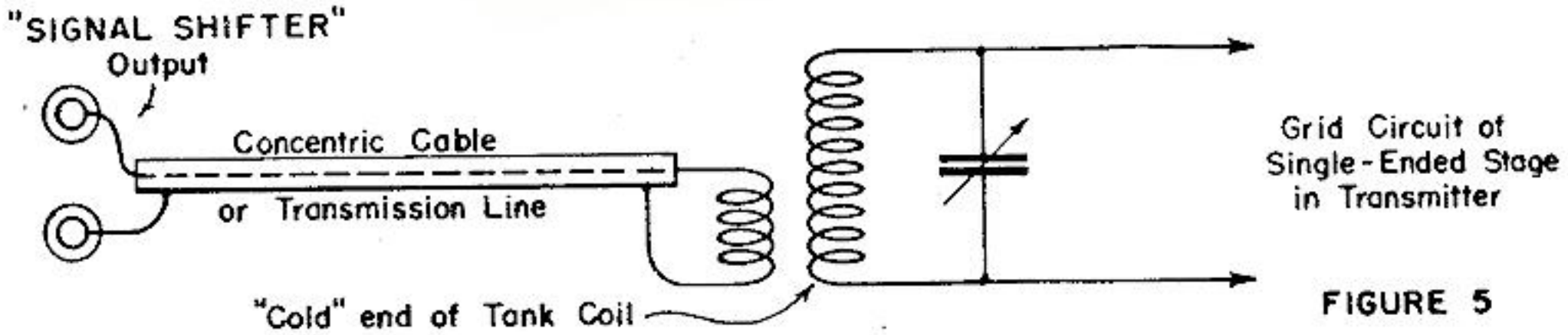

FIGURE 5

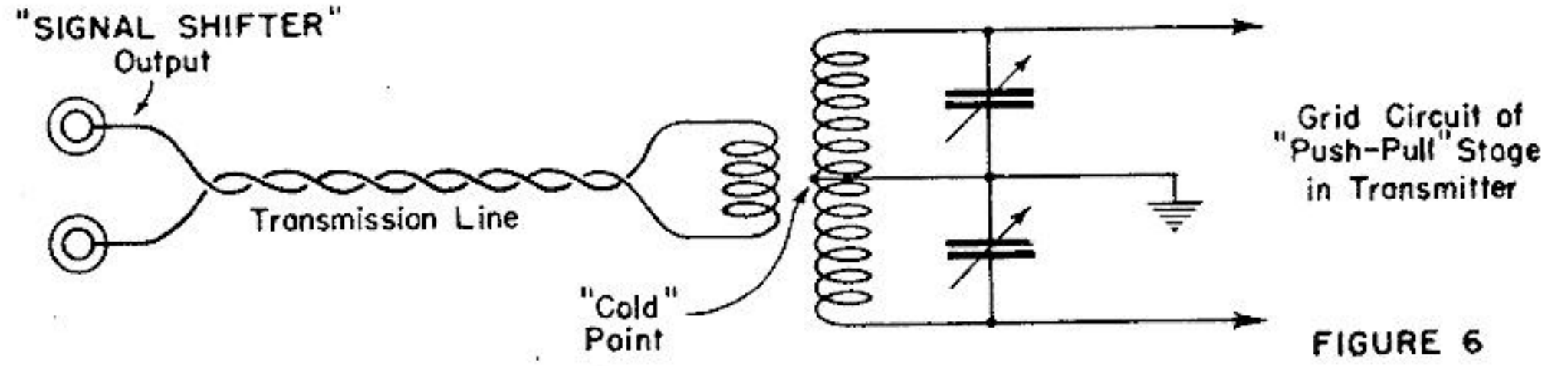

FIGURE 6

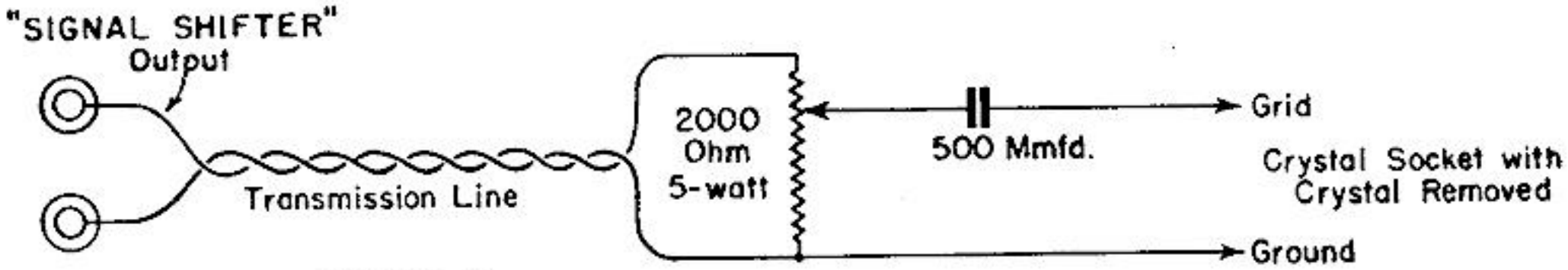

FIGURE 7

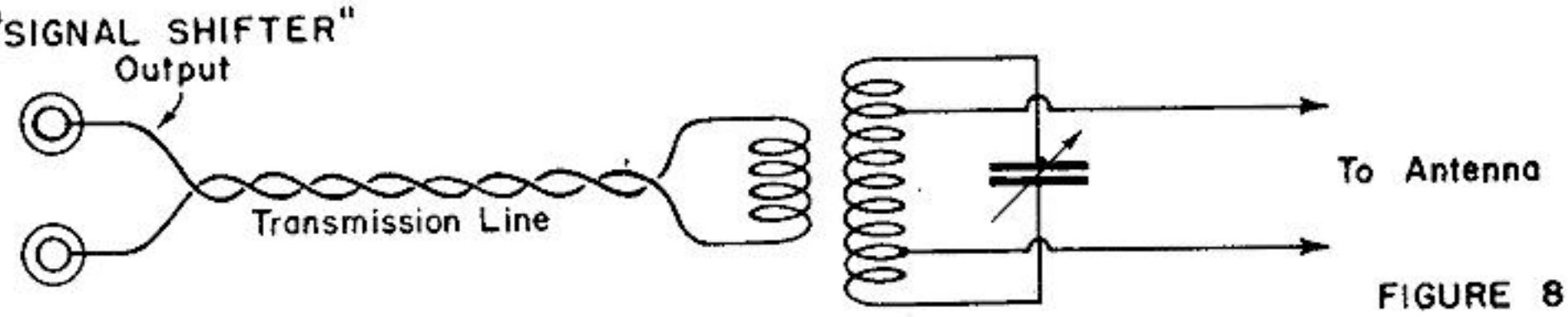

FIGURE 8

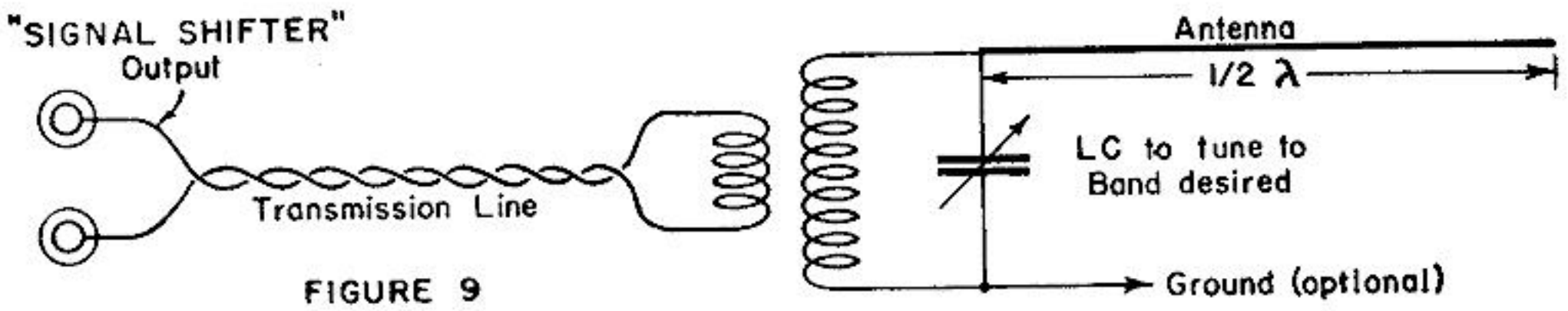

FIGURE 9

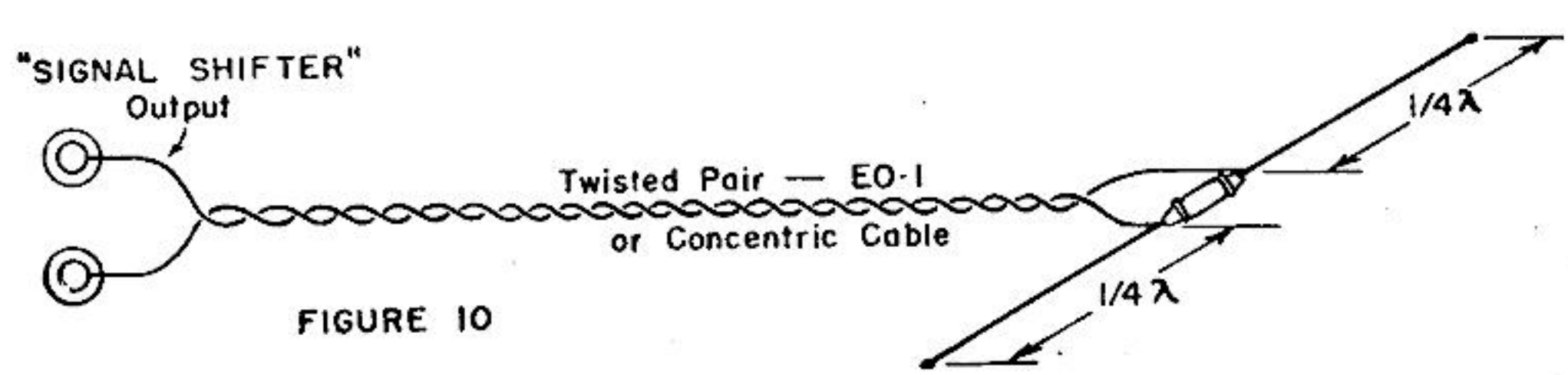

FIGURE 10

Figure 10 — METHODS OF COUPLING

IV. REPLACEABLE PARTS LIST

Circuit Designation	Description	Meissner Part No.
C1, C2, C3	3-gang Special Tuning Condenser	15176
C4	Oscillator Grid-Tank Condenser	15177
C5	Oscillator Plate-Tank Condenser	15240
C6	Buffer Plate-Tank Condenser	15260
C7, C9	100-mmfd. Mica Condenser	14101
C8, C10	500-mmfd. Mica Condenser	14100
