

Homebrew Radios for the 21st Century



AI Klase – N3FRQ



The Story

- Throughout the 20th Century people built their own radios.
 - Out of necessity
 - For education
 - For the pleasure of listening to a radio you built with your own hands
- We can still do this in the 21st Century.

Choose a Basic Technology

- Passive receivers, a.k.a. Crystal Sets
 - All the energy that reaches your eardrum came from the transmitter.
- Vacuum Tubes
 - They glow in the dark.
- Transistors and IC's

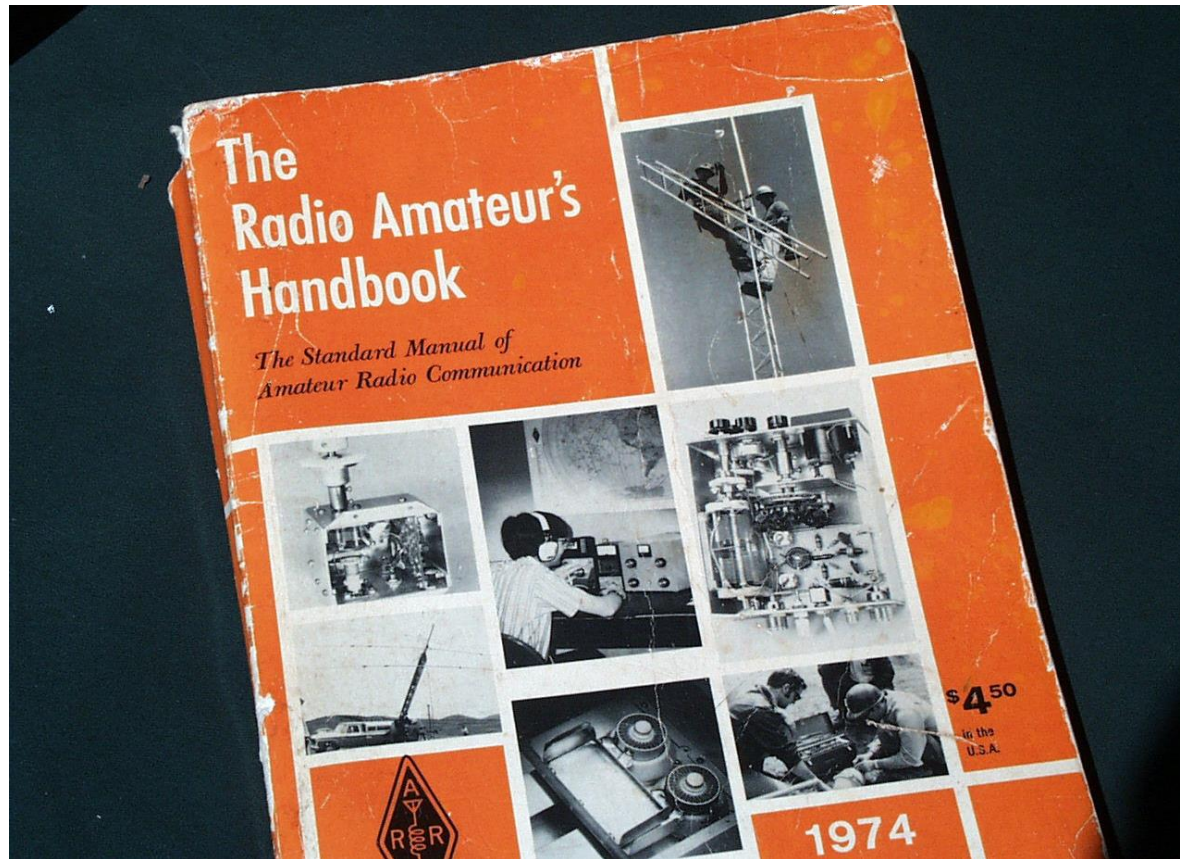
Engineering is not a four-letter word !

- Not to be confused with driving a train.
- Pick a concept.
- Develop a circuit.
- Choose components.
- Assemble a prototype.
- Get it working.

The ACE/KISS School of Engineering

- Avoid Creeping Elegance.
- Keep It Simple, Stupid!

Reference Library

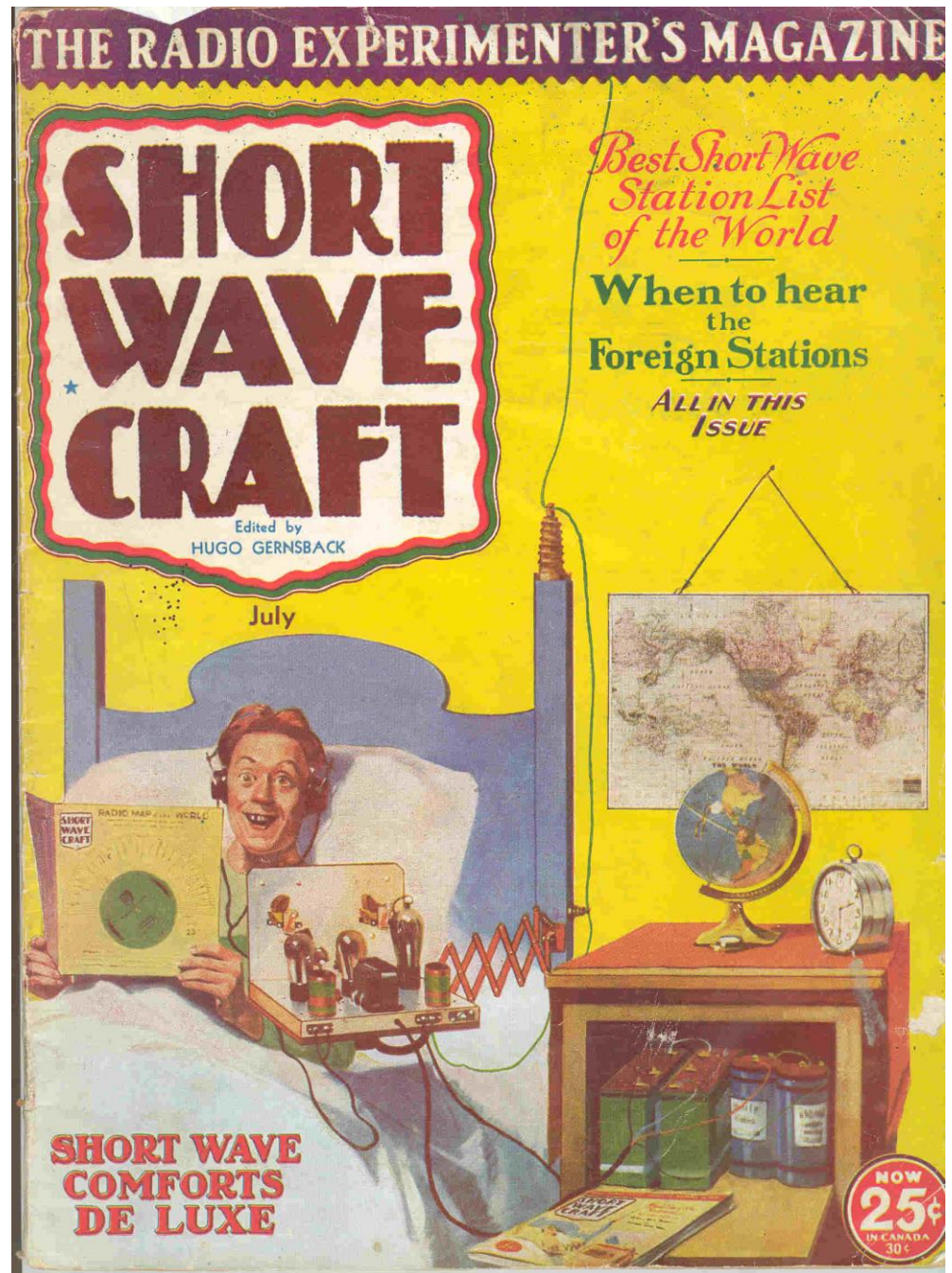


If you only have one reference book, an ARRL Handbook, especially from the pre-1970's is a good choice.

Get an Idea

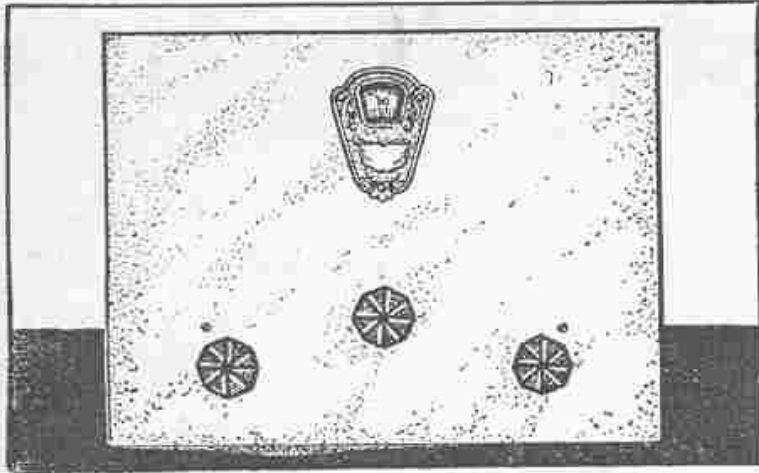
- Old Publications
- The Internet
- Radio Hobbyists

