



another MRL Handbook...

HB-8

# RADIO Kinks

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**AND**

# Quips

By Elmer G. Osterhoudt.

*You can't fix  
a light socket  
with a monkey  
wrench*



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by

Elmer G. Osterhoudt

"With Radio since 1915," including:

Radio Operator, R.C.A. Marine Service  
 Radio Mechanic, Maximum, U.S.N.  
 Technician, Electrical Products Corporation  
 Southern California Edison Company  
 Majestic Electrical Products  
 U.S. Motor Company  
 Manchester Radio Electric shop  
 Modern Radio Laboratories  
 Amateur and Radio Service  
 6NW (1919)

Litho. in U.S.A. by Modern Radio Laboratories

## FOREWORD

Few single ideas are new. However, combinations of these are new to most of us - and there are millions of combinations. By reading another man's kinks- and adding your own - we can often come up with a surprise! Almost any "complete" discussion you read - you can easily add something the other fellow left out.

Often we are quite amused at some of the kinks that are published. Many will not work - and some will get you into serious trouble. Any practical man can see what we mean. Here is a good example - and one that everyone used several years ago. It was the screwing of jar caps under a shelf. Jars were filled with screws and screwed into the jar caps. If you ever got one cross-threaded, and dropped it, you'd have a Duke's mixture of glass & screws. This can cause cuts- and a loss of time. We know - as we have dropped several! Place the screw jars on a 1x4 shelf, with a strip of Plywood extending up 1/2" to prevent them from slipping off. (We may have an Earthquake some day!) Other ideas are so complicated and not worth spending hours on in preference to going to the dime store.

Here's hoping our Kinks are practical - for if they are, you have saved some money.

Arrangement. Most Kink books jumble them all up - but we got an idea to classify them by each page for easier reference. Maybe it will help.

Jokes. S.J. Perlman, one of our wittiest men and Academy award winner, says: "I don't see much humor writing any more. The immensity of life is a deterrent. Everything today has assumed such a terrific shape and size that it dwarfs the individual & his point of view. The spectacle of a middle-man, trying to make a living, is the funniest - as well as the saddest." May we also add class consciousness for now we cannot kid anyone.

Radio, too, is getting to be a very serious business. Seriousness and technicalities dominate the average Radio magazine. So, we feel the Radio man can use a little humor with his business.

Humor is said to be something that happens to the other fellow - we wouldn't like ourselves. We can recall many of the situations that have happened to us. What's funny to one man - isn't to another. In the *Orphan*, it is funny to see a man drowning, but here it is pathetic - so it depends on one's point of view.

Anyway, we hope you will excuse the bum ones. Hi. And good luck with your experimenting.

## NATURAL WAVELENGTH OF "L" ANT.

Most of us have no idea as to what frequency our Aerials work best. We have figured an average natural period in meters, depending on height and length. The closer the Ant. to ground the higher the capacity - just like adding plates to a condenser. Add height and length of the flat-top in feet, and add percentage shown below. This will give result in meters. Consult a meters/frequency chart for the frequency. Lack of this - divide 300,000 by meters to get kilocycles (kc.).

20 ft. high plus length add 18%.
30 " " " 16%.
40 " " " 15%.
60 " " " 14%.
100 " " " 13%.

As an example, an Aerial 60 ft. long and 20 ft. high will have a natural period of 76 meters, or 3145 kc. and will work best at, or near this frequency.

There was the engineer who was so dumb he thought a Logarithm was a lumber song.

## A QUICK WINDOW LEADIN STRIP.

Slip a piece of 300 ohm TV transmission line under the sash and solder on leads. If using as Ant. only - solder 2 wires together. Or, one may be used as a ground and other as Aerial lead.

"My kid wants two things for Xmas - his Radio fixed and his violin busted."

## HI-GAIN FROM AERIAL.

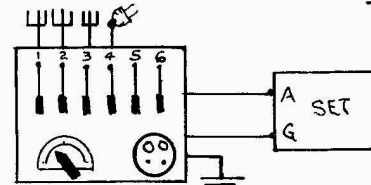
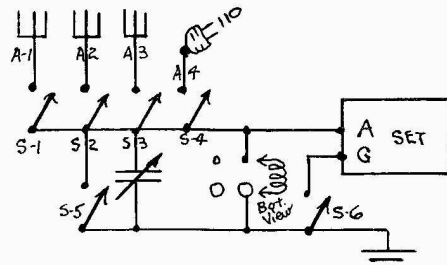


An old trick from midget mfrs. is to wrap pc. of hookup wire around second-ary lead and solder to pri. for greater volume. May be used across any coupled RF stage, un-tuned or tuned, crystal or tube set. More turns; the more signal. You get capacity and inductance, a form of link coupling. Use it on your set to obtain more volume.

## Aerials

## AN ADJUSTABLE DX ANTENNA SYSTEM.

We have long recommended the use of several Aerials and their individual hookup in the circuit



## 1. Unique Antenna System.

## PARTS LIST.

- 1 Compo. panel 5 1/2 x 7.
- 6 SPST knife switches.
- 1 .00035 variable condenser.
- 1 1 1/4" Bar knob and scale.
- 1 4 prong wafer socket.
- 1 Antenna eliminator.
- 1 Set A, or other coils.
- Hookup wire, etc.

to give better DX reception. By rigging up this board you may use one or more Aerials. Or you may use the ground for Aerial by using S-5 switch. Throwing S-6 switch grounds the set and cond. and plug-in coil acts as a signal booster.

A-1 Aerial is long outside; A-2 is short outside; A-3 is inside. A-4 is Antenna eliminator to the 110. Unit should be made a permanent part of the test bench.

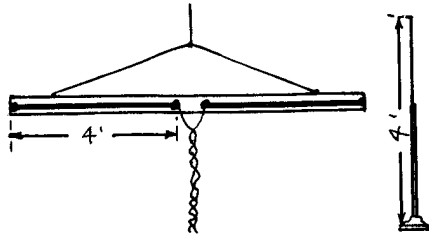
Radio announcer: "Now for the news that happened during the commercial."

RAISE THAT AERIAL to at least 10 ft. above buildings. Higher will increase DX reception.

## Amateur

## SIMPLE 5 METER "T" ANTENNA.

You might want to hoist up a 5 meter sky hook that is adjustable for height and direction. A



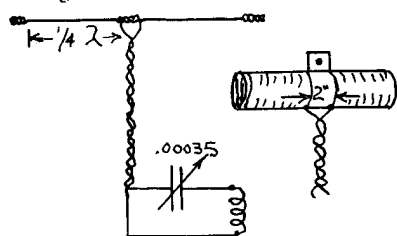
sketch is shown here. Make strip of wood 1x2-9 ft. long. Use 4' aluminum tubing on each side. Raise tubing up on small stand-off insulators that protect it in bad weather. Anchor 2-conductor twisted transmission leadin to them as shown. Every foot of height you can get will increase your distance a lot.

A 4 ft. telescopic Ant. may be used if desired, as it is non-directional. Aerials are getting to be more complicated.

Grandpa has heard so much against drinking that he refuses to buy any more batts. for his hearing aid.

## INSIDE DOUBLET FOR APARTMENTS.

Will work the same as outside, except you won't get the DX. Cut 2 lengths of enameled wire and



wind on - leaving 2" between the windings. Space them as much as possible. Wind in the same direction. You may make one for each band. Mount them up near the ceiling.

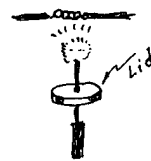
Each side represents a quarter wavelength with measurements as

follows: 20 m. 16½' on a side; 40 m. 33'; 80 m. 66'; 160 m. 132 ft. A .00035 variable condenser will allow finer tuning, as well as tuning to a harmonic.

Radio Man: "I'd better be getting back to the shop or I'll be late for quitting time."

## SOLDERING AERIAL IN HIGH WIND.

A simple trick, if you don't have a blow torch. Fasten some cotton waste on a piece of heavy wire. Slip thru tin lid 4 protection. Dip in wood alcohol, light and hold under joint as you solder. Will stand a high wind.



Will make a good joint as an iron. Iron is usually cooled by time you can get back up. Hi.

Doctor, to wife: "I don't like the looks of your husband."

Wife: "Neither do I but I am married to him."

## RECLAIMING PORCELAIN INSULATORS.

Mfrs. carelessly ship porcelain insulators in barrels like potatoes and they get chipped. With a soldering iron you may melt some white or brown sealing wax on the chips. Wax lays down good and smooth. Makes insulator look neater and keeps out moisture. It also helps to clean the soldering iron tip. Wipe off on a rag when iron is hot.

Autos don't grow on trees - they come from plants.

