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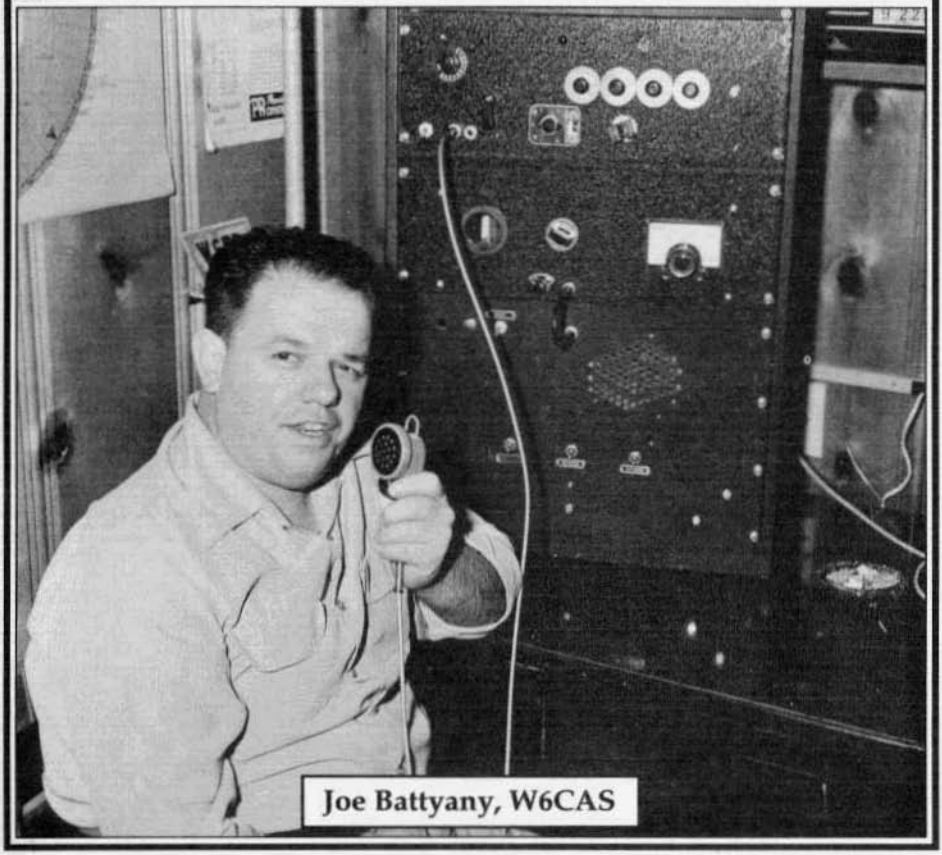
ELECTRIC RADIO

celebrating a bygone era

Number 114 October 1998



Joe Battyany, W6CAS

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Electric Radio is published primarily for those who appreciate vintage gear and those who are interested in the history of radio. It is hoped that the magazine will provide inspiration and encouragement to collectors, restorers and builders.

We depend on our readers to supply material for ER. Our primary interest is in articles that pertain to vintage equipment/operating with an emphasis on AM, but articles on CW and SSB are also needed. Photos of hams in their hamshacks are always appreciated. We invite those interested in writing for ER to write or call.

Regular contributors include:

Walt Hutchens, KJ4KV; Bill Kleronomos, KDØHG; Ray Osterwald, NØDMS; Dave Ishmael, WA6VVL; Jim Hanlon, W8KGI; Chuck Penson, WA7ZZE; Dennis Petrich, KØEOO; Bob Dennison, W2HBE; Dale Gagnon, KW1I; Rob Brownstein, K6RB; Don Meadows, N6DM; Lew McCoy, W1ICP; Kurt Miska, N8WGW; Warren Bruene, W5OLY; Brian Harris, WA5UEK; Thomas Bonomo, K6AD and others.

Editor's Comments

10-Meter Band

Over the last week or so we've had some good openings on ten. I think that from here on propagation will just get better and better. Although I can't operate as much as I'd like to, I do monitor 29.0 most of the day. I've made a couple of observations: The first is that there is not the level of activity that I expected. In the last cycle whenever I was hearing SSB activity on the low end of the band there would be a somewhat corresponding number of stations operating up in the AM window at 29.0 to 29.2. That doesn't seem to be the case now. I'm hoping that as conditions get better, with longer openings, that we'll see an increase in the number of stations operating regularly in the AM window.

Another observation is that there seems to be more illegal CB activity occurring on ten this cycle than last. I understand that more and more CB'ers are equipping their homes and trucks with Japanese hamband transceivers that allow them to operate on both 10 and 11 meters with the same antenna. I'm told that with the new automatic antenna tuners this is possible with just the push of a button. With no enforcement of FCC regulations I expect that illegal activity on ten meters will become more and more of a problem as time goes on.

The HPM Book

The HPM book is selling very well and the reviews we're receiving from readers are mostly good. The only negative comment on the book is that there are not enough photographs. Believe me, the author and I think that we have investigated all possible sources for good pictures that relate to HPM. One thing that I haven't done, that I'd like to do now, is to appeal to the readers of ER. Please let us know if you have any photos of Maxim or anyone closely associated with him. We'd like to use them here in ER and also in a possible second edition of the book. N6CSW

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Cover: Joe Battyany, W6CAS, in his 1947 hamshack. The gear in the rack is WW II military surplus, part of the SCR-522 set, a BC-625 VHF transmitter and a BC-624 VHF receiver. He used this gear on 2 meters.

Looking Back

by Lew McCoy, W1ICP
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It is a little hard getting back on track at the computer. My wife's passing hit me really hard—60 years together is a long, long time so I know it is going to get some getting use to. I want to thank everyone for the kindness, it is much appreciated.

As I am writing this I am getting ready to leave here in southern New Mexico and drive up and visit Barry at Electric Radio and hand-deliver this column. My usual method is to write the column and then send it to Barry via e-mail .

Barry tells me that the new edition of the book on Hiram Percy Maxim is off the presses and it should be well worth anyone's time to read it. Unfortunately I never knew Maxim but I did know Ira Spencer who lived in Hartford and was the inventor of the Spencer Turbine. He and Maxim were friends and Ira told me many stories about Maxim. A lot of the readers may not be aware but Hartford and New England in that era was a hotbed of inventions.

My close buddy, who many readers will remember, Twisty Ljonquist, W4DWK, grew up in Hartford and

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I found this photo in my archives. The woman on the left is Cecil Powell, HPM's secretary; on the right is Clarence Tuska, a very early associate of Maxim's. The car is a Franklin and it belonged to Maxim. The photo was taken by Maxim.

Military Radio Collectors Group—Update

by Hank Brown, W6DJX

Plans are underway for the fourth annual MRCG meet in San Luis Obispo. Location will be the same as last year - - Camp San Luis Obispo NCO Club. The meet will start 0600 Saturday, May 1, 1999.

Friday quite a few members will set up field rigs for operations. If you plan on operating we would like to know so we can publish a bulletin with that information. Suggested frequencies will also be published.

Early information indicates we will see TCS, AN/GRC-9 and GRC-109 gear in operation. The popular BC-611 and PRC-6 will be in use.

Both tent and RV spaces can be reserved by calling (805) 594-6500.

At 0600 Saturday there will be a military gear swap meet. This has been popular and well received.

We are requesting information on what will be brought to the swap meet. Your name and address will not be used. The idea is to let everyone know what to expect at the swap meet and not to engage in sales at this time.

Again, information indicates we will see Navy RBB and RBC receivers, ATA/ARA - SCR-274N - ARC-5 gear (some NIB), ART-13's, ARB'S, BC-348's, racks, plugs, cables and military manuals.

Let us know what you plan to put on passive display in the NCO club. We would also like to know what will be operational in the club. Both 110 VAC and 12/24 VDC at 50 amps will be available. So far a Signal Corps R-203 receiver will be working (RMCA 8506-B from 1943).

The Saturday program will get under way at 0930. Two speakers are scheduled and a couple more to be contacted.

Around 1200 there will be an excellent BBQ in back of the NCO club. We pass the hat for the BBQ and contributions to fund the event. The NCO club cost is $100 for Saturday but if there is interest we will rent the club for Friday.

The afternoon is scheduled for speakers. There will be break times to look over equipment, discuss gear, put out your want list and operate in the field.

The formal program ends with a business meeting to select someone to put together the next meet. NOTE: we do not have officers, dues or an organization. We just get together and do it!

A video camera will tape the event. Tapes will be available at a cost of $10 postpaid and run 3 hours on VHS format. Tapes for the 1996, 1997 and 1998 event are available.

Dave Ragsdale has a website for the group on the internet: http://www.calpoly.edu/~doragsda/mrcg.html.

There will be a ladies program on Saturday. This is not part of our meet and will not conflict with our schedules. The idea is to have members bring their ladies to the SLO meet: they can have a good time on their own. When the ladies program is firmed up we will publish the schedule and meeting place.

There is time to work up your display, collect gear for display, check operations and set aside gear for the swap meet. However, we would like to obtain information to publish ahead of time to let everyone know what to expect. Drop a line or contact us with a note on the internet. We also need an idea of what to prepare for the big BBQ.

ER

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Collins KWS-1 Aeronautical Mobile

by Chuck Teeters, W4MEW
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I should have kept my mouth shut on 75 SSB that summer evening in 1962. Allen Biggs, W3ZP, was giving me the business about my Collins. Of course I had always chided Allen for using a store-bought Central Electronics rig when I was using my home brew SSB stuff. Now that I had a KWS-1 I couldn't keep quiet about how compact it was. One Sunday afternoon in November I said that it would easily fit into my airplane. Allen said it couldn't be done. After about 20 minutes of discussion by everyone on 3999, I couldn't back down. I had to give it a try.

Allen and I go back to November 1952. I was on 3999 when he got on with a W9DYV, 10A sideband exciter. We got together almost every night after that and discovered we had many common interests, but different opinions about most. We first met in New York at the IRE SSB dinner in March 1953.

We both had small airplanes, but they were as different as our sideband rigs. I was a lover of Beechcraft Bonanzas, while Allen thought nothing could outfly a Bellanca Cruisair. When I got the KWS-1, Allen said I was conceding that commercial SSB equipment was better than homebrew and therefore that Bellanca was better than Beech. To outdo that faulty reasoning I had to put the KWS-1 on the air from the Bonanza.

While they are different externally, my K-35 Beechcraft Bonanza had about the same interior space and electrical capabilities as a Volkswagen bug, four seats, a 3' by 4' baggage compartment, and a 14-volt/50-amp electrical system. Antenna-wise I was a little better off as I had a run of 14 feet to the tail and a 15 foot horizontal mast (wing) sticking out on each side.

The 1000-watt Collins KWS-1 is in a cabinet that is identical to a 75A-4. It has a separate power supply in a 32" high cabinet that requires 120/240 volts AC and consumes 1600 watts. I think the KWS-1 was the only product where Collins used the Heathkit approach. The KWS-1 was available wired or as a partial kit. The exciter was factory wired only but the PA and power supply were available as kits. You could shave $360 off the $1995 price by doing it yourself. Apparently amateurs buying Collins were not interested as Collins dropped the kits the year after the KWS-1 came out.

Space- and weight-wise there was no problem getting the KWS-1 in the Bonanza, but AC power, antenna, and receiver-wise I was in deep trouble. With the help of Harry, W2KQJ and Bill, K2SAZ, I began plotting in secret. Allen never brought up the subject of the KWS-1 aero-mobile again, and I certainly wasn't going to stir him up.

My plane had 115 volts AC but 400 hertz at 100 VA maximum, so there was no way to use the Collins power supply. I had a 14-volt BD-77 dynamotor from a BC-191/SCR-193 that put out 1100 volts, and a King VHF aircraft power pack that could take care of the other voltages. We couldn't tap the plane's battery for the filament voltage, so we decided it would be necessary to carry an automobile battery for the filaments. Harry took on the job of making up the cables and relay box for the power supplies. He was good with the Amphenol 25-series connectors that Collins and King used.

The author's Beechcraft Bonanza model K-35.

For receiving we hooked a Gonset converter to the Lear Automatic Direction Finder. We put feedback on the IF for a BFO but It wasn't worth a darn on SSB. I had a 12 volt 3 to 6 MHz ARC-5 Command set receiver that could receive SSB reasonably well, so we used that with the ADF sense antenna. I connected the ARC-5 audio output to a spare receiver selector switch, and made a cable to connect the KWS-1 phone patch input and P/T to the transmitter selector of the Bonanza's interphone system.

The transmitting antenna was a wire to the tail, and from there to each wing tip with a loading coil from a BC-458 in the baggage compartment. In January we tuned it with W2KQJ's HT-19 transmitter on the ground at the Monmouth County, NJ airport. We made several local contacts so the transmitting antenna and the ARC-5 receiver were working OK. Harry had the transmitter power system wired up so we planned a ground test for February 10th.

To keep the center of gravity within limits, we put the extra battery on the floor in front of the right seat, the dynamotor and King power unit on the floor in the back and the KWS-1 on the rear seat. So I could get at the tuning and RF gain controls, we stood the ARC-5 receiver on end by my left leg and strapped it to the fuel selector valve. We kept an eye out for FAA inspectors, as nothing was certified, nor did we give any thought to doing a 337 aircraft modification form. A test flight was planned for the following Sunday. Bill would ride as radio mechanic and copilot. Harry would be our ground contact as he hadn't flown since he bailed out of his burning B-29 over Japan in 1944.

Sunday February 17, 1963 was an overcast but VFR day. When I came home from church at 12:30, I fired up on 3999 and there was Allen working Charlie, W2JN; Frank, W2AMJ; Hank, W2NCY and Chuck, W1IPO. When I got on the first thing Allen did was give me the business about when was I going to demonstrate the compact KWS-1 aero-mobile. Opportunity was knocking, so I told Allen I had not thought about it since last November. Just to prove how simple it was however, I would run out to the airport with the KWS-1 and be on in an hour or so.

I called Bill and Harry. Harry had to visit his son in South Jersey, and Bill's brother-in-law had just been taken to the hospital. A bad start, but I put the KWS-1 in the car and drove to the airport anyway. I strapped it in the back seat. It checked out great so I started the fan and took off. I headed west towards Trenton, NJ as W3ZP's farm was in Greenville, PA about 20 miles northwest of Trenton.

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Designing the T-195 HF Transmitter

Part 2

by Fred Johnson
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Design Requirements

From the start of the program the shock and vibration requirements had everyone's attention. A 20-ft free fall was a specification requirement along with package shaker tests. We accomplished design proof by dropping a unit from the roof of the main plant—a one story building. Further, there was a Belgian block Munson road test course at Ft. Monmouth. I don't recall any specific vibration tests but it was obvious that the design had to be very rugged. Some of the tests were done at Ft. Monmouth and at other military facilities. The need for ruggedness greatly influenced design details within the subassemblies, as well as on the completed transmitter. There is a lot of delicate structure and precision machinery that has to live through the rough handling.

Humidity requirements, high and low temperature operation, tune-up time and reliability were "all bears" according to Stu. We had temperature chambers right on the lab benches or adjacent to them. Components and subassemblies were tested often and thoroughly. Being Project Engineer, Stu was front line contact with the customer regarding tests and specification compliance.

Arlo says: "When they parachute dropped the GRC-19 on a palletized jeep, and the test went OK, Pengally called back to Stu and told him something like, 'Water off a duck's back'."

The transmitter was completely automatically tuned. The Collins-developed Autotune system was used. It met rigid requirements for accuracy, tune-up time, VSWR, and for RF match to a whip antenna connected to the insulated terminal on the front panel. We designed a little lever that automatically prevented firing RF output intended for a whip antenna into the 72-ohm connector on the panel.

The tune-up time requirement was an electromechanical mountain to overcome. It was tough due to a requirement for a 5-digit frequency readout of the ten-turn master oscillator shaft driven by the Collins Autotune. I learned from Dennis DuVall's article that a coproducer with Collins ran the Autotune slower than we did. Boy, do I understand why they did that! More on this later, you'll understand why.