Short Wave Craft
July 1933

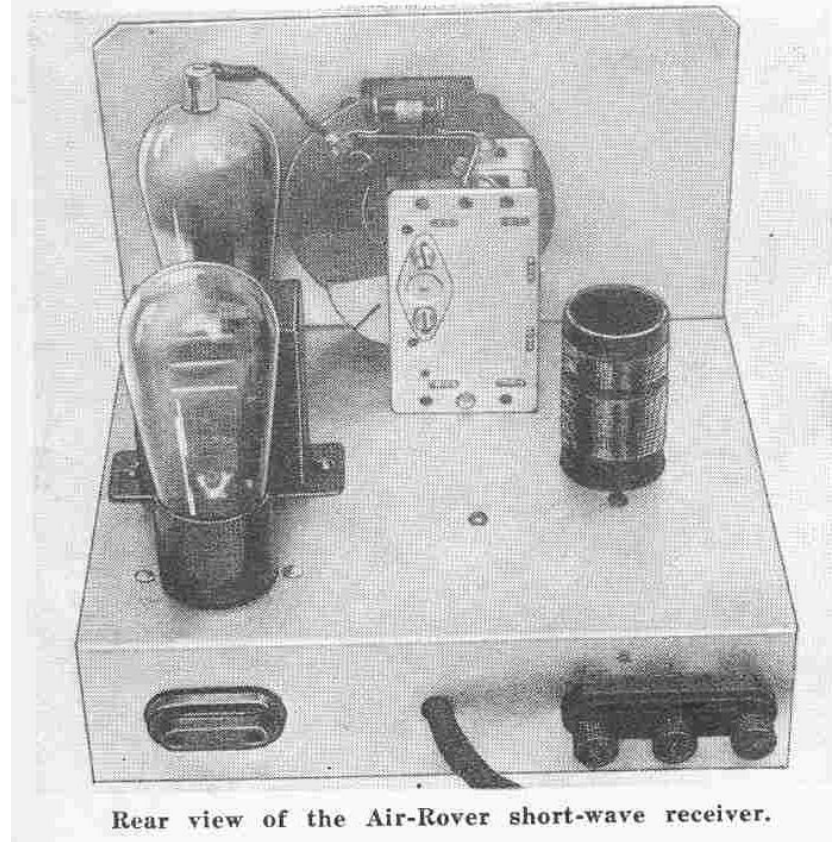


“Air-Rover” Hauls ‘Em in on Two “2-Volt” Tubes

By Clifford E. Denton

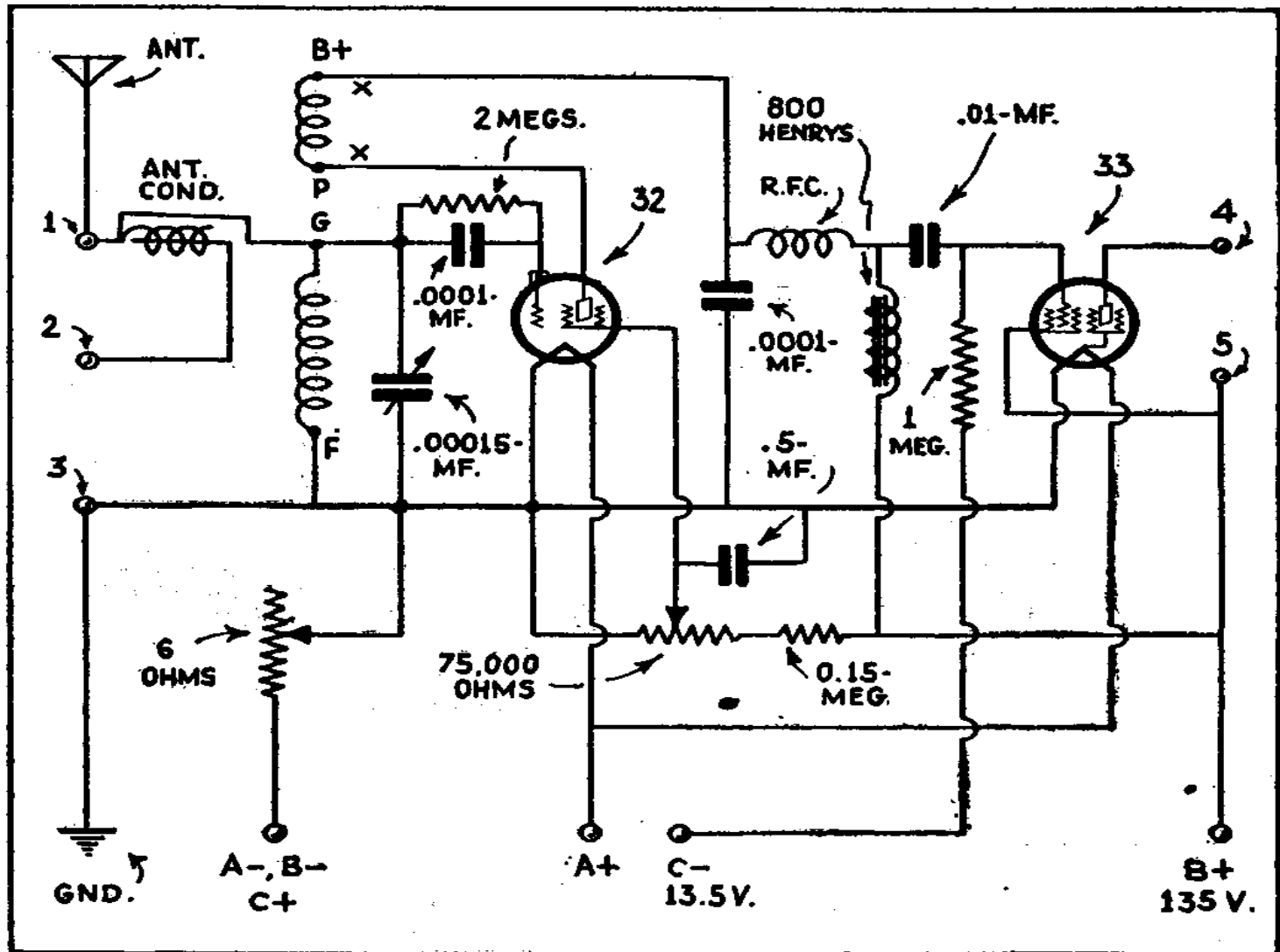


A nice example of
1930's “homebrew.”



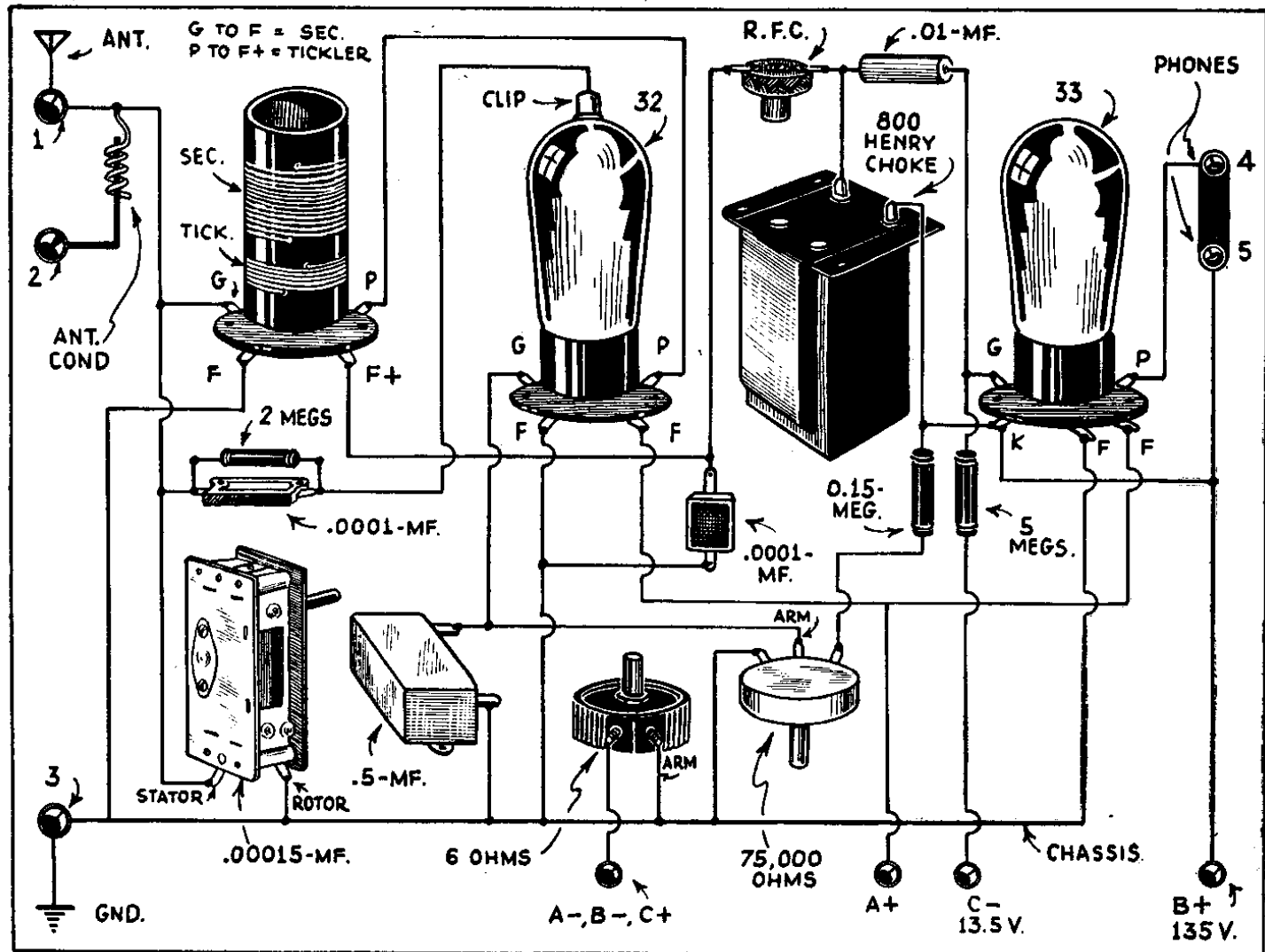
Rear view of the Air-Rover short-wave receiver.

