MRL HB 9 - MRL Radio Notes No. 1.

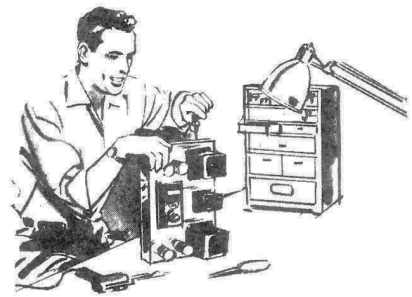
another MRL Handbook... HB-9

RADIO NOTES

NO.1

CONTENTS

By Elmer G. Osterhoudt.



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)

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FOREWORD

Original plates for our MRL "Radio Builder" No. 34 wore out. Also, in moving, we lost a large box of duplicate copies. As requests for this issue keep coming in - we had to do something about it.

Rather than make up duplicate plates - we decided to make it into an entirely new MRL Handbook - which you see here.

As our Handbooks are aimed at permanence - the advertising, announcements, etc. are all left out. Every article has been greatly broadened and revised. Even the "Questions and answers" were each made into separate articles. Several new articles were made up from other material on hand.

From the many comments on our MRL Handbook '8 - "Radio Kinks and Quips"- we found it appealed to Radio Fans generally. We feel this new Handbook will follow along closely. It is hard to put up a Handbook on any specific subject and still have general appeal. Almost any subject can be pretty well covered as there is lots of material in our library at our disposal. Any Radio subjects are interesting to us.

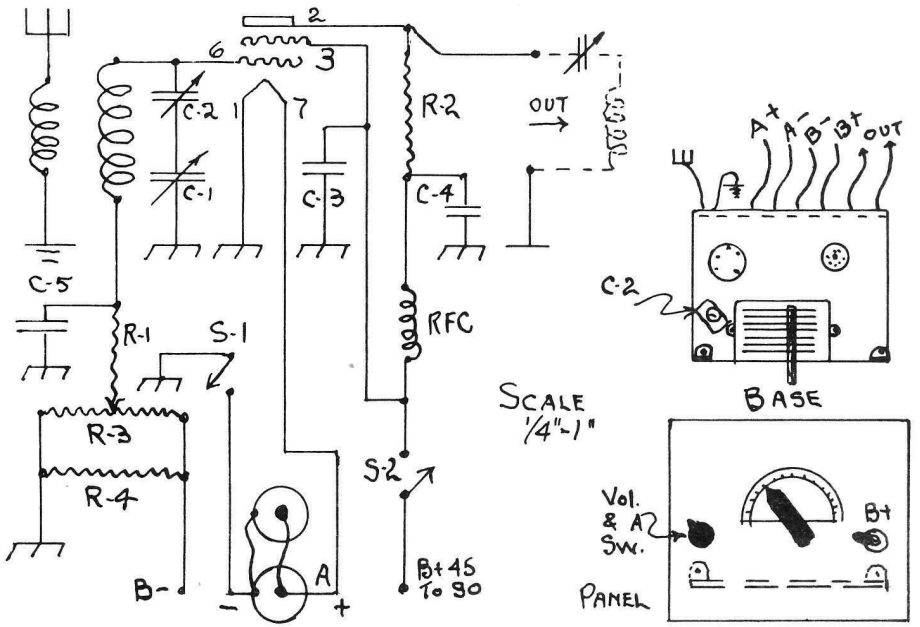
We thank the many contributors who send in items now and then. Knowledge is based on the experiences of all of us put together - like water drops in a stream. Everyone may see things a little differently - each with his own slant on a problem. In the end, many of them can be right and still have different views. In our research, we find lots of facts that are new to us - you see, we can always learn. What we feel interesting - should be interesting to many others.

Most of the technical "gobbledegook" is eliminated as much as possible. Language is meant to convey thoughts - so why try to confuse the other person? Often many of the $1.50 words are not fully understood by the "emitter!" Hi.

In all our literature, we try to specify standard parts. Altho you will find reference to our original Celluloid coils, forms, crystals and other parts - we leave that to your discretion as to which you use. We have proven our Celluloid coils, etc. to be superior to most, however.

Speaking of tangents - yes we often ride off on them. Little interesting side items are the spice of reading, we think.

MRL 1-TUBE TRF STAGE FOR MORE DX. ALL-WAVE



1. Tuned R.F. Stage for any Set.

PARTS LIST.

C-1.	.00035 Variable condenser.
C-2.	25-280 trimmer.
C-3,4,5	.05 Bypass condensers.
R-1.	100K x ½ watt resistor.
R-2.	75K " " "
R-3.	50K volume con. & switch.
R-4.	500 ohm x ½ watt resistor.
RFC	2½ mhy. RF choke.
S-2.	SPST toggle switch.
Coils	see text.
1	4x5 compo. panel.
1	3x4 " base.
1	1¼" bar knob and scale.
1	Small pointer knob.
1	4 or 5 prong wafer socket.
1	7 prong Miniature "
2	½ x ½ angle brackets.
1	1T4 tube.
2	Flashlite cells.
1	Plywood base strip 3/4 x 4
	Hookup wire, solder, etc.

Many MRL Fans are interested in adding a tuned Radio frequency stage on ahead of their present rig. This will get a lot of the weaker stations that your present set will pass over. Besides getting more DX, it will greatly increase the selectivity of your present detector stage. The more RF stages ahead of a detector - the sharper the detector tunes. For this reason we eliminate band-spread condensers on everything but the detector.

Dotted lines show the output feeding into a 1-tube detector stage - or the TRF stage of any set. It may be fed into a crystal set just as well. We have used separate A and B batteries to eliminate as much inter-stage coupling as possible. Its small size makes it easy to set next to any set. Being just one stage it is easy to construct.

The panel and base sketches show the approximate layout of parts. We don't believe you can improve much on the layout. Use

the ¼" to 1" scale and take your measurements from the drawings. Mount the coil socket as far back as possible, so the condenser won't interfere with taking coils in or out. Mount a UX wafer if using our Type RF; 5-prong if using Type 5-RF, Compo. may be used for both panel and base, If you prefer - you may use a regular Aluminum chassis instead of the compo. base. If you find any body capacity on the weaker stations - you may slip a piece of tin between tuning condenser and panel, and ground it to the connection for the chassis. If using compo. base - all chassis sign lines can be hooked together. If using a metal chassis you hook all chassis signs to the base at the nearest point. Use lugs and lockwashers to make a perfect joint. In this connection, to see how important good chassis connections are - we can give a good example. At the U.S. Naval base, Alameda, during the War, the inspector had an 0-1 ohm ohmmeter. By moving the lock washer, screw and nut around, a great variation in resistance could be had. We wonder just how many bad chassis connections are floating around !

Mount condenser on panel and cut out the dial scale. Cement latter on with Heavy coil cement and holding it off at a distance to get it level. We also use a square in the shop. Mount volume control and the SPST toggle sw. Mount parts on base and assemble the two units. It's a good idea to drill some holes thru the Ply back strip to carry the battery, input and output leads. Be sure to mark them so you won't burn out the tube. Fasten compo. base to base strip by #2 x ½" FH wood screws - countersunk.

We have had good luck with the 1T4 tubes, so made the circuit for them. However, you may also use a 1L4, 1LC5, 1LG5, 1N5, 1P5, or 1U4, or many of the new miniature tubes of later types.

You will note the C-bias at R-3 and 4. You may vary this and so control the volume on the incoming signals, as some may be pretty loud and overload your detector tube. Changing the bias may also affect the selectivity to quite a degree. Switch S-2 cuts off the B batt. by itself, because they cannot be put together under one control as you can see in diagram. This C-bias does not affect the next tube.

You will find the adjustment of the trimmer condenser very easy. Mount it flat so it may be adjusted with an insulated type of screwdriver. Tune BC set to about 1000 kc. and set the knob for the RF stage at the same pt. on the dial. Bring the trimmer adjustment around until signal is the loudest. This will work pretty good all over the bands, as the SW stations tune broadly. It may take a little more adjusting later to make the two condensers track. Another method is to screw the trimmer condenser clear in and then back out about ½ turn. This matches our S.W. coils. After adjustment, a finer adjustment may be made with the volume control turned down.

If you get too much BC interference a .01 bypass condenser may be placed between Aerial and Ant. post of amplifier. You will note the circuit separates the A-G circuit from the secondary, which gives added selectivity. A lot can be done with all sets if you get the right sized Aerial for your location. This applies to Crystal as well as tube sets. Try out different lengths and you will find one to work best for your location while combatting strong local interference.