C11, C14	0.1-mfd., 200-volt Paper Condenser	15142
C12, C13, C20	.01-mfd., 400-volt Paper Condenser	14110
C15	Align-Aire Neutralizing Condenser	6765
C16	0.1-mfd., 400-volt Paper Condenser	15143
C17, C18	12-mfd., 450-volt Electrolytic Condenser	15186
C19	8-mfd., 450-volt Electrolytic Condenser	16113
C22	.05-mfd., 400-volt Paper Condenser	14181
C23	0.1-mfd., 600-volt Paper Condenser	16166
R1	40,000-ohm, ½-watt Resistor	15155
R2	400-ohm, 1-watt Resistor	15184
R3	50,000-ohm, 1-watt Resistor	15183
R4	300-ohm, 2-watt Resistor	15182
R5	12,000-ohm, 3-watt Resistor	15179
R6	13,000-ohm, 5-watt Resistor	15180
R7	4,000-ohm, 5-watt Resistor	15181
R8	50-ohm, ¼-watt Resistor	16143
R9, C21	Temperature Compensator	9910
R10	60,000-ohm, 5-watt Resistor	17165
R11	30,000-ohm, ½-watt Resistor	17168
R12	4,000-ohm, 10-watt Resistor	17166
R13	1,000-ohm, 5-watt Resistor	17167
R14	60,000-ohm, ½-watt Resistor	17154
CH1, CH3	4-pie RF Choke Coil	19-1996
CH2	Parasitic RF Choke Coil	8822
CH4	7-Henry Filter Choke	19251
CH5	2-Henry Filter Choke	19528
CH6	6-Henry Filter Choke	19341
PT	Power Transformer, 110-volt	19253
PT	Power Transformer, 220-volt	19428
RL	Automatic Stand-by Relay	19229
SW1	3-Position Selector Switch	19223
SW2	"On-Off" AC Line Switch	19475
2 Required	Ceramic Octal Tube Socket	8437
3 Required	Aluminum Coil Shield	17917
2 Required	Bakelite Bar Knob	25-8222
1 Required	Tuning Knob for Standard Models	25-8224