The Schematic



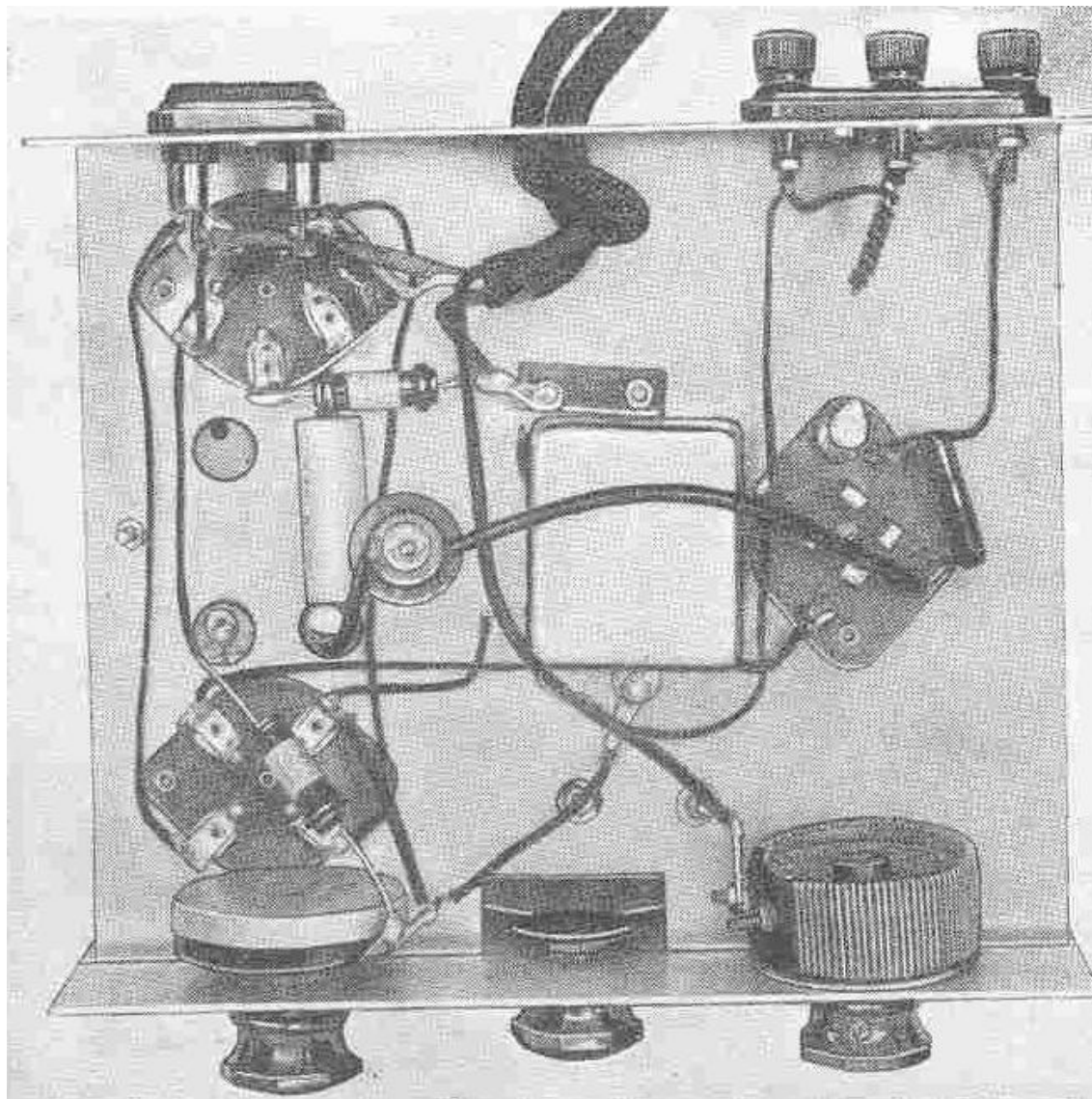
Wiring diagram which you can easily follow, even though you are a beginner.

The Pictorial



Perhaps you would rather follow the "picture" wiring diagram, when you start build ceiver here described by Mr. Denton.

The Actual Set



The Parts List

Parts List for "Air-Rover"

Acratest Triple Binding Post. Aerial & Ground Connections

Acratest Twin Phone Tip Jack, Speaker or Phone Connections

1¼" Piece of Bare No. 14 Wire wound over with appx. 14 turns of No. 18 insulated push-back hook-up wire.

Set of Four Plug-in Short Wave Coils. These are accessories. Not furnished with kit.

Coil A—200 to 80 meters

Coil B—80 to 40 meters

Coil C—40 to 20 meters

Coil D—20 to 10 meters

A four-prong wafer type socket, for the short-wave plug-in coil, is riveted to the chassis

Acratest Short Wave R.F. Choke

High Impedance Acratest Audio Choke

2 meg., ½ watt Resistor

75,000 ohm Potentiometer

150,000 ohm, 1 watt Resistor

1 meg., 1 watt Acratest Resistor

6-ohm Acratest Rheostat

.00015 mf. Acratest Variable Tuning Condenser

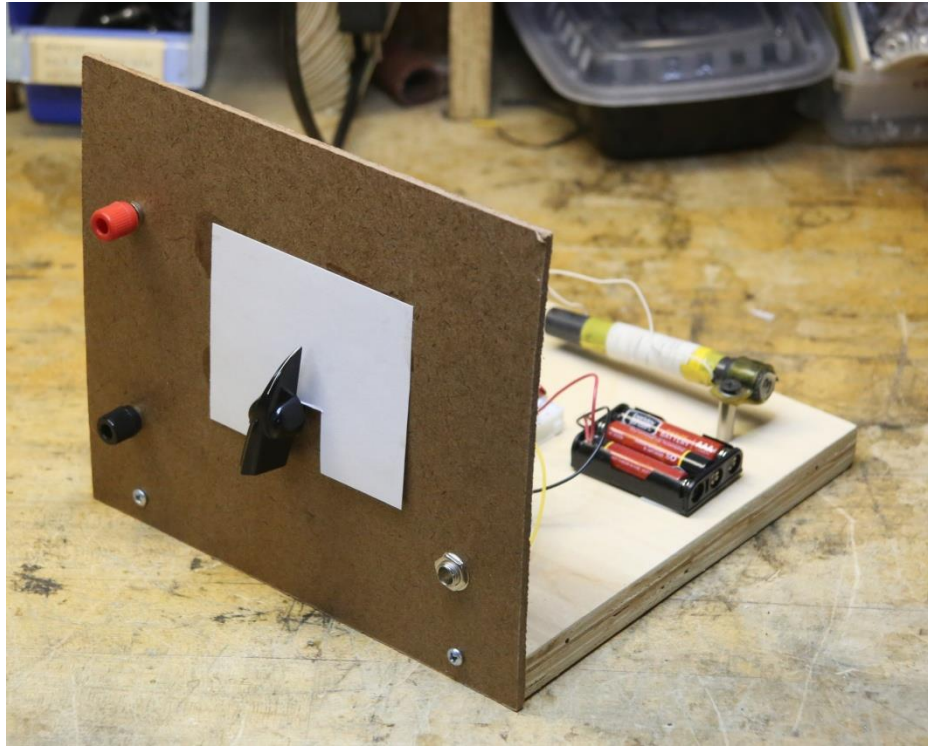
.0001 mf. Acratest Mica Condenser

.00025 mf. Acratest Mica Condenser

.01 mf., 400 volt Acratest Cartridge Condenser

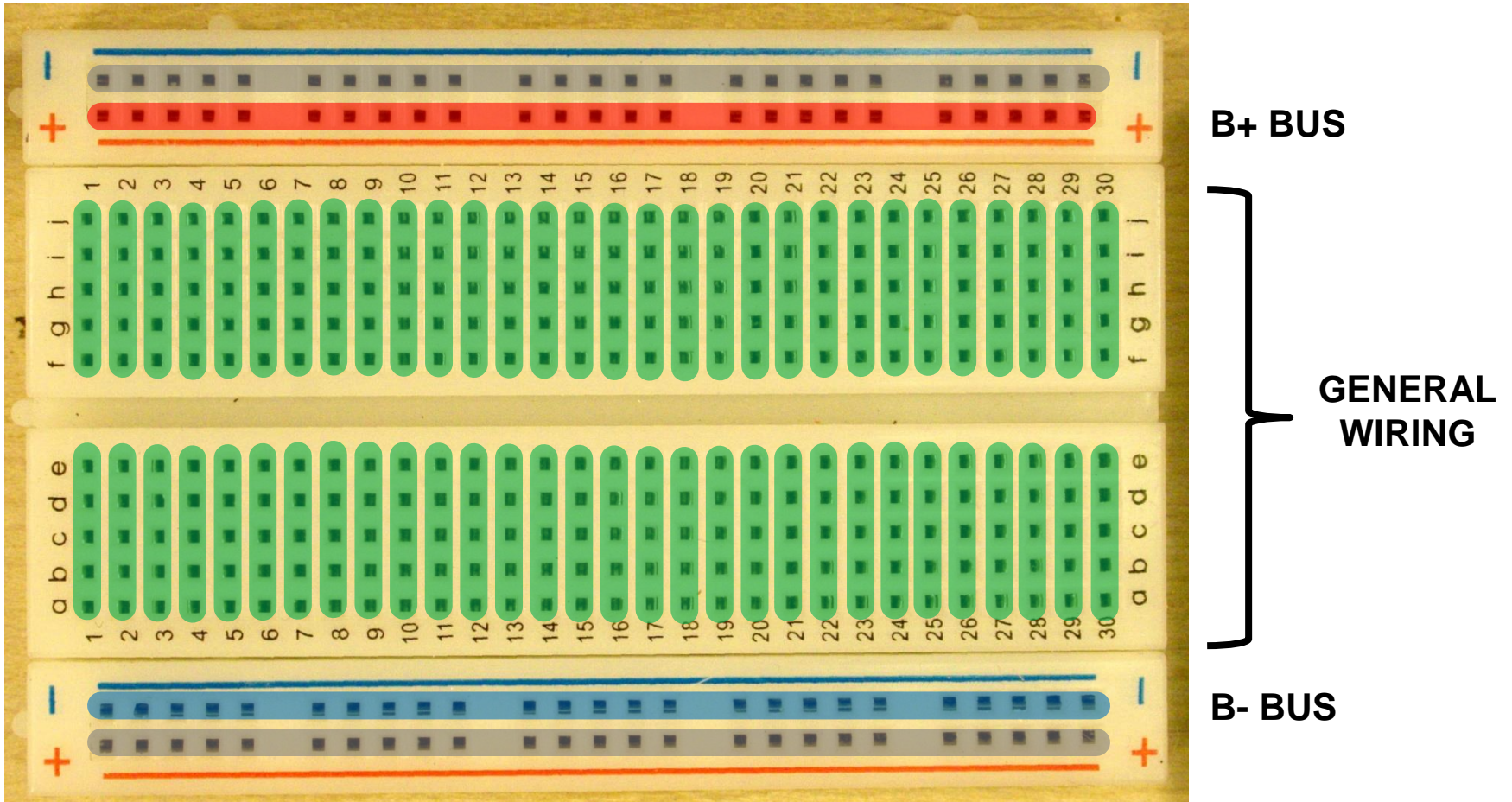
.5 mf., 200 volt Acratest Metal Case Condenser