Regarding the A-batteries, we prefer to solder 2 large flashlight cells, or 2 ignitor batts. together in series-parallel, as shown in diagram. This makes them last much longer, as they have recuperative power when off.

For B batteries, you'll have to experiment as to correct voltage. But we find 45 to be OK.

In use, you will find this TRF amplifier to be well worth your time in building. It will make your DX tuning very stable and help in separating those strong BC stations. You will find the gain in signal strength of weak stations to be most helpful. You might want to put your 1-tuber and this TRF amplifier on the same chassis - which can easily be done to your satisfaction.

MRL D COUPLER.

We have had our MRL Type D Coupler ever since 1934, in San Francisco. We used to sell them by the dozens when plug-in coils were the rage. Later, we just neglected to push them - but the advantages still remain.

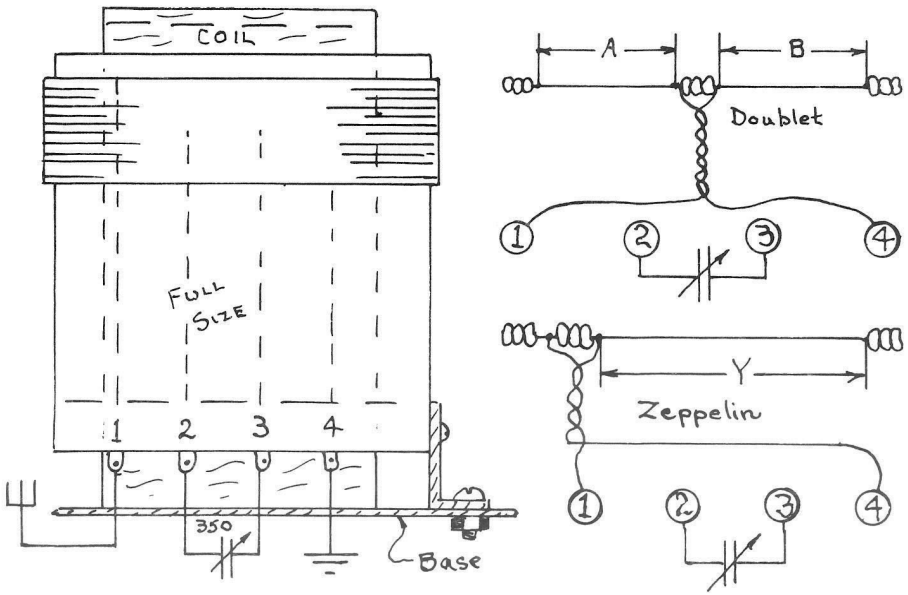
As you can see, the plug-in coil slips inside. The coil on the coupler acts as a tuned primary and inductively coupled to the secondary coil. It is far enough away from the latter to help increase selectivity.

Mount it above the base on a spacer, so it clears the lugs. Also centrally over a plug-in coil socket. It eliminates the 2-plate midget condenser which couples a 1-tuber to the Aerial. The .00035 variable condenser tunes to the wavelength, or the harmonic of the station. This increases volume of the signal. It may be used with any type of plug-in coil or any make, just so it is 1½" in diameter. It is designed to help all rigs from 10 to 600 meters wavelength.

Mount the variable condenser on an insulated bracket, on base and bring insulated shaft control out to bar knob and scale on the front panel, if desired.

Drawings show use on inverted "L," Doublet or Zepplin types of Aerials. Leadins may be a 2-conductor twisted, or of 2 parallel feeders. Even lamp cord, run thru tar, will work OK.

At the top of the Doublet, or Zeppelin, is all that tunes - this is where the length may be



2. MRL Low Loss Antenna Coupler for Plug-in Coils.

more critical than an "L" Ant: You probably know a SW set may work good on 40 meters, when it is tuned with a 20 meter Aerial. This harmonic principle is the one used in the D coupler.

The top Aerial wires should be #12 or #14 enameled for best results, altho stranded will work. Exact lengths are not absolutely required but it helps. When using a Doublet, only one side may be used as an "L" if you wish. Or, the leads may be hooked together to get a "T" Aerial. Any of these types may be worked on the D coupler.

Here are some simple rules we find useful:

To measure a Doublet, use

$\frac{2 \times (A \text{ plus } B)}{3\text{-}1/3}$ - Meters of natural period to work on.

To design a Doublet:

$\frac{\text{Meters} \times 3\text{-}1/3}{4}$ Ft. on a side.

Best all-around Doublet is 58 ft on a side.

To measure a Zeppelin, Y is as long as A & B together, or

$\frac{2Y}{3\text{-}1/3}$ - Meters to work on.

To design a Zeppelin:

$\frac{\text{Meters} \times 3\text{-}1/3}{2}$ - Total of Zepp.

FADING DUE TO HOUSE WIRING.

By Al. Bolin, Illinois.

Here is something you may, or may not know, but let me tell U of a recent experience. I'll make it short and to the point.

On several occasions I have found Radios, especially those with built-in Aerials, were affected by vibrations set up in the building due to persons who may be walking - or slamming the doors. The set would work perfectly before. Inspection of the set showed no loose connections, and one station seemed to be the most affected, usually around 900 kc. It was discovered, after thoro search, that the conduit, or BX, within the walls was the cause of the interrupted signals or changes in volume. In all the cases it was found a joint, or junction box had worked loose over a period of years. This is very common in buildings where the wiring is very old. Also, buildings which were wired for AC. after gaslights, or some 30 years ago. In this time, many loose joints and corrosion may occur thruout the building.

Sometimes the BX may run over a steel beam, or pipe. This may have the same effect. It is very hard to locate the joint giving trouble and often there are more than one. The cleaning and the tightening the anchoring, or fitting at the point of entrance to the receptacle, or switch box, is the only remedy. Be sure your boxes are grounded and then make a fast connection to the BX as it comes in. If your wiring job is knob and tube - then it may be loose joints or frayed wire rubbing on pipes, etc.

The reason such trouble in the wiring armor, or BX causes a set to operate improperly is due to the fact the light line is picking up the signal, as well as is the set's Antenna. Electrical wiring, acting as an Antenna introduces a circuit problem, i.e. the wiring itself becomes a tunable HF. circuit, since it has both capacity and inductance. It really assumes part of the set's RF, or Antenna system. Just as in any tuned circuit, variations in both resistance and/or continuity will change the circuit balance and effect its resonance at HF.

If you ever run into the described trouble - find it. It is not only a headache to Radio reception, but is a potential fire hazard. Loose joints may cause sparking - and if the inductance is high enough a fire develops.

A lot of RF noise may be traced to loose switch contacts and plugs. Wall switches eventually have to be replaced. Switch it slowly and note if the light flickers. If so, replace it. Before some lamps go out - they may create a lot of noise as the filament continues to burn away. We have seen them go on this way for a month before they finally get loose.

EDitor. One time, while we were selling sets in Los Angeles, we ran into a similar problem that cost us money. A restaurant owner offered $500 for any Radio that would play for 10 minutes, without cutting out. Even with an outside Antenna and ground, - sure enough, after 4-5 minutes, out the station would go. If we had thought to check the electrical circuit- we may have made the sale.

Also, when other occupants of the house, or neighbors, switch a light on or off, it will vary the tunable length of the Aerial by induction from the light line and cause station to vary.

SUBSTITUTE FOR WOOD'S METAL.

By Chas. Langnecker, Jr., Electrical Engineer, Penn.

In your RB-27 I noticed a very good article on mounting crystals in Wood's metal. Here is a very good substitute for Wood's metal, and altho some what expensive, is considerably easier to obtain. Add Mercury to ordinary 60-40 solder, or 50-50 solder less rosin core. You can add the Mercury until the solder will melt as easily as wax. Mercury is a good conductor of Electricity and this special solder is excellent for mounting crystals.

This special solder is an old time jewelers' secret, used for soldering pewter and various other articles of jewelry where it is impossible to heat to the melting point of regular solder.

A lot of information may be found in MRL HB-3 "Crystal Detectors" - on mounting crystals.

Overheating a natural crystal tends to dis-arrange the atomic structure so that it is less sensitive. So be careful.

BARGAIN IN LIGHT BULBS.

Higher wattage bulbs are the best buy. A 150 watter produces 10 times the light of a 25 watt bulb but uses only 6 times the amount of Electricity.

