radio-electronic circuits

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contents

preface

THIS is a companion book to HANDY KINKS AND SHORT CUTS. It represents the circuit ideas of the radio experimenter rather than of the editors. Some of the circuits are ingenious, other are adaptations of common circuits to meet the special requirements of the builder, but all represent the ideas of the active experimenter at work.

The relative size of each chapter is an accurate gauge of the experimenter's interest; the number of circuits in each chapter is based on the number of contributions to the *Radio-Electronic Circuits* department of RADIO-CRAFT magazine. It is no surprise that receivers and amplifiers top the list in popularity. Among the many circuits given are those for a one-tube superhet; an all-wave portable receiver; an r.f. regenerator and several different superregenerators.

This book, the editors feel, will find a place on every radio man's bookshelf, because of the many odd and useful circuits which are not to be found elsewhere.

Circuits are the basis of the electronic experimenter's handiwork. In many cases the ideas incorporated in these circuits, plus some new slant or variation conceived by the reader, will help to solve his problem.

The diagrams have been checked carefully and represent actual working hookups contributed by readers of RADIO-CRAFT.

Section 1...

RECEIVERS

1-Tube Superhet

USING the multi-element 1D8 tube, I have designed the superheterodyne shown in Fig. 101.

The pentode section is the mixer, the triode is the oscillator, and the diode plate a detector. T2 is the oscillator coil, T3 the transformer, and C1-C2 may be ganged. C3 and C6 are padders.

C3 may be omitted in most cases, the rotor of C1 being connected directly to ground. Alignment troubles will be saved if C1 and C2 are not ganged, but tuned independently.—MAX W. SCHMUCKLER.

3-Tube A.C.-D.C. Set

THE diagram in Fig. 102 shows a midget 3-tube t.r.f. receiver for 115-volt a.c.-d.c. operation. The use of 2 dual-purpose tubes makes the set more compact.

The 6K7-GT functions as an amplifier, while the first section of the 6C8-G acts as a detector supplying the a.f. voltage into the second section for additional amplification.

The 25A7-GT is a combined output pentode and half-wave rectifier.

A good 3-inch PM speaker will handle the output.

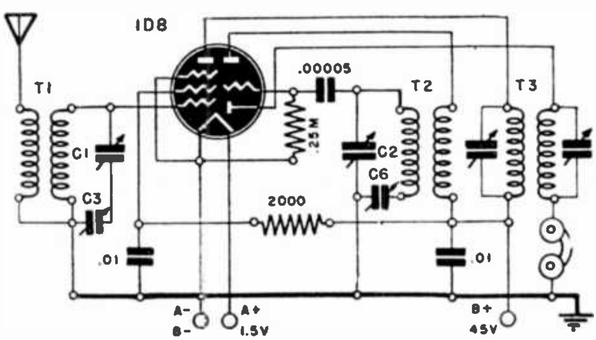


Fig. 101

Careful construction and alignment of the trimmers on the 2-gang tuning condenser will give plenty of volume.

A 10 foot antenna should be sufficient. —DOUGLAS KOHL.

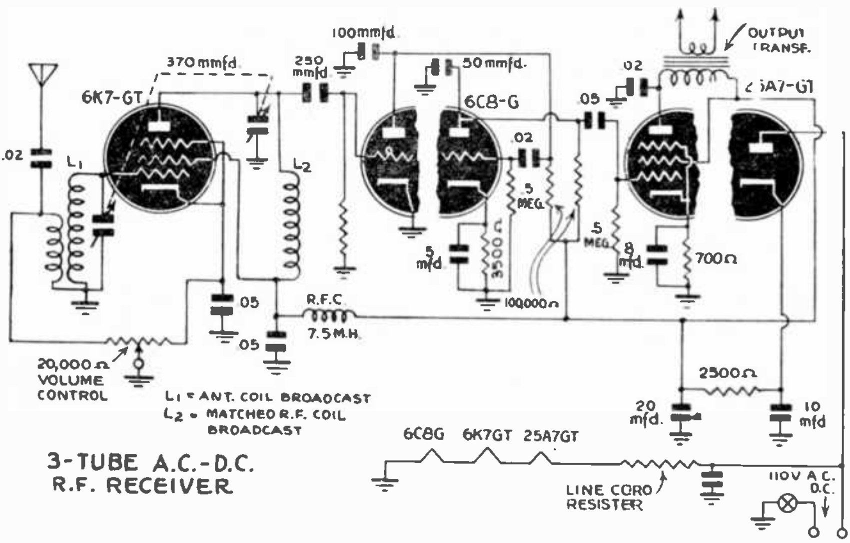


Fig. 102

All-Wave Portable

I EMPLOY this hookup (Fig. 103) in a battery portable. It uses one 1T4 and one double-purpose triode, the 1G6-G. These characteristics save space. The tubes can be lighted by 1 or 2 flashlight batteries. Two stages of audio are provided.

The short-wave coils, down to 19 meters, all work fine, and regeneration is smooth and easy to control. Standard short-wave coils are used. — ROBERT W. L. MARKS.

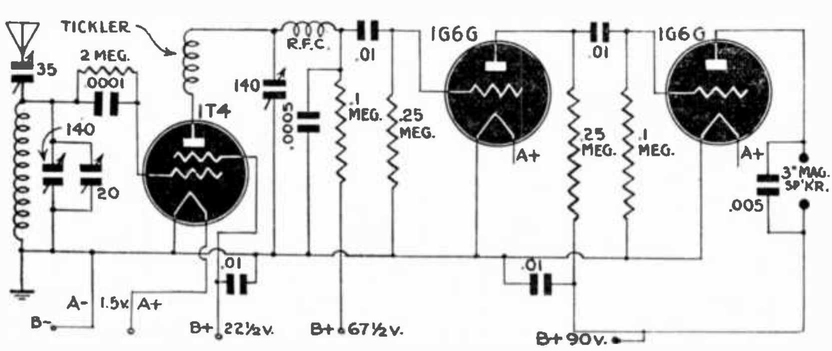


Fig. 103

Short-Wave Receiver

After long experimenting with various circuits to find one that would regenerate satisfactorily on 20 meters, I thought of of designing a circuit with dual regeneration control (Fig. 104). I put a potentiometer in the screen-grid circuit of the 6J7 and a variable condenser in the plate circuit for regeneration. The screen voltage is quite critical for certain combinations, but this circuit provides a means of selecting the screen voltage which will make the set the most selective. It regenerates on all bands down to 16 meters. This set will bring in foreign stations with good earphone volume. — Wilfred Cieluch.

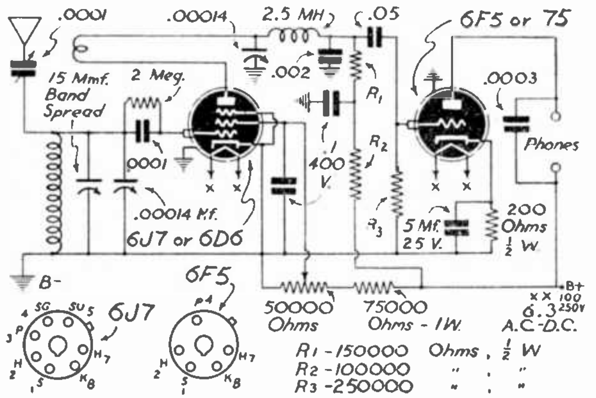


Fig. 104

4-Tube Receiver

I have been using this circuit (Fig. 105) on short and long waves for some time. I am using manufactured coils.

The set seems quite tricky. The 27 detector works better than the usual 57 or some other pentode on the higher frequencies. I found that about 180 v works better than 300.

The antenna condenser is not a trimmer, but a small variable. This makes its easier to set for each band. It must be carefully set each time, but only a few seconds are required. The regeneration method works very well also, with but slight additional cost for parts.

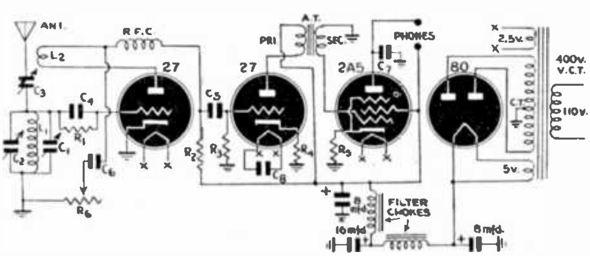


Fig. 105

PARTS LIST

C1—250 $\mu\mu$f	RFC—2.5 mh.
C2—30 $\mu\mu$f	R1—2 meg
C3—15 $\mu\mu$f	R2—100,000 ohms
C4—100 $\mu\mu$f	R3—250,000 ohms
C5—0.01 μf	R4—2,500 ohms
C6—0.001 μf	R5—400 ohms
C7—0.006 μf	R6—50,000 ohms
C8—0.01 μf	

—ROBERT J. MEAGHER.

Economy Four

THIS 4-tube superhet (Fig. 106) uses midget-type tubes. The circuit of the radio is conventional but for the power supply, which is designed to operate efficiently on a 6 volt d.c. source of power. Because of the low B drain, the power supply can be designed so that the maximum drain will only be 1.5 amp. The vibrator transformer can be easily wound to fit the core of a bell-ringing transformer (try a small power transformer) by using the ratio of 6 turns per volt and No. 20 wire for the primary and No. 35 wire for the secondary. By using a fixed bias of 6 v on the 1S4, good undistorted volume will result, even from the most powerful locals.

The synchronous vibrator makes a handy and compact power pack, but there is no reason why a vibrator using a rectifier tube should not be used, if available.

—D. A. KOHL.

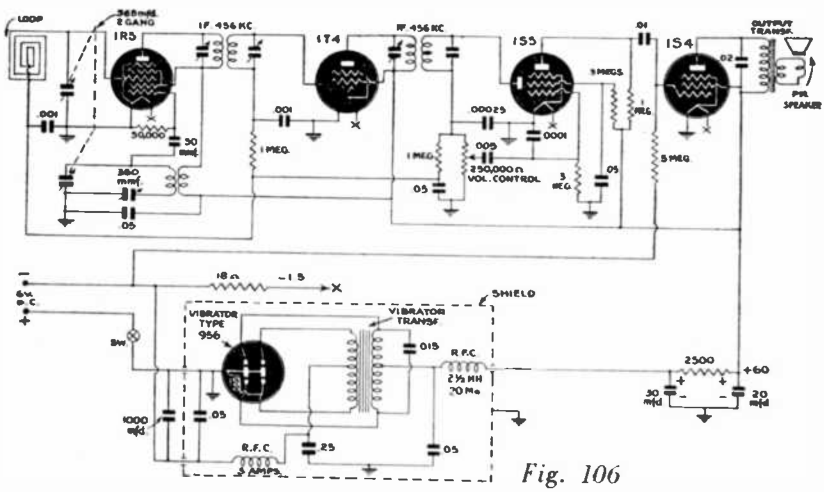


Fig. 106

R.F. Regenerator

THE diagram shown (Fig. 107) is of a set which I constructed and which works very well. Unusual features are regeneration in the second r.f. stage (not the detector), the method of securing regeneration, and the use of an untuned detector stage. The latter was decided upon because a diode detector instead of the second r.f. stage would load the tuned circuit and reduce the selectivity. Use the smallest condenser at C which will just permit oscillation over the entire band.

The coils were taken from an old t.r.f. set and the feedback coil was inserted inside the primary winding. The feedback coil L5 is approximately 20 turns. The point of oscillation varies very slightly over the entire band. Component

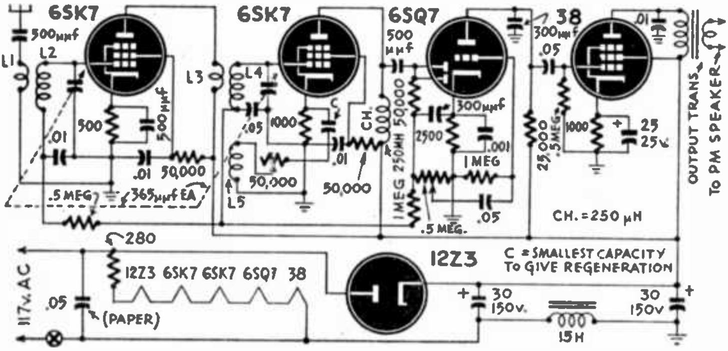


Fig. 107

values are all listed on the diagram. —VAUGHN G. LAYMAN.

gang 365-μμf condenser is used and reception is very good.

It is necessary to shield the 57 tube to obtain maximum efficiency, and the coils must be enclosed in shield cans to prevent oscillation. I have mounted the whole works, including the power supply on a chassis 5 x 9 x ½ inches. —WILBUR HAIT.

Old-Type Tubes in T.R.F. Set

THIS diagram (Fig. 108) is for a cheap but powerful 4-tube t.r.f. receiver. The tubes are non-critical ones and will outlast the new types. Most of the parts can

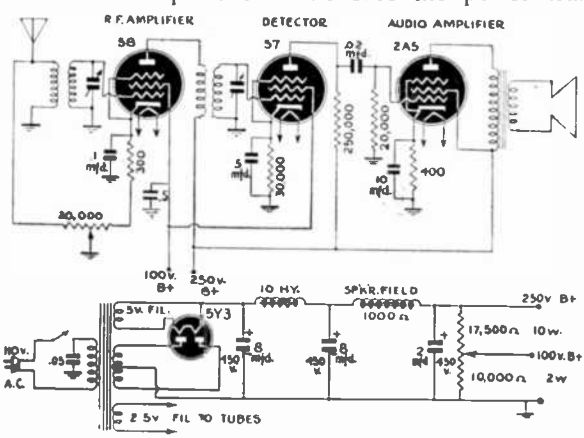


Fig. 108

be found in the junk box. Antenna and r.f. are standard coils (Meissner were used in this case.) A 2-

A.C. 5-Tube B.C. Receiver

IN the diagram, (Fig. 109) be sure the power transformer is shielded or else it is so placed on the chassis as to avoid undesirable hum. It can be located by turning the power transformer when the receiver is in operation,

T1—Power Transformer 700 v (C.t.)
5 v, 3.5 amp
6.3 v, 0.3 amp
350-350 v, 120 ma

T2--Audio 3:1 for single 6L6 tube

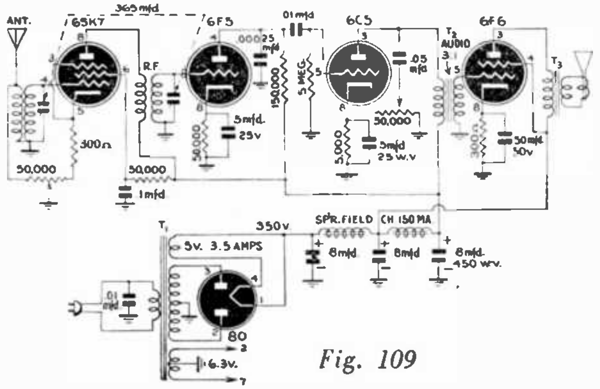


Fig. 109

T3—Universal output transformer

1—Speaker (8-10 inch) electrodynamic speaker

R—All resistors may be 1 w

All other values are given on the diagram — Eusebio V. Maniquis.

Battery Short-Waver

While there is nothing new about this circuit (a 2-tube regenerative short-wave set with a 1N5-G as grid-leak detector resistance-capacity coupled to a 1C5-G as audio amplifier), it has given me such good results I would like to call it to the attention of readers (see Fig. 110).

It uses a 3-winding plug-in type of coil. I tried values of grid-leak ranging from 1 to 5 megohms but found 2 megohms best. The regeneration control is the usual 50,000-ohm potentiometer, used to vary the screen-grid voltage. I found no place on the dial where dead spots occurred and yet the control was not too "touchy."

The plate load for the 1C5-G was a filter choke salvaged from an old electric set. This tube adds greatly to the amplification and

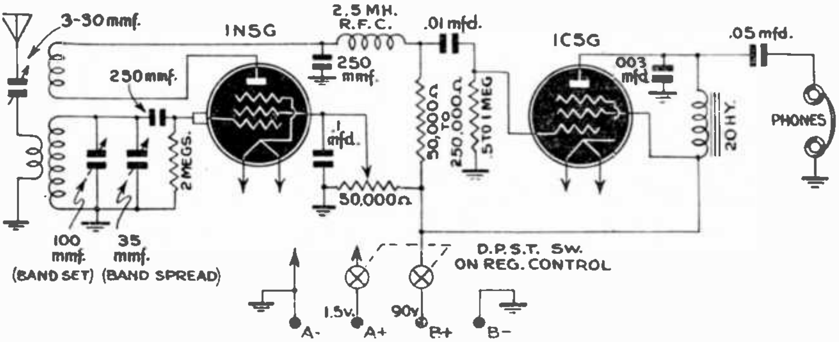


Fig. 110

will operate a small PM or magnetic speaker on many strong stations.

I have received all continents on this, using only the coil covering the 17- to 41-meter bands. —
GERALD A. CHASE.

Portable Radio

THIS novel receiver is intended for local reception only. Although it can be built much smaller I purposely made it large so that the loop would be bigger and have more pickup.

The circuit (Fig. 111) is straight regenerative.

Almost any small tube available may be used, such as the 1S5, 1A5-G, 1N5-G, all of which work equally well. The only trick is to have enough turns on L3 so the set will regenerate at any spot on the dial.

L1 is a spiderweb loop with approximately 30 turns roughly 3 x 6 inches. L2 is 20 turns on a 1-inch tube, and L3 is 35 turns wound directly over L2. Battery A is a

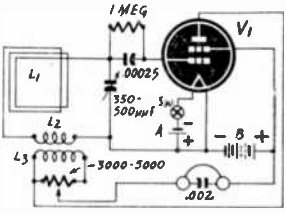


Fig. 111

1.5-v flashlight cell and B, 15 to 45 volts of B-battery. Any one of the tubes works very well on 22.5 v, and many on less.
—HAROLD J. SHAFFER.

1R5 Superregenerator

I HAVE designed a superregenerative receiver that is economical, light in weight, and sensitive for operation at remote locations.

The novelty of the circuit (Fig. 112) lies in the coefficient of coupling between the grid windings, and in the system of controlling regeneration. The circuit normally oscillates strongly, and is then damped by inserting a low value of resistance in the grid circuit. At the point of proper operation, a strong hiss will be heard in the headphones and the stations may then be tuned in.

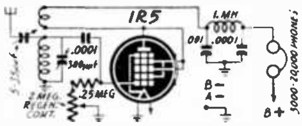


Fig. 112

The builder may wind the coils to any frequency. The coils are wound as for normal regenerative operation with the addition of 40 to 50 percent more turns added to the tickler.

Generally this circuit works best at the higher frequencies and is not recommended for operation at frequencies below 7 megacycles.
—BOB ESSEX.

10-200 Meter Set

THE circuit for this set uses a 6J7 regenerative detector and a 6C8 as an amplifier and half-wave rectifier. All other parts are from the junk box (Fig. 113).

