handy kinks & short cuts

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Handy Kinks and Short Cuts

preface

WHAT IS a kink? Webster defines it as "a clever method of doing something", which is a good definition—as far as it goes. An improvised neutralizing condenser or a novel method of volume control repair; these certainly are "clever methods of doing something" in the absence of standard parts. The typical radioman is a past master at this sort of thing; the popularity of the "Try This One" department of RADIO-CRAFT attests to this.

So many of the ideas in this department seemed worthwhile that we decided to publish a new edition of a pre-war best-seller, the RADIO-CRAFT kink book. As a result, the best of the last four years' "Try This One's" have been collected here. While the basis of selection was practicality, the material is sufficiently diversified to be of value to every radioman. Although some of the ideas may not be of direct use to the reader, they undoubtedly will serve as a starting point for the development of new ideas. If they accomplish this, they will have served their purpose.

Our thanks go to the many ingenious radio fans who made publication possible.

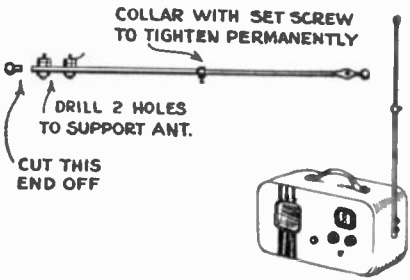
The book has been organized into several different categories for convenience of reference. As a further aid it has been indexed.

Section 1 . . .

ANTENNAS

Curtain-Rod Antenna

An ordinary curtain rod of the telescoping variety makes a neat antenna for a



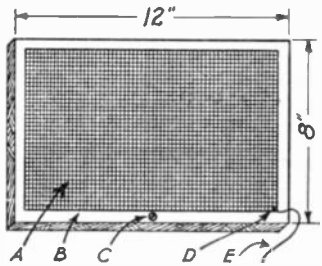
Curtain-rod antenna for portable set.

portable radio. I find that signals are considerably better with such an aerial.

One end is cut off and two holes drilled to take the machine screws that hold it to the side of the portable. A collar with a set screw is slipped over the inside rod, so that when it is tightened the antenna will remain extended in spite of any jars it may receive. Thus it can be used in a car, or even carried while the antenna is extended.—LOUIS JOLIVET.

Portable Antenna

Many people have asked me to install some form of "portable" aerial in their radios, as outside aerials are forbidden in some hotels. I obtained a sheet of copper mesh from a discarded screen door and cleaned this with a stiff wire brush. Then I cut it into pieces 11 x 7 inches. I then cut a number of plywood boards, ⅛ of an inch thick, into pieces 12 x 8 inches, and mounted each section of mesh to a board. The jagged ends of the mesh were covered by strips of plywood and a short piece of lead-in wire was soldered to one corner of the mesh. This goes to the aerial of the set. I also provided each aerial with a wood screw for mounting on window sills, backs of radios, etc. Cost per aerial is almost nil, and it works well.—GERALD SAMKOFSKY.



Portable antenna — A, copper screening. B, plywood strips. C, mounting screws. D, solder. E, lead to Ant. post.

Aerial Tuner

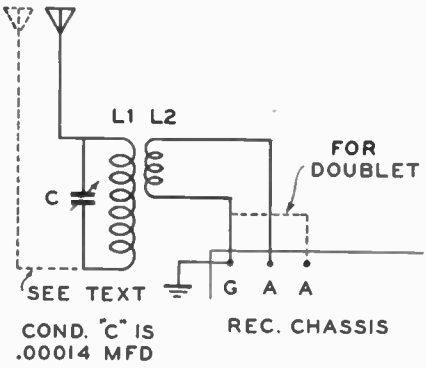
Here is an aerial tuning arrangement I have been using for some time and find is very good.

All the coils can be wound on 1¼-inch diameter forms, or the short-wave coils can be wound self-supporting as shown. Both work equally well. Be sure the link

coil is wound on the antenna end of the tuning coil. Do not ground antenna coil, but ground one side of the link coil as shown. Hook up as per dotted lines if doublet antenna is used and if receiver is provided with doublet terminals. In this case the link coil should be wound in the center of the tuning coil. Use a 140-$\mu\mu$f tuning condenser because it gives a greater inductance to capacity ratio.

A tapped coil and a four-gang switch could be used, but the individual coils give the best results.

I am using this arrangement on an all-wave superhet, with fine results. I have heard all continents and scores of amateurs located throughout the world. The length of the antenna and the lead-in is not critical. If the tuner should fail to resonate on any particular band, remove a few feet of wire from the antenna.—JOHN L. BOLLINGER.



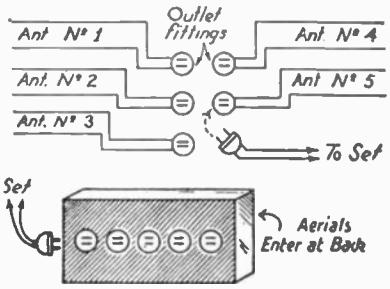
Tuning circuit adaptable to doublets.

Multi-Antenna System

As an ardent short-wave and DX fan, I need an elaborate antenna system for best results. Switching is a problem, and because "jack" is scarce, I used a little "skull drudgery" to work up this inexpensive "plug" system.

Five outlets were purchased and set up as in the diagram. The doublet lead to the set was equipped with an ordinary electric light plug. (No worry about losses on the low-voltage lead-in circuit.) One antenna was attached to each outlet.

All I have to do to change from one aerial to another is to shift the plug.

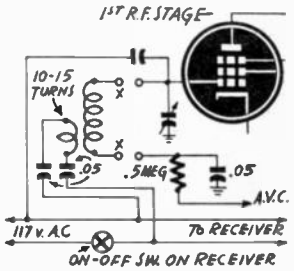


Plug-in switch for using different antennas.

It is a good idea to hook up one or two outlets as spares. The receptacles should be mounted in a box, for neat appearance and quick and easy changing.—BIAGIO TRIMBOLI.

Loop Substitute

When we moved into a building having a large quantity of steel in its construction, we found that loop reception on our radio was impossible. A novel scheme was tried to pick up signals on the short-wave and broadcast bands. The loop was disconnected and a regular antenna coil of 150 microhenries substituted instead at points X-X. Ten turns of No. 22 wire were wound at the ground end of the coil and connected as shown.

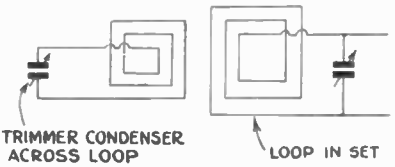


Antenna coil instead of "loop" improves reception.

The results were surprisingly good and in most instances, the signals received compared favorably with the regular loop formerly used.—BOB ESSEX.

Wave Traps and Cross-Talk

In some cases when cross-talk is bad, grounding the a.c. line at the set will clear the trouble. Use a 1-μf paper condenser in series with the ground line, and



Auxiliary tuned loop eliminates cross-talk.

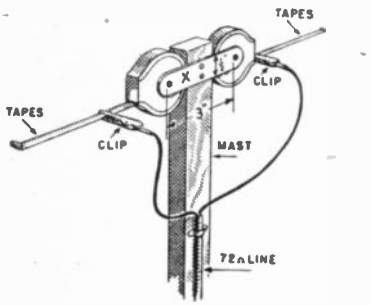
ground the *grounded side* of the line, as otherwise such a large condenser would cause complications.

With sets using loop antennas, cross-talk and station riding can often be reduced or completely eliminated by placing another loop—tuned to the frequency of the interfering station—adjacent to the set's loop.—Leo G. Sands.

V. H. F. Antenna

For use on 2½ meters, a novel antenna constructed from two steel tape rules of the self-supporting type makes a highly efficient system and is extremely portable.

The steel rules are drilled, tapped and bolted to a supporting strip of poly-

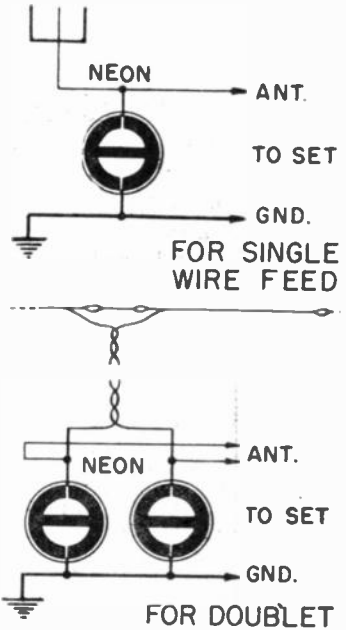


V.h.f. aerial made with steel tape rules.

styrene 4 x ½ x ¼ inches. The polystyrene strip is marked "X" in the diagram. Only one of these need be used. The center of the supporting insulator is fixed to the supporting mast. The aerial is fed by a 72-ohm line with alligator clips on its ends. By adjusting the clips and the length of the tapes, the aerial may be loaded to suit the frequency being used. —W. Duggan, Jr.

Lightning Arrestor

A very simple and inexpensive lightning arrestor can be made for less than a dollar. A one-watt neon lamp is simply connected between the aerial and a good



Neon lamps connected as lightning arrestors.

outside ground. It is necessary that the ground be in moist earth, although in an apartment good connection to a water-pipe will make an acceptable substitute.

Close observation during a storm shows that when a large charge accumulates on the antenna the excess is directed to ground. The bulb lights up at the same time.

In the case of a doublet antenna a neon bulb in each leg, as shown in the diagram, will solve the arrestor problem. —Biago J. Trimboli.

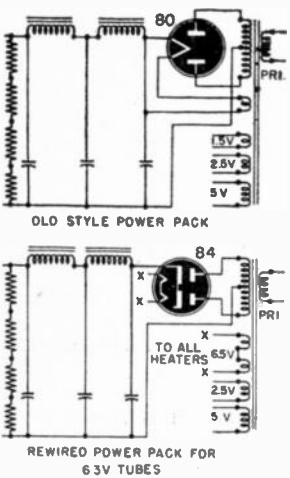
Section 2 . . .

POWER SUPPLIES

Power Packs Modernized

Most early all-electric receivers used separate power packs. Only a few changes need be made to apply them to up-to-date circuits using modern tubes.

The '80 socket can be replaced with a five-prong socket for a type '84. As shown



Rewiring power supply for 6.3 v tubes.

in the rewired diagram, the five-volt rectifier winding is connected in series-aiding (found by trial) with a 1.5-volt winding, the total being the heater supply of all 6.3-volt tubes including rectifier. (This is also an economical method of converting auto radios.)

The second filter choke can be replaced with a speaker field. If the old set had a dynamic speaker obtaining excitation from the power pack, the speaker can still be used. It usually will be necessary to discard the output transformer—usually wound for triode output tubes—and use one matched to the output tube desired and the voice-coil resistance of the speaker.

With low-voltage B eliminators, it is possible to connect a 3,000-ohm a.c.-d.c. type speaker field across the 90-volt output.

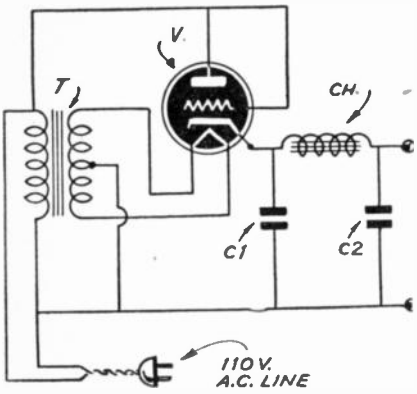
In converting auto sets, the voltage divider is left connected but its taps are disregarded. Thus only four connections between power supply and set are needed. By making common one side of the heater winding and B—, this is cut to three.

An old B eliminator can be used to restore operation of a.c.-d.c. sets when rectifier tubes are not available. This is especially true of 25Z5 or 25Z6 tubes which may have good heaters but open cathodes. Leave the tubes in the set to complete the heater circuit and connect the cathodes to the 90-volt tap. If the rectifier was used as a voltage-doubler use the 180-volt tap. If the tube heater is open, bridge the ends with a resistor of proper value, or simply short them, disconnect the heater series resistor and replace with a suitable lamp bulb.—E. E. YOUNGKIN.

B Power Supply Pack

In many cases a small power supply may be found useful on the service bench to test small receivers or adjust a speaker. The writer built a unit as shown in the diagram and found it especially useful for this purpose.

This pack can also be employed to energize a 2500-ohm dynamic speaker by omitting the choke and second capacitor.



Simple power supply for test bench.

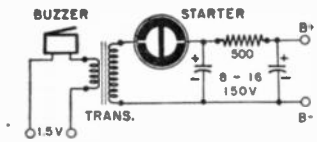
The output of the supply is about 100 volts with a current of between 12 to 30 ma.

T represents a 2.5-v transformer, V a '27 type tube, C1 and C2 4-μf capacitors, CH a 30-henry choke.—I. W. STUBBLEBINE *(From C-D Capacitor)*.

Starter Rectifier

I find that a fluorescent light (gas type) starter makes a good half-wave rectifier and works well with one and two tube receivers. Mine gives 95 volts at 25 ma.

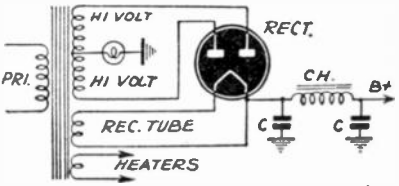
The transformer may be of the tube-to-speaker type. I used a model plane induction coil. The buzzer is of the 1.5-volt type.—RICHARD F. REED.



Fluorescent lamp starter used as rectifier.

A Pilot-Lamp Fuse

I put a .15-ampere pilot lamp in series with the high-voltage center-tap of the transformer in any experimental power packs I use.



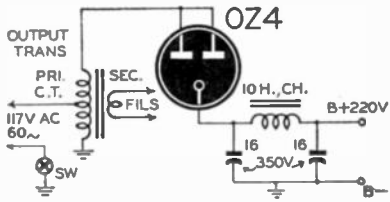
Pilot lamp fuse protects power pack.

With the 10-cent lamp in place, a short at any point in the circuit burns out the bulb and saves the transformer from harmful overload.—WILLIAM H. PORTER.

Novel Power Supply

A center-tapped output transformer may be adapted for service as a power transformer by using it in the manner described in the circuit.

The primary of the transformer is used as a center-tapped auto-transformer and the high-voltage output is fed to the plates of an OZ4. This tube was selected because it does not require cathode heating voltages. The filter section is the conventional "brute-force" type and with the values specified it is possible to get 220 volts d.c. from the output.

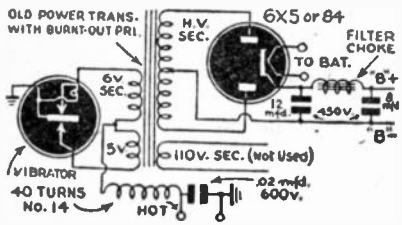


Center-tapped output transformer for power supply.

The turns ratio of some transformers is such that the voice coil will yield a usable voltage which may be applied to heat filaments. Using a heavy transformer designed to work into several output impedances, it may be possible to find some combination where standard filament voltages are available.—IRWIN STELZER.

Vibrator Supply

Following is a kink that I have found very handy as well as money-saving. It involves the use of the 6-volt and 5-volt windings of an ordinary power transformer as the primaries of a vibrator transformer in a 6-volt power supply.



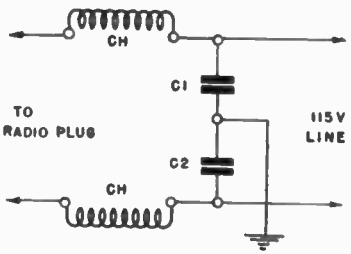
Improvised vibrator power supply.

Although some may shudder at the thought of using an unbalanced primary like this, a good hash suppression system such as the one in the diagram, together with a good filter, will iron out the hum, etc., introduced by the fluctuating voltages.

As it is a simple matter to pick up an old, supposedly no-good vibrator, and make it work, it is possible, with the aid of this kink, to build a first rate vibrator supply for practically nothing. — PAUL GREEN.

Efficient Line Filter

I have used the line filter illustrated with excellent results. The two chokes CH are 10 turns each of No. 14 enamel



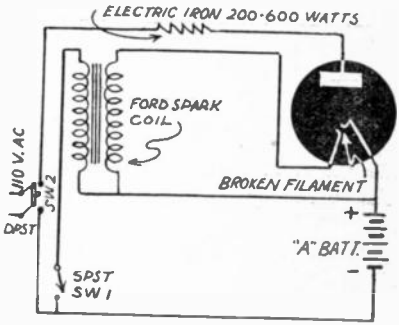
Simple line filter to eliminate noise.

wire wound on a form ½ inch in diameter. C1 and C2 are 0.1-μf condensers, 600-volt rating, of *good quality*. Sometimes the ground is necessary—often results are better without it.

A friend complained that the static in his office was so terrible that he couldn't pick up a strong local station. I gave him a filter and he reports that the noise has all disappeared.—LOUIS DE BOTLARI, JR.

Simple Battery Charger

By using the circuit illustrated, it is possible to assemble a battery charger at practically no cost. The rectifier may be a burned-out tungar-type tube which has been discarded. The only other apparatus which is necessary to purchase is a Ford spark coil (with vibrator). In place of a stepdown transformer to reduce the voltage of alternating current to the value required for charging a storage battery, an electric iron is connected in series with



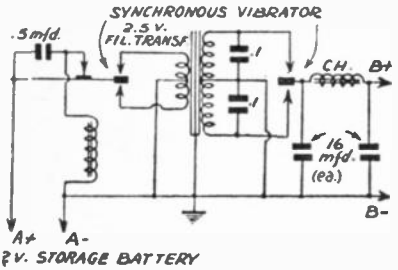
Charger from ignition coil and Tungar tube.

the 110-volt circuit (irons consuming between 200 and 600 watts). In wiring the charger, the primary winding of the spark coil is connected across the storage battery with a small switch in series. To place the charger in operation connect the 110-volt a.c. circuit by closing the switch No. 2. Next close the switch No. 1 until the high voltage from the spark coil causes an arc to bridge the break in the filament. Now the switch No. 1 may be opened.—ERNEST GAUDET.

2-Volt Power Pack

The transformer in this vibrator pack is an old 2.5-volt filament transformer,

with a few turns taken off the 2.5-volt winding to change the turns ratio of the secondary.



Power pack from vibrator and filament transformer.

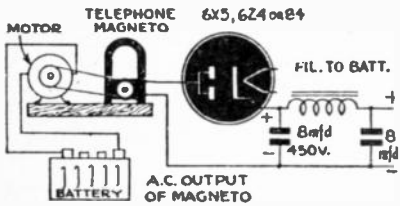
We use a 6-volt synchronous vibrator with approximately 2/3 of the winding removed for operation on 2 volts. It works very well.

Using the smallest parts obtainable, this can be made into a very compact unit.—EUGENE R. GUTCHMAN.

(The 0.1-μf condensers may have to be changed for other values, depending on the individual transformer and vibrator used. The correct capacity is that which gives least sparking at the vibrator points and lowest A battery current.—*Editor*)

Magneto Power Supply

The following diagram is of an emergency power supply, or it can be used for portable work. The power supply can be driven by a small motor powered by the battery from which tube filaments are lit. Voltage will depend on the speed at which the telephone magneto is driven.



Rectifier and filter for magneto power supply.

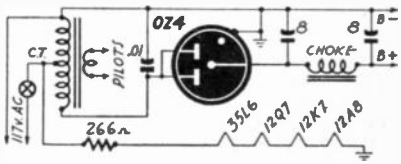
The rectifier tube is a 6X5, 6Z4 or 84, used as a half-wave rectifier.

Remove both large and small gears and obtain a pulley with a ¼-inch hole. Put it on the shaft for the small gear. The magneto can now easily be driven by a belt and motor.—RICHARD GRAHAM.

Power Supply

Having burned out a 50Z6 and having an OZ4 on the shelf, I devised this circuit using an ordinary output transformer of 8 watts rating. This put the small radio back in playing condition.

The advantage of such a circuit is that it doubles the voltage and in addition has a tap for the pilot lamp.

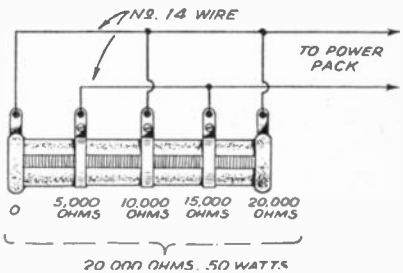


Substituting OZ4 for 50Z6 in power supply.

Care must be taken that a resistor of the proper value be placed in the filament circuit for the tube that has been removed.—WILBUR RATZLAFF.

Hi-Wattage Resistor

Needing a high-wattage bleeder for a C bias supply I took an ordinary 50-watt



Increasing wattage capacity of resistor.

bleeder with slider taps and arranged the taps at 5,000, 10,000 and 15,000 ohms with an ohmmeter. Then I connected No. 14 wire to the taps as shown. The original bleeder was 20,000 ohms. The two connecting wires were then taken off as shown. This arrangement makes a resistance of 1,250 ohms at 200 watts. —EARLE C. DRAESE.