Going back to a 1917 chart, we find a 25 watt lamp gave 95 lumens of light while a 150 watter gave 630. 6 x 95 is 570 lumens, so we got a gain of 60 lumens then for our money. Assuming a 25 watter gives 100 lumens now, we should have 1000 lumens for a 150 watter. This can be increased 10% or more if the room has lite colored walls.

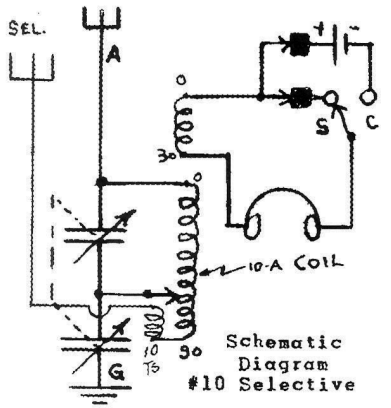
Filaments of lamps may be of Osmium, Tungsten, Tantalum, Carbon, and other alloys. The correct mixture of metal is placed in a glass bulb drawn to a vacuum. Without Oxygen the filament will not burn up, or oxidize. A great improvement has been made since the old Carbon lamps. This form of lamp uses lots of juice, but gives only about 1/3rd the light of a Mazda. They make good resistance units for chargers, etc. - more so than for light. Tungsten has a melting point of 5,792 deg. F. A Tungsten filament may weld itself after a break. Tantalum melts at 1800 C. Osmium is one of the hardest and heaviest of metals - hard enough to scratch glass. It is a by-product of the Platinum industry but used in lamps and some semi-conductors. Metallized Carbon was used in early lamps. Carbon filament resistance decreases as it gets hot - the reverse of most other conductors of Electricity. Carbon granules tend to keep apart - while metals tend to weld themselves together.

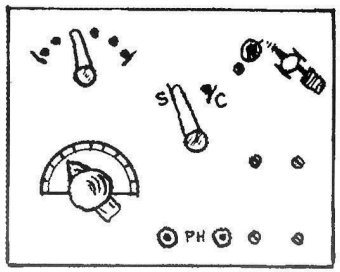
In the 20's the Japanese imported millions of carbon lamps. Prices were away down - so much so that G.E. kept reducing the prices of Mazdas. Altho these foreign lamps seldom lasted over a few days - they did sell, and took the place of good lamp money.

Some of you Old Timers may remember the pull-chain lamp bulbs about vintage 1917 - and later. Here 2 filaments were placed in one bulb and changed by a pull-chain to light or dim. I believe they were mostly Carbon lamps.

G.E. says there are more lamps in the average auto than in the home - figuring all dashlites, etc.

A gooseneck type of lamp is much harder on the eyes than a table lamp with a light shade. The gooseneck type tends to reflect light from the table - and with darkness all around. The one with the light shade shields the direct rays but gives an even light around the room.





Front panel. Scale 1/4"- 1"

3. MRL #10 Crystal Set with new Antenna Coil for selectivity.

Predictions for 1979. Scientists predict we will have walls phosphorous painted for light and will come on when we enter the room. TV will be pictured on the walls - with a centrally operated set in a closet. You may talk with a Videophone - you see your party at the same time, or without pictures if desired. We will have washing machines that clean clothes in a few minutes and cooking contraptions to serve the meals in the same time - won't we have fun ?

BUILDING MRL #10 CRYSTAL SET.

The #10 is one of our most selective Crystal sets. The series and parallel tuning condenser is our own get-up, and is self-adjusting.

But now and then we run into the most ornery kind of location - where some strong local makes no attempt to kill its strong ground wave. It is too much to expect any kind of Radio to knock them out under these adverse conditions.

Gerald Sarkisian, WA6EWM, Cal. working under similar conditions has come up with a way to knock out that strong station. He just wraps sbout 10 turns of hookup wire around his hand - and inserts it inside the coil. Hooks one side to the 90 turn tap and the other end to the Aerial. He eliminates the other Aerial connection. He says this cuts them like a knife. If you have a #10, you might try it. The more turns of wire - the broader it tunes. This primary winding can apply to any type of set.

When mounting 2-gang condenser insert screws and tighten nuts with small hex wrench. Cut dial scale and cement on with heavy Coil cement. Use a square, or hold it off at a distance to get it on level.

When mounting switch levers, bend them down to make a good contact. Put on lug and run 5/16 nut up fairly close and hold in position with a hex wrench. Then put the ¼" nut on as a locknut and tighten with a nut spinner. A slight touch of vaseline will make contacts work smoothly. Rub off the excess grease.

Mount fixed Carborundum Xtal in a convenient position - using the #14 busbar for sturdiness. Don't get Xtal too hot. Adjust it necessary, by sliding contact in a sidewise motion, and on a weak station only. Try battery upside down to see if it works better. If so, reverse Xtal polarity. The battery should stand upright or the liquid may run out. Be sure to cut off lever to battery when not in use to preserve battery.

Remove insulation from coil taps with light sandpaper, and tin leads with iron. Then mount the coil after everything else has been wired up. Use heavy wire for the set but small #22 hookup for the coil leads.

When soldering leads to switch points, tin the wire and bend it into switch point holes, if using tubular rivet points. Hold it down to panel with screwdriver and cool with pliers or file. Yank it to see if wires are on solidly. Run leads to coil in a loose manner to they won't break off. Be sure coil clears the tuning condenser and levers.

Lee Shoblom, Calif., says: "I thought I'd report on my #10. On the first nite, using 130' Ant., I got 46 stations. 13 were from Mexico; 6 police; 2 aircraft. That was with a low ohm pillow speaker. Wait until I send you my DX log, when I get phones.

"About 6 houses down the St. is W6RMG, operated by a swell fellow "Holly" Hollins. He has a 150 watt Collins transmitter. I get him on #10 without Aerial or ground, but still #10 has enough selectivity to cut him out for other stations. I also get W6BHF - another Ham."

And his later report; "Got four more BC stations and 6 Hams on #10. Got all DX on a 1N34 diode, which works best here. I re-arranged the switch so I can play on 1N34 or Steel galena at will. More DX reports later."

Editor: Very few Xtal sets can be worked on a 130' Antenna and still be selective. Also, note Mr. Shoblom was using a pillow speaker, which can't possibly let you hear all the weaker DX stations. Also, the Ham down the street can be cut out at will - while most Xtal sets he'll get in some way. The Carborundum and Steel galena are more selective than the 1N34. The latter is OK for the country where stations do not tend to mix.

Roy Slaughter, Tenn. says: "I just finished building #10. I've built your #2 - but I like #10 the best here. Your Steel galena works the best. Here is a complete list of stations on #10: XERA (950); KFAG (700); WFAA and WBAP (650); KDKA (550); KRMG (500); WWL, WENR, WJJD (450); WLMO (350); WCKY (325); KMOX (300); WHP (250), etc."

ERRATIC S.W. DX RECEPTION.

H. Sutton, calif. calls our attention to the fact that a super-regenerative should be better in summertime as DX is so bad in June.

Also that it's noticeable how an Equatorial spot, like Central Africa, comes in pretty regularly any time of the year, but some places off the Equatorial belt vary a good deal with the seasons. North and Central China are better in Summer in Calif. Australia varies, but is better in Winter. He thinks maybe the Ionosphere is more uniform over the Equatorial belt than at each side. No doubt the Ionosphere is much heavier at the Equator as it is closer to the Sun.

Because S.W. transmissions tend toward a straight line - most of the DX results from successive reflections off the Ionosphere, back to Earth and on around the World.

The Ionosphere is produced by the Sun and subject to the effect of the Sun spots and other Solar activities. Giant streams of particles are shot off the surface of the Sun during Sun spot activities and it takes a day or two to reach our Ionosphere. Constant variations of the Ionosphere make S.W. predictions inaccurade. However, certain localities are received better at certain times of the day or nite. The tables you see around are the best we can get. Maximum Sun spot activity occurs every 11 years - and 1959 was a peak year. So S.W. reception should improve from now on.

There are many factors that affect reception. Power of the transmitter means a lot. Also if their Aerial is beamed toward U, then it is most effective. Various mineral deposits. trees, mountains, buildings, etc. may interfere with transmissions in certain directions. Conditions on the receiving end may have a lot to do with it. You may not be located to get the "skip" from the ionosphere. Also, you may be behind mountains, etc. Type of Aerial, ground and receiver have a lot to do with good reception. Again, the time of the year or day is important.

Along this line, I believe the magnetic lines of force, between the poles greatly affect reception. Magnetic lines of force generate Electricity - so why wouldn't they help here?