It should be kept in mind that Arthur Collins was, at this time, looking ahead to SSB, although there were no SSB products yet designed. Stu Morrison puts this situation well: "Remember, we were developing the GRC-19, the R-390 series of receivers, and a 5-KW fixed station transmitter for Ft. Monmouth, all at the same time. The Signal Corps, unlike the Air Force and Navy, wanted a direct hand in determining the engineering approaches to be followed. On the other hand, Arthur felt the customer was paying Collins for our engineering expertise and we should be left alone to use it". This situation made for some uncomfortable times for those involved.

The Roller Inductor

Probably the most evident new technology in automatic tuning of the T-195 was the "roller coil" in the antenna coupler. It spawned the "180-series" of Collins antenna couplers that followed for both military and commercial appli-

cations. This was a grooved high alumina ceramic drum on which silver ribbon is wound from a grounded metal storage drum for the inactive ribbon. This scheme seamlessly rolls up as much inductance as the servo system is commanded, by a discriminator, to provide. Once this design is done, you look at it and say: "Of course".

Making the drum of brittle ceramic took some understanding. The high alumina ceramic is brittle. **But, it is strong!!** Only Coors had the diamond grinding capability to groove a fully fired ceramic drum and meet the necessary tight tolerances.

Ernie tells it this way: "The T-195 was designed to couple into a 16-ft. Jeep-mounted whip antenna. This requires a high-Q load coil to ensure greatest efficiency. In the past, antenna couplers had used tapped coils and roller coils in which the inductance of the coil was adjusted by changing taps or by rotating the coil with a conducting wheel shorting out a portion of the coil. In each application it was found that the unused portion of the coil absorbed a lot of power lowering the efficiency of the coupler.

"In the T-195, it was decided to roll a silver ribbon on the ceramic drum and store the inactive ribbon on a rotating metal drum to make the stepless 'variable inductor'. The two drums were geared together and spring loaded to each other to keep the silver ribbon tight".

Ernie continues: "American Lava and Centralab were contacted with no success. The required mechanical tolerances were beyond their capability." Fortunately, Coors was deep into the high alumina technology and agreed to build drums with diamond-ground grooves to the required tolerances.

It should be pointed out that early models of the ceramic drum were not grooved. As the unit tuned to the low frequencies, the needed inductance took all the turns available. With all turns of the silver ribbon on the ceramic drum, heating caused differential expansion of the silver and ceramic. The silver expanded more than the ceramic making the turns loose so they would slide endwise and touch each other. Walt recalls: "This made the PA tubes real unhappy". Thus the requirement for grooves to keep the turns in place. A thick coating on the ceramic of a softer material was tried so the grooves could be turned in the softer material, rather than "ground from hard". Those trials failed and Coors' ability to grind the grooves directly in the high alumina saved the day.

Ernie says: "I contacted Coors and explained the problem. Joe Coors thought that the job could be done and a few samples were ordered. They worked beyond our expectations. The grooved drum and silver ribbon made possible the fine infinitely adjustable variable inductor ultimately used in the T-195 coupler. (And many Collins couplers to follow).

I was involved with design of the coupler framework, drums, and their servo gear train. We were very conscious of gear train backlash in the servo system. If I let backlash creep in, the servo system would "hunt" (oscillate). Center distances between gears, and their testing pitch radii were toleranced to a few tenths of a thousandth. This design requirement was before calculators were everywhere. It was a tedious and error prone operation to manually calculate gear dimensions and gear centers to the tight tolerances required.

Later on I had the company IBM mainframe computer (used for accounting purposes) calculate the square of every integer from 1 to 100,000. I sweet-talked the publications department to print up a few dozen of these books and distributed them to other ME's in the company. Other ME's and I could then simply look up the required dimensional

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triangulations and quickly have an answer accurate to 1/10,000 inch. Alternatively, the job was long-hand squares and square roots. The job could also have been done on a 20-ft long slide rule I guess. Arlo and I still have our copies of this useful book of squares.

I really wanted to put the servo motor for the rolling coil inside the grounded metal takeup drum. But, at the time I couldn't find a way. However, we did do that on subsequent 180-series designs that went into B-52's and several Boeing commercial planes.

Roger Bettin brings up another aspect of the roller coil design: "Another problem was the big powdered iron slug in the tape-wound variable inductor coil. It would not pass shock tests and kept breaking, as it could be supported only on one end. We tried many ways and finally solved the problem". My recollection is that we realized that flux density in the center of this large powdered iron slug would be less than in the outer portions, therefore we could use a metal insert for strength without much increase in RF losses. Again, this shows the value of testing at the component level.

Walt Zarris recalls: "I had a lot of hands-on work on the discriminator in the coupler. I was a pair of hands for Stu who was busy with project issues".

Elmer Schwittek has another view of the coupler design. Here are his thoughts: "Stu was the Project Engineer, from whom I learned much. Because he was so good at impedance matching I believe he personally took care of the electrical design of the antenna coupler elements, ie., the wind-up coil, the antenna variable capacitor assembly, the discriminator, and myself the exciter. Walt Zarris designed the power amplifier and we farmed out the variable frequency oscillator to the oscillator group under Dave Hodgin. I'm hazy on some points, but I think I helped Dale Carlson with the modulator a bit."

Walt recalls some pretty fine-grain detail from the program: "When we started the project we used an Eimac 4X150 tube. It was the only tube that would handle the requirements. We were really pushing the parameters of the tube in that application. We were constantly pushing for the required 100 watts out under all conditions."

Walt continues with some performance goals tough to meet: "The plate choke was a problem to get enough impedance at low frequencies. We spent a lot of time figuring out where to tap the choke. Of course we had to fight high frequency resonances. That accounts for the two chokes at right angles used in the final design." The plate coil had to be tapped for each of the ten bands. Getting the mechanical clearances in the switch, and operating torques low enough for simple drives, took additional work.

The antenna coupler also has a servo driven variable capacitor. Roger Bettin, who joined the program in mid course, has this to say about the variable capacitor drive: "One problem was the mechanical clutch in the variable capacitor of the antenna tuner. The motor would drive the variable air capacitor, and when it hit its end stop the clutch was designed to slip and step in fixed capacitors until the discriminator was satisfied. The clutch had to drag enough to drive the air capacitor and this couldn't be made reliable. So, one day I talked to Stu and got an OK to try and remove the clutch and end stops and just let the variable air capacitor keep rotating 360 degrees. Once each revolution it would add or subtract the fixed C's. This scheme worked, and it is used in the final design. It took a little longer to tune up but the Signal Corps was pleased with the simple (agricultural?) solution".

I will confess that at that stage of my experience I was just being introduced to "self-de-energizing" clutches. If the

problem had been worked later we could have solved it with a more predictable clutch. In any event Roger's simpler solution was better. I remember discussions with him on the subject and at the time felt I should have done better.

From my mechanical outlook there were two most formidable design problems. They were 1. the front panel and its associated structure for the whole transmitter. And, 2. the requirement for a 5-place 4-bank counter digital frequency readout. This was the beginning of digital display thinking in the industry. Let me discuss the panel subject first.

The Front Panel And Main Structure

A quick glance at a T-195 shows all structure was box - framed and built off the front panel. It was decided early that the complex of stuff to be attached to the panel required mounting and support surfaces in all three planes. Trying to design a strong waterproof panel structure any other way looked foolish. So we set out to design a very complex die casting in close concert with a manufacturer. Today that would be called "concurrent engineering". Alcoa gave up on the die casting as they said it was too big for their resources. However, Doehler-Jarvis took on this task with us. It was the largest high precision die casting done at that time.

Arlo helped me immensely with design ideas and design checking. All of the complexities had to be figured for "shrink". The die into which the molten aluminum is injected under pressure must be sized a precise amount larger than the part at room temperature. When the part then cools it comes to the correct dimensions. We worked with Doehler-Jarvis to a satisfactory agreement on all the tight tolerances. Many dimensions required precision machining for tolerance or surface finish. We worked out the machining allowances and everywhere there was to be a machined metal surface we designed in metal to be machined. Getting the casting sufficiently void-free was another tough job eventually achieved by Doehler-Jarvis. Liquid aluminum injected into the mold "frothed" during flow under pressure leaving tiny voids where the flow was turbulent.

The front rim of the panel was interrupted in 16 places for wing screws which mounted the assembly to the case. These screws were needed to tighten and compress the sealing gasket with hand turning only, no tools. The specs prevented use of tools to separate the case and panel. To get the "wings" on the fasteners to align with the rim when the case was "tight", we used a spline which required special hobs and breaches. The spline let the screws be tightened and then the wings positioned in line with the rim. I recently saw that common screws, requiring use of common tools, were allowed in later production.

The panel provided structural support for a sub frame which mounted the Autotune mechanism and bandswitch drive. An intermediate plate immediately behind the panel supported the digital counter mechanism and band switch indicator.

Every shaft that penetrated the panel had to be sealed for the immersion test requirements. Machinery associated with shafts had to line up and the seals could not put too much drag on rotation.

Another mechanical element worth mention is the "Oldham" type mechanical shaft couplers. They are used to allow separation and accurate re-assembly of driven sub-units from their drive mechanism behind the panel. These couplers consist of a drive and driven plate separated by a cross slotted intermediate member. In addition to their accuracy and permanence of alignment, they are one of very few types of separable coupling that allow lateral and axial

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WW II Chi 4 Receiver

by Stan Tajima, JA1DNQ/KD2HB
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Japanese WW II Chi Ichi (meaning ground unit) receiver is well known as the Japanese WW II main army receiver. The Chi Ichi system was designed to establish 1000 km or longer-haul radio communications between the ground base and aircraft and it consists of the Chi Ichi receiver and a transmitter capable of 1.1 KW for A1 and 400W for A3. It is also famous for the mechanical design similar to that of the HRO families.

Chi 4 system was designed for much shorter haul communications of about 100 KM and its matching transmitter was capable of 50W A1/10W A3. The frequency coverage for both TX/RX is 4,000 kc - 20,000 kc. Chi 4 systems deployed were much smaller in number (about 200 systems in 1944) whereas Chi Ichi (1) systems were produced more than 1000 in 1944. After the WW II many of those Chi Ichi were used by JA hams, but today it is very seldom that you see well preserved sets.

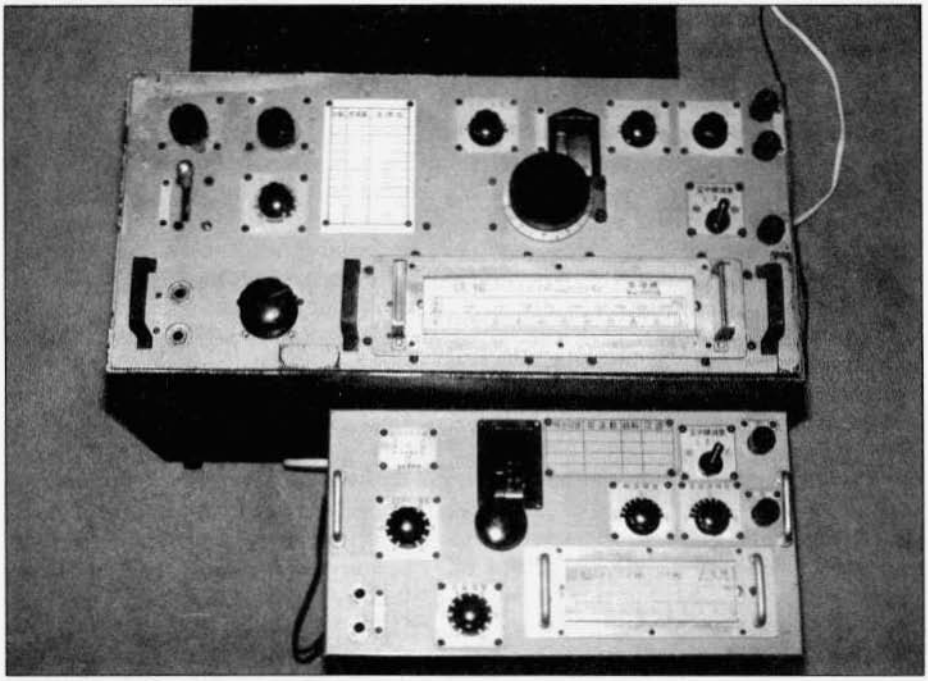
Chi 4 receiver is a very simplified version of Chi Ichi having 9 6D6s (6 6D6s for the receiver and 3 6D6s for voltage regulation). It seems that the design engineers have tried hard to reduce the necessary electronics components per each receiver to satisfy the then desperate situation of terrible material scarcity (see the picture showing the size difference between Chi Ichi and Chi 4). The outside dimensions are: 12.8" x 7.1" x 9.1". Like many other Japanese WW II military radios, Chi 4 uses only ST tubes. I am not aware of any Japanese WW II radio using other tubes than ST. If you know, please advise me.

The radio engineering status in JA at the time of WW II might have been 10 years behind the US (radar is an example, somehow usable radar was deployed only during 1944-45 time, but it is said they were still not reliable). On top of that, the military leaders (particularly army) did not understand the value of modern technology, and they were heavily emphasizing spiritual strength. (Because of material scarcity, they may have had no option).

The receiver diagram is very simple and typical for the Japanese WW II receiver: single RF amplifier, mixer, local oscillator, IF amplifier, regenerative detector and AF amplifier. It has no BFO and no crystal filter. Crystals were scarce at that time, so most of the Japanese receivers used regeneration detectors to achieve better sensitivity (also BFO function) and selectivity. The diagram shown here is what I have traced from the actual wiring. The regenerative detector feedback is done through the IF circuit as shown. I hope I have made no mistakes tracing the actual wiring.

The overall performance and engineering compared to, say the BC-348, is much poorer and I greatly sympathize with the Japanese radio operators who had to compete against the US signal corps GIs with much inferior sensitivity, stability, serviceability, durability and on top of it the poor support by the military leaders for noncombat logistics like radio communications. (For instance, the famous Zero pilot compartment was not bullet proof and its fuel tank was not protected by rubber sheet).

The Chi 4 I have acquired was from a US signal corps veteran who happened to land at Iwo Jima during the operation and had found one of the Japanese communications centers with lots of radios. According to him, after having



Chi Ichi receiver top and Chi 4 receiver bottom.

secured the Chi 4, a US pilot had flown suicidally over the cave where the radios were hidden and crashed into it destroying all the remaining radios.

The radio was in its original condition with most of the original tubes (produced by Toshiba, where I have previously worked) with two plug-in coils covering 4-6 mc and 6-9 mc (actually they cover about 3.5 to 10 mc) but no manuals. Some wires were missing and detached from the original soldering points, otherwise the mechanical condition was good. It was not so difficult, therefore, to trace the wiring one by one and do the re-soldering on all points as well as repairing those detached wires. The capacitors are either mica or oil paper types, while the resistors are all carbon type. Surprisingly the original values are maintained so I did not need to replace anything.

One big difference compared to the US made military craftsmanship is the soldering wires were simply pierced through the holes then soldered but not pierced/tied like the standard military procedure in the US. My other Japanese WW II radios do not show such novice soldering methods and I assume many Chi 4 radios having such novice-like soldering points must have experienced disconnection of soldering points during operations. I do not know why the Japanese mil specs then allowed such novice techniques. (Was there any mil spec in JA at that time?)

The mystery was those 3 6D6s at the back of the chassis. My W6 friend, Mike, has helped me resolve the mystery and it was found they were part of a voltage regulator circuit. I feed 260 VDC (already filtered) to the voltage regulation circuit and the output is 160 volt. The receiver draws about 21 mA.

All other Japanese WW II radios (even tank mobile radios which I have) have no such regulation circuit. Chi Ichi has

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no regulation. (The power supply system for Chi 4 consists of an air cooled engine generator, not by those hungry/skinny Japanese soldiers cranking human powered generator desperately resulting in uneven voltage, Hi). If anybody knows the reason, please advise me.