The Breadboard

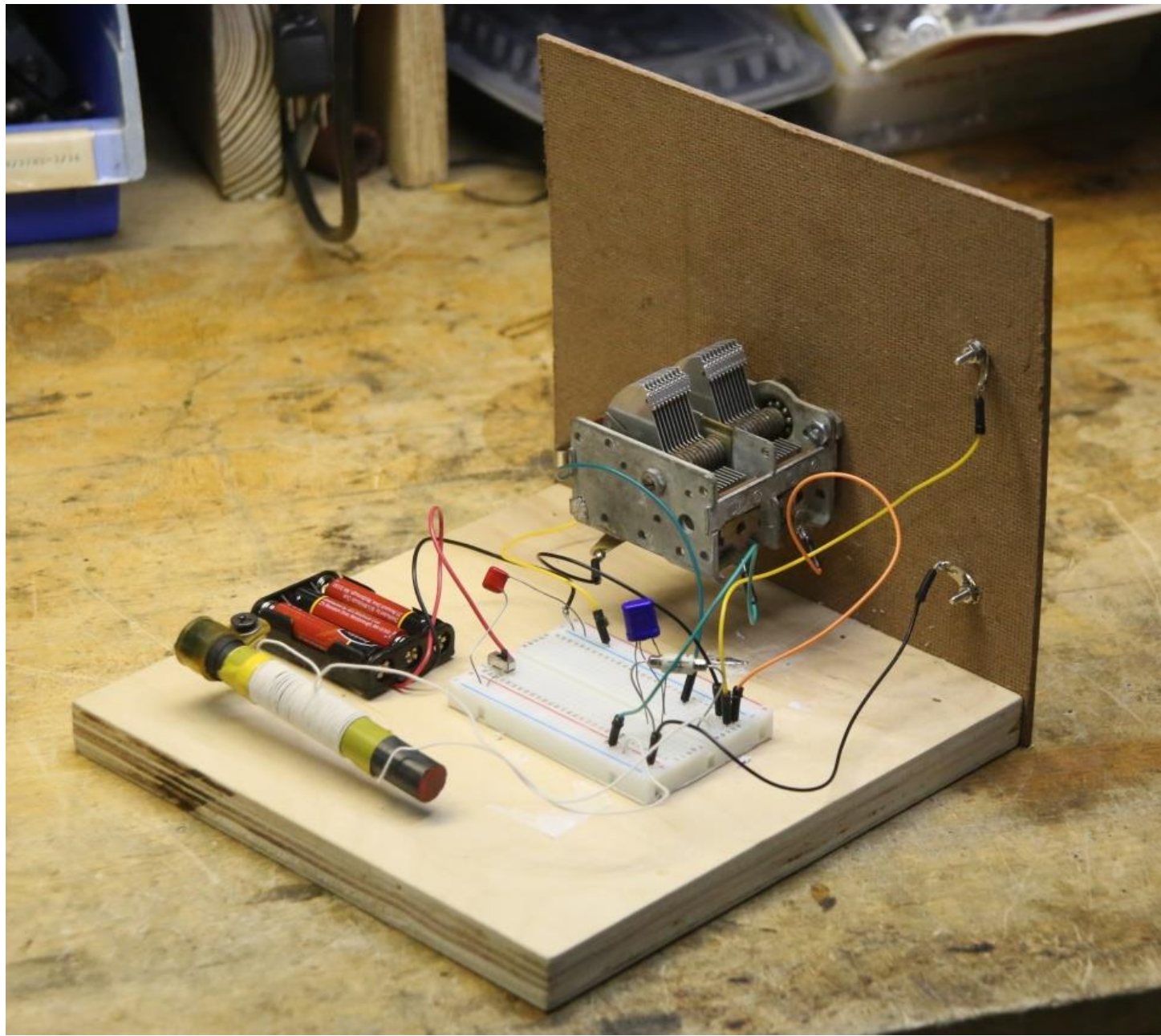


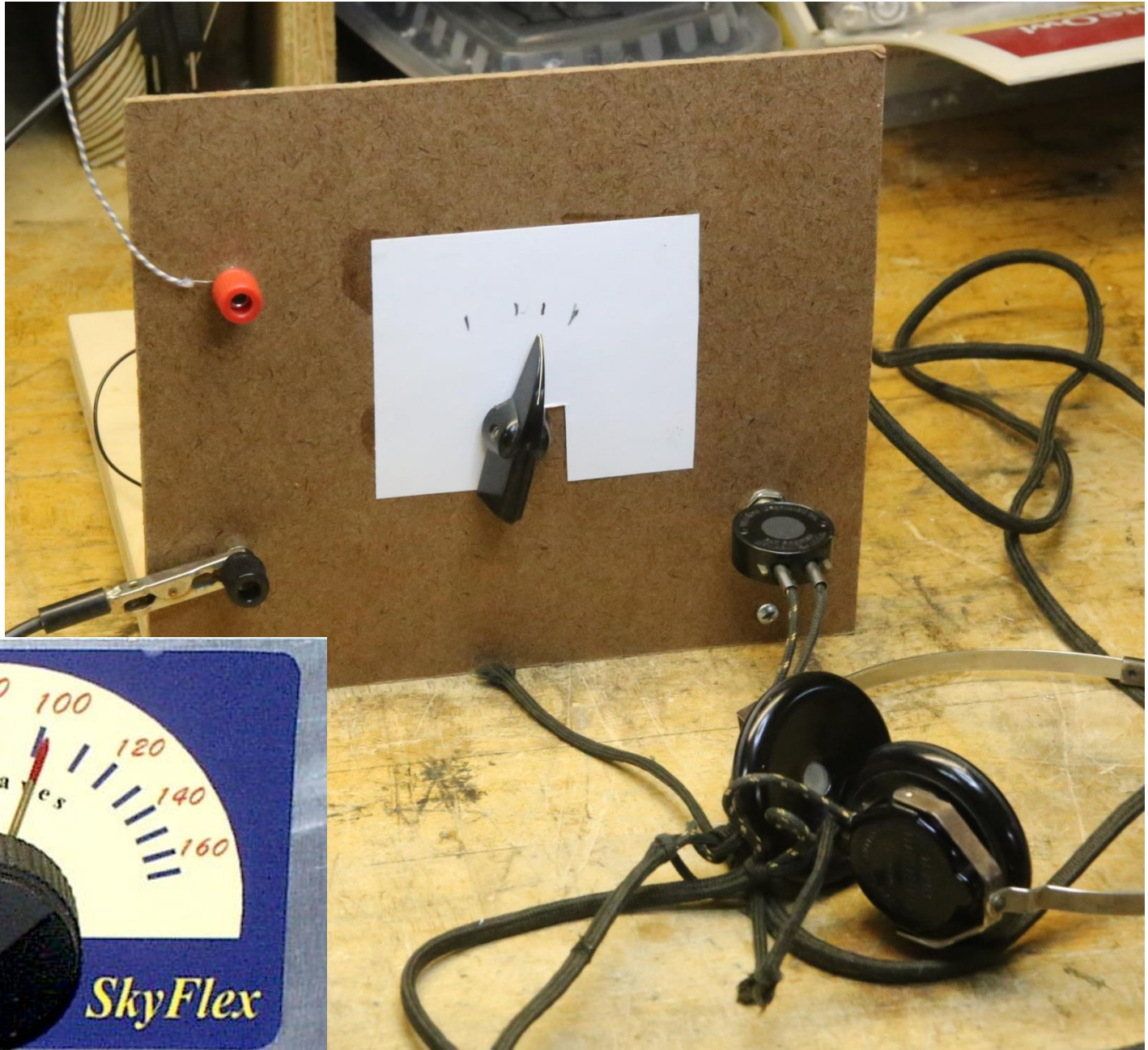
- Make sure your circuit works, and you have the right parts before “drilling and blasting” sheet metal.
- $\frac{3}{4}$ -inch plywood and $\frac{1}{8}$ -inch tempered hardboard are good choices.