Receiving in certain directions is most important. On my trips on tankers, as Radio Op., to Ketchikan and Juneau, Alaska, I noticed U.S. stations all over came in loud and clear. Possibly due a lot to clear, moist air up there. In the U.S. the Alaskan stations were almost impossible at that time.

Also, while 1200 miles west of Panama, on a trip to Chile, I made the World's record for KDKA at that time - with big writeups in the press, etc. On this certain nite I must have been favored by the Ionosphere as there were hundreds of U.S. stations to be picked off. I reported the strongest, which was KDKA, or I may have had lots of "World's records" if I had wanted to log more of them. I didn't know it was a freak nite. On that same nite I logged 3 SOS calls, that sounded like locals. But I soon found they were up off the East coast 3000 miles away - and not local. I made two more trips but never experienced this same good receiving condition again. This location was practically on the Equator, off Ecuador, so Mr. Sutton may have a point about equatorial conditions affecting reception.

In this location, the eastern U.S. stations boom in but the Western coastal stations were very hard to get at that time. Possibly because the former were almost due North of me. Stations on southern S.A. were also hard to get - showing reception to the north was better than in a southerly direction on 600 meters.

In the harbor of Iquique, Chile, I worked WNY, New York, 4500 miles on 600 m. spark about midnite.

Another peculiar experience I had 1200 miles off Panama. While copying long wave arc press from NBA, Panama, in the early hours, Guam, 5500 miles to the west would drown him out. I'd then shift over to the Guam arc and copy the same press. The reason was the effect of sunrise on Panama, when he'd fade out, and conditions were ideal for picking up Guam.

All work at Sea was done with a 1-tube Audiotron, 6 v. tube. A big 4 wire Aerial, 300 ft. long didn't hurt a bit, either! A set of 3 honeycomb coils served as a tuner - pri. sec. and tickler.

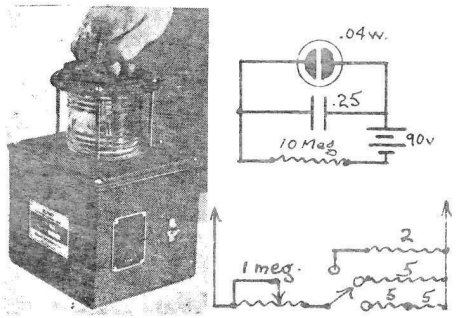
How much would most of the DX Fans give for a good high Aerial and salt water ground like we had at Sea! Ideal conditions.

TWO NEON FLASHERS.
By R.D.Mickelson, Illinois.

Here is a single and a 3-unit Neon flasher. The single is like the one used on roads, etc. They will flash in one direction and then the other, for the 3-unit, just by touching the condensers.

Due to using Neons, they draw but very little current. Those used on the road usually take 180 volts of batteries, which may be small amperage type. Bob used 90 volts on his 3-unit.

Other info. is given on these flashers thruout our literature. Placed in a store window, it is sure to attract attention.



4. Single Neon Flasher.

PARTS LIST.

1 1/25th watt Neon lamp.
1 .25 x 600 v. Bypass condenser.
1 10 meg. resistor (or 2-5 meg.) or substitute resistors as shown.

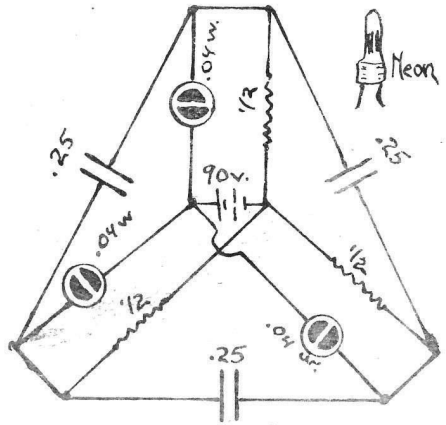
Fig. 4 shows his latest diagram of a 1-Neon flasher. It uses a 1/25th watt Neon hooked across a .25 mfd. Bypass condenser and a 10 meg. resistor. It is similar to the War surplus units.

TV AND THE FUTURE SCIENTIST.

With TV, we are up-to-date -

And, believe me, up too late!
Radio, stamps - all undone.

TV surely will make me a Bum!
The Xtal Fan adds his "Amen!"



5. 3-Neon Flasher.

PARTS LIST.

3 .25 x 600 v. bypass condensers
3 1/25 watt Neon lamps.
3 470,000 x ½ watt resistors.
1 90 volt battery.

FINISHING RADIO PANELS.
By R.D.Mickelson, Illinois.

Here is a neat trick you may wish to pass on to your readers. It's a formula for a metallic gray paint that gives a nice appearance to chassis and panels. Mix 1 part of Aluminum paint; 1 part clear varnish; and 1 part black paint- preferably one with a rubber base, altho not essential. Mix well and spray on. To brush on makes it streaked. But if you wish a hammertone effect, you may brush it on and dab the surface with a synthetic sponge, to make a professional stippled finish. Baking with an ordinary heat lamp results in a glossy finish. Placing in a warm oven may help, but turn off the gas. Be careful not to burn the paint - so look at it occasionally.

Aluminum panels may also be finished by dipping them in a solution of Lye (Sodium or Potassium hydroxide) and water. In a very short time the chemical action will cause a boiling effect, and you may observe the

satin finish appearing. If necessary to bring out the finish, and remove manufacturer's marks, brush the metal with a brass brush. When the right amount of etching is obtained - wash and dry it thoroughly.

At present you can buy Aerosol cans with various kinds of paint and lacquer. We find the telephone gray lacquer to work fine on panels. Spray lightly and go over it several times.Never hold a sprayer in one place as paint piles up - keep in motion.

Wooden bases may be dipped in cloth dyes of various colors, to get a fancy looking set.

MAKING A PAPER BAROMETER.

By R.D.Mickelson, Illinois.

Altho this is not related to Radio directly - it may affect your DX reception - as to how much moisture is in the air. The formula has been used for years. Cobalt chloride 1 oz.; Sodium chloride (table salt) ½ oz.; Calcium chloride 75 grains; Water 3 oz.

Dip white blotter, or white cloth in solution and let dry. Cut to size.

Indications as follows: Rose red means rain; pale red means very moist weather; bluish red moist; lavender blue nearly dry; blue is very dry weather.

Your article on Lightning reminded me of a time in Peru,Ill. when I was hooking DX on a very stormy nite. A bolt of lightning came down my Aerial and arced over to ground. I had no lightning arrester at the time. There was no damage but it gave me a big scare. Lucky the leadins were close together. I realize how important a lightning arrester is on any set.

ADVANTAGES OF TWO CRYSTAL SETS.

By Joe Amorose, Virginia.

A good pointer for Xtal Fans is to use two Xtal sets instead of one - in areas where a long Aerial cannot be erected. A set with a 50 ft. Ant. won't give a lot of volume. But two, with a separate Ant. and ground will give a lot more volume. I have used meters to prove it. Also, adding extra grounds to each set will bring the "S" meter up.

The Aerials should be at least 2 ft. apart for best results. If too close it is no good. I figured this may be of interest. Two sets permit the Fan to get reception when the signal from one isn't loud enough. Also one acts as a booster for the other. By doing so it will help to keep out some interference if close to stations.

PLAYER PIANO ROLLS.

We often hear "Why! Do people still make Crystal sets?" Yep, and how! Yes, and they still are pumping the old Piano rolls. Likewise, the train hasn't given up all its business to the Airplanes and fast busses. It seems each has its own field of usefulness- just like the Xtal set.

We hear of a firm in S.F. who has 10,000 piano player rolls at $1 each. He has a mailing list of customers from China to Minnesota. He claims there are 1000 player pianos in the S.F. bay region, alone. He has been in business since 1911. Hit parade tunes are available, altho the old steady pullers as "Nola," "Alexander's Ragtime Band," and the old "Merry Widow Waltz" are still bringing in the dough.

FIRST VOTE RETURNS BY RADIO.

The first voice BC of votes took place on the Harding-Cox election in 1920 over KDKA. The BC was heard by only a few pioneers using Xtal sets and phones as tube sets weren't in use. Beginning with that event, KDKA became the first regular broadcaster of Radio programs.

Too well do I remember that election. I was Radio Opr. on the Standard Oil Barge 93, tied up at Grand Pacific dock in Vancouver, B.C. While election returns could be gotten down the street a few blocks, the Captain and Pumpman (self-styled Chief Engineer) insisted we get election returns by telegraph. NPG, Navy San Francisco, was the only station sending CW on long waves to the Orient. A speedy Opr. very handy with a Bug key was used for the trick. Only being 5 months at Sea - I was hard-pressed to keep up. Besides frequent QRM from the Pumpman as to "who was ahead now?" I was certainly relieved when the "flash" came over that Harding had won. Then, Sparks could go ashore and run up and down Hastings Street! Hi.

