



# Radio Builder & Hobbyist

FOR THE EXPERIMENTER.

## CONTENTS

• Our first language is English. Our second is Mathematics.—J. D. Williams

### METRIC EQUIVALENTS

(Based on National Bureau of Standards)

| Length |               |      |             |
|--------|---------------|------|-------------|
| Cm     | = 0.3937 in.  | In.  | = 2.5400 cm |
| Meter  | = 3.2808 ft   | Ft   | = 0.3048 m  |
| Meter  | = 1.0936 yd   | Yd   | = 0.9144 m  |
| Km     | = 0.6214 mile | Mile | = 1.6093 km |

| Area    |                  |         |                  |
|---------|------------------|---------|------------------|
| Sq cm   | = 0.1550 sq in.  | Sq in.  | = 6.4516 sq cm   |
| Sq m    | = 10.7639 sq ft  | Sq ft   | = 0.0929 sq m    |
| Sq m    | = 1.1960 sq yd   | Sq yd   | = 0.8361 sq m    |
| Hectare | = 2.4710 acres   | Acre    | = 0.4047 hectare |
| Sq km   | = 0.3861 sq mile | Sq mile | = 2.5900 sq km   |

| Volume |                 |        |                 |
|--------|-----------------|--------|-----------------|
| Cu cm  | = 0.0610 cu in. | Cu in. | = 16.3872 cu cm |
| Cu m   | = 35.3145 cu ft | Cu ft  | = 0.0283 cu m   |
| Cu m   | = 1.3079 cu yd  | Cu yd  | = 0.7646 cu m   |

| Capacity |                    |        |                  |
|----------|--------------------|--------|------------------|
| Liter    | = 61.0250 cu in.   | Cu in. | = 0.0164 liter   |
| Liter    | = 0.0353 cu ft     | Cu ft  | = 28.3162 liters |
| Liter    | = 0.2642 gal(U.S.) | Gal    | = 3.7853 liters  |
| Liter    | = 0.0284 bu(U.S.)  | Bu     | = 35.2383 liters |

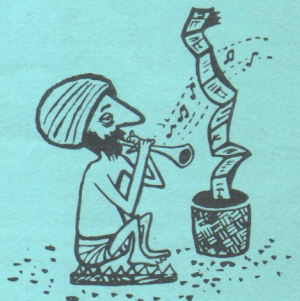
|       |  |
|-------|--|
| Liter | = $\frac{1000.027 \text{ cu cm}}{1.0567 \text{ qt (liquid) or } 0.9081 \text{ qt (dry)}}$<br>$\frac{2.2046 \text{ lb of pure water at } 4 \text{ }^\circ\text{C}}{1 \text{ kg}}$ |
|-------|--|

| Weight    |                   |          |                    |
|-----------|-------------------|----------|--------------------|
| Gram      | = 15.4324 grains  | Grain    | = 0.0648 g         |
| Gram      | = 0.0353 oz       | Oz       | = 28.3495 g        |
| Kg        | = 2.2046 lb       | Lb       | = 0.4536 kg        |
| Kg        | = 0.0011 ton(sht) | Ton(sht) | = 907.1848 kg      |
| Ton(met.) | = 1.1023 ton(sht) | Ton(sht) | = 0.9072 ton(met.) |
| Ton(met.) | = 0.9842 ton(lg)  | Ton(lg)  | = 1.0160 ton(met.) |

| Pressure        |                            |
|-----------------|----------------------------|
| 1 kg per sq cm  | = 14.223 lb per sq in.     |
| 1 lb per sq in. | = 0.0703 kg per sq cm      |
| 1 kg per sq m   | = 0.2048 lb per sq ft      |
| 1 lb per sq ft  | = 4.8824 kg per sq m       |
| 1 kg per sq cm  | = 0.9678 normal atmosphere |

|                       |   |
|-----------------------|---|
| 1 normal atmosphere = | $\left\{ \begin{array}{l} 1.0332 \text{ kg per sq cm} \\ 1.0133 \text{ bars} \\ 14.696 \text{ lb per sq in.} \end{array} \right.$ |
|-----------------------|---|

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MRL Radio Builder & Hobbyist No. 49

## MRL "RADIO BUILDER &amp; HOBBYIST" SHORT WAVE ANTENNA TUNER-COUPLER

Published quarterly by

Modern Radio Laboratories,  
1131 Valota Road,  
Redwood City, Calif. U. S. A.

Specialists in Small Set  
Development since 1932.

Lithographed in U.S.A. by MRL.

Quotations are permissible if  
credit is given RB&H.

World-wide subscription price:  
12 issues \$2.50; 6 for \$1.35;  
Single copy 28¢ postpaid.

Back numbers 25-40 at 15¢ each  
plus postage; #41 on 25¢ each,  
plus postage.

## EDITORIAL NOISE LEVEL



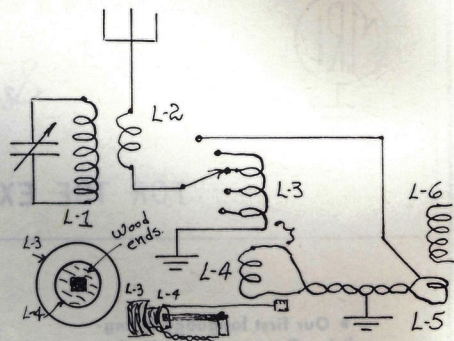
Well, fellows, we're hitting this deadline pretty close. No matter how far we get caught up, something seems to demand our immediate attention first.

We thank the fellows for their subscriptions. They help to build a better mag. The ads are also appreciated- as they help to pay for some of the postage. Remember - they continue to pull in back numbers we always sell.

We have stopped subscriptions to several magazines & may stop others. They are getting too technical for our use. They are being written by Engineers, connected with the expensive ads, who try to outdo each other. We like down-to-earth interesting experimental work, and we'll keep RB&H easy to read and enjoy.

Send in your comments and reports. We enjoy them, and the best wishes to you from MRL.--EO

Besides separating SW stations - it helps to overcome BC interference by half or more.



**COILS.** Use MRL QRM Coil for L-1, 2. Or you can make it by winding 110 Ts #32 Enamel on a fibre form 1' dia. x 1½' long. Over this wind 20 turns #24 DCC. closewound.

L-3 is a Bak. form 1' dia. by 1½' long, of 20 Ts #20 DCC tapped every 5 turns to a switch.

L-4 is wound on a Bak. tubing ½' dia. x 1' long, of 10 Ts #20 DCC, cemented down. In one end fit a wooden plug with a 3/16' hole in the center for rod to run in. Use a 3/16' slider rod about 4' long. Mount L-3 on a baseboard and raise the rod on bushings so it slides freely. Twist the leads of hookup wire from L-4 to the set. Fashion a piece of stiff copper wire to the panel so it can be pulled in or out.

If using MRL A coils, you can wrap 7 turns around ground end.

If coils with a primary, as MRL RF, B, etc. just hook to pri. and the same to any receiver.

Put QRM cond. on a bothersome BC station and tune it out. It should remove all harmonics.

Ground one side of the link; try for best side. Removing this connection improves selectivity. Put on #1 point for direct connection to your set.

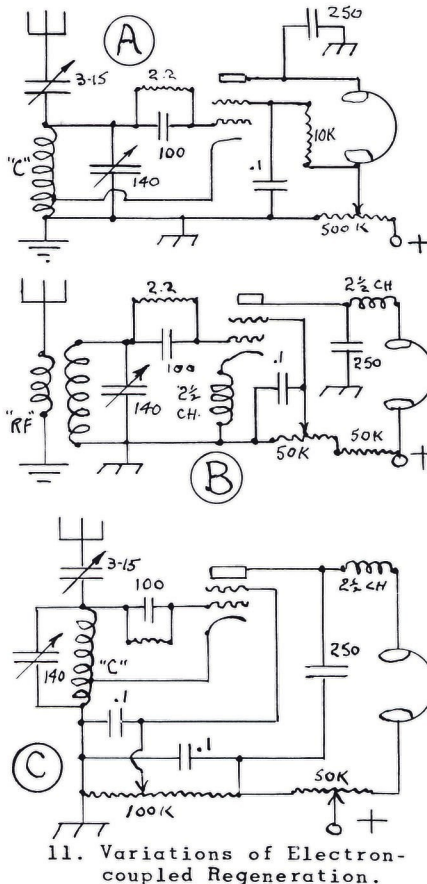
## REGENERATION.

Continued from RB&H No. 48.

## ELECTRON-COUPLED REGENERATION.

Now we'll come to the most sensitive circuits made. It is called Electron-coupled, or E-C because regeneration takes place in a screen grid tube by coupling between the tube elements & the cathode.

Fig. 11-A uses a single coil with a tap close to the ground end. On our MRL Type C coils we make a tap at 1 for 20 m.; 1½ for 40 m.; and 2 for 80, 160 and BC. Variation of the screen grid voltage does the trick nicely.



