

No. 48

Spring - 1959

REGENERATION.

on page 3.



Radio Builder & Hobbyist

FOR THE EXPERIMENTER.

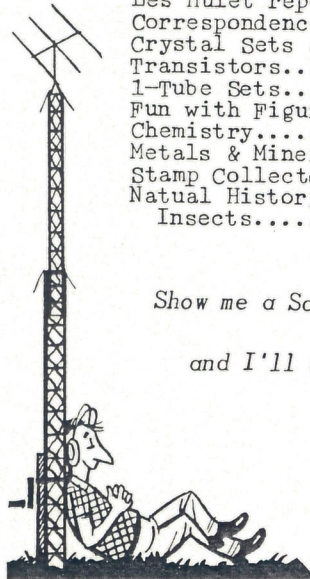
WAVELENGTH/FREQUENCY CHART.

Can work for either.

Meters	Kilocycles
1.....	300,000
2.....	150,000
3.....	100,000
4.....	75,000
5.....	60,000
6.....	50,000
7.....	42,900
8.....	37,500
9.....	33,330
10.....	30,000
15.....	20,000
20.....	15,000
25.....	12,000
30.....	10,000
35.....	8,570
40.....	7,500
45.....	6,670
50.....	6,000
80.....	3,750
160.....	1,875
200.....	1,500
300.....	1,000
400.....	750
500.....	600
600.....	500
700.....	429
800.....	375
900.....	333
1,000.....	300
1,500.....	200
2,000.....	150
2,500.....	120
3,000.....	100
5,000.....	60
10,000.....	30
25,000.....	12
50,000.....	6

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Show me a Satisfied Man -

and I'll Show You a Failure.

Edison.

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plus postage.

EDITORIAL NOISE LEVEL



... and we have something
to crow about!

Hello, - gang! It's nice to be
greeting you again.

As you Old Timers may see - we
have changed the plan of the
RB&H a little. Now that we have
the occasional MPL "Radio Flyer"
- we can put most of our adver-
tising in it. This leaves room
for a lot more "gab" in RB&H. Am
sure you prefer it that way. All
Buyers and Subscribers get a
copy of the "Flyer" FREE anyway,
when issued.

We have eliminated "What's in
the Mags" - let them do their
own advertising! They don't ad-

vertise for us unless we pay 50¢
to \$1.25 per word. Besides, we
figure this space can go for
much better data.

A page each of "Chemistry" and
"Metals & Minerals" have been
added. These are slanted toward
Radio or Electricity. Also two
pages for Transistors, which we
ran in with Crystals before. The
contents will vary as interests
change. We want to keep you all
happy! Hi.

Ads will start from the center
of the mag. so you can easily
locate them. Give these adver-
tisers a boost so they will come
back to us. We thank the fellows
for a good showing of ads.

The Correspondence Column has
been brought back again. This is
a perfect way to get others to
write to you about experiments.

Flyer #6 has brought lots of
subscribers into the fold. Also
a lot of the subscribers have
added to their subscriptions.

So, get your friends to send
in a subscription - even a short
one helps a lot. It takes money
to run a deal like this - and the
Grocer says if we want to "eat
up high on the hog" - by gosh we
will have to pay for it!

Let us know what you think of
the issue. Also, how many mis-
takes we have made! Tell us what
you'd like to see in RB&H.

We will have more time to get
up #49 - as we got started late.
Even so, we hit it pretty close.
Business has been the best in 5
years - so this required the
burning of quite a bit of "early
morning" oil to get her out.

73. E.G. Osterhoudt "EO"

HINTS & KINKS. Doors.

Hacksaw the top or bottom of
doors that stick. It won't tear
the wood - and a lot easier than
planing them. Some Douglas fir
gets pretty hard after it is
well-seasoned. Also some paraf-
fine will help. Cardboard under
hinges will raise a warped door.
Hit the frame with a block of
wood - often the frame sags at
the top. We drive in a good FH
nail to pull her in.

REGENERATION.

AUTODYNE.

"Auto" means self. "Dyne" sig-
nifies force. So Autodyne is
"self-forcing." Like "automobile"
as self-moving. All regenerative
detectors are called Autodynes.
It may also be called a beat, or
self-heterodyne receiver. This
is where oscillation takes place
in one section of a tube but not
a dual tube like a Super-het.
converter with 2 tubes in one.

When regeneration is properly
used it may obtain a gain of 25
times over the straight non-re-
generative detector. This is 3
times that obtained by a good
TRF stage, or equal to 2 stages
of tuned Radio frequency.

All regenerative detectors ra-
diate energy - but usually not
enough to bother the neighbors.
Some of those, like the Reinartz
really put out a good signal.
For this reason, TRF stages are
put ahead of the detector to act
as a buffer between detector and
Aerial. We don't believe any cir-
cuit can beat a Super-het. for
putting out and picking up other
squeals in the neighborhood.

ESSENTIALS FOR A GOOD DETECTOR.

To obtain sustained oscilla-
tions in a regenerative receiver
several points must be stressed.
The tickler must have the right
number of turns and be in phase
with the grid circuit. We need
not worry about polarity - we
just reverse the connections.
The more efficiently your set is
built - the less tickler turns
you will require. This is a good
test of your set-building abili-
ty. Tickler turns must have the
right amount of coupling to the
grid circuit to work smoothly.

The proper regeneration con-
trol must be used for smooth ad-
justing. Enough, but not too
much plate voltage must be used
to make it oscillate right.

The proper coupling from the
Aerial-ground circuit to the
grid circuit is essential. Prop-
er size grid condenser, usually

.0001 or .00025 mfd. A good grid
leak, low wattage is OK, but not
over 5 megohms resistance. Size
now specified is about 2.2 megohms.

The detector tube works better
if it is a little "soft" - as we
used to find out when we juggled
201-A's around in 5-tube sets. A
"soft" tube is one where a tiny
bit of gas was allowed to remain
in the tube when it was evacua-
ted. Older detector tubes were
made soft on purpose. A soft
tube usually shows a low test so
this is an advantage.

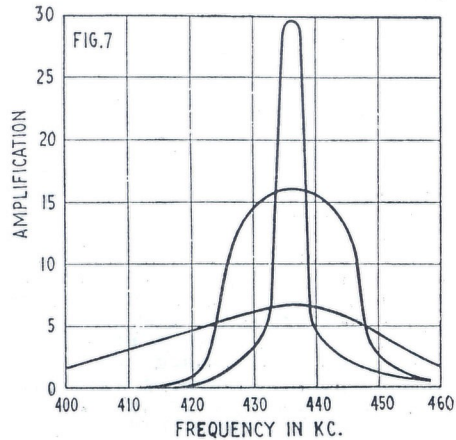
Now, hook up a good Aerial and
you are ready to go to work.

BEATS.

If cw. comes into a non-regen-
erative detector it cannot be
heard. The tickler, or other re-
generative method is brought in-
to play and a beat note is read.
For instance, if the signal is
500 kc. and the tickler is 501,
then you get a difference of 1
kc. (1000 cycles) in frequency,
or what we call a beat note in
the phones. This is just like a
Super-het. in this respect, ex-
cept the latter uses a separate
oscillator for the signal to
beat against. This may be a sep-
arate oscillator tube or be part
of the mixer, or converter tube.
The most sensitive part of the
received signal is just below
the point of oscillation. So,
make your set oscillate and back
the control down just below the
point of oscillation and you
have the most sensitive spot for
receiving voice, or modulation.
If you want cw. then make it os-
cillate a little more to beat
against the incoming cw. signal.

SELECTIVITY.

This is greatly increased by
regeneration. If you short the
tickler turns you will see what
we mean. The chart (1) shows how
selectivity is increased as well
as the amplification of the sig-
nal. If too much selectivity is
obtained you cut the sidebands &
lose the high notes. The more

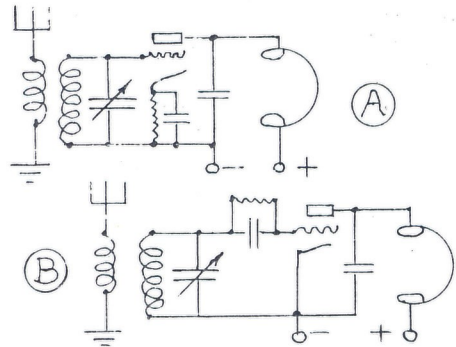


1. Increase of Sensitivity and Selectivity by Regeneration.

regeneration, the sharper the peak. The peak is where the circuit has less reactance.

CW. versus MODULATION.

CW., or continuous wave, is an un-modulated carrier, with sidebands on each side. In telegraphy the whole carrier is keyed. If you super-impose a sound wave on this carrier you have modulation or fluctuation, as in Radio telephony. It may also be an intermittent cw. or modulated tone of a key. A Crystal detector cannot receive cw. unless it is made to



2. Detectors. (A) Power. (B) Grid Leak & Condenser.

oscillate like a Transistor. But it can receive all forms of modulated waves.