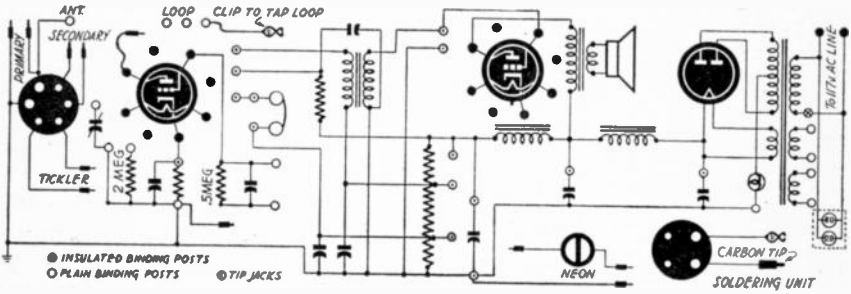
Section 3...

TEST EQUIPMENT

Experimental Kit

By combining on one chassis a power supply with a number of commonly used parts, a universal experimental unit results and an unlimited number of experiments may be made. "Variable" points of a number of fundamental circuits are brought out to tip jacks and binding posts. It also includes its own soldering iron and testing outfit! Since parts wear out more quickly from handling than from use, this unit conserves them.

The sketch shows the general idea. No dimensions or parts list are given since the experimenter will have some of his own ideas to add.



Layout with plug connections for making various tests—even a soldering iron is provided.

The writer prefers a chassis resembling an inverted table. The legs are cut long enough to clear everything mounted on top, so that the unit may be turned upside down or stood on end or side without danger of damage.

The soldering iron is made from a tube base (4 prong) with leads soldered to filament prongs. One lead terminates in a clip, the other in a metal tube which holds a flashlight cell carbon. To use, merely remove the rectifier (thus cutting off high voltage during soldering) and insert above tube base into socket.

The second filter choke can be disconnected and a speaker field plugged in. Also the filter condensers can be taken out of the circuit and used with test leads to check another set.

By suitable plug-in, phones or speaker may be used or the amplifier changed from resistance to transformer coupling.

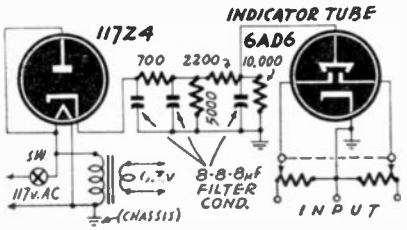
Leads from the plug-in coil socket permit hooking up a number of circuits. For audio, the 500,000-ohm resistor (in the

cathode circuit of one triode) is grounded directly. The condenser across it is .0005 μf. For use as a signal tracer or receiver, it is connected to the 2-megohm resistor.

Among uses of this unit are: r.f. amplifier, audio amplifier, r.f. oscillator, signal tracer and all-wave receiver.—E. E. YOUNGKIN.

Balance Checker

Although this gadget was meant only to compare push-pull audio stages, I find it useful for checking anything where a comparison method is desirable, including resistor or condenser measurements. The variable resistors must be of the same tapers — preferably linear — and mounted on a single shaft. Resistance is not critical — half-megohm or one-megohm units work equally well.



Comparison tester for resistors and condensers.

A 6AD6 electron-ray tube is used as the indicating device. Changes in the voltages applied to the control electrodes vary the amount of indication or balance. Essentially it is a balanced circuit. When a device is placed across one side of the input, the voltage to one of the control electrodes changes, causing a difference in the degree of "closing" (or shadow) on the "eye." If, for example, two resistors of equal value were placed across the input, with the common connected to ground, the shadows would be equal in size. If one of the resistors were twice the value of the other, the shadow of one side would be proportionately greater.

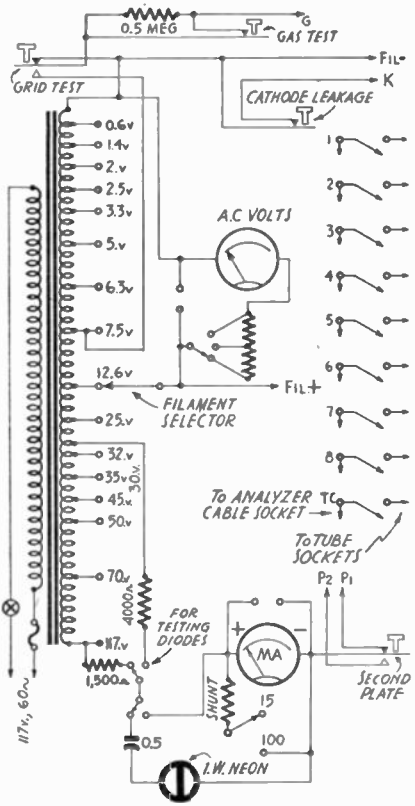
By adding an amplifier to each side (using a twin triode such as the 6SN7), its usefulness may be still further increased.—DALE COLLINS.

Tube Tester

This tester really does a good job. The transformer was built from a power transformer. The four test switches were made from Yaxley anticapacity switches. The filament selector is a non-shorting 17-point switch. Flexible leads and jumpers plug into jacks connected to the sockets.

For the grid test, contact is made either to 0 or 7.5 volts, the change being noted on the milliammeter. Opening the cathode return indicates whether appreciable leakage is present. For testing diodes I use the 30-volt tap with 4,000 ohms in series, a switch contacting either one diode plate or the other.

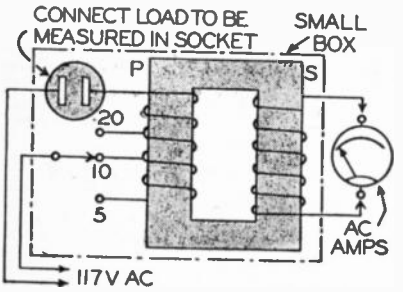
For protection I use a neon short-indicator.—CHARLES O. MAXIM.



Handy tube tester with special transformer built from a power transformer. Tests all tubes. Uses neon "short" indicator.

A. C. Meter Adapter

The serviceman who wishes to measure a.c. amperes occasionally but has no a.c. ammeter can build the gadget shown to be used in connection with an a.c. voltmeter. This one was made to be used



Using a transformer and an a.c. voltmeter to measure alternating current.

with a Triplett 400-ohm, moving-vane type meter, with a 10-volt scale. It was mounted in a small box with a panel about 4 x 6 inches.

The device consists of a current transformer made from an old output transformer, a fairly heavy tap-switch, a convenience outlet, a short cord equipped with phone tips, and a 3-foot cord with plug.

The voice-coil winding of an output transformer is removed and 15 turns of No. 12 wire is wound on in its place. This winding must be heavy enough to carry the maximum amperage to be measured.

I used another a.c. ammeter to calibrate mine and made the first tap on the winding where a five ampere load gave full-scale reading on the voltmeter. The second tap was made to give full-scale reading at ten amperes, and the third tap was made to give full-scale reading at twenty amperes.—E. C. WARREN.

Transformer Check

Connect a 15- or 20-watt 115-volt lamp in series with test leads and the line. If the transformer is good the lamp will light dimly on the primary and will not light at all on the high-voltage secondaries. It will light very brightly on the filament windings. Also test from each of the windings to the laminations to see that none are grounded. If the transformer is shorted the lamp will light up to full brightness on the primary.—H. G. QUADE.

Volt-Ohmmeter

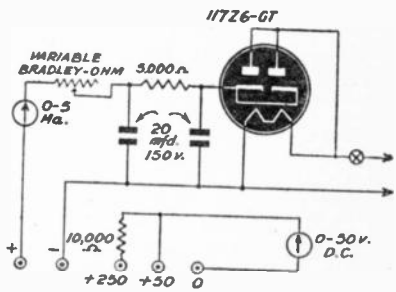
I needed a small tester for measuring volts and ohms.

Standard meters were unavailable at the moment, so a pair of small Readrite meters were used.

A small power supply using a 117Z6-GT half-wave rectifier was built to supply voltage for the ohmmeter. The power supply filter consisted of a 5,000-ohm, one-watt resistor and dual 20-μf electrolytic condensers.

One of the meters was an 0-5 ma. This was adjusted so that it could be brought to a zero reading (full-scale) by means of a variable Bradley-ohm of about 25,000 ohms' resistance. This was adjusted with a small pointer knob on top of front panel.

The small ohmmeter will measure only from 2,000 ohms to 1 megohm, though it could be bypassed with a shunt resistor for a lower ohm scale. The scale can be calibrated by using standard fixed resistors and then, if desired, marking with India ink, turning the old scale over or



Volt-ohmmeter power supply, using 117Z6-GT tube.

using a new one to mark on. Although the meter is cheap in construction, it worked well for this purpose.

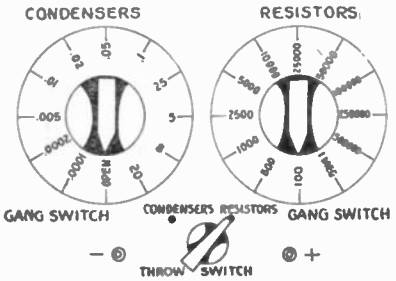
The small voltmeter is an 0-50 d.c. Readrite voltmeter. A 10,000-ohm, 1-watt

resistor increased the range to 250 volts. —Homer L. Davidson.

Substitution Box

This portable substitution box is very useful, especially in the field or in the laboratory for fast testing, or for ascertaining correct resistance and correct condensers.

This instrument is very fast, capable and correct.—Charles E. Lewis.

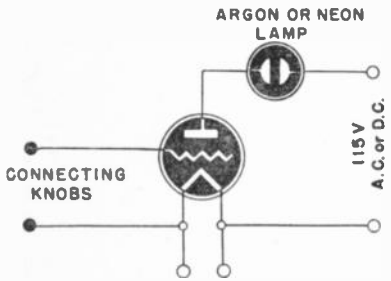


Capacity-resistor substitution box.

Voltage Detector

A schematic for a vacuum-tube electroscope is shown. This device is exceedingly sensitive and it may be used for detecting static and galvanic charges.

In determining the polarity of a static charge the electrified object is brought near the grid lead. If the charge is positive, the argon lamp brightens; if negative, it darkens. The polarity of a cell or battery may thus be found by connecting it in series with the connecting knobs and noting brightness of the lamp.



Sensitive detector of static charges.

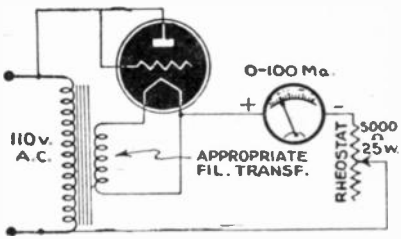
Many of the gold-leaf experiments work well with this device. Shielding the tube helps to improve its performance.—Avis Savatgy.

Transmitter Tube Checker

I have used this hook-up very successfully for testing the filament emission of 810's, though there is no reason it could not be used equally well with other types of transmitting tubes.

By using one or two brand new tubes as calibrators and setting the rheostat to read, say, 80 milliamperes a fairly accurate test of filament emission can be made.

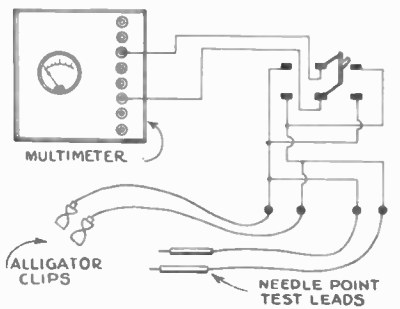
This tester has been very valuable in testing tubes which have been "rejuvenated" by running them at a slightly higher filament voltage and with no plate voltage, according to the maker's instructions.—J. G. Wilkinson.



Filament emission tester of simple design.

Reversing Switch

This is a sketch of a simple set-up for use with a standard test instrument. The idea is to give a quick reversing means to the test leads for the purpose of testing condensers. It also helps in testing d.c. voltages and, by means of the two pairs of

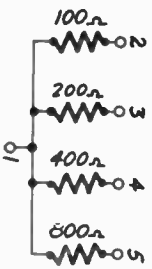


Quick reverser-switch for condenser tests.

leads connected at all times, gives a choice of needle-point leads or alligator clips.—James M. Maccowan.

Resistance Boards

I use 10-watt resistors for greater flexibility. Mount them on a board with five terminals and a jumper wire. I type a list of values and terminals on a 4 x 6" index card and mount it in a celluloid holder right on the board.



Useful resistance box.

The accompanying diagram is self-explanatory and a complete table of values is given for one of the boards. This "post-office" circuit gives numerous values.

For example—if 280 ohms are needed, connect one lead to terminal 3 and the other lead to terminals 2 and 4.

Value	*Terminals*
54 ohms	1 and 2345
57 "	1 " 234
61 "	1 " 235
66 "	1 " 23
73 "	1 " 245
80 "	1 " 24
88 "	1 " 25
100 "	1 " 2
114 "	1 " 345
133 "	1 " 34
160 "	1 " 35
200 "	1 " 3
214 "	2 " 345
233 "	2 " 34
260 "	2 " 35
273 "	3 " 245
280 "	3 " 24
288 "	3 " 25
300 "	2 " 3
366 "	2 " 45
400 "	1 " 4
461 "	4 " 235
466 "	4 " 23
488 "	4 " 25
500 "	2 " 4
560 "	4 " 35
600 "	3 " 4
800 "	1 " 5
857 "	5 " 234
866 "	5 " 23
880 "	5 " 24
900 "	2 " 5
933 "	5 " 34
1000 "	3 " 5
1200 "	4 " 5

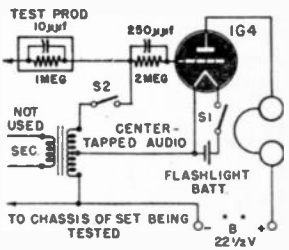
Right column of terminals means that those numbered terminals must all be tied together to form one lead. — Al Drain.

Phone Tips

Headphone cords and cords on test equipment have a bad habit of breaking off right at the shoulder, and usually do so just when you need them most. I solved the problem of eliminating that weak point simply by soldering another tip on the end of the existing tip. This removes the strain from the weak cord and places it on the strong phone tip. Formerly the cords on my test equipment broke every few months. Since using this double-tip idea, I have had the same cord set in constant use for nearly two years and not a break has occurred yet. — Joseph Amarose.

Signal Tracer

For servicing intermittent receivers this tracer is a great help. With S2 open, the prod touched at any r.f., i.f. or a.f. plate will determine conditions in that stage. Closing S2, the circuit becomes an a.f. oscillator to test audio stages.

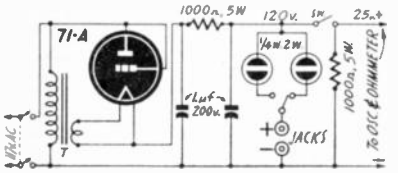


Signal tracer made from odd parts.

Since it works on batteries, it is portable and safe for use with a.c.-d.c. receivers.—R. Scott Herbert.

Power Unit

I devised this power unit to supply 22.5 volts for my combination oscillator-ohmmeter to replace batteries. The tester



22.5 v power unit for oscillator-ohmmeter.

is a model 1180 Triplett Perpetual Tester, but this unit may be adapted to any similar outfit.

Since it is to be housed in the battery compartment, I made the unit very compact. The condenser checker is an additional convenience taking advantage of the 120 volts d.c.

Transformer T is a small output transformer with voice coil rewound for 5-volt secondary. With SW open about 120 volts is available for testing condensers by means of the two neon lamps. The smaller lamp tests paper, the larger tests electrolytic condensers.

When SW is closed, a 1,000-ohm bleeder shunts the output which drops to about 25 volts. The high bleeder current (25 ma) stabilizes the output, since the meter current (.5 ma) is a small percentage of that through the bleeder. Ohmmeter readings will therefore be correct. Otherwise the voltage available would vary with each resistance being measured.

The d.p.s.t. line switch isolates the power line from the unit when it is not in use. This is necessary because the minus terminal is connected to one side of the line. When the combination meter is used as voltmeter or milliammeter, opening it prevents a short. — C. W. Battels.

Meter Box

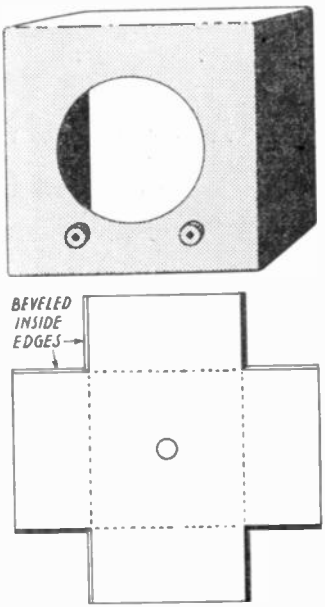
A very attractive and neat plastic meter case can be molded from old phonograph records. One must choose a large 12-inch record, preferably with cutting only on one side. This makes a much smoother face finish, although a two-sided disc will serve nicely.

The four sides are laid out upon the record with meter hole in center and marked with an awl or pencil. The latter must be held into the light while cutting since the pencil graphite will reflect upon the dark surface.

Placing the record over a hot flame, as of gas, will make it flimsy and soft. (Try boiling water.—*Editor*). The sides can then be cut with a straightedge and razor blade.

The record will become hard and brittle as it cools off and must be watched closely while bending. A straightedge will help to make square, sharp edges.

After the four sides are folded up tight, small pieces of record are placed inside the corners and heated with a hot, round object such as a rat-tail file to mold and bevel the corners. The outside corners may be beveled off with a fine



Meter box from phonograph records.

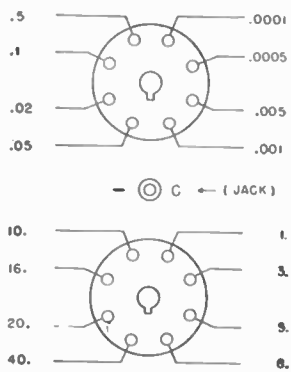
file after joints have been made and cooled.

The case can be finished with a glossy coat of varnish.—H. C. Davidson.

Decade Socket

Here is an idea I feel is worth passing along.

It is a decade box which needs no switches. I used two octal tube bases and



Two octal tube bases and a phone jack provide a handy decade box.

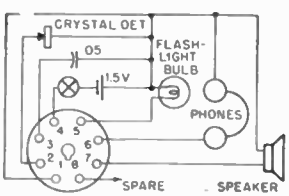
a phone jack. It permits the use of the test cords of some of your other test equipment.

The idea is explained in the drawing. Condensers of the values marked are, of course, wired between the correct socket prongs and the jack C (minus) terminal. As I used electrolytics for the bigger condensers, it is necessary to observe polarity.

Simply plug into the desired prong.—WILLIAM B. THORNE.

Handy Tester

This tester is made up of parts assembled on a bakelite panel, the numbered ends of each part being connected



Tube socket and test lead, with phone tip, provide flexible test set.

to the prongs of an octal socket. To make external connection, a phone tip end of a cord is inserted into the socket. The other end has a test prod.

USES

1 and 6. Test a.f. stages.

2 and 6. Test r.f. stages.

4 and 6. Test resistors.

4 and 5. Test condensers or wire connections.

4 and 1. Test dial bulbs.

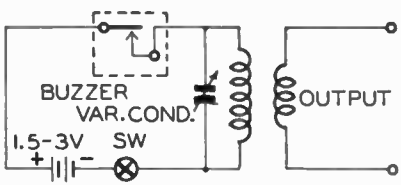
1 and 7. Use of test speaker.

1 and 5. Test filament wiring. First remove all tubes, then contact test prods to filament prongs of each tube. If bulb lights normally, tubes may be inserted.

I have found this instrument very useful in making quick tests. A great advantage is that there are no expensive meters to damage or burn out. — V. EDIGER.

Simple Test Oscillator

An old broadcast coil and condenser, an ordinary high-frequency buzzer and a battery and switch make a very practical test oscillator or signal generator for hunting trouble in sets, and even for alignment.



H.f. buzzer, plus b.c. coil=test oscillator.

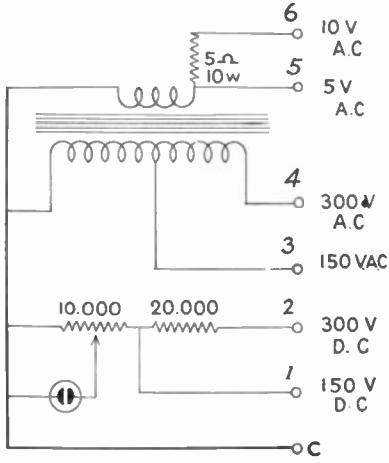
This type of generator was called a wavemeter in the old days, and though modern servicemen may find it a trifle broad for alignment, it used to be considered good enough for frequency calibration purposes. Sparking at the buzzer contacts produces a damped-wave signal which is tuned by the secondary of the coil and the variable condenser across it. The primary is used as an output coil. By using an i.f. transformer instead of a broadcast coil, intermediate frequencies can be produced.

One advantage of the broad tuning of this circuit is that it will put a signal

through sets so badly misaligned that an ordinary signal generator cannot get through.—HAROLD FREEMAN.

Neon Tester

The indicator is a ¼-watt neon bulb connected to a potentiometer so that the voltage can be adjusted till the bulb just



A.c. and d.c. voltage tests are quickly made with this neon tube and transformer set-up.

"strikes." This striking voltage is very constant, though it is different on a.c. and d.c. and calibration curves must be run for each, using known voltages. The tester has an a.c. range from 1 volt to 300, and a d.c. range from 75 to 300 volts. The ranges can be extended higher by the addition of a couple of resistors if the constructor so desires.