11. Variations of Electron-coupled Regeneration.

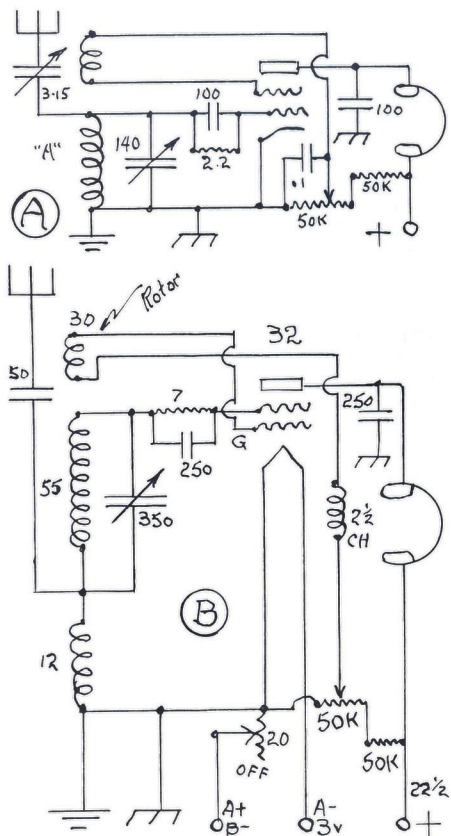
(B) gets regeneration from the RF choke in series with the cathode. No tap is used on the coil. This idea may also be used in DC tubes by running one filament lead thru a choke.

(C) From Argentina we have this sensitive voltage control of both plate and screen grid voltages. It uses our C coils.

## SCREEN GRID CONTROL OF REGEN.

Fig. 12-A. Instead of using the plate to the tickler, this idea uses the screen grid. It is a form of E-C as it couples from screen grid to cathode. This uses our A coils. We used to make coils for E.M. Sargent for his DX kits where he used this type of regeneration. It works very efficiently, possibly because it takes less voltage to operate the screen grid than the plate. Also the screen grid is nearer the cathode than the plate.

(B) David J Mauzeral, Maine, shoots us this revised Megadyne "N" circuit, originally put out by Gernsbach. He says it really 'picks a wallop.' Also very selective. We have changed the power connections around a little to bring it up-to-date. The tuning coil is made up of 55 Ts of #24 DCC on a 2" Celluloid form. On other end is 12 turns wound close for primary. Then on the inside of the first end you mount a rotor - controlled from front of panel, as one regeneration control. The other is the 50K voltage control. The rotor has 30 turns on it and can be 1½ inch diameter tubing. You will note this circuit uses the famous space-charge detector. The grid condenser-leak goes to the screen grid of the #32 instead of the grid. Also the control grid is in series with the rotor and choke to the 50K control. Because space-charge detectors require very little B battery - we believe it can be operated on around 22½ volts. From the looks



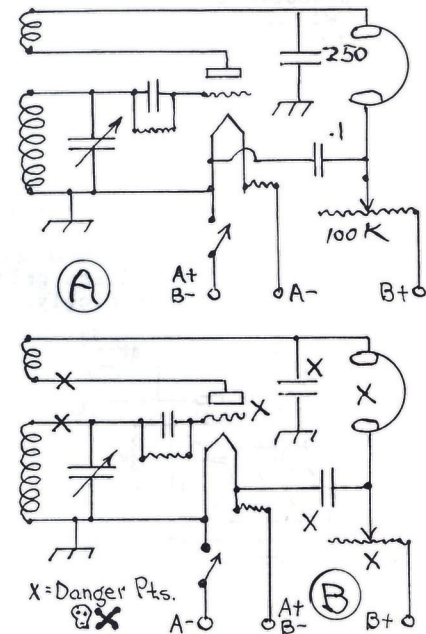
12. Variations of Screen Grid Regeneration Control.

of the circuit - you should be able to get a very smooth control of regeneration as you have inductive feedback as well as voltage adjustment. For even better adjustment you might make the 50 mmfd. in Antenna a .00035 mfd. variable to adjust to the Aerial you are using.

**B BATTERY REGENERATION CONTROL.**

Fig. 13-A shows how the control of B battery supply can regulate any regenerative set. In most regenerative circuits any element of a tube may be regulated and leave the others

fixed. In this case we have a fixed tickler and regeneration condenser. All we do is to vary the power supply. If it is con-



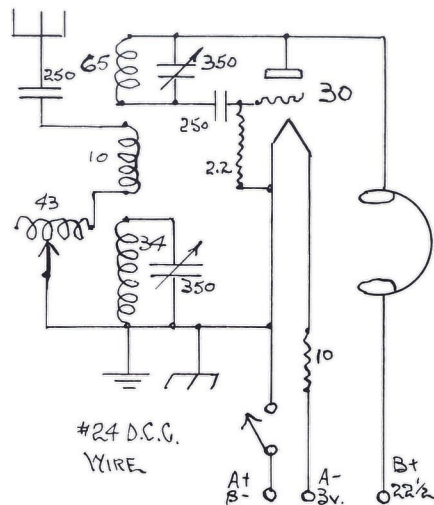
13. (A) Plate Voltage Control of Regeneration. (B) Using Wrong way to hook A & B Batteries.

nected as shown it will give a smooth control. Please note how the A and B batteries are hooked up in this circuit.

(B) shows the wrong way to connect A and B batteries. We figured this is a good spot to bring this up. Compare with (13-A) and see the difference. If you get a short between the tickler and grid coil you will blow a tube as it will have the A and the B in series across the tube filament. It is amazing how many early circuits used this hookup (and when tubes were five bucks each, yet!).

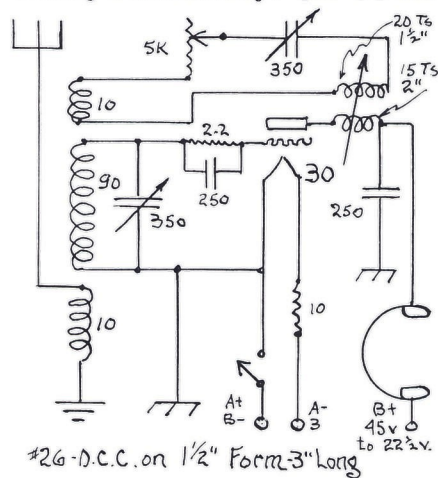
**MISCELLANEOUS REGEN. CIRCUITS.**

Fig. 14 shows the once-popular Cockaday 4-circuit tuner. You'll



14. The Cockaday 4-circuit Tuner.

note that the plate and grid are hooked in series - and uses a different principle. The 3 coils may be wound on the same 2" by 4 1/2" Celluloid form. The 43 turn coil is placed at right angles to the 34 turn to help in regulating selectivity. The 34 turn

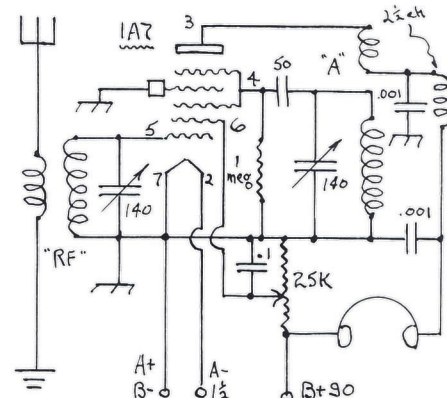


15. Link-coupled Regeneration Control.

is a booster, as we call it now-a-days, and is tuned to the station. Keep the 10 and 65 turn windings insulated from each other. The turns may vary some depending on your condenser.

Fig. 15 is a separate link-controlled method of regeneration. You have several variables in it as you can see. You have a 5K variable resistor; a 350 mmfd. variable condenser; variable coupling between the link and plate circuit; and a fixed tickler of 10 turns. With all this U should get it right! Hi. The variable coupling may be a split variometer. The idea is to get 2 controls adjusted and just work the third for regular tuning.

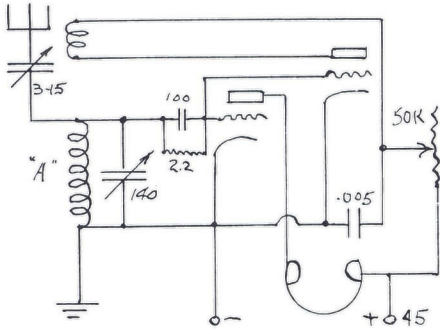
Fig. 16 uses a converter tube in a novel circuit. Coupling between Aerial and set has always been a problem. The series condenser is very sensitive but is sharp adjusting. The primary coil may be too large for one band & too small for another range of stations. This idea uses 2 sets of plug-in coils. Any AC or DC converter tube may be used. The second set of coils is electronically coupled to the input thru the tube. Control of the power to the #3 grid regulates the amount of regeneration. It is claimed to be more sensitive and selective than the ordinary



16. Electron-coupling Between Antenna & Detector.

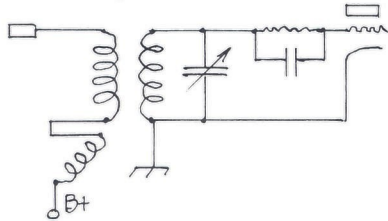
close-coupled detector. The coupling to the Aerial and regeneration are kept separate.

Fig. 17. Along this same line we have a separate tube for controlling regeneration. Any type of tube is OK. The way it looks is that the first tube is working more on low frequency to the phones while the second is only for Hi-F regeneration. The control is by regulating the power supply to the tickler.



17. Using a Separate Tube for Regeneration.

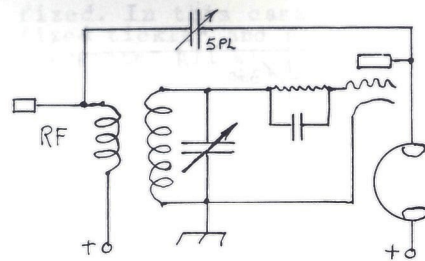
Fig. 18. We have seen where the Aerial coupling has a lot to do with regeneration control. Now



18. RF Plate Control of Detector Regeneration.

we run from an RF stage and have part of the primary of the RF split and moveable. The variation of the inductance between these three coils will give some regeneration.

