C-W 11-A

Restoration of Cutting & Washington 11-A

Inspected 2-22-1923

Regenerative receiver of unusual mechanical construction.

I have had this receiver in my collection for over 25 years. I acquired it at a fairly low price because it had silver plated brass bezels; 6 of which had lost virtually all the silver plate. This is a common malady for these radios, and I don't know of any collector that has figured out how to restore the finish without access to silver electroplating. The other malady to befall these radios is the fact that the hard rubber front panel turns ash gray when cleaning is attempted with water-based cleaners, especially if they are caustic in nature. I hoped to figure solutions but soon became discouraged and so there it sat for years.

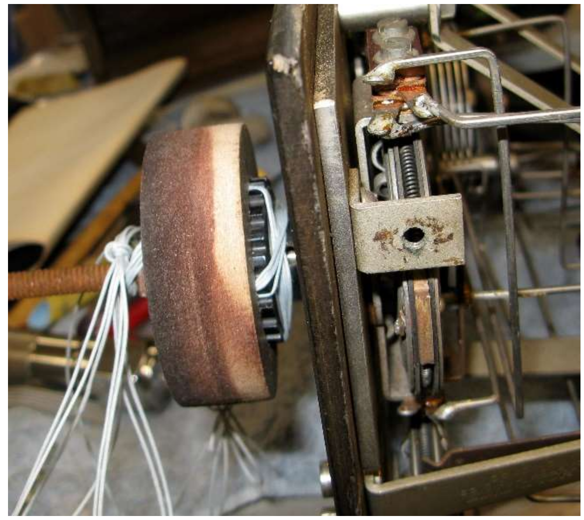
In working to conserve/restore other artifacts in recent years, I finally realized that I had developed techniques that I should be able to apply to this long-neglected radio.

The Cutting & Washington receivers, although rather Spartan and unattractive by my standards, and with the bad silver plate on the bezels; were built with superb craftsmanship.

Some years ago, I had purchased a small bottle of electroless silver plate solution and inherited a bottle of electroless tin plating solution. I have recently discovered the advantages of using a solution of hydrogen peroxide and sodium bisulfite to thoroughly clean oxidized brass. About two years ago I found a way to improve the surface of heavily oxidized hard rubber panels. However, the panel must be stripped free of all parts in order to do the job. I thought that I could now proceed to attempt to restore the plated bezels and panel.

It was not at all clear how the dial bezels were attached… Were they glued, or did they have studs attached to the back? The hard rubber panel is attached to a massive 1/8" thick nickel-plated brass chassis plate only slightly smaller than the panel. I had no problem removing six of the seven knobs BUT, the last knob simply refused to slip off the steel rheostat shaft. Construction of the rheostat makes it impossible to free the shaft from the back side of the assembly. There was some sort of burr capturing the knob. The shaft could be immobilized, and the knob would spin freely after its set screw was removed. Try as I might, I could not twist and pull the knob off. I finally arrived at a unique extraction method with what I thought might be the least probability of breaking or scarring the Bakelite knob body.

On my lathe I turned a recess in a disc of MDF (Medium Density Fiberboard - shelving stock.) Four 2.5mm holes were drilled to align with four flutes in the knob. This MDF disc was then mounted to a carriage bolt. I gathered four strands