The main feature of the set is the transformer, which is an ordinary push-pull output type. Other parts needed are a 10,000-ohm wire-wound potentiometer, the neon bulb, several resistors for multipliers, several tip jacks, a pair of test leads and a jumper with phone tips on each end, and a dial plate and knob. The knob should have a long arm, as several scales must be drawn beneath it on the dial plate.

The method of using the tester is simple. For a.c. volts from 1 to 5, plug the leads in between C and 5 and jumper between 2 and 4. To measure to 10 volts and over, connect the leads between C and 6 and leave the jumper between 2 and 4. With most bulbs 25 volts will strike with leads between C and 3 and jumper between 4 and 2. From 100 to 150 volts leads are in C and 3 and jumper between 2 and 4. From 150 to 300 volts, leads in C and 4 and jumper between 1 and 3.

D.c. voltages are measured between C and 1 or 2. The jumper is not used.

The indication point is found by adjusting the potentiometer till the bulb just begins to glow.

In extending the lower ranges we made our resistors from nichrome wire. The higher a.c. ranges may also be obtained, but the multiplying resistor must be found by cut-and-try, as it depends on the characteristics of the output transformer used.—E. C. STOCKMAN.

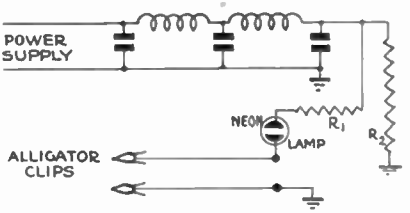
Handy Tester

Practically every experimenter has a power supply which he keeps in the workshop for testing receiver circuits, experimenting, etc. To increase the utility of this power supply, wire a small neon light in series with the 250-volt terminal and arrange a pair of alligator clips in series with the neon lamp and the power supply.

This makes an admirable condenser tester, and an equally good continuity tester, because it is extremely sensitive.

Use a ¼-watt neon lamp and a 60,000-watt resistor (R1) for protection against short circuits; R2 is the bleeder resistor of the power pack.

A good condenser, when connected in the circuit, will cause the glow lamp to



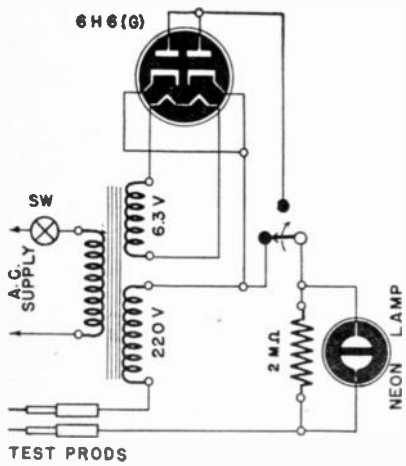
Condenser and continuity tester of simple construction, using neon lamp and resistor.

flash once. A leaky condenser will cause it to flash intermittently. An open con-

denser will cause no flash.—MATTHEW MASTERS.

Condenser Tester

Electrolytics are tested on d.c. by proper switching. By using a.c. (on other



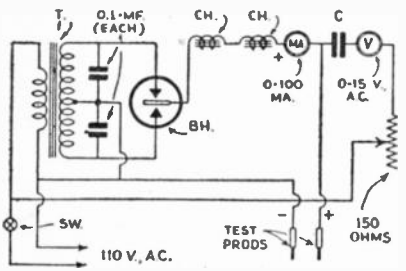
Condensers, including electrolytics, may be tested on a.c. or d.c. with this rig.

types) it is possible to estimate condenser capacitance by noting the brightness of the neon glow. The greater the capacitance, the greater the glow.

Open condensers show no light. Intermittent ones give an intermittent glow. —E. MENZEL.

Electrolytic Tester

This tester will measure the capacity of a condenser and at the same time



Capacity and leakage tester for condenser.

measure its leakage. To measure the capacity we must use alternating current, and as we cannot use a.c. alone on an electrolytic condenser a rectifier is employed (a B eliminator will do as a substitute) as shown. The voltmeter measures the capacity by calibrating the scale against known condensers and the leakage should not be more than 1 ma per μf.—E. A. REDMON.

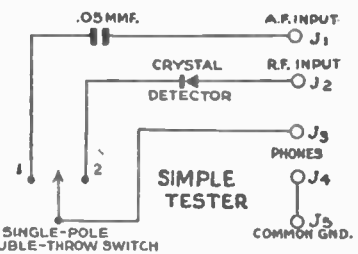
Set Tester

This diagram of a very simple set tester should be of interest to every beginner.

This tester in conjunction with a voltmeter makes servicing a very easy job.

With the tester radio troubles can be found and the defective stage isolated within a very short time.

As shown in the diagram it is made up of a fixed crystal detector, an .05-μf condenser, tip jacks, test prods, and headphones; all mounted on a bakelite panel 5 by 11 inches with a voltmeter and a milliammeter.—EDGAR BOLES.



Flexible set tester for use with voltmeter.

Multimeter Accessory

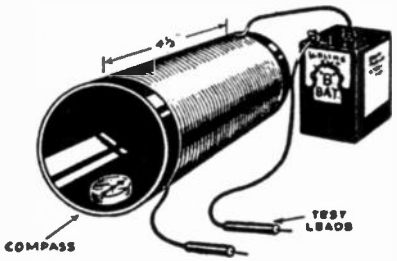
One of our handiest gadgets is a 16-μf, 450-volt electrolytic condenser mounted in each of our multimeters, with the negative lead connected to the negative pin jack, and the positive lead to the positive pin jack, through a toggle switch. When checking voltages, a snap of the switch throws in a condenser which is known to be good, and any increase in voltage reading is clear indication of an open or partly open filter. Since the charge quickly leaks off through the meter, this eliminates the annoyance of accidentally coming in contact with a "hot" condenser.—ARTHUR S. SIMON.

Section 4 . . .

SERVICING

Circuit Tester

A very handy circuit tester can be constructed at small cost. The tester is very good in tracing leads in various circuits and comes in handy when checking transformers, chokes and even condensers.



Circuit tester from coil and magnetic compass.

The circuit consists of a coil of wire wound on a cardboard tube. Approximately 100 turns should be plenty. A cheap compass inside the coil will be the indicator.

A test lead is connected to one end of the coil and two dry cells of the flashlight type are connected between the other test lead and the coil.—ERRA P. DAWSON.

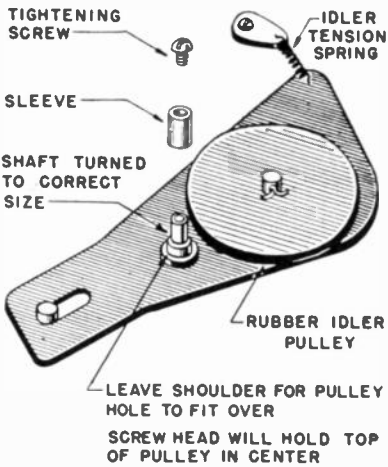
Condenser Shorts

In order to save time and work unsoldering capacitors, a shorted capacitor can be easily determined by using an ohmmeter range that is less than the resistance of the shunt. A 0-10-ohm range will show infinite resistance for good capacitors and zero resistance for shorted capacitors because the shunt resistors have a resistance of more than 10 ohms d.c. —R. M. HUGHES, (*From C-D Capacitor*)

Dual-Speed Phono Unit

The popular General Industries single-speed unit may be easily and quickly converted so that it will also run at 33⅓ r.p.m. as well as 78 r.p.m.

First remove turntable (held by a set screw) and the movable drive wheel assembly. Turning on the motor, file down the shaft so that it is reduced to half of the original pulley diameter. Leave an



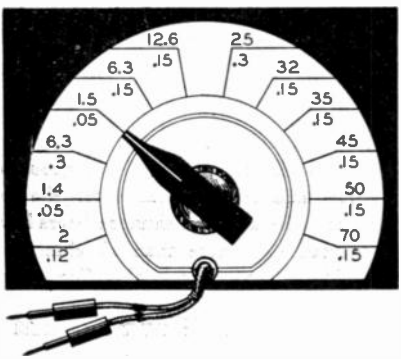
How to change speed of phono turntable.

⅛-inch shoulder for the pulley to rest on when the 78 r.p.m. speed is desired (see illustration). Adjustment of the spring tension will probably be required.

Change from one speed to another simply by removing or replacing the sleeve.—W. V. DRINKARD, S. O. WEISS.

Burn-Out Locator

Here is a simple method of locating burned-out filaments in an a.c.-d.c. receiver.



Resistance substitution box locates open filaments.

I took a 500-ohm wire-wound volume control and used an ohmmeter to mark off resistances equal to the resistance of the various types of tubes. Two flexible leads were fitted with phone tips and connected to the control.

When trying to locate a burned-out filament in a series circuit, a tube is removed from its socket and the tester tips inserted in the filament holes of the socket. The dial of the locator is then turned to the proper resistance. If the remaining tubes heat up, the tube that you have removed is the bad one. — WRAY WYCHOFF.

Slipping Dials

In the majority of sets manufactured during the past ten years, the method of moving a dial pointer in step with the tuning condenser has invariably been by means of a dial cord or cable.

Eventually the cord loosens or expands sufficiently so that the condenser moves but not the pointer.

Here is a remedy for that condition. Prepare a solution of gasoline and resin. Brush this on the cord, revolving the dial as you do so. The gasoline will evaporate and leave the resin in the cable, which in average cases is sufficiently frictional to do the trick.—ANDY R. HARCAR, JR.

(Transformer oil and resin has also been used with excellent effect.—*Editor*)

Buzz Cure

After replacing a power transformer in a console type receiver, I noticed a buzzing sound that was audible above the signal when the volume was turned low.

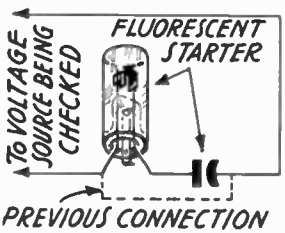
Wedging the coils on the transformer core was tried without success. I found that thin service cement applied to the edges of the windings and the core laminations produced a positive cure. — CLAUDE M. PREW.

Test Light

Here is a test light made from an old fluorescent starter.

The starters have a condenser in them which is connected originally as shown by the dotted line. Disconnect it on one side and wire it in series with the starter as shown. This prevents the starter from getting enough voltage to close its contacts.—HARRY KROUT.

(If a condenser is used, the tester will be useful on a.c. only—unless the condenser is very leaky. A resistor in series, large enough to keep current down to a milliampere or two, will be effective on



Fluorescent lamp starter as voltage tester.

either a.c. or d.c. It will also be found that some starters flash at a much lower voltage than others. Select the most sensitive one available.—*Editor*)

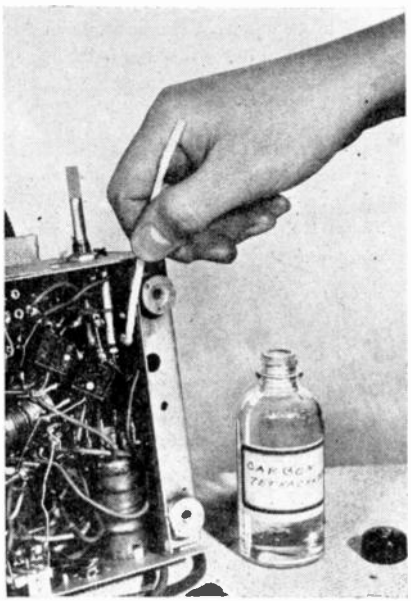
Dial Cords

Dial cords are often hard to replace on receivers that use a number of pulleys placed in almost inaccessible positions. The method described may be used for a quick and accurate replacement.

Attach two pieces of cord to the proper places on the dial drum. Thread the free ends around the pulleys and bring them out to a point where they may be tied with a square knot. Saturate the knot with coil dope or Duco cement and clip the ends.—Otto Woolley.

Noise Eliminator

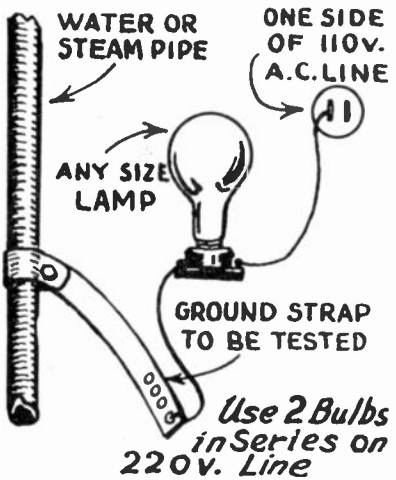
A bottle of carbon tetrachloride on the service bench may prove useful in locating the source of intermittent noises in many radios. Many erratic noises are caused by dirty or corroded movable contacts on tone controls, band switches and tuning condensers. In most cases, noises from these sources may be eliminated by cleaning all switch points and movable contacts with a liberal application of "carbon tet." A pipe cleaner makes a good applicator for the cleaning solution as it may be bent so that it will reach into any narrow or crowded space. — H. Leeper.



Pipe cleaner applicator for cleaning solution.

Test For Ground

By using one side of the a.c. line as one terminal and the ground clamp or strap to be tested as the other, one can determine whether the ground connection is good or not.



Simple ground test, using light bulb.

If the bulb flickers and is not steady, the ground connection is poor, but if it burns brightly, (as it should), the ground connection is OK.

If one side of the a.c. line does not light the lamp at all, try the other one. —Jerome Mulberg.

Tube Isolation

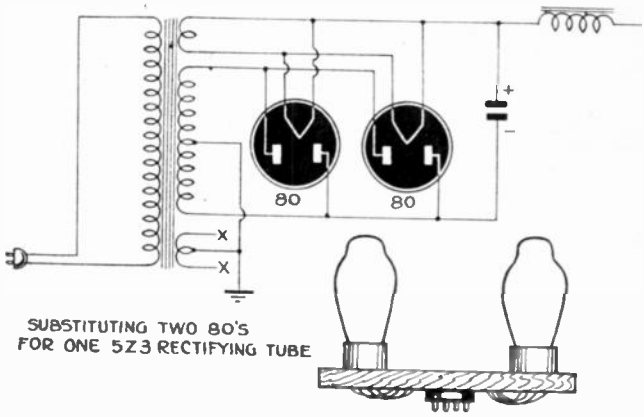
If you ever have occasion to "isolate" a tube to keep the other tubes in operation while servicing a receiver wired in series, here is a real help.

I use an old base from a discarded tube as an adapter and connect *filament leads only* to an external socket. The tube in question is plugged into the socket.

This is far superior to using resistors or bulbs which do not always maintain the original filament current in the remaining tubes.—K. Bradley.

Two 80's For One 5Z3

I have a 6L6 amplifier with a 5Z3 rectifier tube which burned out. I could not get a new 5Z3.



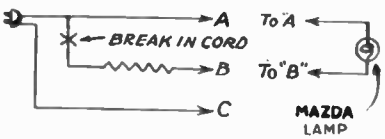
Using two 80's as a substitute for a 5Z3 rectifier.

I find that two 80's in parallel will work just as well, and without heating the plates.

I did not want to change the wiring of the amplifier, so made a small strip of bakelite with one tube base on the bottom and two sockets in parallel on the top.—STANLEY BOWERS.

Line-Cord Repair

If a line-cord resistor has a break in it (as at X for example) a simple temporary repair can be effected by running a lead from the terminal at which "A" connects to the set, to an ordinary incandescent light socket and then connecting the other terminal of the socket to the terminal at which "B" is connected. Use a lamp in the socket which will have the same resistance (approximately) that the line cord had originally. Special cases may require special combinations of series or parallel arrangements to get the correct resistance.



Lamp shunt cures "open" cord trouble.

I used a 25-watt, 115-volt Mazda lamp as a temporary repair for an RCA Model 25BP. This is a three-way portable and originally used resistance of 545 ohms for a voltage drop of approximately 79 volts at .15 amp. The resistance of the 25-watt lamp is approximately 530 ohms which is close enough to be used satisfactorily. The lamp can be mounted in any convenient place, preferably exposed to the open air.—HARRY A. FREIBERGER.

Grid Cap Repair

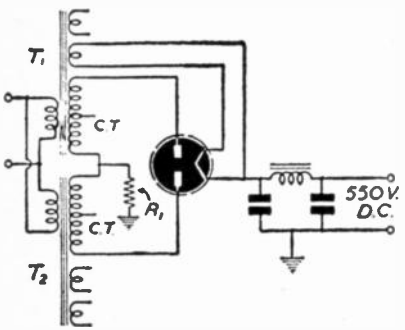
When the grid cap of the tube comes off, it can be repaired in the following manner: Hold the cap in a pair of pliers. Clean the inside out and melt the old solder out of the hole in the top. Wind a piece of wire around the stub of the wire coming from the top of the tube. Push this through the hole left by the melted solder. Place a small lump of plastic wood inside the cap and press the cap down on the top of the tube. After the plastic wood is dry, cut the end of the wire off and solder it to the cap. Clean off the excess plastic wood, and the job is finished, putting a useless tube back into action.—DAVID KALLANDER.

(The usual stunt is to use Duco cement instead of plastic wood.—*Editor*)

Servicing Hint

Some circuits using direct-coupled or Class-B audio systems call for a power supply furnishing a higher-than-normal voltage to the tube plates. When the power transformer on such a job fails, and a replacement can not be found, secondaries of two universal power transformers may be hooked in series to supply the needed voltage.

If the resultant voltage is too high, it may be reduced by increasing the size of R_1, which is shown in the diagram as a 10-watt resistor of 150 ohms to supply approximately 550 volts d.c. (this however varies greatly with the load current and can be best determined by experiment).



Secondaries in series provide high voltage.

In paralleling the two primaries, care must be taken to observe polarity. Otherwise, the secondaries of the two transformers T1 and T2 will actually be in parallel, resulting in half-wave rectification.—Paul B. Falk.

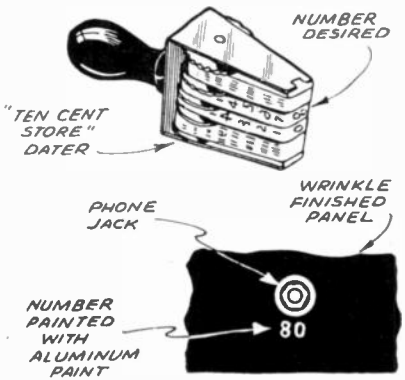
Faded Tube Numbers

The tube type number is often printed on the side of the glass type tubes and through frequent handling, the number soon becomes unreadable.

I overcome the handicap by dipping the glass portion of the tube in ammonia and allowing it to dry. The numbers then stand out clearly. Powdered ammonia may also be used by spreading it on the surface of the tube and then dipping into warm water and allowing it to dry. — John B. Rolls.

To Renew Lettering

To reprint numbers I purchased in a 5-10 cent store a dater (see sketch) which stamps the month, day, and year.



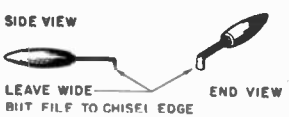
Date stamp, plus paint, restores dial numbers.

I used the numbers of the days to reprint the numbers on the selector switch. Aluminum paint works better than ink or enamels to print with. For numbers such as 300, 140, etc., where three digits are needed, the final zero was made by changing the dater around to utilize the "O" of "Oct." MA, D.C., A.C. and other signs can also be printed with a little ingenuity by the user. If larger words or numbers are wanted get a small set of rubber type, with holder.—Robert Lindberg.

Tube Puller

This puller may be used for tubes or vibrators which become stuck in their sockets. It is made from the handle of an old pancake turner.

The end is turned, filed flat and pointed as shown, so it will work under the base. This saves tubes which become loose in their bases. After removal they may be

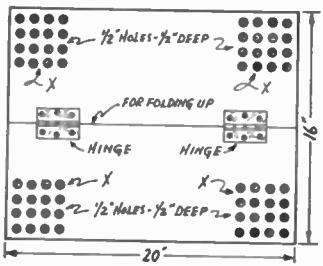


Pancake turner becomes tube puller.

cemented by running coil cement or thin Duco between glass and base.—Edwin Cooper.

Handy Tube Rack

The rack is made of ¾-inch hard wood, 8 inches wide. Felt can be glued to the bottom of the rack so that it may be placed on top of a radio cabinet while servicing the phonograph. This can be

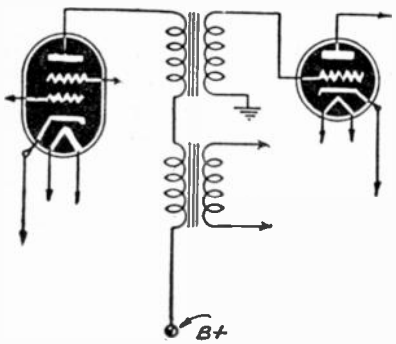


Folding tube rack with hinged panels.

folded up when not in use and can be carried about in your service kit for use when needed.—RALPH BLOOM.

Matching Trick

When using a tube with a high plate resistance, it is not satisfactory to use an audio transformer, and resistance coupling means higher voltages. I use the



Primary of one audio transformer and secondary of another, series connected, match high plate resistance.

primary of one audio transformer and the secondary of another in series.—W. D. LYONS.

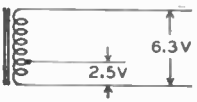
Mounting Speaker Cones

One of the greatest difficulties many servicemen experience when reassembling a speaker is in holding the outside rim of a cone in place on the speaker frame while the cement is drying. The method employed at our shop never fails to line up the cone perfectly.