POWER versus GRID LEAK DETECTOR.

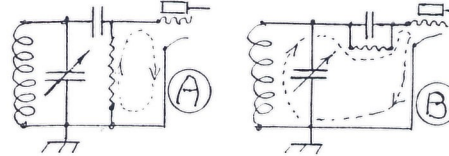
A detector is a de-modulator. It removes the modulation, or detects the vibrations on the carrier. A power, or plate detector (2-A) cannot receive cw. or modulated waves as well as a grid-leak detector (2-B). De-modulation takes place in the grid circuit of a grid-leak detector. But it takes place in the plate circuit of a power detector. There is amplification of the signal in a grid-leak detector grid circuit but not in that of a power detector.

THE GRID LEAK AND CONDENSER.

No amplification takes place in a Crystal diode. An amplifier must be added to get more power. A tube must have bias to work properly. The grid-leak, in a regenerative detector, provides a bias and a DC return path from the grid back to cathode. It acts as a half-wave rectifier. The resistor is the load and the condenser is the filter. Grid is always negative in respect to the cathode. When it remains in a negative state no current change is noted in the plate circuit. Upon receiving an AC signal, from the tuning circuit, the AC goes across the leak to make the grid positive for one-half cycle. This impulse shows up as a change in plate current. The condenser bypasses RF current (as only HF AC can go thru a condenser back to the tuning circuit from the grid. We used to think the grid leak was to keep the grid from overloading & blocking the tube. The de-modulated AC signal appears across the resistor and is fed into the grid and amplified by the tube. The bias is constant because the condenser bypasses the RF signal around the leak. A blocked, or overloaded grid, is one that has an accumulation of negative charges that prevent the flow of plate current. A shorted grid

condenser shows no signal, and produces distortion, excessive plate current and no, or erratic oscillation.

Saturation is the point where any further increase in the grid voltage does not produce any more plate current. This is another way of saying that the amplification factor drops to a fraction of its initial value, which reduces the amount of amplification secured. This acts as an automatic valve and maintains the oscillating amplitude at a constant level. So, they build up from zero to a final level and remain there.



3. Two ways to hook Grid Leaks, showing path of grid return.

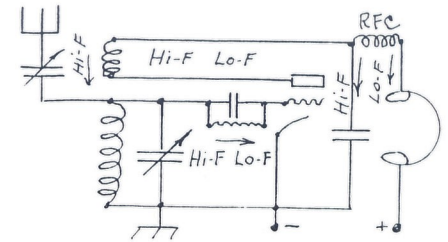
Fig. 3 shows two methods of hooking up a grid leak. Be sure to run it to the B- side or it causes distortion. During operation, the bias voltage developed is equal to the average grid current multiplied by the leak resistance in ohms.

ACTION IN THE PLATE CIRCUIT.

The rectifying action of the detector tube results in an Hi-F pulsating output and a Lo-F pulsating output to the plate. The plate current does not reverse after coming thru the "rectifier" tube, but rises and falls with the incoming signal fluctuations. But pulsating current works the same by going thru condensers, transformers, etc. as an AC wave.

The diagram (Fig. 4) shows the paths of the different frequencies. The low freq. goes into the phones and is converted to sound. The Hi-F is bypassed to ground (negative) by a fixed condenser (we usually call it the regeneration condenser).

However, this Hi-F energy, in



4. Types of Current in a Regenerative Receiver.

the plate circuit can be made to work for you by feeding it back into the grid circuit inductively by a tickler; capacitatively thru a condenser; or electronically thru the tube elements. The Hi-F current is in phase with the grid coil and makes it oscillate. Signal is then amplified more and it goes thru the tube again. One would expect the signals to keep building up indefinitely. They do to a certain point, where they stop. Twice during each cycle the tube grid is saturated at the upper and lower levels of the characteristic curve. The plate then oscillates from maximum to zero. If the tickler is out of phase, all we do is reverse the connections until it oscillates correctly.

TROUBLES & DEAD SPOTS.

If a receiver regenerates too freely - reduce the number of tickler turns. Reducing plate or screen grid voltage may help. By increasing Antenna coupling by winding more turns on the primary coil, or putting it closer, or over the secondary may help.

You may find some places on Ur dial that your set refuses to oscillate. These are called dead spots. This means the set pulls more power at this point on the dial. The Aerial may cause dead spots at its exact frequency, or harmonics. You can see how this works if you have used an MRL QRM Coil as a series wave-trap in the Aerial circuit, or in series with the tuning coil and condenser. It traps out a station

when it and the set are tuned to the same frequency. For the A-G circuit the primary may be altered by adding or removing a few turns of wire. This altering of the frequency can also be done by using the series condenser (HB-4, MRL 1-tuber). This causes the dead spots to be moved away from the tuned spot and let the set oscillate all over the dial. The series condenser may also be used for vernier tuning on certain SW stations.

Sometimes an RF choke, in the plate circuit, will resonate with the grid circuit at a certain place and cause dead spots. Removing a few turns may alter this trouble. Poor chokes may also cause phone cords to be "alive" with body capacity. For a complete discussion on wave trap phenomena see RB&H # 43.

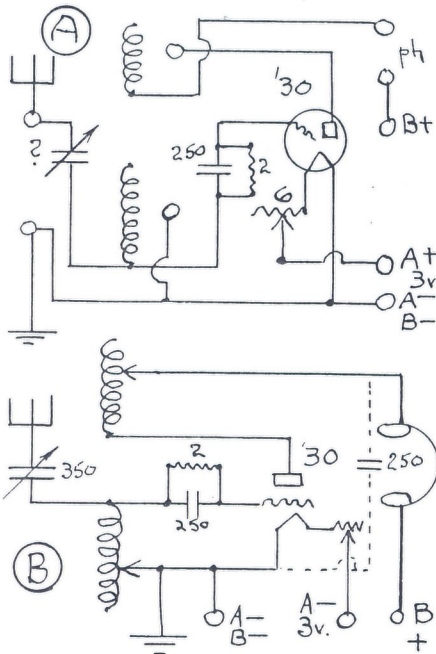
ARMSTRONG TICKLER CIRCUIT.

All these tickler regenerative forms use the Armstrong tuned grid oscillator with series feed and often called the 3-circuit. The Antenna series condenser is part of the A-G circuit in case you are not using a primary.

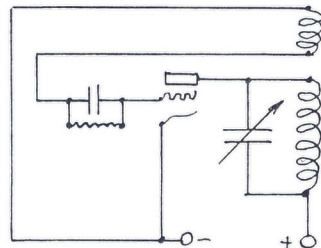
Fig. 5 shows a tickler regenerative set called the Vesco, of Oakland, California. In the late 20's he was selling them like hotcakes. In those days a City was lucky to have a half dozen BC stations instead of scads of them today. So, separation was no great problem then like it is now. We are showing how it was originally drawn and how we show it in normal schematic. When you look at 5-B you will see how simple it is, but it shows up some good principles of feedback - like tuning the secondary and tickler. We added the .0001 bypass condenser to ground. It uses a tapped secondary and tickler. As no secondary condenser was shown, he must have trimmed the station with the Antenna series condenser. No doubt the filament rheostat played a good part in the adjustment. Filament control was used to control the regeneration in some earlier sets. Due to the time lag in the filament heating- this was objectionable.

For a loop set - you might run a few turns back from the plate and get some regeneration to pep up those weaker stations, especially on the lower freq. BC.

Fig. 6. This is the reverse of tuned grid - being a tuned plate oscillator. In the same manner,

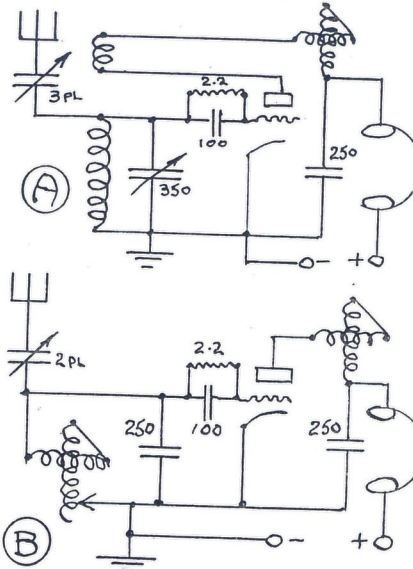


5. (A) Vesco circuit - complicated? (B) But it isn't!