The tracking and IF adjustments were simple. All Toshiba original tubes unfortunately needed to be replaced (so I put JAN tubes, Hi). And now it works great. Again the Chi 4 is nothing comparable to its enemy contemporary radio like BC-348, but with its simple circuit, it works fine. The only inherent design problem is that the regenerative detector is not stable, so demodulating CW is unstable. It also has no AGC (like many other contemporary Japanese WW II receivers).

Although the actual frequency coverage is wider than specified (eg 4-6 mc coil can cover 3.5 to 7 mc.), but to keep the dial precision, the usable frequency must have been kept narrow.

The demodulation hum is somehow strong and I could only eliminate it completely when I fed 6.3 DC to the heater circuit. Replacing the tubes does not stop the hum. Any suggestions?

The antenna attenuation switch capacitors were actually measured, but the circuit does not work.

I plan to use the Chi 4 as the baseband receiver for 50 mc AM QSOs using a home built crystal converter. If anyone has Chi 4 plug-in coils, I would like to purchase them. **ER**

The comparison chart of Chi Ichi (1), Chi Ni (2), Chi San (3), Chi Yon (4), Chi Go (5)

System	Chi Ichi	Chi Ni	Chi San	Chi Yon	Chi Go
Distance covered	1,000 Km	500 Km	100 Km	100 Km	1500 Km
Frequency coverage					
Transmission	2.5-13.35 mc	2.5-10 mc	1.5-6.7 mc	4-20 mc	4.5-20 mc
Receive	-do-	-do-	1.5-8.9 mc	-do-	-do-
Output Power	A1 1100W A3 400	A1 180W A3 40	A1 40W A3 8	A1 50W A3 10	A1 2KW
Receiver	RF2 IF2	RF1 IF2	RF1 IF1	RF1 IF1	No Specific Receiver
Deployed Number (in 1944)	1000 sets		2700 sets	200 sets	

A complete index of the entire 9+ years of ER is available for viewing or downloading at the following website:
http://www.qsl.net/n9oo

Reviews of the Book "Hiram Percy Maxim"

Jim Hanlon, W8KGI

Even before I became a Novice in 1952, I was familiar with the picture of Hiram Percy Maxim with his great shock of white hair and his captivating eyes from the front of the ARRL Handbook. I knew then and came to appreciate even more later when I read "200 Meters and Down" that he was the founder of the ARRL, a champion for amateur radio in the early days when its very existence was being challenged in Congress, and the original holder of (W)1AW.

But I knew very little of him beyond that, in particular very little of what he was like as a boy, man, father, engineer, inventor, community leader and business man.

So it was a most pleasant experience to discover these later aspects of Mr. Maxim's life and personality through the pages of his biography written by Alice Schumacher. As she explained in the last issue of ER, Alice did her homework well. Over a 9 year span, she interviewed HPM's son, daughter, grandchildren and friends; researched the HPM Memorial section of the Hartford, Connecticut State Library which holds Maxim's early engineering notebooks from his "horse less carriage" days, the manuscripts of his three books, scrapbooks, personal papers and many other materials. She watched him and his family in his many home movies and traced his formal persona and his T.O.M. secret alter ego through many pages of QST.

Her resulting, well written book first introduces "Percy" as a rambunctious, curious four year old son of a somewhat eccentric inventor, Hiram Stephens Maxim. We follow many incidents in his childhood, through his graduation from MIT as a Mechanical Engineer at the age of 16 and his courtship and marriage to Josephine Hamilton at 29. We meet him as a husband and father, an early automotive engineer, and an inventor and business man. HPM proves to be a gregarious man of tremendous energy, enthusiasm and intelligence. He built the first auto in Connecticut and personally drove to victory in the first automobile track race between his Pope Mark VIII and a Stanley Steamer in 1899. He invented the Maxim Silencer, whose principle he put to work as a gun silencer and flash diffuser for army rifles in WW I, as a muffler for cars, trucks and factory engines and compressors, and even as an early "air conditioner" which let air come in through a window but which deadened outside noise. On a bet with his sister-in-law, he wrote a flamboyant movie script which much to his surprise Hollywood produced as "The Virgin Paradise" with Pearl White in the leading role. Acting as a newspaper correspondent, he covered the 1920 Democrat National Convention in San Francisco to which Mrs. Maxim had been elected as a suffragist delegate. (On their way to the convention their train was held up near Gallup, New Mexico by "Mexican bandits!"). He was an early amateur motion picture enthusiast and founded the Amateur Cinema League. He had a long time fascination with outer space and the universe, and he made a globe of Mars with all of its then known features. He was a yachtsman and a lieutenant commander in the USNR, and a pioneer glider enthusiast.

And of course we meet HPM as the father of Amateur Radio. In 1911, inspired by the activities of his technical

assistant Roland Bourne (later W1ANA), 42 year old HPM learned the code and became a "ham" along with his son, Hamilton. His first call was SNY, then 1WH and 1ZM. His first station had a range of one city block. After WW I to his final QRT in 1936, Maxim was (W)1AW. His personally made, 8000 rpm, belt driven rotary spark gap of that era was T.O.M's "Old Betsy." Mrs. Schumacher details HPM's organization of the ARRL and the IARU and his successful defense of Amateur Radio before Congress, including highlights of his 1930 speech before the Interstate Commerce Commission in Washington, D. C. She includes many QST excerpts from his HPM-signed editorials and his T.O.M. letters on "rotten radio."

So if you'd like to get to know the grand gentleman who had so much to do with Amateur Radio's existence today, to get reacquainted with the Wouffhong, Uggerumph and Rettysnitch, pick up a copy of Hiram Percy Maxim by Alice Clink Schumacher. It's a great read! ER

Chuck Penson, WA7ZZE

Before reading the book, my impression of HPM was that he was stern, humorless, and all business. After all, with a nickname like The Old Man, what else was I to imagine? It didn't take many pages to convince me that in fact he was exactly the opposite. Schumacher's narrative paints a clear picture of a warm, honorable, and good natured husband, father, inventor, and genius.

Biographies are the hardest books to write. Their authors constantly struggle between too much detail and not enough. Let's face it, a book about HPM had the potential to be real snooze material. I am happy to report that Schumacher walked the tightrope of detail and never once lost her balance. HPM is an easy to read, fast paced, and enticing book. Who'd a thunk it was possible?

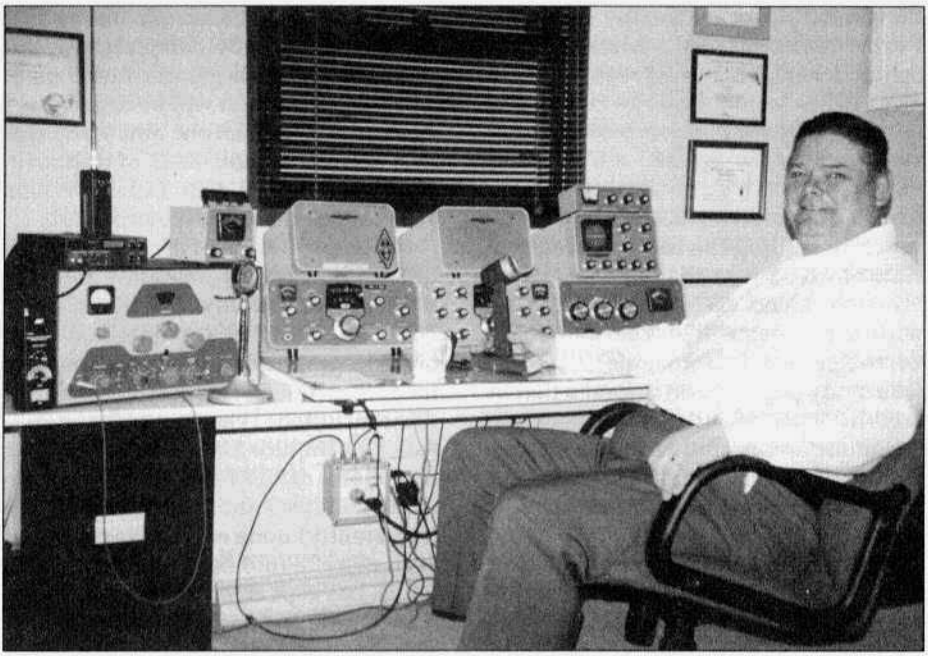
Even if one had no particular interest in HPM, there is a lot of automotive, ham radio, and early twentieth century history woven into this book. It works on a variety of levels.

T.O.M. is eminently quotable and the book is filled with his wit and wisdom. One of my favorites is this from a 1922 QST editorial. "Amateur radio is still amateur radio... not a snobbish group able to buy the best, nor a group of engineers who know everything and never make a technical mistake." I'd like to think it was still true today.

Maxim's legendary insight and forward thinking are summed up neatly in this quote from testimony given before the Senate in 1930. He was speaking about the possible creation of an agency to oversee all forms of wireless communications. "Any governmental agency will be besieged by commercial interests to grant even greater numbers of channels to them. It will be urged upon such an agency that the amateur channels are worth thousands of dollars in earning ability." Ahh, Hiram. Where are you when we really need you?

My only criticism of the book is for its lack of photographs. Including the cover photo, there are only four in the entire book. The author references hundreds of photographs and describes many of them in detail. Why were not a few of these included? I checked with the publisher to inquire about the absence of any photos of HPM and his radio equipment and was shocked to learn that (apparently) none exist. I was shocked even more to find out that not even the ARRL has kept any historical photos of the T.O.M. If this is true, the league should be severely admonished for its lack of historical values. ER

Marvin Moss, W4UXJ, operating the University of Florida club station, W4DFU, during the '50's. Marv used the Collins gear to talk to his Dad, formerly W4ZEH, now K7VSV.



Tom Thompson, W9CHP, in his hamshack which consists of Heathkit gear mostly.

John Miller, AK7DX, in his Anchorage hamshack. The receiver on the left is an R-390A and on the left is a 51J4.

Steve Balmer, WB6BNT, in his hamshack back in 1963 when he was 14 years old. That's a Ranger TX on the left and a Hammarlund HQ-129X RX on the right.

Simple Power Reduction for the Viking Ranger

by Robert H. Dilworth, W4LQE
1167 Highgrove Gardens Way
Knoxville, TN 37922

Many AM operators would like to drive linear amplifiers with the Johnson Viking Ranger or Ranger II transmitters. The normal 40-plus watt output of the Ranger is much in excess of the 12 to 15 watts drive needed by typical linear amplifiers for AM operation. Dropping the output to this level is beyond the range of the pi-network output coupling parameters of the Ranger on the lower frequency bands, so some other means is required to reduce the output while leaving the other Ranger functions unchanged.

The Ranger manual suggests dropping the output on CW by reducing the grid drive to the 6146 final. While this can be done on CW, it is unsuitable for AM operation, since starving the grid drive of the 6146 final results in poor modulation capability and produces unacceptable audio distortion. Using an attenuator between the Ranger and a linear amplifier works nicely, but finding suitable non-inductive power resistors to build such attenuators is difficult. It is also necessary to choose send-receive relay circuits that do not leave the attenuator in the received signal path.

Fortunately, there is a simple way to reduce Ranger output that exists as a consequence of provisions designed into the Ranger when used as the RF and audio source for the Viking Desk Kilowatt. A nine-pin plug and socket on the rear of the Ranger chassis has connections that allowed the center-tapped modulation transformer secondary to become a driver transformer for push-pull 810 class-B modulators in the "Desk". When used "barefoot", jumpers across certain plug pins connect the bottom of the secondary to B-plus, and the top to the 6146 plate and screen, with the center-tap unused. When used as an exciter for the Desk, external connections through the 9-pin connector shunted unmodulated HV to the 6146, furnished 810 grid bias to the center-tap, and connected the ends of the winding to the 810 grids.

These rear connections allow a very

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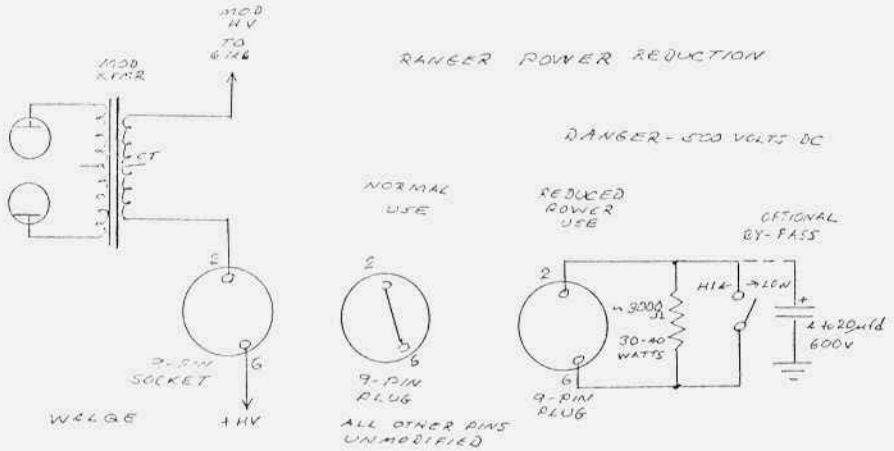


VINTAGE NETS

California Early Bird Net: Saturday mornings at 8 AM PST on 3870.
California Vintage SSB Net: Sunday mornings at 8 AM PST on 3835
Southeast Swap Net: Tuesday nights at 7:30 ET on 3885. Net control is Andy, WA4KCY. This same group also has a Sunday afternoon net on 3885 at 2 PM ET.
Eastern AM Swap Net: Thursday evenings on 3885 at 7:30 ET. This net is for the exchange of AM related equipment only.
Northwest AM Net: AM activity daily 3 PM - 5 PM on 3875. This same group meets on 6 meters (50.4) Sundays and Wednesdays at 8:00 PT and on 2 meters (144.4) Tuesdays and Thursdays at 8:00 PT. The formal AM net and swap session is on 3875, Sundays at 3 PM.
K6HQI Memorial Twenty Meter AM Net: This net on 14.286 has been in continuous operation for at least the last 20 years. It starts at 3:00 PM PT, 7 days a week and usually goes for about 2 hours. Net control varies with propagation.
Arizona AM Net: Meets Sundays at 3 PM MT on 3855. On 6 meters (50.4) this group meets at 8 PM MT Saturdays.
Colorado Morning Net: An informal group of AM'ers get together on 3876 Monday, Wednesday Friday, Saturday and Sunday mornings at 7AM MT.
DX-60 Net: This net meets on 3880 at 0800 AM, ET, Sundays. Net control is Jim, N8LUV, with alternates. This net is all about entry-level AM rigs like the Heath DX-60.
Eastcoast Military Net: It isn't necessary to check in with military gear but that is what this net is all about. Net control is Dennis, WA3YXN but sometimes it rotates to other ops. Saturday mornings on 1995 at 0500 ET. Will move to 3885 for summer.
Westcoast Military Radio Collectors Net: Meets Sunday mornings at 0930 local on 3975 + or - QRM, except the 1st Sunday of the month when the net meets at 2130 local. Net control is Tom, WA6OPE.
Gray Hair Net: The oldest (or one of the oldest - 44+ years) 160-meter AM nets. It meets on Tuesday nights on 1945 at 8:00 PM EST & 8:30 EDT. URL: http://www.crompton.com/wa3dsp/grayhair.html
Vintage SSB Net: Net control is Andy, WB0SNF. The Net meets on 14.293 at 1900Z Sunday and is followed by the New Heathkit Net at about 2030Z on the same freq. Net control is Don, WB6LRG.
Collins Collectors Association Nets: Technical and swap session each Sunday, 14.263 MHz, 2000Z, is a long-established net run by call areas. Informal ragchew nets meet at 0100Z Tuesday nights on 3805 and on Thursday nights on 3875.
Collins Swap and Shop Net: Meets every Tuesday at 8PM EST on 3955. Net control is Ed, WA3AMJ.
Drake Users Net: Another relatively new net. This group gets together on 3865 Saturday nights at 8 PM ET. Net controls are Criss, KB8IZX; Don, WZ8O; Rob, KE3EE and Huey, KD3UI.
Swan Users Net: This group meets on 14.250 Sunday afternoons at 4 PM CT. The net control is usually Dean, WA9AZK.
Nostalgia/Hi-Fi Net: Meets on Fridays at 7 PM PT on 1930. This net was started in 1978.
K1JCL 6-Meter AM Repeater: Located in Connecticut it operates on 50.4 in and 50.5 out.
JA AM Net: 14.190 at 0100 UTC, Saturdays and Sundays. Stan Tajima, JA1DNQ is net control.
Fort Wayne Area 6-Meter AM Net: Meets nightly at 7 PM ET on 50.58 MHz. This net has been meeting since the late '50's. Most members are using vintage or homebrew gear.
Southern California Sunday Morning 6 Meter AM Net: 10 AM Sundays on 50.4. Net control is Will, AA6DD.
Old Buzzards Net: Meets daily at 10 AM Local time on 3945. This is an informal net in the New England area . Net hosts are George, W1GAC and Paul, W1ECO.
Canadian Boatanchor Net: Meets Saturday afternoons, 3:00 PM EST on 3745. For hams who enjoy using AM, restoring and operating
Midwest Classic Radio Net: Saturday mornings on 3885 at 8AM Central time. Only AM checkins allowed. Swap/sale, hamfest info and technical help are frequent topics.
Boatanchors CW Group: Meets nightly at 0200Z on 3579.5 Mhz (7050 alternate). Listen for stations calling "CQ BA" or signing "BA" after their callsigns.
Wireless Set No. 19 Net: Meets the first Sunday of every month on 14.165 at 1900Z and 3760 at 2000Z. Net control is Dave, VA3ORP.
Beer Town Traders Net: On 3885, 5:30 Central Daylight Time on Saturdays.
Westcoast 40M AM Net: Sunday afternoons from 3-4 PM westcoast local time until 4-5 PM on 7160 +or- QRM.