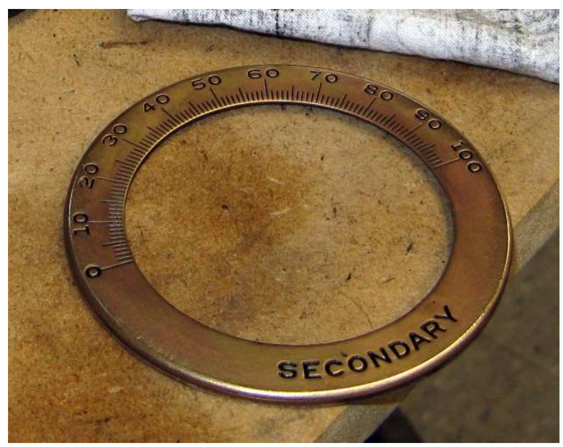


of Kevlar braided cord and tied the knob down in the well as tightly as possible. The carriage bolt was chucked in my cordless drill set on its higher speed range. The rheostat body was held to prevent shaft rotation. I spun the drill for about ten seconds at high speed while pulling on the knob, and it released! On inspection of the shaft, it was deceptively smooth as well as the brass insert in the knob. Apparently, the heat generated by fast rotation smoothed surfaces and wiped-away evidence of where the knob was sticking. The key thing for me was that the MDF and Kevlar cord were not abrasive enough to harm the Bakelite knob in any way.

So now I was ready to separate the hard rubber panel from the steel chassis plate. I noted that the attachment was via #8 x 32 bottoming-tap holes in the less than ¼" thick hard rubber panel. My thought is that this must have been a very tedious task requiring high skill. And oh so, very, very easy to cross thread with the ¼" screws holding the two together. I was surprised to discover that there were no signs of attachment for the bezels! Were the bezels simply glued-on? I began to probe the inside flange of the bezel using a strip of 0.005" phosphor bronze shim stock. Only maybe half of the 7 bezels had any

gaps where this shim stock could be inserted a little way. I began a tedious process of trying to force the shim stock all around the bezel. The next step was to then try and insert another strip of shim stock under the first piece to create a 0.010" gap. I fabricated a strip of 0.016" stainless steel with a dull knife edge on one end and attached it to a wood handle. I could eventually force the tool blade into the 0.010" gap. From there on, it became increasingly easy to wedge more strips and finally extricate the first bezel. Much to my surprise, it was not glue that was holding the bezels in place, but the outer ring of the bezel was a flange press-fit into a precision groove cut in the hard rubber panel! I had thought that the larger bezels would be the most difficult to extract, but that was not to be the case. I soon realized that the cut-outs in the rheostat bezels put the precision machined groove very close to my pressure points for wedging the bezel out of the panel. Any 90+ year old hard rubber is going to be far more brittle than the day of manufacture. The stakes were extremely high, so I spent several hours extracting the bezels and succeeded with zero damage.

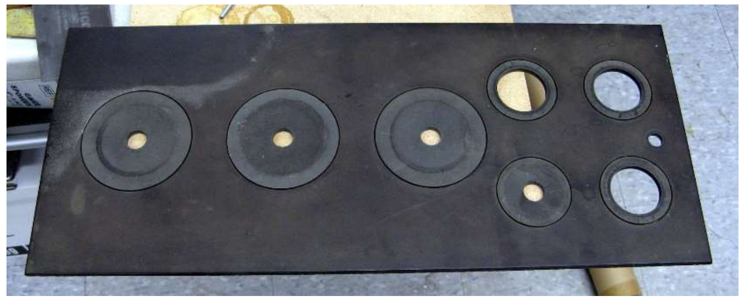
For the bezels where I could not find enough of a gap to insert the first shim stock, I laid a single edge razor blade flat on the panel surface and used a wood stick to push the reinforced edge. Of course, the corners of the blade could have snapped, so I used a face shield and gripped the stick so that my thrust was extremely limited should the stick jump-off the blade. Fortunately, I did not have any accidents and the process produced enough gaps to insert the 0.005" shim stock.



It was now time to try and remove the oxidation on one of the bezels using techniques that I have been using recently. I would have liked to have put these bezels in my ultrasonic cleaner, but I did not want to remove the black and red paint filling the markings embossed in the brass. I found that the brass did not return to the bright yellow luster I have experienced on my other cleaning tasks using peroxide and sodium bisulfite acid… Yes, it looked like cleaned brass, but it still appeared uneven in coloration and I feared that it would interfere with the electroless silver plate solution. I was correct and unpleasantly surprised to see virtually no affinity for the plating solution on my cleaned brass even though the solution is described as working on brass surfaces. I repeated the cleaning steps several times and still no deposition of the silver. I was not at all prepared for that outcome.