6. Tuned Plate Feedback Oscillator.

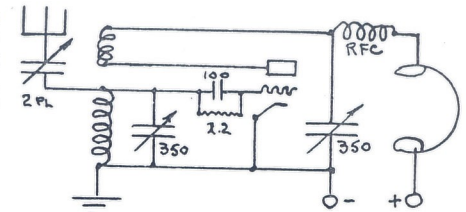
the energy is fed back thru the grid leak and condenser. It is also called a reversed feedback oscillator. It is seldom used in test oscillators but more in transmitting circuits.



7. (A) Tickler & Variometer Regeneration in Plate. (B) A Tapped Variometer & Plate Regeneration.

Fig. 7. This progresses a little farther by using a Variometer in series with the tickler coil. Also the tickler turns inside the secondary for further control. While operating on the Tankers, I used to put a Variometer in series with my honeycomb coil tickler. It would often aid in picking out stations. At (B) you can see how a tapped Variometer may be used to tune the secondary circuit.

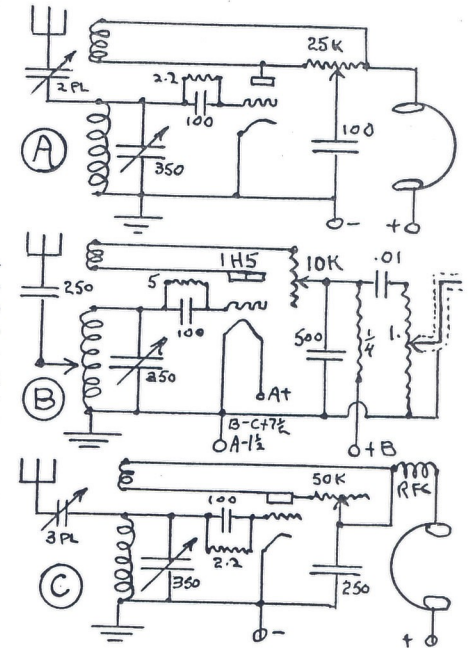
Fig. 8. This is the throttle condenser, or capacitive regeneration method. It has also been called a coupling condenser at times. By juggling the fixed condensers around and adjusting number of turns on the tickler - you will be able to cover all



8. Using a Throttle Condenser.

regeneration necessary with a .00035 variable. Proper adjustment of B voltage is also good.

This is a very sensitive control as there is no damping of the tickler turns as when we put a resistance across them. Read RB-37 and 38 about a 11,500 mile record on DP-29 circuit of MRL 1 tuber, using this method of regeneration and MRL A coils. These two young fellows each won a \$100 Hallicrafters set as a 1st prize in a "Boy's Life" contest.



9. Various Resistance Controls of Tickler Feedback.

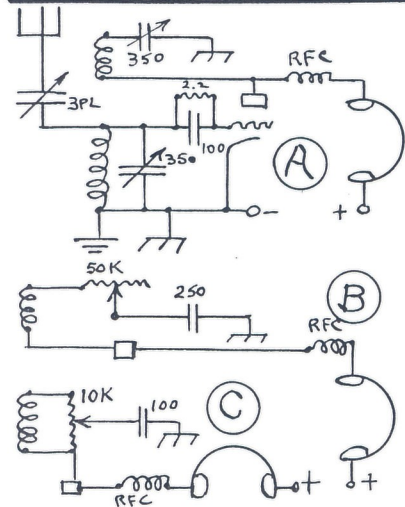
Fig. 9. There are several ways of regulating the tickler feedback by a variable resistance. We have shown 3 types here, and you may think of more. (A) is the one used on the MRL 1-tuber (HB-4) and works very successfully as judged from DX reports. When we used a 50K volume control we had to use a .00025 mica regeneration condenser. But for 25K we found a .0001 better and at times it worked without it but was very unstable.

(B) is used in one of the Philmore kits with a 10K variable resistance in series. You will note we have shown the coupling to the audio stage for a shielded grid lead is used to prevent howls (interstage coupling). In this circuit they use 2 stages of audio - and use a 7½ volt C-battery in series with the last grid resistor.

(C) is another variation where the control runs across the tickler winding. This is OK if U have a smooth control.

REINARTZ REGENERATION.

This was introduced by an Amateur-experimenter, John L. Reinartz, for reception of cw. signals. It is excellent for cw.



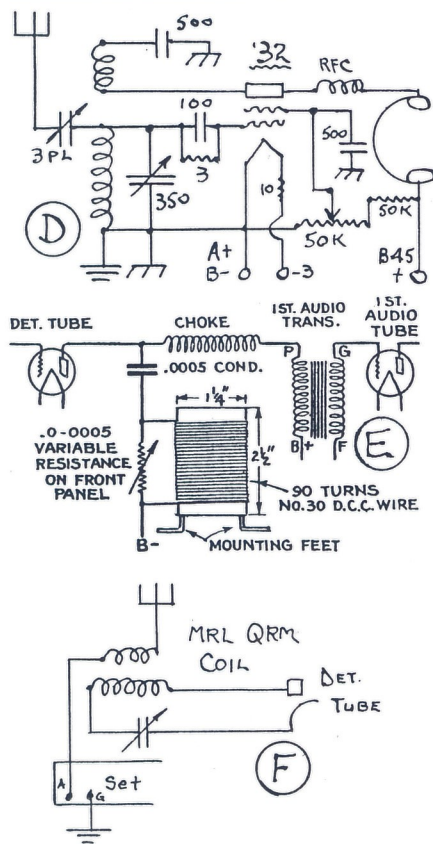
10. Variations of the Reinartz.

but not too good for voice. It's used a lot in Australian circuits. There are many variations of it. We built them in Los Angeles but found them very broad on BC bands. However, by controlling the Aerial and tuning circuits its broadness may be overcome. It is a fine radiator, as your neighbors can vouch! Hi.

Fig. 10-A is the most popular. When you get the correct tickler turns - the regeneration is effected by a variable condenser. MRL A coils may be used in all Reinartz circuits.

(B) controls regeneration by a variable resistor. The condenser and resistor will have to be

Continued on page 14.



AROUND THE WORLD WITH THE MRL

1-TUBER, and OTHER REPORTS.

By Bill Stillinger, 395 Ardsley Road, Scarsdale, New York.

In my opinion the MRL 1-tuber is the best receiver in its own class. I have received over 21 verifications (QSL cards). I also enjoy listening to the SSB (Single side band) Hams and networks across the country. The following list is only the SW DX stations that I have received, but I feel the set has done a fine job for me. I have had no luck with 10 meter coils yet, but am going to experiment with wire sizes, etc. I put a Japanese vernier dial on the 1-tuber and it sure makes it run smoothly with DX stations.

I also hooked the 1-tuber up to my Heath EA-2 amplifier. The set has amazing treble response and can get good bass response on New York City locals.

While trying to rig a good 10 meter coil I stumbled onto a coil that brings in the 19-25 m. bands fairly well. It uses 5 turns of #18 wire for both the secondary and tickler. Both of the windings are close-wound. I call this the 2-A in my list below. (20 meter A). 4 is 40 m.; 8 is 80 m.; 16 is 160 meter coil.

Location	QSA	Coil	Miles
Melbourne, Aus.*	3	2A	10,100
Karachi, Pakistan	2	2A	7,400
Peiping, China	3	2A	7,000
Leopoldville, BC*	4	4	6,600
Brazzaville, FEA*	3	2A	6,600
Teheran, Iran*	3	2A	6,400
Baghdad, Iraq	2	4	6,000
Ankara, Turkey*	4	4	5,600
Buenos Aires, Ar.*	3	4	5,600
Sofia, Bulgaria*	4	4	4,800
Moscow*	5	2A,4	4,800
Bucharest, Romania	4	4	4,800
Prague, Czecho.	4	4	4,400
Rome, Italy*	4	4	4,400
Vatican, Italy	4	2A,4	4,400
Warsaw, Poland	3	4	4,300
Budapest, Hungary*	4	4	4,300
Berne, Switzer.*	5	2A,4	4,100
Brussels, Belgium*	4	2A,4	4,000

Hilversum, Neth.*	4	2A,4	4,000
Copenhagen, Den.	4	4	4,000
Cologne, Germany	5	2A,4	4,000
Tangier, Morocco	3	4	3,900
Oslo, Norway	3	2A	3,800
Paris, France*	4	2A,4	3,700
Madrid, Spain*	4	4	3,500
London, England	5	2A,4	3,500
Lisbon, Portugal*	4	2A,4	3,400
Quito, Ecuador	5	2A,4	2,900
Delano, Calif.	3	4	2,700
Los Angeles, Cal.	3	4	2,600
Georgetown, B.G.*	3	4	2,500
Caracas, Venezuela	4	2A	2,400
Guatemala City	3	4	1,900
Havana, Cuba	4	2A	1,400

(*) verified by QSL cards.

The Army MARS net. has scheduled SSB transmissions, and by following the directions in the MRL CAT. page K-3-A, they may be received on the 1-tuber.