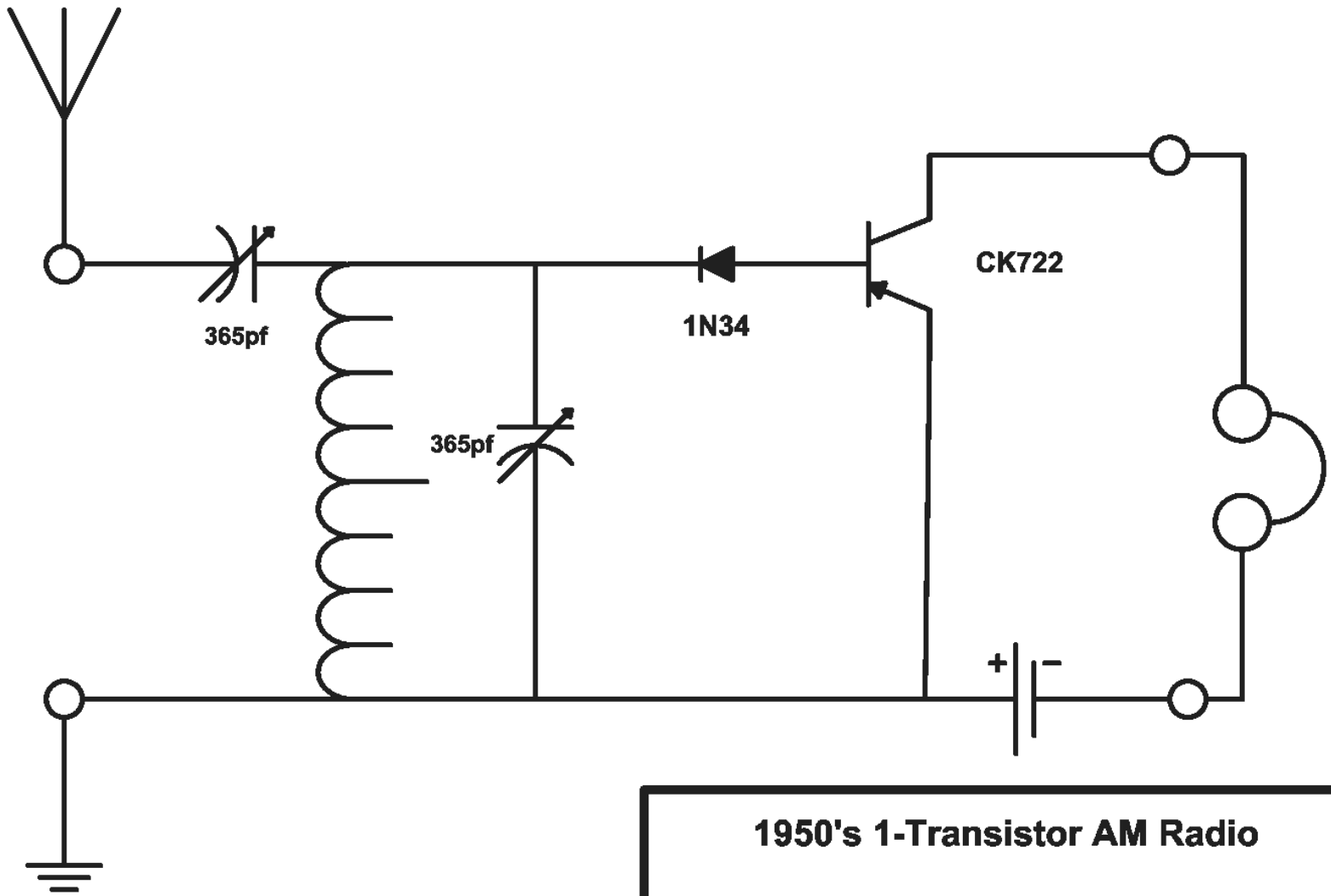
Modern Solder-less Breadboard



Shaded indicates common connections.



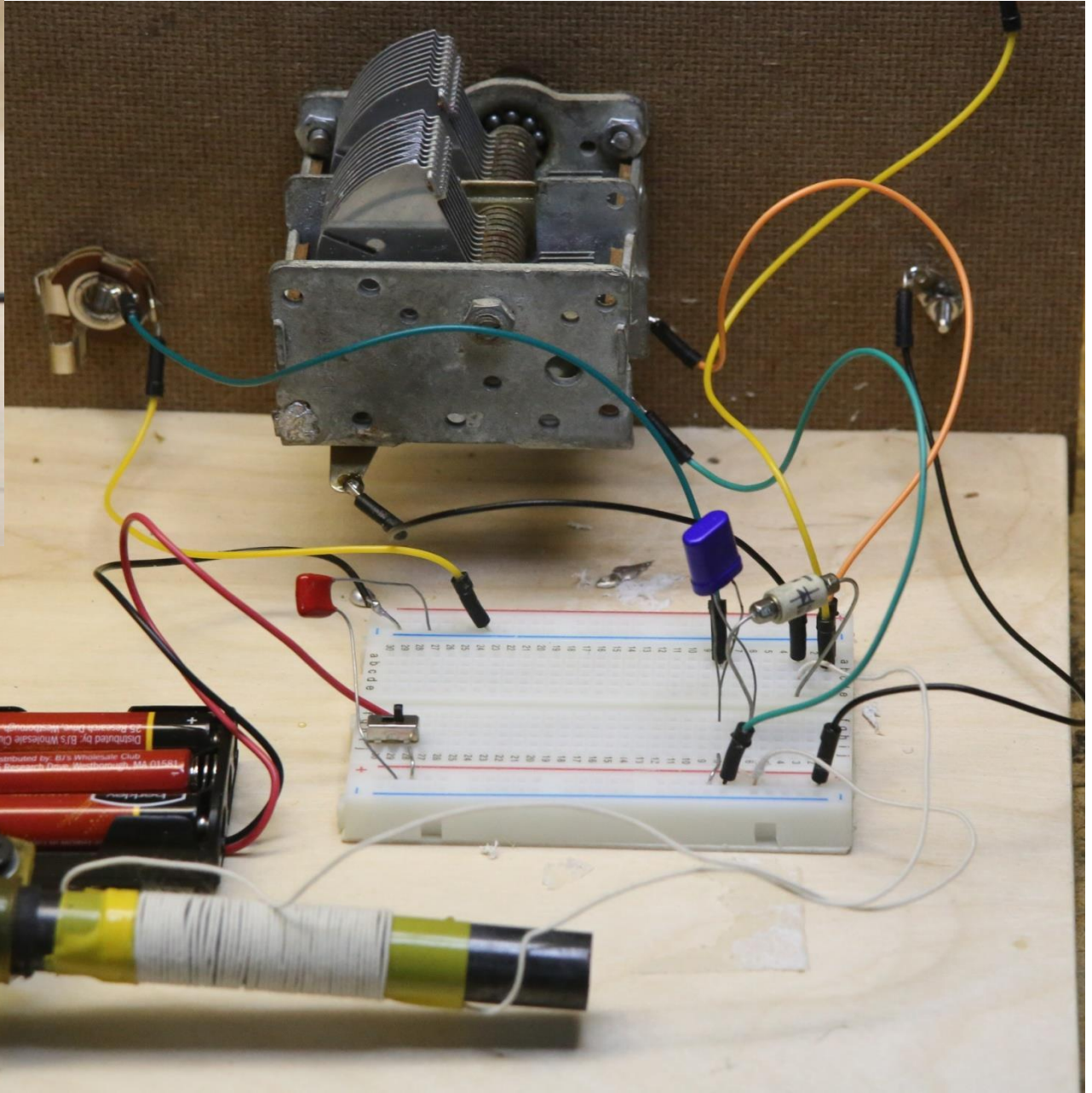
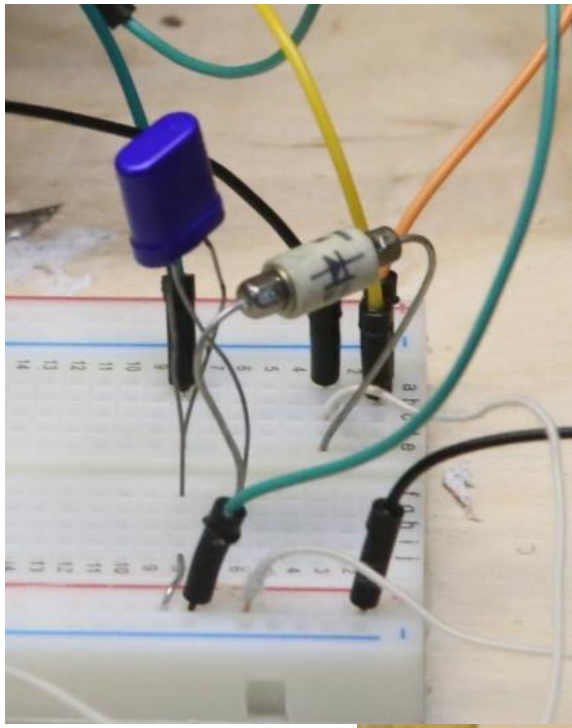