Nets that are underlined are new or have changed times or frequency since the last issue.

Radio as an Art Form

a tribute to our radio pioneers

by Bruce Vaughan, NR5Q
504 Maple Dr.
Springdale, AR 72764

Years ago when the technological age was in its infancy, art, by then well developed, was enjoying the fruits of maturity. It is only natural that artisans other than painters and sculptors developed a knowledge and appreciation of design and form. Nowhere is this more noticeable than in the fields of science and manufacturing.

Take a look at early stock tickers, telephones, telegraph keys and sounders, microscopes, cast iron machines, farm equipment, hand tools, etc.--what may have been lacking technically was overshadowed by the sheer beauty of such equipment. And yes, this beauty of line and form became part of the newest scientific marvels of the time, including wireless!

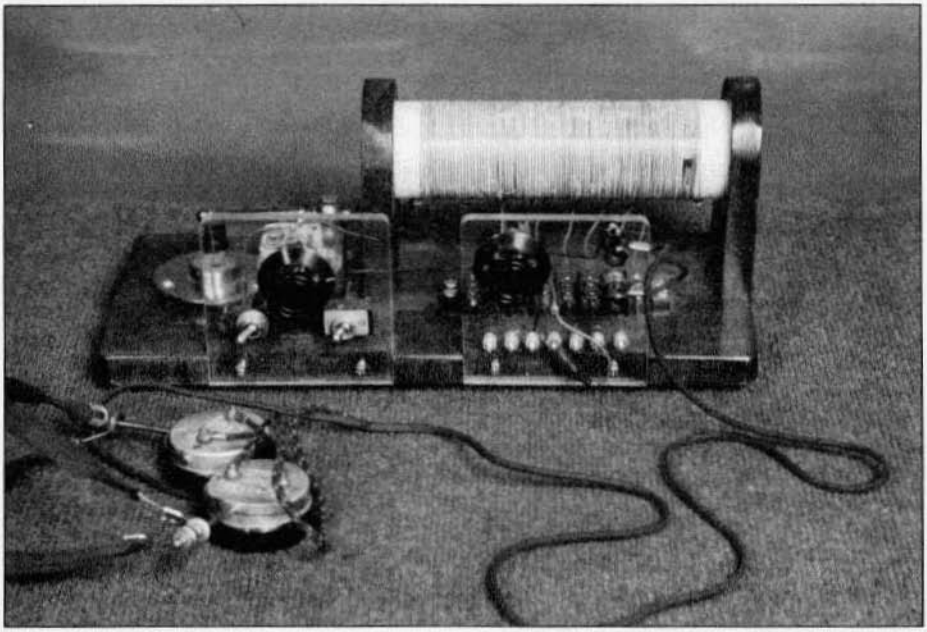
What a wonderful time to be alive! The Penny Farthing 'Wheel' was being replaced by a machine much easier and more comfortable to ride--the bicycle. A few companies, Excelsior, Indian, Harley Davidson, Henderson, and others were building motorized two wheel machines. The horseless carriage, sometimes referred to as the 'automobile,' was attracting attention from manufacturers large and small. Over 2200 companies would eventually build an automobile. Few turned a profit--even fewer survived. Most 'fairs' and celebrations featured balloon ascensions, or a 'flying machine' exhibition. One such event offered the thrill of the century; a race between Barney Oldfield in a 'racer' and a daredevil pilot in a biplane.

In the beginning necessity forced everyone interested in electricity as a hobby to became a builder--commercial equipment was both scarce and expensive. More than a few amateurs became so involved with building that their efforts led them into manufacturing. Names of some of those early experimenters were destined to become household words, as well as respected leaders in the fledging industry.

Long before Edwin Howard Armstrong discovered regeneration, before the 'loudspeaker,' before 'Amos n' Andy,' Lowell Thomas, and 'The Lone Ranger,' radio equipment began to take on a beauty of its own. To the dismay and frustration of many of our fairer sex, the average radio aficionado found beauty analogous to science--therefore the more popular 'short-wave' radios were ones that resembled laboratory equipment

During this formative period of 'wireless,' radio was not a household item. Prior to 1920's the entertainment value of radio lay dormant--a sleeping giant who once awakened grabbed the country in its grip and never let go. Consequently, the only radio equipment found in homes before 1920 was quite likely crude, home constructed receivers and transmitters in use by radio amateurs, and a few hardy experimenters--mostly young in age. But the age of beautifully constructed home built radios and artistically designed, well made commercial equipment was fast approaching.

Some years ago this writer conducted an interview with one of our local citizens. This interview was part of a local



Crystal radio using 1925 type construction. The clear plastic should be replaced with 'bakelite' either real or imitation for a more authentic appearance. Radio was built when I bet my ten year old granddaughter that I could "Get rock music out of a little rock". She thought it was more amazing than her new computer.

history booklet I was doing for our local museum. It gives us a very candid glimpse into that distant past when radio was just emerging.

Robert "Bob" H. Clark (October 1993)

I had the first real radio in Springdale--not necessarily the first radio. Several boys around town were playing with crystal radios, with practically no success. I must have built a dozen. Occasionally you could hear one of the high-power spark transmitters sending code. That is all there was then.

I became interested in electricity when the town branch, as was its custom, flooded the basement of my dad's Hardware. Several dry cell batteries stored there had their cardboard covers ruined, rendering them unsaleable. Dad asked me if I would like to have them. Of course, I was interested. He brought them home. I was curious to see whether they had any "life" left in them. I picked up a pair of pliers and shorted out the positive terminal to ground. Sparks flew all over my shop. I was so excited that I had no other thought in life but to find out everything I could about electricity. Dad was with me all the way.

In 1921, I was 15 years old. We had been taking Radio News magazine for two or three years. We took two magazines: The American Boy and Radio News. I sent off for an A. C. Gilbert Company catalog. The Gilbert Company sold Erector sets, chemistry sets, radio and electrical supplies.

Donovan Youree was my friend and fellow experimenter. We had been building crystal sets with little or no success. Anyway, in the A. C. Gilbert catalog they had a one audion (tube) radio kit for sale. The tube had wires coming out of the top and bottom. I showed the ad to my dad and asked if I could have the audion receiver kit for Christmas.

Dad said, "You sure can, Son. I will see that you get it."

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I built the set and kept fiddling around with it. Donovan had his crystal set. We learned the code and, using Model T coils as spark transmitters, communicated between our house on Thompson, across from the Lutheran Church, and Donovan's home on Allen. I strung my aerial, or antenna, from the top of the old water tower, behind our house on Johnson and Highway 71 to the barn that was just south of our house. The aerial was sixty feet long and consisted of four copper wires strung between six-foot cross arms located on each end. It was a handsome thing, glistening in the sun.

I had a telephone, but Donovan didn't. After we spent a hour or so each night transmitting messages in code, we would meet half way between our homes and compare notes to see how well we had done. Of course, we were operating without a license, and therefore illegally, but the government was rather lax about such things in 1921.

We loved to listen to the Rotary Spark Gap transmitter they had at the University of Arkansas amateur radio station. It would start with a low raspy note of about 60 cycles and gradually increase in frequency up to 600 cycles or so, as the rotary gap picked up speed. It made so much noise that they had to rig up a sound isolation room to house it.

I could pick up the Arlington time signals on the one-tube receiver. I got a lot of publicity on this. Jewelers and others would come to the house and set their watches by the signals.

I had my one-tube audion working good. I was sitting there one night, spinning the dial, when I heard a voice. You can imagine my surprise. Back then, there was nothing on the air but code transmitters. I was glued to that thing for at least a half hour. Finally I heard them say, "This is KDKA, Pittsburgh."

I was so flabbergasted--I had no idea I could reach that far. I ran downstairs and told my parents I was hearing voices on my radio. Dad said, "Let's go upstairs and take a look at that wondrous receiver."

I listened to see that KDKA was still coming through and handed Dad the head phone. He put it to his ear and listened and listened. We stood perfectly still; finally he lowered the little earphone. He looked at me with amazement and said, "Do you know what I just heard? I heard a Miss Birch from Argentina--a soprano--singing opera."

He sat down on a box and was quiet for some time. Then he said, "Son, is there some way we could have that louder so the family and friends could enjoy it?"

I was way ahead of him. "Dad," I said, "for two hundred and fifty-nine dollars I can buy enough stuff to build a regenerative detector and two-step audio amplifier. That price would include one of the new Magnavox horn-type speakers."

I had the price figured to the penny. My prices were from the latest Tucker Duck and Rubber Company catalog. The Duck catalog was the prime reference and dream book for experimenters in the late teens and twenties.

Dad said, "Son, you take that catalog down to the store tomorrow and give it to 'Stant' Thompson. He's our bookkeeper. Tell him to order everything you need and charge it to me."

Dad was anxious for the parts to arrive. When they came, I built the radio on a breadboard with the usual black Bakelite panel. When it was finished, I checked it out to be sure it was working, then called Dad upstairs to my attic workshop. He listened to it and just went crazy. After listening for awhile, he looked at me and said, "Son, that is amazing . . . but can't you make it look a little bit better?"

"Well, I guess so," I answered. He replied, "There is a excellent cabinetmaker downtown. Take it to him tomorrow and tell him to build a solid walnut cabinet for that radio. I want it to look as good as it sounds."

I can't remember the cabinetmaker's name, but he built the prettiest walnut cabinet you can imagine. It was about thirty inches wide and had a hinged door across the top.

Regenerative receiver built to capture the sound and feeling of my start in ham radio. 'Bakelite' panel is actually a plastic panel sold by Antique Radio. Cost for a panel like this is approximately $12.

Every night our living room was full of friends and family. We just could not take care of all the people who wanted to hear radio. They came from Hindsville, Siloam Springs, Rogers, and all around just to hear this new marvel. Finally, Dad had an idea. We took out the upstairs attic window and placed the horn speaker so that it aimed outside and downward Then we borrowed folding chairs from the church and put them in our front yard. We had enough chairs to seat fifty people. Sometimes every chair was filled, with some listeners sitting on the grass.

Amateurs and experimenters began to 'clean up' their home built equipment. 'Breadboard' was the accepted form of building--even among commercial builders. The famous Atwater-Kent company built a series of breadboard broadcast radio receivers. What can you do to make a breadboard look better? As it turns out--quite a lot. Though soft woods remained the favorite foundation for receivers and transmitters, the wood was sanded to glass-like smoothness, stained, and given several coats of varnish. This was the age of 90 degree bends. Most wiring was done with solid, often square, heavy-weight tinned bus--carefully bent at 90 degree angles, and kept perfectly parallel or vertical to the breadboard. Exception--too many wires ruined the beauty of a project so some builders drilled holes through the breadboard and ran such mundane wiring as filament circuits below the 'chassis.'

It was during this time that 'rack and panel' (more recently referred to as rack-panel) construction became popular with hams. Almost overnight it seemed, the cluttered woodwork benches with a maze of exposed electrical wiring gave way to a more organized and pleasing appearance. Sometimes--OK, very often--the clutter remained, but now it was hidden behind nice black panels attached to home built racks.

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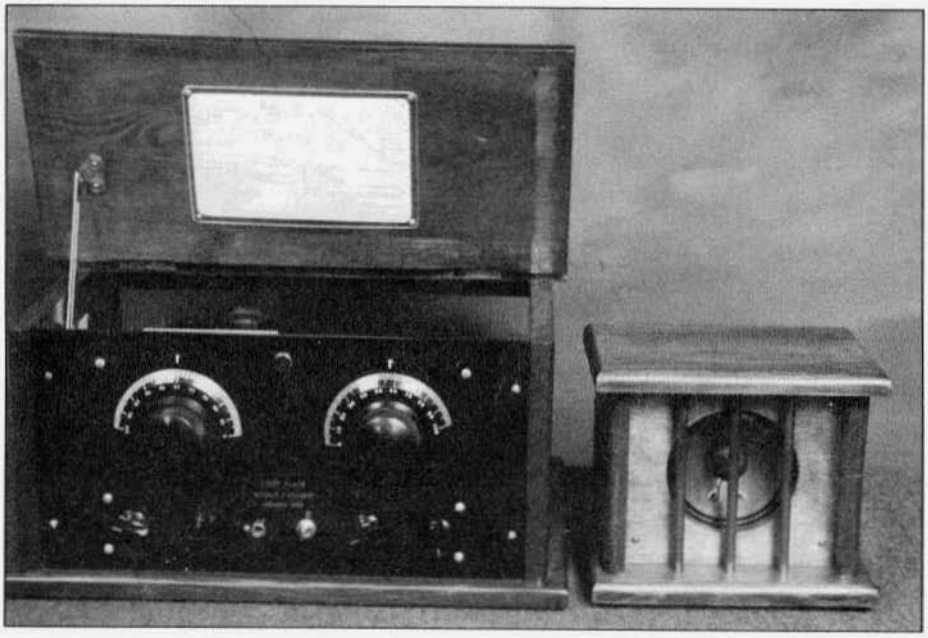


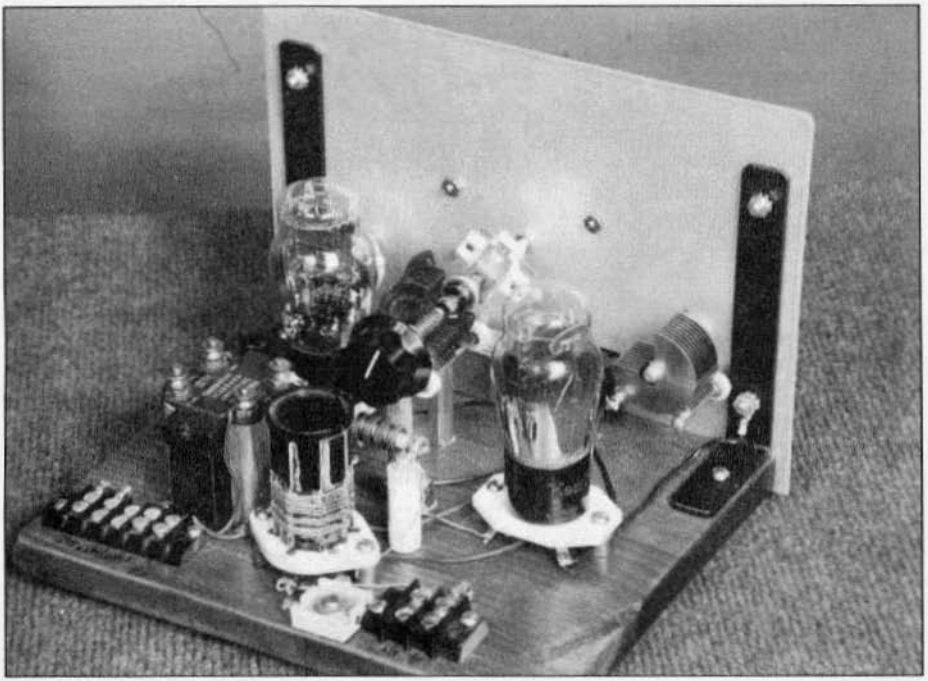
Mid-30's regenerative receiver. Diagram mounted in lid is for benefit of those who fall into ownership of this after I become a 'silent key'.