CHANGES 50 TO 60 CYCLES.

A S.F. farm broadcaster, over KFSO, recently made some tape recordings from farmers on a recent trip over Mexico. But they had 50 cycle and the tape would not reproduce faithfully. So the Emeryville PG&E light company rigged a motor-generator to operate on 50 cycles. They were then run off and re-taped on 60.

FACTS ABOUT ENAMELED WIRE.

Each company usually has its own much-guarded formula for its own varnish. Robling calls it Rovar; Belden calls it Beldenamel; Essex calls their's Formvar. It is said the basis for their compound is Stearin pitch. There may also be some form of Shellac varnish in the mixture. Usually, most of the Old Timers have called it Shellac and forgotten about it. Stearin pitch consists of many animal and vegetable fats and oils. There may also be some resin in it.

A new type of wire is now on the market. It is called Polyester enamel. It is taking the place of cotton, silk and regular enamel.It is priced the same as heavy enamel, but far less than single cotton-enamel. It is claimed it takes a higher temperature than enamel. Its one advantage is that to take off the enamel - you just touch the tip of the iron to it - and wipe off with a rag. It is then ready to solder.

The machine, for coating the wire, runs it thru a warm bath of the compound, until a very fine layer has been deposited. This may be in tenths of a mil. It is then baked.If another layer is needed, it is fed thru again. Small wire may finish up with ½ mil., While larger wires may run to 2 mil. of insulation.

Highly sensitive electronic controls are used to keep the wire from breaking. You might wonder how several miles of fine wire can go on a 10 lb. spool - and all in one piece. They say they don't have to worry about breaking any more. At one time we used to get broken places in the spool.

Good enameled wire should take bending around its own diameter without breaking the enamel. The dielectric strength is about 500 volts per mil. of enamel thickness, or 4 times the value of silk covered wire. It will stand up to 100 deg. C. or boiling pt. of water, continuously or 300 deg.C. before breaking down electrically. Turpentine, shellac, alcohol, paint remover,coal tar solvents, etc. all will attack enamel.

The advantages of enameled wire is its smaller spaced windings. It has more distributed capacity because wires wind much closer together. Therefore, an enameled wire winding takes a few less turns than single cotton or single silk. At one time, when stations were weaker, it was considered better to use DCC or silk-covered wire for coils. But now it seems the factories all use enameled for almost all their windings. So much so that to get DCC we have to have a big minimum order so the factory can make it special.

You may not know that magnet wire is made in square and rectangular shapes as well as in round. Also, it is covered with

spun Dacron glass, Thermalex "F," Glass silicone and various forms of heat resisting coverings.

Fine enameled wires may give out in transformer windings, - mostly where there was a flaw. This may later break from heat expansion, high-voltage or from moisture. Also, pin holes from bubbles may occur during the final enameling process.

Extreme care must be exercised in soldering enameled wire. Be sure to scrape it off clean, or solder won't stick. We had some buzzers, that came in from Germany. They used a clear enamel so it looked like bare wire. The Fans didn't scrape it off so, as a result, no connection. We use a piece of plywood ¼" x ½" wide and 6" long, with sandpaper around one end to scrape off the enamel when making coils.

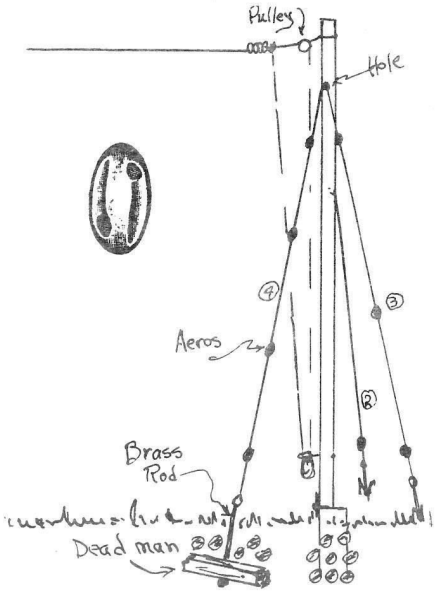
Many faults with factory sets result from poor soldered connections to enameled coils. Due to Litz wire having so many fine wires, it may be dipped in Wood alcohol to remove the enamel. Then, twist the wires and solder them together before hooking in the circuit. Litz (Litzendraht) is ideal for BC, or long waves, but no good for S.W. 32-38 means 32 strands of #38 enamel. They are twisted together so each wire comes to the surface at a given time. In a test of a Litz wire of 32 strands, resistance of the final was given as: none broken - 3.1 ohms; 4 strands broken - 3.3 ohms; 10 broken 3.8 20 broken - 7.4; 31 broken 51.6 ohms. So if your Litz wire is unbroken - you have efficiency.

GUY WIRES AND INSULATORS.

R. B. Richardson, Calif. says: "Noted about insulators in guy wires, as per one of your publications. When I attended RCA Institutes I learned that guy insulators discourage resonance at harmonic, or sub-harmonic frequencies. It also eliminates interference and unwanted uni-directional and reflection effects in reception. This can be very quickly seen with the example of a TV receiving Antenna. Resonant guy wires, or even nearby receivers, will cause "ghosts" or double images to appear on the picture tube."

We usually call guy insulators Aeroplane insulators. Others may have different names as strain-type, compression, egg-type halyard insulators or Johnny balls. If the insulator breaks it will not let your pole down. Never put glass insulators on your guy wires, or they may pull apart.

As said above, they are used to break up harmonics and better reception. They should be spaced unevenly around the pole so this is better accomplished. You need all the pickup your Aerial can get - so why run it off thru the guy wires to ground? It is customary to put one about a foot from the pole and the same at the bottom. In the next guy, put one in the middle. In your third guy space 2 in between. This will tend to break up the harmonics.



6. Guy Insulators & Dead men.

Simply speaking, the guys may serve as separate Aerials and, by induction, transfer a tuned frequency over to your receiver. If you get around a big shore-to-ship station, you will see all the insulators in the guys. This effect will not be noticeable on local BC stations but is very effective on S.W. DX.

Guy wires should never be pulled taut as the additional pull by the wind may break them. If you attach Aerial to tree trunk, be sure to use a take-up spring or a rope and weight thru a pulley. Even the largest trees sway in the wind, as you can see if you look directly up the trunk.

For wires - always use larger than you think necessary. Use a good galvanized wire. Around Los Angeles, in early Wireless days, we erected a 55 ft. mast made up of all sorts of 2x4, 2x3, and pairs of 1x2 bowed out in the middle for rigidity. We had about a dozen guy wires, made from baling wire. After about a year we moved and let the tower down. To our surprise, the salty Ocean air had almost eaten thru the wire in many places. It would have fallen in another month.

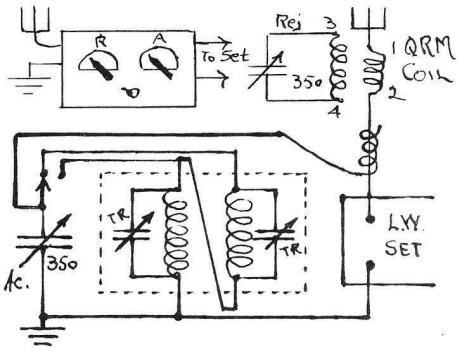
"Dead men" may be used if you have a big tower. However, a 2x4 Redwood, or Cedar, driven into the ground a few feet will serve well for an anchor. For the Dead man, use a brass rod to your guy as Iron will rust out. It may be buried in the ground a few feet.

For a line thru your pulley, we prefer galvanized clothesline wire. Rope will eventually break and you're in trouble. Be sure to fasten ends together so you can pull it up or down. Fashion a couple of screw eyes next to the pulley so the wire won't jump the track. A squirt of oil, on the pulley, may not be amiss. If the Aerial lead breaks off, you can still pull the line down or you'd lose it otherwise.

We always like a mast that is hinged at the bottom so it may be taken down now and then. A little linseed oil paint will always help to preserve it and make the neighbors happy! Taking the Aerial down once a year and cleaning the insulators is always a good idea. A Redwood post may be buried and the mast hinged to it near ground level. Be sure to paint, or creosote the post to preserve it.

Ordinarily #14 galvanized wire is big enough for guys, altho if you can get #12 - it is better.