Fig. 19. This was used years ago to produce feedback from the plate of the detector to the plate of the RF stage. Usually we had a little 7 plate midget



19. Capacity Control of Plate to Plate Regeneration Feedback.

condenser to do the trick. However, a 5 plater is probably OK. This is good for a TRF set where you can't get to the coils to put on a tickler and regeneration control.

Well, RB&H Fans - we think you will find enough in this article to keep you busy for many moons. One beauty about Radio experimenting is that there are so many combinations we can devise. There is always a reason for everything in Science - if we but find the answers. None of us are so good we know all the answers. But it is a lot more fun to look for information than to find it. Too true!

**COST OF GAS & ELECTRICITY.**

Average Pacific Coast rate per month in a BUSY household. Electric rate of 4 1/2¢ per kilowatt:

|                             |       |
|-----------------------------|-------|
| 9 hrs. electric ironer..... | .28   |
| 150 hrs. lighting.....      | 1.40  |
| 2 electric clocks.....      | .12   |
| 130 hrs. Television.....    | .67   |
| 9 hrs. vacuuming.....       | .08   |
| 30 days of refrigeration... | .83   |
| 80 meals (family of 5)..... | .80   |
| 2000 gal. of hot water for: |       |
| 85 baths.....               | .82   |
| 20 loads of clothes.....    | .23   |
| 35 hrs. dishwashing.....    | .15   |
| daily shaves & washups...   | .07   |
| 5 hrs. of scrubbing.....    | .01   |
| 20 loads automatic washer.. | .08   |
| 275 slices of toast.....    | .12   |
| 95 hrs. of Radio.....       | .22   |
| 30 days gas heater (Jan.).. | 5.29  |
| waffle iron and mixer.....  | .08   |
| Average per day 36¢         | II.25 |

**DEAD END TURNS ON COILS.**

Most of our Crystal set circuits use tapped coils for convenience and good coverage with one coil. This works very well on the lower frequencies - but not too good on frequencies that go above 40 meters. We'll admit that the big DX records of our Crystal sets have been on Short waves - but if one used, say two sets of coils - the short waves would be much better received.

When an inductance coil is tapped, there is a capacity and voltage built up in the unused section of the coil which is not in use. This is called the "dead end" effect. A certain portion of the HF current will oscillate in this dead end of the coil and pass thru the distributed capacity of the part in use. This tends to increase the resistance of the part in use and lower the volume in the phones.

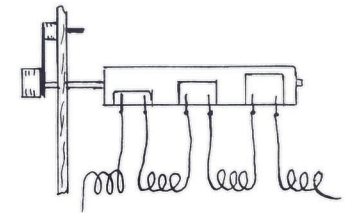
On local BC stations it is not too easy to realize the effects of dead end turns. This is because we are using all, or most all of the coil, and there are few dead end turns. If you were using a tapped 3000 meter coil, you'd find the BC harder to get at full volume. Likewise, if the 90 turn coil is used - we'll find the 5 and 10 taps do not work as well as expected on short waves.

The slider coil is another one with dead ends, altho some exceptional distance has been received with them, especially if two or more sliders are used.

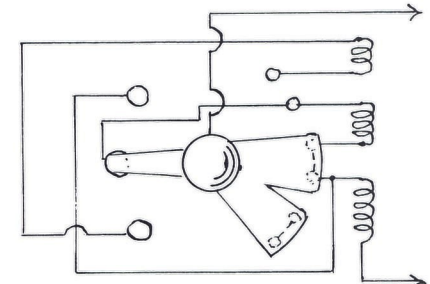
In long wave ship sets - this dead end effect was appreciated before 1917 - when tuning coils ran to 3000 meters. The effect was especially undesirable on 600 meter tuning.

As a result, special dead end switches were added to the inductance switch, to cut out unused portions of the coils from the circuit. In Fig. 1 and 2 you will see two methods of using dead end switches - altho the principle is the same in each.

Coils, to be used with dead



1. Dead End Control with Commutator Switch.



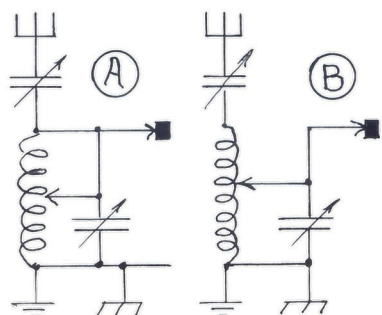
2. Dead End Control with Switch Levers.

end switches, should have each section separated about 1/4 to 1/2" from the adjacent one - to lessen the absorption effect. This is the reason why band coils are separated and at angles to each other in multi-tube sets.

Do not short dead end portions of your coil that are not in use as this forms a short-circuit. A dead short will absorb a great deal of power. It is better to leave the end free as the power dissipation will be far less than if shorted.

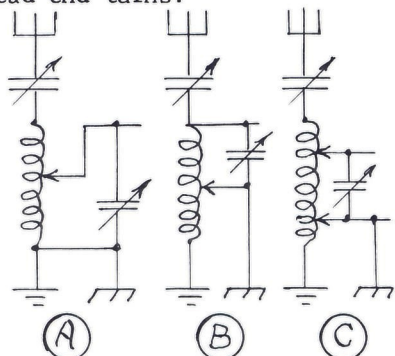
From a test made by Mr. Albert K. Saylor, Virginia, on Mr. E.H. Heintze's Diode-Transistor set (DS Vol. 1 & 2) we have been made to realize just what dead end turns mean on extreme SW DX. This is really the only way to check it - where extreme sensitivity is absolutely necessary. In fact, it is better than all the meters going. Fig. 3-A shows the original method and the one finally adopted at (B).

In Fig. 4 we have 3 ways to overcome dead end without dead



3. Saylor's Test on Dead Ends.

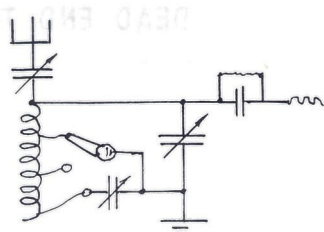
end switches. In (A) we use the unused turns as Aerial loading coil - and this additional inductance is tuned up by adjusting the Ant. condenser. At (B) we do the same with the ground end, where it is used in the A-G circuit, but placed differently. You will note in (A) the ground and chassis may be hooked together. But at (B) and (C) the ground is separated from the chassis - or you would short the dead end turns.



4. Using Dead Ends as Loading Coils to Reduce Loss.

At (C) you will see a combination of the two. We feel this may be an advantage in High frequency SW tuning, as you can get a complete balance between Ant., ground and tuning circuits.

Fig. 5 is another way to lessen effect of dead end turns. Put a small 3-15 mmfd. trimmer across the unused portions. This



5. Tuning Dead End Circuit.

tunes the unused section to a different frequency than that you are tuning. However, when using on the half-coil tap you will get a boost in signal volume when you hit the same frequency as the trimmer is tuned.

It is always better to use plug-in coils - altho you may not like to change them. In this World, we have to exert a little energy now and then. We suggest you take one band per session - and this will eliminate any sort of bother. Go back and forth on the band for new stations that keep popping up.

Any type of plug-in coil may be used - on tube bases, like our Hi-Q Celluloid coils, or like the Crystal plug-in coils using banana plugs and jacks (See HB-2). There is a great advantage to plug-in coils - where there is no "loose" inductance laying around in the coil fields and no dead end turns.

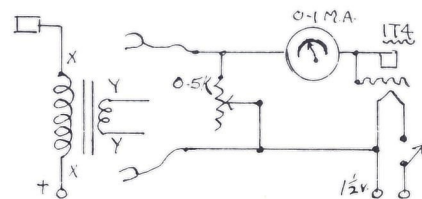
There are certain advantages to everything - and dead end turns are no exception. In certain local-selective sets it may be used to advantage as a bucking coil to increase selectivity, at the expense of volume. This volume is later amplified so you have little to lose this way. But, never do it with Short waves - or they are lost.

See MRL Handbook #6 for more info. on dead end turns, etc.

For you DX Hounds - this is a good field for experimentation. Make your tests when tuning in a real long distant station. This will give you a positive check that nobody can dispute. This goes for any DX experimenting.

## A VERSATILE OUTPUT METER.

H.D. Brown, Penn. rigged up an output meter as shown. This may



be hooked to the secondary of the output trans., as most of them are, or hooked from plate to B plus.

The 5000 ohm vc. may have a switch that controls filament voltage to the 1T4 miniature. It acts as a half-wave rectifier as current flows but one direction, and poles the meter.

In using, you adjust the control to read a certain point. Go ahead and make adjustments and note new reading. It works good.

## RADIO NORWAY.

By Bill Stillinger.

Norsk Rikskringkasting, the Norwegian Broadcasting Company, has been the center of broadcasting in Norway since 1933. It is governed by a board of 5 members, appointed by the King. The organization is in charge of all domestic and SW transmission.

Due to the terrain of the land there - a large number of Xmtrs. are required to attain coverage of all licensed listeners at home. Norsk Rikskringkasting operates 2 long wave and 28 medium wave units. The SW center is at Fredrikstad with several different transmitters. The Antenna system consists of 50 directional Aerials for various bands. There are 6 SW transmissions per day - each lasting 1 1/4 hrs. The ones to North America are given at 0100-0225 GMT (East coast) and 0400-0525 for the West coast of U.S.A. on 6.13, 9.61, 11.735, and 15.175 mcs. Much of the ma-

terial is in Norwegian, but before each program there are English announcements when the frequencies and schedule are given.