After shims are placed on pole pieces of the speaker, the cone is lined up around the outer rim of the cone and cement applied on the speaker frame. The rim of the cone is then pressed in place carefully and held with several spring-type wood clothes pins. For small cones six or eight pins are required. but for larger cones 10 or 12 are required to do a good job.—TONY ZACCONE *(From C-D Capacitor)*.

Replacement

Many times in the past we have been obliged to replace one tube with another of different heater voltage, such as a 2A5 with a 42. To supply this tube with the required filament voltage we constructed an auto-transformer, using the iron core of a small output transformer. The first 48 turns are fed from the 2.5 volts supplied by the filament winding of the set and the total of 122 turns furnishes the 6.3 volts required by the 42. It is, of course, understood that this may be reversed so that a 6.3-volt filament supply can be used to operate a 2.5-volt tube.—P. LIVADAS.



Odd voltage supply.

Slide Rule Kink

While using my slide rule I chanced upon the idea for converting frequency to wavelength and vice versa. The C_1 and D scales are used, the marker "1" of the C_1 scale being put over the "3" on D. The product of C_1 by its corresponding D value will then always be 3.

Since the product of kilocycles and meters is always 300,000, one may be converted to the other by simply noting decimal point. For example, if we treat the "1" on C_1 as 1000 kc, the corresponding D reading "3" really means 300 meters, and so on for all other readings along the scale.—BILLY MITCHELL.

Replacement For Push-Pull

We fellows who "keep them playing" in little rural towns, where spare parts are only available from our stock, sometimes meet the following problems of burned-out primary in an audio-push-pull coupling transformer. You look through your stock and won't find a spare. Of course there is the solution of figuring out a combination of resistances or resistors that probably won't work satisfactorily.

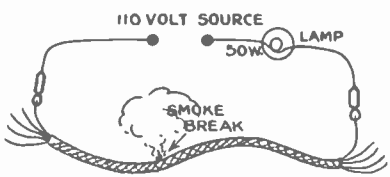
I've done as follows with excellent results, and three sets that I've "kept on playing" are now working with a transformer picked out from the unforgettable junk box. The transformer to substitute was a push-pull audio coupler (two leads from the primary and three from the secondary) with (as usual) the primary burned out. I found a 3 to 1 transformer (two leads for the primary and two to the secondary). I just soldered the leads of the secondary over the outer leads of the affected one.

The sets have only lost about 10 percent of volume and, as the owners say: "They are working *muy bien* (very well)."—GILBERTO GARZA G.

Locating Break

Here is one method of finding an "open" wire in cloth-covered cables. Connect a 110-volt lamp of 50 watts or more to each end of the suspected wire.

Twist and pull on cable until position is found where lamp can be flashed rapidly, causing an arc at the break. The ensuing smoke will locate the exact spot.

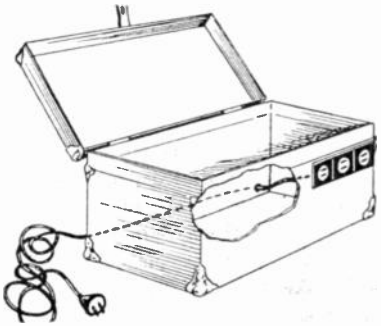


Smoke indicates location of "open" in cord.

Open the covering with a razor blade, repair, and tape up with cotton or linen tape, which makes a neat flexible job and can be colored to match.—E. L. RUSSELL.

Outlets In Radio Tool Box

This kink came about as a result of difficulties when trying to keep a soldering iron, tube tester and the customer's radio all plugged into different outlets in



Multiple outlets on tool box permit plugging in radio set, soldering iron and tester at same time.

widely separated parts of a large room. The confusion nearly resulted in an accident to the customer's set and made me look very foolish.

The first thing I did was to buy a forty-foot extension cord and three flat outlets. Then I fastened the outlets to the box as shown in the illustration, drilled a hole in the back lower corner and led out the end of the extension that was to go to the wall outlet. Now I have a triple outlet without any more trouble than plugging in a soldering iron, and the cord is long enough so that I don't have to go crawling behind furniture or under sofas to plug in.—JOHN GLENNEY.

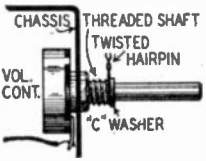
Tube Repairs

Glass tubes frequently come loose from their base. An attempt to use the tubes in this condition will often result in breakage or short-circuiting the leads.

Simply wrap two or three turns of ½-inch Scotch tape around the tube at the junction of the base and the bulb. If the tube is handled carefully, the joint will be firm for the rest of its life.—OTTO WOOLLEY.

Volume Control Repair

Here is one of my favorite kinks for repairing noisy volume controls. It is unnecessary to remove the control from its circuit.



Repairing noisy volume control with hairpin.

Remove the chassis from the cabinet and place a small hairpin between the C washer and the threaded bushing. A few twists on the hairpin with a pair of pliers will hold the pin in place. This will make a tighter fit between the rotating arm and the carbon strip.—SAUL KIRSHNER.

Condenser Calibrator

With a few alterations, a signal generator may be used to calibrate condensers whose value is unknown.

Leads are brought from the ground and grid ends of the broadcast coil of the signal generator and connected to binding posts that are mounted in a convenient place on the panel.

Condensers are calibrated by tuning the generator to the low-frequency end of the broadcast band. This signal is tuned in on a nearby broadcast receiver. Condensers of known value are connected across the binding posts. Tune the frequency control of the generator until the signal is again heard on the receiver. The frequency difference between the two settings of the tuning dial is noted along with the value of the condenser being used.

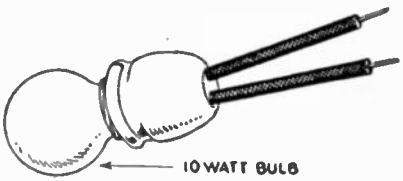
Condensers from 10 to 250 $\mu\mu f$ may be calibrated by this method.—AUGUSTINE MAYER.

Shield Cans

If you ever need a shield for a small tube, perhaps this will be the solution. I hit upon the idea of using the zinc can of a dead dry-cell flashlight battery from which I removed the electrolyte and carbon. I found that it fitted snugly over the tube which I was using. — FRED W. SPARKS.

Open Filament Checker

A frequent cause of failure in a.c.-d.c. radios is the breakdown of tube filaments. I find the little gadget pictured here very useful. It is simply a lamp socket with wire attached and a small 10-watt bulb. (A 25-watt bulb may be used on sets drawing 0.3 ampere.)

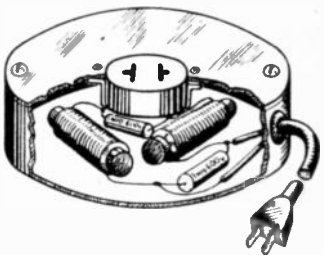


Lamp substituted for tube locates "opens".

Run a bit of solder on the wire ends to stiffen them, then turn on the set to be tested, remove one tube at a time and insert the ends of the wires in the filament holes. When the defective bulb is removed and the wires inserted, the set will light up.—ARTHUR CREAMER.

Noise Filter

I recently installed a radio in a large apartment house. However, the line noise almost drowned out the stations. Not having a suitable filter handy, I put one together in a regular outlet box, using a standard circuit.

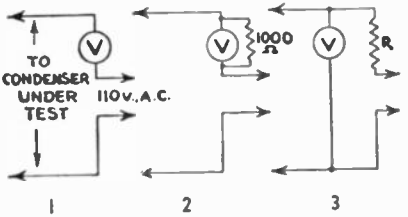


Noise filter built into outlet box.

The chokes are wound on dowels, 100 turns of No. 18 wire. The condensers are 1 μf at 600 volts.—GERALD SAMOFSKY.

A Capacity Meter

I believe the simplest way for determining the capacity of condensers is to use a 1,000-ohm-per-volt rectifier-type a.c. voltmeter in series with a condenser across the 110-volt a.c. line, as illustrated in the diagram.



Determining condenser capacity with a.c. voltmeter.

Though this system is not as accurate as the a.c. bridge, approximate capacities can be identified with more than enough accuracy for radio service work. The meter dial can be calibrated by using condensers of known capacity.

Capacities from .001 μf to 0.1 μf can be found with Circuit 1, and capacities from 0.1 μf to 10 μf with Circuit 2. Use Circuit 3 for condensers of larger capacity.—ALEX SEBESTYEN, JR.

Dial Cord Repair

It often becomes necessary to repair dial cords on late model radios. When these cords break, the common practice is to tie them together. When they just "break down"—that is, when they fail to turn the dial drum or pointer, the serviceman usually applies a bit of rosin solution or something similar. A solution is not always handy nor is it always effective. Probably the simplest method of repair in such cases is to apply a strip of Scotch tape under the cord. Even a short strip will increase the diameter of the pulley enough to stop the slipping in the most severe cases.—RICHARD R. KENYON.

Loctal Plugs

Servicemen and experimenters have been making plugs from tube bases for years, but when it comes to loctal tubes it is another story.

Take a three-cornered file and make a scratch all the way around the glass at the top of the metal band. About the second time around the glass will part. Cut off the tube elements and brighten the tops of the pins. (A small flat ignition file is best for this.) Leads can then be soldered to the pins after forming small loops to fit them.—E. E. YOUNGKIN.

Quick Set Conversion

I have seen several extensive explanations on how to convert an auto radio for home use.

The simplest method used a 115-volt to 6-volt transformer. Using this system, I converted a set for home use in 20 minutes with only a toy train transformer.

First I removed the vibrator and inserted a wire jumper to supply 6 volts a.c. to the primary of the set's power transformer. Then I hooked up the 6-volt tap from the train transformer to the regular A lead and shield or ground.

The radio can be used again on 6 volts d.c. by merely taking out the jumper, putting the vibrator back in and disconnecting the train transformer. Try it! —NORTON E. FAUTZ.

Coded Test Prods

I have found that it is possible to make test prods from auto inner tube valve stems and caps.

The valve stem is cut off close to the tube and the needle removed. A nail or long tack is driven through the valve cap with a small portion of its head protruding. A piece of insulated wire is passed through the stem and wrapped around the head of the nail. The cap is then screwed on the stem.

Test prod from tire tube valve stem.

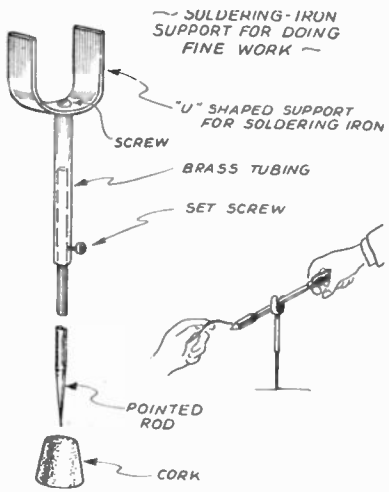
By selecting valve stems from red and black tubes, I have a pair of shock-proof, color-coded, solderless test prods.—A. C. FROHNOPFEL.

Section 5 . . .

In The Shop

Soldering Iron Support

I found it difficult to do fine soldering with an iron without my hand shaking. As a result I designed the support shown in the sketch. It can be adjusted to any



Soldering iron support for fine work.

reasonable height and supports the weight of the soldering iron so any shakiness of the hand will not destroy the efficiency of the job. A pointed end prevents it slipping on wood surfaces while a small cork acts as a non-scarring foot on glass or finely finished surfaces.

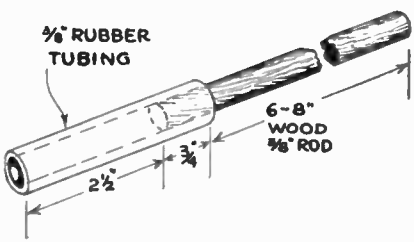
A yoke of stiff metal was fashioned as a cradle for the copper itself. A small hole was drilled in the center of the bottom. Then a short length of brass tubing was threaded in one end for a screw. The screw passed down through the hole in the yoke and thus secured the tube solidly to it below. A threaded hole and set screw were fastened in the side of the tube near the bottom. Then a steel rod, pointed at one end, was slid into the bottom of the tube as shown.

It is only necessary to adjust the height of the supporting column by adjustment of the sliding rod. Then stand the support on the working base and rest the copper in the yoke.—L. B. Robbins.

Pilot Lamp Remover

Here is a pilot lamp remover which I believe to be superior.

The rubber tubing takes a better grip on the lamp. It also has the advantage of



Pilot lamp remover.

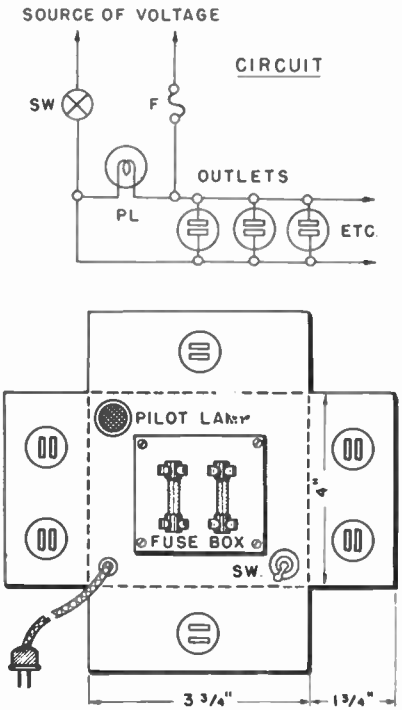
flexibility—can bend to get into some of the tight places into which they put pilot lamps.—William Porter.

Protection Box

This is a fuse or protection box which we have found very handy for providing multiple outlets when a bench may have to be used as a service bench, then cleared off for a workbench, making it impractical to effect a permanent layout.

With this kink, we have six outlets at our fingertips. The fuse protects the line fuses, eliminating the necessity of leaving your work to change fuses.

The pilot light gives instant notice of the blowing of a fuse, and should be a small 110-volt bulb. Dimensions of our



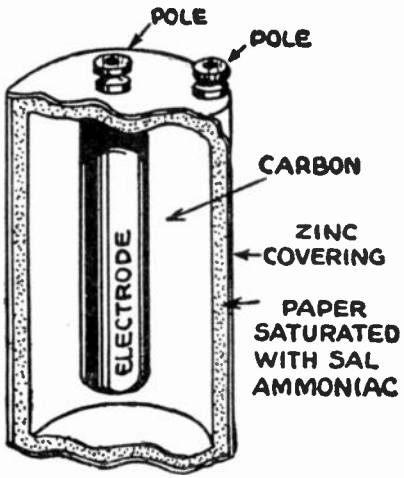
Pilot lamp and fuse for "test" outlets.

box are given, but the size can readily be varied to accommodate parts at hand. —RENE RAMIREZ.

Tinning Soldering Irons

Amateurs or experimenters are often confronted with a deteriorated soldering iron and no sal ammoniac at hand.

All you have to do is to secure one or two 1.5-volt dry cells, large size (see drawing).



Sal ammoniac for tinning soldering irons is obtainable from old dry cells.

Split the battery from top to bottom, and also cut off the bottom piece.

Empty out the carbon mix and remove the center electrode. Peel off the paper from the zinc.

Enough sal ammoniac will be found between the layers of the paper and on the inside part of the zinc to tin the soldering iron hundreds of times.—ALTON J. LARPENTEUR.

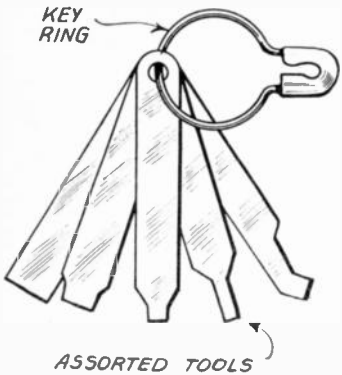
Inspection Mirror

Service suggestions recommend the use of a dental mirror as visual aid in radio work, but dental mirrors are made with the small mirror fixed to the handle at one angle.

The writer, however, obtained at a local drug store a dental mirror which has its small mirror hinged to the handle, which permits inspection at any desired angle. Any standard dental mirror can easily be remodeled this way by removing the mirror from the handle and attaching a home-made hinge arrangement. — J. R. LIMBECK *(From C-D Capacitor)*.

Sawblade Screwdrivers

Old sawblades of hack saws are made of an excellent steel and are too good to throw away. Cut them in half lengths,



Screwdrivers and other tools from sawblades.

grind the teeth away and grind the end without the spanning hole just to the shape you need. Without any cost you are able to make yourself a set of screwdrivers from the width of 3/8" to about 1/16" for very small screws, sunken and concealed screws. The figure may give some ideas. If you keep the hole of the sawblade, which usually fits into the mounting of the saw, on the opposite end of the shaping, you are able to keep your screwdriver set nicely together with a safety pin, which permits you to take the screwdriver out easily.—R. Glass.

Color Scheme

In using the so-called Spintites, a serviceman usually has to dig through his tool box to select the proper size. There are invariably eight drivers to a set. The only identification one has is a small stamp on the handle denoting the size. I overcame this difficulty by dipping the handles in lacquer, using various colors. Red, yellow, and black may be used for the more popular sizes as the colors are dominant; other colors may be selected to dip the remainder. After becoming accustomed to the color scheme, much time may be saved in reaching for the proper size at a glance.—Dan W. Damrow.

Shop Kinks

When replacing nuts or bolts, wrap a piece of adhesive tape around your finger with the gummed side facing outward. Place a nut on the tape and it will stick there until you get the bolt started. Then just pull the tape away.

When tracing wires, use a crochet needle which has a small barb on it. Then you can reach in and pull your wires apart (from each other).

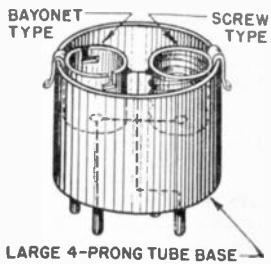
When checking small tubular condensers, number them with a piece of clay chalk. For example, start from the input and mark condenser No. 1. Continue to output. This will indicate that the condensers have been checked.

Electric Iron Repairs

A number of the newer electric irons use a ribbon-type heating element. When the element burns out a new one cannot always be procured. A quick repair can be made by drilling or grinding a small hole in each end of the burned-out ribbon and riveting the two ends together, using a nail for a rivet. This makes a quick repair which will last for a long time.—R. S. Havenhill.

Pilot Bulb Tester

Using only two snap-on panel-lamp sockets and a 4-prong tube base, it is possible to make a simple pilot lamp tester.



Pilot lamp tester from 4-prong tube base.

The pilot base (one for bayonet and the other for screw types) are wired to the filament prongs so that on inserting into any 4-prong socket of a radio or analyzer it is possible to test bulbs. — W. F. Onder.

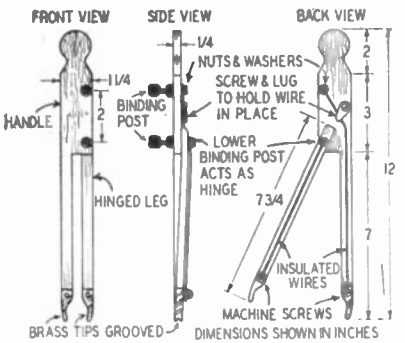
Serviceman's Compass

Here is a handy device to use when checking a receiver by substituting parts to find if any are defective.

It is a compass-like device made of ¼-inch hardwood. Two screw-type binding posts are mounted on the body, and wires are run down metal-tipped legs.

Resistors, condensers or coils may be tied to the binding posts and the brass legs are touched to the two points in the circuit where the part is to be inserted. By connecting headphones and a blocking condenser across the binding posts, the device may be used as an audio signal tracer.

The movable legs make it easy to adjust the device to reach the desired con-



Compass legs make contact with hard-to-reach parts of circuit; test instrument connects to terminal posts.

tact points. Although I used hardwood for my tester, plastic, bakelite or similar insulating material may be used. — EMANUEL F. COX.

Nail File Uses

Next to my long-nosed pliers and soldering iron, the tool I use most is an ordinary fingernail file. The radioman who does not have one of these in his kit is overlooking a useful instrument.

Here are some of its uses:

First—As a probe. Loose wires are detected by wiggling them with the file.

Second—Enamel insulated wire can easily be cleaned by running it between the edge of the file and your finger.

Third—The end may be ground down and used as a screw driver.

Fourth—Filing of contact points or cleaning tube points, wires, etc., is easily done.—BOB FENSTERMACHER.

Chassis Holder

With the use of four "C" clamps, repair and adjustment of automatic record

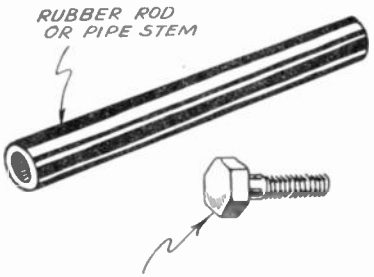
"C" clamps permit elevating chassis above bench.

changers and similar chassis may be made more conveniently.

The clamps are adjusted so that the work will sit up level on the work bench. If desired, a modification may be made, consisting of an extended rod which may be welded to each clamp. It is often desirable to terminate the rod in a washer as shown in the sketch.—G. L. MORRIS.