Hams and engineers suddenly realized how much inherent beauty lay beneath the working components of radio. Copper tubing, used for tank coils in most transmitters of the 30's, was carefully polished with fine steel wool and sometimes sprayed or dipped in clear varnish to prevent tarnishing. Many hams insisted on tubes with ceramic or' Isolantite" bases even though the only band they worked was 160 meter phone. The white bases looked better. I could not afford such luxuries so I painted the bases of my 45's with white paint.

This reminds me of W5GWA a 14 year old friend of mine back in the 30's. Wade decided to put up a new 80 meter Zepp. He cut his six inch spreaders from 1/2 inch wood dowels. As recommended, the wood spacers were then boiled in paraffin for several minutes. Wade went a step further, he painted the paraffined spacers with aluminum paint.

He was so proud of how the antenna looked when it was finally raised. The spreaders sparkled and glittered in the bright summer sum. We went inside to see if it would load up. Boy, would it ever...the problem was we could not work anyone. It took us the rest of the day to discover that the spreaders were creating a very low resistance short across the transmission line.

By 1925 some home radios had become a thing of beauty--other manufacturers never realized the importance of appearance--or perhaps had designers who never fully understood how to combine function and form. Some radio builders kept the 'laboratory equipment' look, but housed their complicated equipment in cabinets made from fine furniture wood. Though radios of this sort appealed to many--especially ham radio operators, their names soon disappeared. Many today never heard of names like Federal, Lincoln, David Grimes, or Kennedy.



Breadboard receiver. Type 30 and 33 tubes. This receiver circuit was featured in "How to Become a Radio Amateur" back in the mid-30's. The most difficult part to find was the double-ended tuning capacitor. Note main tuning knob in front of the coil. The bandspread dial on the front is a National 'Velvet Vernier'.

One company, the Zenith corporation of Chicago, had from its inception developed a solid reputation. Founded by amateur radio operator 9ZN it was only natural that Zenith endeavored to live up to their slogan--"Zenith--The Long Distance Radio."

When we entered the great depression, many companies fell by the way--competition was fierce and buyers were few. Zenith felt the results and realized they needed a design that set them apart--a design that literally screamed 'Zenith Radio' at the buying public. The big black dial with its excellent mechanical bandspread captured the eye of the buying public. Zenith was on its way to becoming one of the most popular radios of the thirties.

A manufacturer of mechanical parts and toys, The National Company, entered the radio field in 1924. In 1932 the company developed the National AGS, a radio designed for aircraft ground station use. While the radio was all any amateur radio operator could desire, its price was not within the reach of the average ham. Very few were sold to the amateur market. It remains today one of the most handsome radios ever built.

National must have realized they were on the right track. Under the very able leadership of James Millen, a mechanical engineer who joined the company in 1928, they developed one of the finest short wave receivers ever built--the National HRO. The HRO could best be described as a no nonsense radio. It was solid as a rock, dependable, neat appearing without 'flash' or even a hint of art decor trim that was just beginning to rear its ugly head. Soon, the big satin silver HRO dial became recognizable to every ham and SWL in the

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world. The radio was an instant hit. Not cheap, but within reach of enough hams to make it a very important part of the National company for the next thirty years. I am lucky enough to own a nice HRO-50 complete with matching speaker and coils. It's not for sale.

The great depression had the world in its grip. Many old companies were closing up shop--their sales had disappeared. In 1931 the Silver-Marshall company went bankrupt and was purchased by a young radio engineer named Bill Halligan. Apparently there was a short learning process as Mr. Halligan felt out the market. In 1934 the name Hallicrafters appeared in their literature. That same year, the name of the company was changed to "The Hallicrafters, Inc."

The Hallicrafters continued to build BC radios for a short time, but by 1935 they switched production to short wave receivers and transmitters exclusively. The first Hallicrafters Skyrider S-1, (1934) was a five tube regenerative receiver. Bill Halligan never moved slowly. When he introduced the SX-9 in 1935 he had, within months, gone through several models of the Skyrider--but in doing so he hit on one of the most popular designs of the century. Basic in concept, offering average engineering with above average eye appeal, the Skyrider's external five inch silver dial captured the eyes and hearts of hams everywhere. Calibration was no more accurate with this dial, and certainly it was not cheaper to produce, but it was unique. I will never forget the first Super Skyrider I saw. It was in the shack of W5FKT--I was 14 years old. I can actually say that my heart skipped a couple of beats. I had never been in a real ham shack before, and Clyde, W5FKT suspected as much.

He flipped on the receiver and after the usual 25 second warmup started tuning across the 160 meter band. There it was--a strong signal calling CQ 160. Clyde turned on his 100 watt transmitter housed in the six foot tall rack to the left of his operating desk. Soon contact was established with a ham almost 35 miles away. After the usual greetings and report, Clyde handed me the mike. I was shaking so badly I could only utter a few words. I don't remember what I said, but I remember the Skyrider. I thought that was the most beautiful thing in the world, and so did many others. Hallicrafters became a top seller in America and continued so for years.

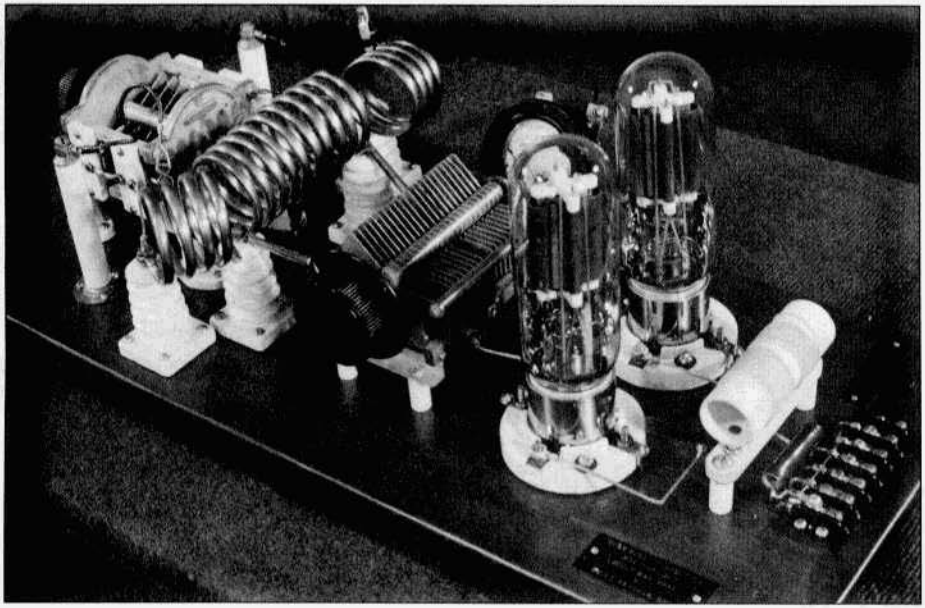
Howard spent a lot of money advertising their line of radios back in the late thirties and early forties. I understand they had a pretty good receiver. Though I have been a ham for sixty years, I have never seen a Howard radio. I can't believe they sold very well. The reason in my opinion was that they placed their money on Art Deco styling--a design that was in decline by the time they first started using it.

Other good receivers that fell short in the design department were Patterson and RCA. Both receivers were as good as some that sold great but artistically they left a lot to be desired. There was something about the RCA design that simply did not photograph well. When you actually sat down in front of one you found the set was much better looking than you expected from pictures in their ads.

Meanwhile, home-builders were having a ball. National, Millen, Johnson, Hammarlund, and other manufacturers were turning out components that were pleasing to look at as well as practical to use.

From 1935 through 1955 most hams preferred to buy a commercial receiver but build their own transmitters. Some home built gear was better built and more eye appealing than that available from manufacturers.

Yes, radio in the pre-war years was an art form. The measure of a company's success was often related to eye appeal.



A breadboard transmitter like this was featured on the cover of QST and was the feature story for November, 1930. I discovered I had all the parts needed to make a replica of that transmitter. It resides on a pair of shelf brackets above my operating desk.

Is radio still an art form? Oh, yes! Take a look at keys and paddles being made today. Some are sure to become sought after collectibles and even museum pieces. Unfortunately, there is a sameness of design in modern day transceivers that is not very exciting, but even here one or two manufacturers show a little imagination.

It is often said, "You can't go back again." I don't believe a word of it. All it takes to re-live the thrills of long ago is a little work and imagination. You might like to start by building a replica of some old time ham gear--for example the little 6L6 breadboard transmitter that is shown in this article. Take a look at the schematic--there is nothing here that should present a problem. Parts are still available--often at shamefully low prices. Everything is marked on the schematic but coil data. I use 15 turns on a 2 inch form for 40 meters. The antenna coupling link should be about 2 to 3 turns. Variable capacitors for both tuning and antenna link are not all that critical--I use 140pf. RF chokes are standard 2.5 mh receiving chokes...they are still available new from Antique Radio.

I prefer running from 250 to 300 volts on the 6L6 plate. The tube will take more--but your crystal may not. It is possible to crack crystals in the pursuit of power.

How do you begin a building project? I start with a cardboard box. To the top of the box I tape a typewritten list of all the parts needed for my project. As I find a part it goes into the box and is scratched off the list. When all but a few parts are on hand start your project. If you do not know what you want your finished project to look like search old magazines, catalogues, and radio books. Let your imagination soar.

When your little transmitter is completed, put it on the air and work some DX with it. I promise the thrill is still

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RBA/RBB/RBC Receiver Restoration

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After reading Jack Strayer's (WB7EOB) article in ER#49 concerning these radios, I was intrigued by his claim that the Navy considered them "no compromise" receivers suitable for on-board or shore station use under adverse combat conditions. Such receivers would have to stand up to the shock-wave of 16-inch guns in the presence of heat and humidity in a room full of high power transmitters and be able to hear the weak ones and do this around the clock. Repairs would have to be easy and fast but reliability would be paramount. According to Stryer, RCA "borrowed" the top engineers from seventeen companies to design these radios! And he called the receivers "A design engineer's dream come true." The radios cost in 1940 as follows:

RBA: Supergain 8-tube TRF tuning 14.5-600 KHz (later versions were modified to tune down to 10 KHz). Mfg by RCA & Federal Telegraph - $3000.

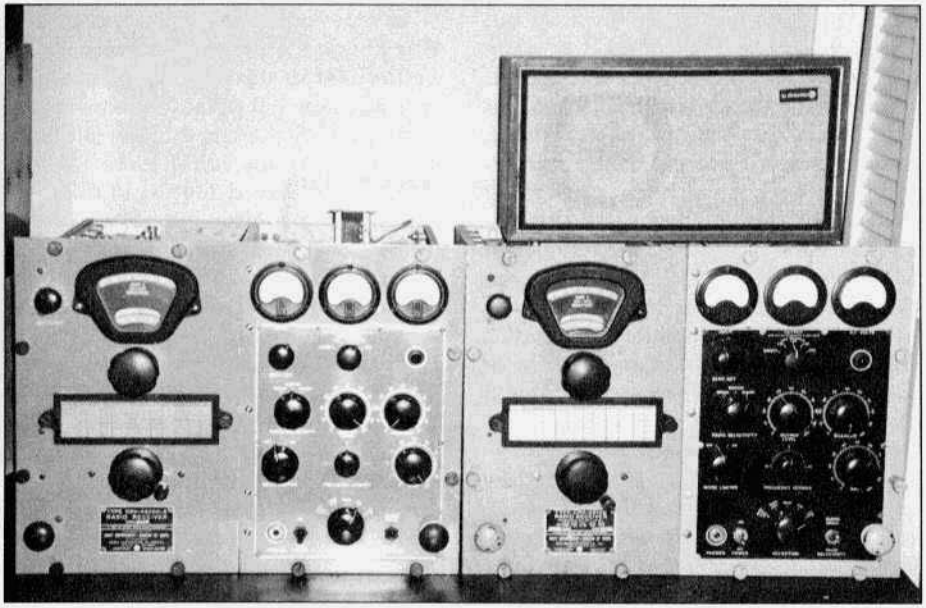
RBB: Single conversion, 19-tube superhet tuning 500 Khz to 4.0 Mhz, Mfg RCA - $2700.

RBC: Single conversion, 19-tube superhet tuning 4.0 Mhz to 27 Mhz, Mfg RCA - $2400.

I'm sure that in the late thirties and early forties when these receivers were designed, our Navy was not sure of itself. After all the Germans and Japanese where armed to the teeth with the latest equipment and were fanatics dedicated to conquest and genocide. The fleet would need the best the country could produce to replace the earlier radios, some of which were unacceptable TRF or other radiatively compromised types. Would the result of this effort by our best engineers be a worthy progenitor of the legendary R-390's or just another forgettable receiver that like the proverbial "hammer" our military paid too much for?

After going to hamfests all over the southeast and not seeing one of these receivers, I came to the conclusion that they are just too heavy to haul around with the hope of a sale. I was lucky to see a posting on one of the news groups for a "restored" pair with power supply and armored interconnecting cable. The radios arrived in good shape delivered by UPS. I have to admit that UPS did a good job here even though I would bet they didn't appreciate jockeying 80-90# boxes. The power supply alone weighs 52#s. So we are talking about true boatanchors. Don't mess with these radios if you can't lift an R-390A. I use a backbrace belt and limber-up before lifting. The nice thing about the RBB/RBCs is that they can be easily separated into two sections, RF and IF/AF. The RF section contains the tuning mechanism and coil boxes etc. and weighs about 45-50# and the IF/AF about 30-35#. Obviously, it's a lot easier to handle these sets in two pieces. Just turn them over, remove bottom cover over IF/AF section and unfasten the cable from its binding posts. Turn RX right side up and loosen IF output screw holding IF coupling to IF/AF section. Also loosen ground connection nearby. Remove 4 screws holding top of chassis together then remove screws from the front panel then the ones circled on the back. Separate the sections—that's it.

"Restored" turned out to be a label on one cabinet that said restored during



RBB on the left, RBC on the right.

the 50's by the Baltimore naval yard. Another set of RBB/RBCs acquired later were restored by the Charleston naval yard also in the 50's. A close inspection reveals that unlike unrestored radios these sport modern looking resistors and the bathtub caps look newer. Unrestored radios that I have show worrisome signs of leakage around the bathtub cap terminals while the restored ones are nice and clean. Unfortunately, I can offer no blanket statement concerning the caps, only that it is wise to check them out carefully and when in doubt to change them out for new ones. The unrestored ones also had open resistors or ones unacceptably higher in value than specified. The first order of business with these radios is to check all of the resistors individually. Replace any more than 10-20% out of spec. Next replace all of the suspicious bathtubs. I obtained suitable replacements from Mouser (CDE polyester film cat. No. 5989). These are 1.0 mFd/400/V. For the 0.125 mFd bathtubs, I used 0.1 mFd 400V orange drops with no apparent problem. In one case (C-378A&B) I parallel two 0.1s and a 0.047, but my opinion is that you have some flexibility here even though exact matches in value would be best. All of this work is in the IF/AF section so before leaving it, use Deoxit on all switches.