1950's 1-Transistor AM Radio

Al Klase - N3FRQ - 5 Feb 2018

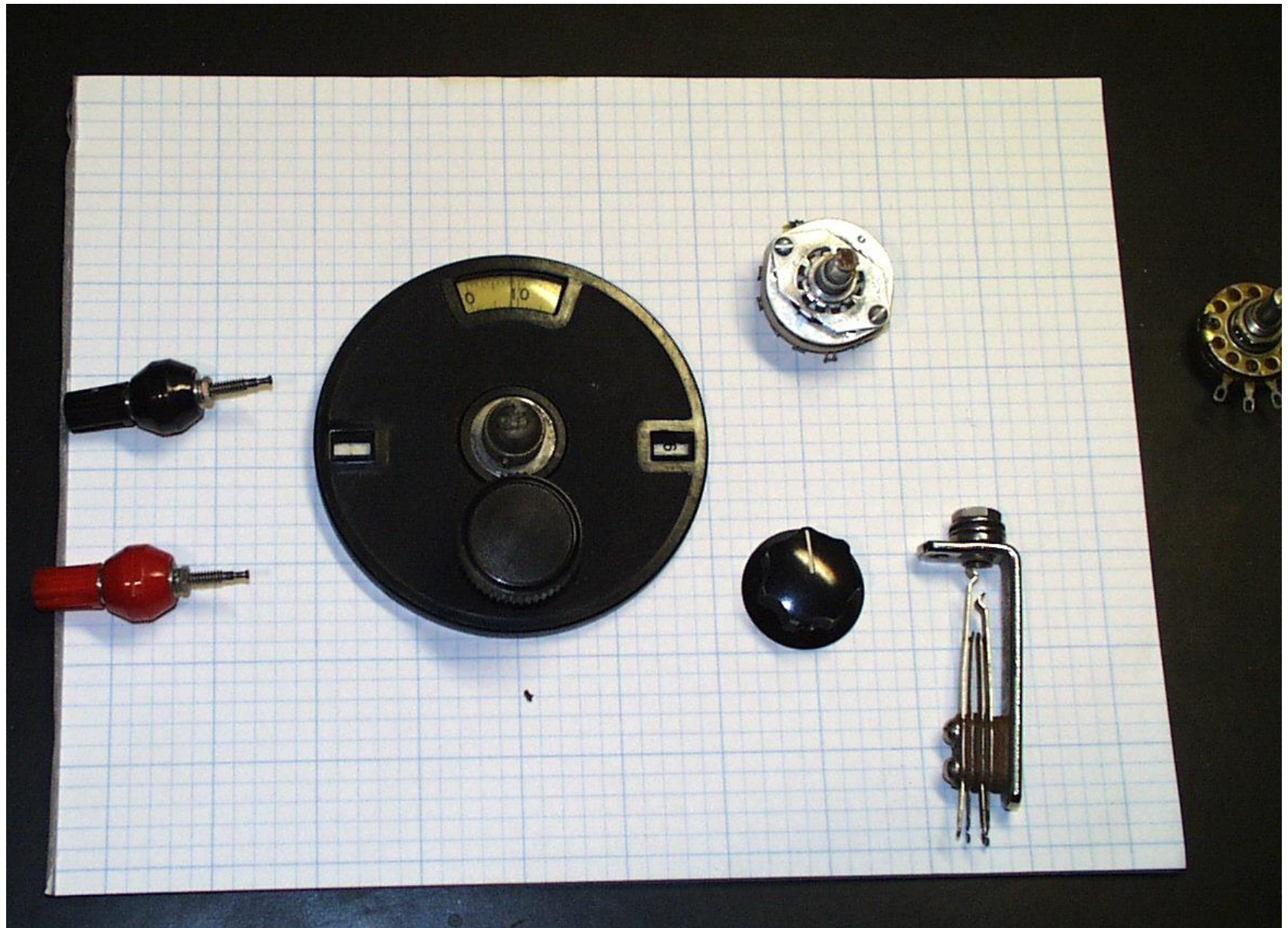
The Radio Technology Museum
<http://www.rtm.ar88.net/>



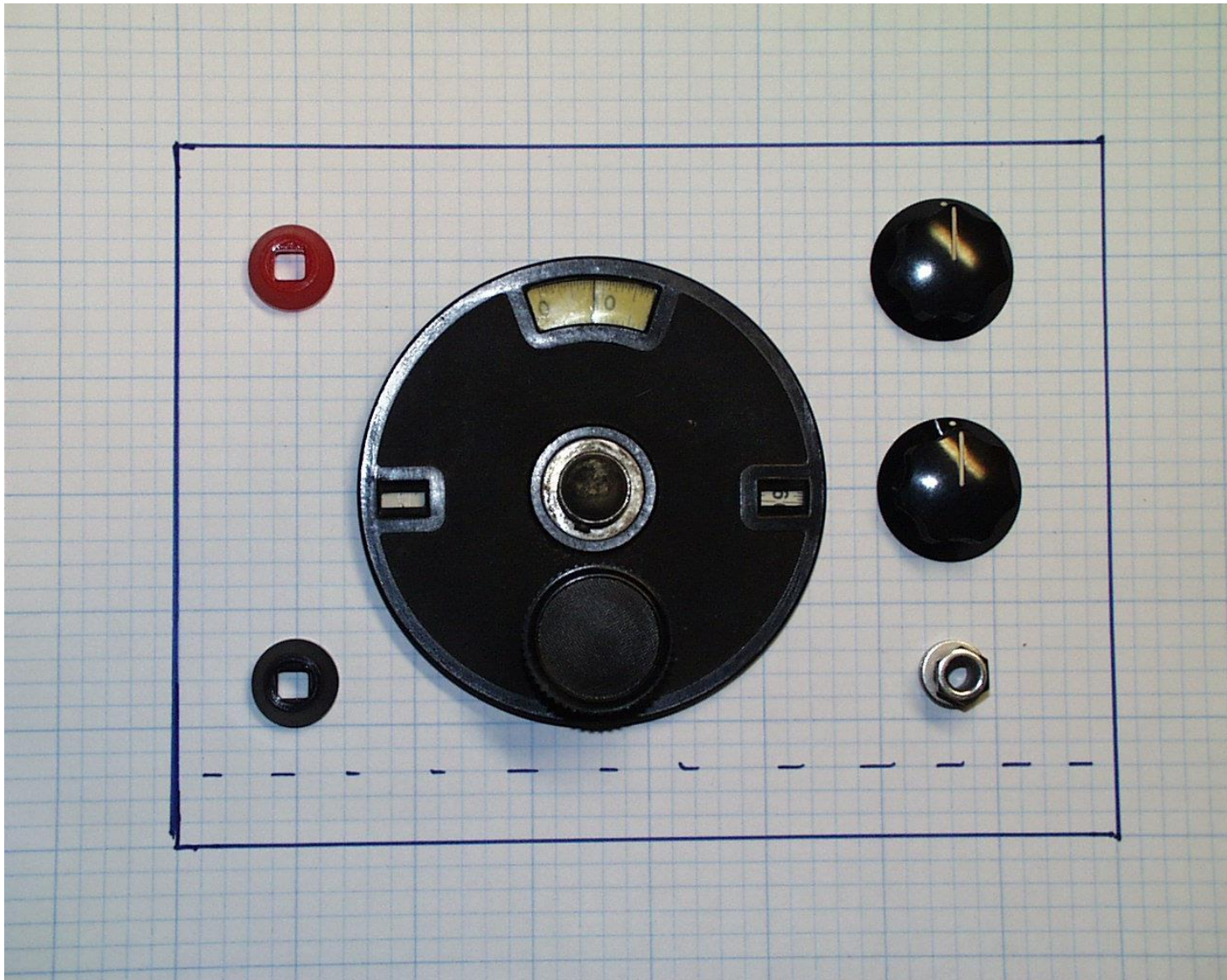


Mechanical Design

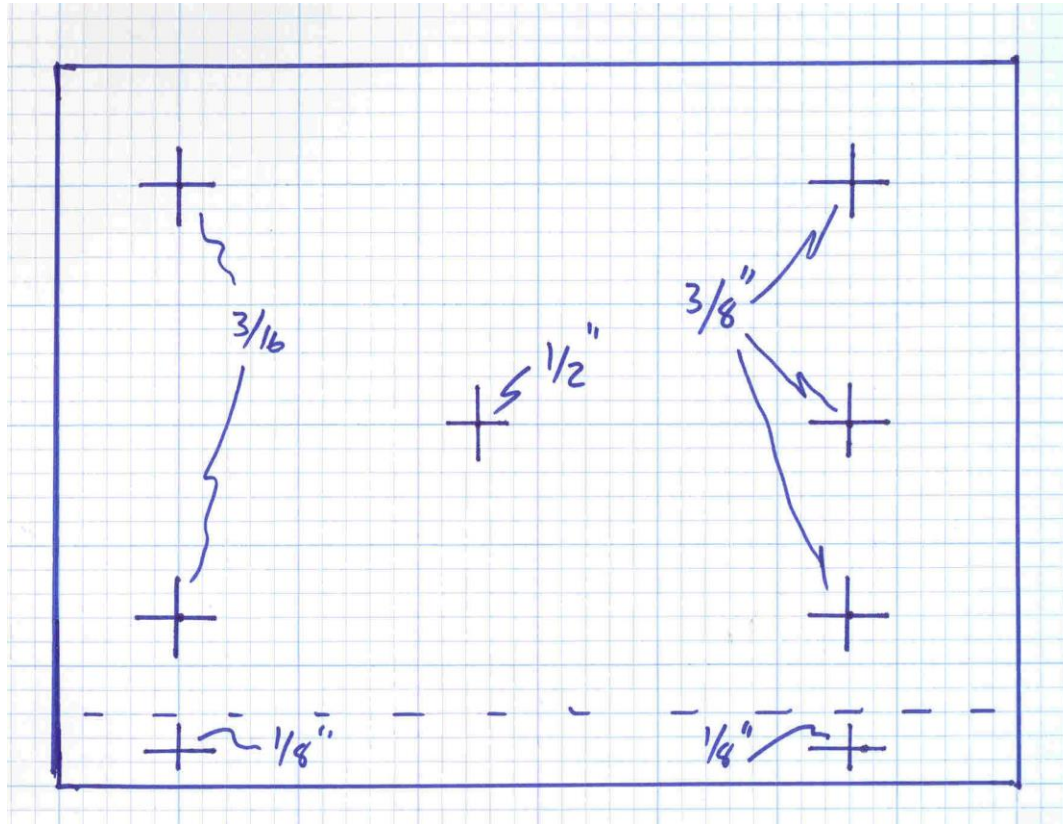
Sizing a Front Panel



Develop a Balanced Layout



Transfer Layout to Panel



- Now days you can do the drawing in CAD.
- Tape it to the panel, and center punch the holes.

Materials

- Wood
- Plastic
- Metal – especially Aluminum
- Tempered Masonite – 1/8”
- Commercial Chassis’ and Enclosures
- Salvage
- The Cigar Box
- Add computer-generated artwork

Secret Weapons

Ya gotta have the tools for the job!

Presbyopia* Strikes Every Seventeen Seconds!



- * “Old Eyes”
- But this can be “close work” even for young people.

Working Aluminum



- A carbide blade in a table saw will easily cut aluminum.
- File the edges smooth.