## IT TAKES TIME TO LEARN CODE.

Don't expect to learn it in a few months; it takes years to make a good Op. By all means, learn to copy on a typewriter. Even one letter at a time will show progress. The Navy teaches Ops. only with typewriters. Take all the code from tape you can get. Learn to send slowly; making each character distinctly. Get a friend to send to you and you to him. If you can read each other you are on the way to being a good operator.

## AUDIO

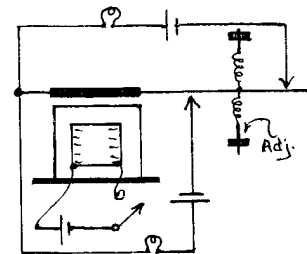
or low frequency chokes are audio transformers with but one winding. If you have a transformer unit with but 2 leads, it is always a choke. Likewise, one side of an audio transformer may be used as a choke. Try each coil for best operation. However, it may have the inductance but will not carry the current as the wire may be too small. It may soon burn out as a choke.

Radio, or hi-frequency chokes usually have air cores. Now they have made a slight change by using Polyiron, or powdered iron cores. These are tiny iron filings embedded in a binder and each filing has a North and a South pole. They are polarized after being embedded. So, in a strict sense, they are iron core chokes as we usually term them. The powdered Iron raises the inductance. An air core choke with DC resistance of 220 ohms has 80 mhy. inductance. One with powdered Iron may have 150 mhy. This is the same core as used in a modern Loopstick.

A Radio Man got a do-it-urself kit for Xmas, but he can't get the blame lid off.

## AF CHOKE AS A MAGNET.

By energizing with DC from a battery, or power supply, an audio choke becomes an electro-magnet. It may be put to many

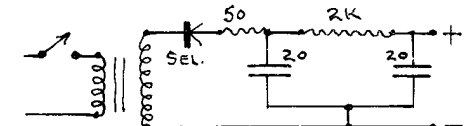


uses. You can magnetize your knife, tools, (watch!), etc. or use it as an electro-magnet pulling an armature. The armature may make or break a circuit or form a relay to control other circuits as shown above.

## Chokes

## CHOKES REPLACED BY RESISTORS.

Recently many cheaper power supplies have replaced chokes with resistors, as the 2000 ohm in diagram. This makes a power supply cost less money and take less space. It also reduces hum inherent in an Iron choke in the



filter circuit. The ohmage and wattage vary as can be seen if U compare values given in different circuits. Ohms depends on how much voltage you need - consistent with amount of hum you can stand. Amperage is controlled by the smallest "gate" in the series circuit. If your Selenium rectifier passes 100 m.a. and the resistor but 50 - then 50 m.a. is the controlling value and is the "gate" for the whole circuit.

Consult your tube manual and compare a 1C5 and 6V6 tube. Add P and SG amps. (given in m.a.) & multiply by volts shown. Plate is .007 A. plus SG .0035 A. is .0105 A. X 83 v. or .8715 watts. So a 1 watt resistor is OK.

6V6 P draws .030 A. plus SG of .004 A. totals .034 A. X 180 v. gives 6.120 watts. You should use a 10 watt resistor.

You should try different resistors as 1K, 2K, etc. until U cut the hum to correct point.

Teacher: "Where is the English channel?"

Johnny: "I don't know- we can't get it on our TV set."

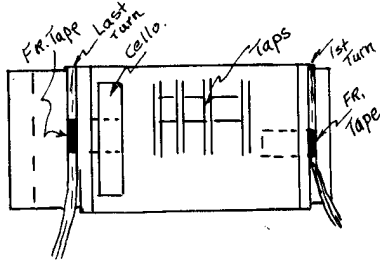
## ADJUST POSITION OF CHOKES.

In some sets and power supplies a hum may occur. If cores of chokes, transformers, etc. R close together the hum may be strong. Move them around for a minimum hum. Also, try reversing some choke connections so they will buck other iron core units, and be out of phase.

## Coils

### HOLDING XTAL COIL TERMINALS.

As described in our various publications, start winding Xtal solenoid coils with a 1" piece of friction tape looped around the first turn. Run ends of tape under the turns to follow.



For taps, just slip a piece of light cardboard  $\frac{1}{8}$ " wide under each turn to be tapped.

On last turn, leave a 6" end & cut wire. Form friction tape loop around last turn and lay it under the next to last turn. Then cinch up 2 last turns and place a piece of Cellophane tape over the loose end of friction tape to make a neat job. Paint light coil cement along edges of coil to keep it from slipping.

The Finance company was taking Old man Jenkin's TV set.

Kid: "Say, why don't you take my father instead?"

### ADJUST SELECTIVITY.

Any coil, with a primary winding, may be adjusted for selectivity. Fewer turns on the pri. will make it more selective. By pulling pri. away from sec. you sharpen it up. For real broad & loud signals wind primary over the secondary.

Then there's the undertaker who tries to look sad at a \$2000 funeral.

### COUPLING CHANGES TUNING.

Whenever you tighten up the coupling the tuning condenser will read lower, due to added inductance caused by the primary reacting with the secondary. If

your detector is coupled to the Aerial circuit this change is most noticeable. The more tuned RF stages you have, in front of the detector, the less it will affect the detector tuning.

A recent AP Science Writer, in July, 1958, wrote about two jet planes passing each other, and traveling at  $2\frac{1}{2}$  times the speed of sound. As they got closer they would "lose" each other's signal and part of the message. Possibly the writer did not know the cause of this "drift" caused by change of coupling between the two Aerials. Am sure the Air Force is aware of it. As coupling between coils will change the tuning - likewise with Aerials, which have inductance and capacity. Change of whistle tone of a locomotive passing is called the Doppler effect. Altho it is supposed to apply to all wave motions, we believe the jet difficulty is due to coupling.

Most midget Antenna coils have sliding primaries that may be secured with Cello. tape when U get the right selectivity.

### USING BAND SPREAD CONDENSER.

Place band/spread tuning condenser only across the detector tuning cond. of a TRF set. As you go back to Aerial the tuning gets broader. There is no need of a band/spread on BC bands. We like a 2 plate with plates separated about  $\frac{1}{4}$ " and with a  $1\frac{1}{2}$ " Bar knob and scale.

HI-GAIN, refer to AERIAL. See HB-6 on Coils for more data.

### FINE WIRE TUNES SHARPER.

You won't get the volume on coils with fine wire, but you do get more selectivity. Our Hi-Q plug-in coil sets use about 6 different sizes of wire - each 4 a special purpose and effect.

### THOSE COIL CEMENT BOTTLES.

You might not think they stick but when they do - tap the lid with a stick. Vaseline the lid and it won't stick.

If at first you don't succeed, that makes you about average.

## EFFICIENT CRYSTAL OPERATION.

Many write in asking if a 1N21 is better than a 1N34. Or if a Germanium is better than a Steel galena, etc.

Hundreds have told us their Steel galena beats any Germanium crystal made on DX. Others will bet their shirt that their Iron pyrites cannot be beaten for SW. All we can say is that it depends on the individual crystal. Nature performs miracles on one hand - but makes quite a conglomeration out of minerals. The resulting "impurities" are what makes sensitive crystals. Manufacturers of crystals find they have to add impurities to the pure element to make it rectify properly and be sensitive.

Testing a crystal on weak signals is a lot different than in a Laboratory. There a DC voltage is applied in forward and reverse directions and the ratio noted. Their Diodes are very sensitive on loud signals but are poor on weak DX stations. The "tiny flea power" furnished by DX stations is hardly measurable. It may be detected only by a crystal having certain characteristics and adjustments.

The relation between catwhisker and crystal is very important. A fine c/w, with a very light contact on a good crystal will bring in the DX. Factory type Diodes use a fixed c/w - which cannot possibly be effective on DX as it is too stiff & cannot be moved to a more sensitive spot. You can make a test on a loud local. Adjust the c/w for best volume. Then, turn to a very weak station. If you re-adjust your c/w you will find the volume has increased many times. This proves that fixed c/w are not the answer to weak DX.

However, if you're interested only in locals, with no adjustment problems, by all means use a fixed crystal or Diode.

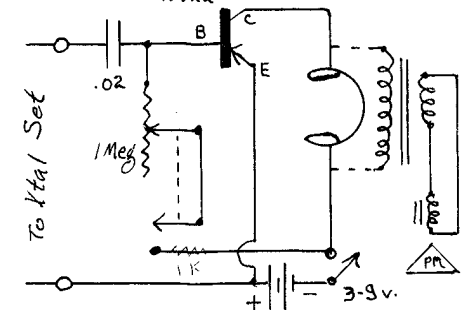
Wife: "Let's play a game."  
Husband: "OK - let's play Radio store and you shut up for the night."