Aligning Tool

The tool may be made from an old pipe stem, or piece of round hard rubber. Drill a hole in the material, then clamp a screwhead of the proper size firmly in a vise and heat very hot with the soldering iron. While keeping the head hot,

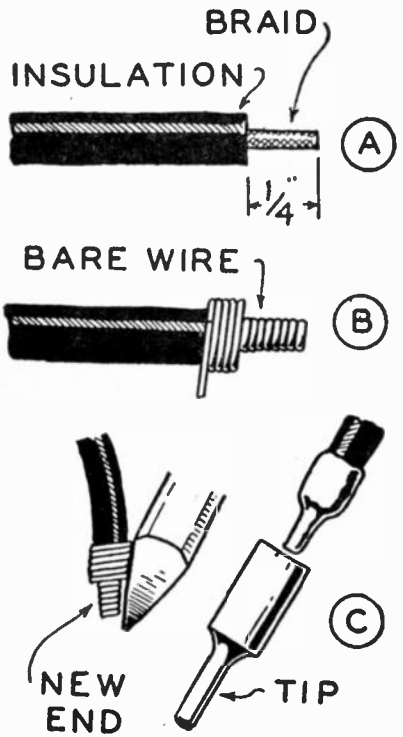


Home-made aligning tool.

gently but firmly force the tool with the hole in it over the head and keep it there until cool.—TONY FRATIA.

Repairing Phone Tips

When the phone tip ends break off or pull out, clean out the old remaining braid which is in the tip by heating on the side with a soldering iron.



Successive stages in repairing phone cord tips.

Take the wires, cut them off neatly, i.e., the insulation and the braid. Then with a sharp razor cut off the insulation so that one-quarter of an inch of the braid shows.

Clean the wire braid so it can make good contact. Then take some bare wire (about No. 36 or No. 40), wrap the wire around the end of the insulation, and continue to the end of the wire braid. —Leslie G. McCracken, Jr.

Soldering Flux

Many of the so-called "non-corrosive" pastes consist of a mixture of muriatic acid and grease. If the paste becomes unduly warm—as might be the case if a hot soldering iron were placed in it—the two components separate and the paste becomes anything but non-corrosive.

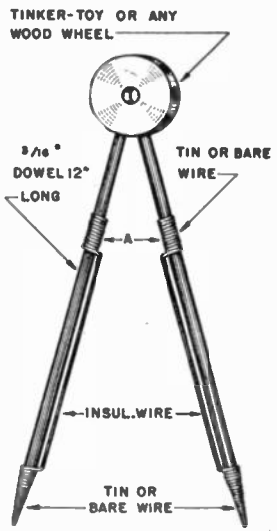
One type of soldering flux widely used by manufacturers of radio and electrical equipment may be easily made by any serviceman. To a given quantity of alcohol, add as much powdered resin as can be dissolved in it.

A small amount of this solution is applied directly to the connection to be soldered. This is usually done by means of a small paint brush. If ordinary wire solder is used, there is little danger of having a "resin joint." This is one of the truly non-corrosive soldering fluxes. — Paul Bauman.

Inserter

I find this gadget very handy around my radio shop when shunting condensers or resistors around suspected "open" ones.

It was made with two wood dowels and a "Tinkertoy" wood wheel. Simply wrap



Device for shunting condensers across units under test.

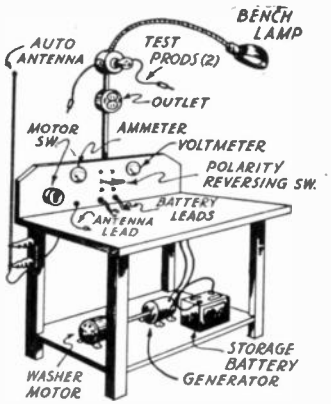
the pigtails of a good condenser (or resistor) tightly around point A. Different condensers or resistors can be fastened on or taken off quickly.—W. S. Moore.

Auto Radio Bench

I built and equipped a bench for auto set testing and found that such work can be greatly speeded up in this way. I converted mine from a worn-out cylinder-type washing machine.

The washer was stripped down to the angle iron frame and the motor board removed, a full width ⅞-inch shelf replacing it. The top was made in like manner, both being fastened with flat head stove bolts. The washer motor was placed on the shelf and connected to an old auto generator by ½-inch coupling (flexible).

My ammeter came from an auto dash, and my voltmeter from an old A eliminator. The battery can be a used one,



Bench for testing auto radio sets.

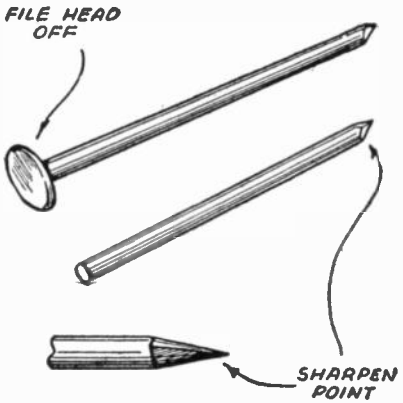
one too weak to start a car being satisfactory for a radio. Accessories consisting of lamp and outlets may be added. A polarity reversing switch also comes in handy.—E. E. YOUNGKIN.

Simple Wire Gauge

A handy wire gauge may be made by mounting wire of various known sizes on a piece of 12 by 8-inch white cardboard. The wires may be held on the board by small strips of cellulose tape. The size of the wire is noted just below the test strips. When it is necessary to determine the size of a wire, it is held side by side with the test strips until the two sizes are matched.—JOHN TREBYCH, JR.

Home-Made Drill

I ran out of small drills and then came upon this idea for drilling coil forms. File off the head of a small brad, sharpening the point if necessary, and use it



Emergency drill made from nail.

as a regular bit. Mine actually cut through the bakelite form quicker and more easily than the standard bit. If you file the point, be sure that the pyramid effect remains, as shown in the accompanying diagram, since this is the cutting surface. The only difficulty that may be encountered is that after two or three holes have been drilled the bit is apt to bend, but they are cheap enough to replace.—RICHARD JEFFREY.

Soldering Iron Cleaner

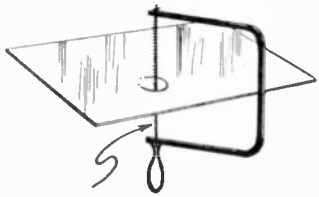
Merely fill an old soldering paste can with some steel wool and soldering paste mixed in it. When you insert the soldering iron point and give it a few twists,

Steel wool, plus soldering paste = clean iron.

the corrosion disappears, and the point is clean for soldering.—WILLIAM WAELDER.

Aluminum Cutter

Diagram shows a cheap and efficient manner of cutting holes in aluminum or sheet metal for tube sockets, etc. A coping saw may be purchased from a five and



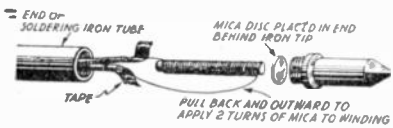
How to cut holes in sheet metal.

ten cent store and a blade for a power jig saw from a hardware store. A hole is drilled in the chassis near the edge of the circle to be cut. The jig saw blade is slipped through and fastened to the frame of the coping saw. By changing the position of the blade, a circle is cut out.

The small necessary cost of the saw and blade is a saving over that of a circle cutter or a punch for cutting metal.—Wm. N. Plimpton.

Soldering Iron

Having trouble in locating a good 32-volt soldering iron, I decided to construct one. I had on hand a burned-out iron, and had to make a 32-volt element for it. I chose a length of a 110-volt hot-plate



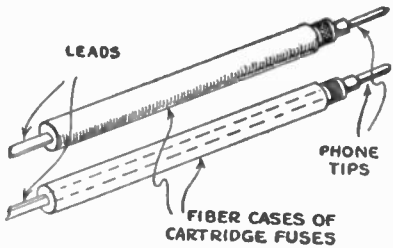
A 32-volt soldering iron.

element which would make a bright-red glow on 32 volts. If the wire should become uncoiled, recoil it tightly on a ⅛-inch rod. One end is unwound for about 2 inches, and the other end long enough to come back along the coil. Leads are then connected to the ends.

I used mica to insulate the wires, having nothing better on hand. Tape covers the splices, and the mica (of medium thickness and 3 inches longer than the element) is wrapped around the complete element. The mica may first be rolled over a pencil, making it easier to handle. Two mica layers are wrapped around the element, then between the leads and then around the whole assembly. A mica disc at the end of the tube prevents shorts effectively.—Howard F. Boyle.

Cheap Test Prods

Here is a pair of very inexpensive but remarkably efficient test prods. The points used were common, noninsulated, solderless phone tips. They may be sharpened to pierce insulation, corrosion, etc.



Test prods made from cartridge fuses.

The handles were made from the cylindrical fiber insulators on cartridge type telephone fuses. Your local telephone office will probably give you a pair.

The leads were attached to the phone tips, threaded through the case, and the tips were forced into place.

Put another pair of phone tips on the free ends, and you have a set of test prods that will stand much abuse. —Chas. G. Sting, Jr.

Wire Stripper

Most servicemen do not care to spend money for a wire stripper. I have a very good idea which works nicely. Simply take a pocket knife and file or grind a notch in it, at about one inch from the

Notch in knife removes wire insulation.

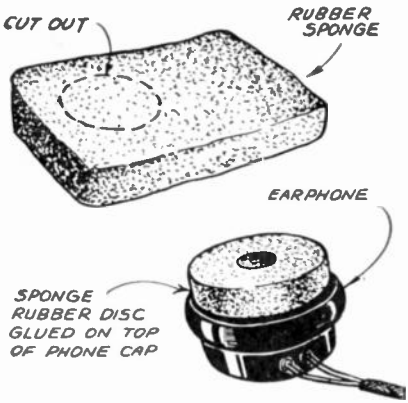
pointed end and about ⅛-inch deep, tapering to form a phantom wedge.—Herman N. Goldbreath.

Section 6. . .

PHONOS & AMPLIFIERS

Earphone Cushion

This earphone cushion can be made from a rubber sponge obtainable from any 5 and 10 cent store.—MAX GOODSTEIN.



Earphone cushion from sponge rubber.

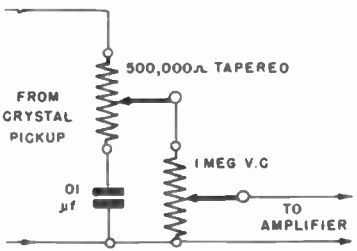
Tone and Volume Control

Here is an idea for a tone and volume control to be inserted between a crystal pick-up and the first amplifier tube. I believe it to be tops for us fellows who don't have any too much testing equipment to plot response curves and impedances. It is an adaption from a circuit given in the *Radiotron Designer's Handbook.*

In operation, turning the 500,000-ohm potentiometer toward the treble response end will produce increasing degrees of brilliance in the music and an apparent increase in volume. The volume can then be adjusted to suit your conditions. Working the potentiometer toward the bass response end will produce an apparent bass boost when equalized with the volume control.

The beauty of the network is that a place can be found where the surface noise from the record is largely eliminated but yet a good response will be retained for the higher frequencies in the music. If you find that the total treble attenuation is too great, substitute a .006-μf condenser in the place of the .01 μf.

Needless to say, both the 500,000-ohm potentiometer and the 1-meg volume control should both be of a very good grade and as noiseless in operation as possible,

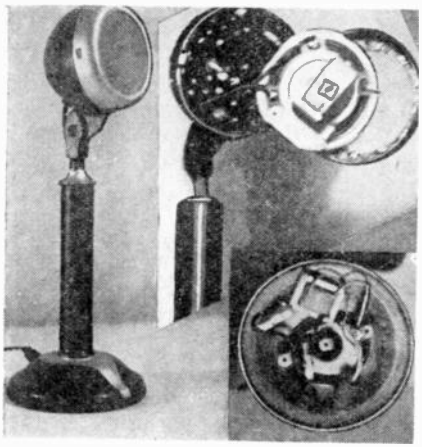


Tone and volume control for insertion between crystal pick-up and first amplifier.

because any noise introduced here is amplified by the entire gain of the amplifier. —NORMAN V. CHURCHILL.

Ingenious PM Mike

I made this mike from a PM speaker out of an RCA kodak radio. The speaker is 3½ inches diameter (cone) by 1¾ inches in depth. I had two of these in my junk box, and though both seemed to be



Microphone constructed from PM speaker, bicycle lamp and old telephone stand.

exactly the same, one was clear while the other was bassy.

The casing is an old bicycle lamp, and the stand is an old desk telephone, as can plainly be seen in the photo. I bought these for fifty cents from a junk shop. The PM fitted the case fine. It measured 3¾ inches inside diameter and 4 inches from front to back.

The glass, reflector and light socket were taken out, and a screen put in where the glass had been. This was soldered around the edges, and while soldering I made it bulge out a little. The output transformer of the PM speaker was then disconnected and put in the base of the telephone stand, which was stripped to the point shown in the photograph.

The mike sounded terrible in its case. So I borrowed an electric drill and made about 70 3/16-inch holes, pattern style, in the back of the casing. This cleared up the tone.

Several methods may be used to hold the speaker firmly in the case. I used an L-shaped piece of sheet metal fastened to the two tapped holes on top of the magnet. The bent part, which extended down parallel to the back of the speaker, was drilled, and another hole drilled through the back of the case. A bolt and bushings held it securely.

The casing of the microphone and one side of the voice coil should be connected together and attached to the grounded lead of the amplifier, or you will have hum. The leads from the microphone to the amplifier should also be shielded.—P. McGregor.

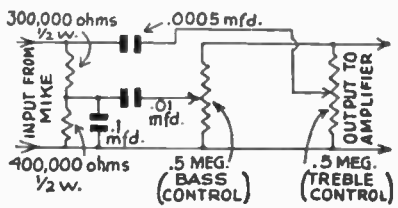
PA Kink

In some public address applications it is necessary to feed a speaker from the voice-coil winding of an amplifier's output transformer at some times, and from a 500-ohm line at others.

A double-pole double-throw switch mounted in the speaker case is a great convenience in such cases. The speaker can be adapted to either line or low-impedance output winding immediately. —Edwin Coofer.

Tone Control

This is a diagram of a tone control which may not be original, but which I have never seen published. It gives all the benefits of an electronic tone control without the expense of a tube or choke and the many other components. It is very easy to build, and I believe that most fellows will have the parts in their junk box. I have designed it to go in the



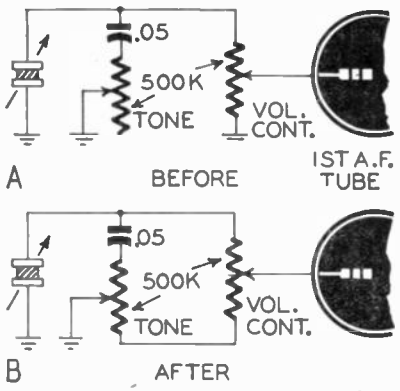
Tone control for use in pre-amplifier grid circuit.

grid circuit of the pre-amplifier. It will not work in the output of a power tube. The ideal set-up is to connect the mike or pick-up to the control and the output to the amplifier.—P. Fisk.

Compensated Tone Control

The volume of my phonograph amplifier dropped as the tone control was adjusted for greater attenuation of the "highs." In the hook-up, as shown in *a*, will be noted that the two controls are in parallel with each other. Since this position is especially effective (for removing needle scratch and other reasons) I did not want to change it, and devised the compensating circuit in *b*.

Now, when I increase the "high" attenuation with the tone control, it automatically increases the amount of resistance between the center arm of the volume control and ground, in effect turning up the volume control and increasing the voltage input to the first tube of the audio amplifier. The ordinary



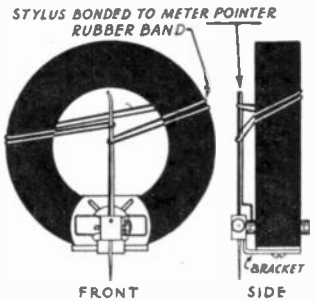
"Before" and "after" circuits of compensated tone control.

volume control adjustment sets the general volume level, of course.

Values of the circuit were as shown in the diagram.—Roy G. Loughary.

Phono Pick-up

I used a discarded volt-ammeter, sometimes used in auto ignition work. The stylus of an old phonograph reproducer is bound and cemented to the meter pointer, after aligning the stylus pivot point with the axis of the moving coil of the meter. One or more rubber bands hold the stylus in the neutral position (vertical). As shown, a bracket is used to support the pick-up weight without binding the meter coil pivots.



Phono pick-up made from volt-ammeter.

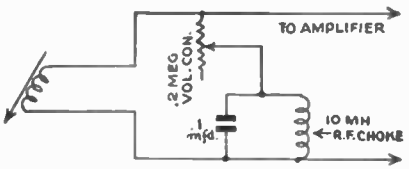
The leads from the meter coil are brought out to the primary of a suitable transformer which may be used as counter-balance for the pickup. A voice-coil-to-grid or a ribbon mike transformer may be used.—E. E. Youngkin.

Low-Note Suppressor

Recently I built an intercommunication system using a pair of 3½-inch PM's, but found the speakers to have a frequency response too low for normal crisp voice reproduction. I applied a light coat of lacquer to the paper cone with a spray gun. This eliminated all trace of "woofer" action and brought the frequency response up to where it sounded very well on voice.—Dan W. Damrow.

Scratch Filter

Here is a circuit for a scratch filter

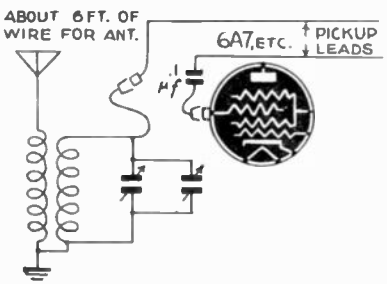


Scratch filter and volume control.

and volume control for use with any high-impedance radio phonograph pick-up. It eliminates scratch noise usually present at approximately 5000 cycles. — Nolin Quillet.

Wireless Phono Player

The converter tube on my four-tube a.c. superhet is used as a wireless phono player. The grid cap is removed and one lead from the pick-up is connected to it.



Converter tube used as wireless phono player.

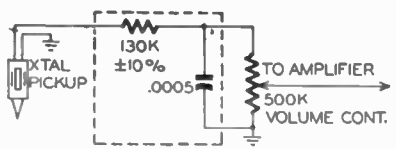
The other lead is connected to the grid through a .1-μf condenser. The set is turned on and dialed to 1060 kc. A signal should be heard at about 1500 kc on the main radio which is located in another room. Reverse the a.c. plug for loudest signal.

A longer antenna may be needed if lights and other electrical appliances are in use.

To test this circuit, use a small receiver with one i.f. transformer, as it does not work satisfactorily with receivers using two i.f.'s and better shielding.—W. L. Doud.

Phono Scratch Filter

Here is a favorite scratch filter circuit of mine which uses no hum-collecting chokes, reduces high-frequency response



Filter eliminates record surface noise.

by only a small amount, and above all, eliminates a great percentage of record surface noise.—Gerald J. Walsh.

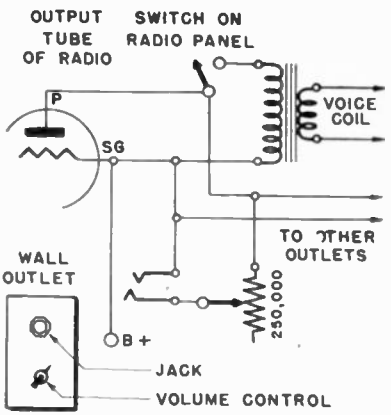
Safety Iron

To prevent charring of wires and condensers while soldering in close quarters, take a piece of thin asbestos cloth and wrap it around the lower part of the body and tip of the soldering iron. About three-quarters of an inch of the copper is left exposed. The asbestos is bound to the iron with fine wire.—Wm. A. Plees.

Front Seat Radio

The writer has his house wired as illustrated. Two or three headsets plugged in on the line cause a little drop in volume of the speaker, but that can be overcome by increasing the volume control on the radio.

Father can cut out the radio speaker, and listen to his favorite program while mother is quarreling with the children about getting their school home-work done.



Circuit to feed several headphone sets.

Or little Johnny can have his silent reception while pa and ma are entertaining their callers.

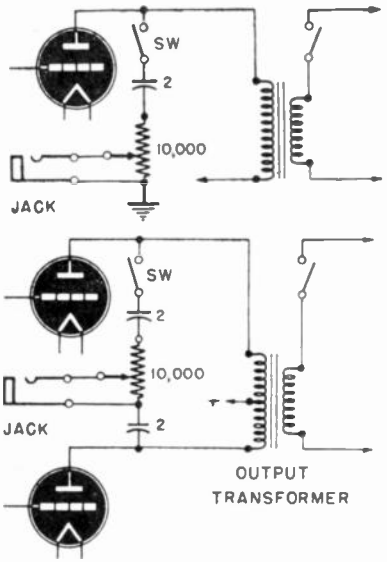
Mother can plug in a speaker in the kitchen (instead of phones) and enjoy her work over a hot stove, or in the afternoon, she can plug in the phones in order not to wake up the baby.

An outlet should be put in the dining room for meals, the little bedroom off to the side for convalescents and dad's den for poor, tired father where he can escape the household and other worries.—Fred H. Randolph.

Adding Headphones

A simple connection for the addition of headphones to a modern radio is the following: only a 10,000-ohm potentiometer, a blocking condenser and a switch are required.