Cutting Square Parts



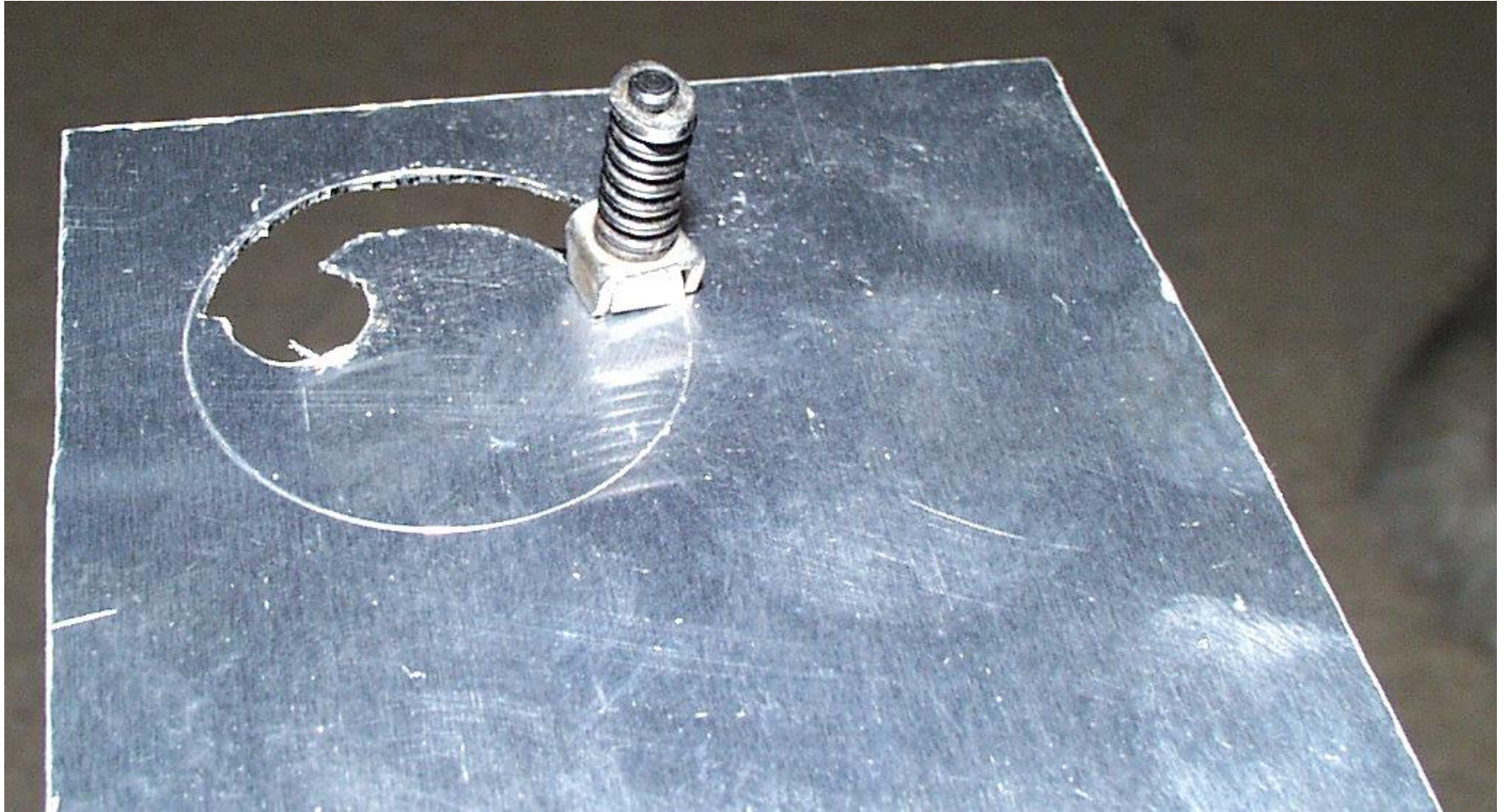
- A homemade panel cutter has served well over the years.
- The rail on the bottom engages the slot in the saw table.

Large Holes



- Taper reamer and nibbling tool shown.
- Greenlee and Whitney punches are also useful, but expensive and hard to find.

Adel Nibbler in Action



Suggestions for Beginners

- Use 1.4-volt vacuum tubes and batteries.
 - One D-cell + four 9-volters
- Power pentodes for better match to headset
 - 1S4, 3S4, 3V4, 3Q4, etc.
- Try a regenerative short-wave circuit
 - Easy coil construction
 - Strong signals = simple antenna

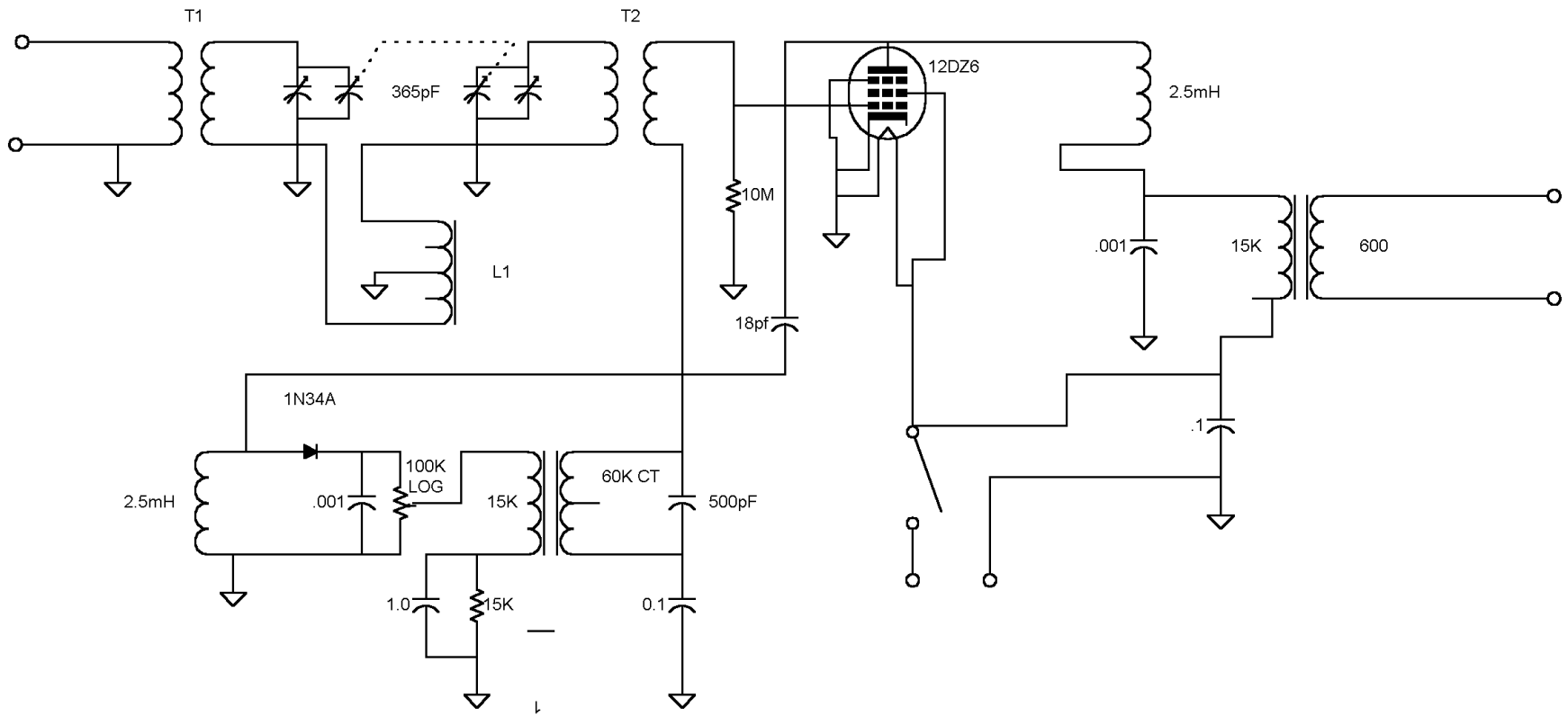
Other Concepts

- Transistors and/or IC's
- 12-volt (plate supply) car-radio tubes.
- Very small radios
- Superregeneration
- Steam Punk