By using standard plug-in coils, the range of 10 to 200 meters can be covered. Regeneration is controlled by the 15,000-ohm potentiometer. This set brings in London, South American stations, aircraft, ship, and c.w. with plenty of wallop. —F. MACADAM.

Short-Wave Converter

THIS (Fig. 114) short-wave converter is just about the simplest and most economical converter that can be built. Under favorable conditions it will easily pick up

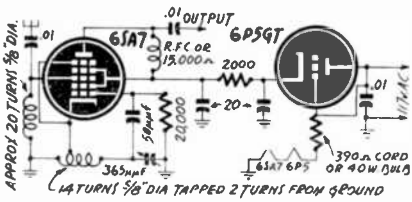


Fig. 114

London when connected to the antenna binding post of any 5-tube superhet.

The converter has its own power supply, and because of the low drain almost any tube may be used as a rectifier—provided, of course, that proper considerations are given to heater requirements.

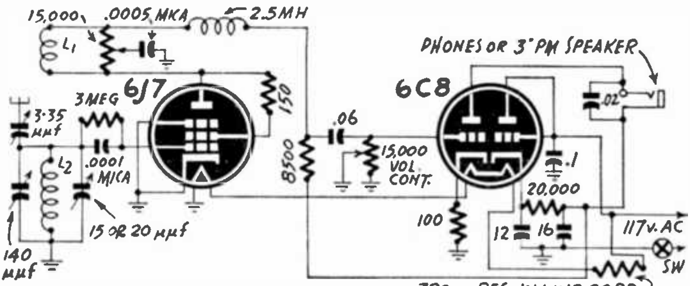


Fig. 113

If oscillation does not occur, it may be necessary to increase the feedback by moving the oscillator coil tap, away from ground. No more than one additional turn should be required. — Y. MUKAI.

Novel Receiver

THIS sensitive superregenerative receiver uses a 6AK5 high-frequency pentode and standard plug-in coils. The a.f. amplifier is a 6K6. A small power supply using a 6X5 supplies 200 volts for the plates of the tubes. If the voltage on the plate of the

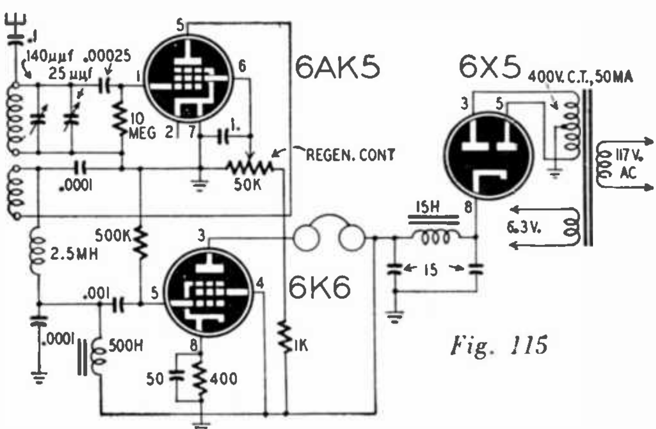


Fig. 115

6AK5 exceeds 180 volts, a resistor should be inserted between the B-plus lead and the 500-henry choke to drop the voltage to the desired value (see Fig. 115).

The power supply should be turned off when changing coils to avoid the risk of receiving a shock and to prevent operating the detector without plate voltage.

—JOHN JUSTIN.

1-Tube A.C.-D.C. Receiver

THE diagram (Fig. 116) shows a 1-tube a.c.-d.c. set that has

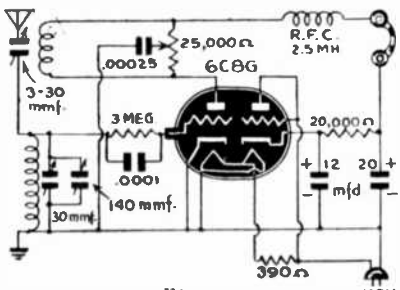


Fig. 116

been used very successfully. In about 25 nights I received over 200 short-wave stations.

The set uses a 6C8-G as combined detector and rectifier. The tuning is by a variable condenser and plug-in coils. The set is used with phones or a small PM speaker.

—LEO SILBER.

High-Fidelity Tuner

THIS simple high-fidelity tuner can be attached to any public address system with excellent results. It uses a 6K7 r.f. stage and a 76 detector. See Fig. 117. The coils and tuning condensers were salvaged from an old t.r.f. receiver.

In localities where there are strong local stations, it may be necessary to use a small condenser (50-250 $\mu\mu$f) in series with the antenna to provide the proper ratio between selectivity and sensitivity.

—SAUL SHERMAN, W2MPL.

Effective Detector

THIS detector is just another variation of the well-known voltage doubler circuit applied as a detector (Fig. 118). If the .0005-μf condensers are increased in size it may increase the gain. The highs will be reduced if the condensers are of too large a value. If less

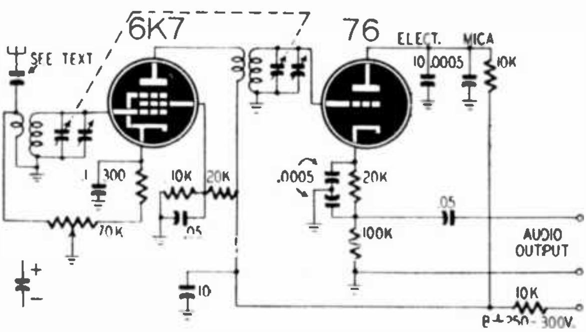


Fig. 117

a.v.c. action is needed, the a.v.c. may be obtained by tapping the diode load resistor. The other components are the same as in the usual diode circuit — KENNETH LOEWEN.

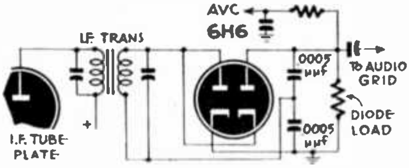


Fig. 118

Superregenerator

THIS superregenerator (Fig. 119) is selective enough that I

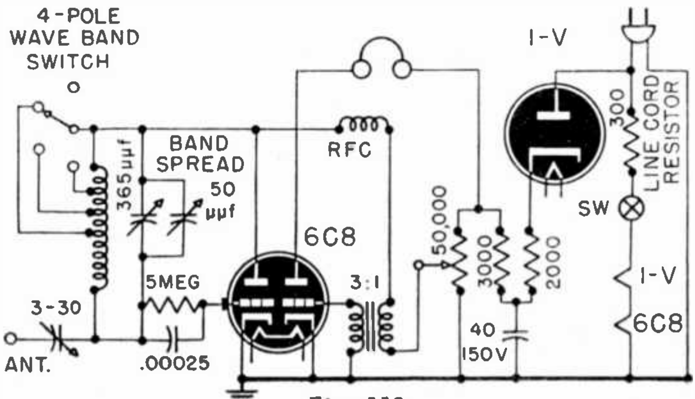


Fig. 119

have no difficulty separating the stations, although I occasionally have trouble keeping police calls apart.

The set uses a broadcast coil tapped for the short waves. I have no trouble with radiation except when the regeneration control is advanced too far. Then it puts out a healthy whistle. The 6C8 is a detector and audio amplifier, while the 1-V is used as the rectifier. The 6C8 must be shielded to prevent hum — DONALD CHASE.

Reflex-Regenerator

THE circuit of this reflex-regenerator is essentially a 3-tube set using only 1 tube. The signal first undergoes regeneration through the tickler coil. It is then fed to the diode detector through an r.f. transformer. The detected component is applied through the audio transformer to the grid of the triode to be amplified at audio frequency. (See Fig. 120.)

Tr1 and Tr4 are standard r.f. transformers; Tr2 and Tr3 are audio transformers. The tickler coil L is a small coil wound on Tr4 as determined by experiment.

This set gives excellent results

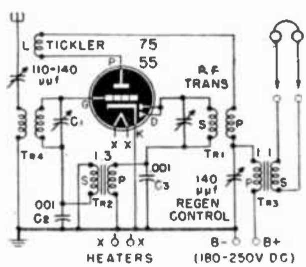


Fig. 120

on short-wave bands and is good for broadcast reception.

—HENRY W. GOULD.

Broadcast 30 Set

THIS set (see Fig. 121) gives good results on local stations with 3 volts on the plate. On

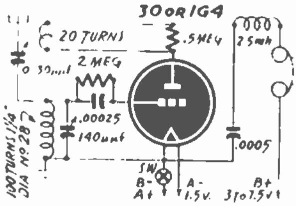


Fig. 121

it a half-dozen broadcast stations were tuned in clearly, at a distance of about 25 miles. The values of the parts are not critical, and even the regenerative action of the tickler coil needn't be used.

I started out with a 100,000-ohm volume control across the tickler, but took off turns and put in the 0.5-megohm fixed resistor after a number of experiments. If the experimenter wants regeneration, a 50,000- or 100,000-ohm variable resistor can be used, with tickler turns adjusted until the the set breaks into oscillation with most of the resistance in circuit.

—BILL BUEHRLE, JR.

(To cover the whole broadcast band with a 140-$\mu\mu$f condenser 2 coils will be needed. *Editor*)

Wide-Band Tuner

A SIMPLE t.r.f. tuner for local broadcast reception, capable of reproducing a wide band of frequencies, 20 cycles to 10 kc, can be built from parts easily obtained from any old t.r.f. receiver (Fig. 122). An infinite-impedance detector is used on account of its low harmonic distortion capabilities. Resistors are used in shunt with the tuned circuits for wide band passage, and should be not less than 50,000 ohms as adjacent channel interference may be encountered. C3 is used in the cathode of the 27-cathode follower stage, as a by-pass condenser, increasing the high-fre-

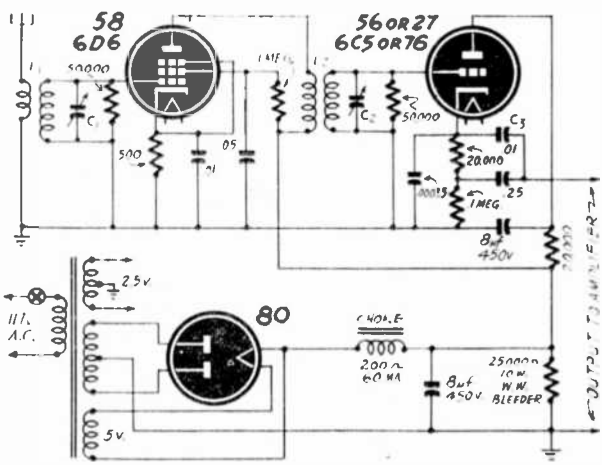


Fig. 122

quency output. The antenna should be as short as possible for best results. L1 and L2 are broadcast t.r.f. matched coils and C1 and C2 is a 2-gang variable-tuning condenser.

When used in conjunction with a high-fidelity amplifier, excellent results are obtained.

—ROBERT H. KNAPP.

2-Channel Radio

IN this novel hookup 2 type-19 tubes (see Fig. 123) are used. Note that 2 tuners in parallel are

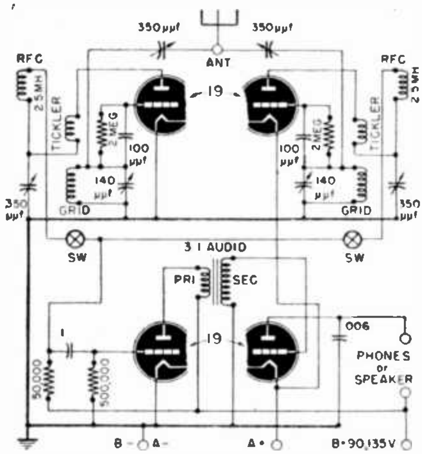


Fig. 123

provided by the first tube, the second tube being 2 a.f. amplifiers in series.

Many uses will suggest themselves. For instance, both sides of a plane or ship conversation, etc., may be tuned in by merely tuning one stage to each frequency being used. Also, I can switch into the circuit one stage at a time.

—GEORGE HIRSHFIELD.

Duplex Detector

As used on my receiver, this circuit permits using a diode or infinite-impedance detector at will. (Fig. 124).

Switch S1 connects the plate

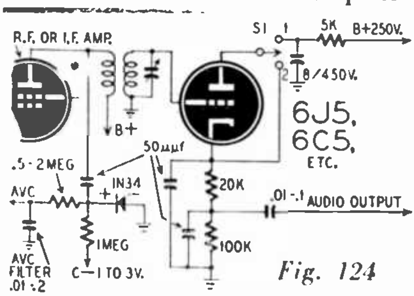


Fig. 124

of the detector to B-plus or to the cathode, depending on the circuit in use. The 20,000- and 100,000-ohm resistors form the load with the audio output taken off at the junction of the resistors. When S1 is in position 1, the tube operates as an infinite-impedance detector. In position 2 it is a diode detector.

Signal voltage is taken from the plate of the i.f. or r.f. amplifier and rectified by a 1N34 crystal diode. This rectified voltage is applied in series with 1 to 3 volts of fixed bias which provides delayed a.v.c. The bias voltage may be obtained from batteries, bias cells, or a tap on the bleeder resistor.

—H. M. HARVEY.

Pretuned Set

WE decided to build a simple radio receiver; we wanted to use a switch in place of the conventional tuning capacitor, since there were only two broadcast stations in the vicinity, and the idea of preset capacitors rather intrigued us.

Since we desired high-fidelity operation, we used an impedance-loaded r.f. amplifier rather than another tuned circuit (see Fig. 125). The high-quality infinite-imped-

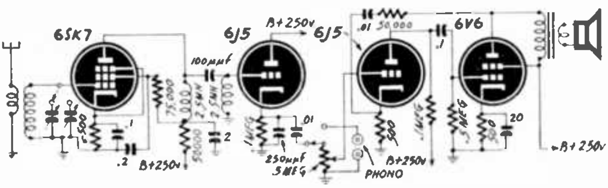


Fig. 125

ance detector does not overload and gives distortion-free response.

This detector is coupled through a phono-radio switch into a 2-stage audio amplifier. An inverse-feedback network is incorporated to enhance the bass response and to reduce harmonic distortion. The power supply is a conventional full-wave rectifier and capacitor-input filter.

—JEROME I. COOPERMAN.

Space-Charge Set

GOOD volume on all local stations is obtained from this receiver which fits in a box 4 x 5 x 2 inches. Note that the input is fed to the screen grid, and that the control grid is used as a space-charge element. (See Fig. 126.)

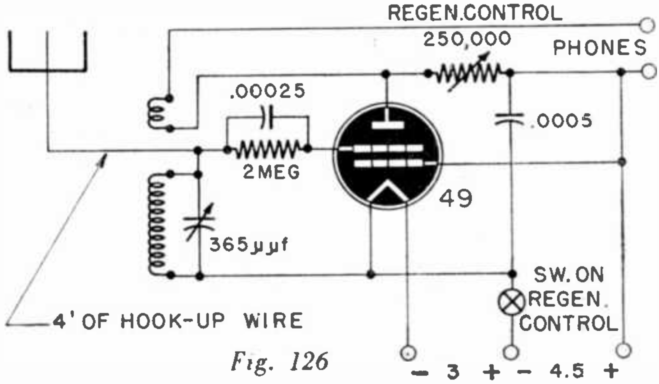


Fig. 126

Two regular flashlight cells form the A-battery, and 3 penlight cells are used for the B. The grid coil has 95 turns 1½ inches in diameter, the tickler 35 turns wound just above. I use a 365-μμf trimmer with one plate removed.

—JIM BROPHY.

Photo-Tube Radio

THIS novel circuit (Fig. 127) will detect r.f. signals due to the electronic emission of a photo cell when it is struck by a light beam. When the light is turned off, no detection will result.

Dim light causes low volume, and bright light a higher volume level.

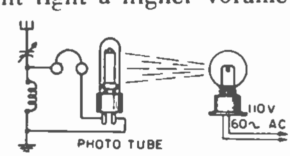


Fig. 127

No hum is noticeable, using a 60-watt incandescent lamp on a 60-cycle source. —L. E. SHEPARD.

Converter Control

HERE is a simple method of controlling the strength of the oscillator voltage applied to the grid of the converter of a superhet. It permits the operator to maintain a desirable ratio between oscillator injection voltage and signal voltage in the converter tube, and reduces objectionable hiss that is common at low signal levels.

In this circuit (Fig. 128), the oscillator of the set is replaced by one triode section of a 6SL7, the output of which is resistance-capacity-coupled to the remaining section through a variable control. The injection voltage for the converter is taken from the plate of the amplifier through a 10-$\mu\mu$f condenser.

It is imperative that the 50,000-ohm control be mounted very close to the socket of the 6SL7. An extension shaft may be used to bring a control out to the panel. Keep all other leads as short as possible in accordance with standard practice of oscillator construction.

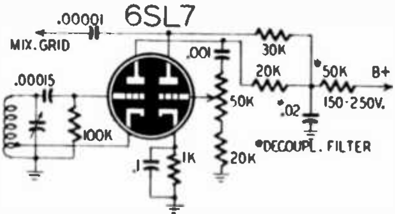


Fig. 128

The c.w. operator may use this circuit on his beat-frequency oscillator with the same advantages.

—C. E. HENDERSON.

Two-Tube Portable

THIS regenerative receiver (Fig. 129) covers the broadcast band without an external antenna and with enough power to drive a small speaker on strong locals. A standard broadcast loop antenna, mounted on the case with wooden supports, provides enough pickup for most purposes. The entire set, including batteries, is built in a box 3 x 4 x 5 inches.

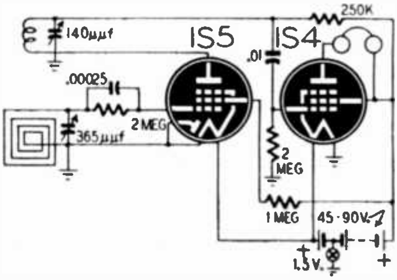


Fig. 129

It uses a 1S5 detector with a 1S4 a.f. amplifier. Regeneration is provided by winding a 10- to 15-turn loop, using No. 28 wire, over the grid winding. Volume and regeneration are controlled by a 140-$\mu\mu$f variable between one side of the tickler and ground. The grid winding is tuned with a small 365-$\mu\mu$f variable. Plate voltages are supplied from a 45- or 90-volt B-battery, the latter supplying sufficient power for a speaker.

—ARNOLD ETTINGER.

Novel Regenerator

THIS compact 1-tube superregenerator provides a.f. amplification without an additional amplifier stage. It uses a 1A7-GT with the detector coils connected between the No. 1 and No. 2 grids (Fig. 130). This permits the plate to operate at full voltage without the coupling resistor normally used for interstage coupling to an a.f. amplifier. The plate is coupled to the detector by the electron stream. Regeneration is controlled with a .02-μf condenser and 500,000-ohm potentiometer in series between the No. 2 grid and ground.

If a long antenna is used, it should be connected to the control grid, No. 4, which is returned to

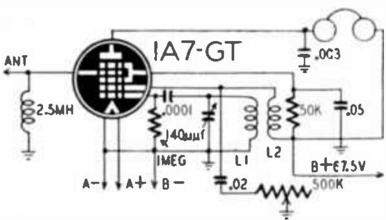


Fig. 130

ground through a 2.5-millihenry r.f. choke. A short antenna works best when connected directly to the oscillator grid.