I am not equipped for electroplating silver so I decided to see if I could deposit electroless tin on my parts. I had recently had success in tin plating some old

copper bus wire using this solution. The same bezel was again cleaned and placed in the tin solution and immediately began to plate-out onto the brass fairly well. The tin presents almost the same color and luster as old silver, so after rinsing and light buffing, I sprayed a coat of clear acrylic lacquer on the bezels and called the job done.



Now that the hard rubber panel was free of all parts, I could employ the cleaning methods learned through experimentation in the past two years.

First of all, under no circumstances should you apply any water-based cleaners to old hard rubber. If there is any grime to remove, use a *waterless* hand cleaner like *Goop* or *Go-Jo*. Wipe-down with mineral spirits. If the surface is rough, sand with 220 grit paper lubricated with mineral spirits. To achieve a satin finish, continue rubbing with #0000 steel wool lubricated with spirits and using long linear strokes.

Once you have the surface finish to your liking, wipe-down the entire panel with fresh spirits and rub as dry as possible with a clean rag. Take the time to use Q-Tips to dry the insides of holes in the panel and do the same along any edges of the panel. Otherwise the spirits will wick-out in following steps.

There is no way to determine how deep the oxidation may be on a hard rubber panel, you are not likely to get back to a uniform original coloration. You may decide to simply stop at this point, give the panel a coat of wax and move-on to other things. But on some projects, you may want to improve the coloration. I have found that you can apply an aniline wood dye in alcohol solution, in this case black, to the panel. I use "Mohawk's Ultra® Penetrating NGR Stain". This can give you an even color, BUT there is a critical illumination angle to viewing the panel where you will see a very pronounced magenta hue. I have found that this hue can be eliminated by polishing the panel with colored wax specifically made for rejuvenating black painted cars. "Turtle Wax Color Magic Car Polish - Jet Black" worked well on this project. I then very carefully pushed a shaved toothpick through the machined grooves to make sure there was no trace of debris.

When it came time to re-install the dial bezels, I wondered if it would be necessary to apply some glue to the rings before insertion. I chucked a disc of scrap plywood mounted on a carriage bolt into my drill press and used the quill feed to apply near perfect perpendicular pressure on the rings. The first ring seemed to offer a fair amount of resistance to insertion and I decided to forgo adding any glue. The same proved true for the other six rings.

As I began to inspect the chassis prior to cleaning, I realized how exceptional the manufacturing craftsmanship is in this radio. I stopped to read the section of Alan Douglas's *Radio Manufacturers of the 1920s* Vol. 1 on the Cutting and Washington companies. The company founders were educated at Harvard and Columbia; they both worked at Harvard's famous Cruft laboratories and had managed to form a company to manufacture a form of quenched gap spark transmitter for which they obtained a government contract to build 1000 units in 1917/18. So, they certainly had experience in directing the building of rugged equipment to high mechanical standards. Alan could find no evidence that C&W had its own manufacturing operations and some evidence that they contracted work with De Forest in the New York area. However, Alan states that delivery of contracted work was very poor, and they moved to vendors in Minneapolis for a short time before settling on the subcontractor services of Automatic Electric in Chicago. But by August 1924 the company had gone into receivership.

I came to the part of the narrative by Alan where he mentions that their first radio receiver, the type 11, appears on the market in May 1922. My radio has an inspection tag dated 2-22-1923. The brass tag attached to the underside of the top lid says New York and Minneapolis and a serial number of 1272. In Minneapolis, C&W seems to have first contracted with the Minneapolis Heat Regulator, Co. (later known as Honeywell) but he reports that this did not work out well and manufacture was moved to Automatic Electric in Chicago. I would like to know if any of the Type 11-A sets have a tag that does not say Minneapolis. I am inclined to think that the Type 11 was designed for 1 Amp. tubes and the Type 11-A was for quarter Amp. tubes that were introduced in October 1922. There was an 11-B with rheostats to work with UV-199 tubes. Greg Farmer has an example of this model and it does have UV-199 sockets. He reports that he has never seen

any C&W sets with Chicago markings. Could be because they never had an office in Chicago even if product was being built there.