## Crystals & Diodes

### AMPLIFY YOUR XTAL DX STATIONS.

Build a 1-stage Transistor amplifier to help bring in those weaker stations. As an amplifier the fixed Transistor crystal is just the thing, but we'll leave the detector to the c/w type. An output transformer to a PM type speaker may be used. If you can find a magnetic speaker - it will work where the phones connect. A switch goes on back of volume control and cuts out the bias. Mr. Heintze, of Louisiana, says it makes some stations better if it is cut out. The more battery voltage, the louder the signals.

CK-722



### PARTS LIST.

- 1 PNP Transistor.
- 1 .02 x 600 bypass condenser.
- 1 1 meg. volume control & switch
- 1 2000 ohm Imp. output transf'r.
- 1 PM speaker.
- 1  $\frac{1}{2}$  to 9 volts of drycells.
- 1 SPST toggle switch.
- 1 Compo. panel 3x3 if desired.
- 1 Small pointer knob.
- Hookup wire, etc.

### CUT CATWHISKERS FLAT.

Cut off ends of c/w with scissors to make them flat. Do not use pliers as they cut the wire to a knife-edge, as can be seen under a microscope.

### REVERSE CRYSTALS & DIODES.

When you get a weak DX station reverse your crystal to see if it can be improved. Different circuits pole differently, so we have found. We don't know why some act as they do.

## Condensers

Capacity is the property of 2 electrical conductors, when separated by insulation or dielectric, to receive and retain Electricity. Electricity charges the plates until released. The Aerial and ground form a large fixed condenser.

Dielectric, between the plates may be air, mica, paper, glass, oil, plastic, etc. Plates may be any size or shape and may be two or more. All negatives are together and all positives together. Condensers, with mica dielectric will take more than twice the charge of paper separators. Instead of dielectric we rate condensers with Working Volts (WV). Cond. of 600 wv. will have twice the thickness of paper we find in 200 wv. Ratio of Flash, or Test voltage to wv. may be 2:1 or better.

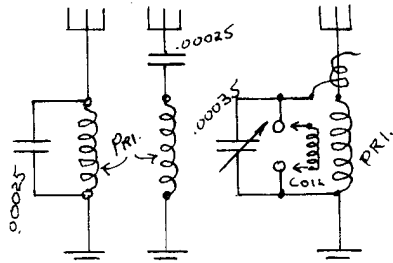
Plates - thickness makes no difference - only the square surface. Closer together, the higher the charge, or mfd. Likewise, more cond. plates turned in the higher the mfd. Bypass and filter cond. are rolled before impregnating.

DC does not go thru a condenser at all. Lo-F, as 110 passes only a little. Higher the frequency, the more it passes.

*We haven't had so much fun since the nurse put the sneezing powder in the anesthetic.*

### CONDENSER BOOSTS SIGNALS.

A .00025, or other size, cond. placed across A-G may help vol-



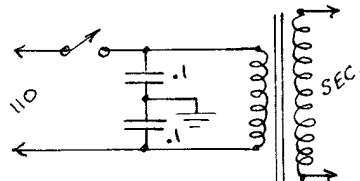
ume on Lo-F stations. A cond. between A and set will help the

Hi-F BC stations to come in. But the best rig is a booster with a .00035 condenser across a plug-in secondary coil. You can then boost both the high and low fre. stations without changing the dial setting. While boosting, it will also tend to cut interfering stations down in volume. The bottom is grounded but the top is capacitatively coupled by a few turns of hookup wire wound around the Ant. lead. The more turns; the more coupling.

*Radio Man: "Maybe a good day's work never hurt anyone - but neither does a good day's rest."*

### LINE HUM & INTERFERENCE.

On almost any power transformer set you can improve reception by connecting 2 .1 x 600 volt bypass condensers as shown. They



were necessary in the old spark transmitter days as "kickback preventers." Without them you'd always blow a fuse. Line noises tend to leak off to ground.

### SIZES OF CONDENSERS.

Tho some writers like to appear difficult - the following sizes will work for most sets. A grid condenser for SW, or all-wave sets should be .0001 mica. For BC, or Long waves a .00025. RF cathode condensers are .1. If you have a power amplifier stage then 5-10-20 mfd. x 25 to 50 v. will work - and keep down hum from the cathode. Coupling from P to G may be .002 to .02, but 600 v. once called stopping con. HF tubular ceramic tuning cond. run .5 to 10 mmfd. SW tuning cond. run .00014; BC are .00035; Long wave .001. Super-het. cond. are usually a gang of .00035 and .00013 for the oscillator, or other nearby combinations.

**PICROFARAD** - pf.  
is British for mmfd.

## DX

**Location.** If you're in a poor location near power line interference, or hi-powered stations, your DX will be very limited. If you're in a deep valley you will have a hard time getting over the hills - altho some here report good freak reception.

**Good set & circuit** is the next important requirement. Even under the best conditions a poorly-built set will not measure up.

**Aerial must be good.** In a City the length is usually limited - both by space and by Electrical length due to interference problems. Always height is more important for DX than length. At least 10 ft. above any building is the minimum. The preferred wave band may alter the length, especially if SW is desired. Keep Ant. away from trees, towers, etc. Use #12 solid Enameled wire if possible, and glass insulators. If you have limited space, make 2 or more wires 30" apart. If you want good pickup and selectivity both - make a "T" Ant. by running leadin from the middle of the flat-top.

**Ground.** If you're on an upper floor - a ground may be a detriment as it adds to the leadin length. If on the ground floor, you should hook up all the types of ground you can reach. Fix it so ground may be removed if desired. Water pipes make a quick ground, but a galvanized pipe in a wet flower bed may be closer.

**Large coils** have less resistance to weak signals than tiny ones. Keep them away from metal parts when you can.

**Good joints** are imperative. Sloppy soldering will give you lots of trouble. Always place a lockwasher under each lug so it can be tightened up when solder cools. Make screw joints tight, a fault we find with many jobs we have seen.

**Tubes and Crystal detectors** must be sensitive and be able to bring in those weak stations. If

you try different ones on DX stations you can see the difference. In DC set days we used to cart out dozens of 01-A tubes & found, by switching them around, the volume could be increased by many times.

**Good phones** will always pay for themselves. As most of us buy one set a lifetime - why not get a good one? If phones lose their magnetism - you won't even hear the weak stations.

**Time of day or nite** must be determined for certain parts of the World by consulting SW DX charts. Get the Orient in a.m.

**Patience** may be last, but most important. Tune slowly so you won't miss any. Go back over the dial for ones that just came on. Work on the weak ones.

*CBS film crews ran into difficulty when shooting an Indian's qdobe home. He refused to take down his TV antenna because he wanted to see "Broken Arrow."*

**Log it down.** Operate a Logbook by listing call, station, kc., dial and adjustment readings and date and time of day. You can then refer back to it later.

*A man was 'running off at the mouth.' A boy looked out and said: "Boy, that guy must have been vaccinated with a phonograph needle."*

### GET A GLOBE FOR DX.

There is no map that can give you the accuracy of a globe to measure Radio DX. We used to think we were getting London at 6400 miles, when it was really coming "over the top" at 5300. A good 10" globe can be purchased for around \$6. Make up a scale 4 it. Use pc. of dial cable to get the direct distance and transfer to the scale. It is amazing how reports of distances sent in can vary - sometimes by 1000 miles. Write your distances down.

## Grounds

### TRY A COUNTERPOISE.

Many are located in arid regions where the ground is very dry and it is hard to get a good ground contact. (British term is Earth.) Others may be on rocky ground where the same conditions exist as rocks are insulators.

In these cases one may string an insulated wire underneath the Aerial and about a foot above ground. This is used as a ground and acts as the other side of the "Antenna condenser." It is good for experimenting - even under good ground conditions.

When transoceanic land stations had massive Aerials - they also had miles of bare wire buried in the ground underneath the Aerials. This formed a sure connection for the ground.

If you are on an upper floor & must use an inside Ant. - fasten the Ant. wire around the room on the picture molding. Run the counterpoise ground around the room on the baseboard.

You might try an Antenna eliminator for a ground - as one side of the 110 is grounded. Gas, radiator, water and vent pipes may eventually get to ground - so try them all.

Solicitor: "Lady, may I interest you in a new TV set?"

Lady: "No - see the folks next door. We always watch their's & it is terrible."

### STRONG GROUND WAVES.

If you are within a few miles of a strong transmitter it may put out a strong ground wave. On BC stations it may be possible U cannot use your ground. Another way is to put a .00035 variable condenser between ground and set and control selectivity. If only a little capacity is turned in, it will tune sharply. A fixed mica condenser may be used once you find correct relation between Aerial and ground.