The top figure shows the method for a single tube output; the lower for a push-

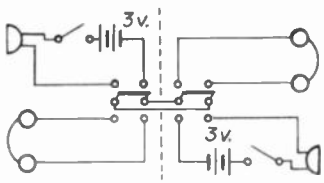


Top—adding phone jack to single tube output; Bottom—push-pull hook-up.

pull stage. An additional switch serves to disconnect the speaker when phones alone are desired.—B. E. Shelby.

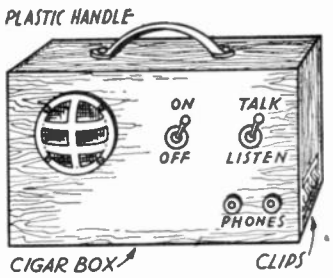
Intercom

This intercom is just the thing that has long been needed for the service man, the researcher, or the kids.



Simple intercom works without tubes.

It requires no tubes and can be put together with a couple of old carbon microphones and two low-impedance telephone receivers or small PM speakers. The entire unit is mounted in a cigar-box. The d.p.d.t. switches should, if pos-



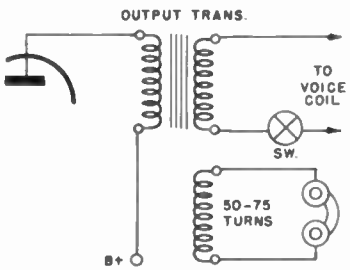
Intercom built in cigar box case.

sible, be standard "talk-listen" switches which spring back into the "listen" position when released.

Two No. 6 dry cells supply the power. A PM speaker can be used in place of the headphones and the entire unit may be mounted in an ordinary cigar-box. The diagram illustrates the hook-up and method of mounting.—Edward Howell.

Good Phones Connection

Here is a simple and convenient way of coupling phones into the output circuit of almost any radio. First, break one of the leads between the output transformer



Convenient way to connect phones to output.

and the voice coil, and insert a s.p.s.t. switch. This may be toggle or may be connected to a switch in the phone jack. The coil should be from 50 to 75 turns of No. 30 enamel wire, and should be wound around the transformer. The coil should be wound parallel to the windings of the transformer, and brought directly to the phone jack which may be mounted to the rear of the chassis.—John Vance.

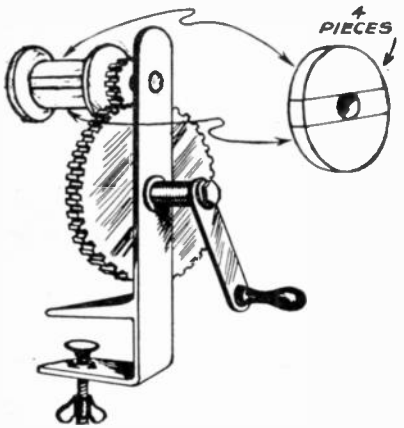
Section 7 . . .

COILS & TRANSFORMERS

Quick Coil Winder

Coils having a large number of turns, such as the windings in headphone magnets, speaker coils, transformer coils, etc., can easily be made. Remove the grindstone from an emery wheel and replace it with two wooden wheels beveled on the inside, so as not to catch the wire on the edges. Put spacers between the wheels to separate them, as illustrated.

Tightening the mounting nut will hold the parts together till the coil is wound, after which the whole form is slipped off. The inside core pieces fall out very easily, and the form can then be slipped off.

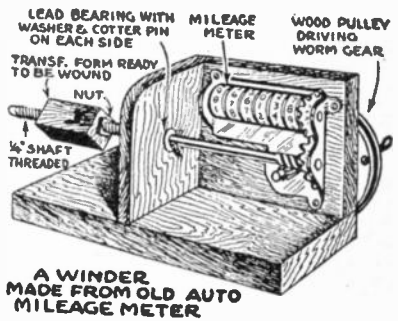


Coil winder devised from grinder.

If wire from an old transformer is used, it is best to wind it onto a spool first, using the winder for that purpose. The danger of breakage is thereby greatly reduced.—JAMES EICH.

Revolution Counter

This winder is constructed from an old automobile mileage meter. The picture



Mileage counter makes good coil winder.

tells practically the whole story. Most of the stuff in it comes from the meter and associated parts. It is very handy to have a winder like this for odd repair jobs, and when you use a winder, the counter is almost necessary.

A cover could be put over the disc counters so that only the numbers to be read would show.—DONALD ANDERSON.

Removing Wax From Coils

Many oscillator, i.f. or similar wax-coated coils are easily repaired by the competent technician if the wax coating

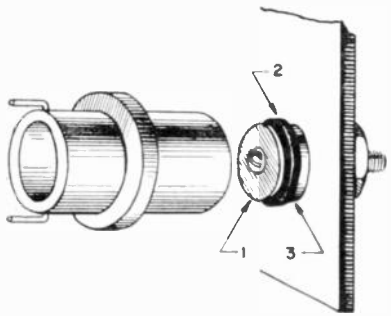
is first removed in the following simple and effective manner.

Fold three or four layers of ordinary Kleenex or similar absorbent tissue over the coil and press lightly over this with a hot soldering iron. The heat will melt the wax and the tissue will absorb it.

The coil is left practically wax-free for an easy repair job.—M. Oberholtzer.

Coil Holder

While attempting to improvise a wave trap from an old i.f. coil, I hit upon the



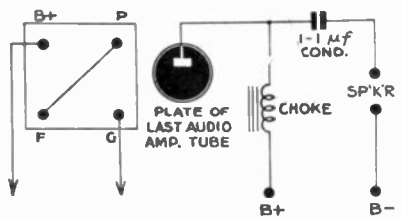
Rubber washer holds coil on chassis.

following idea for holding it in place on the chassis without using rivets or sockets.

I use three washers, first a hard fiber or metal one, second a rubber washer such as from an old tire tube, and last a cardboard washer. Each is equal to the diameter of the coil to be held. Now a screw and nut hold them in place as in the diagram (2 is the rubber washer). Simply press the i.f. coil form over the washers!—Miguel Varca.

Use For Old Audios

Old audio transformers may be used for many jobs that call for small chokes. Simply hook them up as shown.



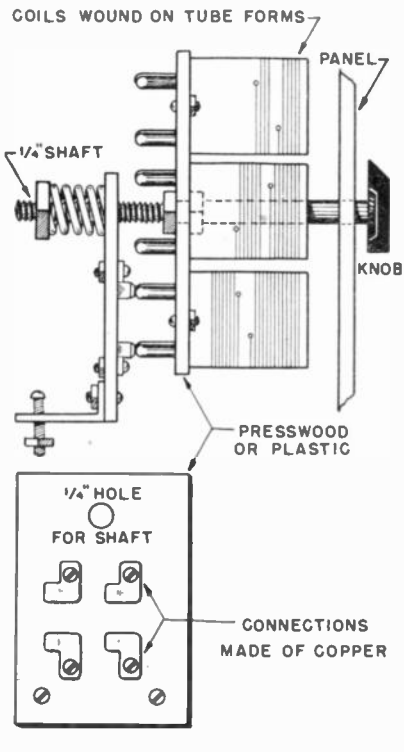
Old audio transformer used as a.f. choke.

I first tried this when I wanted a choke to connect a magnetic speaker or headphones to a small radio. They can be used also in the plate circuits of amplifiers where resistors are called for. In battery or 110-volt sets changing the plate resistor for one of these audio chokes makes quite an increase in the volume. —Al Hauser.

Coil Switch

The illustration is self-explanatory and shows a very good arrangement for short-wave sets. The contacts of the coil forms make good contact on the connectors.—John Millsaps, Jr.

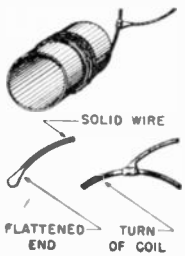
(For those who prefer the three separate circuits scheme, that is, primary, secondary, tickler, a six-prong form could be used instead of the four.—*Editor*)



Short-wave coil switch of simple design.

Efficient Coil Taps

Here is a suggestion for a useful kink in tapping home-made coils. One end of a piece of heavy (No. 14 or 16) copper wire is flattened out with a hammer on an iron block. When winding the coil, the insulation is scraped at the desired point, the wire cleaned and sandpapered, and the flattened wire end crimped tightly around it and soldered, using as little solder as possible.

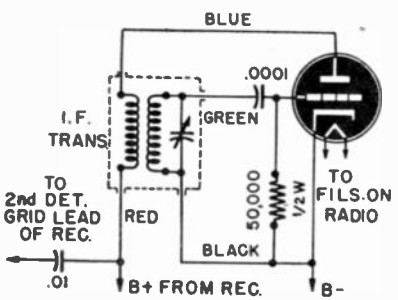


This method of connection makes a solid joint which takes up very little space and therefore does not throw the winding out of shape. It also makes very neat joints in bus-bar wiring.—RALPH C. LIPPERT.

B-F Oscillator

The circuit in this oscillator is extremely simple and the parts consist of an old i.f. transformer, a .0001-μf condenser, and a tube which is, or can be used as, a triode. None of the values given are at all critical and a variety of tubes may be used.

In this particular installation a 6J5 which has seen better days gives excellent results. The i.f. transformer should



An easily improvised b.f. oscillator.

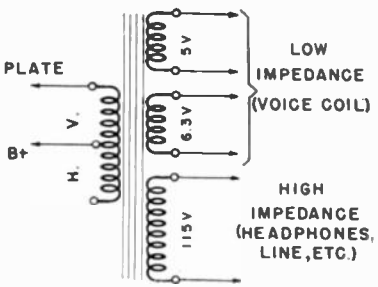
tune to approximately the i.f. of the receiver in use and after being installed, may be tuned to give a suitable note and output. It never needs to be re-adjusted as the tuning is usually so sharp in a broadcast-type receiver that the note may be varied quite easily by detuning slightly.

In this particular case there was so much output from the oscillator that it was not necessary to couple to the second detector of the receiver at all, so the .01-μf condenser was dispensed with, a short lead about an inch long serving to give plenty of coupling.

If the tube used has a suppressor grid, it may be left floating and a screen grid may be tied to the plate. The color code shown applies only to the particular i.f. transformer that was used, but a quick continuity test with an ohmmeter or batteries and headset will show the different sides of the transformer, as the red lead will always go to B plus.—A. A. WICKS.

Output Transformer

When some emergency arises and you are in desperate need for an output transformer, don't worry. Just dig up an old



Power transformer serves as output transformer.

power transformer and connect it according to the diagram.

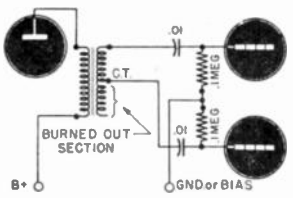
This output transformer may be used as a push-pull output or a driver for either single or push-pull stages. In the latter case, the 115-volt winding would be the primary.—BOB WEBB.

(Some queer matches may be obtained from such a transformer. It is recommended that for many voice coils it might be worth while to try the two filament windings in series, comparing the results with those when one is used.—*Editor*)

Transformer Kink

This kink may help someone who finds himself in the same position I did when one side of my push-pull transformer burned out. I rewired the circuit as per diagram, eliminating the burned-out section.

The transformer still furnishes 180°



Transformer burn-out bridged by shifting connections.

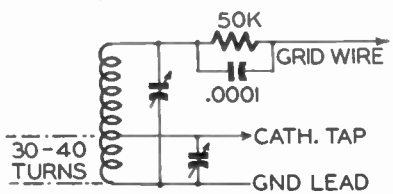
out-of-phase signal to the output grids but at a lower voltage.—DONALD CHASE.

(Incidentally, this method could be employed to use any audio transformer for push-pull input. Voltage gain and grid impedance would be low, but the idea might be worth while in some cases.—*Editor*)

B. F. O. Transformers

Very good transformers for beat frequency oscillators can he made from burned-out i.f. transformers.

Cut off the burned-out winding, leaving the good one. (It rarely happens that both windings on one transformer go bad.) Unwind 30-40 turns and take off a cathode tap, then wind them back on again. Attach one of the trimmers across the whole coil and the other between the cathode tap and ground end. The grid



B.f.o. transformer from old i.f. unit.

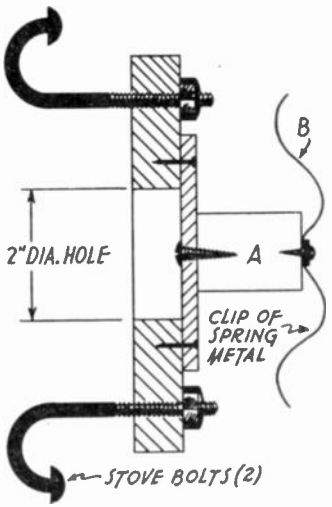
leak and condenser can be installed inside the shield can, and you have a complete b.f.o. assembly, as shown in the figure.

I have made three of these and had good results with all of them—D. K. VANDERWATER.

Coil Winder Jig

Here is a simple jig for coil winding that can be easily attached to the flywheel of a sewing machine. I have wound power and output transformers quite satisfactorily with it.

Two stove bolts form the means of fastening the board to the flywheel. The board used is 6 x 6 x ¾ inches, but this will vary with the machine used. If possible, the holts can also be used to pre vent the shuttle clutch from locking so that the sewing mechanism is inoperative.



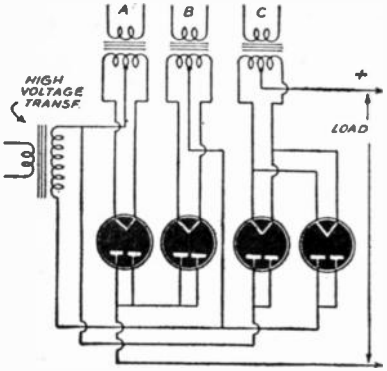
Simple jig for winding coils.

Various sizes of cores may be accommodated by varying the size of the block A, which is fastened to the jig by the screw. Spring clip B is necessary to hold the bobbin securely.

For counting the turns, the shuttle winding mechanism of the machine is useful. It frequently has a reciprocating arm to help in threading the bobbin evenly, which moves back and forth slowly. On this particular machine, I used one complete cycle of this arm to correspond to 36 turns of the flywheel. Counting the number of turns was thus easily accomplished.—ALLEN W. JACKSON.

Doubling Voltage

Many questions have been asked as to just how we get away with using a small power transformer (plate) and get so much high voltage.



High voltage from small power transformer.

Those who build this unit will find the cost low and the construction easy. Also, it will prove trouble-free.

You can double your present transformer rating, and get up to five hundred watts output, depending on the tubes you use as rectifiers. And the rectifiers are *receiving* tubes!

I have run anywhere from six hundred to twelve hundred volts input this way, and from two hundred to seven hundred milliamperes.

This can easily be seen as the plates of each rectifier are connected in parallel.

Three 5-volt or 2.5-volt filament transformers with good insulation should be used.

The input of the plate transformer will be double, since the use of the center tap is done away with.—WILFRED NEIL.

Experimental Coil Form

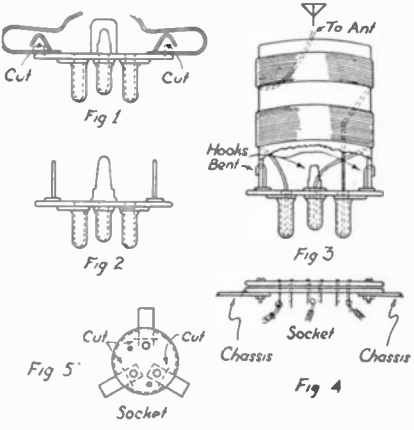
When changing coils in experimental receiving sets, use an above-chassis socket and to each terminal solder a Fahnestock spring clip. Standard coils can still be plugged in if desired without interfering with the clips and temporary-permanent connections can be made if desired.

When constructing a new coil, if the exact number of turns is not determined, simply wind about half a dozen more turns than you think are necessary to do a required job, attach the free end of the wire or wires to the Fahnestock clip and then begin taking off turns, making a temporary connection after each turn until the desired number of turns is reached.

This idea can also be used on tube sockets when experimenting with a new type of circuit and where many temporary experimental connections have to be made. A good deal of superfluous soldering can be avoided in this manner. —JOSEPH CZABAN.

Plug-in Coil

Here is an economy for radio beginners who have bought plenty of 45-volt B batteries of the plug-in type. I use a plug and a socket taken from a worn-out 45-volt battery. From the plug, I cut off the clips (Fig. 1) leaving only the hook straightened up as in Fig. 2. Now take a cardboard tube of one-inch diameter and make three small holes near the base to suit the location of the hooks. Bend the hooks through the holes so that the coil



Plug-in coil from battery plug and socket.

form is held intact to the plug. Then wind your coil and solder the ends of the wires to the prongs of the plug. In the

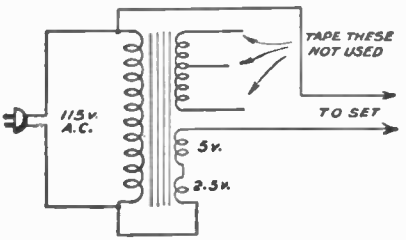
case of Eveready plugs, the prongs are hollowed. Since there are three prongs, the terminal leading to the antenna can be left hanging as in Fig. 3.

The socket may be used like an ordinary socket to suit the purpose. Cut off the metal strips as in Fig. 5, and mount on the chassis. The terminal of the socket would serve as the terminals for the corresponding leads as in Fig. 4. — A. Locilio.

Simple Line Booster

In many temporary installations and not a few towns, the a.c. power lines may have very poor regulation.

As a result, many sets, especially some of the a.c.-d.c. type, do not give good service during the evening hours, and some stop entirely. To overcome this, I used an ordinary old power transformer to boost the voltage. Only the filament windings are used. On old transformers,



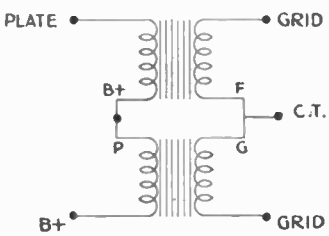
Using filament windings as line voltage booster.

these are usually 2.5 and 5 volts, so you can have either of those voltages or 7.5 by connecting them together. If you have a transformer with a 6.3-volt filament winding, you can get as much as 11 volts, and some of the old-timers have several windings, also making a choice possible. On some of the smaller a.c.-d.c. sets, an ordinary bell-transformer with a 10-volt secondary worked well.

The drawing is self-explanatory. If the set does not work with this arrangement simply reverse the leads connected to the secondary terminals. This must also be watched in connecting two secondaries together, for in one direction the voltages add but in the other they subtract. — George Murakami.

Push-Pull Transformer

I constructed a general-purpose amplifier with a push-pull output stage, but I could not get a push-pull transformer with a center-tapped secondary. I had two single transformers from an old Fada 480, so I connected them as shown in the illustration.—Ernest W. Carlson.

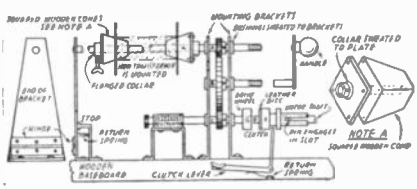


Improvised push-pull transformer.

Coil Winder

As sketched, the motor (if used) drives section E which may be moved against the driving wheel by pressure on the clutch lever, while the spring tends to cause its return. Hand operation is used where heavy wires are involved, the handle being connected to either the top or middle shaft. Gears A and C are best of the same size, so that a 1 to 1 ratio is obtained for motor drive. B may be large enough to give a 4 or 5 to 1 ratio.

To mount the coil form, the end bracket is pulled back along its hinge and the outer cone (see figure) removed. The form is placed in position and the cone replaced. The latter is then tightened by means of a set screw.



Flexible coil winder with counter.

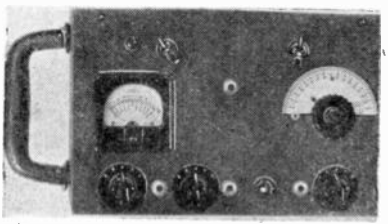
To carry the wire spool, two brackets may be mounted away from the winder. Two ordinary cones (not squared) may then be mounted on a ½-inch shaft.—L. W. Smith.

Section 8 . . .

MISCELLANEOUS

Protractor Dial

When in need of a precision dial, why not try a protractor? Its divisions are accurately spaced and make a neat appearance, as may be seen in the photo.



Dial at right made from protractor.

The metal types are usable where the readings are referred to a graph or chart for interpolation. When it is desirable to have a direct-reading dial, a celluloid protractor is most useful. A paper backing with the necessary markings and notations is placed behind the transparent dial so that the calibration may be seen at a glance. A knob with a transparent hairline pointer increases the accuracy of the dial readings.

Three small screws or rivets may be used to fasten the dial to the panel.—HAROLD PALLATZ.

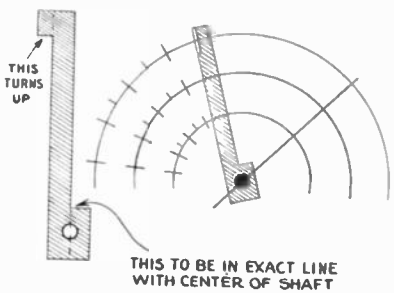
Dial Marking Template

Often the experimenter finds it difficult to mark dials for home-made equipment. When this is attempted free-hand it often results in a splotchy job with markings not running true with the pointer.