The primary tuned circuit has an amazing inductance with a tap at every turn for a total of 50 taps! The 50-tap switch looks to be virtually the same approach as used in the Strowger telephone relays of the day. The regeneration is controlled by a variometer. A parallel tuning capacitor is across the secondary with an outboard single vane rotor for vernier capacity adjustment. When regeneration is advanced, the tuning becomes so very sharp that the Vernier is essential.

The radio was a genuine "blooper", that could radiate spurious oscillations directly into the antenna when excessive feedback is applied to the detector. A *Radio Broadcast* article in May 1924 describes essentially the same regenerative design with an added 4th tube RF amplifier to isolate the antenna. This may have been a model called the *Teledyne* or Model 12 and presumed to have been built by Automatic Electric in Chicago.

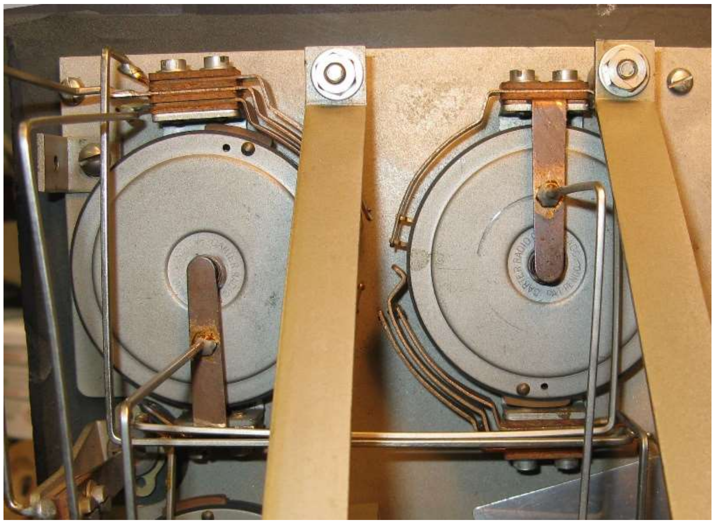
Initial on-the-air tests did not produce the performance expected. The regeneration control did not give the range of control expected and the secondary tuning is extremely sharp. There is no counterbalance for the secondary tuning capacitor and the leaf spring assuring perfect contact for the rotor vanes works to turn the dial when released. There is a cup washer behind the knob, but it does not seem to be effective. There is also a friction lever on the back of the rotor assembly with an adjustment screw but seems to not work well enough. I have installed a thin felt washer behind the knob to add additional drag.

I realized that the rotation range of the feedback coil was set wrong and on correction, the regeneration worked as expected. But tuning this set definitely takes some getting used to. By adjusting the detector filament voltage, you can indeed achieve a very wide range of regeneration. With the much less than optimum end fed long wire antenna I have; tuning range is from about 1200 kHz.

down to below 500 kHz. I note that there are two jumper straps accessible on the rear connection panel for the secondary and regen coil labeled as LOADING COILS. This should permit tuning down to lower frequencies. Alan Douglas tells us that the spark transmitters that C&W built for the military in The Great War were, after the war, supposed to be part of a package of equipment for land-based point-to-point private communication. Those transmitters are presumed to have been used on frequencies below 500 kHz. It could be that the 11-A was intended to work as a low wave receiver for that service. It appears that the land-based communications scheme was not successfully implemented.

The B+ for the audio amplifiers is only +45 Volts. The grid leak measures about 800K and there is virtually no leakage in the parallel connected 0.00005 capacitor. The same is true for the 0.002 capacitor for detector RF bypass. The B+ has a bypass capacitor of about 0.1 mfd. When operated with headphones directly in the plate circuit of the detector, the audio quality is fine. However, I find that the audio amplifier stages introduce considerable distortion although the winding resistance readings suggest that there are not faulty connections due to corrosion.