Electricity is bashful. It won't go anywhere unless it has a way to come back.

### SUBSTITUTE GROUNDS.

During the 20's - there were all kinds of schemes for substitute grounds. Old car radiators used to be buried but they usually resulted in corrosion noises. Rubber-covered housewire may be buried in a ditch. The insulation forms a dielectric between wire and ground. It is said to have some advantages. A counterpoise, raised on stakes, may be dangerous - so possibly if insulated wires can be buried they may serve the same purpose. An Aluminum pan dropped into a well or stream makes an excellent ground - but most of us are not handy to these conditions.

Phone caller: "Please check Ur TV station because there is some kind of school business coming over it."

### LIGHTING ARRESTER.

For an outside Ant. be sure to install a lightning arrester. It is not needed on inside Aerial. Be sure a heavy wire goes to the ground. You can twist several #14 wires together to get the same effect.

### WATER-SOAKED GROUND.

One idea is to sink some water pipes into the ground. Hook your ground clamp onto this. Have a fitting on top to attach the hose. Now and then give it a good wetting.

### GROUND CLAMP vs GROUND STRAP.

Some prefer one to the other. If your pipe gets rusty then be sure to use a clamp that digs into the pipe. Be sure galvanized pipe is clean when you use a ground strap. Solder the lead.

Many live wires would be dead ones if it wasn't for their connections.

### DOUBLE GROUND SYSTEM

Use one ground for the ground. A good distance away, run down another ground - and use it as an Aerial. Sometimes it has many advantages - no noisy reception.

## Hi-Fi

At home, my brother and I used to drive our poor Dad nuts. We had an Edison cylinder record phonograph. We used to reverse the belt and run it backwards. I see now we could have slipped the record on backwards to get the same effect.

### HUM.

The two worst disturbances on a Hi-Fi are hum and noise. Here are some of the causes of hum:

AC cables placed too close to audio lines.

Too much bunching of cables.

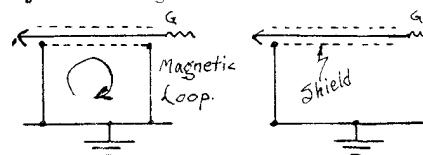
Condensers all, or partly gone out and not filtering.

Loose tube sockets.

Bypass the power line as shown under Condensers.

Reverse AC plug for polarity.

Shield grid leads and ground the shield. Avoid ground loops by breaking the shield and run-



WRONG

RIGHT

ning each to the chassis, or to one grounding point, as shown.

Loose tube shields.

Tighten clamping bolts running thru transformer cores.

Wires shorting to chassis.

Don't crowd the parts.

Edison invented the phonograph and Radio so people will stay up nites & use his electric lites.

### NOISE.

Noisy volume controls.

Clean records with brush.

Old records - be sure to use a scratch filter.

Speaker cone rattles by being broken. Repair with Heavy Coil cement or Cellophane tape.

Speaker cone off-center. Press to one side for a check.

Speaker baffle loose.

Loose joints - vibrating panel

Turntable rumble.

Check tubes for noise.

Keep turntable loose.  
Don't over lubricate.  
Cushion the amplifier.  
Keep stylus properly centered between pole pieces.  
Worn needles.

The gas and Electric bill of a local club went sky high. He found his ice-making machine was hooked to the hot water line.

### NO PERMANENT NEEDLES.

50% of records are lost due to careless handling. It is false economy to use cheap needles and there is no permanent needle. A 3 mil. needle is used for 78 rpm while 1 mil. is for 33-45 rpm. A diamond needle may run 1000 hrs. but is easiest on records. The records are made from Vinylite plastic and attract dust, etc. by static. Dust wears needles. A dust brush may be put on tone arm. Handle records by outer edge. Don't leave on turntable. Keep them stored flat.

"Say, Grandpa, why don't you get a hearing aid?"

"Well, Son, I can hear more now than I can understand."

### SPEAKER.

Low note waves, you can feel, are 35 ft. long and 30-40 cps. Hi notes may run 7/8" long and be up to 15,000 cps. A "woofer" is used for low notes; "squawker" for middle tones and "tweeter" for hi notes. Build a bass reflex cabinet for best tones.

Turk St., San Francisco, salutation: 'Hallo - I haven't seen U for a long distance.'

### DON'T FORGET THE CRYSTAL SET.

You will be passing up a good bet if you don't feed the output from a Crystal set into your Hi-Fi. The fidelity of a crystal cannot be duplicated. The nearest to it is an FM station. A crystal has a greater range than a tube, as can be seen when we have to add tone controls to tubes.



## Panels & Chassis

### DRILLING PANEL HOLES.

If you drill many panels, for a certain set or part, it is a good idea to use a template. Or, if you're doing a lot of experimenting you should make a template for each unit. This may include variable condensers, Xtl stands, switch levers & points, tube sockets, etc. Make template from 20 guage (.04") galvanized Iron. Punch with a center punch. Drill guiding hole with a #50 drill and circle hole with India ink so it is easy to see. Clamp template to your work and drill with a #50 drill. Remove template and drill holes right size.

Templates for variable condensers may be easily made, altho look hard. One Fan drills a  $\frac{1}{8}$ " hole for the shaft then he covers the back of panel with flour to show mounting holes. We believe our method is better. Make a  $\frac{1}{8}$ " hole in a light piece of cardboard and slip over the shaft. Punch holes thru and lay the template on the face of your panel and center holes. Easy!

When drilling Compo. or Plywood panels you often get a very heavy burr around the holes. You can clean them up with a model knife, as used for making model Airplanes. A large drill, held in your hand, is also good for cleaning off burrs from Compo. or metal panels.

Radio man: "Lady, you have a short circuit in your set."  
Lady: "OK, would you please lengthen it while I wait?"

### PROPER WIRING.

For flexible HF leads use 7/26 tinned Ant. wire for leads. The leads from variable condensers to coil use heavy solid hookup wire or busbar - the heavier the better. Use #22 stranded Plastic hookup wire from switch to the switch points of coil. Use #22 stranded hookup for battery connections out the back - solid wires will break later.

When soldering, use nothing but Rosin core solder - English

Tri-sol seems to be the best. Tin stranded wire before cutting and it will fit into soldering lugs, socket prongs, etc. better and quicker. If soldering house-wire, cords, etc. you can wrap some Steel wool near the end to break the heat from the insulation. Hold the Steel wool with a clothespin. Mount Electrician's plastic tape in a Cello. tape dispenser - it works good and is always handy to start the tape.

Cabinets may be stained and waxed with Shoe polish - blending it for the right color. It may then be polished with a rag.

Radio Ad: "Large surprise Radio assortment \$4.95."  
(Boy, won't he be surprised?)

### DIALS.

Dial etchings, after cleaning out, may be filled in several ways. A China marking, or Crayola pencil may be rubbed in the grooves. A cloth, dampened in cleaner or Kerosene, may be rubbed over letters to make them adhere to the dial.

Shellac, thinned with Wood alcohol, may be painted over the grooves. Rub chalk in grooves & wipe off excess chalk and Shellac for a neat job.

The Navy makes sticks of melted Paraffine and chalk to fill up the grooves.

Sign, on Radio store: "During alterations - there will be NO business, as usual."

### SHIELDING.

It is not necessary to use a metal panel. If you use a tin shield between condensers and volume controls and panel you can shield it enough. Crystals, switch levers & pts., etc. need not be shielded. Therefore, a Compo. panel works fine and will take markings well. It may be sprayed and lettered with India ink. No need for insulated bushings to prevent shorts. Panel acts as a baffle for speaker.

No, my friend, a Pee Wee clip does not take the place of a baby's safety pin.

## PHONE TIPS NO LONGER CLICK.

Years ago we used to touch the phone tips together to test out super-sensitive phones. Fans say they "get no clicks - why?" We wrote Trimm Mfg. Co. and received a nice letter from Paul A. Bottorff, the owner, from which we are quoting:

"The reason for the producing of a click, in the first place, arises out of the fact that the phone cord tips are usually plated out of Nickel, and Nickel plating, in times past, was rarely non-porous. If the tip was wetted by an Electrolyte (or saliva) a battery couple would be produced between the brass metal and the Nickel deposit. In more recent years, the quality of the plating has gradually become improved by reason of technical processes.

"Another factor, that influences this to some degree, is the fact that most of the pins today are manufactured out of sheet stock. The pins are drawn instead of being made out of rod stock. The rod type of metal can not be plated as successfully as the sheet stock and this results in a more impervious layer of plating on the pin. At any rate, the reason for the lack of a click, or the presence of one, isn't actually related to the headset itself but is related to the question as to whether or not the plating happens to be totally impervious, or not, to water. Porosity gives a similar action of a battery and the tiny current is heard in the phones."