I have made the job easy by employing a gadget made of thin metal as shown at the left of the figure. The device should be slightly longer than the pointer on the dial and the marking side should line up exactly with the center of the shaft. The tab at the outer end should be turned up so the marker can be held firmly in position.

To use, remove the dial pointer and drop the marker guide down on shaft, replacing pointer again, as shown at the right.

Now, suppose you are calibrating some instrument, say an oscillator. After tuning to the exact point on the dial, the guide is brought into exact line with the pointer and held firmly and then the pointer is moved out of the way and the line marked in.

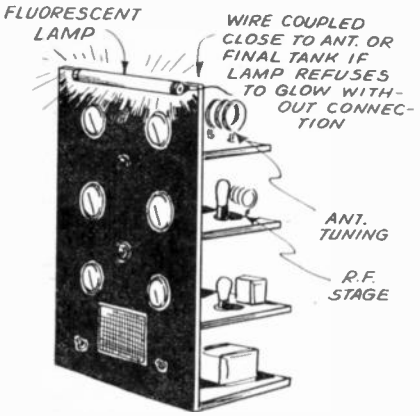


This template makes dial marking easy.

Main points can be marked with longer cross lines and intermediate points with shorter ones, as shown.—AUDIE ROBERSON.

Fluorescent Lamps

Burned-out fluorescent lamps may be used to advantage by Radio Amateurs. They may be used as resonance or output indicators on the transmitter. They may be mounted on the panel of the r.f. stage of the transmitter, or coupled closely to the antenna feeders. If the r.f. output is not great enough to light the lamp, a wire connected to it should be placed close to the tank coil or the antenna post. Not only does it serve this purpose but it also beautifies the transmitter with its glow. It may be used as a modulation indicator on phone transmitters, since it



Fluorescent lamp lighted by r.f. field.

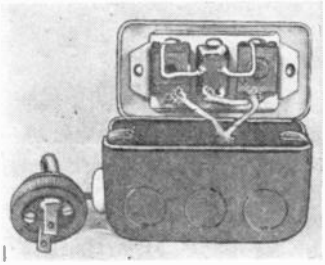
will glow more brightly when the audio voltage is impressed on the carrier. — ALEXANDER RICCIO.

Series Outlet

The sketch and photographs show a simple series-parallel attachment outlet which has a multitude of uses around the repair shop.

One of the many uses would be to connect the soldering iron to one outlet and a 100-watt lamp (or other size depending on the wattage of the iron) to the other. To keep the iron warm but to prevent tip burning, throw switch to series position. For full heat throw to parallel position.

The use of two photoflood lamps of the kind used in photography, connected to these outlets permits, in the series position, plenty of light for focussing and composition together with exceptionally

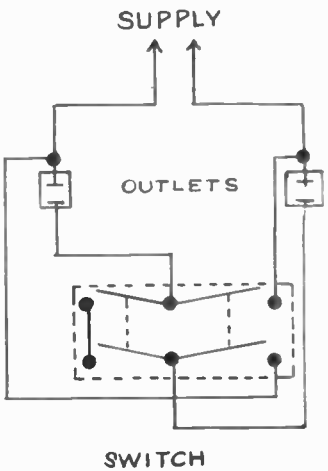


How the outlet box is wired.

The box has a neat appearance.

long life, and a pre-conditioning before turning on full brilliancy in the parallel position.

For compactness, standard interchangeable plates and receptacles are used. The radio type, double-pole, double-throw

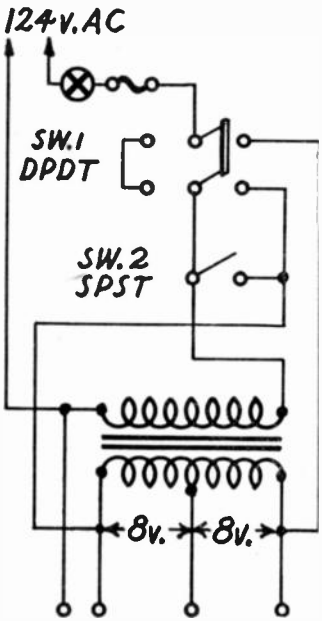


Switch to left — "series"; to right — "parallel".

switch is mounted in one of the triple knockouts in the plate and wired as per sketch.—A. B. KLYNE.

Voltage Adjuster

To prolong tube life in experimental apparatus where the line voltage ran to about 124 volts, I converted a bell-ringing transformer into an auto-transformer



Auto-transformer hook-up to control line voltage.

which permits lowering the voltage. Simply connect one terminal of the secondary winding to a terminal of the primary so that they aid each other and connect the two windings in series across the line.

The transformer used in this case had a 16-volt center-tapped secondary. A few sockets, the transformer, a fuse block and a snap switch all mounted on a breadboard, provided a handy power supply outlet for the workbench. A more elaborate device can be constructed if desired by using a multiple switching arrangement as shown in the figure, from which you can obtain a boosting or bucking auto-transformer or a straight step-down to rated secondary voltages.—HAROLD J. MAHAFFEY.

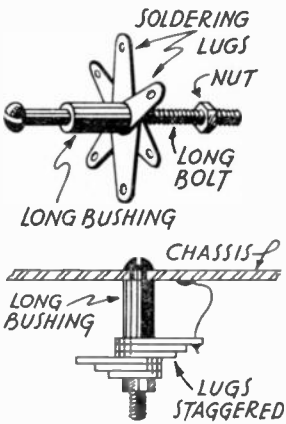
(A bell transformer is not too good for this purpose. An ordinary toy transformer would be more efficient, as it is built for continuous load.—*Editor*)

Cable Jack

I have found a new use for old fluorescent starters. After failing in my attempts to find a cable extension jack, I hit upon the idea of using a standard chassis jack and a defective fluorescent starter for the purpose. The starter is first dis-assembled. The metal shell is used for the housing. The plastic bottom plate is used as a base for the jack. The starter is disconnected from this plate and the terminals are punched out, leaving two small holes. A hole is drilled in the closed end of the metal shell. Wires are connected to the chassis jack and are pushed through the holes in the plastic base. The nut is screwed on the jack and then the base is fitted to the casing. Insert the paper insulator that originally was in the starter. Bend the metal tabs back into position and the job is done. An ordinary phone plug is used.—JERRE H. PAPIER.

Common Ground

When a number of leads are to be grounded, a neater and more efficient job



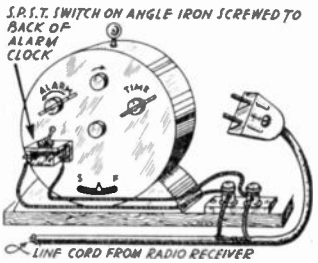
Multiple ground terminal.

is made by using a common post consisting of soldering lugs mounted in staggered positions on a screw grounded to the chassis.—*N. Z. Radiogram.*

Automatic Off Switch

This is for the benefit of those who listen to late programs in bed and do not want their radio to go on playing all night if they should fall asleep.

Merely set the clock to ring at the end



Radio cut-off switch made from alarm clock.

of your favorite program. When it goes off, the wing nut turns the switch off automatically.—Robert L. Bevard.

Winding Indicator

An old "Readrite" or similar moving-vane type of meter, or one that has a burned-out winding can be utilized as an excellent test meter to differentiate between the various windings of a power transformer. Some transformers are not coded in accordance with RMA specifications.

To test, the meter is simply laid on top of the core of the transformer. Then each winding is excited by connecting the leads to a 1.5-volt dry cell. There will be only a slight deflection when the high-voltage leads are connected, but the 5-volt and 6.3-volt windings will indicate approximately half-scale deflection. The 5-volt winding will read slightly higher than the 6.3-volt winding while a 2.5-volt filament winding will read highest of all. With a little practice and some sort of calibrated chart, the settings for each winding can be discovered. It will then be possible to determine whether any windings are shorted partially or completely.

It would *not* be advisable to use a meter that is still in regular daily use, as the intense magnetic field developed may cause a change in the meter magnet which would cause inaccuracy in future voltage readings.—Peter R. Heath.

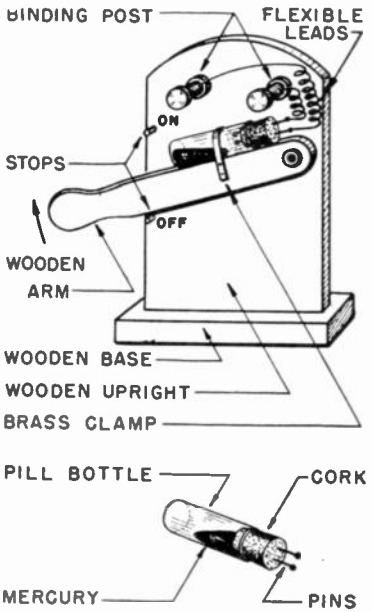
Heavy Wire Lug

It is often difficult to attach heavy stranded wire to any device that is equipped with small screw terminals.

This task is made easier and more substantial by filling the end of the wire with molten solder and allowing it to cool. The end is then pounded flat and drilled to pass the screw. The screw is run through the wire and into the terminal block to make a semi-permanent fastening.—Theodore A. Byles.

Simple Mercury Switch

The figure illustrates an easy-to-build mercury switch for use at 110-volt loads. Two common pins are pushed through a cork in a glass pill-bottle (obtainable from drug stores), leads being soldered to binding posts. I bent the ends of the pins into loops to make better contact.

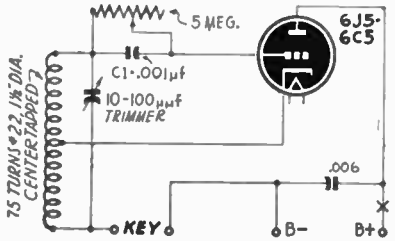


Home made 110-volt mercury switch.

A small amount of mercury is placed in the bottle and the bottle clamped to a wooden arm.—Howard H. Arnold.

Audio "Squegger"

I have been using this audio oscillator circuit for some time. It is simple to construct, very cheap to build and uses no large parts such as transformers.



Simple audio oscillator.

Actually it is nothing but a simple self-pulsing oscillator with the pulse rate falling in the desired part of the audio spectrum. The one I have at present is adjusted to oscillate at 800 cycles which is a standard m.c.w. (modulated continuous wave) frequency. If the coil specifications are followed, it will transmit a modulated c.w. signal which can be picked up on any broadcast set within 20 or 30 feet. No connections between the broadcast set and the oscillator are necessary.

If the plate lead is broken at point X one or more pairs of headphones may be operated directly from the oscillator without the use of the broadcast set.

If the 5-meg potentiometer is set too low, (which would increase the audio frequency) the oscillator may start acting as a superregenerative detector and cause hissing in the broadcast set. This will occur only when the frequency is set much too high for proper audio output (around 6 kc). It can be eliminated by experimenting with the value of C1. Using this exact circuit, no such trouble should be encountered.—J. W. HARFORD.

Improved Volume Control

When a receiver using the antenna shunt plus grid-bias type of volume control circuit is tuned to a powerful station, it is often difficult to completely silence the set at the minimum setting of the volume control. This may be cured by connecting a resistor from the B plus end of the plate coil to the cathode of the r.f. tube. This causes additional current to flow through cathode biasing resistor thus increasing the bias on the grid.

The value of the resistor will have to be determined by experiment, but will probably range between 50,000 and 100,000 ohms. A two-watt resistor is recommended in this revised circuit, as considerable current flows when the volume control is in a position which connects its lower end to ground direct.—H. A. NICKERSON.

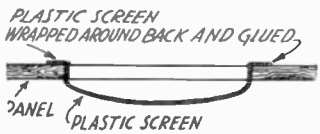
Two Short-Wave Kinks

A music stand base makes a FB antenna for either 2½ or 1¼- meter bands, giving directional characteristics in three directions. If legs are adjustable, experiment to find resonant length. Approximately 24 inches is a quarter-wave at 2½ and a half-wave at 1¼ meters.

A five-cent pyrex bowl makes a good feed-through insulator. Drill through, using low-pressure drill and light oil for lubrication. Total cost is 20 cents compared to about $3.00 when purchased complete.—GERALD SAMKOFSKY.

Speaker Grille

A convenient and modern-looking grille for small speakers can be made from a plastic screen or old dial celluloid. The dial covering is well adapted for this purpose as it is convex rather than flat. It can be glued in place from the inside of the cabinet. If thin celluloid is used, slots can be cut with a penknife or single-edged razor blade following any

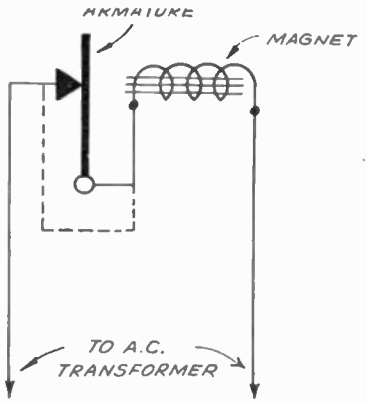


Plastic speaker grille.

design which may appeal to the constructor's taste. The grille can be given a coat of shellac or paint if desired as a finish.—TOM LAMB.

Interference Eliminator

Interference in radio receivers caused by doorbells can be eliminated in two ways: (1) By connecting a condenser across the contacts of the bell, or (2) by making the bell an alternating-current type. Since most bells now work on a transformer, this can be done easily. The wire leading to the armature contact of the bell is removed and connected to the coil, as shown in the diagram. The bell will vibrate as well on a.c. with this connection as it did previous to the change. The armature may have to be stiffened slightly to permit vibration. — V. PETRUCELLY, JR.



Doorbell noise eliminated by converting to a.c.

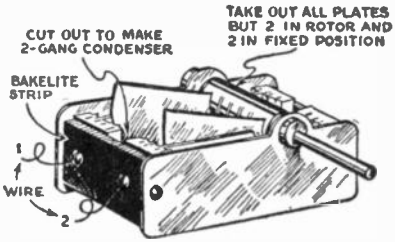
Band-Spread Condenser

This band-spread condenser was made from an old junk box condenser (from one of the first battery radios made). This was one of the condensers that was put together with screws instead of by other means.

First it was taken apart and the two bars at each end that held the stator plates were cut out about ½ inch in the center of this bar (see diagram). All but two plates were then removed from the two sections.

Before doing this affix the two bakelite pieces on each end by putting a hole through the bakelite and the center of the bar that is going to be cut out. Then make two holes ⅜ of an inch from the center of the first hole and tap these. This condenser took me about four hours to construct.

Other types of condensers can be made



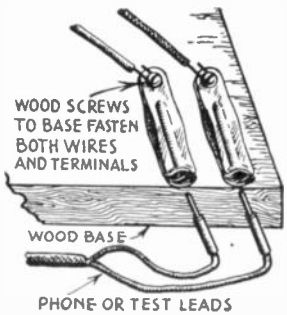
BAND SPREAD CONDENSER

Band-spread condenser made by removing plates.

into band-spread condensers with a little work and thinking. A two-gang condenser would be still better for a band-spread condenser if the plates are broken or taken out.—LAWRENCE HANT.

Binding Posts

Here is a good idea for amateurs and experimenters when stuck for binding posts or phone terminals. The brass female contacts inside an ironing-cord socket can be used in the following manner. A wood screw is used to hold the contact to a breadboard. The wire from the unit being connected is wound around the head of the screw. The screw is then tightened down securely. Phone tips or test leads can then be plugged in at will. If there is any high voltage present, the

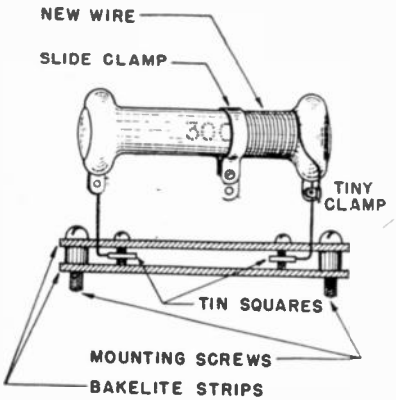


Ironing cord terminals as binding posts.

contacts can be covered with cellulose tape to prevent shock and minimize the danger of shorting.—V. GZOWSKI.

Odd-Sized Resistor

If you need, let's say, a 10-watt 30-ohm resistor, look for one of approximately the same wattage; for example, a 300-ohm or as close as you can get to the desired resistance. (The resistor must be of the insulated type.) Get from a burnt-out wire



Odd-sized resistors from old insulated units.

resistor a piece of wire. Wind it securely around one of the ends of the resistor, make a tiny clamp with a little screw and two small nuts; clamp the wound wire to the resistor terminal with the clamp.

Wind over the same resistor the amount of wire required to satisfy your needs, then put over the new terminal a previously fixed slide clamp from a discarded resistor, and . . . Oh, yes! A mounting. Solder two little squares of tin or brass sheet to the wire points of the resistor. Get two strips of bakelite or other similar material. Make two slots in one of the strips to receive squares and wire, bend wires properly. Drill two holes in strips of bakelite so you can mount on chassis.—GILBERTO GARZAC.

Stand-By Switch

On our signal generators in the lab we installed a stand-by switch in the B plus circuit so that the signal could be cut off when not wanted, yet was ready to use in an instant without warming up. This prevented an interfering signal from being picked up when we did not want one. Simply placing a toggle switch in the B plus circuit does the trick.—KENNETH C. DIKE.

A Good Kink

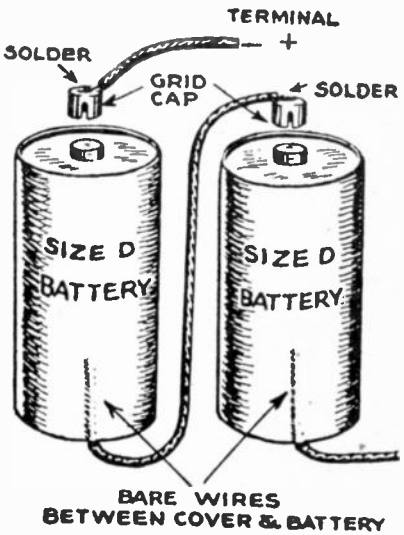
For beginners who want to learn the code, but who own broadcast receivers without a b.f.o. here's a good trick.

There are two simple ways to get regeneration and enable the set to pick up c.w. signals. One way is to wrap a piece of thin wire around the plate of the first i.f. tube and then wrap it around the grid of the same stage. Needless to say the wire must be insulated. Experimenting will indicate just the right amount of wire to use.

Another method is to disconnect the screen bypass condenser of the first i.f. stage. Either method will cause the tube to oscillate, thereby beating with c.w. signals and making them audible. —JOHN OLIVEIRA.

Quick Battery Hook-Up

Many times one desires to use flashlight cells without having to solder wires to the terminals of the batteries. One can



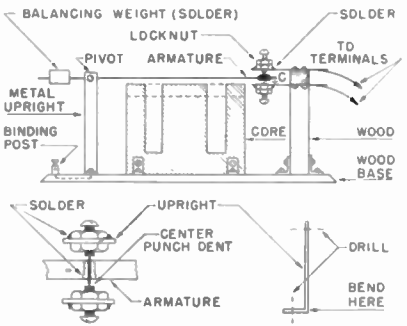
Grid caps make fine battery connectors.

avoid this by using grid caps for the positive terminals and a bare wire slipped under the cardboard cover of the battery for the negative terminals.—DON LIM.

Relays

This substitute for a high-resistance relay uses a core from an old audio transformer or filter choke with the core cut as shown in the dotted lines. Earphone pole pieces might be used also. The core is cut or one side is removed, and the windings left on. Both windings may be connected together for added impedance, but is not necessary, it being possible to use a transformer with a burnt-out primary by connecting the secondary alone.

Windings are not shown in the diagram for the sake of simplicity. The armature is of soft iron to prevent its maintaining magnetism. C is a copper rivet. Space between armature and core should be small for higher efficiency. The armature



Audio transformer converted into sensitive relay.

could conveniently be one of the laminations cut out to proper size and shape.

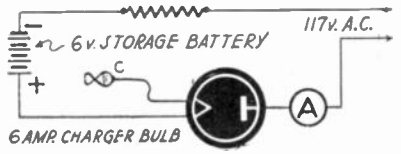
The upright for the pivot may be made up from an old lamination.

A Ford ignition coil secondary might be used with a few modifications in designs.—Giles M. Crabtree.

Battery Charger

You don't need expensive apparatus to charge your storage battery. You only need a 6-amp charger bulb and a resistance. The latter may be a 600-watt cone heating element with one-half the resistance wire removed and the remainder stretched to fit the cone form. This arrangement produces a 5-amp charge rate. If the entire resistance unit is used the charging rate will be about 2 amp. An inexpensive ammeter may be inserted at A to indicate charging rate.

To operate: connect clip C to one cell of the battery and as soon as the bulb filament glows, insert plug into a 110-volt a.c. outlet. When rectification starts,



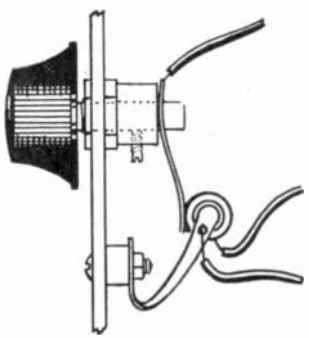
Simplest a.c. battery charger.

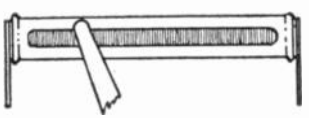
remove clip. Heat produced by rectification maintains the action.—Harold E. Bulmore.