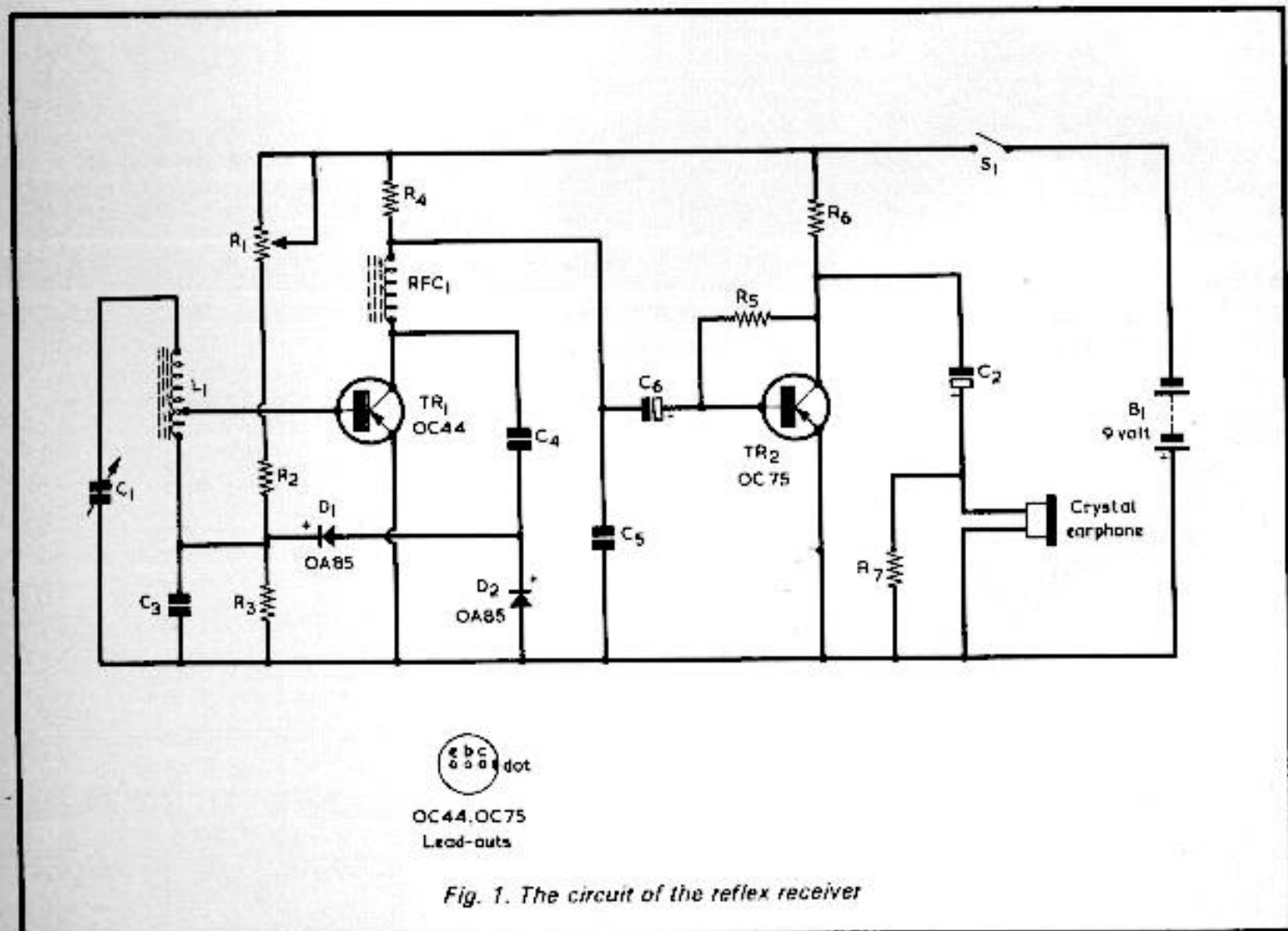


Reflex Circuits

- A lot of bang for the buck



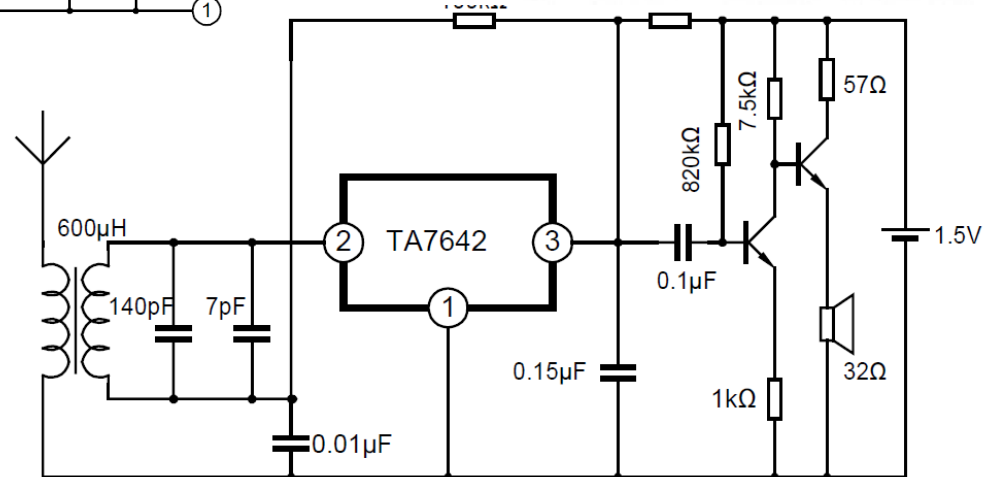
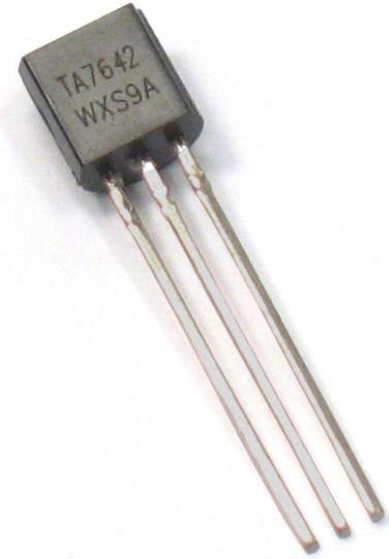
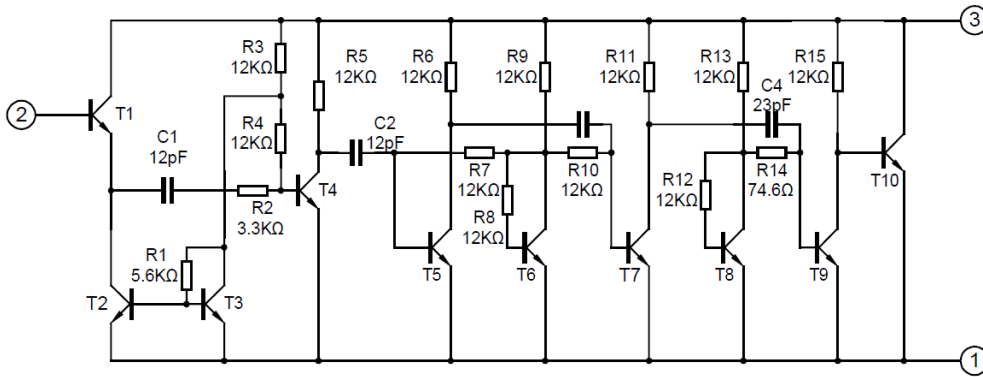
Leave it to the Brits

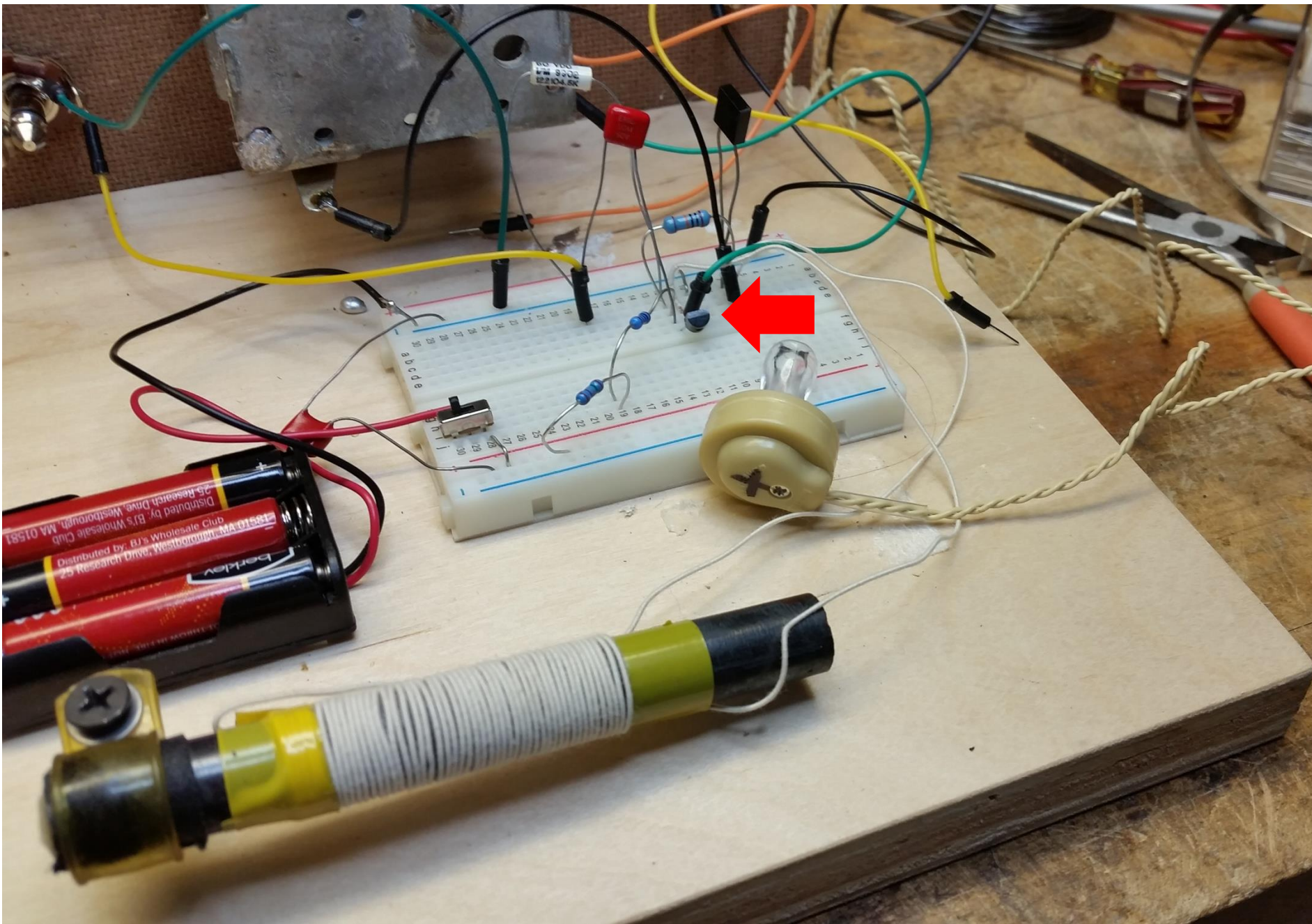


Use an IC !?

- Ferranti ZN414 - AM Radio
- a.k.a., MK-484, TA-7642

EQUIVALENT CIRCUIT





Build a Radio!

It's good for your soul.

The Steps

- The Concept
- Research
- Circuit Development – The Breadboard
- Construction