The Norwegian National Assembly decided, in 1957, that TV should be introduced into their country. In the same year TV became available to their citizens who pay for a license.

Radio Norway verifies promptly and there is no need to send an International coupon. Their QTH is Radio Norway, Oslo, Norway.

## RADIO SOFIA.

By Bill Stillinger.

Bulgarian Radio became organized in 1926, when a group of enthusiasts formed a club for Radio Amateurs. In 1930, this club built and set into operation a small station called Rodno Radio at the time. The government of Bulgaria monopolized all aspects of broadcasting in Bulgaria in 1935. During World War 2 the Hristo Botev station began to broadcast underground. This station carried the voice of Georgi Dimitrov, the eminent Bulgarian socialist and public leader.

Today, Bulgaria's largest city is its capital, Sofia. Radio Sofia broadcasts 24 hrs. per day in 13 languages. The broadcasts to North America are at 0100-0130 and 0400-0430 GMT, on 9.7 mcs. in the 31 m. band. The mail-bag program is presented at 0115 GMT on Thursdays. Also a special program is on the air daily, as "Music from Bulgaria" at 2300-2325 GMT.

Sofia's QSL is a multi-colored card, with verification on the back. Their QTH is Radio Sofia, English Language Section, Sofia, Bulgaria.

In December I entered a contest held by Radio Sofia. After answering 5 questions about Bulgaria (one incorrectly) I won 1 of the 6 third prizes. My prize was a wooden box, carved in a typically Bulgarian style. It makes a FB container for Xtals!

## WORLD SHORT WAVE B.C. STATIONS.

Most complete listing obtainable; from many sources. Freqs. often change. Max. power shown.

- 26.470 mc. - 11.35 meters.
- 470 Brussels, Belg. 100 kw.  
200 " " 100.
- 080 GSK London, England. 100.  
040 WBOU Bound Brook, N.J. 50.  
020 HED9 Berne, Switzerland. 100.  
000 ZL17 Wellington, N.Z. 7½.
- 25.990 mc. - 11.54 meters.
- 990 KNBH Dixon, Calif. 200.  
950 WBOU Bound Brook, N.J. 50.  
945 OEI39 Linz, Austria. 20.  
900 Lamberseter, Norway. 5.  
DMQ25 Cologne, Germany. 100.
- 880 Tangier, Morocco. 35.  
840 GSS London, England. 100.  
800 SABC Paradys, U.S.Africa. 20  
ZL6 Wellington, N.Z. 7½.  
Philippines.
- 780 Vatican, Italy. 100.  
750 GSQ London, England. 100.  
740 Vatican, Italy. 100.  
720 GSR London, England. 100.  
700 CSA51 Lisbon, Portugal. 100.  
Luzon, Philippines. 35.  
Manila, " 50.
- 675 Melbourne, Austral. 100.  
670 Stockholm, Sweden. 100.  
Tangier, Morocco. 100.
- 650 London, England. 100.  
DMQ25 Cologne, Germany. 100.
- 630 KCBR Delano, Calif. 200.  
615 OEI38 Linz, Austria. 20  
610 Holland. 50.  
605 Tangier, Morocco. 100.  
000 WWV Washington, D.C.
- 21.900 mc. - 13.7 meters.
- 900 Moscow, Russia. 100.  
795 Lisbon, Portugal. 7½.  
750 London, England.  
745 Germany.  
740 Vatican, Italy. 100.
- KGEI San Francisco, Calif.  
KCBR Delano, Calif. 200.  
MCY London, England. 100.  
Paris, France. 100.
- 735 DMQ21 Cologne, Germany. 100.  
730 WBOU Bound Brook, N.J. 50.  
WLWO Bethany, Ohio. 110.  
LLQ Lamberseter, Norway. 5.  
ORU3/5 Brussels, Belg. 150.
- 725 DMQ21 Cologne, Germany. 100.  
720 SBT Stockholm, Sweden. 100.  
Allouis, France. 100.  
Germany. 100  
Singapore, Malaya. 100.
- London, England. 100.  
Lisbon, Portugal. 100
- 715 Brussels, Belgium. 100.  
710 GVS London, England. 100.  
CHLA Sackville, N.B., Can.50
- 705 Tangier, Morocco. 100.  
HEU9 Berne, Switzerland. 100
- 700 CSA49 Lisbon, Portugal. 100.  
VUD-10 Delhi, India. 100.  
690 WDSI Brentwood, N.Y.50.  
Stockholm, Sweden. 100.  
Delhi, India. 100.  
Tangier, Morocco. 100.  
Lisbon, Portugal.
- 685 VUD Delhi, India. 100.  
680 VLC-21 Melbourne, Austr. 100  
Tangier, Morocco. 100.  
London, England. 100.
- 675 GVR Moscow, Russia. 100.  
670 LLP Lamberseter, Norway. 5.  
665 Germany, RFE. 100.
- 660 MCX London, England. 100.  
Lisbon, Portugal.  
TAX-3 Ankara, Turkey. 100.  
London, England. 100.
- 655 Singapore, Malaya. 100.  
650 KNBH Dixon, Calif. 200.  
WLWO Bethany, Ohio. 200.  
London, England. 100.  
Bombay, India. 100  
Luzon, Philippines. 35  
WDSI Wayne, N.Y. 50.  
Delhi, India. 100.  
Singapore, Malaya. 100.
- 640 GRZ London, England. 100.  
Allouis, France. 100.
- 630 KCBR Delano, Calif. 200.  
GVT London, England. 100.  
Luzon, Philippines. 35.  
Manila, " 50.
- 620 Colombo, Ceylon.  
Lisbon, Portugal. 100.  
JOB-24. Tokyo, Japan. 100.  
Paris, France. 100.  
Germany, RFE. 100.
- 615 WLWO Bethany, Ohio. 200.  
610 Moscow, Russia. 100.  
KNBH Dixon, Calif. 200.  
WLWO Bethany, Ohio. 200.  
Tangier, Morocco. 100.
- 605 HEI9 Berne, Switzerland. 100.  
600 Lisbon, Portugal. 100.  
CKRP Sackville, N.B., Can.50.  
Germany, RFE. 100.  
Melbourne. Austral. 100.
- 590 WGEO Schenectady, N.Y. 100.  
Karachi, Pakistan. 50.  
Melbourne, Austral. 100
- 580 SBT Stockholm, Sweden. 100.  
Continued in next issue.

## QUESTIONS &amp; ANSWERS.

Do you have any data on a Xtal set, from Wash. D.C., that uses no Aerial or ground?

ANS. You cannot get enough pickup to work a Xtal set without an Aerial or ground. About the nearest thing to it is a loop but it must be of considerable size to get energy pickup. A whip Ant. is next. However, it isn't too bad to have a wire to hook onto a stove, electrical fixture, phone, etc. If you want to carry it around - string some wires around you! Hi.

I am located near a sending station, with a Xtal set. It used to be loud, but not any more.

ANS. It could be a number of things. Your Ant. lead may be broken, or ground connection bad - or even your phones may have become demagnetized. Crystals should be replaced now and then. Dust doesn't help either. Try a new catwhisker - using a fine one as they are more sensitive.

How about Xtal sets to receive long wave stations?

ANS. A Xtal set will receive long wave signals if you get enough energy. You will have to have a very big Ant. to do this. Xtal sets were standard equipment on ships until about 1930. Aerials ran 300' long, 4 wires 75 ft. high and salt water for a ground. These Xtal sets tuned to 3000 meters (100 kc.). Only voice or spark or ICW could be rec'd.

Are there many long wave BC stations?

ANS. There are many from 548 kc. to 151 kc. (1987 m.). They R mostly Russian and other European and Oriental. Australia, Brazil, Cuba, Canada and Mexico are on 540 kc. They require lots of power - one in Russia is 500 kw.

My Xtal set is only one-fourth as strong at nite as daytime.

ANS. It could be the transmitters do not use as much power at night - as they carry farther.

Also the AC lines have a strong effect on reception - especially if you use an inside, or a short Aerial. When a lot of lites are turned on they may boost or retard the signals - depending on their length, layout, etc. Other sets in the same building may affect your reception. Usually it is the reverse- they are much better at night by far.

Is 22½ volts too strong for a #30 tube? I burned mine out!

ANS. It is on the filament! Hi For plate voltage it can stand up to 180 volts. As a detector it works good on 22½ v. As it takes 2 v. filament - it is good to use 2 drycells in series to make 3 volts - but put a 15 ohm resistor in series when batts. R new. Later a 10 ohm is OK. The 30 has an amplification factor of 9.3 against an 01-A of 8, so it may be used in any 201-A circuit with just the changing of the filament voltage.

Is it so that 5 meter (60 mc.) signals can only go 40-60 miles?

ANS. This is pretty close. Due to their traveling in a fairly straight line - the horizon is the limit. DX records are being made by freakish reception, due to reflection against the Heavyside Layer, etc. If you watch the Ham mags. you can find a lot of good DX reports. These fellows have a good location, good TV or FM receiver and rotating Ant.

"...and you got problems, too?"



