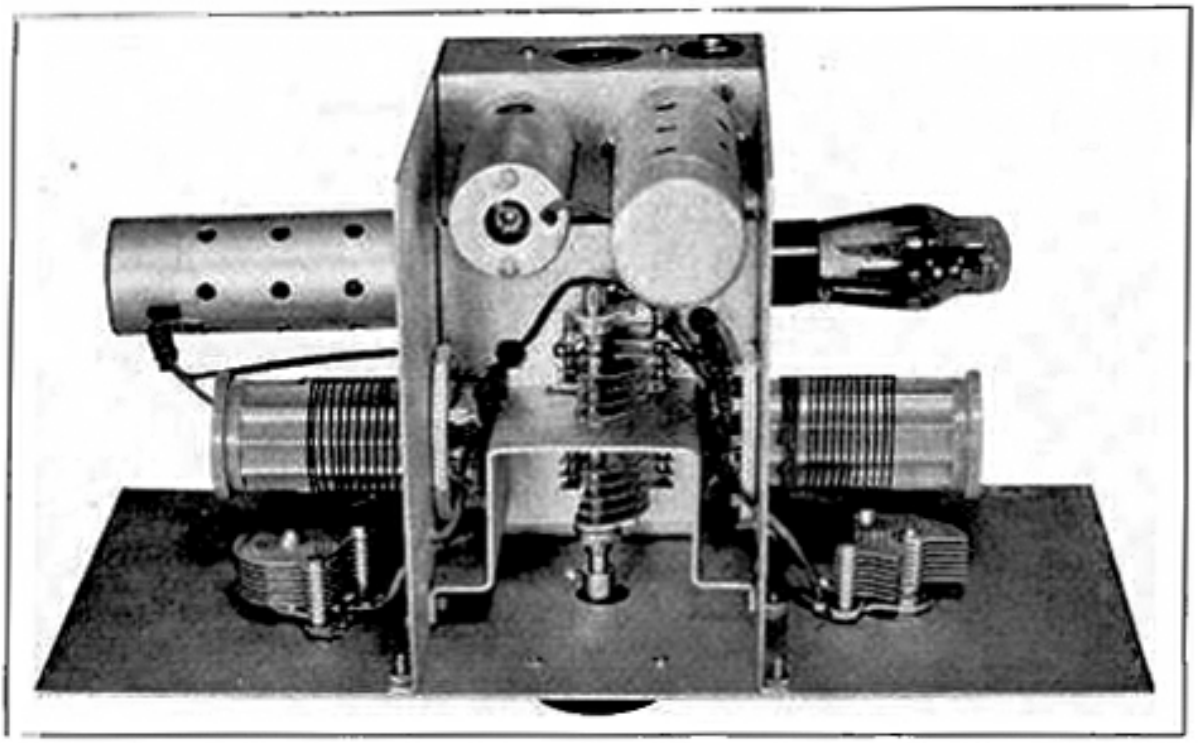
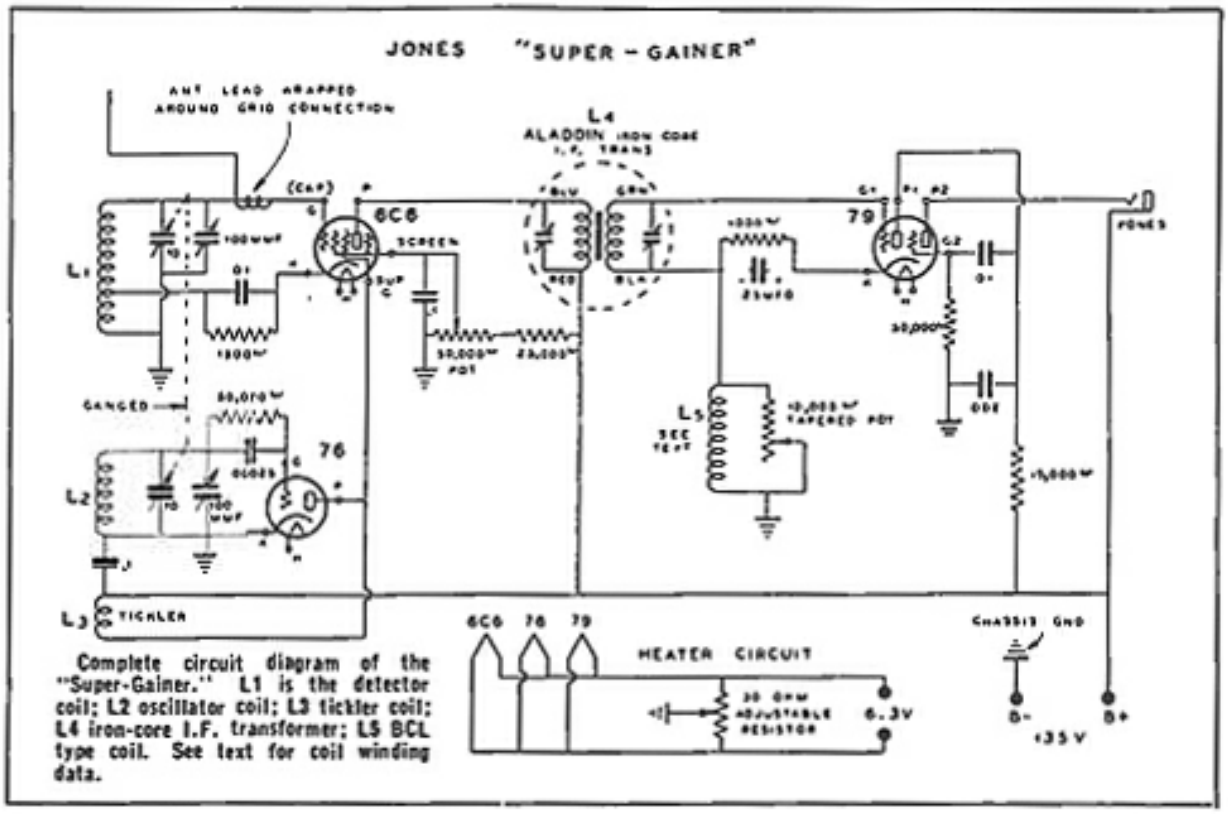