Late one nite I received an announcer in Arabic, in the 31 meter band. Upon a check in a DX mag. I found it was a "Clandestine" station, transmitting propaganda from a secretive location. This particular one was the "Voice of Egypt," location, of course, is unknown.

I built up the MRL #2 Crystal Set and it is great. Selectivity on the BC is tremendous and can work a speaker on local WCBS.



Prof.: 'Of course, it still has a few bugs in it, but....'

Built the Transistor code oscillator (DP-41) and it serves a double purpose. It also works as a tester for batts. because when they run down the tone changes.

A Transistor battery was rigged up out of Copper and Aluminum. It produced .5 volts and it was enough power to work the oscillator for 10 minutes. When the squeal died down I squeezed the lemon juice out of the blotter between plates- and it would start to oscillate again! The batt. is held together with rubber bands. There are only 2 sq. inches of surface on which the electrolyte can work. No data yet on the "best brand" of lemon juice to use!

The MRL 50-in-1 Antenna tuner was built up. Even tho I can only use it on the 25 and 19 meter bands - it is certainly doing a great job. I'm getting another set of A's for the tuner.

My Trimm professional phones sure help a lot on that DX.

Made Mickelson's flasher as described in RB&H 34. Instead of 90 v. DC I use a power supply & it works OK.

MRL Handbooks are tops, especially 2, 4, 5 and 8. They are full of material that I wonder about the most. They are read over and over. I am very happy 2 see RB&H printed again - and I have all the back issues.

"HER4 - SWITZERLAND CALLING.."

Submitted by Bill Stillinger.

Among the most easily tuned Short wave stations in the 49, 31 and 25 meter bands are the ones owned by the Swiss Short-wave Service. Operated by 35 permanent and an equal number of non-permanent employees, the SSS has broadcasts in 7 languages, including English. The transmission can be beamed in 10 possible directions, covering the entire Globe.

The SSS began broadcasting shortly before the outbreak of WW2 to bring information about



The Swiss Antenna System.

Switzerland and the various aspects of life there. Her neutral and impartial views on the big events of the day have since been of growing interest to listeners abroad, and the program services rapidly developed into an around-the-clock operation.

The studios for this work are located in Berne, but the actual transmitting equipment is situated in the village of Schwarzenburg. Five 100 KW. Marconi, Swiss manufactured transmitters are used. The Antenna system, which has been in use since 1954 beams the programs with a stacked dipole system. It uses 8 dipoles in the actual Antenna and 8 more in the reflector, which aims the wave toward its destination. This system follows the theory that the height of the Antenna is equal to the wavelength of the transmitted wave. Thus the 48.66 meter outlet goes out from an Antenna raised to a point just below the top of their highest tower, 50 meters high. For their home service, circular Antennae are used. They transmit in French, German and Italian, for the three language groups in Switzerland.

Beams to the U.S. are aimed directly on Chicago, but coverage

Continued on page 14.

QUESTIONS & ANSWERS

Have you seen those Xmas tree lites that clamp onto the cord? Do they pierce the cord?

ANS. These would be small 1/25 watt neons. One side could pierce the insulation, so possibly only one side is hooked to the clamp. Enough current is induced thru the air to light it.

Is it possible to work experimental arc lamps off the 110 without blowing a fuse?

ANS. You old meanie! The TV guys are going to hate you! It's better to use a power transformer and wind the secondary at a low voltage, like a welding Xfr. You use large wire, but bring it down to 12-15 volts, and you can "pull an arc." Some form of choke or high inductance should be in series - or you won't get a fat spark. Look in Hawkin's Electrical Guides for a lot of data on arcs - all types. To protect the line from blowing fuses - hook 2 1 mfd. condensers in series & across the 110 line. Ground the center- where they connect. This will "leak off" the hi-surges.

How can I get the wax off the mica condensers?

ANS. Wipe them with lacquer thinner. The government specifies them to be waxed for tropical climates. Not necessary.

What is dope on winding Xtal coils on oatmeal boxes as they used to do?

ANS. Being about 4" in dia. - they make a good form. If wound with large wire they are very efficient. However, the main difficulty is that this large dia. tends to broaden the tuning in congested areas. If you are away from hi-power stations they may be used effectively on DX. The idea is that they have such a large field. Smaller coils & finer wire introduce losses but give a more concentrated field. I wonder how many boxes of oatmeal were sold - just to get the boxes for Crystal sets?

What is the difference between a trimmer and padder condenser?

ANS. Either may be fixed or variable, but mostly the latter. A trimmer is connected in parallel (across) a condenser or a coil. A padder is always connected in series with a coil. It is used mostly in the oscillator of a super-het. A trimmer condenser is usually adjusted when the main tuning condenser is clear open. A padder is adjusted when the condenser is clear in.

I cannot read your Radio diagrams. How can I get some information on them?

ANS. Our DP-28 "Radio Symbols" will help to straighten you out. However, don't get discouraged. Little by little you will learn what they mean. You can see what would happen if we had to draw a picture of everything we hooked up. Diagrams and signs are used to shorten our work. Learn them!

My phones are dwindling away. Stations getting weaker on my Brandes. What do I do?

ANS. The magnets are getting de-magnetized. They have been hooked up wrong, according to the cords. The red goes to the positive side of set. Putting it on negative will de-magnetize. Our HB-1 on Phones will explain. Brandes Superior and Trimm Professionals are about the same. Better Iron is now used for the magnets - so they last longer.

You got 'em.
we got 'em!



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CRYSTAL Radio Experimenters. Write to Hulet... Hope, Lakewood, New Jersey, (5-52)

KEEP Oil at to break - ever change - complete test... gram \$1.00. -it-you... material cost less than... R. Filter, 1, Box 7 El Cajon, California. (1/4

KINKS & QUIPS

Drills. Drills break easily so for the finer ones you may use small brads. Cut off the heads & sharpen the point with a flat edge. May be used on wood, Compo or Bakelite OK.

Joe: "Did you enjoy Havana?" Jane: "Yes, I sure did. I got NYC on my Radio every nite."

Sal ammoniac. Chemical name is NH₄Cl, or Ammonium chloride. Is used in making drycells. Also is good for tinning your Iron.

Bill's wife is a back-seat driver in the country. At home she is a good TV boss.

Aluminum solder. Formula is Tin 75.5; Zinc 18; Aluminum 2.5. All by weight. No flux is needed with this. Same companies now have a good Aluminum solder on the market but never tried it.

Father: "Would Oscar make a good match?"

Daughter: "No, I think he'd make a better blowtorch."

Woods Metal. Hugonium. For the mounting of Xtals. Melts at 158 deg. F. Tin 4 parts; Bismuth 15; Lead 8; Gadmiun 4 by weight. You melt and set Xtal in. Don't heat Xtal any more than necessary. MRL HB-3 gives more information.

Then there's the Prohi. senator who refuses to use a 'wet' battery in his car.

Audio transformers should not be used after a detector. You can use them after the 1st A.F. stage if you want lots of smooth volume. If they howl put a 100K resistor, or .00025 mica across secondary. From .001 to .006 mfd may go across primary to lower howls and make tone lower. The reversing of pri. or sec. leads often helps to cut howls.

Flapper: "I'd like to see the Captain." Sailor: "He's forward, miss." Flapper: "I don't care - this is a pleasure trip anyway."

Empire cloth does not show up pencil marks. Use fountain or ball pen to mark. Cut with razor blade for smooth edge.

There's the fellow who puts coffee on his ground to get Java and hooks a snuff box to his set to get Copenhagen.

Phone cord capacity is about .001 mfd. between cords. Some use up to .006 mfd. across the phones. This lowers tone but it also cuts the volume on DX.

Jake had a good horse in that race - it took 12 good horses to beat him.

BUILDER-Experimenters: "Radio Workbench" magazine is jam-packed with material for you. Latest issue 25¢. Radio Workbench, Circulation Dept., Carlsbad, New Mexico. (1-48)

Please mention RB&H when answering ads.

LES HULET reports...

TRANSISTORS differ greatly, especially the brands, types and numbers that are easily obtainable by Civilian Experimenters.

Even apparently identical numbers are not identical in action in a circuit. This has long been a problem to Experimenters who have carefully followed all the specifications of a particular circuit, and still failed to get results as claimed. One may require a different sized resistor for bias, or a different stopping condenser. It also may even work better without a resistor.

The "brain-bags" say all solid Transistors are a mess of traveling holes with electrons hopping from hole to hole. The best circuits are those of Xtal sets.

Send stamped envelope to me at 305 Hope, Lakewood, N.J. --LES

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10¢ per word; 3 times 5¢ per word. Put name, address and your interests as words. All fans below want to hear from other Experimenters. Let's fill up their mail box! About your name in next issue? Adli June 10th.