Coils are wound as follows:

	L_1	L_2
14- 25 met	4t	6t
23- 41 met	7t	9t
40- 85 met	14t	12t
83-125 met	23t	23t
120-200 met	36t	36t

No. 36 d.c.c. or enamel wire is used on 1¼-inch forms. The windings are spaced ⅛ inch apart.

—HAROLD R. NEWELL.

around the room or laid on the floor (see Fig. 131).

The tube is a 1D8-GT—a combination diode-triode-pentode in one

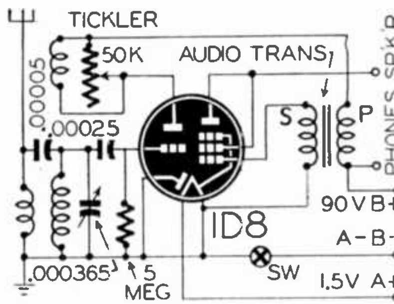


Fig. 131

envelope. The diode is unused and is grounded. The coil is a regular antenna coil with 30 turns of No. 30 wire wound on it for a tickler. Regeneration is controlled by a 50,000-ohm variable resistor across the tickler. —RICHARD KRAFT, JR.

115-Volt D.C. Receiver

HERE is a simple receiver that was constructed aboard ship as an auxiliary h.f. receiver. Standard 2- and 3-winding coils are used in the r.f. and detector circuits as shown in Fig. 132. A 15-henry choke was inserted in the plate lead to the detector to remove all traces of commutator hash. —J. YOUNG.

1-Tube Set

THIS one-tube regenerative circuit gives excellent results on the broadcast band. I receive 5 to 10 stations at fair loudspeaker volume, with a 60-foot antenna and a good ground. Local stations can be received with a short 10-foot piece of wire strung

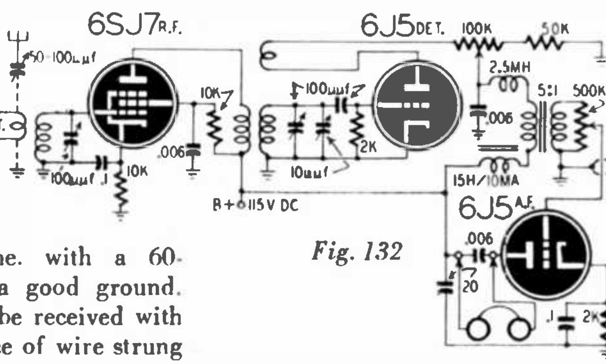


Fig. 132

Section 2...

AMPLIFIERS

Push-Pull Amplifier

THIS push-pull circuit delivers 4 to 5 watts of power. The voltage-doubling circuit provides adequate voltage on the plates. An 8-inch speaker is recommended. (See Fig. 201)

The phase inverter (6SC7) feeds an out-of-phase signal to the power stage. The 70L7 tubes are combined amplifiers and power rectifiers.

The 2 parallel 70L7's in series with the 6SC7 and 150-ohm resistor make an excellent filament combination, but by varying the filament resistor other types of tubes could be used.

—JOSEPH F. DUNDOVIC.

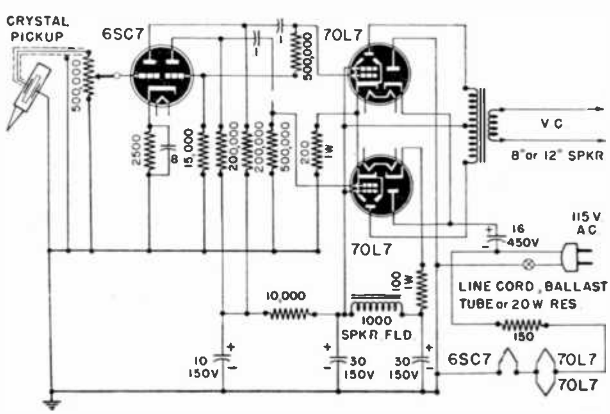


Fig. 201

12-Watt Amplifier

SHOWN here is a diagram of a 12-watt high-gain amplifier which I designed (See Fig. 202).

The voltage amplifier has sufficient gain to drive the output stage well up to a 15-watt peak. Three inputs are provided: 2 for phonographs with a fader control, and 1 for a high-impedance crystal, dynamic, velocity, or other microphone with a low output.

In the high-gain hookup of the 6SJ7, careful arrangement of parts must be made, and all grid and plate leads should be shielded. The shielding should be grounded

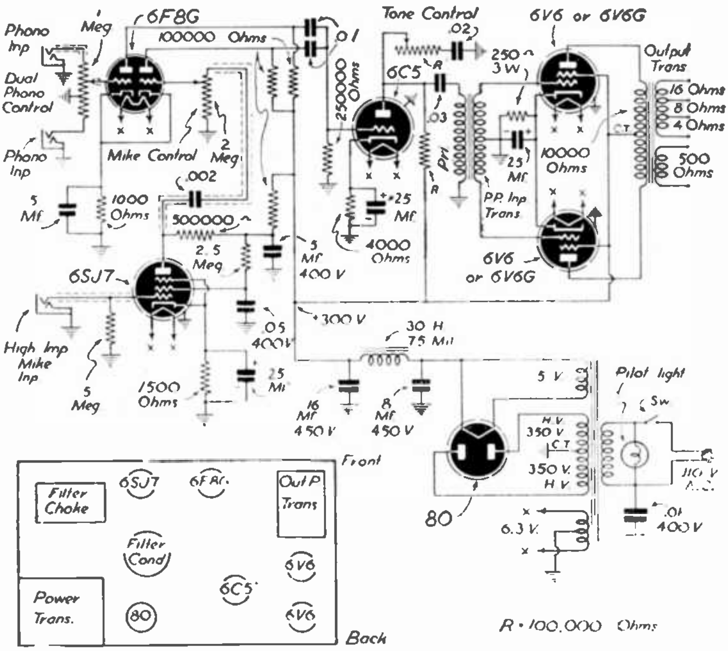


Fig. 202

to prevent hum pickup. Unless this is carefully done, the hum will be bad. The volume control for the mike is on the grid of the next stage, to prevent the high-gain hum pickup from being amplified.

All input jacks should be shielded. Use closed-circuit jacks to ground the grids when no input is connected.

—Roger Harrington.

D.C. Amplifier

Fig. 203 present a diagram of a versatile direct-coupled amplifier for d.c. I designed it for use with a rather insensitive photocell, but the unusually high gain warrants its use as an all-purpose laboratory amplifier (for d.c.).

The sensitivity control is a potentiometer which regulates the bias on the input (6J7) tube. About 20 volts, which is several times the cutoff bias of the 6J7, is developed across this potentiometer. This high bias is often necessary in order to compensate for superfluous light striking the photo-electric cell or leakage across the cell. Incidentally, a 900-megohm leakage would cause 1 volt to be developed across the grid circuit, so watch out for leakage and its chief cause, dampness.

This amplifier is designed for direct voltage amplification, but it can be used as an a.c. voltmeter as shown in the diagram. When so used, the sensitivity control is turned to the extreme right (zero bias), and the plate current decreases in the 6J5 as the input voltage increases.

The 20,000-ohm resistor and 0.5-μf condenser in the B-plus line serve as additional filter and also to decouple the 2 stages. The

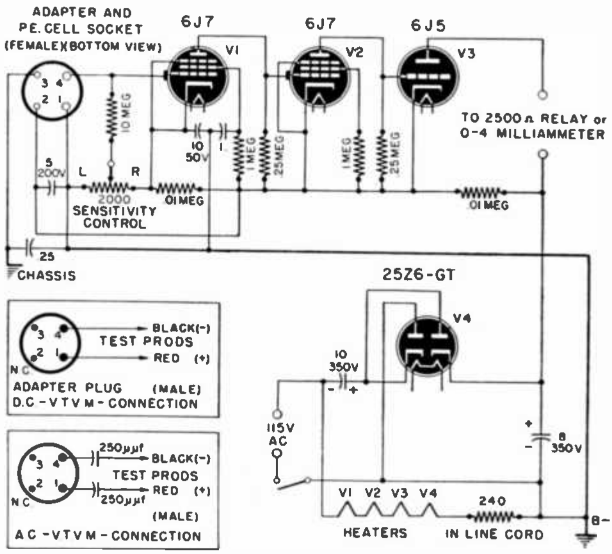


Fig. 203

The power supply, a 25Z6-GT as a half-wave voltage doubler, is only partially filtered but if relay chatters the 8-μf filter condenser can be increased in capacity.

—VERNON J. FOWLER.

2-Stage Amplifier

THIS 2-stage resistance-coupled amplifier (Fig. 204) was used to good advantage in talking to students grouped around a U-shaped bench. Outside noises, combined with other instructors talking loudly to their students, induced me to build the circuit. It has sufficient gain to enable good reception and is very clear and distinct.

inductor in the output tube's plate circuit was an old 1:3 audio transformer with a burned-out primary. Six pairs of headsets were used in parallel, though more could have been used.

The results were so good that a number were constructed for the various benches. Tubes used were either 6C5's, 6J5's or a single 6SN7.

—ROSS C. FERRY.

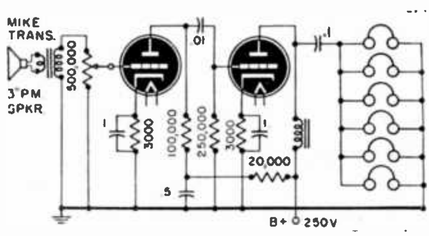


Fig. 204

Electronic Mixer

THE diagram (Fig. 205) is for a 3-tube electronic mixer which

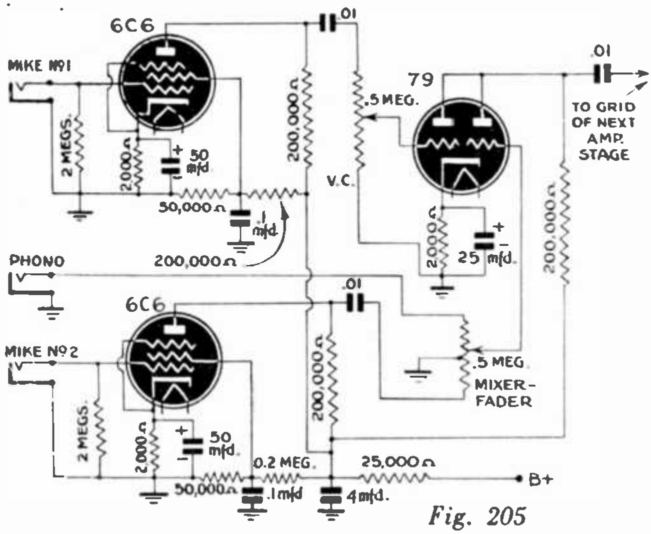


Fig. 205

I use with my recording amplifier. I obtained most of the parts from my junk box. It is very useful in recording dialogue for dramatic purposes.

The unit provides 2 microphone and 1 phono input. Low-level signals are amplified through the 2 preamplifier tubes, which are 6C6's, but may be any other tubes of the same characteristics. The mixer-fader applies either phono or mike to the second section of the 79 tube, or may be used to fade one microphone in and the other out. —ALBAN HATZELL.

Compact Preamplifier

THIS compact preamplifier (Fig. 206) will prove extremely useful when it is desired to operate a crystal mike or some type of photo-electric cell unit with an amplifier that does not provide enough gain.

No internal connections to the existing amplifier are required. Just connect the output to the pick-up input terminals and plug in the power. Chassis should be connected to the main amplifier through a 0.5- or 1-μf condenser. For mini-

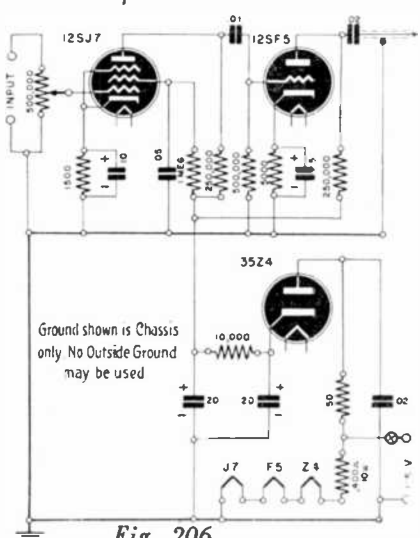


Fig. 206

mum hum try reversing the power plug. —JACK MASSECAR.

Inverse-Feedback Amplifier

THIS 3-watt amplifier uses inverse feedback, and an input circuit which gives a reasonable amount of quality control (see Fig. 207).

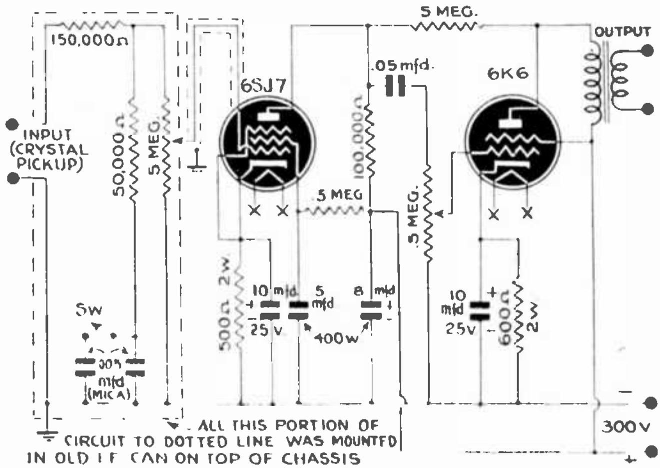


Fig. 207

The amplifier was designed for phonograph use, with the specific requirements of good reproduction combined with simplicity and compactness. All the parts including tubes are easy to obtain, and any well-filtered power supply of about 300 v may be used.

While the construction is quite simple and straightforward, all the usual precautions must be taken to avoid hum trouble. —HOWARD JOHN.

Preamplifier

FIG. 208 shows a simple but effective preamplifier. It uses a 6F5 with a balanced center-tapped filament to reduce hum. A single bias cell is connected in series with the grid resistor to provide fixed bias for the tube. It may be an ordinary flashlight cell. This preamp may be used with either a crystal or dynamic microphone. The output can be fed to an audio amplifier with excellent results.

A standard power supply is needed to supply the filament and plate voltages. This can easily be constructed or a power supply from an old set can be utilized.

—DAVID BROSE.

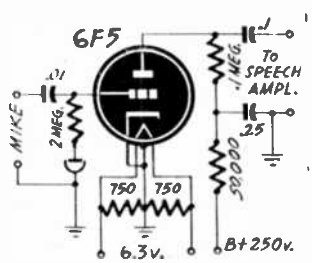


Fig. 208

Square-Wave Amplifier

To observe square waves down to 30 cycles, the vertical amplifier in the scope must have an excellent low-frequency response. The most logical method seems to be the use of a d.c. amplifier for vertical deflection. This circuit (Fig. 209) using a 6J7, 6K7, or equivalent tube gives a voltage gain of about 30, higher figures being possible by the use of tubes with higher transconductance, such as the 1232 or 1853. There is no need for a special device to center the graph on the screen of the c.r. tube, the adjustment of the screen-grid potentiometer of the amplifier tube does it.

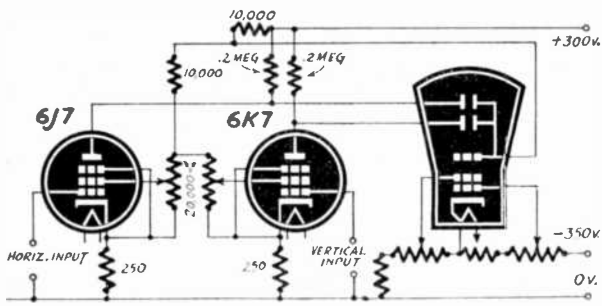


Fig. 209

It is necessary to separate the last accelerating anode and the deflecting plates from ground potential, this being probably the only drawback in this circuit; in this case the shell of the 913 c.r. tube has now a positive charge of 200 volts. As the potential of the last accelerating electrode has been raised from zero volts to 200 volts above ground, it is necessary to *reduce* all other negative potentials on the same tube by the same amount, so that the cathode, which may have had—500 volts. must now have only -300 volts and so on.

— HAROLDO ELLERN.

Phono Amplifier

HERE is the circuit of a phono amplifier that can be constructed easily with parts salvaged from an old broadcast receiver using 2.5-volt tubes (Fig. 210).

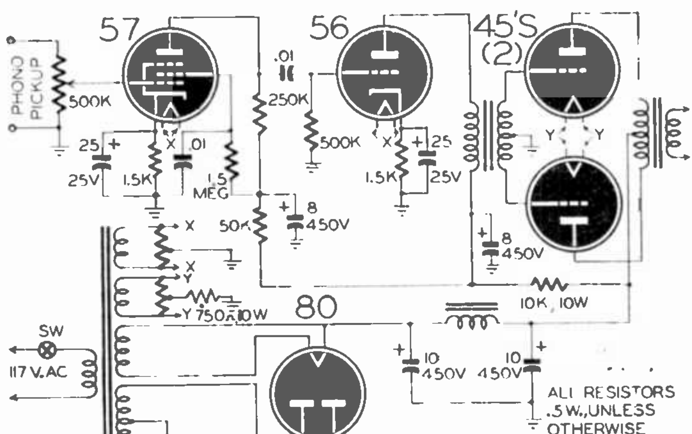


Fig. 210

The input stage uses a 57 tube resistance coupled to a 56 driver.

The driver is transformer-coupled to the push-pull 45 output tubes.

Self-bias for the 45's is obtained by inserting a 750-ohm wire-wound resistor between the center-tap of the filament winding and ground. The hum level is kept low by a grounded center-tapped re-resistor (humdinger) across the 56 and 57 heaters.

—JOSEPH SWARTZ.

"Expressor"

THE simple volume expander-compressor shown is ef-

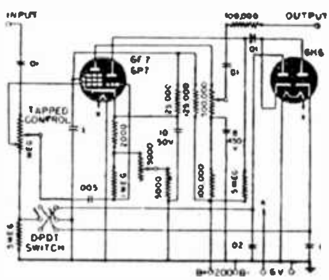


Fig. 211

fective and does not use a 6L7 which tends to be noisy and requires a lot of parts. The compressor is used for making transcriptions, the expander being more or less incidental. (See Fig. 211).

When the d.p. d.t. switch is thrown upward, the signal is expanded; downward, it is compressed. Filter values are such that the compressor takes hold almost immediately and releases gradually, while the expander acts more slowly. The output control acts as master gain.

The 5,000-ohm cathode circuit control is required for proper operation of the pentode. A low value is good for compression and vice versa for expansion. The screen voltage has been found very critical. The 100,000-ohm series resistor in the output can be changed to alter frequency response, but was found best in my case.

The input should not be too high for good fidelity. Output from a record player or the second detector of a receiver is about right. It is possible to obtain 30- to 40-db change, and that is ample deviation from normal. —DON LANGBELL.