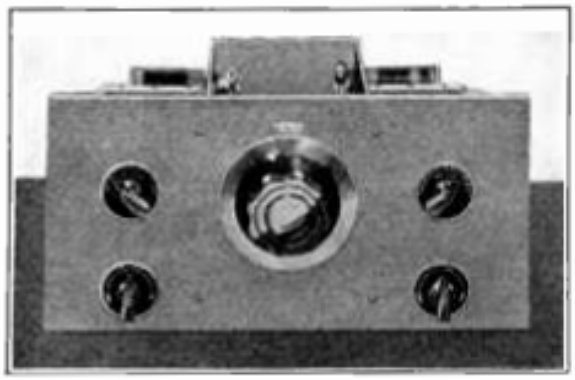
Professional construction characterizes this model of the Jones "Super-Gainer." Note the short, direct leads. The antenna is coupled to the grid by twisting a few turns of the antenna lead around the grid lead.

The second detector, a '79 twin-triode, is the most important component in this new receiver. The tube functions as a regenerative second detector, beat-frequency oscillator, and as an additional stage of audio amplification. Regeneration in the second detector, even when oscillating for CW reception, eliminates the need of an IF stage. By the same token, a separate BFO tube is eliminated. The second triode only functions as a stage of resistance coupled audio amplification.

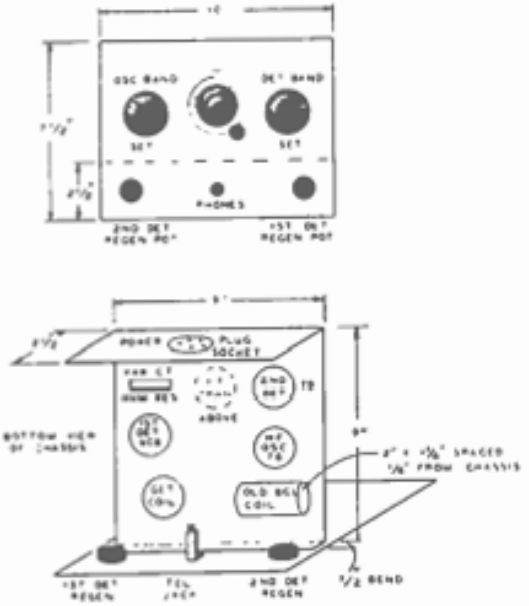
Cathode regeneration is used in the first section of the 79 tube. The cathode coil consists of an old BCL receiver coil of about 90 turns of No. 30 wire, wound on a 1¼-inch diameter form. The regeneration is controlled by means of a tapered



Complete circuit diagram of the "Super-Gainer." L1 is the detector coil; L2 oscillator coil; L3 tickler coil; L4 iron-core I.F. transformer; L5 BCL type coil. See text for coil winding data.



Front view of the Jones "Super-Gainer."



Front panel view and under-chassis layout of alternate design using standard front panel and "U"-bend chassis.

10,000 ohm variable resistor shunted across the BCL coil. This latter component is not directly a part of the 456 KC tuned circuit, and therefore no trouble is encountered from a detuning effect on CW for various settings of the regeneration or oscillation control. A 1000 ohm control may give smoother control.

A single Aladdin iron-core IF transformer (465 KC) provides sufficient selectivity for this receiver. This unit has a screw adjustment on the side of the shield-can which varies the coupling between the two tuned coils. When the second detector is made to regenerate it is necessary that very loose coupling between the circuits be maintained. For this reason only such types of IF transformers should be used which will allow adjustment of coupling.