She reminds me of a telephone switchboard. When she walks all her lines are busy.

## HANG UP YOUR PHONES.

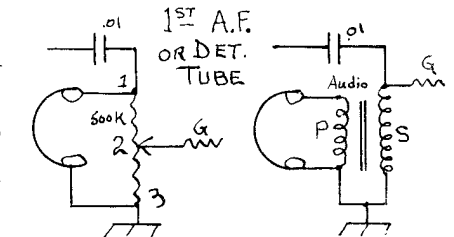
Don't abuse them. Hang them up on closet, or coat hooks. Wind the cord around headband. Caps may get broken or diaphragms can pick up filings, etc.

Fan: "Send me some literature. I am a stark, staring-mad, naked beginner."

## Phones

### MICROPHONE FROM PHONES.

An old kink but diagram shows how easily it may be done. Use magnetic phones only. Phones may be connected to point 1 or 2, whichever works best. The volume control is usually 500,000 ohms.



Headphones must be strong or you will have to talk loudly. Another way is to run a phone into an audio transformer, with the secondary taking the place of the volume control. This will prevent body capacity, see next --

### BODY CAPACITY IN PHONE CORDS.

This may be eliminated by using an output transformer from the power tube to phones. Besides cutting down body capacity it will save your phones. Phone cords may also be shielded to cut body capacity. A higher impedance transformer secondary is better for phone operation.

In the difficult Urdu, India, language Vidyudwanekshepakano-grakayantra means Radio. That's one place I'm not going!

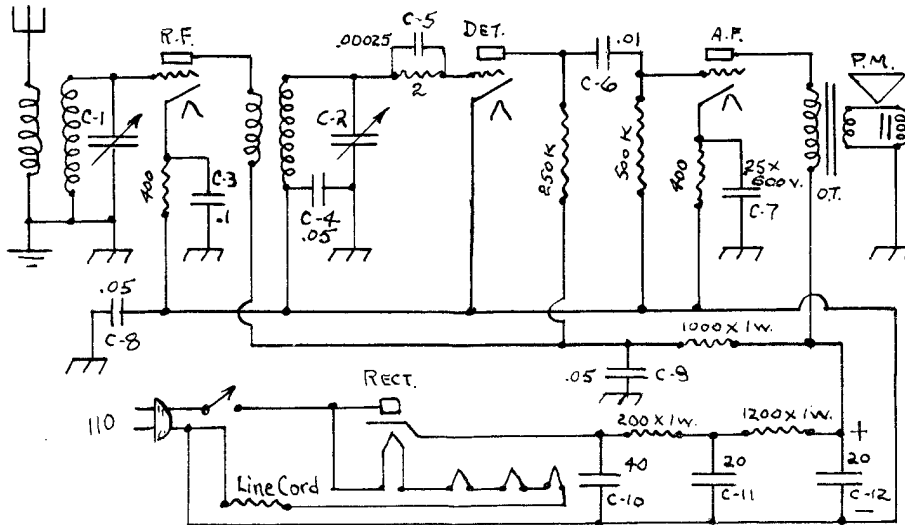
### REVERSE DIAPHRAGM OCCASIONALLY.

It may make your phones a bit more sensitive if you turn the diaphragm now and then. Be sure it doesn't touch pole pieces. We have covered phones pretty good in our Handbook #1.

### OBSERVE POLARITY ON CORDS.

Run the red tracer cord to the positive side of the battery and the other toward the Plate of the tube. This boosts magnetism instead of taking it out.

## Power Supplies



We'll give this page to a most important subject concerning power supplies. The use of line cords to cut down filament voltage in midget sets has become almost universal. However, many of these sets are built so they are dangerous to handle.

One side of the 110 is usually grounded to the chassis. In case you have wet hands and feet, or hook a ground onto the set, you may have serious trouble if the chassis happens to get hooked to the hot side of the 110.

We have drawn the circuit so B- and B-plus are above ground (not hooked directly to chassis) which will lessen any danger. All values are not shown, but just the general circuit. Values are not critical in most cases. You will note that condensers C-3,4,7,8 all go from B- to the chassis so the RF can get a return to ground. Be sure to use paper condensers because all electrolytics are partly shorted thru the chemical.

Also note that cond. C-1,2 have their frames grounded. The coil for C-2 is above ground, but the HF current passes thru cond. C-4. Cond. C-7 is usually

25 mfd. x 25 or 50 volt, but this is an electrolytic, so we R substituting a .25 mfd. x 600 paper condenser.

A Selenium rectifier may be substituted for the rectifier tube. In this case put a 50 ohm resistor between Selenium and the 200 ohm filter resistor.

No volume control is shown but it generally is a 10K ohm working between RF cathode and Ant. coil - note your circuit.

## CENTER-TAPPED FILAMENTS.

The first AC tubes used  $2\frac{1}{2}$  v. filaments. In this case it was necessary to center-tap the line or in the transformer. Now they use more 6.3 v. Tubes and it is no longer necessary to worry about this. One side of the fil. winding is grounded. In fact, some transformers using 6W4 tube connect them inside and tend to confuse the builder. Transformers using a center-tapped secondary usually use a tube rectifier. Ones without a CT may be used with a Selenium OK.

Because 6.3 v. tubes draw so much less current - the transformer doesn't heat up. It uses smaller wire for the winding.

## Resistors

## COLOR CODING RESISTORS.

With a little care, you can color code resistors with some Crayolas and a soldering iron. When you change colors be sure to wipe off the iron.

A better way is to have some lacquer of various colors. Do all of one color at a time.

A better way for the Experimenter is to wrap a resistor with Cello. tape and write the resistance with India Ink, then there is no guesswork. If you're wrong - it may be changed.

## BROKEN NICHROME ELEMENTS.

For broken rheostats, wire-wound pots., etc. just sprinkle some powdered Borax on the joint and melt with soldering Iron. It will form a weld.

## MOTOR BOATING.

Not the "putt-putt" you hear on Sundays - but the one that drives a Radio man nuts. Use a variable (say 500,000 ohm) for grid return resistors in an amplifier. When you get it right, you can measure it and replace with a fixed one. The plate resistor is not too critical. Each tube may vary a lot and you can get more volume and better tone if the grid resistor is right. U may use anything from  $\frac{1}{4}$  watt up for a grid resistor.

When typing Del Rio - I accidentally wrote 'Del Riot.' I'd never thought of it myself, but the typewriter did.

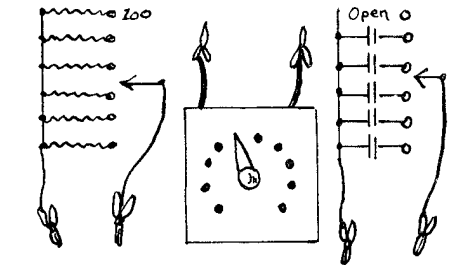
## IMPROVE REGENERATION CONTROL.

We used to bridge the 2 outer lugs of a regeneration control with a resistor of some sort. It tends to lengthen the life of a control as most of them are made of carbon in a binder. If you have a 50K vol. control - then put a 100K across it. Regeneration will also be smoother.

On the back of a Radio truck: "Volts Wagon." Another one sez: "Made in Las Vegas from slot machine parts - the hard way."

## RESISTOR SUBSTITUTION BOX.

Make a small box with a switch lever and points on it. Connect up a bunch of resistors and mark their resistance on the front by each point. When you are trying out a circuit - put the clips across the circuit - and locate



the resistor that works best. You can use resistors as 100-500-1K-2500-5K-10K-25K-50K-100K-250K-500K-1 meg. Put clips on the end for quick connections. You can also make one for fixed condensers, as follows: Open-.0001-.00025-.0005-.001-.002-.006-.01-.02-.05-.1-.25-.5-1, etc.

## ACCURACY NOT REQUIRED.

Many specify an exact resistor size. This is not necessary unless you are building a meter, and then you want them wirewound and close. Resistors run between 5-20% accurate - the closer ones costing more. Inasmuch as tubes, volume controls, etc. have to be adjusted anyway - there is no need for anyone specifying a resistor of 390,000 when 400,000 wouldn't make any difference.

## CATHODE RESISTORS IMPORTANT

If you'll refer to tube books, you will find a Resistance-coupled amplifier chart. This shows the correct cathode resistor to use under different B voltages, coupling condensers, bypass condensers, etc. Looking at these charts will save you an education in Engineering, as it is all figured out. Can really say that these values are not at all critical - so do the best you can with values shown.