Home-Built PA

AT a summer resort the children decided to put on a concert for a charity. It was up to me to see that their voices would fill the hall.

To a small 2-tube amplifier in in my shop I added a preamplifier. The entire outfit worked out very well, with enough volume to fill the crowded hall (Fig. 212).

—L. H. DANIELS.

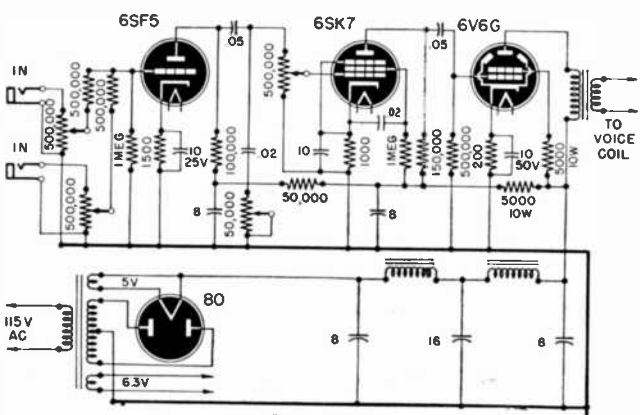


Fig. 212

Dual Push-Pull Amplifier

I USE this amplifier circuit (Fig. 213) in connection with my crystal pickup. With a well-baffled 12-inch speaker the power is ample and the tone excellent. My crystal pickup has 3 tabs or lugs, one of which is grounded to the case. Two-conductor shielded wire, with the crystal case grounded to the shield, is connected to the dual control.

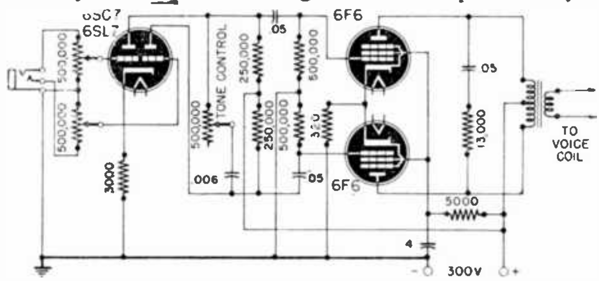


Fig. 213

I use a conventional power supply, an 80 rectifier with capacity-input filter consisting of 16 μf on each side of a 1,500-ohm speaker field.

If response is too brilliant, a little by-passing on the input will bring it down. No cathode by-passing or decoupling is necessary except on the 6F6 screens.

—WESLEY MARSHALL.

30-Watt PA Amplifier

RESULTS have been most gratifying with this 30-watt, 47-db gain amplifier. With excellent filtering, there is practically no hum present. Shielded wire was used in wiring in the controls and the input circuit. Phase inversion makes an input transformer unnecessary. Inverse feedback is utilized, the connection being from the 4-ohm tap through a 1-meg-ohm resistor to the first 6N7 cathode (see Fig. 214).

Unless the plate leads to the 6L6's are correctly phased, oscillation will take place. The leads should be transposed if this happens.

—JOSEPH SWARTZ.

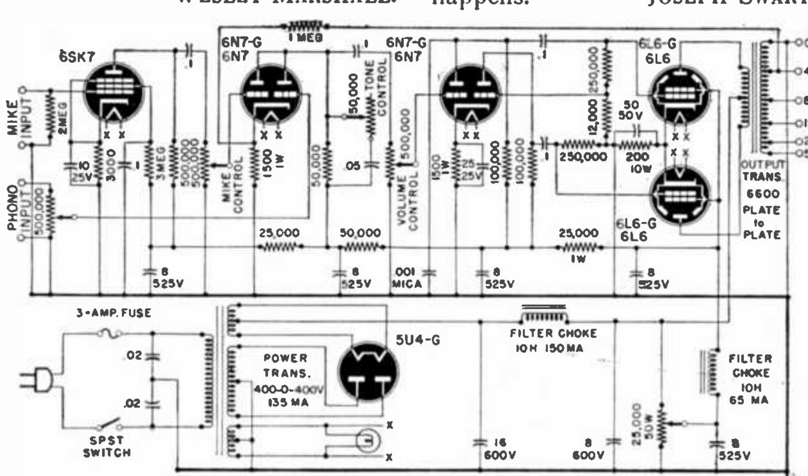


Fig. 214

Phono Amplifier

AFTER playing our portable phonograph a short time we found that it didn't have enough volume. Tracing connections showed that the pickup fed directly into a beam power tube.

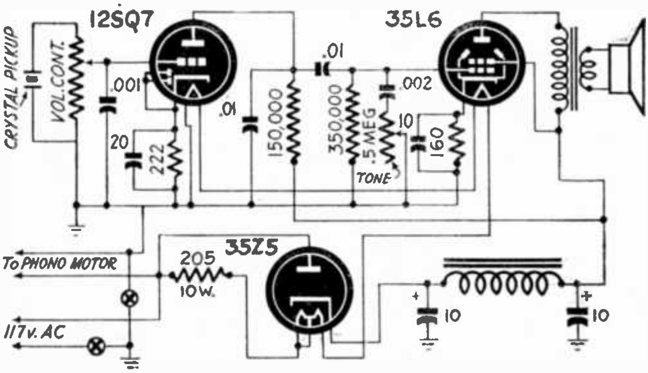


Fig. 215

I decided to add another 0.15-amp tube amplifier and chose the 12SQ7, changing the line cord to one of 205 ohms, 10 watts. Complete schematic of the new hookup is given in Fig. 215. A .001-μf condenser across the volume control cut out a slight whistle.

We obtain plenty of volume now on a 6-inch PM speaker! —

RALPH L. MORRISON.

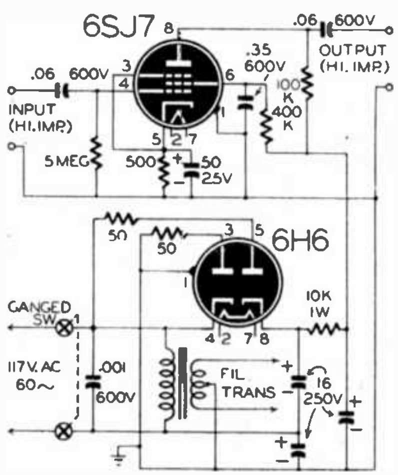
(The cathode resistor of 12SQ7 seems low. A value near 2,000 ohms might be better.—*Editor*)

Microphone Preamplifier

COMPACTLY built, this preamplifier has enough voltage gain to couple a crystal microphone into the audio frequency end of practically any home radio receiver. It is designed around the 6SJ7, connected as pentode with an approximate voltage gain of 100. Carefully selected resistors and condenser values give this unit excellent frequency response (see Fig. 216).

In keeping with our desire to make the unit as compact as possible, an a.c.-d.c. circuit was used. As the current rating of a 6H6 will not be exceeded by the current demands of the 6SJ7, a 6H6 working into a R-C filter was used as a full-wave voltage doubler.

The filament requirements for the tubes are met by using a small 6.3-volt transformer.



RESISTORS .25W., EXCEPT AS NOTED.

Fig. 216

NOTE:—The unit may be made more compact by using a 350-ohm line-cord resistor. —PAUL FISK.

Tone Control

DUE to the fact that 2 separate channels are provided, one for treble, the other for bass, the circuit shown in Fig. 217 will really control tone even for the most critical listener. It is possible either to attenuate highs or lows or to mix them in any way.

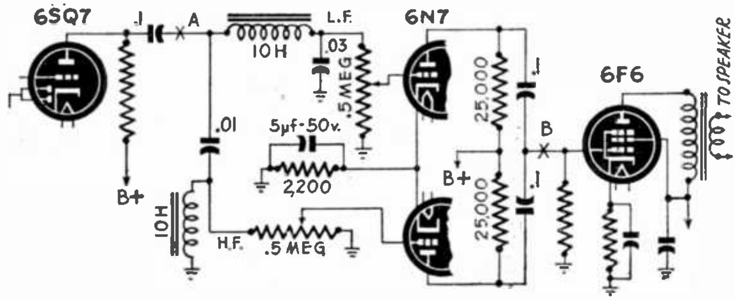


Fig. 217

The choke and condenser in the upper channel allow only low frequencies to reach the 500,000-ohm potentiometer in the grid circuit. The lower channel high-pass filter allows only the highs to be amplified. Mixing takes place in the grid of the final 6F6.

The unit (between points A and B) may be added to any existing amplifier or record player. The 6N7 may be replaced with 6SN7, or two 6C5's may be used.

—GEORGE C. LEE.

High-Low Tone Control

WHILE building an amplifier, I was confronted with the problem of a suitable tone control which would have the following requirements:

1. No chokes. (Only standard resistors and condensers.)

2. Separate controls for bass and treble.

3. Absolutely no interaction between bass and treble controls.

4. Controls to work smoothly with no jumps. They must be very *effective*, and able to produce any tonal combination possible.

5. Simplicity and ease of construction with available materials.

After considerable search I finally came across a hookup that has all of these features. (See Fig. 218.) When adding it to an amplifier, keep the leads as short as possible. It should be preceded by several stages of audio amplification to minimize any possibility of hum pickup.

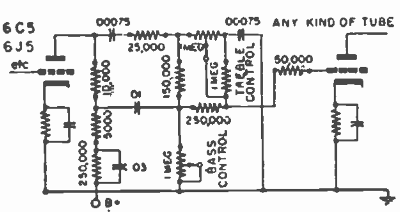


Fig. 218

—DONALD W. NELSON.

Dividing Network

THIS tone control has been used with excellent results. A small speaker with little baffling is used for the high frequencies and a 12-inch speaker in a bass reflex cabinet for the lows. The

.05-μf condenser is used as a high-frequency by-pass. (See Fig. 219.) Any change in condenser will serve to vary the tone slightly. The 13,000-ohm variable resistor is

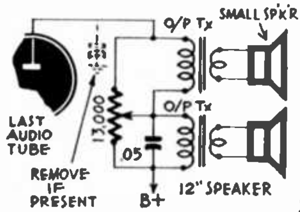


Fig. 219

used as the tone control, properly apportioning the amount of signal given to each speaker. The difference in volume between that reproduced by the high speaker and the low speaker gives the listener an apparent tone control. The resistor should be a wire-wound type capable of handling double the plate current of the last audio stage. —VAUGHN G. LAYMAN.

Tone Compensator

ALTHOUGH this circuit (Fig. 220) uses quite a few parts, it is really worth it, as almost any de-

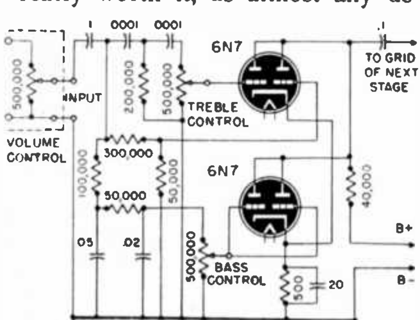


Fig. 220

sired frequency response may be obtained.

This compensator is fed into a 6N7 phase inverter and then into a pair of 6L6's. The result will please the most critical ear. The circuit forms 2 channels: one for highs, the other for lows; and they may be combined in any proportion.

Keep all leads short and shield the lower ones.

—KURT A. MALER.

Phase Inverter

THE circuit shown in Fig. 221 is typical of one that has been used as a phase inverter commercially by several receiver manufacturers. Used with a crystal pickup, it has plenty of gain and power

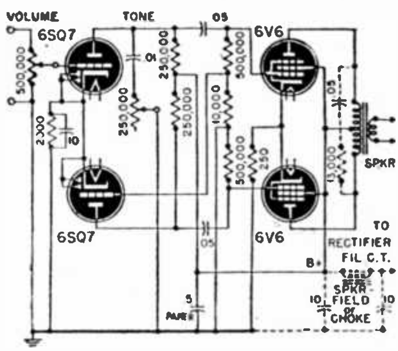


Fig. 221

output. There is nothing critical in its construction to make it difficult for the home constructor. The 13,000-ohm resistor and .05 condenser across the output transformer may be dispensed with if a good output transformer and speaker are used, but may be found valuable with average equipment.

—ROY L. GALLAGHER.

Simple Tone Control

THIS tone-control circuit (Fig. 222) is one of the simplest and most "bug-proof" I have ever used. Any size potentiometer between 250,000 ohms and 1 meg will do, with 500,000 ohms recommended.

The .006-μf condenser is connected from the outer leg of the 50,000-ohm resistor to the center arm of the potentiometer. When the arm is at the ground side of the "pot," the highs are by-passed, giving bass reproduction. When the arm is at the grid side of the "pot," the bass is attenuated, due to the R/C pad (the .006-μf condenser offers higher resistance to the bass notes than it does to the high notes), and the reproduction is treble.

Intermediate positions of the arm

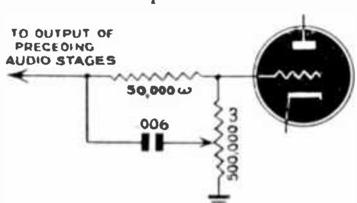


Fig. 222

will give different bass-treble response. Best position is determined by the listener's ear.

—LEON A. WORTMAN.

Test Amplifier

THE circuit shown in Fig. 223 of the 117L7-GT, is a compact little setup for making many tests on the experimenting bench.

To the input you can hook up any kind of signal you want to amplify—output from a 1-tube receiver, or a phono pickup, or from a signal generator, etc.

Also, inasmuch as the rectifier portion of the 117L7-GT furnishes B-supply, you can get any voltage from 90 down to 22.5 volts d.c. by using either 2 variable resistors of about 1,000 ohm capacity each, or a fixed power resistor with several taps that can be slid along.

FRED U. DILLION.

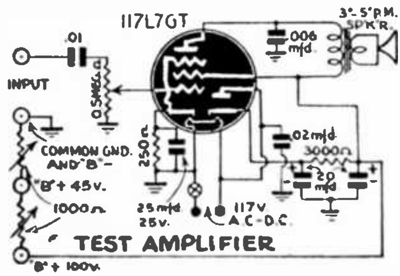


Fig. 223

Photoelectric Cell Amplifier

THE diagram shows a circuit which was converted for use with a 117L7-GT tube.

In this circuit (Fig. 224) one tube does the work of two 37's and has much higher amplification. There is no need for a voltage-dropping line-cord resistor. All this makes possible a more compact and efficient unit.

This circuit has sufficient power to work homemade relays. Strong sensitive relays can be made from

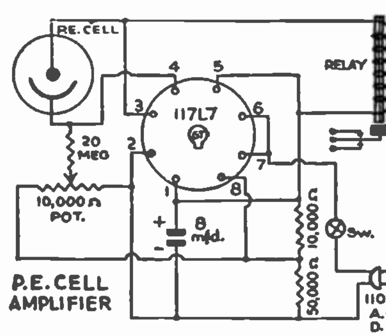


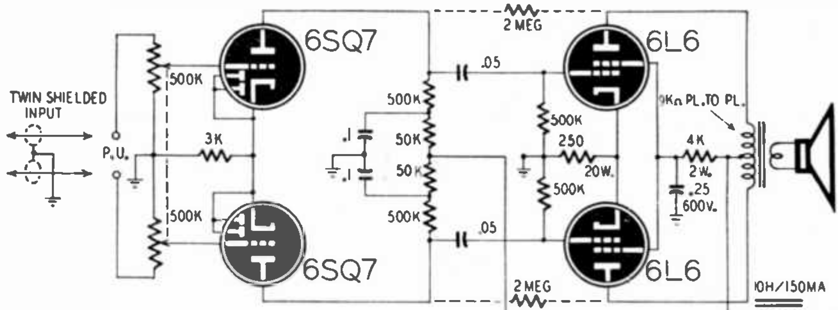
Fig. 224

old telephone ringers or cheap high-resistance milliammeters.

—EUGENE HARMON.

25-Watt Amplifier

An output of 25 watts is produced with minimum distortion by the amplifier in Fig. 225. It can be constructed on a relatively small chassis. A push-pull input stage is used to eliminate phase inverters and coupling transformers: 6SQ7's were used in the input stage, but 6SF5's may be used. Input from a pickup or high-gain mike is through a 2-conductor shielded cable. The conductors are connected to the high sides of the ganged volume controls and the shield is grounded. If desired, inverse feedback may be used by connecting two 2-megohm resistors as shown by the dotted lines. —Frank Gue.



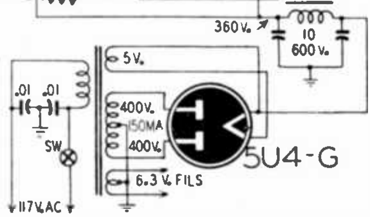


Fig. 225

A.C.-D.C. Amplifier

This circuit of an a.c.-d.c. amplifier may be of use to many readers. Together with simplicity in design, a minimum of parts and a two-watt output, I have never made an amplifier that had comparable response or such high gain.

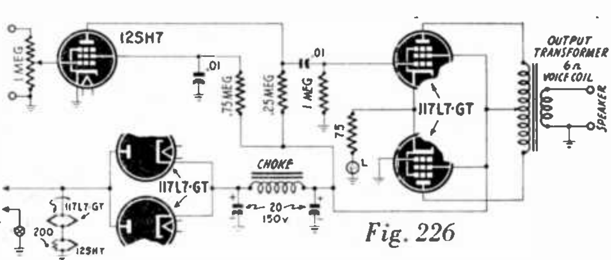


Fig. 226

Having noticed that many variations in design have been published, I do not recall circuits with a paraphase amplifier which is known for low-distortion output (see Fig. 226).

The method of lighting the pilot is unique. At first it was intended to obtain bias for the preamplifier across the pilot, but the amount of hum produced was terrific. Test with a scope showed that the bias produced by grid current was not detrimental to good operation. The series filament operation does not affect operation of the power tubes, but will actually give them longer life because of a lower surge current when the tubes are cold.

—Robert J. Cartwright.

Section 3...

Power Supplies

Midget Power Supply

This B-power supply for an RCA personal radio was made to take the place of the 67.5-volt battery. It can be made to fit in the space which was occupied by the battery. No attempt was made to build a filament supply since the

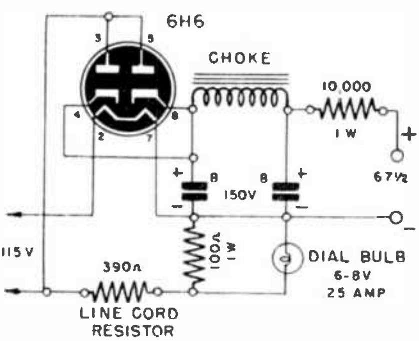


Fig. 301

flashlight cell is always available. (See Fig. 301).

The B-power supply was built on a flat piece of bakelite 3½ x 1¼ x ¼ inches. The midget choke and the 6H6 socket (a wafer type lifted on ¼-inch spacers) are mounted on this panel. A dual 8-μf condenser is also mounted on the panel and strapped to the choke. The other parts are mounted between the tube and condenser. The top of an old 67.5-volt battery was removed and fastened on to the end so that the power supply can be readily disconnected whenever it is desired to use a battery again.