The main tuning is accomplished by means of a two-gang double-spaced condenser, originally having 35 mmfd. max. capacity per section. To prevent interlock effect on 20 meters, an aluminum shield is placed around the oscillator section of the condenser. By removing one stator plate from each of the inside ends of the stators, space is made available for the ground shield. The oscillator section of the condenser also has its front plate removed; thus, this section has 7 dielectric spaces between rotor and stator, while the detector has eight spaces. The detector band-setting condenser is adjusted for maximum signal or noise pick-up by advancing the first detector regeneration control; that is, increasing the screen-grid voltage. The cathode-tap on the first detector coil allows regeneration at the signal frequency; variation of screen-voltage provides a convenient adjustment of regeneration. The tube should never be permitted to oscillate; otherwise it will bring in undesired stations which will differ in frequency from the desired station by the value of the intermediate frequency.

The antenna is capacitively coupled to the grid of the 6C6 by twisting a few turns of the lead-in wire around the grid lead of the first detector. If the antenna is inductively coupled to the receiver, too much coupling, as when using a resonant antenna, will prevent sufficient regeneration.

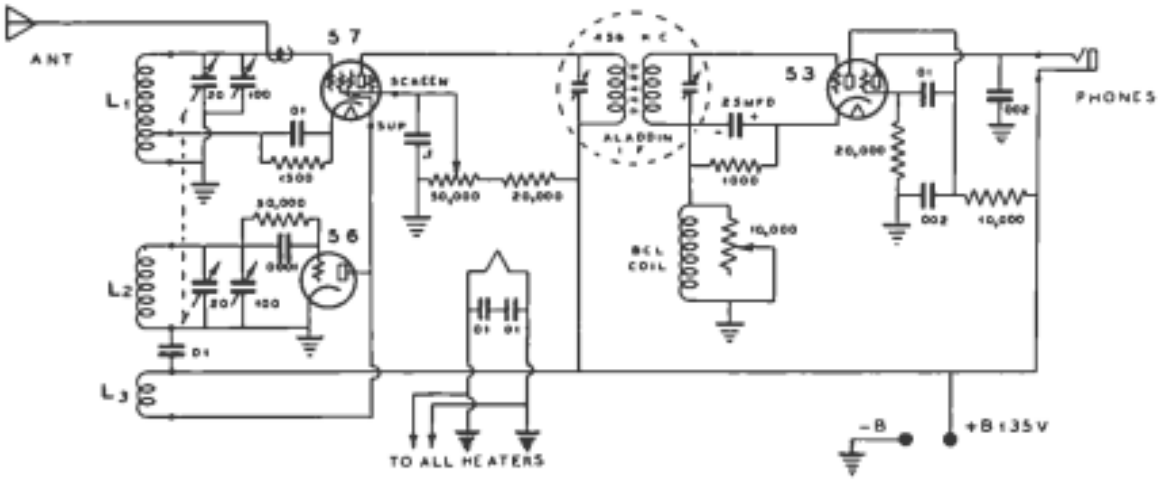
Receiver Adjustments: The second detector must oscillate when its regeneration control is adjusted. The IF transformer tuning can then be adjusted to resonance with the secondary by noting the spot at which it tends to pull this detector out of oscillation.

After the second detector is operating properly, the 76 oscillator can be aligned on some strong signal, or by a calibrated modulated oscillator. The first detector

RECEIVER COIL DATA

All in 1½" Diameter Forms

Wavelength	L_1	L_2	L_3
160 Meters	1¾" winding of #24E. Tapped at 1½ turns. Close wound.	1¾" winding of #24E. Close wound. Grid on top end.	12t #24E. Close wound ⅛" from L2. Same direction as L2 with plate on far end.
80 Meters	40t #20 DSC, spaced to cover 1¾". Tap at ¾ turn.	33t #20DSC, spaced to cover 1¾".	8t #24E. Close wound ⅛" from L2.
40 Meters	12t #20DSC, spaced to cover 1½". Tap at ½ turn.	11t #20DSC, spaced to cover 1¼".	5t #24E, spaced ¼" from L2.
20 Meters	5t #20DSC, spaced to cover⅞". Tap at ½ turn.	5t #20DSC, spaced to cover ⅝".	2½t #20DSC, spaced ¼" from L2.
10 Meters	3½t #20DSC, spaced to cover 1". Tap at ⅓ turn.	3½t #20DSC, spaced to cover 1".	2½t #20 DSC ¼" from L2, and ⅛" between turns.

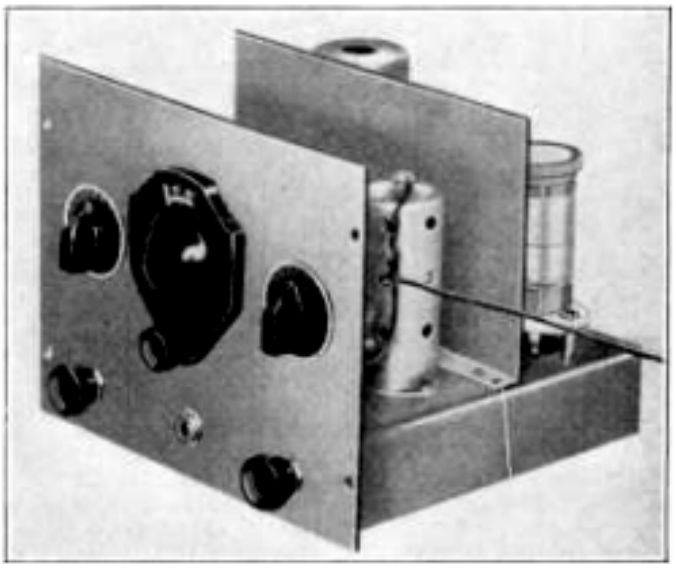


3-tube "Super-Gainer" with 2.5 volt heater tubes.

control must not be advanced to the point of actual oscillation. The antenna coupling can be adjusted so that it will allow the first detector to actually oscillate. All tests can be made by listening with a headset plugged into the telephone jack. The audio volume is not sufficient for operating a loudspeaker.

