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SHORT WAVE CRAFT

Edited by
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"Sh-h-h MOSCOW CALLING"

30

SILENCE

25 CANADA 30¢

At the first trial of the "19" Twinplex, a battery-operated one-tube receiver, foreign, as well as American stations, rolled in with amazing smoothness.

The "19" TWINPLEX Makes 1-Tube Perform as 2

By J. A. WORCESTER, Jr.

A Low-Cost, Easy-to-Build, Short-Wave Receiver of positive interest to "Beginners" and "Old-Timers" alike.

The "19" Twinplex, here described by our well-known contributor, Mr. Worcester, provides one of the *smoothest-working* short-wave receivers it has been our good fortune to try. This ambitious baby-sized set uses but one tube, a type 19, 2 volt, battery type; as this is a twin amplifier, the one tube performs the functions of two stages—detector and audio amplifier. This set is extremely easy, as well as economical, to build and is a dandy for those just breaking into the short-wave game.

● THE short-wave receiver described in this article follows in general principle the "53" Twinplex receiver described in the October issue of this magazine, but requires a less pretentious power supply in that the dry cell type 19 tube is used. This tube consumes .26 ampere at 2 volts and hence requires only two dry cells in a series connection for satisfactory results. The 53 tube previously employed, required 2.0 amperes at 2½ volts, thus making the use of dry cells uneconomical. The plate voltage for the 19 tube can vary between 90 and 135 volts and may be supplied by dry batteries or a well-filtered "B" eliminator.

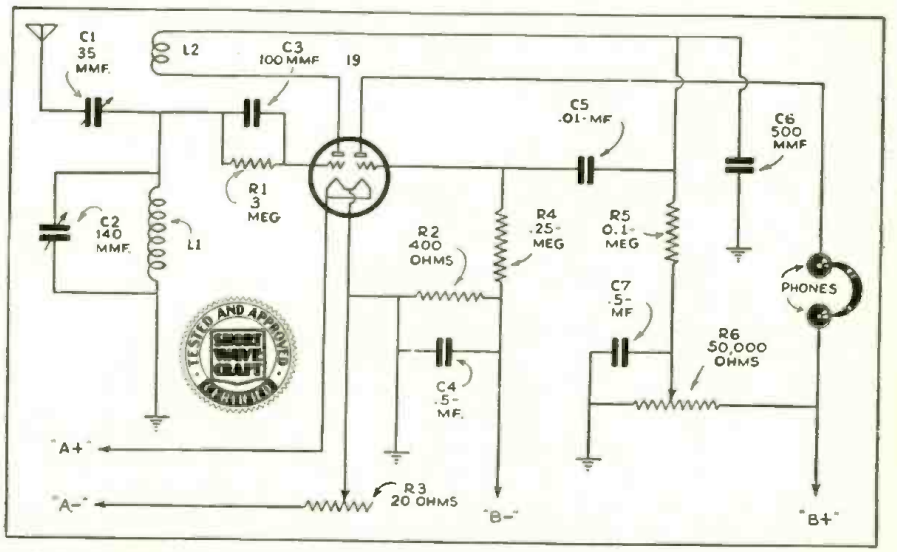
As is well known, this tube was designed as a class "B" twin amplifier and when used in this manner is capable of supplying approximately 2 watts of audio power. Due to the rather large static plate current drawn by this tube, however, it is entirely feasible to employ it for detection and class "A" amplification. The mechanical construction of this tube is similar to that of the 53, in that it effectively comprises two triodes enclosed within a single envelope; only the filament circuit being common.