**RB&H OPPORTUNITY ADS**

**DISPLAY ADS.** \$3 per col. inch, up and down. Covers \$4. Make Ur own copy - we photograph it.

**CLASSIFIED ADS.** 10¢ per word; 3 times same ad 25¢ per word. Count 11 words. (3-50) means 3 times, ending with #50.

Good circulation. Back/numbers sell for years. Don't let your ad run out; we don't notify. A 3 timer pulls better than once. The more you tell; the more you sell. Please do not make ads conflict with our biz. Checking copy with display ads only.

Closing date for #50, Fall issue, is around 10th of Sept.

**LEVITATION? "Logi" Electronics?**  
World's Most Sensory Transistor Plan - 50¢.  
Wolhowe, South Junction, Mass. Canada. (1-49)

**3-TUBE SW. Receiver, Lots DX.**  
Write details. Also exchange Small set idea.  
Smith, 2 Village Road, Paterson Plains, New Jersey. (1-49)

**NAME PLATES - Engraved nameplates for Radio Electronic equipment. The Radio Stationers, Brandywine, Maryland.** (3-51)

Please mention RB&H when answering ads.

**KINKS & QUIPS**

Fahnstock clips. When mounting these, Bill Stillinger uses MRL switch points and nuts. Because they are low and flat you can press the clips down better.

Office boy: "Someone to see you with a mustache."  
Boss: "Tell him I'm busy; I got one already."

Tools with long handles. Drill a #10 hole in the end. Now use a countersink on each side, so you can hit the hole! Fine for rakes and brooms around the place.

"Papa, will you tell me the story of the 40 thieves?"  
"No, son, you are too young to know anything about TV repairs."

AC or DC in your house? Hold a horse-shoe magnet up to the lite and if it vibrates it is AC.

Should I go to sleep with my phones on?  
ANS. No, you might get choked to death!

Kerosene in cans, Drop a spoon full of Wood alcohol in it and ignite it. When it stops burning it is free of Kerosene.

"Dear Sirs: MRL-Please send me one of your Cattle Logs."

Watches, that lose 1 tick in 10,000, will run up to 1 minute per week.

"Cat hairs received in good condition. Now, how do I wind a TINKLER coil?"

"Diagnyzer" at left is quite an instrument. Works on AC line. Checks all popular tubes, and many others that other testers won't. Also picture tubes while in socket. Compare with cost of a good tube tester alone. Also has a strong built-in lantern for dark places.

**RB&H OPPORTUNITY ADS**

**Rubber Stamps** QUICK SERVICE  
MADE TO ORDER  
Send for FREE 16 page catalog of Rubber Stamps at the Lowest Price. Prompt 24 hour Service.  
Get the BEST  
HINZ 16 CICERO 50, ILL.

Rubber stamps may be used in a hundred ways to save time. First in importance is one for your return address. It will save you money - if you are a lousy writer like "EO." Hi. See Hinz --->

Current from Electric clocks, doorbell transformers, etc. does not register on your meter. The input impedance is so high and the amperage pull so low.

**LES HULET reports...**

The Transistor, which is really a Crystal triode - has more points in common with a Radio tube than a crystal. Also like a tube it is not as good as a detector. That's why practically all commercial Transistor Radios use a Crystal diode ahead of the first Transistor. The Diode furnishes a rectified signal that is properly amplified by the Transistor. That is where a TRX shines, as it can, and does yield current amplification of extraordinary magnitude.

That brings up another point - a TRX operates by current and not just voltage, as is largely the case with Crystal sets. They work better in series circuits, where the tuning condenser in the Ant. lead builds up a voltage charge that shocks the Xtal into sensitive operation. As more current is obtained in a parallel circuit, this type of circuit is used for TRX operation.

Like our friend, Elmer, we believe in using simple terminology that is easily understood, rather than "crack wise" with Electronic Technicalities that mean little to a practical Experimenter. Readers, who have been fortunate enough to invest in Elmer's manuals (HB) will readily understand what is meant by simplified terms, as applied to complex Electronic functions. These invaluable manuals make clear, in simple terms, the most intricate problems in Radio.

Write me at 305 Hope, Lakewood, N.J. Stamp appreciated. L E S

**CRYSTAL Radio Experimenters.**

Write Les Hulet, 307 Hope St., Lakewood, New Jersey. (5-52)

**"PEPPY PAL" Transistor Set.** Latest extra sensitive, condenser tuned model. Economical. Base or case mounted. Kit \$3.50. Wired, tested \$4.50. Radi-Ore Labs., 38 Oneida, Lynn, Mass. (3-50)

**NEW SW. DX Co** for Heintze's DS-1 Transistor set. Ultra-efficient. \$15, with latest circuit details. Nevadium, Box 41, Abita Springs, La. (3-51)

**CAPACITORS - free sample.** Send name, address W3 Workshop, Brandywine, Maryland. (3-51)

**TUBE bases wanted.** We'll pay 2¢ CR & mdse. post. for 1/6 prong, 1-3/8" dia. & glass base. MRL

**CORRESPONDENCE COLUMN**

10¢ per word; 3 times 25¢ per word. Count name, address and Ur interests as words. All answers below want to hear from other Experimenters. Let's fill up their mail box! How about your name in next issue? Deadline Sept. 15th.

Bill Stillinger, 395 Ardsley Rd. Scarsdale, New York. 1-tube sets, Crystals, Ham Radio. (3-51)

J.A. Law, 718 S. Edwards, Clarksdale, Miss. Crystal DX. (1-4

**DIAGNYZER** \$9.95 COMPLETE  
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Anyone can do servicing with this wonderful instrument, pays for itself the first time you use it. Best value for money, nothing else like it. Write Today.  
APPARATUS DEVELOPMENT CO.  
Dept. R Wethersfield, Conn.



## RB&H Short Wave Mailbag

Conducted by  
Bill Stillinger,  
395 Ardsley Road,  
Scarsdale, New York.

### SUMMER RECEPTION.

For those of us with smaller sets, there is not much of a chance for DX in the summertime. The Heaviside Layer is probably not in a favorable position for reflecting the RF. As you know, this layer is about 60 mi. high during the day and about 200 mi. at night. At night it splits into 2 separate layers. The more direct rays of the sun, that we get in the summer, could drive this layer even closer to the Earth, or create such irregularity in its surface that skips become virtually impossible.

I suppose the best time for DX is in the winter at night, when the layers are more smooth and regular. Now the thing to do is to wait for Oct. or Nov., the beginning of the DX season.

However, summer is the ideal time to build, or revise your rigs and work up a good Antenna system. Remember, you can't get adequate performance from your receiver unless your A-G system is good - and you try for DX at the right times. Then the small receivers can do amazing things.

BBC, London. I received a pkg. from the BBC containing a stack 1" high of articles reprinted from their station magazine. Also included was their hard cover Handbook and complete station

information. TV facilities and a map of their new TV center were also sent.

**Notes.** I installed the lightning arresters with 1/25th watt Neon bulbs. I used 4 #10 wires braided together for a ground lead to a radiator. We have had 2 rainstorms since and the static charges have flashed many times. Sometimes, when there was no lightning, they flash with the ground on the negative side, possibly from wind static.

I built the 3-neon flasher and up to tonite - it has flashed 28,886 times at 5 flashes every 6 seconds. I use a power supply on it. When the latter is shut off - the flasher keeps flashing for a good 5 minutes after.

I built up your 1-tube Xmtr., using your A coils and it works great (MRL DS. Vol. 1. 30¢). It is used to broadcast records, etc. Further experimenting will turn up other uses. (Ed. Just so they aren't SOS signals!) hi.

Am considering the construction of Mr. Heintze's Transistor diode rig - as it sounds like a real good DX getter. (DS #1 & 2)

I was using my Transistor code oscillator the other day, when I heard local signals. No Aerial or ground was attached. Signals were just below the oscillating point, like a regenerative set.

Am happy to take over the MRL SW Mailbag. Would appreciate the readers writing me direct with any of their reports that they might think interesting to RB&H.

### PROPER WAY TO GET VERIFICATIONS.

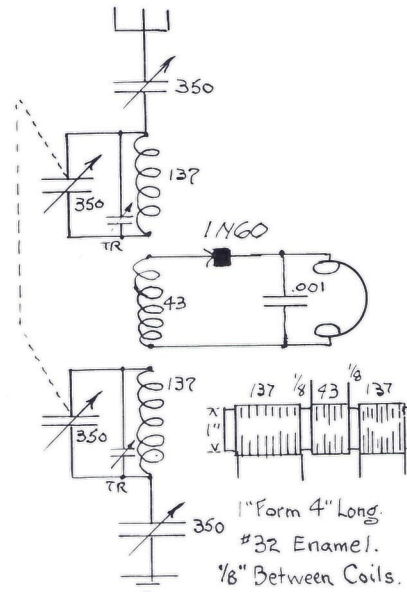
Lewis N. Smith, N.J., one of our steady customers, says not to just say you got the station, and want a QSL card - or you won't get it. What they want is useful info. for them, as time (preferably GMT), frequency, QRM if any, type of set used, quality of signals, and at least 3 items in their program for their checking. Also any other info. U care to give. If you go at it right you'll get it first try.

## CRYSTAL SETS & DIODES.

### SEPARATES 24 LOCALS ON XTAL SET.

Michael Bzowy, New York City, our customer since 1953, sent in this very selective, double-booster Xtal circuit.

In crowded New York City he separates 24 locals without any interference - and that sure is selectivity for a Xtal rig.