IMPORTANT DATA:

When more than 135 volts plate supply is used, the H-F oscillator voltage must be reduced by means of a 25,000 or 50,000 ohm, 1 watt resistor, then by-passed to ground with a 0.1 mfd. condenser. The value of the second detector cathode resistor should be reduced to approximately 250 ohms. Smoother second detector regeneration can be obtained by using either a 400 ohm or 1,000 ohm variable wire-wound resistor instead of the 10,000 ohm resistor across the BCL coil. Sometimes a few turns must be added to the BCL coil when a lower value of variable resistor is used.



Front view of the 2-tube "Super-Gainer," showing shield partition and antenna "condenser" (twisted lead around grid connection).

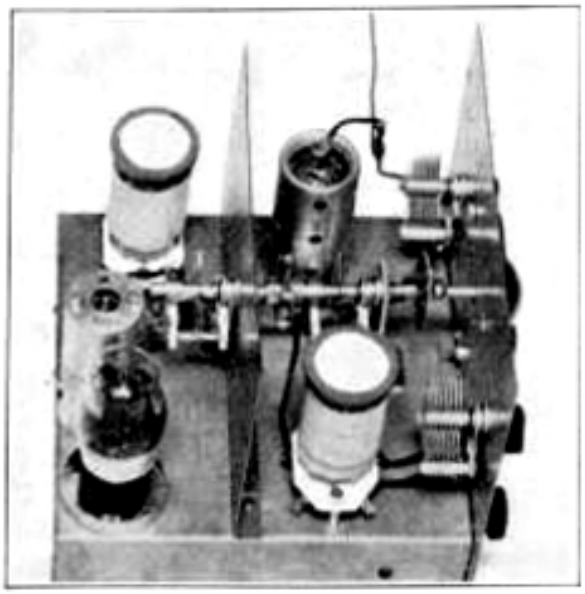
Two-Tube Super-Gainer: Multi-purpose tubes are used in this receiver producing results comparable to 6- or 7-tube superheterodynes. The inherent selectivity of this set is greater than that of a tuned RF receiver and the sensitivity is comparative.

Technical Considerations: A 6F7 dual-purpose tube serves as a regenerative first detector and separate oscillator. A 6A6 double triode performs the functions of regenerative second detector, beat-oscillator and audio amplifier. The receiver sensitivity is apparently higher than the three-tube super-gainer, but has a slight interlock effect which is encountered on 10 and 20 meters. This effect is practically unnoticeable after the two band-setting 100-mmfd. condensers have been properly adjusted for any given band. Turning over any portion of the communication spectrum between 10 and 160 meters is accomplished by means of a two-gang 20-mmfd. condenser.

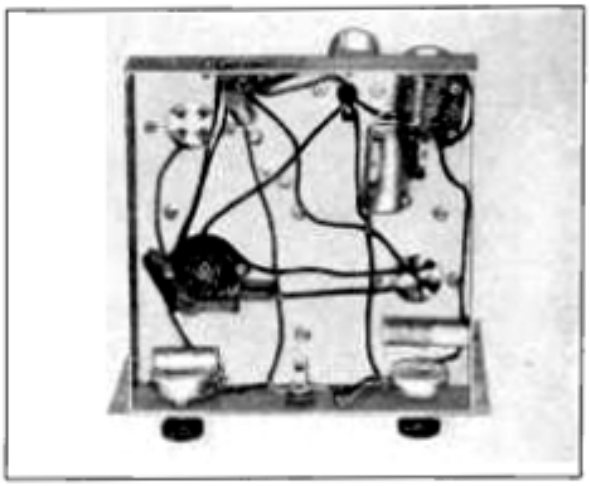
Selectivity is obtained from regeneration in the iron-core intermediate-frequency transformer. In general, the circuit is a simplified superheterodyne. The triode portion of the 6F7 is the H.F. oscillator, tuned to about 456KC higher in frequency than the first detector input. The pentode portion of the 6F7 is a regenerative first detector with cathode-tap for regeneration and H.F. oscillator coupling. Screen-grid voltage variation serves for both volume and regeneration control.