E. Reeser, k Wichita 15, Kansas. Exc. Large Transistor ideas. (1-48)

Bill Stillinger, 395 Ardsley Road, Scarsdale, New York. 1-tubers, C-stals, Am Radio. (3-50)

Ronald Turner, Box 398, 211 Duffin Street, Toronto, Canada. Swap Radio parts with anyone. (1-48)

Continued from page 8.

balanced with the tickler winding. This was used in the old TRF Richardson sets we used to sell in Los Angeles. It played all over the World. However, the condenser used to blow and burn out the resistance.

(C) may be a smoother control than (B) as the total resistance is fixed clear across the coil.

(D) is a fixed condenser with tickler grounded on one end. The regeneration is accomplished by variation of the screen grid v.

(E) is a fixed coil in the plate circuit but not coupled to the grid coil. By varying the resistance you partially short out the inductance of the coil.

(F) Well, MRL has to come up with a gadget! We'll call it a regenerative intensifier for any TRF set where it is hard to get to the coils. It is still a regular Reinartz deal. Slip wires around the plate and cathode pins of the detector tube and hook in series with Aerial and ground and you are ready to do business. It will really sharpen up a set and pull in that DX.

Concluded in next issue

"SWITZERLAND CALLING..."

Continued from page 10.

to the whole country is obtained because of the plus or minus 15 degree "slewing" of the Radio wave. This same beam is reversible for their transmissions to Egypt and India. The beam to So. America can be easily picked up on our East coast of the U.S.

The SSS QSL's promptly. Their card is a postcard with the Stations and their frequencies listed on the back, along with the verification statement. Like any other SW stations, they are eager for reports and remarks on their programs. They will verify all correct reports, and their program schedule is free upon written request.

Like all Swiss Radio, the SSS is a non-profit private organization. It is supported by the license fees that all Swiss Radio listeners are paying on their own sets.

Time for "Switzerland Calling" in the bands mentioned above at 0130 or 0415 GMT. Their interval signal "The Bells of Switzerland" are played 5 min. before each transmission. You will probably find the program material very interesting; even moreso than Radio Moscow!

—Dave Egli, DX Editor, Berne.

A kid asked if permanent waves were good - why couldn't someone invent a permanent bath? In Nev. the desert Rats either bathe or go to jail. Jail is better.

Says one fly: "Humans sure are crazy. They build a nice ceiling and then walk on the floor."

SUBSCRIBE to RB&H NOW!
Help keep the game going!

Still looking for that dime that he sent loose in a letter. Be sure to tape all coins to light cardboard and put on enough postage.

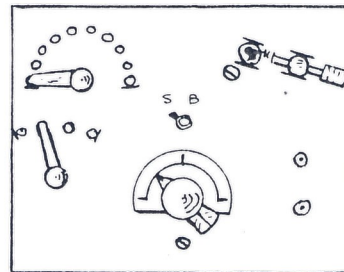
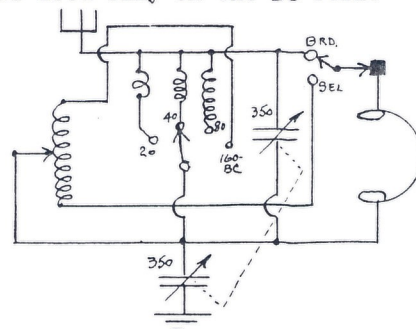


CRYSTAL SETS & DIODES

BERNE, LONDON, SPAIN, MOSCOW...

Errol A. Heath, Maine, a customer of MRL since 1953, sends in a nice report on a re-vamped MRL 2-A Crystal set.

He changed the 2-A over to a 4-coil set by making a few small changes. The SEL-BRD switch is replaced with a SPDT toggle sw. for compactness. It is placed in the center of the panel, right over the condenser dial. This is used only on the BC coil.



The original SEL-BRD switch has 2 more switch points added - one on each side of the original points. Put a stop-lug under the new points and remove them from the originals. So this becomes a coil band switch now.

He used 3 MRL Celluloid plug-in SW coils - 20, 40 and 80 m. & fitted them into sockets behind the panel. Mount them in any position, but place the 20 m. up as close as possible for short leads. The base of each coil may be removed for easier mounting

if you desire. The original coil covers the BC and 160 m. bands so no need to have a 160 coil.

The 2-gang .00035 condenser tracks as well as on the original set. We are showing the whole diagram for anyone desiring to build it up from the start. More details can be had in MRL HB-2 & DP-22-A for layout details.

He also built the Transistor amplifier (RB-38), and uses this for the weakies. A MRL QRM Coil is built into a small case and is used near the set for local BC interference.

Errol says: "I believe the 2-A to be about the best Crystal set on the market, and am sure many others agree. A friend of mine, near me, also has a 2-A and he likes it as well as mine. I would rather listen to my 2-A than watch TV."

His list of stations runs to 161. 107 of them are Hams; over 35 are BC stations in Eastern US and Canada. His best SW DX stations are Moscow (4400); HER5, Berne, Switzerland (4000); Voice of Spain (3400) & London (3300).

The idea of the smaller coils is to eliminate the "dead end" effect of the large BC coil. The original coil is all-wave, but the SW stations are deadened by the large amount of wire that is not in circuit when tuning the SW stations.

SHORT AERIAL IN THE CITY.

When making up DP-22 and 22-A we said "long in the city; small in the country." This was reversed. We have had no comments from the Fans - so we figured U understood.

CRYSTALS & SELECTIVITY.

Experimenters will find that the sensitive Diodes are very broad tuning. Your circuits will have to be altered accordingly. Steel galena, Iron pyrites, Silicon and Carborundum are sharp.

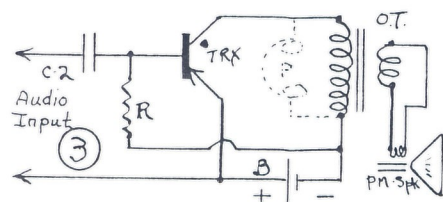
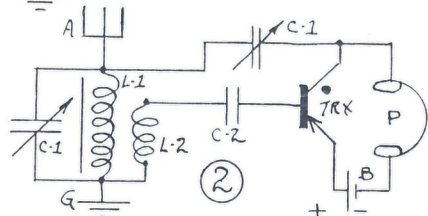
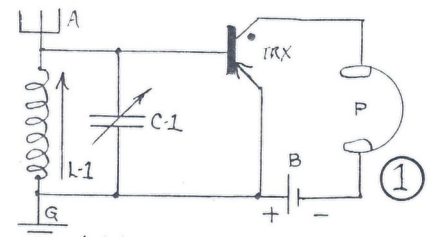
Impedance characteristics of Germanium diodes and other Xtals are different - altering tuning.

TRANSISTORS (TRX)

HOW TO PAVE THE WAY TO EXPERIMENTAL FUN.

By Bill Brushl, Radi-ore Labs.,
38 Oneida St., Lynn, Mass.

Do you know you can get many hours of experimental fun for the expenditure of one dollar for a Transistor? Transistors R ideal for all types of experimental circuits. Almost every Electronic principle can be demonstrated, economically, by the use of a simple Transistor, a



PARTS LIST:

- A 50' Aerial.
- B 1 1/2 v. Penlite cell.
- C-1 .00035 Variable condenser.
- C-2 .25 mfd. fixed condenser.
- G Connection to water pipe.
- L-1 Ferrri-loopstick.
- L-2 8 turns over loopstick.
- OT Output transformer 2000 ohm.
- P Single or double phones.
- R 270 ohm resistor.
- TRX CK-722, 2N107, or any PNP.

flashlight batt., and a few parts to be found in almost any one's workshop. In a Transistor set there are no "B" batteries to run down; no "A" batteries to replace; and no tubes to burn out.

Diagram (1) shows an easily constructed receiver circuit which can be used for further experimental work. The chassis is the conventional "breadboard" style, approximately 1/4" x 4" by 6" long, of plywood or Pine.

Parts are mounted on the chassis and Fahnstock clips are used for A and G and P connections. (L) is a loopstick. (C) is any .00035 variable condenser. (T) is a CK-722 or 2N107 or any similar PNP Transistor. (P) is a 1K ohm or double headset. (B) is a 1 1/2 volt penlite batt. (A) is a 50 ft. Aerial. (G) is a wire attached to a water pipe.

With this basic circuit all sorts of experiments can be conducted. This is a plain BC set, using a Transistor in place of a Crystal or tube. Notice how few parts are required to get good results.

A variation of this circuit at (2) can introduce regeneration by winding an 8 turn feedback coil around the fibre sleeve of the Loopstick. Reverse the coil connections if the regenerative squeal does not develop. This circuit will give far more selectivity than a Crystal or non-regenerative tube circuit.