Moving over to the RF section, you can eliminate the 6-8 Amperite regulator. It regulates the voltage to the filament of the osc tube and is really not necessary in home installations because the voltage usually will not swing enough to see a difference. You can simply steal filament voltage from the available nearby tube to the output of the 6-8. Remember not to plug a 6-8 in to its socket after doing this without reversing the modification. I can't tell the difference from unmodified sets so if 6-8s become unobtainable it won't be a disaster.

One of the RBBs was dead on one or more bands and I narrowed the problem down to the switch wafers inside the coil boxes. To get to the coil boxes requires that the bandswitch rod be removed and the screws be removed from the top of

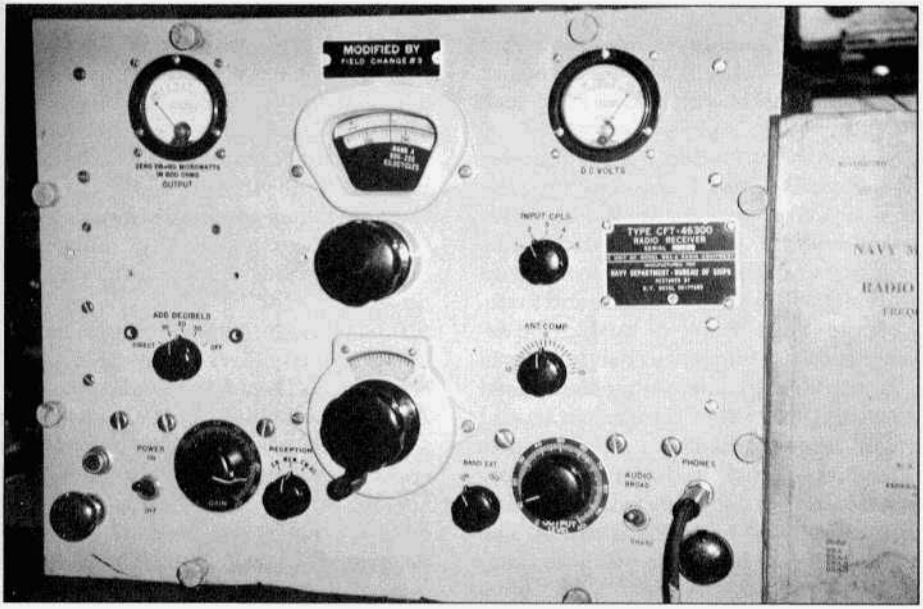
continued next page

each box. This was relatively easy but time consuming. Make sure that when you finally get the boxes out and opened you mark the wafers with a pencil so that you can realign them to band 2, the band recommended for bandswitch rod removal. When you see the workmanship in the coil boxes you begin to realize the quality of the receivers. The bandswitch wafers are super heavy duty and the contacts look to be silver but some as expected were dirty. Some of these radios were obviously stored in undesirable locations and can suffer from dirt but will clean up and work. A good soaking with Deoxit and rotation back and forth realigning with my pencil marks did the trick. The boxes went back together and it was easy to reinsert the rod if the boxes were left somewhat loose so you could jiggle while pushing the rod through. I couldn't find any bad parts in the boxes so nothing in them was replaced. I had no reason to suspect RF component problems in the other receivers I have worked on. There are no bathtubs in this section and I have not found any bad ceramics or micas in either section of the radios. In most of the sets I replaced the archaic coax connector with a modern one. Everything I have done to these radios is reversible but unlike Collins these old salts are not in the fashion plate category even though I consider them beautiful—in short I don't think you will have a problem with resale value!

Well after doing the above you will love how easy it is to work on these radios. They must have been very reliable to begin with and with everything easily reached and checked, a pleasure to work on. Now is the time to check all the tubes on a good tube checker. I use a TV-7D that I have calibrated. Replace any weak or questionable tubes. Put the two sections back together by reversing the disassembly process.

Check out the power supply. Open it up and make sure the fuse is the correct value and the transformer tap is at 120 V as most home wiring is at that level (?). Check the tubes then hook up the cable. Best to start up the radio with a Variac to see if it passes the smoke test. When satisfied everything is OK bring her up to full line voltage. The RX voltmeter should read 200 V and the radio should come alive. Set controls on broad/CW turn gain up and put an antenna on. You should hear plenty but enough for now, time to align the receiver.

I have three manuals; one from 1941 (preliminary instructions IB-38094-1) is complete but no photographs and not as detailed as the one from 1952 (instruction book, Navships 91469). The third is "Maintenance Standards Book" (Navships 900,477.43A). The first two have detailed sections describing the tune up procedures. The later is a logbook for various QC checks such as sensitivity on each band etc. The IFs are at 400 Khz, maybe the navy transmitted on a frequency that interfered with 455? Anyhow, remove the plate supply lead from the oscillator (top connection on side of RX osc box) and feed 400 KHz into grid of 1st detector (pin 4 V104 or V204) then adjust T305 to T302 top & bottom. I would be happy to supply copies of these pertinent sections to other aficionados but the attached charts show the key data to get someone started. Start at the top of each band. Align frequency scale first before peaking to get best results especially if the reading is off by more than a few kHz. I really like it when you find the controls are way off and peaking knocks your socks off. Let me say that after alignment, with my HP-606 turned to the lowest possible setting, I can still distinctly hear the signal. When connected to an antenna (input impedance is 70-1500 ohms), the signals jump out at you and remind me of my HRO-60. On CW, the strong signals thump with no distortion. The receiver has broad/medium/sharp IF settings. A switch mounted on the front panel selects different windings on each IF trans-



The RBA with Field Change #3.

former to apparently change the Q like a fancy Q-multiplier. I don't know of another RX that uses this system—probably because it cost too much? On the sharp IF setting much nearby QRM is eliminated and when the sharp audio filter is also engaged single signal reception is possible. It's like an 800 cps mechanical filter, razor sharp with no loss of volume. The manual indicates that these filters are 200 cps(RBB) and 300 cps(RBC) at 6dB and are peaked to pass 1000 cps. The audio filters are big, housed in sealed cylindrical cases. For audio you need big coils! When you listen to weak signals, you can go to the CW-OL position. This allows the operator to use a special AVC circuit to decrease background noise to help make the weak signal much more readable. I really like the way this receiver works on CW with S9 signals thumping in while being able to discern the weak ones underneath, zero them in then engage the sharp RF filter followed by the sharp audio to hear them clearly in the presence of strong QRM.

On AM you can engage the AVC and broaden out the RF response. This gives the audio a very mellow and pleasing sound. If you move to the SL position the silencer circuit is activated. This is a squelch circuit that allows the operator to monitor an AM channel like 3885 or 7290 without background noise. The input circuit allows several receivers to be on the same antenna at the same time. I have not tried this feature but with the silencer one could conceivably monitor several BA frequencies at the same time with one antenna.

The three meters are interesting, one monitors the RF into the IF section from the RF section but only when the AVC is activated. Another monitors the audio output therefore the operator can quickly see the nature of the signal in relation to the audio level. The last meter is simply the B+ voltage so if power is compromised, the operator can see this immediately.

Of the three RBCs and two RBBs I have acquired, only one original WW II RBC-2 does not have the IF follower output circuit for TTY or panadapter

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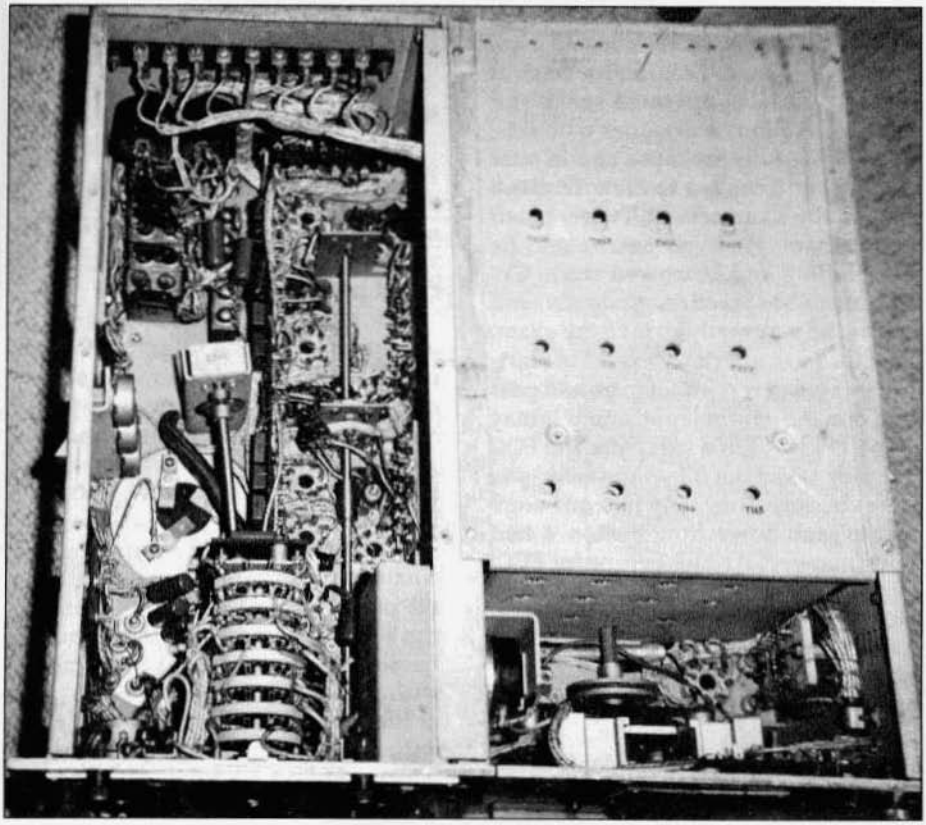
connection. A CV-57 converter or a RBV or RBW panadapter was used with these sets. I would like to obtain one of the panadapters but have never seen one for sale.

Cosmetic restoration may require repainting the panels. I had a real problem in that the knobs were impossible to remove without damage so I decided to work around them. I was able to touch up the paint with a fine brush here and there. I also took the liberty of mixing the escutcheons and frequency chart holders to a more pleasing color arrangement I used Brasso, it has a fine abrasive in it, and really recovers the shine on the panels and knobs. I just used plenty of elbow grease and was able to clean and shine the entire front to my satisfaction. The cases however had suffered more damage from scrapes and dings and I have not tackled their refinishing but anyhow I like the radios sans case as I like to look inside when listening.

Using these sets in a ham station requires some way of silencing the audio if simplex operation is to be considered. Even if separate antennas are used the possibility of annoying feedback must be addressed. Probably the best way to do this is to use a relay on the B+ like the HROs. The RBB/RBC have no standby switch or circuit and have a special gas filled tube (looks like a big neon and is listed as a gas filled JAN991 voltage regulator). Its job is to protect the input from damaging RF. Hence I don't think the Navy transmitted on the same frequency and the receivers were just left on.

Believe it or not, I posted my interest in an RBA on the news groups and BA reflector and obtained one in short order. It cost half the asking price just to ship it but it also arrived in apparently one piece. This was a RBA-6 restored by the Brooklyn navy yard in 1959 with field modification 3. I found out that this consisted of a set of air variable padders to bring the lowest band from 15 to 10KHz so as to receive traffic designed to reach submerged submarines. This is another big heavy armor plated 8-tube TRF RX that uses the same power supply as the others. It covers 15-600KHz and has a very effective antenna-matching network so that nonresonant antennas could be used. It also has the effective audio filters and the CW-OL type circuit. It is a much simpler RX as compared to the others but heavier! It didn't work at all at first, just noise-well that's a start. The problem turned out to be loose collars around the interstage trimmers so that the plates shorted out. These trimmers are not made as well as I would have expected with just a squeezed on metal band to hold the capacitor together. Possibly the RX had some rough treatment that loosened them up but what about combat? I was not impressed! I was able to rebuild all the loose air variables by melting some solder around the shaft forcing back on the ring etc., but this required removing them from the cases, a laborious task. If you work on one of these RXs, don't put any downward pressure on the trimmers when you turn them!

Alignment was now possible, as I couldn't find anything else wrong with the RX. I never worked on a TRF RX so this was a new experience. I have a manual from 1942 (RBA 1-3) that I assume is still acceptable for alignment. The only problem I found is that on the top two bands the coils are slug tuned and accessible along with the trimmers while the lower two bands are sealed (only trimmer adjustments). The manual doesn't mention adjusting these slugs. It indicates that they were factory adjusted, Oh well. I couldn't get the performance I expected on the low ends of the top two bands without touching up these coils. The trimmers are for peaking the top of each band. I'm still not happy with the performance I'm getting and believe it's my fault so will continue to experiment. So far the RBA is a disappointment but what is there to listen to on VLF?



Underchassis view of the RBB. Note the newly-installed orange drops and the rugged construction throughout.

Conclusion

The major problem with the RBB/RBCs is their lack of bandspread on the ham bands. This is not a problem if the goal is to use them for single-channel reception like monitoring the AM hangouts or SW listening. For competitive activities like chasing DX, they are too cumbersome to use but are fun for regular rag chewing. Had more bandspread been included, it would have made them prized receivers. In summation, I believe the Navy got what it paid for, rugged and sensitive but able to receive even in the presence of nearby transmitters because of selectivity not to be seen again in my opinion until the mechanical filters appeared. My opinion is that the RBB/RBCs are as sensitive as the R-390A with features not found on other receivers such as variable selectivity IFs and fantastic audio filters and noise elimination circuitry. Because of the extensive shielding, every potential radiator circuit is shielded in a heavy-duty steel box. They don't give themselves away as radiation is down 95dB at the antenna. The tuning mechanism is way ahead of its time and is a high-class precision device that will put you reliably back on frequency each time. The RBB/RBCs are built like battleships, fun to work on and play with. I'm sure that they did their jobs superbly! I'm still withholding my judgement on the RBA. **ER**

Looking Back from page 2
worked as a handy man for Maxim. Maxim got Twisty interested in ham radio and he passed his license back in the early 20's. He operated spark and then CW. A funny story goes with this. Twisty let his license lapse and in later years, when I moved to New England and Granby, Connecticut, Twisty heard I was a ham. He lived nearby and he came calling and borrowed some CW equipment. He practiced quite a bit and told me he was ready to take the exam. The FCC gave quarterly exams in Hartford so Twisty was all set to go and pass the exam. As it turned out, and this may sound crazy, I got a call from the FCC and they asked me if I would help give exams because they only had one engineer to send down from Boston. I had done this several times before for FCC.

In any case, Twisty showed up and I had to give the CW exam and you guessed it, Twisty was nervous and missed. I don't think he ever quite forgave me for failing him but he passed the next time.

He actually had some of Maxim's old equipment in his barn in Granby which was eventually washed away in a great hurricane flood we had.

I was fortunate in that Roland Bourne, W1ANA, who had been the chief engineer for Maxim was also a close friend. He restored much of the ARRL museum's equipment. His desk abutted against mine for several years and we had lots of conversations about the Old Man. One day he came in and handed me a carefully wrapped package. I opened it and lo and behold, it was a large marble based key that had belonged to Hiram Maxim and that he had used for years at his station 1AW. I remember the key contacts were large and silver and could have been silver dimes. I finally loaned the key to the Antique Wireless Association where it is on exhibit. W1ICP

Silent Keys

Bob Reardon, W8EPQ

On August 6, 1998, Bob Reardon, W8EPQ, became a Silent Key. While Bob died of a cancerous condition, he was active with his mainstay Valiant and HQ-170A close to the time the Lord called him.

Bob recognized his condition with understanding and dignity. I never found him to complain or seek sympathy. That's the kind of guy he was. All his family here in the Cleveland area were with him at the final moments of his life. Also, Bill, K8DBN, was with Bob on that day.

Bob was the most interesting and fascinating person one could ever meet. He possessed an irresistible personality, be it an "Elmer" or father-type. His humor was unique, and that coupled with a vast knowledge of many facets of life, plus his technical expertise and willingness to assist others, was that which should be emulated and carried on.

Thus it is that this news of Bob is passed on to you and all the AM fraternity. Robert will be truly missed, but never forgotten.