At the time of reporting - he hadn't received any real DX with it - but am sure that fellows in less congested areas could get quite a lot of DX. He uses a 60' Antenna and ground to a steam radiator.

The 3 coils are wound on a 1" Bakelite or Fibre form 4" long. Leave a space of 1/8" between the windings for selectivity. If you are in the country - you may wind them close together - or even wind the 43 turn over the others. Be sure to wind them in the same direction. The finer wire helps in sharper tuning.

Use 25-280 trimmers across the

2-gang condensers if it hasn't them already. Balance up on a 1000 kc. station for best results. The Antenna and ground condensers each have a special purpose - in tuning between Ant. and set and set and ground.

He uses a 1N60 diode for sensitivity - and no adjustment. However, any Xtal may be used.

The .001 mica condenser tends to lower the tone in the phones. You can easily arrange it on a panel to suit yourself.

He also uses our Celluloid SW. plug-in coils to get Australia on a tube set.

### DX ON MRL #10 CRYSTAL SET.

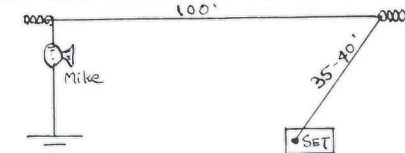
Chris. Brandt, N.J., with us since 1953, reports good reception on '10 Xtal set. He gets Moscow (4800); Switzerland and Germany (4100) and Spain (3700). Those East coast boys sure bring them in!

### GOOD RESULTS ON N-99 DIODE.

Jack Spencer, Idaho, reports his N-99 from MRL is better than any Germanium diodes he has used in his DX work.

### MICROPHONE IN THE GROUND LEAD.

Royal Haney, Kentucky, sends a sketch of an Aerial system he used when a boy. The poor contact detector principle still puts it under a crystal classification. Any microphone, or one from an old telephone is OK but it must be "alive." Length of the Aerial is optional. He



claims the results were wonderful. No doubt the mike acts as a form of detector to ground. No ground used on the set.



## TRANSISTORS (TRX)

### ENGLISH TRANSISTOR CLOCK.

An electric clock is being built in England, using Transistors. Its drain is so low that it uses but 2 flashlite cells a year. It boasts of not having dangling cords but portability.

### WILL GERMANIUM BE REPLACED?

New low-cost compounds of Aluminum, Antimony and other common metals may replace Germanium in the future. These new compounds work as rectifiers and further tests are being made.

Aluminum-Antimony compounds may outperform Germanium at high temp. and cost. A pound of Antimony sells for 50¢ against \$350 for Germanium. See MRL HB-3 for more info. on this detector. The scientists are bringing back a lot of old combinations - and calling them "new".

### NATURAL AND GROWN GERMANIUM.

Bell comes up with this picture of Germanium. On the left, and center are two different natural Germanium Xtals. On the right is one that has been grown in Xtal vats. It may be up to 2½ inches long. Then it is cut into thin wafers with a diamond saw.

### GERMANIUM MADE BY LAYERING.

G.E. is working with a method of layering in their mfr. Each of these layers contain Germanium mixed with Gallium as an impurity to make it a semi-conductor. Between these layers is a thicker Germanium layer containing minute amounts of Antimony.

One section of the Gallium-doped layer in each TRX does the work of the grid in a tube. The Antimony-doped layers take the place of the Cathode.

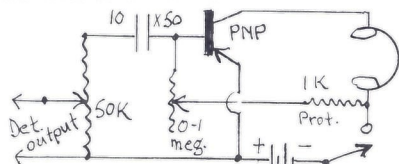
As many as 100 wafer-thin layers may be produced from one 6" ingot. Several thousand TRX are the final output. This will de-

crease production costs, which we all like to see.

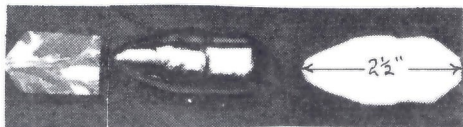
This same Dr. Hall, of G.E., has developed a "melt-back" process for quickly cooling thin, wire-like Xtals in less than a second. Due to quick cooling a very small amount of impurities may get in. As a result of this method the TRX may oscillate at a freq. 5 times greater than at present.

### PROTECTING THAT TRANSISTOR BIAS.

Mr. L.N. Smith, N.J. calls our attention to the fact that too high a bias will ruin a TRX. He has drawn a circuit here showing



how the 1K resistor will protect the TRX in case you put 0-1 meg. down to zero. This works on any type of Transistor.



### NEW JAPANESE SEMI-CONDUCTIVE CONDENSER TO BE PRODUCED.

The Nippon Electric Co. has invented a new type of condenser that has US. patents, etc. first of its kind. GE, and others expect to tie up with them.

The surface of Tantalum is acidified electrolytically and Germanium is vaporized to make it adhere to the surface. Aluminum film is also vaporized over the Germanium.

This is called the "hole condenser." Ordinary condensers may stand a temperature of 80 deg. C but this one goes to 200 C. This makes it indispensable to the

space age. Besides, it can be made as small as 6 mm. x 36 mm.

### SIZE OF HEARING AID TRANSISTORS.

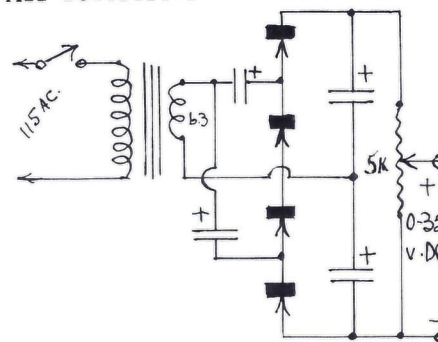
From Popular Science we have a picture of 150 TRX in a teaspoon



so you can see how large they R. An A batt., only a little bigger than an Aspirin tablet runs the hearing aid. Radio-ear of Pittsburgh makes the battery.

### HANDY POWER SUPPLY FOR TRX.

How often do we need a good DC supply for experimenting? Here is one that uses a 6.3 v. fil. trans. as input and a quadrupler circuit and filter. By use of this rig you get 6.3 v. times 5.6, or 35.28 volts DC, less a little drop on the 5000 ohm v.c. All rectifiers are IN34, or other



### PARTS LIST.

- 1 Compo. or plywood base 4x4.
- 1 6.3 v. filament transformer.
- 1 5000 ohm vol. control & switch
- 4 10 x 50 v. electro. condensers
- 4 IN34, IN60, Carb. or other.
- 1 Volume control bracket.
- 1 Small pointer knob.
- Hookup wire, etc.

types of diodes as Carborundum, etc. For power supply, or audio use - all condensers are 10 x 50 volt. If used as an RF multiplier - then make all condensers .01. Use the AC switch on v.c. It will give you a smooth control from 0-35 volts. A simple circuit, like this, is easy to rig on a small board. As a TRX draws such little current - you will have plenty of power.

### IDAHO COMES IN ON A POTATO!

Donald McLean, Canada, reports they connected up a Zinc and a Copper electrode with a potato in between. It worked a 2-TRX set as loud as 3 volts of batt. We assume Idaho came in clear as a bell!

### AMOROSE REPORTS ON TRX CIRCUIT.

I have good results coupling the Xtal direct to TRX. But, of course, it depends on circuit. I have tried regenerative TRX sets a good bit - and find them better than the straight type without regeneration. You have same controlling troubles as with the tube sets.

### LONG LIFE FOR TRANSISTORS.

Dr. Donald G. Fink, Philco, says that surface-barrier-type of TRX should last a century if handled right. Vacuum tubes may reach a life of 40 years as the filaments slowly boil away. But TRX have a tendency to replenish their own material, just like a Copper wire. We might add that a second is the life if hooked up in the wrong direction!

### MRL TRANSISTOR AMPLIFIER. DP-16.

It is built for Xtal sets. But if used on a tube set - put a 2K resistor across phone tip jacks. Then run a .01 cond. from plate detector jack over to one input tip of the Amplifier. Connect the other input tip to the chassis, or negative. Our error!

**I-TUBE SETS**

**10,400 MILES ON MRL I-TUBER.**

John Moran, Penn. sends this fine report on MRL I-Tuber. They were received last summer. He used a 50 ft. Ant. 15 ft. high.

He says: "I used a 22½ v. B-batt. & either 1C5 or 1Q5 tubes. I had it working a speaker at low volume, but all over the room. I also hooked up a Phono. amplifier, which worked good on the BC band coils. I used 4000 ohm phones and an 8" speaker, both with and without an amplifier. I think the MRL I-Tuber is a swell set. I got more stations with it than a friend of mine who had an A-- Space Spanner and with a longer Aerial. Here lists some of my best stations:

- Melbourne, Australia.....10,400
- Brazzaville, Fr. E. Africa 6,600
- Sofia, Bulgaria..... 5,000
- Moscow, 2 bands..... 4,900
- Prague, Czechoslovakia... 4,800
- Warsaw, Poland..... 4,600
- Rome & Budapest..... 4,400
- Berne, Switzerland..... 4,200
- Cologne & Berlin..... 4,000
- Holland & Belgium..... 4,000
- Morocco..... 4,000
- Madrid, Spain..... 3,900
- London, 2 bands..... 3,600
- Quito, Ecuador..... 2,700
- Trinidad, B.W. Indies..... 2,400
- Porto Rico..... 1,700
- Haiti..... 1,600

"Also a lot of unidentified Spanish stations. Hams on 20, 40 and one in N.Y. running mobile on 50 watts.