Another variation of circuits can be arrived at by adding one or more Transistor audio amplifier stages to the detector circuits shown above. Diagram (3) shows this audio stage. This audio stage is strong enough to work into an output transformer to work a PM speaker.

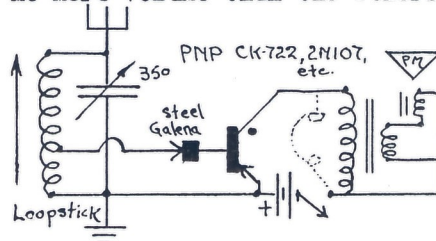
If you really want to experiment - get that Transistor, How else could one have so much experimental fun for so little?

When coupling 2 or more stages of Transistors use a 5K variable between collector and B-. (DS #1)

SOME TRANSISTOR EXPERIMENTS.

J. M. Smith, Attorney, Calif.

"One thing I'd like to pass on - not original by me, as suggested by Rufus P. Turner, in his TRX book - is the 1-transistor Xtal set amplifier. I find it gives me more volume than the others.



The difference is the crystal is hooked directly to the TRX base and no provision for bias. (Ed. The Xtal return goes thru the emitter to ground.) It works well with your Steel galena and Iron pyrites. Limiting battery voltage to 1 1/2-3 v. gets strong speaker volume on locals; booming ear-phones on others. I believe this is safest voltage for this type of circuit. Output transformer seems critical with this rig, but one of the standard sizes should be OK.

"Have been shifting between Transistors and tubes. Have not had much success with TRX on SW. The closest was an SB-103 (Surface barrier type). super-regenerative detector with 2 stages of audio, which finally reached Switzerland one nite. The circuit was very unstable and hard to keep peaked for best results. Despite plenty of shielding the BC interference was ferocious.

"You might try the Surface barrier Transistors such as the Philco AO-90, T-1324 (SB-103), etc. Have found them much superior to CK-722, CK-768, 2N139, etc. (Ed. Objection is the high prices of these, and for this reason, they must be better.) I have put together a passable set with one SB TRX and your MRL 5-A plug-in coils. The SB TRX seem to have better impedance match than the junction types. The

circuit shows enough promise to work on it later.

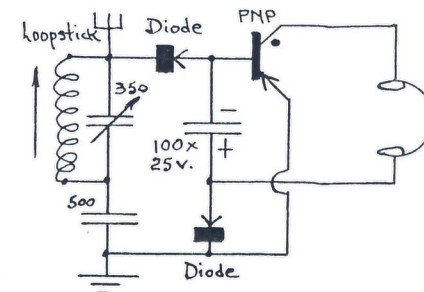
"Keep up your good work. Very much enjoy your various publications. Must have put together at least a dozen of your designs & all have worked exceptionally well."

MRL DP-41 CODE OSCILLATOR.

Sometimes the unusual does happen. We sent a Code kit out to a Fan in Los Angeles. He returned it as not working. Well, we checked everything for shorts and opens. The .02 bypass cond. was open, so it wouldn't oscillate. It is rarely you will ever find an open one as they are checked so well at the factory. If you replace the .02 with a .1 the efficiency is cut down. It is the charging and discharging of this condenser that causes it to oscillate.

ANOTHER FREE POWER CIRCUIT.

Most all of us are always in the market for something free! Here is a simple TRX circuit and no batts. needed. It takes so little current to run a TRX that



it has many possibilities. Diodes may be 1N34, 1N60, N-99, or even a Steel galena, Pyrites or other types. Values are not critical. The 500 mmfd. (.0005) may be changed if desired. Be sure to get polarity of lower Diode and the 100 mfd. filter correct or it won't work. Detector Diode may also be changed to suit.

I-TUBE SETS

REPORTS ON TUBE EXPERIMENTS.

J.M. Smith, Attorney, Calif.: "The 1-tuber and super-regenerative plans seem adaptable to HF reception. By experimenting with 1/2" and 3/8" coil forms and heavy busbar - I have worked them up to TV sound channels (50-215 mc) and FM (88-108 mc.) and other curious transmissions. Almost as much fun trying for the Short waves by trial and error coil winding as searching for another Country via your excellent plug-in coils.

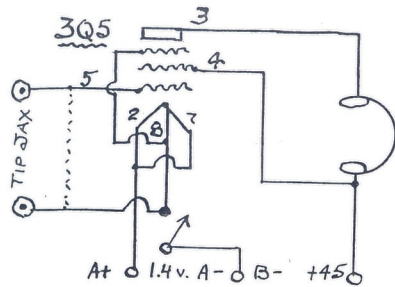
"Again, my compliments on your circuit designs, which are tops. In odd moments I have put together your E-C circuit (CAT.p. E-2) with 6SK7 detector and two stages of audio, with best results ever. Could pull in Moscow, London, Tangier, etc. dependably every night for a week straight with speaker volume. Next project is a repeat, but using your 5-A Celluloid coils, which I have found outstanding for easy oscillation across the entire run of bands."

SOME MRL I-TUBER NOTES.

Regeneration control in this rig is quite a study. We found when we used 50K regeneration control that we had to use a .00025 mfd. condenser. Later, when the supply of 50K got low, we had to switch to 25K. Then we found that .00025 was too much & changed to .0001. It would even work without the .0001 at times. We may have to go to 10K controls when 25K get scarce, but assume that .0001 is OK for it.

A QUICK I-TUBE AMPLIFIER.

Bill Cooley, Penn., sends in this circuit for crystal Fans. Notice it is direct-coupled to the grid of the 3Q5 tube. This is similar to the direct connection of the Xtal to the Transistor base (p. 17). The Xtal gets its ground return around thru



the electron-stream of the tube. The grid return of the tube goes thru the Xtal, etc. In the ordinary amplifier we have a 500K resistor across the grid.

Bill says: "Boy, I sure get the signals with this amplifier hooked to a MRL 2-A Xtal set. Made 2 of your 2-A sets - one for Ken Boord, a great SWL Fan from West Va. I get a lot of good info. fm your material. Ur the only place I can find a lot of answers."

The above amplifier can use a 1Q5, 1C5, etc. just as well. The filaments are hooked together (2 and 7) so you use 1.4 v. fil.

SOME BATTERY NOTES.

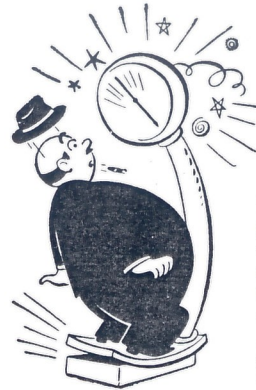
When 1.4 v. tubes were brought out they really opened up the portable field. They really took "the load off" the portables. We remember how hundreds of Kempers and others were lugged around & with a complete set of large A-B batts. to weight you down. Today a 9 v. set of batts. can operate a complicated TRX super-het.

When 1.5 v. drycells get down to 1.2 v. they rapidly drop off in voltage and get noisy. Based on 250 ma. drain of 4 hrs. per day. Likewise, 90 v. B-batts. start going bad at 68 volts.

A good test for noisy A or B batts. is to disconnect Aerial & see if set is still noisy. If so - replace an A or B section.

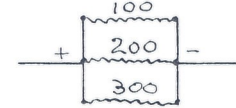
For 1.5 v. A we prefer a large ignitor drycell. Also a compo. base holding several clamps for flashlite cells is ideal.

FUN WITH FIGURES



Continued fm RB&H 41,42,43. #41 discussed quick methods of figuring Ohm's Law. #42 covered series circuits in relation to terminal voltage and drop. #43 had series resistor circuits as concerns the filaments in series.

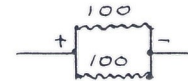
$$R = \frac{1}{\frac{1}{R_1} + \frac{1}{R_2} + \frac{1}{R_3}} \text{ etc.}$$



Rather than make all these reciprocal computations - find the smallest number that 100-200-300 will go into - say 600. Now make this the numerator, as

$$\frac{600}{6} + \frac{600}{3} + \frac{600}{2} = \frac{600}{11} = 54.5$$

PARALLEL RESISTOR CIRCUITS.



Some will say "just put an Ohmmeter across the terminals for an accurate check." Right! But let's see how it can be done by simple mathematics.

Usually only two resistors of the same value are hooked in shunt. As each carries its part of the load we can take one-half - or 50 ohms in case of the two above resistors. If 3-100 ohm are paralleled then we take 1/3 or 33-1/3 ohms, and so on.

If only 2 resistors are placed in parallel we can use this formula for simplicity:

$$R = \frac{R_1 \times R_2}{R_1 + R_2} \text{ for 2 only.}$$

This is useful if you have a hot resistor, - say 2000 ohms X 1 watt. Replace with (2) 4000 ohms in parallel and you'll get 2000 ohms X 2 watts. Resistors seldom break down, but when they do - they are carrying too big a load. The worst enemy is a leaky filter condenser that puts a strain on a resistor and causes it to burn up.