The I.F. transformer coupling is set to a value which will allow regeneration and oscillation within the range of the tapered variable resistor control. This control shunts the 6A6 cathode-coil which consists of 100 turns of No. 32 DSC wire "jumble-wound" on a ½-in. diameter rod. The second detector is by-passed with a .004 mfd. by-pass condenser to ground while the grid and cathode are above ground poten-

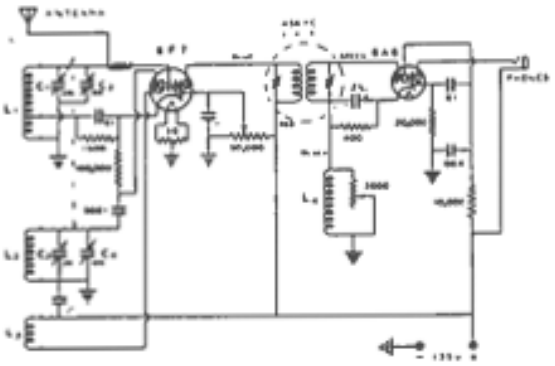
2-Tube "Super-Gainer" Layout



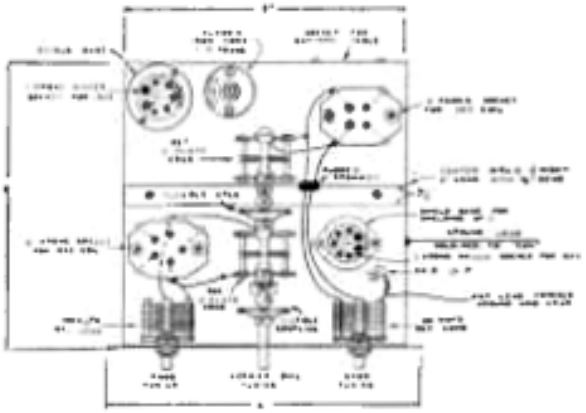
2-tube "Super-Gainer" Layout, 6A6 tube shield removed.



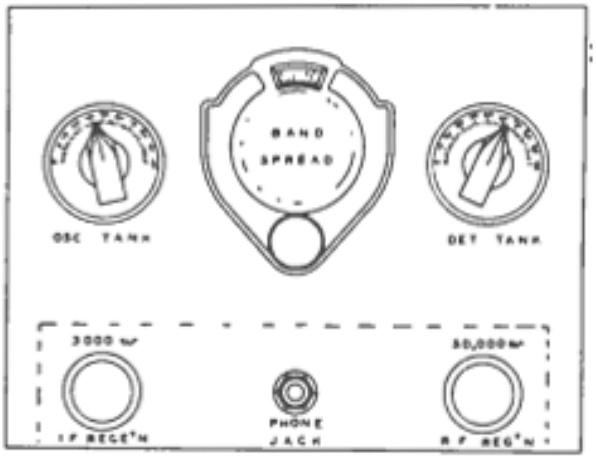
Under-chassis view, showing the BCL coil, L4.



The circuit diagram. See table on page 42 for coil winding data.

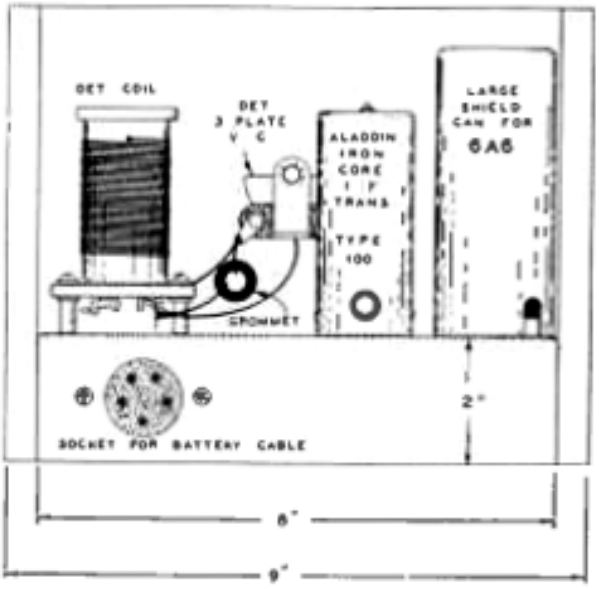


Pictorial arrangement for correct parts placement.