## Shop

### CHEAP FLOOR COVERING.

Over the years we have used all kinds of ideas, next to our bench, to keep from standing on the cement. A wooden rack can do but you drop parts down in the cracks. Rubber matting gets all kinds of screws, etc. embedded in it. Now we use a large piece of strawboard and find it best. It is very resilient and may be renewed later.

### CONTROLLING DEPTH OF DRILL.

Fasten a collar, with a set-screw, onto drill the depth you want to go. Easy to adjust.

### SOLDERING IRON TIPS.

Everyone has soldering Iron tips. Put Aluminum sheet under the Iron to protect bench. - Use Iron to loosen old screws. It expands screw. - For stuck tips, soak in Ammonia a few minutes & it will come out. - For small parts, wrap a piece of #14 bare copper around tip and let it extend. Sharpen it like a pencil. Lay Iron down when soldering fine parts. A Magnifying glass can be used to check. - If your rubber soles get smooth, run the Iron back and forth for grooves. - Soldering in cold weather you hammer solder to flat strip.

### BLOW OUT THE DUST.

Unsolder the can, underneath a fly sprayer, and use the blower to clean out dust from Radios.

### SPEEDY TAPPING.

When tapping a lot of parts we put the tap in a hand drill. Be sure to keep plenty of oil on the drill. Go easy the first two turns. Much quicker - truer.

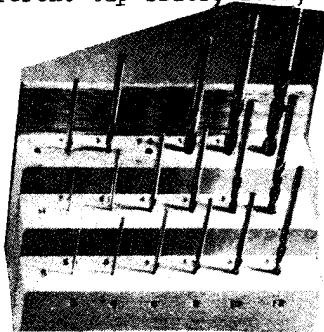
### IDENTIFY SPINNER WRENCHES.

Don't you always grab the wrong one? We colored the handle of each with different colored Lacquer. Albeit we have lost many days, the past years, by always grabbing the wrong one. We have a slanting rack, with lots of holes bored in it, on

the back of bench. Keeps tools out of the way. Keep a nutcracker in the assortment to start bottle tops, large nuts, etc.

### WATCH THOSE DRILLS.

Make up a drill rack from some blocks of wood. Label each for size. We also label them for different tap sizes, i.e., if we



want to make a 6-32 tap we know which drill to use without looking it up. - Keep all drills in sharpened condition; it makes Ur work so much better. - Drill a little larger hole, it helps.

### USE THOSE CLIPS.

Alligator clips, fastened onto parts, help in making tests. On small test junctions you may use paper clips temporarily.

### KEEP 110 VOLT CONNECTIONS GOOD.

We found a loose bolt and nuts thru a wooden panel, that carried hi-amps. had burned out the hole. It could have caused a fire very easily.

*Lady, in Radio store: "If I carry it home myself, do I save the carrying charges?"*

### SMALL PARTS TRAY.

Take a piece of Tin and bend it according to sketch. We assume you keep screws, etc. in jars. After you've looked them over (and never found it!) just pour them back into jar, instead of on the floor.



## Speakers

### UNIVERSAL OUTPUT TRANSFORMERS.

Many ask "what connections do you think work best?" There is a definite set of connections for each condition of match, as can be determined by an expensive Impedance meter. However, you can try various combinations until you get the most volume. The secondary connections determine the load on the tube connected to the primary. Most Universal outputs have about 6 lug taps on the secondary and their impedance readings are as follows:

Single	Push-pull			
Pri.	Sec.	P. Imp.	Sec.	P. Imp.
0-0	1-4	2000	1-6	4000
0-0	1-2	4500	2-5	9000
0-0	3-6	5000	1-4	10000
0-CT	1-5	7000	2-4	14000
0-CT	2-5	8000	1-3	16000
0-CT	1-4	10000	1-2	20000

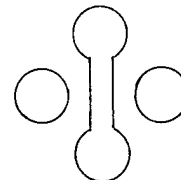
O means outside; CT is center-tap. Push-pull is standard.

Adjust set to moderately loud station and try secondary to the voice coil. When loudest, try the primary, and then go back to the secondary. Or, you may look up Plate load impedance in your tube book and set it from above.

*Student: "I'm making progress in Trigonometry - now I learned how to spell it."*

### USE A BAFFLE.

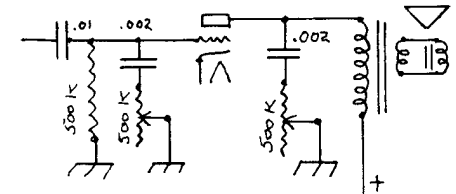
Pick up a piece of  $\frac{1}{2}$ " Cellotex or soft Masonite, etc. to use as a baffle. Place it between your speaker and panel, after you cut a hole for it. Check tone and operation by tightening or the loosening of screws to panel. A design of hole in panel should be like the following sketch, as we got from Australia. This arrangement is supposed to give U better tone.



### REGULATING TONE.

A simple way is to put a mica condenser, about .001 to .006, across the primary of the output transformer.

There are many methods of making a tone control. Most all tone controls use a potentiometer in series with a fixed condenser. A volume control usually works on the center-tap.



Tone controls placed in the Plate circuit have a tendency to burn out. Ones placed in the Grid circuit are to be preferred for this reason. Usually 500K ohms in series with a .002 is OK, but you can try different condensers - as each circuit is different.

*Customer, looking at an \$899. color TV set: "This is the first time I've been glad I'm color blind."*

### RATTLING CONES.

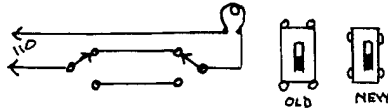
From use, climatic conditions, and other causes - a cone may split - usually at the seam. A quick repair can be made with a piece of Cellophane tape. Another way is to cement a piece of paper over the seam with Heavy coil cement. Another cause of noise is an off-center cone. If you can slip the cone sideways this can be remedied. Moisture may cause the cone to be pulled to one side. Often the core will pick up filings that can become wedged between cone and core. A magnetized screw-driver can remove these easily. A speaker can be re-coned, but unless it is an expensive one, it won't pay, as they charge so much for the job.

*Daffinition. College bread is a 4 year loaf made from Dad's dough.*

**Switches**

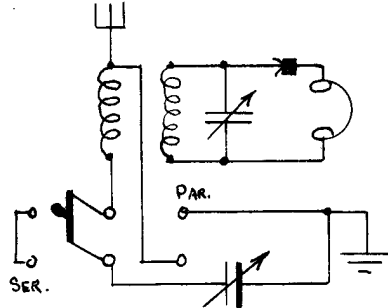
**2-WAY 110 VOLT SWITCH.**

One of the Electrician's pet circuits is a 2-way lite switch. They make them a little different now, but the principle is still the same- 2 SPDT switches.



Test your switch with an Ohm-meter first before installing. U know these - where you turn your lite on, and then turn it off down the hall. Saves steps.

**SERIES-PARALLEL TUNING SWITCH.**

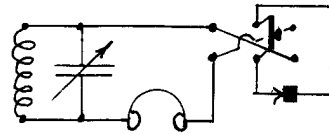


When Honeycomb coils were used and tuning was done both in the primary and secondary - we used one of these switches. It may be a knife or toggle switch, but the latter may have contacts too close. You wind the primary the same size as secondary. It may be wound over the secondary. You throw switch to one side and it puts the condenser in parallel, across the coil. Throw it the other way and it puts condenser between coil and ground. Condenser may be put in the Ant. side, if desired. In parallel, it will boost the stations and make it more selective. In series, it'll tune the Hi-F. stations. Switch may be used in other circuits.

Announcer on Radio was recently talking about a shipyard on strike, where the 'ship lifters' (shipfitters) asked for a raise.

**POLARITY REVERSING SWITCH.**

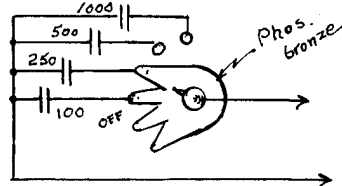
This DPDT switch may be knife or toggle. It is good for checking a crystal - to see if it



works better in one direction than the other. Other uses for it may be found.

**CONDENSER SHORTING SWITCH.**

This can be made from light brass, or phosphor-bronze. Cut



"fingers" as shown. The farther it is turned in - the greater the added capacity. Many uses.

**STANDBY SWITCH.**

When sets were broad as barns we used a standby switch. Nothing but a SPDT switch that throws a broad circuit in or a sharp circuit. Spark code stations tuned all around a certain point, so if a station called you - it could be heard in the background and switched over to selective. With present sets you can have a broad side working on the grid, or direct to crystal. To sharpen it up - you can throw over to a primary circuit.

"That Transistor Radio I got sure is fine. I tried to shave with it for 2 months before I found out what it was."