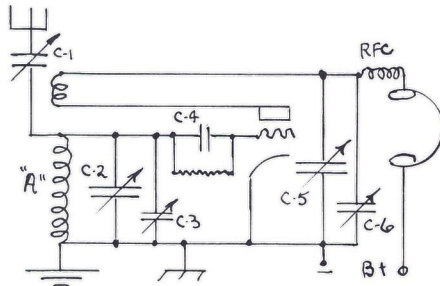
"During last summer, using a loopstick, crystal and phones I picked up Canada, Moscow and Aeroplanes and 40 meter Hams."

**MRL I-TUBER BEATS HEATH.**

Peter Mood, Texas Tech, Texas "I built up your I-Tuber HB-4 set and it is superior, in every way to my Heathkit communication set. It works wonders on 160 m. band, at the bottom of Hi-F BC coil. I don't think any receiver can equal it in its same class.

I have KRLL, 50K watts, near me, and even a Miller Xtal tuner won't cut it out." (Ed. We suggest a shorter Ant. Also, some of our Xtal circuits are very selective - for instance #10, 39 15, 8, 9, 2, just to name a few. However, few Xtal sets R selective hooked to a 100 ft. Aerial near a 50,000 watt station).

**SMOOTH REGENERATION CONTROL.**



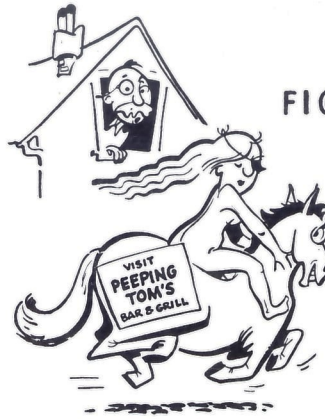
When using a throttle condenser control of regeneration - it is a good idea to add a 2 or 3 plate across this control (C-6). When you get the main throttle cond. (C-5) set - then smooth it up with (C-6). Proper values for most circuits are C-1, 3, 6 2-3 plates; C-2, 5 .00014 or .00035; C-4 grid cond. .0001. Use these values correctly with MRL Celluloid SW coils and a hi-Gain tube and you have the best circuit.

**JUST CAN'T KEEP 'EM!** Sez Tommy Hughes, Texas: "Send another CAT. My Science teacher bought mine."

**#19 PHONE TRANSMITTER WORKS OK.**

Michael Mudray, "The Happy Experimenter," Canada, says: "I built up that Phone transmitter (DS Vol. 1. 30¢), and a friend, built another one. We sure have a lot of fun with them." (Ed. We have plenty of #19 tubes now - and also 1J6G tubes that are the same as a #19 except it uses an octal socket instead of a 6 prong. Same price - \$1.10.)

**FUN WITH FIGURES**

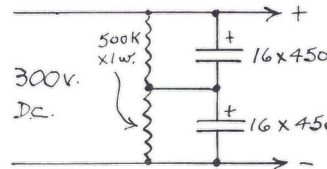


Continued from previous RB&H. #41 discussed quick methods of figuring Ohm's law; #42 series circuits and voltage drop; #43 series resistor circuits and filament resistors; #48 parallel resistor circuits.

**CONDENSERS IN SERIES.**

As Electrical laws work similarly, condensers in series are figured the same as resistors in parallel (RB&H 48). Likewise, the final capacity is always less than the smallest value, just like resistors in parallel. A condenser will pass AC. or a fluctuating DC. - just so there is an interruption in flow.

Filter condensers. In a power supply, if you think an 8 mfd. x 450 v. will blow - or has blown, use 2 16 mfd. x 450 in series. Always use two of the same value and rating and mfr. if possible. Even so, they will vary a little so are not exactly equal. Hooking capacities in series is the same as pulling the plates apart which lessens chance of break-



down. There is a little leakage in all condensers, and especially electrolytics.

Always use single filter condensers in series - never use a dual as plus must go to the minus of the other. The one with the lowest capacity will have the highest voltage drop and the potential for breakdown. The one with the highest capacity will have less voltage drop but will do more filtering. The one with the most leakage will have the lowest capacity. But we can even the load by placing a 500K x 1 watt resistor across each condenser as shown, This makes it a voltage divider network - and any unequal values of these supposedly similar condensers is then equalized.

Figuring any 2 LIKE condensers in series gives:

$$C = \frac{\text{Capacity of each}}{\text{Number of condensers}} = \text{Final}$$

$$\frac{16}{2} = 8 \text{ mfd.} \times 900 \text{ v. final.}$$

Air, or dry condensers. As filter condensers must be the same value, - tuning, or dry condensers may vary. The rule is still the same for any UNEQUAL condensers:

$$C = \frac{C-1 \times C-2}{C-1 + C-2} = \text{final cap.}$$

This is easier than a reciprocal method of figuring. Or for a .00035 (350) and a 25-280 trimmer in series, we have

$$\frac{350 \times 280}{350 + 280} = 155 \text{ mfd. or } .000155.$$

or close enough to .00014 for SW tuning. We back the 280 trimmer off about ½ turn to get 140. Note the final capacity is a little over ½ of 280. Using the 2 in series should be as efficient as a single .00014 as the series arrangement separates the plates still farther.

CHEMISTRY. Carbon monoxide. CO. Mol. wt. 27.93. Density 13.96. Sp.G. 0.967

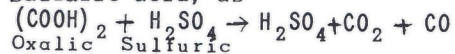
This is a subject important to all of us especially under the present conditions of smog, etc.

Carbon is usually quadri-valent but with this compound it has a valence of 2. It is colorless, tasteless and odorless, neutral gas, almost insoluble in water. It is lighter than air - .967. Condenses at -190 C.

CO is produced wherever Carbon or carbonaceous materials are burned with limited air supply. Conditions for formation of CO are present in any stove, auto or furnace. CO formed in the low part of the furnace is decomposed in the upper part into CO<sub>2</sub>, or Carbon dioxide. The blue flame over a coal fire is CO burning.

CO is mfd. on a large scale by decomposition of steam by red hot coke. The gas mixture is called Water gas and is used for heating.

CO is also formed by the decomposition of Oxalic acid and many other organic substances by Sulfuric acid, as



Formaldehyde, CH<sub>2</sub>O, and Methyl alcohol, CH<sub>3</sub>OH, can be produced from CO and H with the aid of a catalyst and proper temperature and pressure conditions. CO also combines with Chlorine to form Phosgene gas, COCl<sub>2</sub>, for mfr. of dyes, drugs and war gas. CO also unites with some metals as Iron, Nickel, Chromium and Cobalt as Carbonyls. It is important as a reducing agent for Iron, Copper, Zinc, etc.

CO is the most common poisonous gas. The absence of an odor does not work in your favor. If it is inhaled it combines with the red hemoglobin of the blood. As CO combines faster with the hemoglobin than Oxygen - it prevents the blood from absorbing enough Oxygen for the lungs. So death is due to loss of O in the blood - or the same result as suffocation.

More people die from CO in a closed room, coming from faulty gas stoves and furnaces. While we usually say it is because all the O was burned up in the room - it is more from the CO that was produced by the heater.

Exhausts from autos contain 10 to 12 percent of CO. An auto may produce more when idling or in warming up. In a closed garage it may produce a dangerous condition within 3 minutes.

Not more than 1 part in 2500 of air is permissible. One part in 500-750 may cause death within 3 to 4 hours.

In the reduction of Iron in blast furnaces, in large quantities - lots of CO escapes.

Flour explosions may produce CO to a large extent. Coal mine explosions result in many mine deaths from CO poisoning.

CO does not occur in a free state in nature. One source says it has an oppressive odor and 2 parts in 10,000 of air is enough to cause headaches.

It is devoid of acid properties - and therefore is without action on lime water. If lighted CO is placed in limewater it'll turn milky - showing presence of Carbon dioxide which has formed.

Formic acid, on being treated with conc. Sulfuric acid produces pure CO.

In gas warfare CO has not been used much because, being lighter than air - it slowly rises. This is in contrast to Chlorine which hugs the ground.

CO danger is also found in gun turrets, on warships, after the big guns have been fired. Some forms of gas masks have been devised but the problem is hard.

Birds used to be carried into mines after explosions. They are more sensitive to CO than man. Now "Hoolamite" is used. This is a mixture of pumice, Iodine pentoxide, I<sub>2</sub>O<sub>5</sub>, and sulfuric acid. It turns green when CO is found in the mine.

## METALS & MINERALS - COPPER

Copper is said to be the first metal used by man. Copper articles have been found that dated back 6000 years. It was first used on Cypress Is. and called Cyprium - later Cuprum.

It is red with light reflections, but if light is passed thru thin sheets it shows green. In moist air it turns green from Copper carbonate or sulfate. Its valences, both positive, are one which is colorless and white with Cuprous salts. The other is two where the Cupric salts are blue in color.

Copper ores are mixed with a variety of sulfates, oxides, etc. After mining, they are then ground and melted with a flux. Heavier Copper settles to the bottom.

Sulfide ores are the most important. They must be smelted. They are then ground and roasted to remove Sulfur. Various chemicals are used to remove Iron, Alumina, Sand, etc. impurities.

Years ago the Copper smelters used to raise havoc. Each plant had several piles going around the plant - and all putting out strong Sulfur fumes. They were so bad that nothing would grow for miles around. Even the men had a "washed out" look. Now the Sulfur is burned up in the blast furnace - and made to "smelt itself" along with the Copper.