A hole has to be drilled through the panel for the guide pin of the 6H6. The pilot light is installed so that the set will not be left on. A hole can be drilled through the removable back of the set for the power cord. -Floyd E. Smith.

R.F.-A.F. and Power Unit

This is a combination r.f. and a.f. amplifier and regenerative receiver and power supply. (See Fig. 302.)

S3 is for switching the antenna from the regenerative r.f. amplifier to the receiver with which it is used.

Five-prong coil forms are used to accommodate the tapped tickler which may be necessary because of different reactions between receiver and r.f. amplifier connections. R2 and C5 are mounted between tube base pins 2-8. Pins 4 and 5, 7 and 8 are shorted. R1 and C4 are mounted under the chassis on socket lugs 4 and 5. Other connections are shown. (See Fig. 303.)

S1 and S2 are in position for r.f. amplifier connection and audio input connection. Throw switches, and it is a regenerative

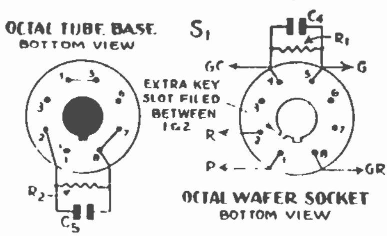


Fig. 303

receiver. R.f. output is shorted for receiver connections.

PARTS LIST

C1—3-30 $\mu\mu f$
C2—140 $\mu\mu f$
C3—35 $\mu\mu f$
C4—.0001 μf
C5—0.1 μf, 200 v
C6—.0005 μf
C7—1 μf, 200 v
C8—.06 μf, 200 v
C9—10 μf, 25 v
C10—16 μf, 150 v
C11—40 μf, 150 v
C12—0.1 μf, 200 v
C13—0.1 μf, 200 v
R1—3 meg, ½ w
R2—1000 ohms, ½ w
R3—0.1 meg, ½ w
R4—50,000 ohms
R5—0.25 meg, ½ w
R6—0.25 meg
R7—200 ohms, 10 w
R8—250 ohms, 10 w
R9—50 ohms, ½ w
R10—2,000 ohms, 10 w, if speaker is not used.
S1—Tube base and socket
S2—d.p.d.t. switch
S3—s.p.s.t. switch
Ch.—25 henry
R.F.C.—2.5 mh

—Robert Vadney.

Novel Power Supply

During the wartime shortage of miniature B-batteries, I designed this unit (Fig. 304) to power a camera-type portable radio.

The vibrator is made by altering a high-frequency code buzzer.

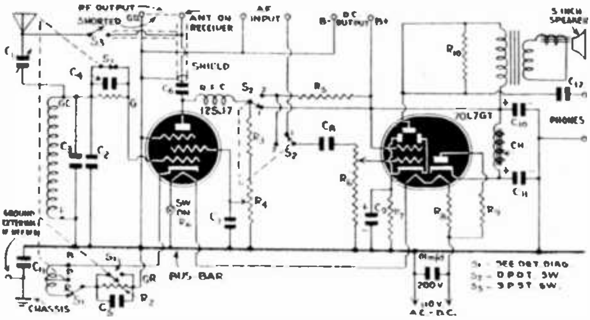


Fig. 302

The armature is removed and replaced by an old razor blade that had been ground to shape. The free end of the armature is weighted by a ¼-inch nut soldered to one side. A silver point is fastened to the armature opposite the fixed contact.

A small output transformer is connected with its secondary in the low-voltage circuit. The high-impedance primary was connected in a half-wave rectifier circuit using a 1T4 tube. Two electrolytic con-

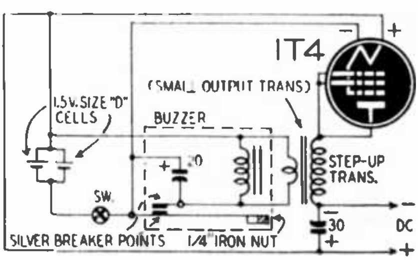


Fig. 304

densers filter out the hum. Two flashlight cells, in parallel, supply the primary power.

This unit supplies 40 volts with an 8-ma load. The high-voltage leads from the transformer should be reversed to determine best connection. —Fred W. Burdon.

Inexpensive B-Supply

MANY users need more than the 95 to 115 volts available from

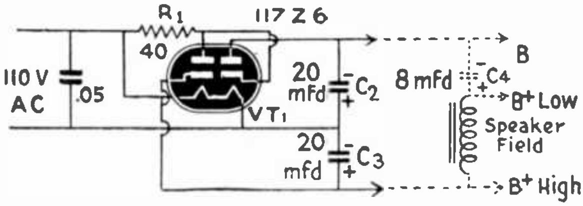


Fig. 305

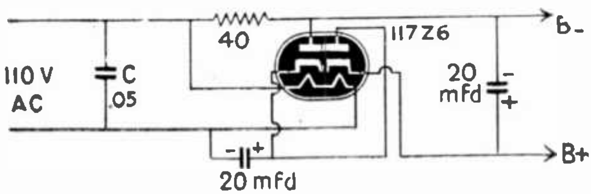


Fig. 306

a half-wave a.c. rectifier operating from the 110-volt supply. I have found the voltage-doubler circuits to be the answer to many of these problems.

In the full-wave circuit shown in Fig. 305 the voltage across the load is the sum of the d.c. output voltage of the conducting diode and the condenser discharge voltage. It can be seen from the circuit shown that one side of the d.c. load cannot be connected to ground or to one side of the a.c. line.

This circuit may cause hum because of the high a.c. voltage between the cathodes and heaters in a.c. sets in which tubes are connected in series across the line.

The half-wave circuit shown in Fig. 306 has one side of the a.c. line as common with the negative side of the d.c. load.

Do not exceed the rated current drain of the tube.

The value of the resistor R1 is not critical and need be only large enough to limit the peak plate current in some applications.

— J. B. PARCHMAN.

B-Eliminator

THIS is an inexpensive easy-to-build emergency B-battery eliminator (see Fig. 307).

The dual electrolytic condenser may be either a 20-20 or a 40-40-μf unit. The primary of an old audio transformer may be used as the filter choke. Almost any 6.3-v, 0.3-amp tube, such as a 37, 77, 78, 6C6, 6D6, etc., may be used with the proper sockets. In any case, all elements of the tubes except the

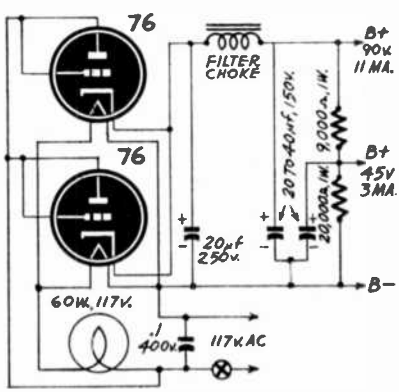


Fig. 307

cathode and filament are connected together.

If a ground is necessary on the radio, connect it through a 0.1-μf, 400-v condenser.—C. W. CLAY, JR.

Speaker Field Supply

A SIMPLE field supply for a dynamic speaker can be assembled from a condenser, 40-watt lamp, and a 25Z5 rectifier tube as Fig. 308 shows.

The circuit will supply approximately 100 ma at 130 v, when used with an 8-μf condenser. Increasing the condenser size increases the output voltage.

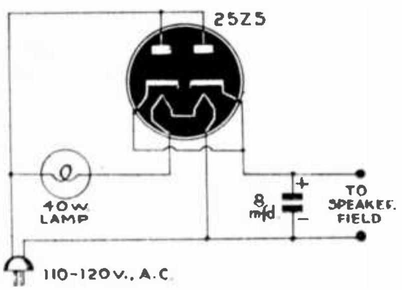


Fig. 308

—CHARLES GRIFFITH.

Voltage Regulator

A 15,000-ohm resistor stabilizes current through the VR-105 which biases the cathode of the lower half of the 6SN7. Both halves of the 6SN7 are used as d.c. amplifiers which amplify any voltage fluctuations due to load variations. The amplified variations are applied to the grid of the 6L6 in the form of bias changes. The plate resistance of the 6L6 varies with the bias, causing the voltage drop across the tube to rise or fall to keep the output voltage constant for varying loads. (See Fig. 309).

The 0.1-μf condenser is used to increase the effectiveness of control with rapid load changes. The 50,000-ohm potentiometer may be used to give a reasonable range of almost perfectly regulated output voltages.

—PFC. H. W. MERRIHEW.

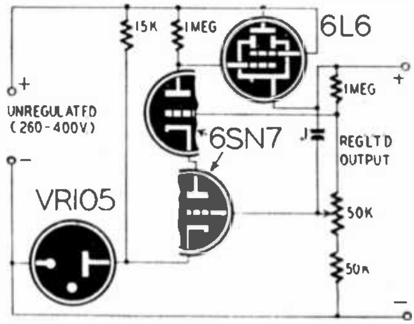


Fig. 309

A.C.-D.C. Power Pack

A DIAGRAM of a hum-free A- and B-voltage supply for portable radios is shown in Fig. 310. A 117Z6 has its plates connected in parallel, and each of its cathodes works into a separate filter network. One cathode is used as a source of A-voltage and may be adjusted by varying R2. The no. 1 cathode supplies the high voltage, which is varied by R1.

By supplying the correct heater voltage to the tube, it is possible to use a 50Y6, 25Z6, 25Z5, or other rectifier tube in the circuit with excellent results.

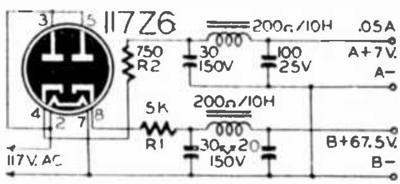


Fig. 310

--LEHMAN M. HAUGER.

(Note that the A-supply should be used only with series-connected tubes drawing not more than 50 ma.—*Editor*)

B-Supply Regulator

THE circuit shown in Fig. 311 employs no special voltage-regulator tubes but nevertheless provides practically unchanging voltage output regardless of varying load. Ripple voltage present

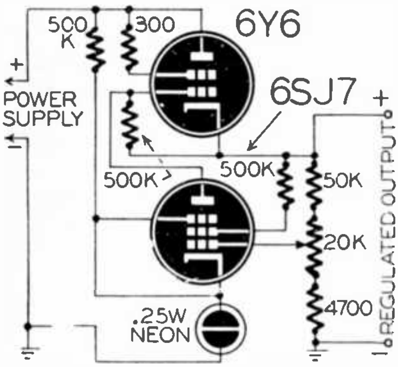


Fig. 311

in the output is less than 0.2 of 1 percent of the d.c. output voltage. Regulation of output voltage is better than 1 percent between no load and 70-ma load.

This circuit is ideal for use with oscillators and special circuits where good voltage regulation is required. All resistors used are of 1-watt rating. The 20,000-ohm control is used to set the output voltage to any desired level.

—HARRY TELLIS.

Hum Filter

IN order to cut down hum

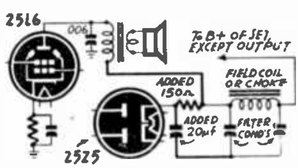


Fig. 312

in an a.c.-d.c. set, a resistor of about 150 ohms plus a filter condenser of say 20 μf may be tried, inserted at the cathode of the rectifier tube such as the 25Z5 or 25Z6. (See Fig. 312). The output tube plate does not need as much filtering as do the others, and the rest of the set will benefit by the lighter current through the choke. The diagram shows such an addition. A separate B-plus lead is run to the power tube output transformer as shown.

—H. A. NICKERSON.

Two-Way Power Unit

HERE is the method (Fig. 313) I use to operate small a.c. receivers from a 6-v storage battery. The filament-type rectifier is replaced with a 6X5 and the filter input lead connected to the cathode. The 5-v winding is unused. (An 0Z4 may be used if the cur-

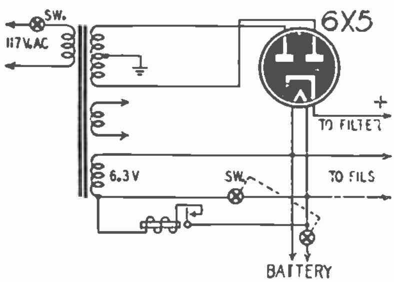


Fig. 313

rent drain is under 50 ma.) A small 6-v vibrator is connected in series with the 6.3-v filament winding with leads running to the battery. A switch shorts the vibrator when a.c. is used. When using a.c., the battery should be disconnected; and for d.c., the 117-volt line should be disconnected. By using a d.p.d.t. switch, the one circuit can be opened and the other closed at the same time. — ALBERT THOMAS, JR.

Section 4 . . .

Transmitters & Oscillators

Transmitter Monitor

This circuit for a transmitter monitors c.w. and phone transmissions (see Fig. 401).

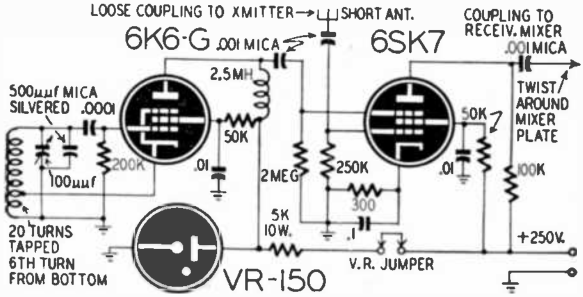


Fig. 401

A 6K6-G electron-coupled oscillator operates at a frequency close to that of the transmitter. Regulated voltage and a high-C tank circuit insure adequate frequency stability. The 40-meter coil is wound on a 1-inch form with 20 turns of No. 22 enameled wire, tapped at the sixth turn from the bottom. The 6SK7 mixes the signals from the oscillator and transmitter and applies the difference frequency to the i.f. amplifier section of a superhet receiver.

The receiver is turned on with the b.f.o. in operation. The transmitter is keyed and the frequency of the monitor adjusted until a beat note is heard in the receiver.

To use the monitor: the stand-by switch of the receiver should be altered so that the i.f. and a.f. sections of the receiver are in operation at all times. Initial adjustments on the monitor are made with the receiver in its stand-by position. — Douglas K. Vanderwater.

B-Batteryless Oscillator

This oscillator (Fig. 402) works with only one battery which is used to supply the filament voltage, the grid bias voltage, and the plate voltage. With the proper combination of tube and audio transformer it should function normally, but the proper combination must be found. It might be necessary, to put a 6-volt battery in se-

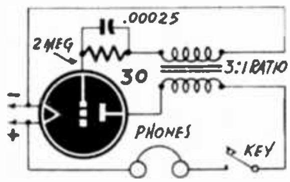


Fig. 402

ries with the positive lead of the filament battery and the phones in order to get it to oscillate. A type 30 or a 1G4 tube is recommended for this oscillator.

—Henry Brown.

Coil-Less Oscillator

Most oscillators require at least one coil or transformer. Here is a circuit which gives very good results and makes no use of any coil whatsoever. Only several condensers, resistors, and a double-triode tube are needed (see Fig. 403).

The condenser values (which are

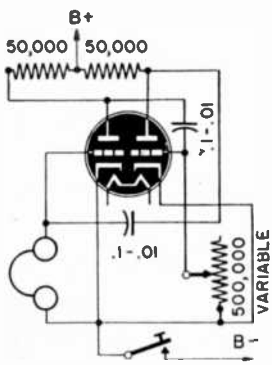


Fig. 403

equal) may be increased to lower the frequency. Typical values are 0.1 µf for the condensers, 50,000 ohms for the fixed resistor, and 500,000 ohms for the variable resistor. The latter has an effect on the tone, also. Any double triode may be used.

—Robt. G. Worley.

Transitron

The transitron oscillator is very useful as a b.f.o. signal generator, audio, or superhet oscillator since it does not require a tapped coil or separate tickler for feedback and has the advantage of being as stable as a crystal without temperature regulation. It is particularly good as a b.f.o., reducing

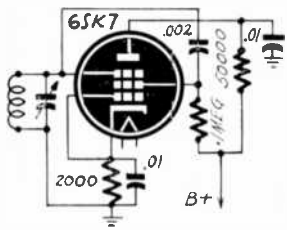


Fig. 404

frequency drift and consequent change in note.

To add a b.f.o. to a superhet, use one coil and trimmer from an i.f. transformer of the same intermediate frequency as the set and couple through a small condenser (around 10 µµf) to the second detector. (See Fig. 404).

The circuit shown will oscillate readily from audio frequencies up to 15 mc at any plate voltage from 100 to 250 volts. Voltage regulation will improve stability. Since the transitron depends on the negative resistance developed by a pentode when the plate is operated at a lower potential than the screen (a nonstandard characteristic), it may be necessary to try several tubes to find a good oscillator.

—JOHN A. DEWAR.

Phono Oscillator

THE 6A8 or 12A8 tube acts as an r.f. oscillator and a mixer (see Fig. 405). The audio frequencies from either a microphone or pickup are fed into grids 1 and 2, thus modulating the continuous waves produced by the other elements of the tube.

Coil L1 is wound with 150 turns of No. 30 enameled wire. It is tapped at the 90th turn for connection to the cathode.

If condenser C1 is calibrated, this set may be used as a signal generator using either phonograph music or the output of an audio oscillator to modulate the signal. The audio oscillator output is fed into the circuit through the same input terminals as the phono.

—RALPH DAY.

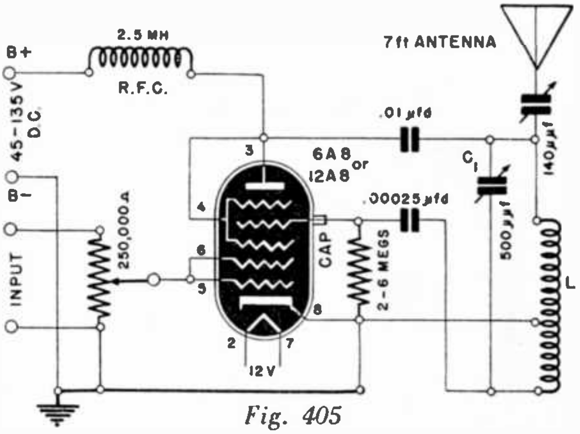


Fig. 405

Remote Control

IN this remote control circuit, (Fig. 406) the local oscillator is tuned to a frequency high enough so that the beat frequency lies in the broadcast band. Any frequency tuned in by the remote control unit is converted to a fixed frequency lying in the broadcast band. This fixed frequency is then radiated to the receiver. Demodulation is left up to the receiver, as advantage can then be taken of the receiver's radio-frequency stages.

The higher beat frequency can be obtained by reducing the number of turns of wire in L4 (an ordinary oscillator coil), and by reducing the number of turns in both L5 and L6 which is an i.f. transformer. Too high a beat frequency must be guarded against, since, as frequency is increased, interaction between oscillator and signal sections of the tube increases as output decreases. This effect can be overcome in some measure by the use of a converter such as the 6SA7

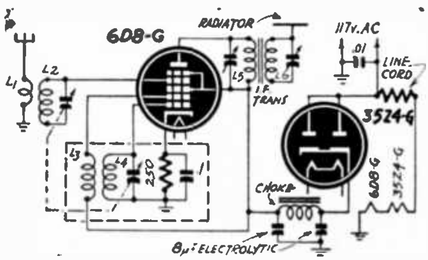


Fig. 406

or similar tube designed to minimize any tendencies toward interlocking.