Potentiometer

Some time ago I had need for a 10-watt potentiometer but could find none available. I made the following substitute from a 10-watt voltage divider.

From an old Atwater-Kent model 40 radio, I removed the outside mounted potentiometer, using the case, knob and wiper. As shown, the wiper (of springy



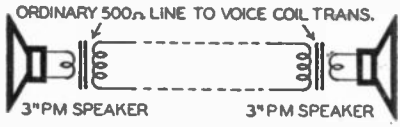


Heavy current potentiometer.

metal) moves across the turns of the voltage divider. The result is a smooth variation of resistance throughout the entire range. Adjust the wiper to make good contact yet little friction.—Dean Speidel.

Powerless Intercom

A good intercommunicator, for short distances, may be made without using batteries or switches.



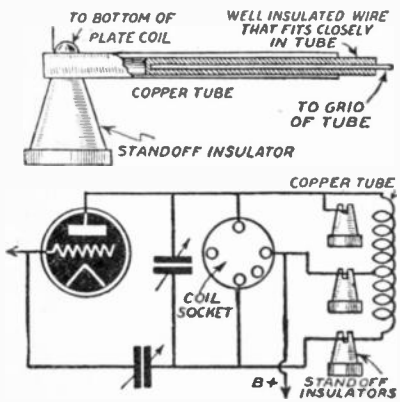
Simplest of intercoms—two PM speakers—plus two output transformers.

Two 3-inch PM dynamic speakers are connected to output transformers (500-ohm to voice-coil) and the primary windings of the transformers connected together by a line.

By speaking into one of the speakers, from a short distance, a voltage is set up within the voice coil and stepped up on the secondary. It is then passed through the primary of the other transformer and the voice coil is excited. This works remarkably well with the high-efficiency speakers which use alnico magnets. — E. A. CHAPMAN.

Transmitter Kinks

Kink number one is a home-made neutralizing condenser for small tubes such as 6L6, 2A5, etc. Take a piece of copper tubing 3/16-inch size as one plate and use a piece of well-insulated wire for the



Top—Low-capacity condenser.
Bottom—Standoffs for coil mounts.

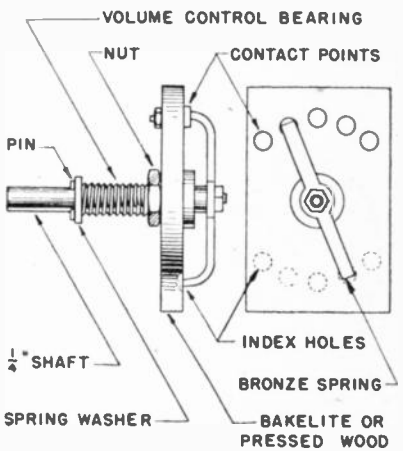
other plate. The copper tube is about 4 inches long, and the capacity can be varied by pushing the wire into the tube or pulling it out.

Kink number two is the use of two coil mounts for one stage in a transmitter. The idea came to me when I found that I could get much more output on 10 meters with a self-supporting copper tube coil, than with a coil wound on a coil form of the plug-in variety. I use a T-40 as the final on 10 meters, but when operating on the other bands the T-40 stage becomes a buffer amp and feeds a 203A final. As the 203A is link-coupled to the T-40, a coil of the plug-in variety was found to be the best suited to the case. I wired in a coil socket for the plug-in coils in parallel with the standoff insulators, which have large jacks for the copper tube coil.—GEORGE LEVENSALOR.

Multi-Point Switch

This is an excellent switch for a number of purposes, such as tone controls, band changing, meter ranges, etc.

Some volume-control shafts and bearings can be easily adapted to this switch. They have the spring washer and pin or split washer to hold the control arm tight.



Multi-point switch easy to build.

A square hole should be punched in the arm and the shaft riveted on. The ground connection can be made by putting a large lug under the nut.—DON LOTZER.

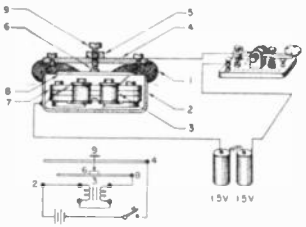
An H-F Buzzer

This buzzer produces an excellent high-frequency note and is not particularly difficult to construct. Any headphone unit will do, though a large one will be easier to work with.

Details are given below:

1. Telephone case cover (insulated).
2. Housing.
3. Telephone coils.
4. Brass plate (app. ½").
5. Fixing nut.
6. Silver contact.
7. Permanent magnet.
8. Diaphragm.
9. Adjusting screw.

The diagram tells the whole story. No



H.f. buzzer from headphone unit.

further instructions are necessary.—W. SNAJBERK.

Cuts Condenser Capacity

This plan will change an ordinary broadcast condenser into a low-capacity type.

A trimmer is connected in series with the broadcast condenser. This lowers the capacity, the amount depending on the size of the series condenser.

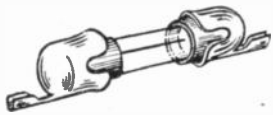
To change a 365-$\mu\mu$f to a 140-$\mu\mu$f condenser, use a 200-$\mu\mu$f condenser in series. A mica condenser or a trimmer type will do. For a 100-$\mu\mu$f condenser use 150 $\mu\mu$f in series, and for a 75-$\mu\mu$f condenser, 100 $\mu\mu$f.

This will work either with a single condenser or with a ganged unit. — EDWIN BOHR.

Novel Fuse Clips

It is sometimes desirable, in a radio set or especially in measuring instruments, to use fuses of the cartridge type to protect the apparatus from damage due to short circuit, overload or other causes.

In some cases there is not sufficient space for the usual fuse mounting. It will



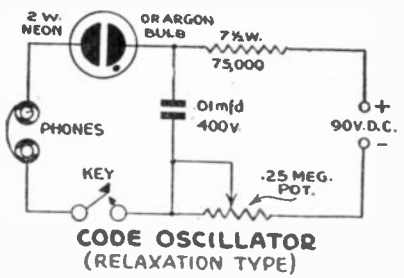
Grid clips make good fuse terminals.

be found that the grid clips, sold for use on metal tubes, will fit perfectly on the caps of these small cartridge fuses and require practically no space.—*New Zealand Radiogram.*

Code Oscillator

Illustrated is a simple but efficient code practice oscillator, which is ideal for code classes because it uses no transformer and does not require a tube and its filament supply. The note is not quite a sine wave, but it is very easy on the ears as there are melodious overtones.

The circuit is a relaxation oscillator which is almost foolproof. Some bulbs will work better than others and on the whole argon bulbs will be found to oscillate more readily than neon ones. If the lamp lights, but no oscillations occur, increase the value of the potentiometer in small steps until the oscillations do occur. If the light goes out before oscillations occur, try a new lamp or more voltage.



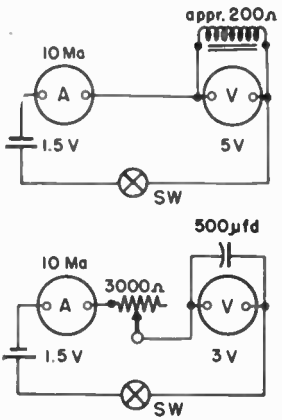
Code practice oscillator utilizing neon tube.

The current drain is very small, so small portable-type B batteries can be used. Even these will last almost indefinitely. —ROBERT HAUFE.

Phase Experiments

Here are two easily performed experiments to show the effects of an inductance and a capacitance on lag and lead of currents.

In the first figure, when the switch is closed, the voltmeter indicates far in ad-



"Lag" and "lead" of current are demonstrable with these simple circuits.

vance of the ammeter. The coil may be one of about 200 ohms d.c. or the secondary of a high-voltage transformer, (If a large condenser [400-700 μf] is added in series, both meters rise at the same rate, showing resonance.)

In the second figure the ammeter indicates first. The condenser may be about 500 μf and the resistor between 2000 and 3000 ohms. A 1.5-volt cell is sufficient for both experiments.—J. H. SHAY.

"Metallized" Panels

Old bakelite panels can be renewed if they are badly drilled up and scratched by gluing or cementing a piece of fancy gift paper (the metal embossed type) over the surface of the panel, then applying a coat of clear lacquer. Old bakelite dials from which the numbers or scale markings have been worn, may be renewed by rubbing tooth paste over the obliterated marks, then removing the excess. They will show up white as new and last as long.—ROBERT E. DESMOND.

(The Editor remembers distinctly his trouble in making a radio work in an apartment papered with a special dull-gold wallpaper. Only after noting sparks between it and the aerial of the a.c.-d.c. set did he inquire, discovering that the room was papered with a metal foil used for packing tea. A 3-foot antenna out of the window restored reception to normal.)

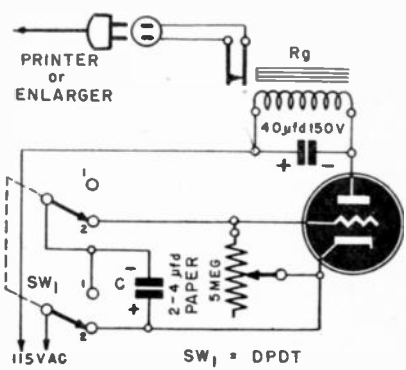
Fixed Crystal Detector

Obtain one of the very many types of adjustable crystal detectors available. Polish the end of the catwhisker with sandpaper and find the most sensitive spot on the crystal.

Now let fall a drop of collodion, used in aeroplane model making, and you have a fixed sensitive detector that will last for years without needing adjustment.—JOSEPH D. AMOROSE.

Print Timer

For photographic and other uses, this timer provides an accurate, dependable circuit to determine time intervals. With SW1 in position 1 the tube acts as a diode, charging condenser C. In position 2, the negative bias (which cuts off plate



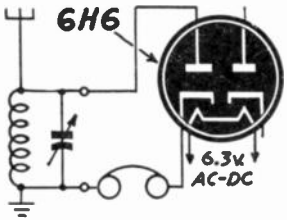
Adjustable time-interval circuit controller.

current) slowly leaks off and the relay opens.

The timing interval (during which the relay is closed) is controlled by the 5-megohm potentiometer, increasing as the resistance of the latter is increased. —JOHN YEAGER.

Xtal Adjuster

The crystal detector enthusiast and experimenter is constantly changing and trying new circuits and substituting components and coils of various sizes and



Diode detector useful in comparing crystals.

types. In making these changes it is necessary to adjust and reset crystals. Often a true comparison of the changes and substitutions cannot be made. By using one side of a 6H6 tube and heating it with either a 6-volt battery or a 6-volt transformer you have a perfect and stable detector. No other voltages are necessary. It works the same with the cathode or plate hooked either way in the circuit. For easy handling place the tube in an unmounted octal socket and solder leads to one plate and one cathode pin (either to pins 3 and 4, or to pins 5 and 8). Using Fahnestock clips this detector can be slipped in and out of the circuit very easily.

This is a little louder than the average crystal, but good crystals will equal its volume. This also gives a good check on the various crystals being experimented with. The compact size of this tube and socket makes it less bulky than some crystal holders and detectors.

The real crystal fan, however, operates without tubes and batteries and will therefore replace this 6H6 detector with his crystal after he has made his adjustment.—J. B. Tannehill.

Improving The Crystal

Some years ago I tried the fixed crystal detector in tubular form put out by Carborundum, and a little later tried their adjustable model, claimed to be permanently sensitive. Success was indifferent, and the crystals were abandoned.

Recently I got out the old carborundum crystals and started a few experiments. The old fixed crystal was supposed to have five pounds contact pressure. I removed the cap with the adjusting screw, mounted the tube in a vertical position, soldered a light flexible pigtail to the brass side of the chromium-plated brass slug and let the slug rest on the crystal *with its own weight only.*

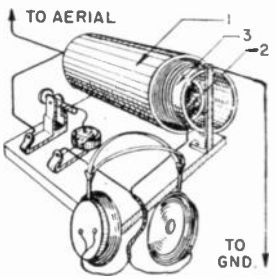
I find this to be a great improvement over either the fixed or adjustable types, and use it regularly. I sometimes lift the slug by its pigtail and rotate it a little, or jar the set, to revive sensitivity, but this need only be done at rare intervals.

In short, I find that chromium-on-carborundum, with *light pressure,* is the most satisfactory crystal.—H. R. Smith.

Canned Crystal Set

Most junk boxes have the necessary parts for this one. Use an old shield can (2) over which is fitted snugly the coil form (3) which has about 125 turns of No. 24 insulated wire. The form is about 2 inches in diameter. Another shield can (1) is now fitted over the coil, so that it will slide back and forth over the coil for tuning.

Use flexible wire for coil connections. Can No. 2 should be wrapped with gummed paper so as to provide a snug fit with the coil over it. I believe this design to be original.—John Haynes.



Shielded tuning coil for crystal set.

(Experiment has shown that operation is improved if the shield cans are slotted lengthwise with a slot about ⅛-inch wide.—*Editor*)

35Z5 Repair

Having quite a few old resistor line cords on my bench and several 35Z5's with a defective filament tap, I tried to use the resistance wire of the line cords

Repairing 35Z5 with open filament tap by winding resistance wire on base.

to repair the tubes, and it worked! I measured 30 to 35 ohms of the line cord resistance, and cut that piece off. I then connected one end of the resistance wire to pin No. 3 of the 35Z5 which is one side of the filament tap. This is brought up onto the tube base to the point where the bakelite base meets the glass. A layer of tape is then wrapped around this to hold it in place and to prevent shorting the wire to succeeding turns. The rest of the wire is wound around the base of the tube, beginning from the top and working down. After this has been completed, another layer of tape is wrapped around the entire winding, and the free end of the resistance wire is brought to the other side of the filament tap, pin No. 2. — DAVID FRIEDMAN.

(This idea is much more satisfactory than the usual repair job of jumping the tap at the base, and either doing without a pilot light or wiring in a separate light.—*Editor*)

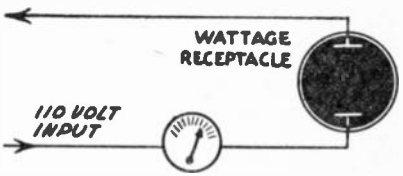
Wattage Receptacle

Most wattmeters require current transformers, expensive shunts and the like. I submit herewith one which is easily made from odd parts.

An 0-10 volt Jewell movable-vane type voltmeter was used. The meter coil was too high to use "as is" so we removed turns, to convert it to an a.c. ammeter. Light bulbs were used as a load, and the turns were removed from the bobbin, until a 50-watt bulb read half-scale. We now have a wattmeter reading between 0-100 watts.

When we get a receiver to repair we immediately put it on the wattmeter receptacle to see how much wattage it consumes. If the wattage is about the same as the manufacturer's rating, we know we can't harm the receiver by letting it run. If the wattmeter shows excessive wattage we immediately shut it off and the ohmmeter goes to work to find the "short."

The receiver may read slightly lower than normal and still be all right since the power factor of the average transformer is about 80%. Light bulbs were used for calibration since they are non-inductive and cause no phase displacement of current and voltage. For those who don't like to read meter scales,

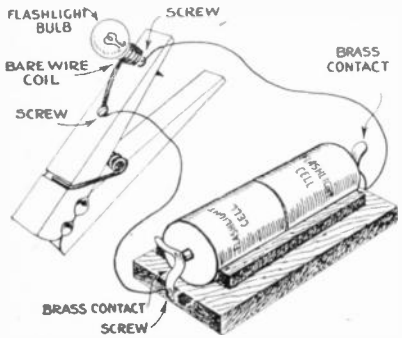


Current consumed by set is indicated on meter.

you can calculate the wattage by multiplying the current by voltage by 80% power factor.—GEORGE R. TARR.

Handy "Trouble-Light"

When making repairs or looking for defects, this clamp-on light made from a



This trouble-light can be clamped anywhere.

spring clothespin lends an extra hand to the radio mechanic.

To prevent splitting the wood of the clothespin, first drill a small hole about half-way through before inserting screws. Be sure to use heavy bare wire for the coil around the base of the bulb.

The uses of this device are practically unlimited. The battery holder can be made to hold more than two cells if desired. Almost any convenient length of wire can be used between batteries and lamp. Flexible twisted cord is good. — G. Bagdy.

Unique Crystal Detector

A single disc from a dry kuprox battery charger makes an excellent "crystal" detector. Use the copper oxide disc as the crystal and a piece of carbon or old motor brush as a catwhisker.

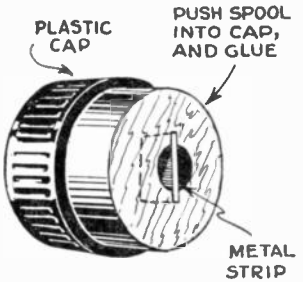
The carbon should be about ¼-inch thick and held to the copper oxide side of the disc with moderate pressure. I use a wooden spring type clothespin.— L. E. Shepard.

Knobs From Bottle Caps

Sometimes, especially in fixing up old or discarded sets, the serviceman needs a set of knobs. Sets of these can easily be made from plastic bottle caps, quantities of which can be found, in all colors and sizes, around the ordinary household.

All that is needed is a few empty thread spools and a strip of metal, such as clock spring or a steel from an old corset, about ¼-inch wide.

Simply trim the spool and cut it the size of the inside of the cap, then glue it in place. Cut a short piece of the metal strip and drive it into the spool across the hole, leaving enough space to fit the hole snugly to the control shaft of the



Plastic cap, plus spool section = radio knob.

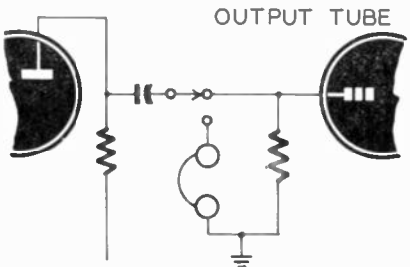
set. The whole idea is illustrated in the diagram.—R. W. Sockwell.

Headphone Adaption

For humless headphone reception from an a.c. radio, try connecting the phones in the power tube *input* circuit instead of the output. Quality will be better and volume loud enough for all practical purposes.

In some cases it may be found even better to go back to the first audio tube grid circuit, and headphones can be hooked into the phono input circuits of some radios.

A switch should be connected as shown in the drawing. A s.p.d.t. switch will both

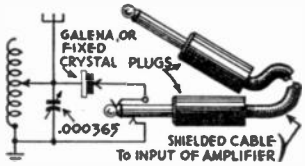


Phones connected to amplifier input circuit.

connect the phones and cut out following stages, silencing the speaker. — Peter Bedrosian.

Crystal Tuner

If you have a PA system or amplifier, this little tuner will come in handy. It can be connected directly to the input circuit of the amplifier and will give better than average reception.

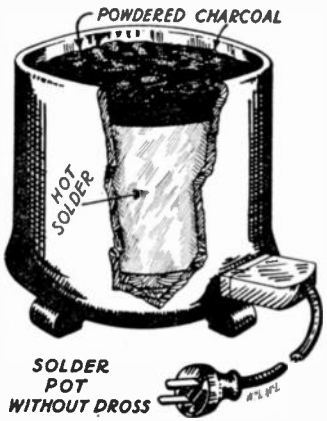


Crystal tuner for use with any amplifier.

The coil is wound on a form 3 inches in diameter, using 100 turns No. 24 cotton-covered or enameled wire tapped every ten turns.—A. LAPOINTE.

Dip Soldering

For production soldering by the dipping method, accumulation of dross is almost entirely eliminated by putting a good supply of powdered charcoal on top of the solder, as shown in the drawing. In dipping, the charcoal spreads away from the component being dipped and



To solder object, simply dip it in pot.

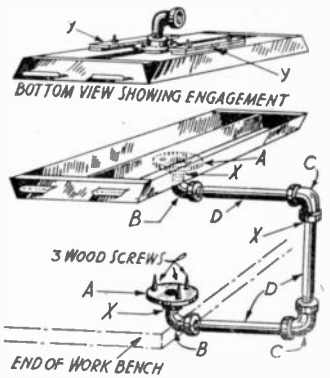
none is withdrawn on the tinned object.

The charcoal is gradually consumed and more should be added as needed. It is important to use wood charcoal powder. Do not use animal bone charcoal, as it retains grease and will adhere to the parts dipped.—WILLIAM LYON.

Handy Tool Tray

The tool tray illustrated is the one found in the usual metal tool box. By constructing a "goose neck" from standard plumbing fittings the tray can be kept off the Serviceman's work bench and, yet, can be replaced in the box for outside jobs.

One-half- or three-quarter-inch water pipe sizes will serve for the plumbing fittings required. These parts are commonly



Adjustable tool tray from pipe fittings.

used and can be obtained either from your local plumber or from the local hardware and plumbing supply store.

"A" is a base used for attachment to wood. Two are required. "B" is a Street Elbow. Two required. "C" is an Elbow. Two required. "D" is a six-inch length of pipe threaded at each end. It comes in stock at this length, threaded as specified. Three required.

Parts should be joined together tightly, except at the three points marked "X" on the illustration. These points must be a little loose to allow for easy swing. The weight of the tray will hold the rig firm.

At points "Y," tracks (grooves), are required to engage the inverted base. These can be made as shown from any available metal strips, or Bakelite. Standard radio bolts (6-32), will be strong enough.—WILLIAM LYON.

index . . .

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