A SIMPLE LONG WAVE SET BOOSTER.



7. Long Wave Booster Trap.

PARTS LIST.

1 I.F. trans. input or output.
2 .00035 variable condensers.
1 3x5 compo. panel.
1 MRL QRM Coil, or see text.
2 1¼" bar knobs and scales.
1 SPDT toggle switch.
1 Wooden box, wire, etc.

Most QRM, on the long waves comes from the BC bands. Therefore, the QRM coil is used as a rejector circuit for this. Tune it to interfering station and leave it there while tuning.

For the booster, or acceptor circuit, we use an IF transformer - either type is OK, but must be around 456 Kc. Connect pri. and sec. in series and to the sw. as shown. Throwing it one way puts half of it in circuit and the other way puts two of them in series for the longer waves.

You may leave the trimmers in circuit as they will help get up on the longer waves. Try reversing the inter-coil connection to see if it is aiding or bucking. If the latter - reverse the connection to the other side of the primary or secondary coil.

From center of switch you run a piece of insulated hookup wire around the Aerial lead - but not hooked directly to it. The more turns around the leadin - the greater the coupling. The shield around the coils will tend to help in keeping out BC stations.

This acceptor section will 'push' the stations in and tend to reject ones not on that frequency. So, by combining the two - you get a very efficient trap for long wave sets.

The unit may be mounted in a small box, as shown. Keep it for future use in your Lab.

Another switch may be added so you can shut out the booster if you work on BC or S.W. If left in the circuit - it will prevent good reception on these frequencies.

MRL QRM Coil is made by winding 110 turns #32 enameled wire on a 1" x 1½" fibre form. Over this, wind 20 turns #24 DCC.

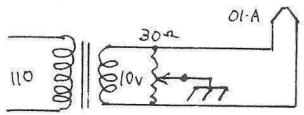
NOTES ON A.C. FILAMENT SUPPLIES.

To understand some of the many problems of tube filaments we must go back to the beginning of tube construction. We know that any heated object gives off electrons. Some give off easily at low temperatures, while others require a white-hot heat to produce them. In a Radio tube, the filament gives off electrons. These are attracted to the positive plate - and by so doing, form a path for the plate current to flow back to the filament or cathode. This interrupted flow is heard in the headphones as sound.

Originally tubes used a Thoriated wire filament and could only operate as detectors and amplifiers when using DC on the filament. Possibly some of you have tried using AC on the filament of an 01-A, 1C5, or other DC type of tube - and noted the loud hum in the phones. As the tube allows the plate current to flow but in one direction, when the opposite cycle of AC comes around - it cuts off the flow - consequently the hum. For rectifier tubes as an 80, etc. the tube filament works on AC. The filter condensers and chokes or resistors smooth out the current for use as a DC supply. Some of the rectifiers, i.e., 84, etc. use the cathode as a positive take-off point to the filters.

In Los Angeles, in the 20's, we made hundreds of Harkness Reflex sets, using 2 01-A tubes and an Iron pyrites crystal detector and reflex circuit. At that time we had no AC tubes - and the idea of not requiring a heavy, messy storage battery was ideal. (01-A's were $5 then!)

We center-tapped the filament transformer (Fig. 8) and then used a 10 v. bell transformer and the 01-A pulled the voltage down to 6 v. due to heavy drain. The 01-A used a higher wattage than the present tubes. The filament line was center-tapped with a 30 ohm potentiometer that we would regulate when the set was tested. 90 volts of B-batts. were stored in the lower part of the cabinet. The two batts. sold for $7.50. With a Table Talker magnetic speaker- we'd get about $65 for them. No doubt the Xtal detector helped smooth out some of the AC hum.

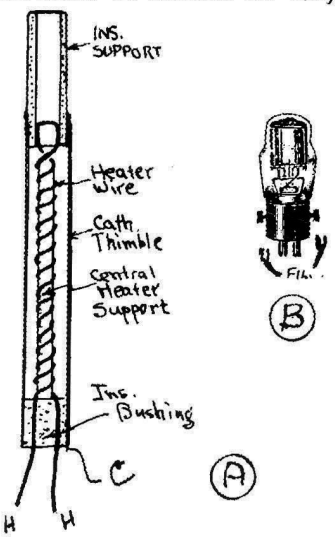


8. CT for 01-A in Harkness

We used to re-activate the 01-A, 226, 71-A, 12-A, 324 by placing them in a tube tester. Then a blow torch was applied to the bulb base and the meter popped up in less than a minute. We found some of them 'dead' but in most cases they would go above normal reading. Apparently it is not possible to rejuvenate the present tubes.

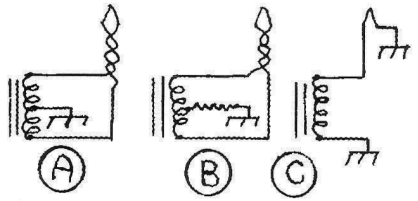
Next they conceived the idea of making a tube work like an Electric iron, by having the filament heat a cathode thimble - which gave off DC electrons. It was the beginning of the AC tube but worked just like a DC tube from the cathode on. Fig. 9 will show the principle of most quick heater, low-hum, type AC tubes of today. AC tubes, with cathodes, may be used on DC just as well, as per the Auto Radio.

Most oxides of metals give off electrons if heated at very high temperatures. But it is necessary to use ones that operate at lower temperatures. Oxides of the rare Earth metals of Thorium Barium, Calcium and Strontium give good amounts of electrons. Two filaments in use today are the Thoriated Tungsten and the oxide coated filament. Emission of Thorium is about 20 times that of Tungsten. The oxide coated filament is about 120 times that of Tungsten alone. A Thoriated Tungsten filament operates at 1700 deg. C. while an oxide coated can operate at 750 deg. C. and on half the current of the Tungsten. It has been suggested that a Radium cathode be used as it gives off a constant stream of electrons - but at a cost of $500,000 - who'd want one?



9. (A) AC Filament inside Cathode thimble. (B) An Early 15 v. AC Tube.

The first AC tubes had 15 volt filaments - with the filaments coming out the side (Fig. 9-B). Later they worked into the 2½ v. filaments. Fig. 10-A shows how they were center-tapped to chassis - and most of them used a potentiometer so the hum could be regulated. Later the filament transformers were made with a center-tap winding. Fig. 10-A shows the CT going to chassis directly. 10-B shows how the CT may be used as a C-bias to build up voltage from B-. Some used the bypass condenser, but other sets left it out. In 2½ v. filaments, due to much heavier current, use large hookup wire as #18. Smaller is OK for 6.3 v. Always twist the 2½ v. filament leads to buck out some of the hum. 2½ v. tubes require a heavier transformer and more hum troubles and heat may develop from them. Usually the 2½ v. tubes required 1.75 a. while the present 6.3 v. tubes take about .3 a.- which is quite a difference.

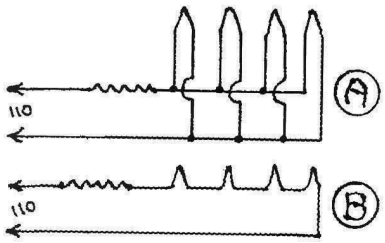


10. (A) CT for 2½ v. AC Tube.
(B) Same with C Bias.
(C) Grounding 6.3 v. Fil.

In Fig. 10-C you ground one side of the 6.3 volt filament winding. It is usually grounded at the closest chassis point and

picked up again at the tube at nearest chassis point. The other filament lead may go direct to the tube by the shortest route.

When they got the AC cathode tubes to working - then they began figuring how to cut out the transformer manufacturer. As AC transformers were heavy units and expensive, they rigged up

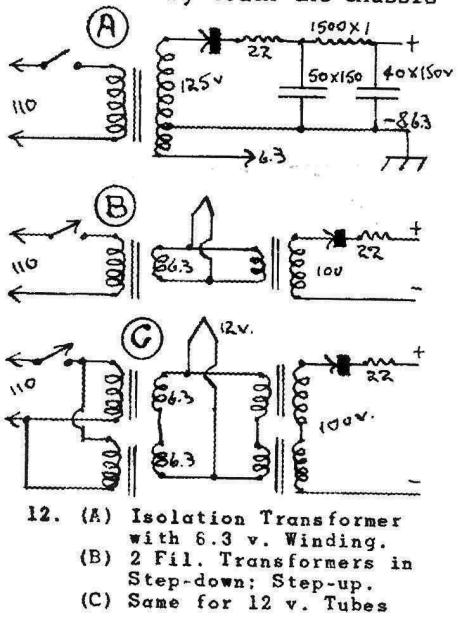


11. (A) Filaments in Parallel.
(B) In Series.

the AC line cords to go in series with the filaments and 110. In Fig. 11-A you can see how the AC tube filaments can also work in parallel - if a big enough resistance is used between 110 to drop it to 6.3 volts. So they finally decided on the series strings, Fig. 11-B. It took a greater resistance to drop them to 6.3 in parallel - or about 103 voltage drop. But in series, we only have a voltage drop of 85 for a 4 tube string, as in Fig. 11-B. Wattage drawn by the parallel circuit was 132. But in the series string it was but 33, or 1/4th as much drain. The 110 was near enough to the B voltage required so it was just a matter of rectifying it properly.