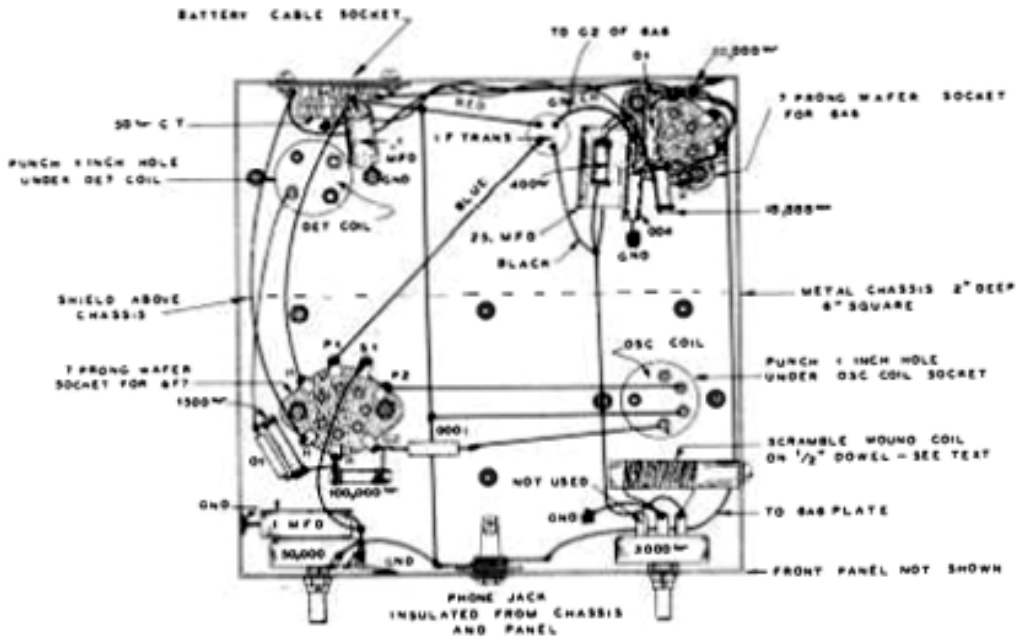


FRONT PANEL LAYOUT FOR 2-TUBE SUPER-GAINER METAL PANEL 9" WIDE, 7" HIGH

The front panel is 9" wide, aluminum or steel.



Rear view showing shield can for 6A6 tube, iron-core I. F. transformer, detector coil and detector condenser.



Construction of the 2-tube "Super-Gainer" is simple, if this under-chassis pictorial wiring plan is carefully followed.

tial for RF, or rather I.F. This forms a regenerative or oscillating circuit controlled by the 2000-ohm variable resistor. The value of the tapered resistor may have a maximum as high as 5000 or 10,000 ohms; control, however, taking place in the region between 0 and 2000 ohms.

The 400-ohm cathode-resistor must be by-passed with a large low-voltage, electrolytic condenser in order to prevent degenerative amplification (motor-boating). The detector is resistively coupled into the audio amplifier part of the 6A6 by low ohmic resistors.

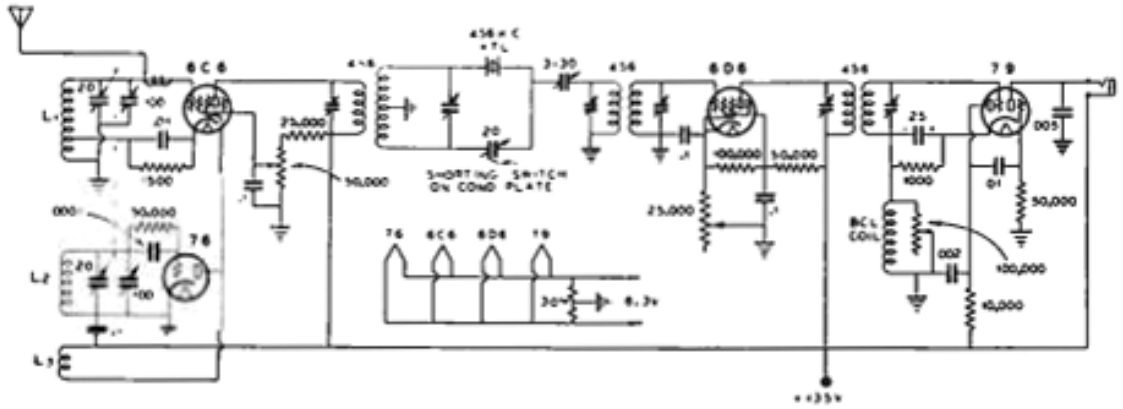
Antenna coupling is varied by twisting more or less insulated hook-up wire around the 6F7 detector grid-lead until smooth regeneration is obtained up to the point of oscillation. Note: A modulated test oscillator will simplify all preliminary adjustments.

The chassis is about 8 x 8 x 1¾th inches with a front panel 8 x 7 inches. A shield 5 inches high separates the first detector and the H.F. oscillator coils and tuning condensers. The latter are ganged by means of a flexible shaft coupling, and tuned by a vernier dial. The two 100-mmfd. band-setting condensers should be controlled from the front panel in order to accurately resonate the detector circuit when using regeneration. The coil turns may be compressed or expanded before cementing in place, so as to obtain circuit tracking across each amateur band. Both tubes should be shielded.