—CARL STOREY.

Phono Oscillator

THIS phono oscillator reproduces the bass notes without noticeable hum modulation. A standard antenna coil is used in the tuned circuit (Fig. 407). The antenna winding is several turns of wire around the oscillator plate lead. The

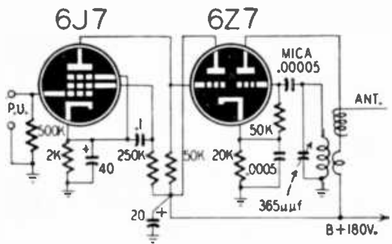


Fig. 407

grid winding is tuned by a standard broadcast condenser.

The preamplifier is direct-coupled to the grid of the modulator section of the 6Z7. With this connection, the grid is about 100 volts positive. This voltage is reduced by using a 20,000-ohm cathode resistor in this stage. The modulator section is connected as a cathode follower grid modulating the oscillator. —G. BORCHERT.

Carrier Transceiver

I GET good results with this 4-tube carrier-current transceiver (Fig. 408). The transmitter is a 6SJ7, suppressor-modulated by a 25L6. For receiving, a 6SJ7 regenerative detector works into the 25L6, which has a pair of headphones switched into its plate circuit. A 50-mh r.f. choke and a pair of 500-$\mu\mu$f condensers prevent r.f. voltages from entering the a.f. amplifier and power supply.

The transmitting coil consists of 160 turns of No. 28 enamel wire on a 1½-inch form with a tap taken off at 50 turns from the bottom end. All of the receiver coils are wound on a common 1½-inch form with No. 32 enamel wire. The grid coil L2 is wound with 300 turns and covered with a thin layer of tape or waxed paper. L4 has 100 turns

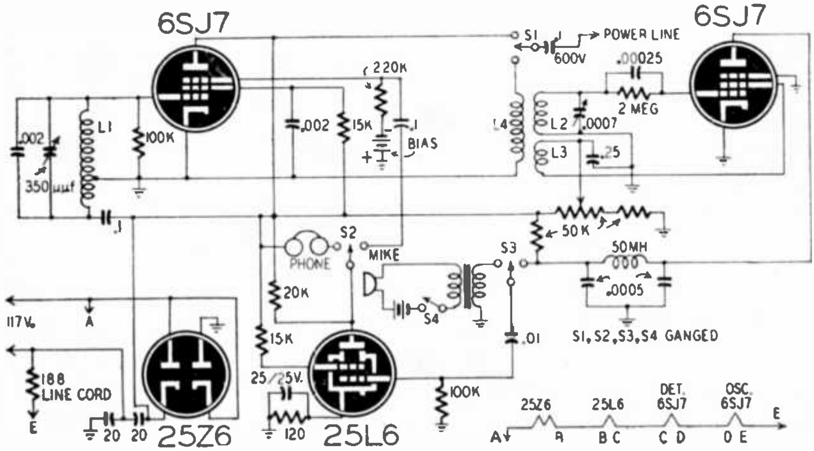


Fig. 408

wound over the grid end of L2, and the tickler L3 has 75 turns wound close to the ground end of L2.

Bias for the suppressor grid is supplied through a 220,000-ohm resistor and a bias battery. The battery voltage may be adjusted by listening to the signal on another transceiver and adjusting for highest modulation strength with least distortion. —H. O. NORTHERN.

Home Broadcasts

THIS home broadcasting unit is very small and simple to make. (See Fig. 409).

The coil may be an old superhet oscillator coil with sufficient capacitance added in parallel to make it operate in the broadcast range. I use a crystal mike, the output of which is amplified by the 1S4 before modulation.

—GLEN SOUTHWORTH.

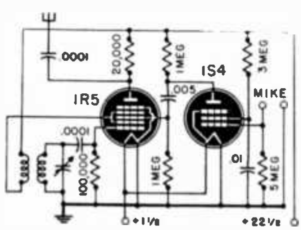


Fig. 409

Code Oscillator

HERE is a diagram (Fig. 410) of a simple code practice oscillator. It uses a 1G6-GT twin triode. Variable pitch control over a wide range is possible through the use of a 500,000-ohm potentiometer in the feedback circuit.

Filament and battery power are supplied from a 1½-volt flashlight cell and 67½-volt B-battery respectively. A d.p.s.t. switch on the tone control is used in the positive side of the A and B leads.

—ARTHUR A. DAY.

(NOTE—If a d.p.s.t. switch is not available, a s.p.s.t. switch in the common negative lead will be satisfactory.—*Editor*)

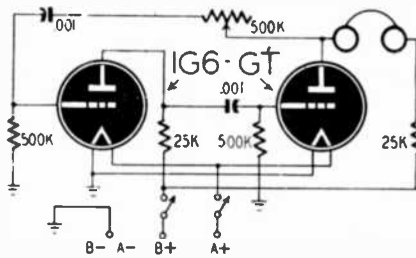


Fig. 410

Phono Oscillator

THIS phono oscillator can be built cheaply and is so compact that it will easily fit into a record player. (See Fig. 411).

When it is operated in conjunction with or near a sensitive receiver, no external antenna is needed but in most cases, a short wire about 7 or 8 feet (or a small loop), will give best results.

The coil consists of 150 turns of No. 28 enameled wire, wound on a 1-inch form, and tapped at the 50th

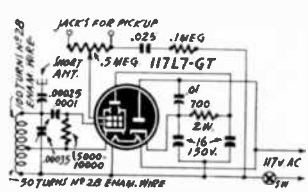


Fig. 411

turn. This coil and the leads from it should be shielded from the 110-volt a.c. line to prevent pickup and consequent 60-cycle hum.

—RALPH DAY.

Section 5...

INTERCOMS

A.C.-D.C. Intercommunicator

THIS intercommunicator gives excellent results up to 50 miles. It is self-contained and was designed for use by signalmen to communicate between interlocking towers and signal locations over available telephone lines. (See Fig. 501).

When S1 is in normal "listening" position, the low-impedance windings coupling T1 to T2 are connected together and simultaneously the speaker is connected to the output secondary. When S1 is depressed, the speaker is connected to T2 and amplifier output T3 is connected to T1 to transmit sounds over wires.

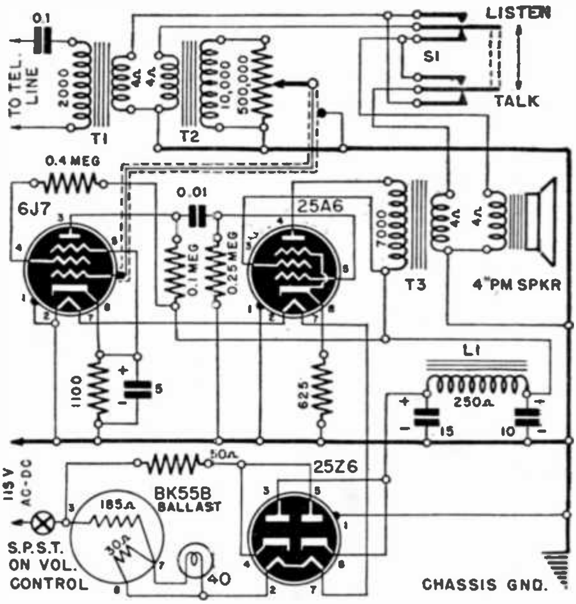


Fig. 501

Components are marked and impedance of transformers is designated. Better results would probably have been obtained had it been possible to obtain a transformer with 600 ohms impedance facing the open line for T1. Instead, an ordinary Jensen output transformer (ZP-1020) was used for it as well as for T2 and T3.

—P. A. Flanagan.

Carrier Current

The transmitter circuit is shown in the diagram, Fig. 502. The oscillator coil is an i.f. tapped

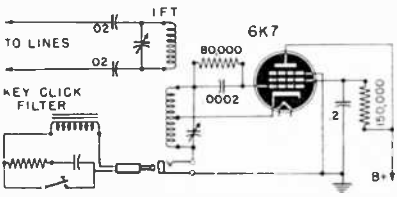


Fig. 502

coil. To eliminate key clicks, the filter may be connected as shown. The i.f. oscillations are then transmitted to the line through .02-μf condensers. The line is a power line, telephone line, or any other available wire.

To receive, it is necessary only to couple the line again through .02-μf condensers to the first i.f. stage of a superheterodyne receiver. A b.f.o. must be used in the receiver so that the code signals can be heard. It is also possible to modulate the oscillator with phone, in which case no b.f.o. is required in the receiver. --Richard Cole.

Compact Intercom

Here is the circuit of a compact instant-heating intercommunicator. A 1N5-G drives a 3Q5-GT power amplifier.

Small PM speakers are used at the master and remote stations where they serve either as speakers or microphones. Talk-listen switching is done, with a d.p.d.t. lever switch. (See Fig. 503.)

The power supply uses a selenium rectifier to supply high voltage for the plates and screen grids and 4.5 volts for the series-connected filaments.

The speaker voice coils are matched to the 1N5-G grid with a voice-coil-to-grid transformer designed for use in intercom units. An 8,000-ohm output transformer matches the plate of the 3Q5-GT to the voice coils. If it is not necessary for the remote station to

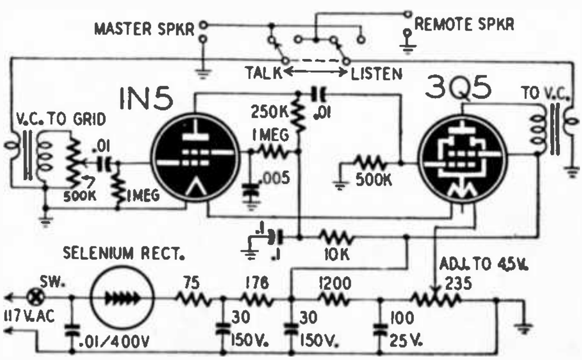


Fig. 503

initiate a call, the unit may be turned off until the master makes a call.—F. C. Hoffman, W9VVU.

Carrier Communicator

THIS circuit uses a 6L6 oscillator, modulated for phone transmission by a 6V6-GT. A 6J5-GT speech amplifier works from a sin-

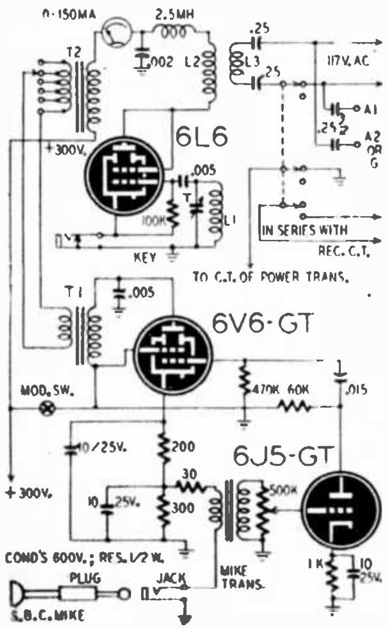


Fig. 504

gle-button carbon mike. Excitation voltage for the mike is obtained from a tap on the modulator cathode resistor. (See Fig. 504).

The oscillator coil L1 is an old 175-kc i.f. transformer. One of the windings is replaced with 75 to 100 turns of No. 30 d.c.c. wire, scramble-wound. This is L2. L3 consists of 8 to 12 turns of No. 24 d.c.c. wire wound around L2. The frequency is set by tuning the trimmer condenser T (15-250 $\mu\mu f$).

Two output transformers T1 and T2, connected back to back, are used in place of a modulation transformer. Impedance matching is handled by changing the taps on T2. Condensers between L3 and the line are 1,000-volt mica type.

The output coil is adjusted so that the oscillator draws 70 ma with 300 volts on the plate. For c.w. operation, the modulator switch is opened and a key inserted in the closed-circuit jack in the oscillator cathode lead. A 3-circuit, 2-position switch opens the receiver B-minus lead, closes the transmitter B-minus lead, and connects the pickup coil to the line, when transmitting. For receiving, the connections are reversed.

— ROBERT K. COBB.

Intercommunicator

A CIRCUIT of an intercom unit that has worked effectively for distances up to two miles is shown in Fig. 505.

One of these units is required for each station. This simple 1-tube circuit uses a 70L7-GT as a rectifier and power amplifier with approximately 2 watts output. T1 and T2 are high-impedance plate-to-voice-coil transformers. A double-pole double-throw switch changes the speaker from the output to input circuits when the unit is used for transmitting.

Multistation circuits may be used

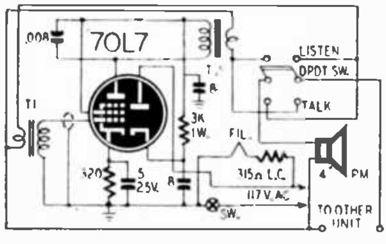


Fig. 505

by connecting a selector switch between the line and *talk-listen* switch.

— G. BOULT.

Section 6...

TESTERS

Vacuum-Tube Voltmeter

A VERY good vacuum-tube voltmeter may be constructed from a high-range d.c. ammeter. (See Fig. 601).

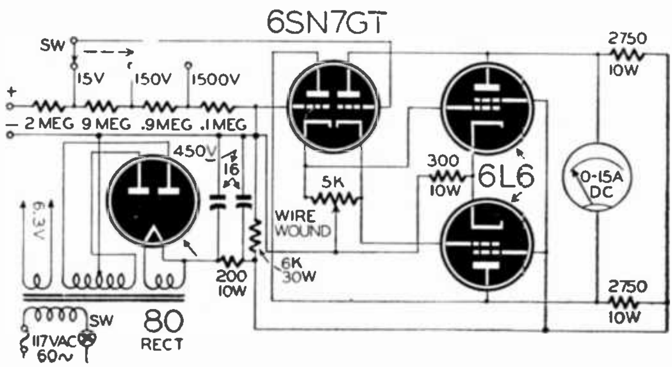


Fig. 601

The shunt is removed from across the terminals of a Westinghouse 15-amp d.c. meter. The meter is inserted in the output circuit of a balanced bridge amplifier using two 6L6 tubes.

Calibration is obtained by adjusting the meter to zero with the 5,000-ohm wire-wound resistor in the cathode circuit of the 6SN7 and applying known voltages to the input.

Care in the selection of the 2-meg resistor for the 15-v range will result in accurate calibration over the entire range of the meter.

—LEONARD W. NORRIS.

Plug-In Signal Generator

THIS signal generator has been giving excellent results in my service work (see Fig. 602).

The 6H6 filament transformer was originally an output transformer designed to match two 2A5's in push-pull. The secondary was rewound to provide 6.3 v (in this case 200 turns of No. 26 d.s.c.

wire were used). The low ripple of the filter provides a clear audio note. The audio input jack enables me to use a wireless record player for modulation.

Plug-in coils comprise the r.f. oscillator coils. A total of 225 turns of No. 35 d.s.c. wire, tapped at 80 turns, tunes from about 300 to 800 kc. The tuning condenser is a straight-line frequency type which can be easily calibrated. I use collodion to keep the coil in place and to keep out moisture.

The 1N5-G is used to isolate the generator from the output. It is also advisable to shield the attenuator and output leads to prevent direct pickup. Wiring of the r.f. section should be done with fairly heavy wire for a steady frequency and output, and the entire instrument should be shielded to avoid radiation. —GERALD A. CHASE.

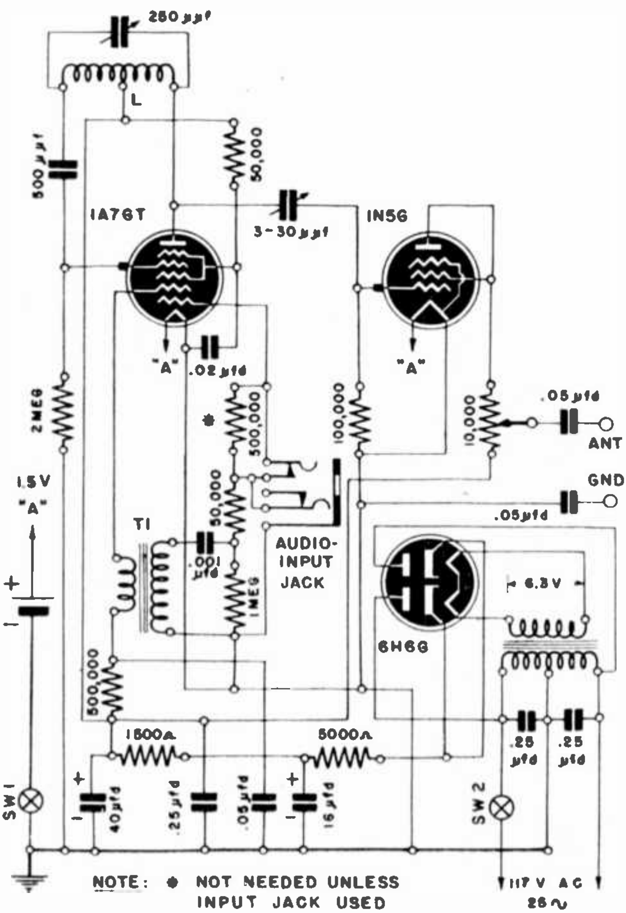


Fig. 602

2-Tube Signal Generator

I HAVE constructed this all-wave signal generator. It gives good, accurate signals, both modulated and unmodulated. The power supply may be 250 v, well filtered. By allowing the generator to warm up before using, little drift will be encountered. (See Fig. 603).

The 6A8 is used as a negative-resistance-type audio oscillator. The inductance of the choke determines frequency range. The 3-pole switch allows choice of 3 modulation tones: I used coils from an old r.f. generator which had a 12SA7 oscillator. The low-frequency coils were made from 2.5-mh chokes and windings from i.f. transformers.

This type of oscillator allows the use of harmonics if desired. At low power, harmonics are greatly decreased. The 6SK7 suppressor circuit switch is opened when a modulated signal is desired. Otherwise the audio oscillator output is shorted to ground. —W. G. BARRETT.

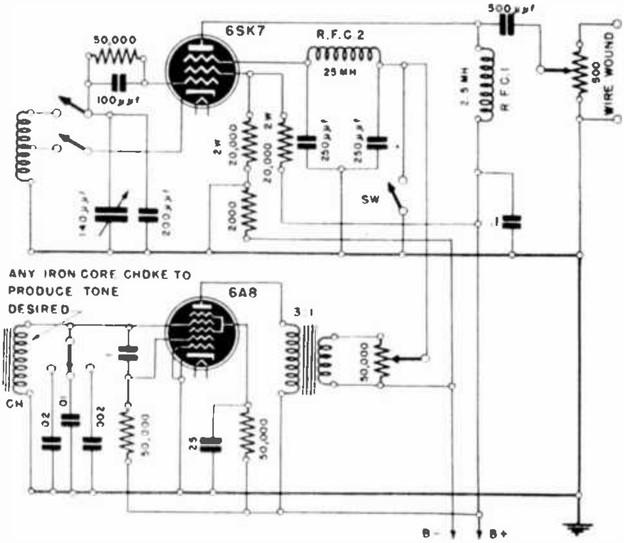


Fig. 603

R-C-L Bridge

THIS very handy piece of equipment can be constructed quite compactly yet may have the precision of a larger laboratory model. In this circuit, Fig. 604, we use the bridge method of comparing known against unknown values and reading the ratio of the bridge.