The formula for 3 or more resistors is as follows:

or a little better than one/half of the smallest resistor.

This proportion runs pretty close for any succession of numbers as 1-2-3 (.545); 5-19-15 (2.73); 20K-40K-60K (10,999) or a little over one/half. Now if U don't like to figure you can guess at it!

When you get into odd combinations as 20-86-100 - use 8600 for a numerator, as

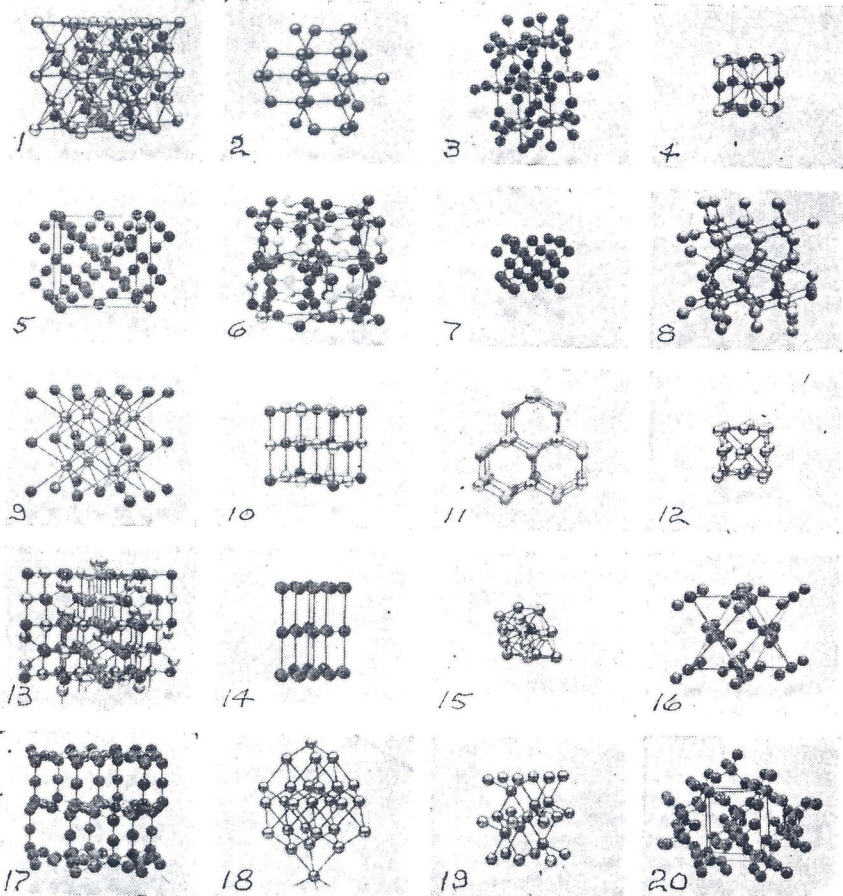
$$\frac{8600}{320} + \frac{8600}{100} + \frac{8600}{86} = \frac{8600}{506} = 17$$

Ordinary commercial resistors are accurate within 10 to 20%. It is not necessary to have them exact except in meters where one scale is used for several ranges of voltage and amperage. In the set it is often a good thing not to have them accurate - as some other resistance may be better. Carbon resistors are made by the mixing of Carbon dust in a binder and pressed into rods. Amount of Carbon controls resistance. Precision resistors are baked at 120 C. for several hours to prevent a slow change in resistance in time.

Volume controls are usually made from a contact running over a Graphite impregnated fibre.

Next will be condensers in series - but they aren't bad.

CHEMISTRY



Crystal Structure Models of Crystal or Space Lattice. Bell Labs.

- | | | |
|------------------------------------|----------------------|---------------------|
| 1. Cuprite. | 7. Diamond. | 14. Graphite. |
| 2. Zinblend. | 8. Iron pyrites. | 15. Beryllium. |
| 3. Rutile | 9. Caesium chloride. | 16. Carbon dioxide. |
| 4. Perovskite. | 10. Sodium chloride. | 17. Tridymite. |
| 5. Cristobalite. | 11. Wurtzite. | 18. Arsenic. |
| 6. Potassium dihydrogen phosphate. | 12. Copper. | 19. Niccolite. |
| | 13. Spinel. | 20. Alpha-quartz. |

In 1914, Moseley found an important relationship between the Atomic # of an element and wavelengths of X-rays emitted from the element when bombarded with cathode rays. Laue discovered if X-rays were passed thru a Xtal the lattice planes diffracted the rays into certain patterns. In this way they could determine the structure of Xtals. If Quartz Xtals are not cut right they'll not oscillate. Labs. use tooth-picks and gum drops for models.

METALS & MINERALS

MICA

Good Mica is found only in regions relatively free from volcanic action. It is from coarse granite deposits called Pegmatite, with feldspar and quartz. Analogy with marble is readily seen as it contains schist, mica, feldspar and quartz.

Mica is one of the natural Silicates like sand, quartz, asbestos, talc, soapstone, etc., but occurring in a laminated crystalline form. It is a refractory mineral of double Silicate of Aluminum and Magnesium, combined with potash, sodium, lithium, iron and other forms of impurities.

The best grade of Mica is Muscovite, called white or Potassium mica, and mined in India, the main source of supply. These deposits also have poorer grades. Phlogopite, or amber Mica is mined in Canada, Madagascar and Russia. This is used for commutators as it is a soft grade.

Other sources are Brazil, Argentina, Rhodesia, E. Africa and Australia. The U.S. has a very poor grade but it still can be used for many things.

Mica may be split into films down to .0005" thick. It fabricates to close tolerances. In India and Madagascar most of the smaller pieces, about 75%, are hand-split into laminae of about .001" thick.

A process, developed by G.E., may soon make U.S. independent of Mica sources. It is ground up Mica formed into sheets with a binder. It is made similarly to paper, except instead of wood pulp - Mica chips are used. It's then impregnated with resins and various carriers. It is called Isomica. At Naval base we used to use Micalox, also made by GE. I think. Altho it was a wonderful HF insulator it broke easily when worked. Ground Mica is also used in mfr. of wallpaper, and as a lubricant. Also an absorbent for Glycerin in dynamite.

Mica is the only mineral suitable, in its natural state, as a first class insulator. Other ma-

terials may possess many of its features - but not all of them. Muscovite has better properties than other types. It is chemically stable, highly flexible, impervious to moisture and highly resistant to heat.

It has low RF loss - some may run about .05 deg. phase angle of around 1 degree.

It is one of the most important dielectric materials in Radio and electrical work. Has a dielectric constant of 6 for the better grades, down to 3 for the poorer. Polystyrene has a dielectric constant of 2.5. Dielectric constant is a measure of its condensive effects with air as a unit of 1.

Dielectric strength ranges fm 700-1200 v. per .001" in thickness. Some runs up to 2-3000 v.

Mica condensers run up to .02 mfd. Small micas, due to their thin plates, have no greater losses or resistance than small air tuning condensers. They are made from metal plates, usually tin or aluminum foil, with Mica in between for a dielectric and all molded in Bakelite. They are unaffected by moisture. Armed forces require them to be waxed over the Bak. but we believe it is unnecessary. No polarity need be observed with mica cond.

Silver micas are condensers made from sheets of Mica coated with a thin layer of Silver - like silvering of mirrors. Metal foil is then placed between the layers. Condenser is then clamped and impregnated.

A Mica dielectric increases the capacity many times over air or paper. On a 20 m. station just slip a piece of Mica between the plates when tuning and you'll "hear" the difference. Higher capacities are achieved by more and larger plates placed closer together with a higher dielectric in between.

You may still buy sheet Mica in hardware stores for use in stove fronts. In 1910 it was used in chimneys, but no details.

STAMP COLLECTORS' PAGE

IDEAS FOR STUCK STAMPS.

As one wise guy says "to keep stamps from sticking together, buy them one at a time!"

Collectors around the Gulf, or other damp places, may like to read about some of the ideas for "stuck up" mint stamps. In hurricane weather, with 4-5 days of rain and humidity, salt sometimes melts into soup. In this kind of weather stamps may stick in almost anything, even glassines.

Talcum powder has been used to absorb the moisture on the gum, but be sure it's the white, unscented type as the medicinal types may alter the colors.

Never use mounts that cut off the circulation of air from the gum. Also black background types that may stick. The Visa-Tray is one that is recommended.

Never leave your album stored flat - often with a pile of books on top. Stand them up on end and don't crowd.

Never store mint sheets, or blocks between pages of newspapers or magazines. Stamps cannot "breathe." It also causes them to turn brown like papers.