Diagram Easy to Follow

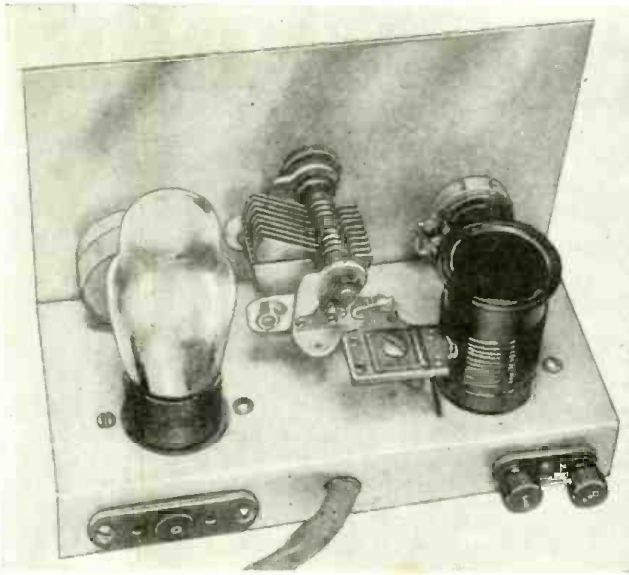
An inspection of the circuit diagram will reveal the simplicity of the layout and the small number of parts required. It will also be noted that the input circuit is entirely conventional. The antenna is coupled to the tuned circuit by means of the small equalizing condenser, C1. Detection is produced by virtue of the grid condenser, C3, and grid-leak, R1. These components have the proper values to automatically bias the tube sufficiently for proper detecting action. The plug-in tuning coils, L1, L2, are of the conventional manufactured variety although data are furnished for constructing same, if the reader wishes to "roll his own." The winding, L2, is employed to feed a portion of the radio frequency current flowing in the plate circuit back to the grid circuit; thus making it possible by suitable adjustment of the feed-back to largely compensate for losses in the tuned circuit. The feed-back is controlled by varying the plate voltage applied to the detector tube by means of the potentiometer, R6. Decreasing the plate voltage increases the internal plate resistance of the tube, causing a corresponding decrease in mutual conductance with a consequent reduction in feed-back. The radio frequency currents flowing in the plate circuit are by-passed to ground by the small capacity condenser, C6. This condenser is too small to allow the audio frequency currents produced by the detecting action of the tube to pass through and they consequently take the alternative path through the plate coupling resistor, R5, and the large capacity condenser, C7.

Audio Frequency Function

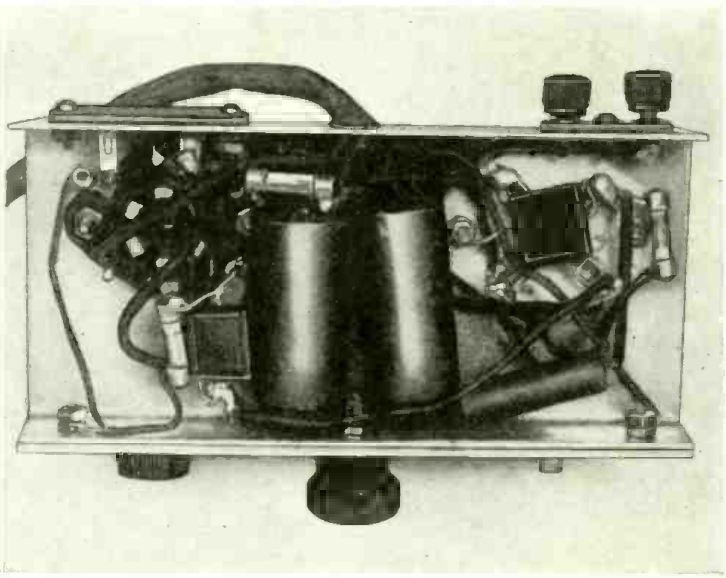
The audio frequency plate current flowing through the resistor, R5, produces corresponding voltage variations across it and these are impressed across the grid of the audio amplifier tube element. The condenser, C5, is employed to prevent the plate voltage of the detector from being impressed on the grid. This necessitates the use of the resistor, R4, to prevent a negative charge from accumulating on the tube and blocking it by reducing the plate current to a negligible value. A negative bias is provided for this tube by the total "B" current flow through the resistor, R2. C4 is employed for by-pass purposes.



Schematic wiring diagram illustrating the general relation of the relatively few parts used in building the "19" Twinplex—a dandy 1-tuber for the embryo short-wave "fan".



Bottom view of the remarkable 1-tube receiver.



Rear view of the "19" Twinplex Receiver.

The amplified audio frequency currents flowing in the plate circuit of the amplifier tube pass through the headphones as shown. The rheostat, R3, is employed to reduce the 3 volt "A" supply, furnished by two dry cells in series, to 2 volts at the tube terminals.