With all the economy of series strings and direct power supplies - these sets offer quite a hazard. If you have the 110 plug in wrong - the chassis is hot. If you are near a sink, pipes or in a bathtub - touching the base can electrocute you. Isolating the 110 is the only way out. An isolation transformer, Fig. 12-A with the filament winding hooked in series with the other Hi-V. works very good. The Selenium rectifier is both efficient and is fairly self-regulating as far as voltage surges are concerned. Be sure to put the 22 ohm, or the necessary protective resistance in series with the Selenium to protect it against surges.

Another method of isolating the power supply is by use of 2 6.3 v. filament transformers in parallel as shown in Fig. 12-B. The filament is taken off the 6.3 v. and the voltage is now stepped up to 110 again - possibly 100 due to filament drain. Then run thru your Selenium rectifier. You may touch the chassis



12. (A) Isolation Transformer with 6.3 v. Winding.
(B) 2 Fil. Transformers in Step-down; Step-up.
(C) Same for 12 v. Tubes

without getting knocked out from the direct 110 v. Four sets of 6.3 v. fil. trans. may be used for 12 v. filaments if desired. Hook primaries and secondaries as shown in Fig. 12-C. Note the primaries of the first two tran. are in parallel. But the other windings are all in series. This gives you 12 volts on the filament but about 200 for your B power supply. Be sure to get the

series windings so they aid each other and not buck. One way you will get full voltage but no voltage if they are wrong.

Another good use for an isolation transformer is in Radio servicing. If working on little sets - one of 100 watts rating is OK. If servicing TV sets, you require one of 250 watts. Some of the TV chassis are hot. It will save you a lot of headaches if you mount one of these on Ur test bench. Instead of plugging into the 110 - use this isolation transformer for all power.

SOME SPEAKER HINTS.

Magnetic speakers are gradually going into discard, altho they work better than anything else on a Crystal set with loud local stations. The old horn type, if you can find one, is the best, altho the tone, due to its construction, does not compare with speakers of today for tone. The horn is about equal to a stage of audio amplification, in many cases.

The difference in tone between the old magnetic speakers and the dynamic speakers is due mostly to the amount of movement of the diaphragms. The old horn, or cone types moved but a few thousandths of an inch before they hit the pole pieces and began to rattle. The dynamics may move up to ¼" - and give a much wider range of sound.

PM and electro-dynamics are both dynamic speakers. 'Dynamic' means one field working into the path of another field, as a motor, dynamo, or dynamic speaker. PM means permanent magnetic field, where a permanent magnet supplies the field force. When a fluctuating field is applied to the voice coil - this causes the cone to move, due to the pushing and pulling of the voice coil in the PM field.

The electro-dynamic types use an external field supply - as a power pack - and it is always used as another choke in the rectifying circuit.

The voice coil of each type is about 3.2 ohms impedance and may be about 90 turns #32 enamel.

Wattage rating of speakers is not too important. If you replace a speaker with the same size the wattage will be near enough.

Magnet weight is often given to show the strength of the Alnico V alloy magnet. A 2 oz. is for home speakers but for Hi-Fi, it may be up to 15 oz. or more. The higher weight gives more volume, less distortion but will cost a lot more.

All dynamic speakers must be fed by an output transformer that matches input and output to speaker. The secondary must match the 3.2 ohm impedance voice coil to work properly. The small coil is used in order to get it into the small air gap space.

The primary of the output transformer must match the output impedance of the tube, Xtal or Transistor feeding into it. Also, changing the impedance of the secondary affects the impedance of the primary - due to magnetic resistance.

Look in any tube manual and U will find the plate resistance in ohms impedance. Try to match this to the primary of the output transformer if possible. If tube plate is 7000 ohms - then get a 7000 ohm OT. It is not critical - in fact, we have seen many work better with different impedances than listed in the tube manuals. To be sure, get an Universal OT and change leads around for the most volume.

Because Transistors draw such little current and work on such low voltages - a standard PM and OT will not work properly. We have had fairly good results using an Universal OT on a single stage Transistor amplifier. But, when we used two stages, the volume was much amplified in the phones - but less in the speaker than the single stage. So the output of the Transistor wasn't matched properly. Now the special Transistor output transformers

run 500 ohms impedance, or 50 ohms DC resistance, and into the standard 3.2 ohms voice coil to match a standard dynamic speaker correctly. The Transistor outputs weigh but ½ oz. while the standard OT may weigh up to 10.

The most important troubles in speakers are broken cones, off-center rubbing voice coils and dirt in the air gaps. The newer types seldom burn out, like they used to do, possibly from use of heavier wire. Greater magnetic efficiency has allowed for use of less wire in the same space.

There are several causes of rattling in a speaker. Broken cones seem to be the worst offenders. Small tears may be temporarily closed by Cello. tape, altho this will come off in damp weather. The best is to cement light paper over the tear with Heavy coil cement and let dry an hour or so. If a small crack occurs, the cement may be painted over the break and some cotton fibers run into the cement for bonding. Do not use too much cement as it stiffens the cone and may change the tone. Replacing a cone for a cheap speaker costs more than a new one, but they may easily be repaired.

The outer edges of a cone may come loose - and may be cemented back in place. If very much of it is loose - be sure to shim it up with thin wooden strips between the voice coil and pole pieces to get it centered right. We use plywood that has been stripped apart to get the right thickness, as metal shims may damage the voice coil.

As a test for rubbing voice coils - turn the set off and gently press the cone in, If it rubs you can feel it. Re-center if possible, by adjusting the spider. Fiber spiders are used for centering the cone. They got their name from shapes used in older speakers - that resembled spider legs.

The voice coil may be rubbing against some dirt or metal filings. Dust and dirt may be blown or shaken out. Tiny strips of Cello. tape may be pulled thru to pick up tiny bits. If Iron filings, hold an Iron wire or tiny screwdriver next to a magnet. Push the tip into the air gap as it will carry the magnetism with it. Filings will attach themselves to the Iron. If you have an electro-dynamic speaker, put full 110 AC on the field and shake the filings out as the AC will de-magnetize them.

Cloth dust caps are used on some of the more expensive type of speakers, to keep dust out of the air gaps. They may work loose and may be cemented back. Other rattling may be caused by loose connections on the voice coil. These can only be fixed by removing the cone or frame.

Do not take the PM magnets to pieces as you may lose the magnetism. The rest of the speaker may be dismantled, but do not fool with the magnet itself. You cannot re-magnetize it without costly equipment. It is cheaper to buy a new speaker.

Electro-dynamic speakers may have 8 miles of fine wire in their fields. Most of them break at the soldered joints - for which we are thankful!

If you want to phase the two speakers, on a Hi-Fi, hook up a flashlite batt. to both. If they click together - they are in phase. However, the changing of the leads back and forth may get a better check to see if they are bucking each other.

If you are running an extra speaker over a long distance- be sure to use leadin wire - do not use fine wire. You will lose a lot of power if you do, besides causing a mis-match.

Speakers, or sets, placed in corners of the room, sound much better than the side wall. A box placed over a tinny speaker will improve the tone. For real Hi-Fi - read up on Bass reflex and other chamber type speakers.

We hope this covers some useful information.

THE BEGINNER IN RADIO.

The Radio Neophyte is beset with many problems.

First of all, his source of easy-to-read literature is being crowded out by technical articles in most Radio magazines. To describe a simple Crystal, or tube set, in a technical magazine, the writer might bring the wrath of the Slide rule clique down upon him. His loss might demote him the next day. It can also be that material is hard to find - giving the magazines the benefit of the doubt. We have long felt there is a stressing need for beginner literature and have devoted our time to it. We all have to begin somewhere- and the beginner today is the good customer of the big houses tomorrow. Why not encourage the beginner - instead of throwing obstacles in his way. Many of the clerks in the large houses seem to have no patience with the fellow who asks easy Radio questions. We like to cater to beginners, not saying we only have beginners on our list. We have literally thousands of real Old Timers - who have been with us since the 30's. We can name Engineers, Doctors, Hams, professional men by the score. They like to dabble in small sets and read our 'propaganda!' Hi.