Mint sheets have been stored in closets with a small electric light burning. The cost of the juice is very low - and may keep moths and moisture from clothes.

Glassine, Kodapak and Cellulose acetate (Celluloid) prevent some sticking in humid climates.

Do not handle mint stamps too much in summer (or when coming out of a swimming pool!) hi.

Don't lay wet stamps on glass as they stick same as paper.

In cigar, or other boxes, your stamps may have a tendency to curl - which may cause perforation breaks later. Some collectors use "Dry-Alls" like used on salt cellars, or other dry chemicals in the boxes to keep them dry. Silica jel is another type of de-hydrator. They are also OK in hinge boxes.

A "sweat box" is good for the loosening of stuck stamps, or to

remove stamps from envelopes. A few are on the market but an ordinary box of wet sand is OK. We used to use this in softening up insects for mounting, but it required 24 hrs. Leave stamps in there an hour and they should pull apart. Leave the box open when not in use to not encourage molds. We used to put a little Carbolic acid in the corner of a wet box for 24 hr. sets.

Keeping them stored right may make them last 20-30 yrs. longer and increase in value. Even with better prices for gummed stamps, some of the brave collectors remove the gum and eliminate all this trouble.

STAMP PACKETS IN STOCK.

Not previously listed by MRL. All different. At old prices.

25	South America.....	.10
100	" "	1.00
5	" Australia.....	.20
10	Spain.....	.05
25	"10
10	Straits Settlements....	.20
25	" "70
50	" "	1.50
1	Swaziland.....	.10
100	Sweden.....	.90
10	Switzerland.....	.05
25	"10
10	Syria.....	.10
50	"90
5	Tannou Tuva.....	.15
50	Togo.....	1.25
4	Transvaal.....	.15
10	Turkey.....	.10
100	"	1.00
4	Ukraine.....	.10
5	Union of South Africa...	.10
25	United States Commemos..	.30
50	" " Precancels..	.30
50	Uruguay.....	.35
25	Vatican.....	.35
2	Victoria.....	.10
100	World wide.....	.10
200	" "25
500	" "65
1000	" "	1.40
5	Wurtemberg.....	.15
3	Yemen.....	.20
7	"50
2	Zanzibar.....	.15

NATURAL HISTORY ODDITIES

INSECTS.

Bees. One bee makes $\frac{1}{4}$ oz. of honey a season. It would take 64 years for a bee to make a pound of honey, and they don't live that long...Honey and Carbolic acid contain same ingredients but in different proportions and molecular arrangement. This makes one delicious and other deadly.. Stay away from bees when a jet is in the air as they will sting anyone near...Bees tell others about nectar by performing dances. A round dance to left and to right means it is close. Farther away it runs back and forth, and waving its abdomen. Combining the runs gives more explicit information. When dance is over the bees fly straight to nectar. Queen lives 4-5 yrs whereas the 20-40K worker bees and a few hundred drones live but a few mo. Queen larva looks like rest. She produces 400K eggs a year. Her food is royal jelly secreted from the throat glands of the worker bees...The Ammophila wasp uses a pebble for tamping dirt.. Wasps, in 105 A.D. gave a Chinese minister the idea for paper. For centuries writings were on stone, metal, wax or skins. Wasp chews vegetable fibres for pulp to build its nest. He produced first paper from bark and old linen. Chinese held it secret until 12th century...Hornets? Plug nest at night with cotton soaked in Carbon tet. Knock nest into a bag and burn it.

Ants. Ants do sleep and when they awake they stretch, shake & open jaws like a yawn...Ants are not intelligent, as many believe as they cannot cope with a new problem - all instinct...An ant can lift a pebble 52 times its own weight...If a fellow ant breaks a leg, as they often do, a fellow ant will amputate it.

Orthoptera. Grasshoppers' ears are on the side of their stomach. In central Calif. a female fly dive bombs grasshoppers and deposits 50 larvae in their leg. Anyone going thru grass is followed by flies in case any more

grasshoppers fly out. In same proportion to a grasshopper's leap - a man could jump over a tall building or 40 miles in one leap, and that's jumpin'..17 yr. locust larvae pierce tree roots and suck the sap while in the ground...Cockroaches adapt readily to temperature changes... Katydid has ears on their front elbows...Crickets tell the temperature. Count number of his chirps for 14 seconds and then add 40 - and this is the temperature. The hotter it gets the faster he chirps...The praying Mantis blends with sticks and grass. He feeds mostly on other insects but will knock off another Mantis if he meets one.

Coleoptera. Beetles are the champion weight-carriers. One was able to lift 850 times its own weight. At that rate an elephant, in theory, could carry 5 million pounds. A Rhinoceros beetle was hitched up to a toy truck with 19 building blocks & pulled it OK. Equivalent to a man pulling 7 tons.

Moths. One female moth and her descendants can destroy as much wool in a year as 13 sheep can produce. Or fabric equal to the weight of a baby grand piano... Moth balls cannot be smelled by a moth, but the chemical has a smothering effect on them...Moth flies into a bright light because he can't help it. Light affects the near eye, which affects the brain that controls the wing on that side. Trying to escape, the moth flies around the light and into it...The larva of the Oriental fruit moth spits out the first bite it takes. In this way it avoids insecticides.

General. Due to their shape, insects cannot balance like man. Possibly why they have 6 legs... U. of Cal. entomologists found insect specimens embedded in amber 60 million years old, 150 miles north of Arctic circle... Hi-voltage secondaries are rigged to 2 screens so when insects step on both, they are killed.

FM ANTENNAE & THEIR INSTALLATION, & LIST OF FM STATIONS OF U. S. A. and CANADA.

24 pages of real good data on FM. Written by an authority on FM Antenna systems. Includes Why FM Antenna; Desirable characteristics; Best Antenna; Yagis; Frequency reception; Impedance matching; Transmission lines; DX FM; Receivers; Lightning arrester; plus 8 lists of FM stations. 24 pages in all. 3¢ postage. . . .25

MIDGET BYPASS CONDENSERS.
Drawing is slightly enlarged
Molded plastic insulation and



hermitically sealed. Ideal for Transistor and other miniature sets. Furnished in sizes:
1 mfd. x 25 v. Midget \$ 27. .20
3 " " " " 28. .25
6 " " " " 29. .30
10 " " " " 30. .35

TUBE SETS WANTED.

IN5gt tubes in stock.....1.00

STATUS OF MRL DATA PRINTS.

New photo-litho'd will now be 10¢ straight. You can still get DP-file #1 of 15 DPs with an article on Static. 5-2. 1.00
Older mimeographed DPs will be 7¢ straight. Paper going up.
Following DPs, not in DP file #1 - are now 10¢ each: #43 -

ICA PLUG-IN COIL SETS GONE.

PHILMORE SUPERTONE SETS SOLD OUT
Just a few Little Wonder sets left. Same circuit. 14-4. .5

2 x 3 PM Speaker. 1 left. .60

LIGHTNING ARRESTER

for TV or Regular Aerial. Used but OK, at 25¢.



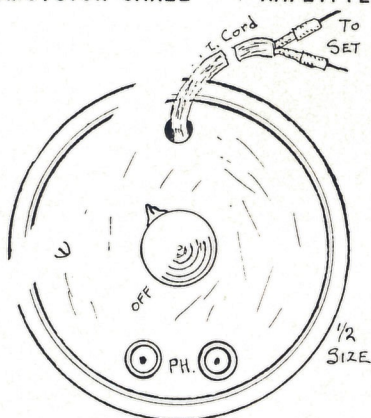
ALL MRL HANDBOOKS ARE NOW 50¢ each, plus postage. Everything is going up, paper, plates, etc. Please observe this increase. We expect another one out before summer is over

SOLDERING IRONS. 55 & 100 watt sold out. My 2-85 watters left at \$3.00 each. Not obtainable.

SHOP CHARGE ON POSTAGE must be charged to customer. You may use quite a few dimes at the 4¢ per oz. rate. Tape to light card. We can use stamps.

Modern Radio Laboratories.

TRANSISTOR SMALL AMPLIFIER.



Here is one of the handiest rigs for the Crystal and 1-tube Fan. It is a Transistor amplifier built into plastic box with a removable lid. You may reduce volume to almost zero and boom in those weak stations. It takes a penlite cell, clipped in. The 1 ft. cord plugs into phone tip jacks. Brings volume level for best tone. Batt. not furnished.
14-14. Amplifier Kit. 1b. 3.50
14-14-W. Same wired. 4.50
New DP-16 shows all details. (Above Amplifier and DP-16 ready on or before May 1, 1959.)

PUT NAMES AND ADDRESSES ON MAIL. We have several that we don't know who sent them!

ALSO - when moving, always give old address as cards filed by STATES only. We cannot bring down credits and subscriptions unless we know your previous State.