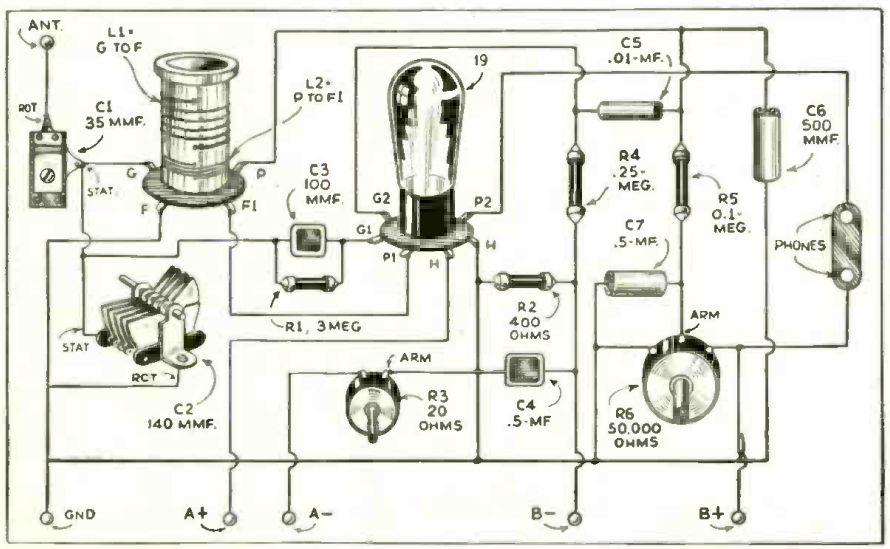
The location of the various parts will be noted from the photographs. The first step in constructing the receiver is to provide the chassis. This consists of a 14 gauge aluminum panel 5"x7" and an aluminum subpanel 7"x3¼"x1". The above subpanel is formed by bending a 5¼"x7" sheet to the above dimensions. On the front panel are mounted the 140 mmf. tuning condenser, C2, the 50,000 ohm potentiometer, R6, and the 20 ohm rheostat, R3. The antenna equalizing condenser, C1, is mounted directly on the tuning condenser as shown.

At the rear of the subpanel are mounted the twin binding post and phone-jack assemblies. A centrally located hole is also drilled to accommodate the battery cable.

Underneath the chassis are mounted the 6-prong tube socket and the isolantite coil socket. The various mica and paper condensers as well as the resistors are mounted directly by their pigtails as shown. Battery connections are made by connecting the cable directly to the proper points.

Parts List

L1, L2—Alden (Na-Ald) Short Wave Coils, 15-200 meters.
C1—Equalizing condenser 3-35 mmf. EC-35; Hammarlund (National, Cardwell).
C2—Isolantite midget condenser, 140 mmf., MC-140-M; Hammarlund (National; Cardwell).
C3—.0001 mf. moulded mica condenser.
C4, C7—.5 mf. tubular by-pass condenser, 200 DCWV.
C5—.01 mf. tubular by-pass condenser, 200 DCWV.
C6—.0005 mf. moulded mica condenser.
R1—3 meg. metallized resistor; Lynch.
R2—400 ohm metallized resistor; Lynch.
R3—20 ohm rheostat.
R4—0.25 meg. metallized resistor; Lynch.
R5—100,000 ohm resistor; Lynch.
R6—50,000 ohm potentiometer; Acratest.
1—Aluminum panel, 7"x5"x⅛"; Blan.
1—Aluminum subpanel 14 ga., 7"x3¼"x1"; Blan.
1—3" vernier dial; National.
1—4-prong isolantite socket; Hammarlund (National).
1—6-prong wafer socket; Alden.
1—Ant.-ground binding-post strip.
1—Twin speaker jack assembly.
1—Type "19" tube RCA (Arco).



Picturized wiring diagram which even the most inexperienced short-wave fan can follow, in order to build this excellent one-tube receiver which gives 2-tube results.

Operating Hints

When putting the set into operation the rheostat should be adjusted until the filament voltage is two volts. The potentiometer should be adjusted until the circuit goes into oscillation. When oscillation starts a pronounced thud generally occurs and pronounced clicks will occur when the ungrounded terminal of the tuning condenser is touched with the finger. It will generally be found advisable to readjust the antenna condenser each time a coil is changed. For the smallest coil, best results will usually be obtained with the condenser plate "all out," while for the largest coil the plate should be nearly "all in" for most satisfactory results. This adjustment should be loose enough so that "dead-spots" in the tuning range, caused by antenna resonance, do not occupy more than five or ten degrees on the tuning scale.

This little receiver will pull in signals from all over the world without the slightest difficulty. Even the weakest foreign stations can be pulled in with perfect clarity, under fair receiving conditions, as there is practically no back-ground noise from the receiver itself. Anyone building this set will surely be surprised at the volume it will produce. There are no tricks in tuning the 19 Twinplex; the regeneration control operates very smoothly and causes only an inappreciable detuning effect. As in all short-wave receivers, extreme care must be exercised in operating, otherwise a great number of the weaker stations will be passed up. *So Tune S-l-o-w-l-y!*

PLUG-IN COIL DATA

Meters Wave-length	Grid coil turns	Tickler turns	Distance between 2 coils
200-80	52 T. No. 28 En. Wound 32 T. per inch	19 T. No. 30 En. Close Wound (CW)	⅛"
80-40	23 T. No. 28 En. Wound 16 T. per inch	11 T. No. 30 En. C. W.	⅛"
40-20	11 T. No. 28 En. 3-32" between turns	9 T. No. 30 En. C. W.	⅛"
20-10	5 T. No. 28 En. 3-16" between turns	7 T. No. 30 En. C. W.	⅛"

Coil form—2⅜" long by 1¼" dia. 4-pin base.