The American Cyanamid Co. developed a process for getting Copper, Nickel and Cobalt directly from the ore. Hydrogen gas, and other reducing agents precipitate the metals from Acid or Ammonia solutions. The result is a fine powder - 99.9% pure.

The largest open pit Copper mine has been in operation for over 50 years at Bingham, Utah. It is almost 2 miles across and 2200 ft. deep - so big that they use planes to direct operations. It produces more than 13 billion lbs. of Copper per year - or 30% of U.S. supply and 10% of World.

Ore is 82% Copper. Anode Copper is refined at Garfield to reach 99.96% pure. Mine used 6 million lbs. of dynamite per year. Owned by Kennecott and employes 3200.

Several years ago Anaconda found a big deposit in Chile, called the Indio Muerto (dead Indian). Butte, Mont. hills may produce Copper for another 50 or more years. The big Copper Hill.

Surplus Copper supplies and prices go up and down. Mines regulate their output to keep the prices up. Supplies were critical in 1955 but have leveled off.

Copper cannot be hardened by heat treatment, unless made into Alloys. Alloys run into the hundreds - most important are Brass and Bronze. Brass can again be divided into over 300 kinds.

See MRL Handbook #3 (Crystal Detectors) for different kinds of Copper used as detectors.

Copper is the best conductor of the cheaper metals. Impurities lower its conductivity. A few hundredths % of Arsenic will reduce conductivity 10-15 %.

Copper shielding is about the best you can use for RF coils, etc. It is non-magnetic and also a good conductor of RF currents to ground. Iron, Aluminum, etc. are now used for shielding to keep the cost down. Loss here is made up in greater amplification of the signal, by more tubes.

When soldering, be sure to remove the oxide with a knife, or sandpaper, or the solder will not stick. Soldering flux is used to remove the oxide and permit a better bond between metals.

Magnet wire is "bright annealed" - or toughened, at high temperatures without air - where O oxidizes it. It is then drawn thru tapered holes in hard steel blocks when hot. Finer wire is annealed and drawn several times to get correct size. Magnet wire is soft-drawn. Miles of wire are wound on a 10# spool without a break.

## STAMP COLLECTORS' PAGE

EFFICIENCY IN THE POST OFFICE. ly to so many new issues.

The P.O. Department has spent 89 million in research on mechanizing mail delivery. The Dept. handles more than 60 billion pieces of mail a year. This is equal to 348 pieces for every person in the US. The last five years it has increased 18%.

PO vending machines were slow in getting started. In 1905, a PO committee was appointed to work on it. The biggest trouble was stamps breaking at the perforations. Our local PO has made a change from 2 to 4¢ - so now we can buy 1, 3 and 4¢ stamps.

"Transorma" is a new machine that was first tried in a Maryland PO. It will sort 3000 letters an hour, after the operator becomes skilled. He sits at a keyboard, similar to a shorthand writing machine, and punches out symbols. After the punch, the letter goes on a belt to one of 400 different separations.

The PO is working on a device that will "read" destinations on letters by Electronic eyes. They are also working on a parcel post handling machine.

Many large PO have a free power trolley system for moving large sacks of mail. It moves along the ceiling and also acts as storage. By pressing a button the operator can call out a sack at once.

There are still several mounted routes on horseback as well as power boat deliveries being made in the US. for hard-to-get places. One of the odd jobs of a Postman (while he's resting!) is to report forest fires.

In the last 10 years postal crimes have increased 29%, while the population went up 3%. 2160 arrests represented 98% of the total committed - so you see, they get you in the end!

In 1958 the U.S. Philatelic Agency, Wash., sold over \$2 million worth of stamps to collectors. The increase was due most-

## WATERMARKS, PAPER &amp; GUM.

Watermarks are a headache. In early days, when there were very few stamps to collect, some wise guy got the idea of watermarks, different paper and perforations to increase the number. We are thankful, that since 1925, very few W/M have been used. A W/M can miss a stamp so it is not a positive identification of some.

However, if we must get into them - any smooth, black surface as a bath tile, etc. will work. Put a drop of Benzine or Carbon tet. on the back of the stamp and the W/M will come out clear.

Why should stamps be different because they ran out of paper?

About gum - do we collect gum or stamps? After years it becomes cracked - or sticks to the album in a mess. Many remove gum from their cheaper stamps.

Let's put stamp collecting on a "face different" basis, where only a small magnifying glass & perforation gauge is needed. Then watch the new collectors get in.



—Linn's

"Well you certainly made a spectacle of yourself tonight, soaking that stamp off in Mrs. Van Grooten's fingerbowl!"

## NATURAL HISTORY ODDITIES MAN.

Health. An insect has 4000 muscles; a man 500...Man has over 100,000 miles of blood vessels in his body...Brain cells do not multiply after birth but get larger and more complex...Teeth of Hindus, Japanese and Chinese at birth are better than Americans, but we take better care of them...Four tastes: acid, sweet, salty and bitter. Others are combinations of these and smell...A good nose can distinguish 15 different components in a given odor...Coffee odor will cause a much more powerful brain reaction than Onions or Camphor...Chinese, Japanese, American Indians and Eskimos do not have slant eyes. Their nose bridges are low and this allows upper eyelids to fold...Only about 2% of US. people have perfect vision and about 50% need glasses...Navajo diet (cancer free) is composed of meat, corn, squash, some fruits, nuts, herbs, native tea and "squaw bread" - a type of crisp panbread...A Dr. says enriched white breads since 1941 are better than whole wheat, rye and pumpernickel breads...The average American eats 3 times as much Lettuce as he did in 1919. (OK, Salinas, Calif.)...Twice as many women now live to be 100 as do men...Javier Pereira. the 167

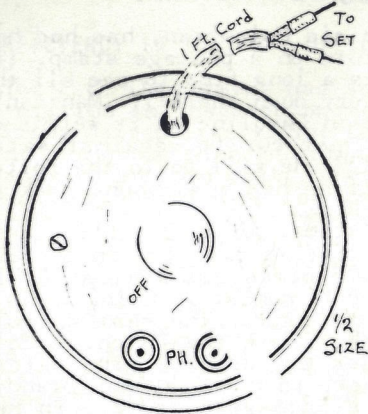
year old Colombian, has had his picture on a postage stamp. (It takes a long time to see all the scenery down there!)...Man can't swim in Gasoline as it weighs 45 lbs. per cu. ft. against water of 62½. He will go to the bottom as if he had a 40 pound rock on his back.

Customs. About 2 million people live in trailers in the US. 11,000 parks are available. In order of number is Calif., Fla., and Arizona...The most durable drinkers are the Dutch. A Hollander can drink 8 gins before dinner, then whisky and brandy, but seldom gets drunk...In Red China there is a population increase of 12 million annually...Australian Aborigines sometimes steal telegraph insulators to fashion spear tips...West African witch doctors often decorate their faces with white shoe polish...There are still a few head hunters in Formosa...North African Engineers often drill for water near 2000 yr. old ruins. If they found olive presses they would plant olive trees...Over 2000 languages are spoken and written. About 2000 more are spoken only...English is the simplest language - only Chinese is simpler. (Oh, Yeah?)

Ancient man. Bones and plants are Radio-carbon dated as follows. Cosmic rays from the upper atmosphere produce Radioactive Carbon particles in Carbon dioxide. Plants absorb some of this thru their leaves. In 5568 years half of this Carbon disintegrates. In another 5568 yrs. another half, so scientists can figure.. In 1958, a Swiss found a man's skeleton 10 million yrs. old...A Mexican find was 25,000, in the Pleistocene age...Concord, Cal. estimated 5-8000 yrs...Sacramento, Calif. one at 25,000...Albuquerque, N.M. one at 25,000...Melbourne, Fla. at 20,000...A mysterious aboriginal race lived in Egypt 10,000 yrs. ago, and had red hair and stone tools.



1. SITOR SMALL SET AMPLIFIER.

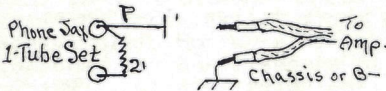


Here is one of the quietest rigs for the Crystal and tube Fan. It is a Transistor amplifier built into a plastic box with a removeable lid. You may reduce volume to almost zero and use a penlite cell, clipped in. The 1 ft. cord plugs into phone type jacks. Brings volume to level of best tone. Batt. not furnished.

14-14. Amplifier Kit. 1/2 lb. .00  
 14-14-W. Same wired. .50  
 New DP-16 shows detail. .10

We have made a change DP-16 when used on 1-tube set. Please use this info. where you say:

USE ON 1-TUBERS. 2K resistor across phone tip of set. Put .01 cond. as shown and ground the other amplifier tip.



W.H.C. Erie, N.Y.: "Amp. working fine. Finds in lots of stations using storm windows for Aerial. For more power - just hook up more windows!"

Tanner, Canada: "Assembled transistor Amplifier and I brought in how loud on my 1-tuber. I had the 40 meter band."

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

Contributors. Don't be offended if we juggle your article around. Many things must be considered as Fans are working under different conditions. The availability of parts, crowded station areas, complexity of the circuit, improvements, etc. we must consider. We try to "fit" everyone, even the round-shouldered guy who sez: "Can I help it if I have to live in a basement, and the landlord makes me use a cloth line for a sky hook?"

Also don't get sore if we do not print your article. We hope to get around to it soon. Your interest is appreciated. The 4 pages of L (Flyer 3) sure stirred them up. Thanks again.

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