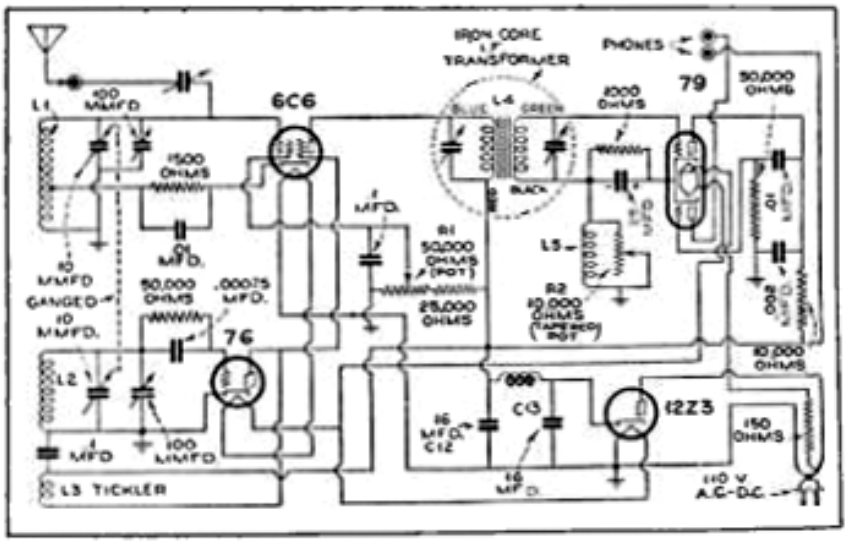
2 TUBE SUPER-GAINER COIL DATA

All Coils Wound on 1½" Diameter Forms

Wavelength	L_1 Detector	L_2 Oscillator	L_3 Tickler
160 Meters	1¾" of #24 E. Tapped at 4 turns. Closewound.	1¼" of #24 E. Closewound. Grid on top end.	20t #24 E. Closewound ⅛" from L2. Same direction as L2 with plate on far end.
80 Meters	40t #20 DSC., Spaced to cover 1¾". Tap at 2 turns.	32t #20 DSC., Spaced to cover 1¾".	10t #28 DSC. Closewound ⅛" from L2.
40 Meters	12t #20 DSC., Spaced to cover 1½". Tap at 1½ turn.	11t #20 DSC., Spaced to cover 1¼".	7t #24 E. Spaced ⅛" from L2.
20 Meters	7t #20 DSC., Spaced to cover 1⅛". Tapped at one turn.	7t #20 DSC., Spaced to cover 1⅛".	4t #20 DSC., Spaced ⅛" from L2.
10 Meters	3½t #20 DSC., Spaced to cover 1". Tap at ⅜ turn.	3½t #20 DSC., Spaced to cover 1".	3t #20 DSC., ⅛" from L2 and ¼" between turns.



Experimental "Super-Gainer" with Crystal Filter.



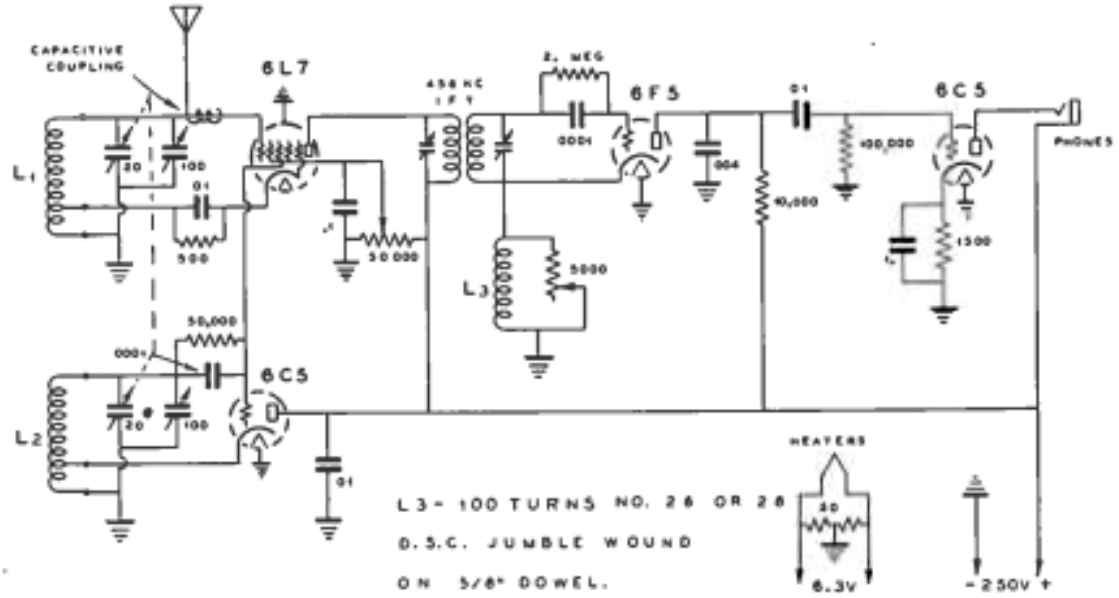
A-C operated "Super-Gainer" with 12Z3 rectifier tube in the power supply. This is a diagram of the McMurdo-Silver factory-built "Super-Gainer."

.etal Tube Super-Gainer: This receiver nas four of the new metal tubes in the Super-Gainer circuit, the characteristics of which are similar to the receiver previously described except that with the inclusion of the 6L7, special mixer tube. the receiver has a higher degree of sensitivity. The 6L7 tube has a higher plate impedance as a first detector so that I.F. gain is as high with a small Aladdin iron-core I.F. unit as with a larger unit and 6C6 tube. The 6L7 also makes a very effective regenerative first detector with variable screen-voltage control. A cathode-tap on the detector grid coil serves as a means of obtaining regeneration at the signal frequency.