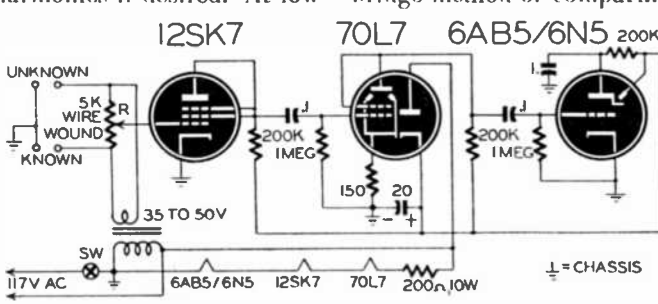


Fig. 604

Balance is indicated by minimum

shadow on the eye of the 6AB5/6N5 indicator tube.

Direct current necessary for the operation of the amplifier and indicator sections of the set is furnished by the rectifier section of the 70L7 and the bridge is fed with an alternating voltage having a value from 30 to 50 v. This voltage may be supplied by rewinding an output transformer. The 5,000-ohm, wire-wound resistor in the circuit is the ratio arm of the bridge. It should have a linear taper.

To calibrate the bridge, it is necessary to have a number of standard resistors, capacitors, and inductors. These are placed across the *known* posts and the unknown value is connected across the *unknown* posts. The dial of the potentiometer is calibrated from 0 to 100 and, if linear, will balance at 50 if known and unknown are equal. After the standards have been selected it is possible to calibrate the dial directly by placing other known values across the *unknown* posts and noting the position of the potentiometer R when the bridge is balanced.

—Dale W. Courter

Self-Signal Tracer

The signal tracer shown in Fig. 605 is merely part of the set

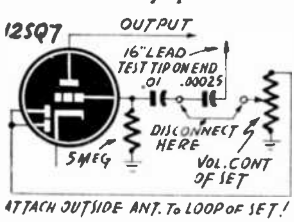


Fig. 605

being tested. An outside antenna is attached to the loop of the set. The center connection on the volume control is disconnected and a .0025-μf or .005-μf condenser is connected to the grid that originally ran to the center position of the volume control. By this means you can use the radio being tested as a signal tracer and it will enable you to check every stage but the one disconnected. The fact that this stage works as the signal tracer indicates to the serviceman that it also is functioning properly.

—Ralph Bloom.

Volt Ohmmeter

This meter has been built into a 9 x 8 x 4-inch box.

The same input terminals are

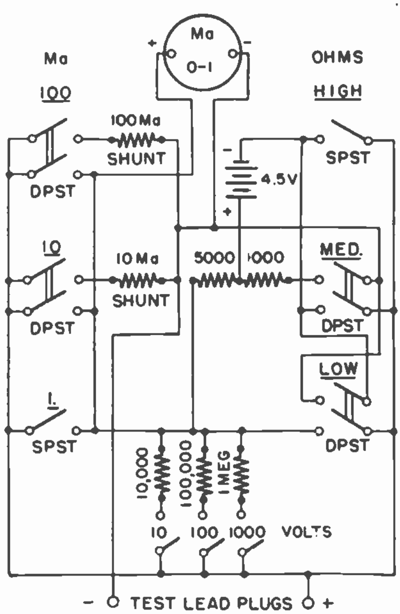


Fig. 606

used for volts, ohms, or milliamperes (see Fig. 606). For volts, a switch closes the desired range circuit: 10, 100, or 1,000. For milliamperes, 1 single-pole switch and

2 double-throw switches are necessary, the desired one being closed. The shunts depend upon the meter resistance, and may be wound by cut-and-try methods. I used a 0-1 milliampere meter, but others can be used by changing the voltage resistors. Shunts always have to be calibrated with the meter used.

Three ohm scales are available. For these circuits 2 double-throw and 1 single-throw switches are required. —PAUL KIRCHBAUM.

(If a 4,000-ohm resistor is used instead of the 5,000, and a series-variable resistor of 1,000 ohms is added as a zero adjuster, aging batteries will be compensated for.—*Editor*)

2-Tube Tracer

A SIGNAL tracer can be built with the help of any old midget or other receiver using a diode detector. Remove all r.f. and i.f. coils, gang condensers, and wave-band switches, with all the wiring, condensers, etc., in the r.f. and i.f. section. Then hook up the i.f. tube as shown in the sketch. It will become an untuned amplifier for the tracer.

No changes are made between the plate of the detector and the speaker. The original audio circuit of the receiver will work equally well in the signal tracer. (See Fig. 607).

If the r.f. lead is kept short, with the 10-$\mu\mu$f condenser connected directly to the prod end, ordinary wire may be used. If this lead is more than 2 feet long, it will be necessary to use flexible co-axial cable. The a.f. lead may be ordinary wire or shielded microphone cable, with the resistor at the prod end. Another lead, about 2 feet long, should be soldered to the chassis for the ground connection of the set.

Since signals from a set in bad condition will not always work the speaker, a headphone jack should be inserted between the plate of the output tube (through a 0.1-μf or larger condenser) and ground. This will make possible the plugging in of a pair of phones. The phones are also useful in detecting causes of slight noise, hum, or distortion.

—BILLY SHELBY.

(It should be noted that the receiver from which a signal tracer

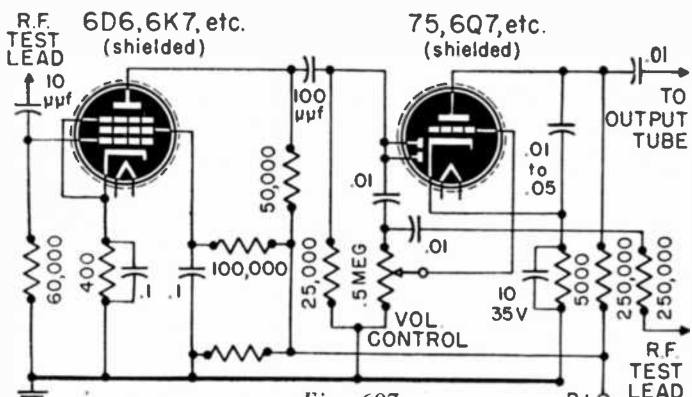


Fig. 607

is made should be one with a power transformer, as difficulties are likely to be experienced if an a.c.-d.c. receiver and tracer are hooked together.—*Editor*)

Signal Tracer

THIS tracer is easy to use as it can be listened to while the probe is moved from place to place in the set (see Fig. 608). Separate posts are provided for r.f., i.f., and a.f. signals. The a.v.c. voltage may also be checked by use of an electron-ray tube.

With sets using a.v.c. it is possible to listen while looking at the *eye*. This gives both visible and audible indication of what is going on while changes or repairs are made. —A. MALINICK.

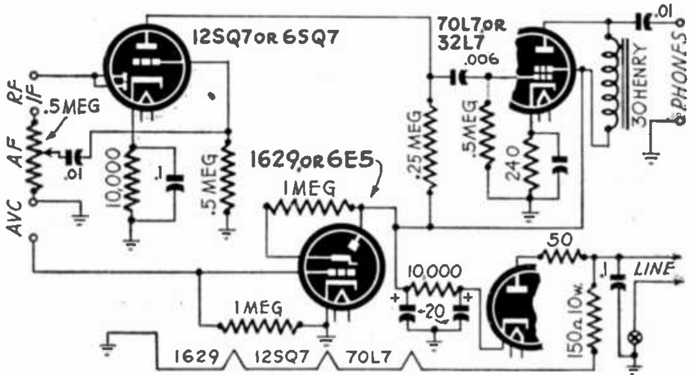


Fig. 608

1-Tube Signal Generator

A FEW parts from the junk box may be assembled in a short time into an efficient signal generator that will furnish either modulated or unmodulated r.f. signals at the will of the operator.

The circuit (Fig. 609) uses a 1G6-G twin triode as radio- and audio-frequency oscillators. The grid coil of the r.f. oscillator is wound with No. 32 enameled wire, close wound, to cover 1⅛ inches on a 1-inch form, and is tuned by one section of a standard broadcast condenser. This winding is then covered with a thin sheet of celluloid. The plate winding is wound over the lower end of the grid coil and covers 3/16 inch. The output coil is wound immediately above the plate coil and covers a ⅛-inch winding space.

The panel controls are: *Tuning*, *Off-Tone-Rf.*, and *Attenuator*. *Off-Tone-R.f.* control is a double-pole, 3 position switch.

If either of the oscillators fail to oscillate, reverse the connections of either of the windings.

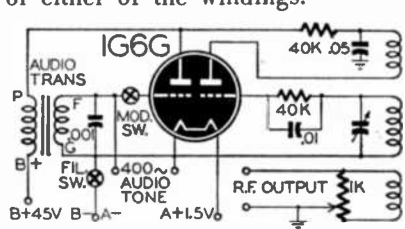


Fig. 609

This signal generator produces a signal from 400 to 1,500 kc. —A. SKITSKI.

Thermocouple

WHEN designing a Q meter to test high-frequency coils, I encountered trouble when I looked around for a thermocouple ammeter of suitable range to check the output voltage of the oscillator. I used an old discarded 26 tube (Ef = 1.5 volts, If = 1.05 amperes) and applied the r.f. voltage to be controlled across the filament of the tube, heating it in this way. Applying sufficient voltage, at least 0.3 volt, the filament starts emitting electrons toward grid and plate (tied together), to which is connected a positive voltage through a protective series resistor. (See Fig. 610). Electron flow is indicated by inserting in the plate circuit a resistor and measuring the voltage drop across it with a v.t.v.m., or by using an electron ray tuning indicator tube (6E5). The set may be adjusted to let the tuning eye shut exactly when the predetermined r.f., a.f., or d.c. voltage is applied to the filament of the 26 tube (ranging from 0.3 volt up to 1.5 volts). Using different tubes with other filament voltages, other readings may be obtained, resistors may be applied in series or in parallel with the filament. I preferred the 26-type tube for its very low resistance (less than 1 ohm when not completely heated). —HAROLDO ELLERN.

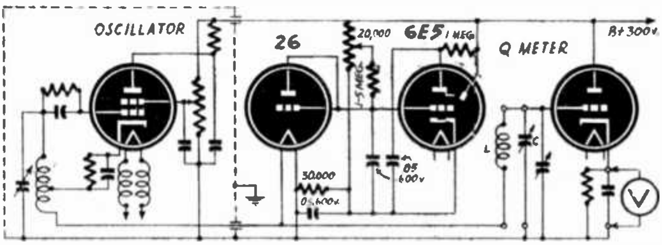


Fig. 610

Capacity Meter

FIG. 611 shows a simple capacity meter which I use around the shop for general condenser checking. Using a 0-1 milliampere meter, the range of this tester is .01 to 4 μf. By using a 5-v winding for the filament, thermionic effects are eliminated. Usually this thermionic effect causes the meter to show a reading with the Cx terminals open. This effect can be noticed more readily with meters of greater sensitivity than 1 ma.

The meter shown in the drawing may be shunted to extend the range if higher capacities are to be measured. This meter was calibrated by using marked, tested condensers. —DAN W. DAMROW.

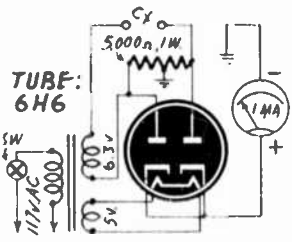


Fig. 611

A Comparator

THIS condenser tester (Fig. 612) works very well.

By using a bank of known condensers, any one of which may be switched into the circuit, it is possible to compare directly with the unknown. When the two neon bulbs are of equal brightness, the

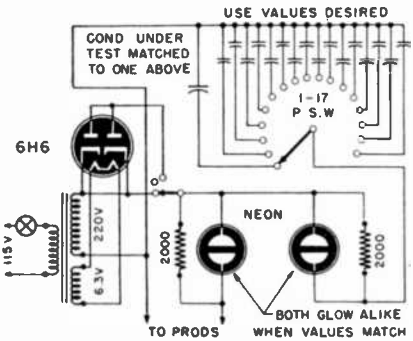


Fig. 612

unknown capacitance is the same as the switched-in standard.

The single-pole double-throw switch changes from a.c. to d.c.

—ROGER WILLS.

V.T. Voltmeter

THIS 1-tube electron voltmeter was built to use a zero-center

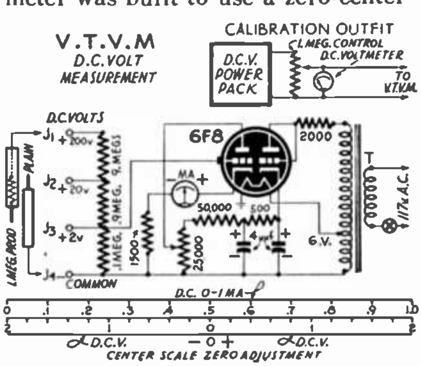


Fig. 613

1-ma meter and a 6F8 tube I had on hand. It is a very effective little instrument and uses only one manual control, for the zero adjustment. (See Fig. 613.)

To adjust the 2-volt scale, increase or decrease the ohmage of the 0.1-meg resistor between J3 and J4 until the correct reading is obtained. Then the other scales will be correct automatically.

Do not use an a.c.-d.c. power supply or any power transformer in which the line can be grounded to the chassis of the v.t.v.m. The one used in my instrument was a tube tester transformer, which isolates the line. One 6F8 works both as the triode for the tester and as a diode for the power supply.

The best way to calibrate the set for the 2-volt scale is to get a d.c. voltmeter and supply a measured voltage of 2 volts to the input by using a voltage divider across two dry cells or low-voltage d.c. power pack. —W. FRED WHALEN.

Saw-Tooth Sweep

WHEN I needed a sweep circuit for an oscilloscope, I could get no gas triode (884, 885).

After plenty of trials with vacu-

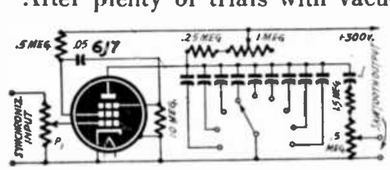


Fig. 614

um-tube circuits, the simplest and most useful proved to be the transitron oscillator.

Synchronization is excellent, requiring about .01 volt on the control grid for stability of the observed wave, it being easy to synchronize signals over a range of 1 to 10.

Sweep frequencies from below 10 cycles up to 50,000 cycles are obtained, so that the wave form of frequencies of 250,000 cycles can be observed. Output voltage of the oscillator is about 10 to 30 volts (peak), the lower figure for the highest frequencies. With 9 different condensers and potentiometer of 1 megohm in the plate circuit (Fig. 614), the range from 10 to 50,000 cycles is covered with sufficient overlapping of ranges, with the highest capacity 0.25 and the lowest .0001-μf. The output of the oscillator must be loaded with a very high impedance load, a minimum of 2 megohms.

—HAROLDO ELLERN.

Signal Generator

THIS compact signal generator uses a 6F7 as electron-coupled

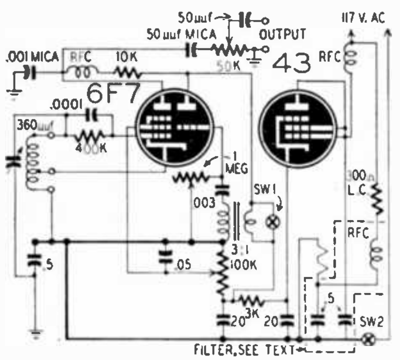


Fig. 615

r.f. oscillator and a.f. oscillator. A 43 with control and screen grids tied to the plate was used as a rectifier. (See Fig. 615).

The strength of r.f. oscillations is controlled by setting the 100,000-ohm potentiometer to determine the screen voltage. The frequency of the a.f.oscillator is varied by a 1-megohm variable grid leak. A 50,000-ohm potentiometer is the attenuator for the r.f. and a.f. output voltages. If the a.f. output is too low, the 50-$\mu\mu$f mica condensers may be replaced with larger ones or another tip jack may be connected directly to the a.f. plate through a .01-μf condenser. Modulation is turned on or off by SW1 mounted on the tone control.

Five plug-in coils, wound on 1½-inch forms, are used to cover the range from 100 kc to 24 mc. The coils are wound as follows:

Band (kc)	*Total turns*	*Tap*
100 to 300	500	150
300 to 900	226	50
900 to 2,700	46	10
2,700 to 8,100	17	3
8,100 to 24,000	5.2	1.4

This unit should be constructed in a shielded metal box to prevent unwanted radiations. The r.f. chokes and by-pass condensers, shown in 117-V line, may be used to keep the r.f. out of the a.c. line, where it might interfere with receiver alignment.

—HAROLD R. NEWELL.

Dual Circuit

I NEEDED a simple 1-tube signal generator which would cover

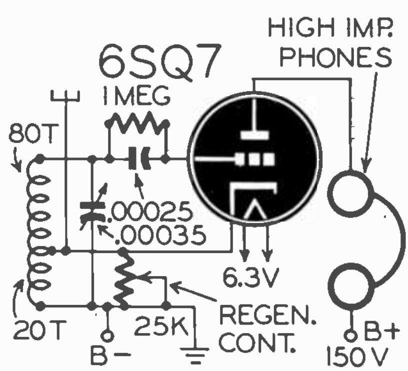


Fig. 616

the broadcast band with fair stability. I finally tried an electron-coupled oscillator circuit using a 6SQ7 tube (the triode section), and obtained what I wanted. (See Fig. 616.)

Then I connected an aerial wire to the grid end of the tank coil and grounded the chassis. A pair of headphones were connected in the plate circuit. I immediately picked up a good half-dozen strong stations. The louder ones were of sufficient volume to be uncomfortable, making a control necessary.

The tank circuit size depends on the condenser used. With one of 350 $\mu\mu$f, use about 100 turns tapped 20 turns from the bottom. The coil is wound with No. 30 enameled wire on a 1½-inch form.

To use as a signal generator, take off the aerial and ground. disconnect phones, and short the jack (or use a closed-circuit jack).

—BENNIE JOHNSON.

Multi-Use Indicator

THIS indicator circuit (Fig. 617) has a large number of uses.

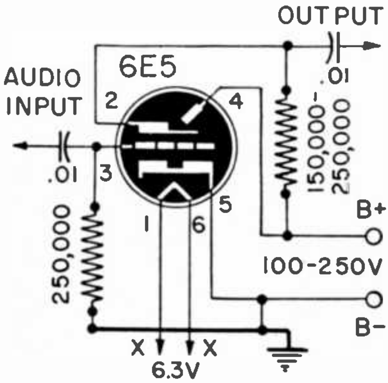


Fig. 617

It can be added to a 1-tube set as a tuning indicator and will amplify the signal as well. It may be inserted between the detector and power tube to act as a voltage amplifier and indicator.