**KEEP SWITCHES IN CONDITION.**

Most switches, including knife and coil switches, may be made to work smoothly by wiping a little vaseline over the contacts with a rag. The rag will always leave a thin film - not enough to break the circuit.

**Television**

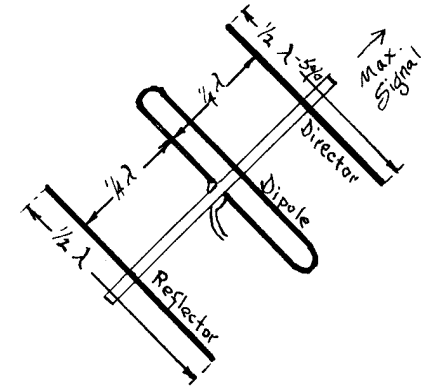
**TO BOOST CERTAIN CHANNELS.**

We have made a few experiments with our Sears 24" TV. We took a piece of Aluminum foil 2" x 4" & wrapped it around our leadin. It was flattened out - and we could slide it along. It cleared up the stations, especially channel 7. It was effective over about a 6" length of leadin. If too close or too far away - it tended to blur the picture. It is a simple idea that may help you. It tunes the signal like a booster.

Ch.	Feet	1/4 wave	Ch.	Feet	1/4 wave
2	7-11 1/2"	4-3 3/4"	8	2-5 1/2"	1-4"
3	7-1 1/2"	3-10 3/4"	9	2-4 3/4"	1-3 1/2"
4	6-6"	3-6 1/2"	10	2-3 3/4"	1-3"
Mid	6-4"	3-5 1/2"	11	2-3"	1-2 3/4"
5	5-8 1/4"	3-1 1/4"	12	2-2 1/4"	1-2 1/4"
6	5-3 1/2"	2-10 1/2"	13	2-1 1/2"	1-1 1/4"
7	2-6 1/2"	1-4 1/2"			

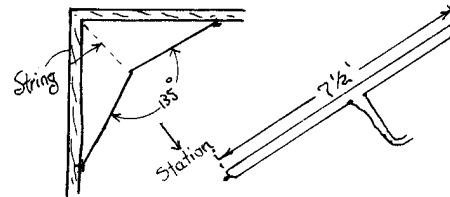
**ANOTHER BOOSTER FOR LEADIN.**

Harold Woods, Oregon, writes that he uses this gimmick to clear up noise and picture distortion. He cuts a piece of 300 ohm transmission leadin and puts it on leadin terminals. For channels 6 and 12 he uses 12". On 13 he uses about 36". He puts a bit more on each one and cuts them off 1/4" at a time until picture or voice clears up. It just hangs down from the back of set. So make one for your worst station.



**A QUICK TEST TV AERIAL.**

Cut a piece of 300 ohm line 7 1/2 ft. long and solder ends together. Cut one side in the center &



bring down leadin. Place it in room in position shown. It will be a good test for indoor Ant.

TV is a great thing - but it will never replace the old-fashioned keyhole.

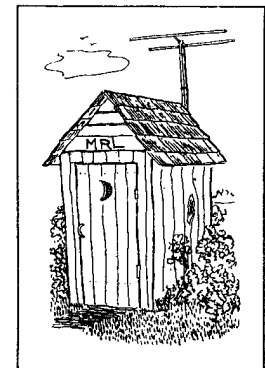
**HALF WAVE TV DIPOLE AERIALS.**

The straight rod Dipole tunes sharp but the folded Dipole is broad tuning - and therefore is preferred, as it takes in nearby channels. Following are overall lengths of folded Dipoles for each channel:

The Reflectors and Directors R placed 1/4-wavelength from the Antenna. Reflector is equal to a half wavelength (or twice the 1/4) in length. The Director is equal to a half wavelength less 5%.

Once we could only hear Static on a Radio - now we have to SEE it on TV.

"Let's play cops and robbers. I'll be the cop and you be the TV repairman."



**Testing**

**ECONOMY VS A-1 JOB.**

Fellows doing Radio service work should adopt the following rule in pre-pricing jobs:

**Economy job.** Replacing the bare necessities in a Radio with no guarantee.

**A-1 job.** Thoro check of set. Replacing all parts that have a habit of going out. Test run for a reasonable time. Guarantee job for 90 days.

Many times we could have gotten a lot more for a job as customer admitted he'd pay more. U can figure prices of each.

**DOWELS & READING GLASS.**

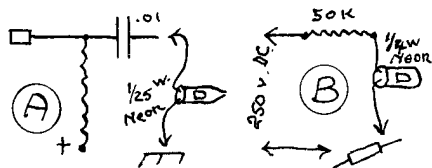
3/16 or 1/4" wooden dowels make good "pushers" for checking your loose connections, rosin joints, etc. Do not use screwdriver or U get shorts. Use a magnifying glass to watch joints move.

**SPARK PLUG TESTING WITH NEONS.**

You can watch each cylinder fire by attaching a 1/25th watt Neon wire to each plug. Wrap the pigtails around the rubber insulation of the plug wires.

**NEON TEST FOR COUPLING CONDENSER**

(A) shows a 1/25th watt Neon hooked after coupling cond. Watch it for flashes when set is on.

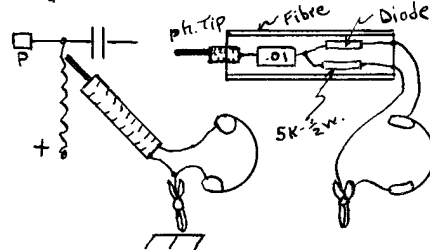


(B) A 50K x 1/2 watt resistor in series with a .25 watt Neon will check condensers if hooked to a 250 v. DC supply. Resistor protects the Neon. If it flashes on and off - cond. leaks. If it stays on - it is shorted. When a larger cond., as .25 mfd. is put on, it will flash for an instant and go off. Cond. is still Ok. It will not test Electrolytics as they are chemical & shorted.

**TEST YOUR TUBES** at least every six months. it pays.

**QUICK RADIO CHECK.**

On a multi-tube Radio, if you get no signal, start from the output transformer first. We have found lots of them out. Touch each grid right back to the 1st tube. This quickly shows which stage is out.



Rig up a simple signal tracer into a fibre tube about 6" long, as shown in sketch. Touch it to Plate of any stage and you can see which is dead. Signal tracer use - start from the front end. Why buy an expensive tracer?

Engineering student to Prof.: "How do you figure women on a slide rule?"

**TESTING VARIABLE CONDENSERS.**

During mfr., many condensers have filings between plates. We put a 50 w. lamp in series with 110 and check them. You can see the current burn them out. Keep one hand in your pocket, or be careful, or you'll get knocked on your ear!

**TEST LEADS.** Keep good 5' Test prod wires made up. Have several sets with fittings. Hang them on a coat hook near the bench.

**TESTING YOUR GROUND.**

Make up a 110 v. test lamp and hook to ground and 110. Try each side of 110. If it lights your ground is OK. If no light at all - you haven't a good ground.

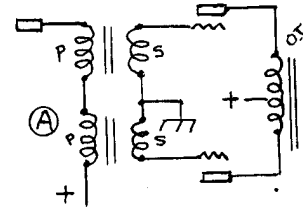
**TESTING FOR POLARITY.**

You might not have a voltmeter handy and would like to test the polarity. Place leads in water, seasoned with a little salt or vinegar. Bubbles will come from the negative side.

**Transformers**

**SUBSTITUTING FOR INPUT TRANS.**

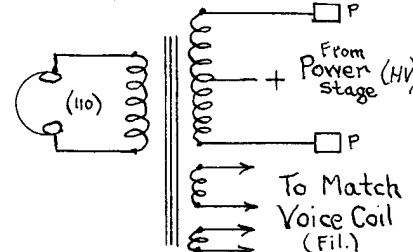
It seems easy to get a push-pull output transformer. If you need a push-pull input in a hurry, and happen to have 2 audio transformers, hook them as (A). You might have to reverse one of the pri. (or sec.) winding so it won't buck.



Many circuits now use a resistance network to take the place of the push-pull input trans. As grid current is more easily controlled - this works OK.

**COMBINATION OUTPUT TRANS.**

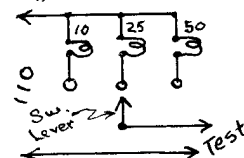
If you have a small good power trans. you can use it as an output trans. Reverse it and use the Hi-voltage side for plate coil.



Use 110 v. for phones and match up the fil. windings for voice coil of the speaker.