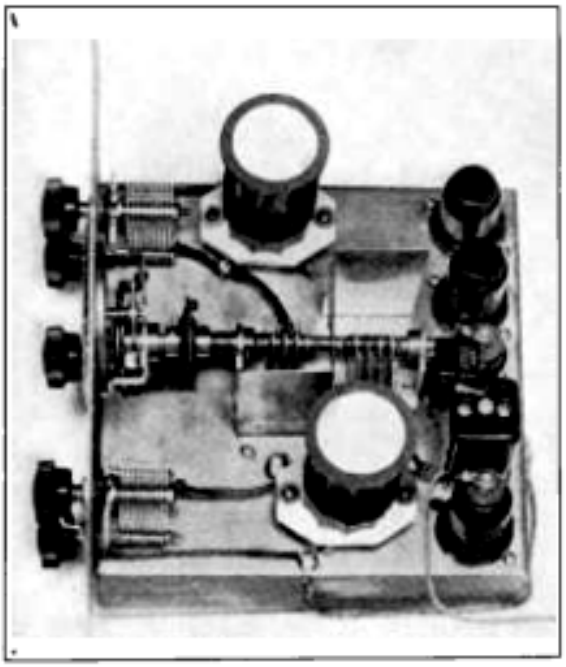
Miscellaneous Notes: Second detector regeneration and oscillation is controlled by a 5000-ohm tapered variable resistor shunted across a cathode coil. The latter is made of 100 turns of No. 26 or No. 28 DSC wire "scramble-wound" on a short section of ⅝th-inch diameter dowel rod. There is no magnetic coupling between this coil and the second detector grid coil. A 6F5 high-mu tube functions as the detector of the grid-leak or bias type. Grid-leak detection is shown, but generally cathode-bias detection will allow the circuit to regenerate smoother.

A 6C5 tube similar to a 76 serves as an audio amplifier, resistance-coupled to the detector circuit. Another 6C5 tube functions as a H.F. oscillator with cathode-tap for oscillation. The grid-leak and condenser bias this tube as well as the special injection grid of the 6L7 tube.

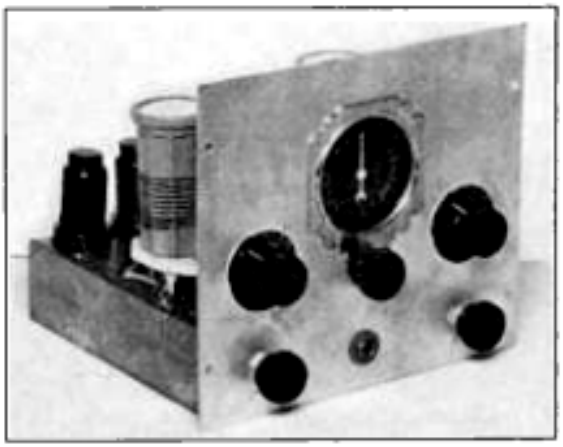
The set is assembled on a 7 x 7 x 1¾-inch metal chassis with a small shield placed between the coils and ganged-condenser sections. The sections are made from 35-35 mmfd. midget condenser having only four stator plates per section (the others being removed). The 100 mmfd. condensers are band-setting controls which are manipulated by small dials on the front panel, the latter is of aluminum 7 x 8 inches 12-gauge. The vernier dial is insulated from the tuning condenser shaft in order to eliminate multiple ground leads and resulting noise when tuning. A power-plug and socket are mounted at the rear of the chassis for connection to a 6.3 volt filament transformer and 135-volts of B-battery, or to similar values of voltage from



METAL TUBE SUPER-GAINER



Looking into the Metal-Tube "Super-Gainer."



The airplane tuning dial adds beauty and convenience.

an AC power supply. With a power-pack, the DC voltage should not be over 180-volts and an 8mfd. condenser must be connected across the voltage divider at this point.

The coils are similar to those listed under the three tube Super-Gainer except that no tickler is needed on the oscillator coils. The cathode-tap in this case is from ⅛th to ⅓rd of the total turns up from the grounded end of each oscillator coil. The antenna coupling should be semi-variable because of the effects of antenna resonance on the first detector regeneration.

METAL TUBE SUPER-GAINER COIL TABLE

All Coils Wound on 1½" Diameter Forms

Wavelength	Detector Coil	Oscillator Coil
160 Meters	1¼" of #24 E., closewound. Tap at 1¼ turns.	1¼" of #24 E., closewound. Tap at 1/3 of total turns.
80 Meters	38t #22 DSC., 1¾" long. Tap at ¼ turn.	32t 22 DSC., 1¾" long. Tap at 10 turns.
40 Meters	12t #22 DSC., 1½" long. Tap at ½ turn.	11t #22 DSC., 1¼" long. Tap at 3½ turns.
20 Meters	6t #22 DSC., 1" long. Tap at ¼ turn.	6t #22 DSC., 1" long. Tap at 1½ turns.
10 Meters	3½t #22 DSC., 1" long. Tap at ¼ turn.	3½t #22 DSC., 1" long. Tap at 1 turn.