It may be attached also to an amplifier or recorder as a volume indicator. —EDWIN BOHR.

V.H.F. Oscillator

THIS 112- to 300-mc parallel-line oscillator makes an ideal signal generator for testing v.h.f. receivers.

The oscillator uses parallel-line

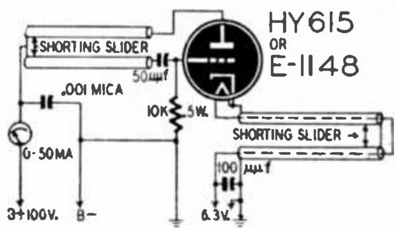


Fig. 618

tuners in the plate-grid and cathode circuits. The plate-grid inductors consist of 2 pieces of 5/16-inch brass tubing, 12 inches long, spaced 1 inch center to center. They are mounted above the chassis with standoff insulators which permit the shortest connections to the plate and grid caps of the tube. The tubes are joined together at the B-plus end with a piece of No. 14 wire. (See Fig. 618.)

The cathode inductors are made of the same material, 7 inches long, mounted below the chassis. One of the filament leads is threaded through the tubes and the other is connected to ground through the inductor. The open ends are connected with a piece of No. 14 wire.

The oscillator frequency is determined by the position of the shorting bar on the plate-grid inductors. The shorting bar on the cathode inductor is varied for maximum output and best stability at the desired frequency. The normal plate current is from 10 to 12 ma.

The oscillator may be either plate or grid modulated if desired.

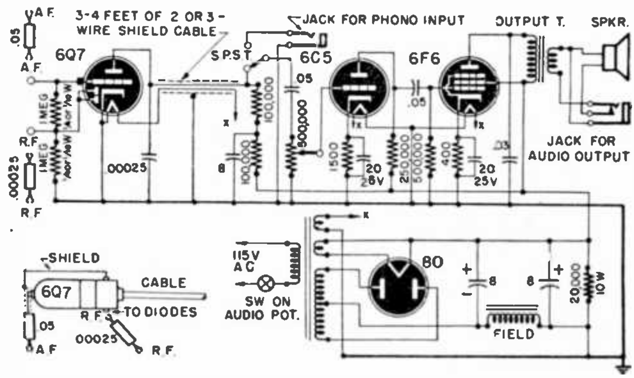


Fig. 619

Output may be taken from the oscillator with a hairpin loop coupled closely to the B-plus end of the plate-grid inductor. The loop may be connected to an antenna or to the tuned grid circuit of an amplifier stage.

—P. EGERTON, JR.

Prod Signal Tracer

THIS circuit (Fig. 619) has been in use for the past five years and has given excellent account of itself.

The 6Q7 is used as the prod, being completely shielded but for an a.f. and an r.f. binding post. The tube is connected to the a.f. amplifier (last 2 tubes) by about 3 feet of 3-wire cable which includes the filament and plate voltage leads. Either a meter (plug-in) or the speaker may be used at the output.

—J. LEONARD KING.

Tracer From Blooper

WHILE planning a new untuned signal tracer, I decided to see what could be done with an old seldom-used regenerative receiver (Fig. 620). The plug-in coil was removed and a tube base connected as a jumper to connect the cathode to ground. A shielded probe was

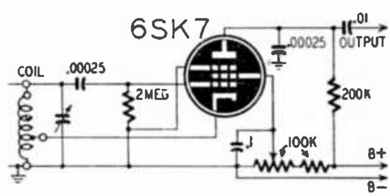


Fig. 620

made and connected to the antenna post. The regeneration control became the gain control. With the tracer (Fig. 621) in action it is possible to follow a signal from the

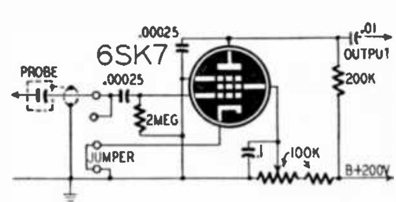


Fig. 621

antenna to the detector of a receiver.

When the coil is replaced the unit becomes a tuned tracer or signal generator.—WESLEY NEELANDS.

A.C.-D.C. V.T.V.M.

HERE is a circuit of a vacuum-tube-voltmeter that I have found useful for measuring a.c. and d.c. voltages up to 500 volts

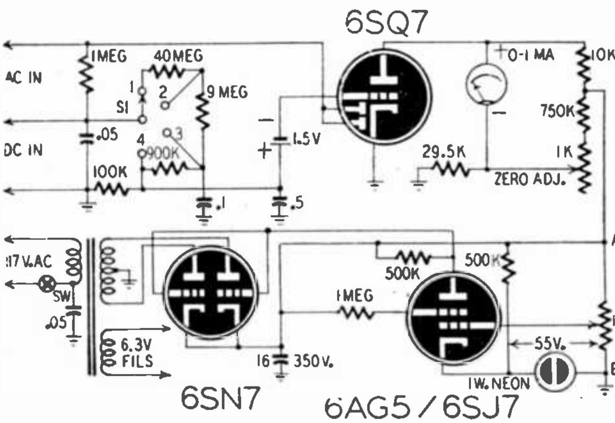


Fig. 622

(Fig. 622). A 6SN7, a 6AG5, and a 1-watt neon lamp are used in a voltage-regulated power supply, and a 6SQ7 acts as meter amplifier and rectifier.

The 6SN7 is connected as a grid-controlled rectifier with its grid voltage derived from the output of the supply. Any changes in the output voltage are neutralized by changes in the internal resistance of the rectifier. A 6AG5 was used as the voltage regulator, but a 6J7, 6K7, and similar tubes can be used with equal results. The bias on these tubes is critical and should be adjusted to give 250 volts between A and B. —LEON MEDLER.

Time-Delay Circuit

THE specially designed time-delay circuit illustrated in Fig. 623 operates a control relay a predetermined length of time after the control voltage has been applied. Upon removal of the control voltage, an equal time interval will elapse before the relay is deactivated.

With switch S1 in position No. 1, the bias developed across the cathode resistor charges condenser C through the control resistor R. This biasing voltage reduces the plate current of the tube to a point at which the relay contacts open.

When the switch is thrown to position No. 2. the cathode resistor is shorted to permit

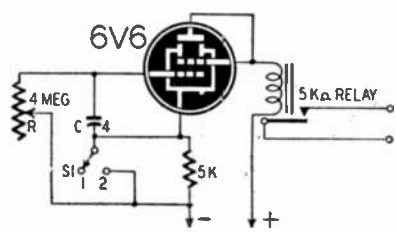


Fig. 623

the charge to leak off the condenser through the variable resistor.

One of the applications of such a time delay circuit is in photographic work. It may be used to control printing time when making photographic prints.

—J. A. SIDERMAN.

Section 7...

MISCELLANEOUS

Capacity-Operated Relay

THIS relay operates on an increase in capacitance across the grid coil so that oscillation is re-

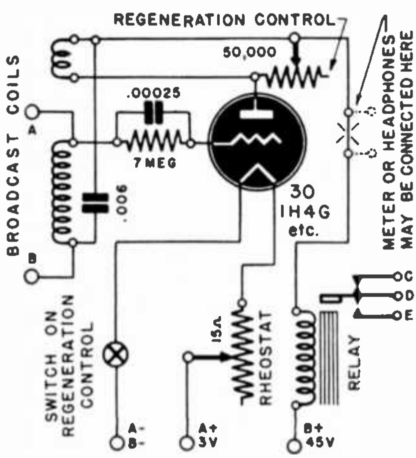


Fig. 701

duced and plate current increased. The relay used should be very sensitive. Point A connects to any large metal object, point B to ground (see Fig. 701).

The relay is adjusted so that, at the point of oscillation, it just opens. A person approaching the large metal plate causes an increase in capacitance which throws the circuit out of oscillation and closes the relay. A meter or phone may be used to indicate oscillation.

This circuit may be used to protect a safe, a motor car, or any other large metal object. In the case of a car, a ground chain would have to be used at point B.

—HAROLD NEWELL.

Home-Made Stroboscope

HERE is a diagram (Fig. 702) of a simple, home-made stroboscope that works by simply attaching one or two medium-sized neon bulbs in series with the output of the circuit, or by connecting an ordinary

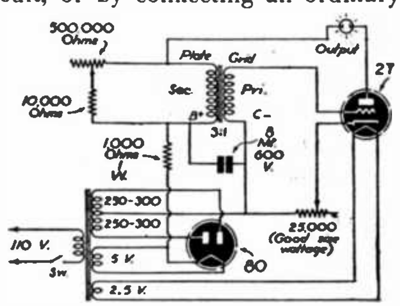


Fig. 702

small fluorescent bulb in series with the output.

The two variable resistors can be

adjusted to decrease or increase the frequency of the output, so that when a rotating or moving object is placed in the vicinity of the oscillating neon bulb, the object will appear to stand still.

No chokes are needed for the power supply which may be between 250 and 300 v, but the 8-μf condenser is a necessity if the circuit is to work. The audio transformer does not necessarily have to be a 1:3 (primary to secondary) ratio but may be some other closely related ratio. I might also add that when a fluorescent bulb is used instead of neon bulbs in the output, an interesting rainbow color effect will be achieved by the rotating object.

—ROY A. HEMPEL.

Line Filter

THE drawing (Fig. 703) illustrates the components and hookup of an efficient power line filter to reduce interference and hum from the a.c. line.

The input condensers are mica, while those at the receiver end are paper.

The chokes are magnet windings

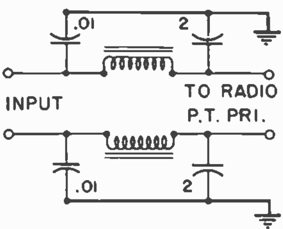


Fig. 703

from an old pair of B-vibrators. They may be wound, using No. 16 enamel magnet wire, on a wooden spool. Leaving out the iron core will not make much difference.

If you wind the chokes, put on from 150 to 200 turns. Good results have been obtained with rolls of bell wire.

The unit is enclosed in a metal shield to which the condensers are grounded. The shield then is grounded externally to a water pipe — separate from the receiver ground.

—EMMETT BRIGHTWELL

Simple Power Supply

THIS interesting a.c. power supply uses a power transformer from an automobile radio. The unit

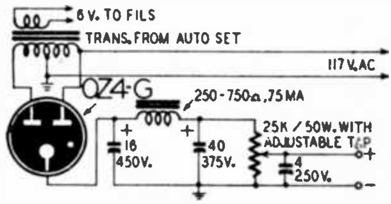


Fig. 704

will supply up to 250 volts of well-filtered d.c. at 75 ma, and 6.3 volts for tube filaments. (Fig. 704).

The center-tapped secondary winding is used as an autotransformer with the a.c. line connected between one end and the center tap. The rectifier plates are connected across the entire winding in the conventional manner.

Filament voltage is taken from the primary winding.

This unit is connected directly to the power line and should not be used with any equipment that uses a direct ground. If a ground is needed, it should be made through a .01-μf, 600-volt condenser.

—RICHARD L. ALLMAN.

Tuning Indicator

A DIAGRAM of an amplified tuning indicator is shown in Fig. 705.

It is possible to use a common

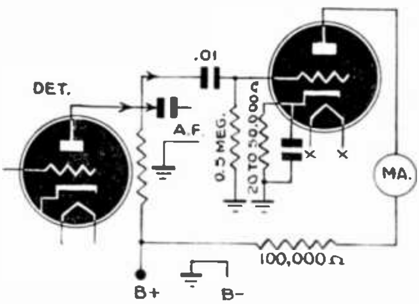


Fig. 705

A- and B-supply with this hookup. Any triode that has a cathode can be used, such as the 76, 56, 6J5, or 6C4 depending on A-supply in the receiver.

One of the main features is its ability to work even on a 1-tube set. —RICHARD GRAHAM.

Electronic Relay

THIS circuit is designed to actuate positively a heavy-duty relay from the light contacts of a small switch or relay. No strain is put upon these contacts, since there

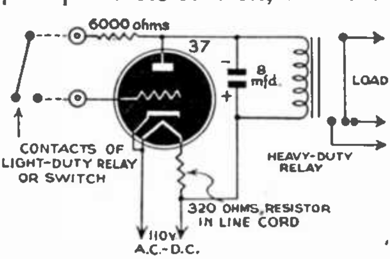


Fig. 706

is no induction and very little current.

The tube can be practically any triode. Different values should be tried for the plate resistor. (See Fig. 706).

This arrangement is of value in body-capacity and photocell circuits, because it does away with relay batteries and burnt contacts. —HENRY CLINTON.

Novel Tone Control

HERE is a useful tone-control circuit. (See Fig. 707). It consists of high- and low-pass filter circuits fed from a common source and working into the grids of a 6N7. The plates of the tube are tied together to form a mixer circuit. The voltage input to the networks is controlled by the setting of a 1-megohm volume control. A 1-megohm variable tone control determines the amount of voltage ap-

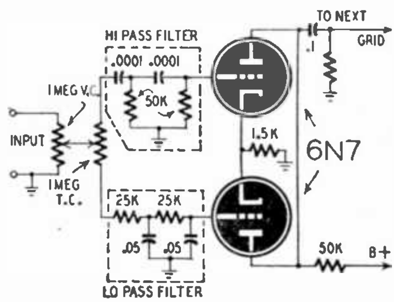


Fig. 707

plied to each grid through its filter network.

—GEORGE A. FRANCE, W3LTA.

Code Oscillator

WITH the use of this single-tube oscillator, (see Fig. 708), all danger of grounding through the power lines is eliminated, and no high voltages are present, thus all possible shocks are avoided.

The 6-volt secondary is used not only to light the filament, but, after rectification by one of the triodes (connected as a diode), it is used as plate supply of the oscillator, the voltage being quite sufficient. —GENE CLARDY.

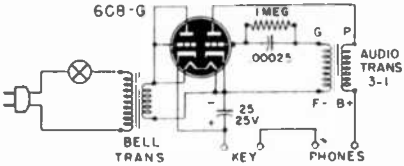


Fig. 708

Easily Built Intercom

I WANTED an intercommunication device for 2-way communication between my study and the kitchen. I tried several circuits, using different tubes and various types of mikes and speakers.

The diagram (Fig. 709) is laid out in detail to avoid the necessity of further explanation. There is a little hum, which could be further eliminated, if it were troublesome, by adding more filter capacity. I tried resistance coupling between the two tubes, but that cut down the volume and didn't help the quality at all. The speakers are old-type magnetics.

—ROBERT W. L. MARKS.

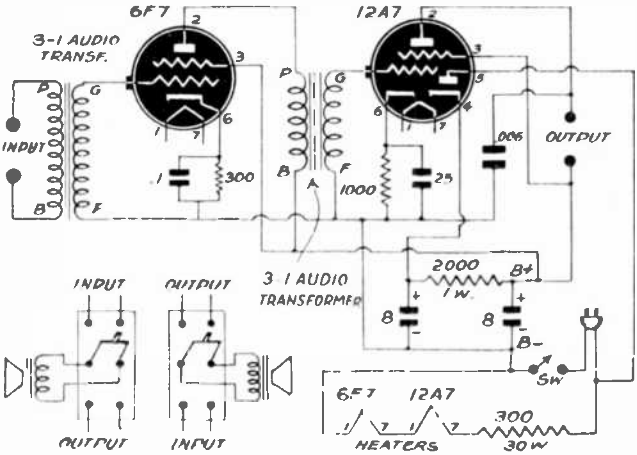


Fig. 709

R.F.-A.F. Generator

THE circuit illustrated in Fig. 710 has been used with very good results. The 6C5 is used as an a.f. oscillator and mixer. The r.f. oscillator is very stable and the frequency is not changed by switching the modulation on and off or by varying the output.

The coil L consists of 130 turns of No. 30 enameled wire, wound on a $1\frac{1}{2}$-inch form tapped 30 turns from the bottom of the coil. The audio choke may be anything on

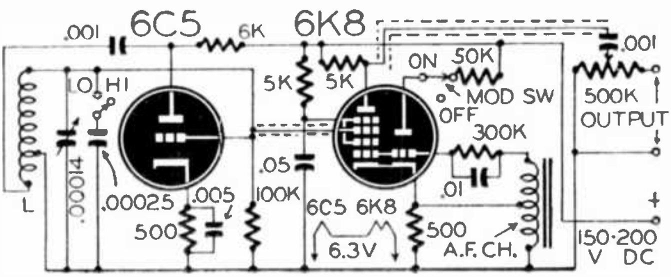


Fig. 710

hand; an audio transformer with the primary and secondary connected in series may be used. Any well-regulated power supply may be utilized. All grid and plate leads should be shielded. The set should be housed in a metal cabinet to prevent oscillation.

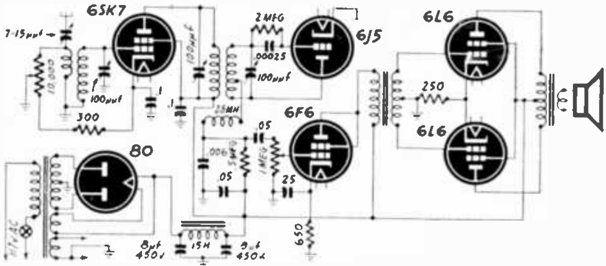


Fig. 711

The frequency range is from 750 to 1,350 kc and from 440 to 525 kc. —DALE COURTER.

Superregenerative Set

THIS set has picked up stations from all over the world.

The set itself is built in a metal cabinet and a 10-inch PM speaker is used.

The circuit (Fig. 711) is composed of an r.f. amplifier, superregenerative detector, a driver, and a push-pull output stage.

—FRANK CHIN.

Universal Antenna

THIS circuit contains practically all of the condensers and resistors that may be specified by set manufacturers, as dummy antennas for aligning their receivers (see Fig. 712).

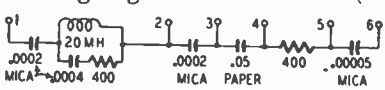


Fig. 712

The components are mounted in a 2 x 6 x 1½-inch metal box which provides sturdy connections and adequate shielding against radiation.

In use, the signal generator is connected to one side of the desired component and the receiver antenna post to the other. If the manufacturer of the set does not specify the type of dummy antenna to be used, the I.R.E. universal antenna may be used by connecting the signal generator to pin No. 1 and the set antenna to pin No. 2.

—RALPH J. WALSH.

Safety Power Supply

The filter constants will depend on the amount of filtering required.

In the circuit shown (Fig. 713),

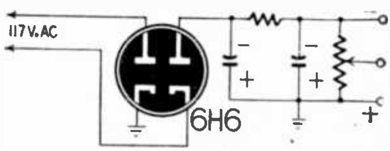


Fig. 713

the chassis is positive. The polarity may be reversed by reversing the connections to each diode section. Any double diode, such as a 25Z6, 50Y6, or 117Z6, may be used as long as the correct heater voltage is applied. The 6H6 may take its heater voltage from the 6.3-volt line of an amplifier or transmitter.

—JOHN A. DEWAR.

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