Note that there is only one headphone/horn speaker jack on the radio. The construction of the Carter brand audio amplifier filament rheostats is a marvel of out-of-the-box thinking in the way that they are configured with automatic bypass switching when the rheostat is turned off. This allows the plate connection of the detector, first audio or second audio to be routed to the single output jack.



These radios were not cost competitive in the markets of the day. Simply too much skilled labor and expensive materials and maybe also a styling that did not quite appeal to the home environment.

Their Armstrong regenerative license restricted their marketing only to direct sales to an end user while most makers were selling through jobbers and distributors who then sell to retailers.

In 1925, much of C&W management had been regrouped to form Colonial Radio Corp. that would continue until about 1934.

Photo Gallery begins on next page.

From the collection of:

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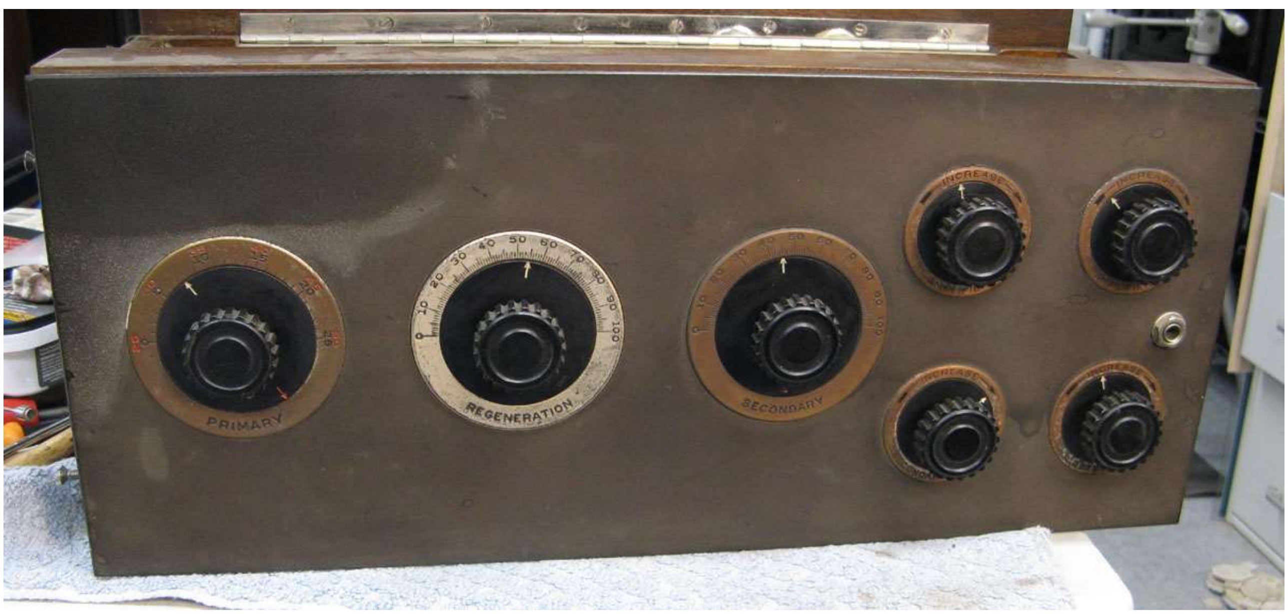
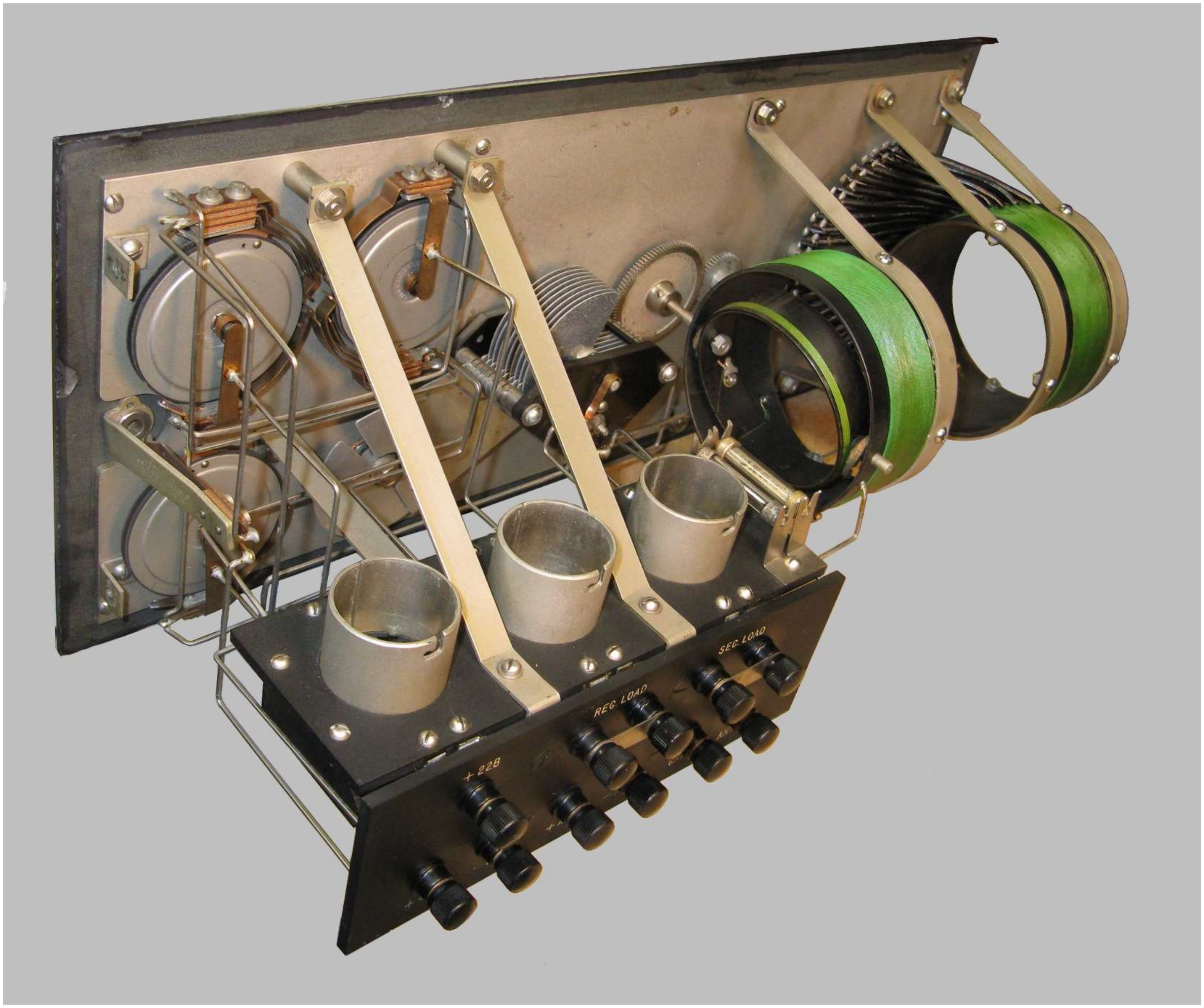


This receiver was acquired in the 1990s and attempts to salvage the appearance of the hard rubber panel were a general failure. I also had no way of restoring the plating of the brass bezels. In January 2020 I thought that I had acquired enough new skills and information to revisit making this receiver suitable for exhibition.



Note that the rheostats are equipped with an integrated switching scheme to route the audio output to a single phone jack regardless of whether you have headphones you want to connect to just the detector output or detector plus one stage of audio or wish to drive a loudspeaker from the second audio amplifier stage.

Note straps bridging terminals labeled REG. LOAD and SEC. LOAD. Presumably for allowing to tune the set at frequencies below the Medium Wave Broadcast Band.