Ron Meyer, W8KYD

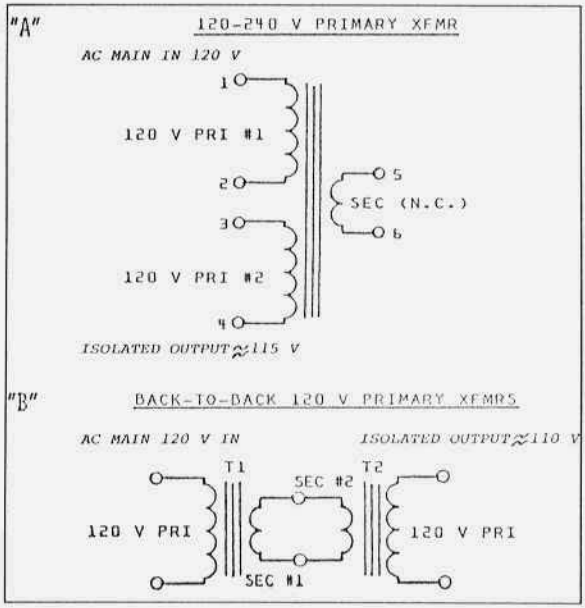
Mel Stoller, K2AOQ

Mel Stoller, K2AOQ, was a well-known military radio collector. He passed away August 31. Graveside services were held September 6th.

Tom Murray, N2GYQ

Two "Poor-Man's" Isolation Transformer Circuits

by Robert G. Wheaton, W5XW
16015 White Fawn Dr.
San Antonio, TX 78255



Have you needed an isolation transformer to safely work on or operate "hot chassis" AC-DC equipment, but balked at the $20 price tag for just a 50 watt unit... sacrificing safety for savings? Recently I did, to include my original S-38A receiver on my operating desk surrounded by 3-wire grounded equipment. Circuit "A" provided me a no-cost solution from the junk box.

I found a 3-pound filament transformer with two 120V primaries, designed for either 120V or 240V connection. Where a transformer has two 120V primaries they are designed to operate with both connected in parallel and in phase for 120V input, or both in series and in phase for 240V input. This insures full saturation of the core so that full power can be delivered by the secondary. However, if some voltage drop at the load can be tolerated and the load is light compared to the transformer's power rating, one primary can be left unconnected to the AC mains and used instead as a "secondary" to provide the required transformer isolation.

The 3-pounder I found provided the 30 watts for the receiver with almost no heating and 119V in supplied 115V out; a four volt drop being quite acceptable.

To see what Circuit "B" would do I connected matched 12.6V/2A transformers weighing 2 pounds each. This provided only a 25 watt power rating (based on the 12.6V/2A secondaries), and with the 30 watt receiver load connected the output voltage was dropping by 20 volts. Larger transformers would reduce the drop; however, voltage drop with two transformers will always be greater. Two 12V/4A transformers so connected would no doubt yield very satisfactory results with a light load of 30 watts or so.

So, if you're going to work with "widow maker" AC-DC radios, and don't yet have an isolation transformer, see what your junk box yields. With luck you'll find both safety and savings! **ER**

The First Radio Amateur's Handbook

by Howard Hartzell Jr., WA3YKD
RR5 Box 129
Mifflinburg, PA 17844

Most of us will never get an opportunity to read the first Radio Amateur's Handbook published back in 1926 but at least through this article we'll get to learn something about it. Ed.

THE RADIO AMATEUR'S HANDBOOK by the ARRL, published in 1926 and authored by Francis Edward Handy. There were 5000 copies of the first edition, first printing. The HANDBOOK is soft bound and has 176 pages of text, a three page index followed by 35 pages of ads.

Note: All material in quotes is taken directly from the HANDBOOK.

"This Handbook is written as a guide for member operators of the League. It is also useful as a source of information to the man who wants to take part in amateur radio activity but who has no idea of how to get started."

The above is from the author's foreword and also stresses that it is "written first of all for the beginner" and also it is "equally valuable as a compendium of information for the experienced brass-pounder and the beginner alike."

These quotes taken from the foreword pretty well set the tone of the Handbook. Remember this is 1926 and much equipment, perhaps most, was home brew.

The table of contents is quite plain and straight forward.

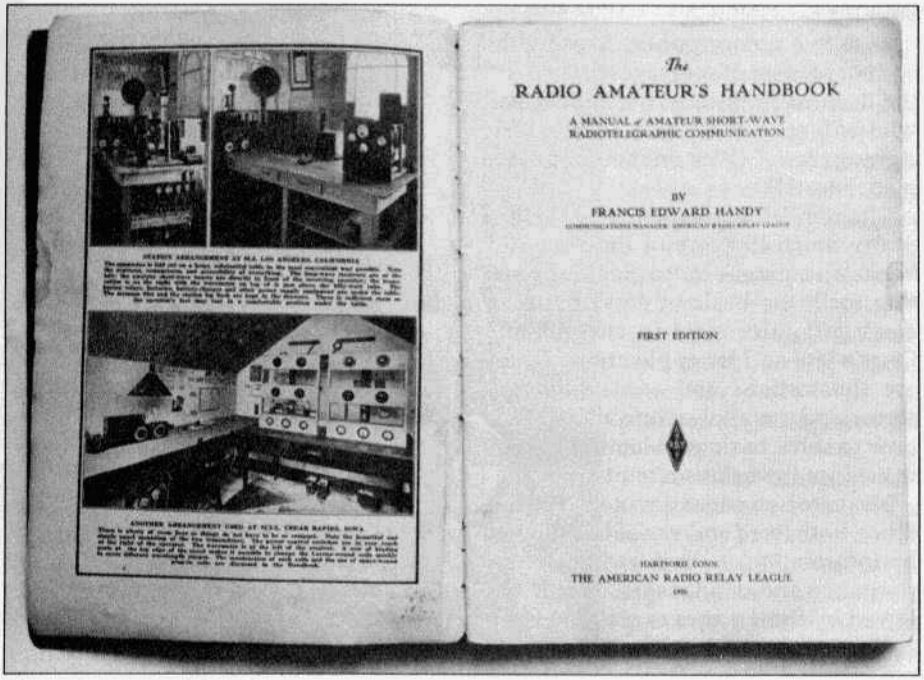
Chapter 1: "What is an amateur?" There are five pages devoted to this. A warning that "a certain amount of skill is required." A bit of elaboration on this and then the "adventures" found in amateur radio. "Distant acquaintances" DX as it were. "Friendly chats", the rag chew. Relaying of "citizen radio messages." The pride in being a good operator and using the most recent developments in the hobby; QRP is mentioned as being very satisfying. All in all, the "philosophy" of amateur radio, at least into the recent years, has remained much the same. Mr. Handy suggests in his introduction, that amateur radio might be referred to "as the eighth wonder of the world."

Next in chapter one is a brief history and description of the ARRL.

In closing chapter one, he writes of the traditions of the League. "The Old Man" H. P. Maxim himself but not identified as such. The WOUFF-HONG and the RETTYSNITCH are pictured. Also here we read of the "Boiled Owls" and the Rag Chewers Club. All who have "twisted the dials" and "pounded the key all night" automatically become "boiled owls" with sunrise. Also mentioned here is the WAC club for those who have succeeded in working all continents, no easy feat in those days.

Chapter 2. "Getting Started." This chapter begins by explaining how to learn the code. A diagram of a practice buzzer and how to use it follows. One is advised to get a "well-balanced smooth action key." Paragraphs on how to grasp the key and how to use it are followed by an illustration of the continental code letters and numerals.

Next is information on "learning by listening" with instructions and a schematic and pictorial of a simple long-wave breadboard receiver using one 1500 turn honeycomb coil (5000 to 15000



The title page of the first ARRL Amateur Radio Handbook.

meters) plus information on other coils that can be used for other wavelengths. Remember that this is 1926 and we are told of the "powerful transatlantic commercial stations" we can listen to for practice.

The above is the "simplest and cheapest long wave outfit", a single circuit affair with inherent advantages and disadvantages. For a more permanent set there is described a three circuit regenerative set that can be used for "all wave lengths." Still using honeycomb coils but with three used in this set: a primary, secondary and tickler circuit. This set, with the appropriate coils, should tune from 140 meters to 21,000 meters, according to the table that follows the description of the set.

Next is a section on "Reading Diagrams." Lacking here are the symbols that represent components, but it is suggested that a person should compare schematic and pictorial diagrams and study these to determine which symbol represents which component. Even suggested is taking a correspondence school course.

Then follows numerous pages with information on what you can hear on the long waves; how to understand time signals and weather reports, ship to shore communications and then how to obtain your government license.

Amateur wavelengths are listed next. 1.5 to 2.0 Mc, 3.5 to 4.0 Mc, 7.0 to 8.0 Mc, 14.0 to 16.0 Mc, 56.0 to 64.0 Mc and 400.0 to 401.0 Mc. The Handbook lists the first four bands as best for long distance in communications.

Then are listed the nine "Inspection Districts" and how to apply to the nearest "Supervisor of Radio."

"When you receive the application blanks, fill them out completely, answer all the questions and return the papers to the radio supervisor. If you pass the examination you will receive

continued next page

your license UNSIGNED. Then take the license to a notary public. Execute the oath of secrecy of messages and return the licenses (plural) to the Supervisor, who will send them back to you after signing them." (Was this sort of a "take home" test???)

Chapter 3: "Fundamentals." This is pretty much like any of the "how to" books on amateur radio. Begins by setting forth the basic understanding of electricity, the electric current and Ohm's law and its applications. There are illustrations and explanations of series and parallel connections. Then how to solve basic problems as to total resistance in various circuits.

Next are two pages devoted to inductance, both fixed and variable, followed by information, with drawings, of capacitance and condensers. This is followed by three pages explaining alternating current and power.

Chapter 4: "How Radio Signals Are Sent and Received." This chapter begins with an illustration of wave motion and explains velocity and frequency. Then an explanation and illustration of damped waves (as with spark) and CW oscillations. A little diagram of a spark transmitter circuit is included here.

Information on antennas and coupling is next. There are seven small diagrams of what is termed "complex coupling."

Following this are three pages of information on vacuum tubes. How to use a vacuum tube to detect, how to use it to amplify and how a vacuum tube "oscillates" and information on regeneration.

In the advertising section in the back of the Handbook there are few ads for tubes. An ad for "Genuine Kenotron Rectifying Tubes Model UV-216." There are "genuine RCA and list at $7.50 each - extra special $1.85 each." Radio transmitting tubes by DeForest. Type P, 250 watt output priced at $110.00 each. "Thermionite Rectifiers" for the Type P at $90.00 each. Type D DeForest input 30 watts at $9.00 each. Type H, maximum input 150 watts at $18.00 each. These are the only ads for tubes in the section. Probably a few issues further along in time would have more tube ads.

Following the vacuum tube explanations there is a page and a half of modulation methods. "The system of modulation most widely used in radiotelephone practice today is known as the Heising method." There follows an explanation of how to use this method plus three small illustrations showing circuit and block diagrams.

Chapter 5: "Building a Station." This chapter is 64 pages in length and begins with a description of the needed tools and materials and instructions on wiring and soldering. A warning against using acid fluxes or pastes is given.

Now the "meat" of the chapter and probably the part most amateurs and would be amateurs read most.

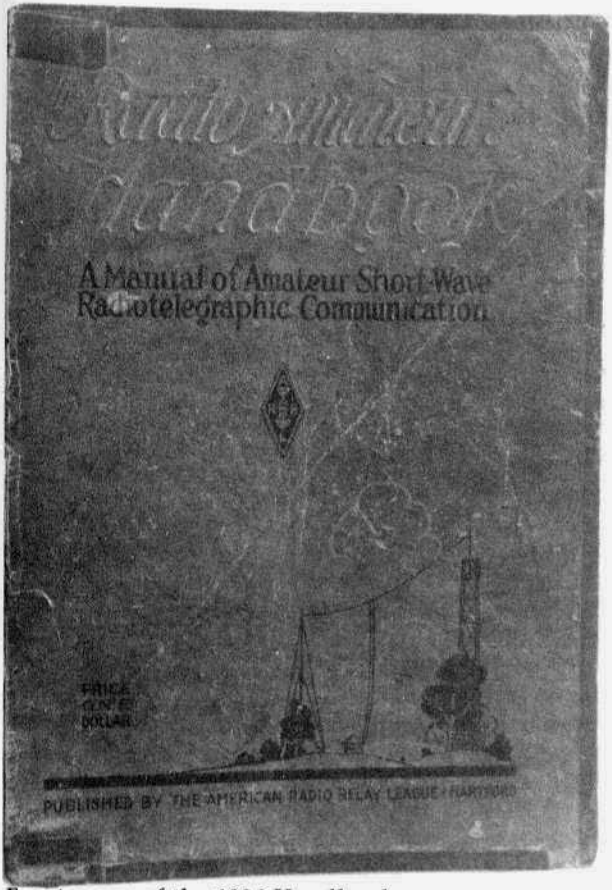
"Designing a receiver" as the first apparatus built for the station. A plug-in coil receiver with a detector and two step amplifier is shown. Manufactured coils are illustrated and also described are home made coils. Both "Lorenz" and "space wound" coils. The builder is cautioned to "not patronize the local cut price or 'gyp' store." "Bootleg parts are cheap" but are likely to prove defective.

First is shown a one-tube regenerative receiver, then how to add one audio stage and finally the three-tube set.

Instructions on how to operate the receiver and some troubleshooting hints are next.

Following this are five pages devoted to the construction and use of a wave meter. "The basic radio measuring instrument."

Now comes the transmitter and power supply. "A typical circuit", a magnetically coupled Hartley is illustrated and described.



Front cover of the 1926 Handbook

There is a listing of available tubes with the characteristics of each. The transmitter described is breadboarded although the handbook states that panel mounting is an option. A list of materials for constructing the transmitter is given along with very detailed instructions on how to make the coils. Other structurally more complicated transmitters are also illustrated and described.

Instructions on making plug-in RF chokes and obtaining good keying are next, then a section on making electrolytic rectifiers. How to use dilute baking sodas with transformer oil on top to reduce evaporation is described. Other solutions, more expensive, are also listed. Throughout the Handbook, one of the major themes is to be cost effective. How to get the most for the amount expended.

Also listed as possibilities are tube rectifiers and gaseous conduction or "S" tubes, B-battery eliminators for low powered sets using receiving tubes, Mercury arc rectifiers with "keep alive" systems, meter generators, synchronous vibrating rectifiers and synchronous rotary rectifiers. Many pages are devoted to the problem of getting rectified current.

The final ten pages of Chapter five are devoted to the theory and construction of antennas. First the receiving antenna and then the transmitting antennas. The construction and adjustment of the antennas are described and illustrated. A list of "antenna pointers" is used to close this chapter. Most of these "pointers" are good common sense and most are applicable today. "High wires in the open are best" "Good insulators are preferred", to cite a few.

Chapter 6: "The A.R.R.L. Communications Department." This chapter describes the organization and function of this department. The Section Communications Manager and his duties and responsibilities. Official Observers and the "Official Relay Station" and how to become an ORS.

Chapter 7: "Operating A Station" As the title implies this chapter sets forth procedures for being a good operator. There are three pages on message traffic, stating when such traffic may be handled and the proper formats to use. There are more pages devoted to "originating traffic", "numbering messages" and how to count and deliver these messages.