**TEST LAMP FOR TRANSFORMERS.**

Rig up some wall sockets on Ur test board, say 10-25-50 watt, & they are good for a lot of other



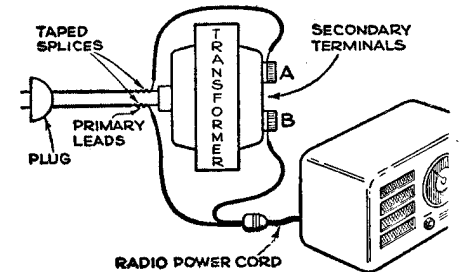
testing besides transformers. The different brilliancies of a 10 watt are especially noticeable.

**REPAIRING AUDIOS.**

Hi-V surges used to burn out a raft of Audios. In the 20's we used them by the hundreds. New ones cost us \$1 and a repaired one 50¢. Some fellows made a biz of repairing them. A Ford spark coil was placed across the terminals and a sizzling resulted. Sparks jumped from one layer to the next one and welded the fine wires together. If not OK they were "shot" again. In most cases they were as good as new ones.

**BOOSTING LINE VOLTAGE.**

In many locations, where many use the 110 line, voltages may drop to 100-105. Hook a filament transformer up as shown. If you get it right - it will up the v. 6.3 or more volts. If secondary is reversed it will cut it down.



**RESISTANCE VS TRANS. AMPLIFIER.**

3-stages of resistance amplification equal 2 of transformer. However, the tone is better with resistance. Some trans. give you audio howls - which would be much easier to control then using resistance coupling.

If a Radio Amateur is a Ham - is his son a Hamlet?

**LOWERING TONE OF TRANS.**

Before dynamics came into being about the only way to lower the tone on our rigs was to put mica condensers across the primaries of Audios. From .001 to .006 mica will make a big difference. Placing them across the secondaries cuts volume. In most sets now - they use the condensers from Plate to ground.

## Transistors

### A SIMPLE TRANSISTOR BATTERY.

For the chronic Experimenter, here is something to work on. A simple Transistor battery may be made up, from simple parts.

Cut a piece of 2 dissimilar metals, according to sketch, and leave holes at each end for your binding post connections. Put a piece of blotting paper between. Drill some holes in the top one so you can add Electrolyte now & then to pep it up. Several may be hooked in series for more v.

From a chart of Electro-chemical Series we find the following potentials, if we use a suitable electrolyte:

Aluminum -1.7 v.; Zinc -.76 v.; Iron -.44 v.; Tin -.14; Lead -.12; Copper plus .34; Gold plus 1.5 volts. Note Copper and Gold are positive.

Now, for the above experiment, if we take Zinc (-.76) and Copper (plus .34) and Copper sulfate solution, we get .76 plus



.34 or 1.1 volts from the cell. 3 cells in series - give 3.3 v.

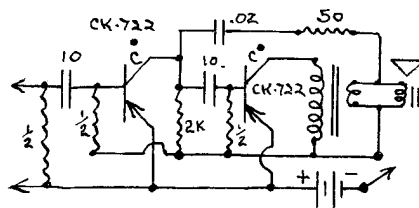
Use a medicine dropper and put some  $\text{CuSO}_4$  on the blotter.

Now if we take Aluminum (-1.7) and Zinc (-.76) we subtract them and get -.94 volts - that will still work a Transistor. Be sure to observe polarity on Trans.

Other combinations are Aluminum and Copper with Lemon juice as an electrolyte, etc.

### MATCHING OUTPUT TO PM SPEAKER.

One stage of Transistor amplification goes well into a regular output trans. to PM. When U use 2 stages you may run into difficulties. A magnetic speaker or a headphone, made into a Reflex speaker (See HB-1), and put on the 2nd Collector, where the phones usually go, works good. A new way is now being used (B) with a standard output trans. to 3.2 voice coil. You use feedback to the first Collector and to hot side of battery. The usual



resistance is about 50 ohms altho it may vary. Some use a 12 ohm magnetic speaker but most of them are too high priced.

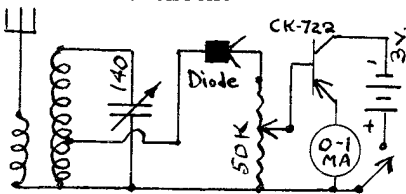
The tone is very good from a Transistor - the old crystal again.

### TRANSISTOR POWER SUPPLIES.

You will find a Diode is used as a rectifier in a Transistor power supply. We recommend a fixed Carborundum as it can take a lot more current without injury. Be sure to check polarity before hooking up Transistor.

### WAVEMETER & XMTR. FREQ. METER.

Use a 5-prong Celluloid RF plug-in coil and tap it up 1/3rd from the ground side. This makes the rig tune sharp and give you an accurate check.



As a field strength meter for Xmtrs. it is ideal, and may be used with or without Aerial. You check when Xmtr. is tuned OK.

As a wavemeter - you can set it alongside another tuned circuit and get a check when the 0-1 m.a. meter drops. Use Log dials, or keep a record of the readings. In tuning DX you can check your receiver for location before tuning for it on set.

*Lady, in Radio store, holding knob in her hand: "This is the knob that's been causing all the trouble in my set."*

*A good TV performer needs a guitar and a cold in his head.*

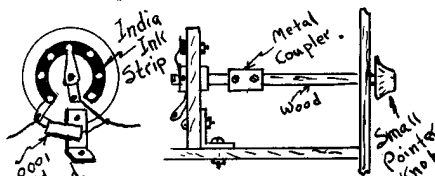
## Tubes

### BUILD VARIABLE GRID LEAK.

Years ago, when it was necessary to get all the "zip" out of a tube for DX, we used variable grid leaks. It was possible to hear many more stations by closer adjustment of the leak.

One I used on the Ship, made by Chelsea mfg. co., cost \$3.50. It was a piece of round paper with an India ink strip around its edge. Switch pts. were run out to a 10 pt. switch. We have shown how it can be made & then controlled from panel.

You may also use a 2 meg. var-



iable with wooden shaft to the panel.

This rig is very effective in a highly regenerative detector.

### NUMBERS ON TUBES.

As many numbers are only put on tubes with stamps - they may wear off. There are several ways to detect them. You may blow Ur breath on them - this usually works. Place them in refrigerator and then blow on them. Dip tube in Ammonia and letters may come out. Construction of the inner parts may help - if compared with other tubes by a Radio dealer.

### LOOSE TUBE BASES.

Tube bases are put on hot but they may break loose. We used to paint the joint with Light coil cement and wrap thread in the slot. Excess cement is then wiped off. It holds them good. You may wrap Cello. tape around it for a quick repair.

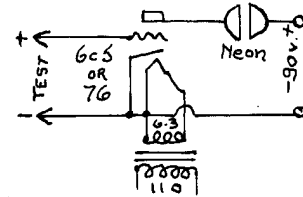
### SENSITIVE VOLTAGE DETECTOR.

In the following circuit, if U put a positive charge on the grid - the Neon, or Argon, tube will glow brighter. Put a negative on the grid and it dims. If

you want to check static, put it across Aerial and ground.

You can use the rig for checking polarity if you wish.

It will also detect leakage by



placing prods at 2 points. If U use it for sensitive experiments be sure to use Bakelite tubing for handles - as body will cause a short.

As it is DC- you will find the Neon glows only on one side. If it was AC - it would glow on the 2 sides. The tube rectifier only allows DC to pass thru.

You may experiment with AC on the plate if you wish - but we believe the test is much better with DC. Shielding tube helps in performance.

The rig may be used for galvanic and gold leaf experiments.

### BLOCKING OF TUBES.

When tubes are overloaded they are said to "block." From the above article, you can see how a negative charge dims the Neon. A tube block is caused by too strong a negative charge on the grid. This prevents proper operation of the tube.

A lower resistance grid leak, lower input power or lower operation voltage will prevent this.

*Susie wants to buy a new color TV set, but - what color?*

### INTER-TUBE CAPACITIES.

Any two terminals of an Electrical system have capacity between them. G-P-Cath.-Fil., etc. all form condenser effects. It's for this reason certain tubes don't oscillate on Hi-F., Acorn, and others as noted in the tube book, are built with low cap. so they may be used for Hi-F. When designing a HF detector be sure to check your tube details.

another MRL Handbook...

5½ x 8½

24 pages

HB-7. "Experiments with Magnetism  
and Coils."

32 drawings

2 charts

24 experiments

## C O N T E N T S.

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IN HANDBOOK 7. Pages given.

What are the forms of Electricity? 4 things in a Radio. p. 3.  
Which way do Current and Electrons flow? Cathode current. 3.  
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What was Faraday's experiment? What relation to Radio? 12.  
Relation between Inductance & lines of force. Direction? 13.

This HB goes hand-in-hand with HB-6 on Coils. Be sure to add it to your Library.