Secondly, the Experimenter must chase around for parts. Many times I need some little item, maybe it costs $1 - and it costs me $5 in time, gas, parking and patience to get it in a big city. Grab a mail-order CAT. and look in the index. The most needed parts will be found there for you. Make up an order and enclose your money in any convenient form - and shoot it in. No worry at all. Soon it'll be in your mail box without your leaving the place. It'll probably be right and it'll cost less. If sending coins - tape them to a light cardboard and mark 'Hand cancel' on the envelope. Be sure to put enough postage to cover the extra weight, Also, don't forget to enclose postage. As most mail-order houses sell on such a short margin they can't pay the postage, too. We find it a good idea to let the customer specify if he wants the balance credited or refunded.

Thirdly, he lacks confidence. Maybe he got hooked on some 'last forever; no tubes or batts to replace---' deal with his last $5. He is lucky to get one local station with it. He could have wound a coil and with a 30¢ crystal and stand - could have gotten more stations. Our kits are all tested out - and we believe most reputable kit manufacturers in the business for any length of time do likewise. Good kits keep the friction down and the customer coming back. A bum kit can give anyone a poor start.

Fourthly, the small set field is a specialized one, We've had Fans return an MRL kit, they had wired up - after some dealer has told them it "would never work!" Eureka! Now, - what did he do? Oh, just put both coil leads on the condenser stator! Now - what about that 'live wire' dealer? He should have caught it at once like we did. (Put me in a TV set and I'm licked- or electrocuted) So, everyone to his own business we always say. Other dealers pass up a reversed socket - so much so that we now rivet them in place.

This recalls one on me. At the Alameda Naval Base, during the War, I was given a control box to wire up. This is rather complicated - and connects most of the individual Aeroplane Radio units together. There was only a pictorial - no schematic. For some reason, my eyes saw it oppositely and I wired it all up backwards. Like looking at a picture of a transparent box- which side is the front? First it is the front; then the back, as the eyes shift. I never lived it down and the fellow, who wired it over, put himself at the head of

the class - by seeing it right.

Fifth. Reading the schematic diagrams may baffle the beginner. We have tried to show the illustrations and diagrams for most of the parts in our CATalog to make it easier. Keep trying to learn them - as no Radio man uses a pictorial after awhile. Schematics are a form of short writing - as it takes too long to draw pictures for circuits.

Sixth. Have patience - you'll lick your problems sooner than you think. And when you do - the information will stick with you. There is a reason for everything and you'll soon find it. You can study Radio all your life - so don't try to master it in just a few weeks.

Seventh. Take it easy - start at the bottom and work up, for a real thoro Radio life. Begin by making Xtal sets, then the 1-2-3 tubers, and up to the superhet. Then each difficult task becomes an easy one. Some beginners begin with circuits I wouldn't get on myself. If you start too high you are in for disappointments. Start at the bottom with everything - it is fun to progress.

BLUE GLOW IN TUBES.

There are several different types of blue haze, or glow in tubes while operating.

The **Fluorescent** glow is usually a violet color, and noticeable around the inside surface of the glass bulb. This glow is a phenomenon caused by electronic bombardment taking place in the tube. It changes with the intensity of the signal, and may become very brilliant. It has absolutely no effect on the operation of the receiver. In fact tubes with this characteristic are particularly good as regards gas content. You will find it mostly in pentodes.

A CRT, or cathode ray tube is what its name implies. The cathode emits electrons. A grid controls the intensity of the beam. A luminescent screen converts the striking electron beam into visible light. The beam may be deflected electrostatically or magnetically. In an electrostatically controlled beam it is deflected toward the positive terminal. Magnetic deflection is at right angles to the field.

Kinescopes are large CRT used in TV and are deflected magnetically. CR tubes for scopes are deflected and focussed electrostatically. Other special CR tubes may be either deflected or focussed by either method, or in combination. A CRT in TV has a tiny hole in the end of the enclosed cylinder which allows the beam to hit the end of the picture tube. The focus coil on an Iron core, is moved along the neck of the tube to regulate the picture. Two deflection coils are also used - to deflect vertically and horizontally.

The human eye retains an image for 1/16 second - so it takes 16 vibrations a second to change the row of dots to a straight line in a picture. Five different kinds of Phosphors are used for the screen. P-4 is the one used in TV - with white fluorescence.

Gas Tubes. When large currents are passed in a tube - the negative electrons build up around the cathode and drop the voltage too much. It is necessary to introduce positive ions to neutralize some of the negative electrons. So a small amount of Mercury is placed in the bulb before sealing it as a vacuum. When the filament is heated. The Mercury vapor arises and a blue glow is noticed between filament and plate. Tiny drops of Mercury may often be seen in the tube. Without this Mercury there would be a big voltage drop in the tube. With the Mercury the voltage drop is held at 10-20 v.

The perfect operation of the 82 and 83 rectifier tubes depend on this vapor. This type of blue haze is in no way detrimental to these tubes. They have low plate heating and use the same two plates and two filaments as the 80. Compared to the 80 - which has an RMS voltage of 400 and ma. drain of 120 - the Mercury vapor types run 500 RMS and 300 milliamps.

But while Mercury vapor tubes must be operated at 25-70 deg. C. Xenon gas may be substituted for Mercury and operate at -70 deg. C. to 90 deg. C., like the 3B25 tube.

Gassy Tubes. A Radio tube is supposed to be a perfect vacuum. But theoretically, there is no perfect vacuum - so we have to settle for "almost a vacuum." Air is gas - but if a tube contains a trace of Air- more plate voltage will flow than necessary and the tube becomes mushy and noisy and less sensitive. We want a greater plate voltage flow, but only up to a certain point. Above this the plate is said to be overloaded. This heavy flow does not affect the flow of electrons from the cathode- only a collision between them, which results in this condition. Tubes seldom get gassy now because we have better methods of evacuation. Gassy tubes may also develop from leaks from tiny glass cracks. Excessive overheating may also produce gas that has been driven from the elements in the tube chamber. A greater vacuum also produces tubes that may have a longer filament life.

This ionization produces a blue glow, or haze, around the filament and plate structure. This condition may become so bad that the grid change does not affect the plate voltage - and causes distortion. It is most noticeable in output tubes where lots of power is used. We used to see it a lot in '45's.

For a quick check- try another tube in its place. The same reproducing conditions may be also caused by other faulty parts in the circuit. Most modern testers have a gas test on them. Allow tube to heat for several minutes before checking. It is said that if a tube reads better than GOOD it may be gassy. We disagree with this rule - as some tubes may naturally test higher.

When in doubt as to the gas content of a tube- hold a magnet near it when operating. If it is deflected, then it is fluorescent and a good thing for the tube. If it does not deflect - then it is gassy - that is bad! This does not apply to Mercury vapor tubes - which do not deflect.

Another form of haze may be found in a rectifier tube, like the 80, when it is overloaded due to blown condenser. If left too long, it will blow the tube from overload. By holding the tube up you might see little flakes of oxide that have been driven off the filament. It will still work as long as the filament lights.

In some cases a gassy tube is good. They are usually called "soft" tubes and are good for detectors. Hard tubes are better for amplifiers. We used to take a sack of 01-A's out on a service call, on a 5-tube receiver. By juggling the tubes around we could often increase the volume on a DX station by 10 times. We always tried it on a weak DX'er. Testing with modern tubes, of the same type, may often produce varying results. Be sure you do not get them in the wrong socket - or they may burn out.

RADIO KINKS.

Old Inner Tubes have many uses as in vise to hold panels. Also around sandpaper block.

Phonograph needles will cut glass. Mount them in a holder and replace when dull.

Variable condensers may be cleaned with finger nail file. It removes burrs from plate edges.

Crystals should be kept clean. Do not touch with fingers due to natural grease. Do not overheat. Replace crystals every 6 months for best results. Always try to use a fine catwhisker.

another MRL Handbook...

$5\frac{1}{2}$ x $8\frac{1}{2}$
24 pages
36 drawings

HB-8. "Radio Kinks & Quips."

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The scheme of this Handbook is different from most Hint and Kink books. Each page covers one classification so you can easily find it. We have tried to eliminate all except practical helps. Handy for all Radio Fans.