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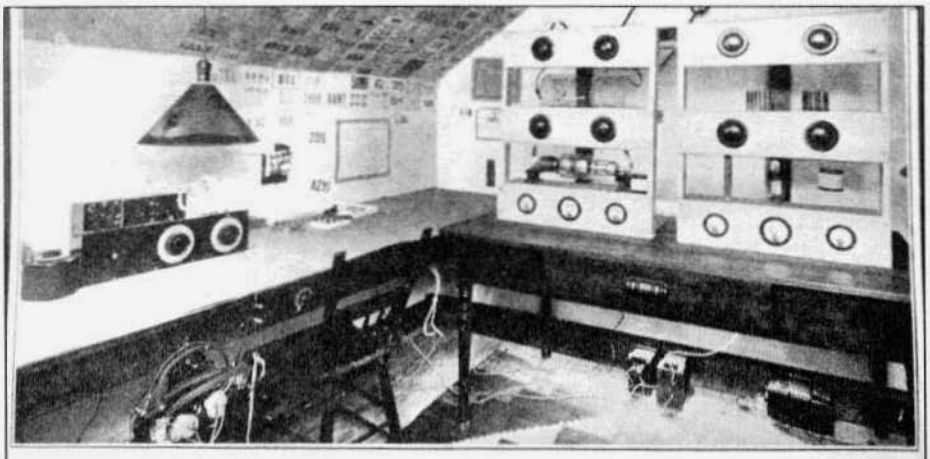

ANOTHER ARRANGEMENT USED AT 9CXX, CEDAR RAPIDS, IOWA

There is plenty of room here so things do not have to be so compact. Note the beautiful and simple panel mounting of the two transmitters. The power control switches are in easy reach at the right of the operator. The wavemeter is at the left of the receiver. A row of binding posts at the top edge of the panel makes it possible to change the Lorenz-wound coils quickly to cover different wavelength ranges. The construction of such coils and the use of space-wound plug-in coils are discussed in the Handbook.

A photo and description of one of Art Collins' first amateur stations.

"Operating Rules and Regulations" for Official Relay Stations follows along with examples of the use of these rules.

Next in this chapter are the basic rules to follow when calling either "CQ" or to a specific station. How to use the break-in system and finishes the chapter with "operating hints": dos and don'ts to be a successful operator.

Chapter 8: "The Experimenter" Here is a brief introduction to the "X Section" which was evidently a section of QST devoted to experiments in things connected with amateur radio.

Following Chapter 8 is the Appendix. Tables and graphs with explanations and usage make up most of this section. A formula for determining wavelength is first. Then is an inductance chart and calculations with accompanying formula. How to wind small transformers along with a table giving input in watts, efficiency at full load, size and number of turns in the primary, turns per volt and an illustrated cross section through the core showing proper arrangement of core and windings. A full page wire table giving gauge, diameter and other specifics about wire is included here.

Also in this section is information on how to use Ford spark coils in the power supply for low powered transmitters. The appendix is ended with a copy of the Continental Code with the phonic equivalent. In 1926 a "dit darr" instead of the "dit dah" with which we are familiar.

Interesting here are the "International Intermediates" used to identify the nationality of sending stations. "A" for Australia, "B" for Belgium, "BE" for Bermuda, "BZ" for Brazil and so on in 1926.

Also included in the Appendix is information on keeping a log; how to drill glass and how to make a relay to use for break in operation. The relay was made from a telegraph sounder.

"Another interesting development until recently beyond the means of most beginners is the use of quartz crystals for controlling the frequency of the transmitter." This explains how the crystal works and how to make and mount a crystal.

Included here is a diagram of a crystal controlled circuit for 80 meters and information on using harmonics of the crystal to "excite the grids of power amplifier tubes." It is suggested that using a crystal will improve a poorly filtered power supply. A diagram of an AC crystal controlled transmitter is shown.

A subscription form and a form to request becoming an ORS is placed between the appendix and the index.

Following the Index is the advertising section. Some of these are familiar and a few are still in business. Allen D. Cardwell Mfg. Co.; Burgess Battery Co.; Western Electrical Instrument Corp.; National Company; DeForest Radio Co.; Everready Batteries; The Vibroplex Co.; EF Johnson Co.; Centralab; National Radio Institute, J.E. Smith, President. ER

Viking Ranger from page 18

simple method of power reduction for the Ranger that does not even require opening the case. One simply inserts a voltage dropping power resistor between the HV supply and the bottom of the modulation transformer secondary. This drops the HV roughly in half and produces the desired 12 to 15 watts output. The modulator functions normally, modulating both the resistor and the final, which are effectively in series. This much higher load impedance for the modulator is of no consequence in view of the very limited amount of audio power needed.

The simplified schematic diagram accompanying this article shows only the portion of the 9-pin plug and socket connections that concern the power reduction method. Note that a jumper connects the power supply HV on pin 6 to the bottom of the modulation transformer secondary on pin 2. All that is necessary is to replace the jumper with a power resistor of about 3000 ohms, rated at 30 to 40 watts. The resistance value is not critical and can be chosen to suit a particular power output range. Series and/or parallel resistor combinations from the junk box can often provide the necessary resistance and wattage. If it is preferred to give the modulator a more nearly normal load, a bypass capacitor of 4 to 20 MFd rated for at least 600 volts DC may be connected from pin 2 to ground, excluding the resistor from the modulator load. The plate current drawn by the 6146 at resonance will be significantly lower than usual, and will depend on the choice of loading control settings. Since the screen voltage of the 6146 is derived from a dropping resistor from the plate voltage, it will suitably self-adjust with respect to the plate voltage.

If rapid switching between normal and reduced power is desired, it is only necessary to provide a shorting switch for the dropping resistor. **However, it is important to note that the circuit is at 500 volts DC above ground, and is therefore a significant safety hazard.** At W4LQE I use a ceramic rotary switch mounted behind a metal panel, with well insulated wiring.

This power reduction method has been used for 15 years now at W4LQE, with no complications. I hope you find it useful. ER

Radio as an Art Form from page 27

there. The satisfaction and pride that comes from building and operating a replica transmitter is every bit as great today as it was for hams of long ago.

Collectors and builders today can still enjoy the very best of the golden age of ham radio-- unfortunately this is a phase of our hobby that in time will encounter difficulties. Parts and tubes will gradually disappear, and as they become more and more scarce, builders will have to become more resourceful. I have no doubt that they will do so. ER

Collins KWS-1 Aeronautical Mobile from page 5

The first station I heard was Bill, W2EUH, in Trenton, so I broke in, and there was W3ZP. Allen didn't believe that I was airborne, so I said go outside and hold on to your hat. With some guidance from Allen, 15 minutes later I was over his farm. He still wasn't convinced it was me, so he walked his 2200' pasture/runway, pronounced it fit to land on, and said come on down. I did and Allen came charging over when I shut down. He couldn't believe it when he looked in the cabin door, but agreed that it really was a KWS-1 in the Bonanza.

Back in the house he got on 3999 and told everyone I really was aero-mobile. We had a few more QSOs, took the necessary walk out to the barn to kick the tires on his Bellanca and I departed for Monmouth County. The weather had deteriorated so I got a controlled VFR clearance through Mercer county airspace, and filed IFR via V157 to Monmouth County. Thank goodness I hadn't disconnected any of the Bonanza's radios, but I was too busy to get on 75 SSB.

Total flying time was 1 hour and 50 minutes. I used 21 gallons of 91/93 octane from the left main tank. While the Bonanza carried 68 gallons, I found I couldn't operate the fuel selector valve with the ARC-5 strapped to it, and only had 3 gallons usable remaining. If I had busted up, I'll bet the accident investigators would have had fun figuring out what all the strange parts were. I removed everything from the plane Sunday night. In the interest of self preservation I decided to stick to my 2 meter Gonset Communicator for aero-mobile and give up the haywire.

W3ZP retired, sold his Bellanca and the farm and moved to Florida the following year. He got K4AA as a call. Allen and I continued our SSB QSOs and disagreed as usual about everything from airplanes to antennas. However we remained good friends and would get together once or twice a year.

I never logged any calls I worked A/M on Feb 17, 1963 and wasn't smart enough to ask Allen before he died. I hope there is some reader who can thumb through his log and help me out. My call at the Jersey shore and in the plane was K2DHE. While I was A/M Allen kept interchanging 5378E, my aircraft call with my amateur callsign. It was his idea of a rib, since at the time he thought I was pulling his leg about being A/M and was really sitting home. I think that was the only time I outfoxed him, however I never mentioned the fuel selector valve or my fuel status to Allen. **ER**

T-195 HF Transmitter from page 9

misalignment with no resulting angular misalignment. For example, if a driven switch shaft is mislocated with its driving shaft (radial offset), no angular error occurs through the full 360 degrees rotation. The Oldham coupler can be easily disassembled and reassembled with no loss of angular alignment, thus it was used extensively in Collins mechanical designs of the time.

After design check and quality test the design was released to production.

Roger Bettin stayed with the program well into production. He reports: "Stromberg-Carlson later redesigned the case of the T-195 which became a casting for cost reduction reasons." As a guess, I'd bet a ton that Stromberg didn't have to pass all the shock/drop tests on their cast case that Collins did with our ribbed multilayer "crush zone" sheet metal case design. Arlo and Roger both participated in the shock and package tests. If you saw the "package test" you'd wonder how anything could withstand that. Dale Carlson also followed the design into production. **ER**

Part 3 next month, Ed.

CLASSIFIEDS

Advertising Information

Subscribers receive 1 free - 20 word- ad per month. **Extra words are .20.** Here's how to count the words in your ad: the heading - For Sale, Wanted, etc count as **1 word**. Your name, call, address and telephone number count as **6 words**. Hyphenated words count as **2 words**. **Please count the words in your ad and if you're over 20 words send payment for the extra words.**

Non-subscribers: $3 minimum for each ad (up to 20 words). Each additional word is .25. **Please call or write for display rates.**

VINTAGE EQUIPMENT ONLY

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e-mail: er@frontier.net

DEADLINE for the NOVEMBER Issue: NOVEMBER 1

FOR SALE: Repair and restoration on all vintage equipment; 45 years experience. Barney Wooters,W5KSO, 8303 E. Mansfield Ave., Denver, CO 80237. (303) 770-5314

FOR SALE: "AM FOREVER" quality Haynes T-shirts, grey, blue, green & red. Sizes M, L, XL - $15 shpd. Rick, K8MLV/Ø, 1802 W. 17th St., Pueblo, CO 81003. (719) 543-2459

FOR SALE: R-390A Orig. Maint. Manual,TM11-5820-358-35,189 pgs - $28 incl. Dom Priority Mail. Aben, POB 4118, Jersey City, NJ 07304. avidov@aol.com

FOR SALE: Radio books, magazines, catalogs, manuals (copies), radios, hifi, parts. Send 2 stamp LSASE. David Crowell, KA1EDP, 40 Briarwood Rd., North Scituate, RI02857-2805. aq253@cnfn.org

FOR SALE: KWM-2 fan bracket - $12 ppd. Dave Ishmael, WA6VVL,2222Sycamore Ave.,Tustin CA 92780. (714) 573-0901.

FOR SALE: R390A - $325; R392 W/PS - $180; BC1004 W/PS - $175; 51J3, refurbed by W3HM (beautiful is the word) - $450; RME45 w/spkr - $160, all working; Radiotron Designers 4th Edition, like new - $80. + shpg on all. Dave Metz, (540) 885-7914 eves till 10PM EST

FOR SALE: Heath HX-10 Marauder, very good, exceptionally clean, matching mic - $200. U-ship. Bill, K4AJ, VA, (540) 989 2081, dotdachs@roava.net

FOR SALE: Collins S-Line aluminum knob inlays: small (exciter/PA tuning) - $1; 30L-1 - $2; spinner/plain (main tuning) - $3. Charlie, K3ICH, 13192 Pinnacle Lane, Leesburg, VA 20176. (540) 822-5643

FOR SALE: Hallicrafters, RME, Gonset, others. Also some military, test equipment,VHF/RF amps, more. LASE, Don Jeffrey, POB 1164, Monrovia, CA 91017.

FOR SALE: Tubes, Penta Labs, 811A- $20.; 572B- $55.; 3-500Z- $170.; ZG also avail.(these are Amer. made); NOS 811A- $35.. Many other US NOS. VISA/MC. Dee, W4PNT, VA (540) 249-3161, soundnmind@rica.net

FOR SALE: Panalyzor Model SB-8b Type T-200 (.5 to 35mc); Heathkit Sixer; Eico 730. Marvin, VA, (804) 275-1252, wa4toj@juno.com

FOR SALE: Rare Hallicrafters SR-34 2/6 meter scvr, w/manual, new tubes & antenna - $300; Collins designed GRC-19, shock mount, T-195, R392, pwr cable, interface cable, mic, manuals - $700. Randy, AZ, (602) 266-2256, rbest@primenet.com

FOR SALE: 40 German Nazi tubes; Crosley Radio Service Manuals, advertizing; Riders 1 to 15, index; other Riders; 25 lbs Ham books - $25; ART13 antenna switch. Bill Coolahan, 1450 Miami Dr. NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

WANTED: QST, CQ, Radio Craft & Radio News magazines, 30s, 40s, 50s. Advise price + shpg. Beni Fernandez, KP4DN, 1674 Atlas St., Summit Hills, PR 00920.

WANTED: Collins - Amateur catalogs, sales literature, manuals, promotional items & Signals. Richard Coyne, POB 2000-200, Mission Viejo, CA 92690.

WANTED: Howard radios of any type. Andy Howard, WA4KCY, 105 Sweet Bay Ln, Carrollton, GA 30116. wa4kcy@usa.net

WANTED: E. F. Johnson Co. HAMALOGs, unusual photos and information 1923-70. Bruce Hering, 41120 State Highway 13, Waseca, MN 56093, (507) 835-5619. bhering@efjohnson.com

WANTED: Homebrew xmtrs and rcvrs or parts, working or not. George, N1TNQ, (401) 724-5516

WANTED: Top dollar paid for Winchester Radios and Winchester related items. Donald Daggett, 122 Hall Rd., Grahamsville, NY 12740. (914) 985-7249, wc2e@webtv.com

WANTED: German W.W.2. military radio/avionics gear. Clandestine sets all periods. Cash or swap. Rag Otterstad OZ8RO. Hosterkobvej 10. DK 3460 Birkerod, Denmark, otterstad@inet.uni2.dk

WANTED: Owners of the John Leary, W9WHM, re-engineered Hammarlund SP-600 rcvr, seeking info and serial number of rcvr. Bill Mills, KC4AA, (912) 452-2957, wmills@gmc.cc.ga.us.

WANTED: Galaxy V accessories (F-3, DAC-35, SC-1, RV-1, etc); cabinet for 600L. Tom Hoitenga, K8NGV, GA, (770) 426-8682, hoitenga@bellsouth.net

WANTED: HRO-5 coils J (50-100 kc) and H (100-200 kc), wood coil box, misc HRO-5 stuff. Don, (616) 541-9874, fsmv34a@prodigy.com

WANTED: 1960 Popular Electronics Experimenters Handbook. Louis L. D'Antuono, 8802 Ridge Blvd., Brooklyn, NY 11209. (718) 748-9612 after 6 PM

WANTED: 1963 WRL catalog. Will trade old Allied, Lafayette, WRL, BA, Walter Ashe catalogs. NI4Q, POB 690098, Orlando, Fl. 32869-0098. (407) 351-5536, ni4q@juno.com

WANTED: Hallicrafters SX-28 main tuning dial clutch for my restored SX-28. James Geer, WB5LXZ, 1013 Overhill, Bedford, TX 76022-7206. (817) 540-4331

WANTED: IF xfmr 45-5 kc for HQ-170 Hammarlund rcvr or will buy unusable rig for parts. Burt, KC8FBR, MI, (517) 736-8020.

WANTED: Drake 2-BQ spkr & 2-AC calibrator; any Harvey-Wells spkr, VFO, ps or accessory. Kelley, W8GFG, IN, (219) 365-4730.

WANTED: WW II German, Japanese, Italian, French equipment, tubes, manuals and parts. Bob Graham, 2105 NW 30th, Oklahoma City, OK 73112. (405) 525-3376

WANTED: Collins 310A-1 &/or 310A-3, any condx; 30J, 30K (any); 302C-1, 312A-1. **FOR SALE:** SC-101 lamp hoods & grills. Butch, KØBS, MN, (507) 282-2141

WANTED: HeathGear, unassembled kits, catalogs and manuals. Bill Robbins, 5339 Chickadee Dr., Kalamazoo, MI 49009. (616) 375-7978, billrobb@net-link.net

WANTED: Books by Thomas Adams published by Howard W. Sams in the Basic Electronic Series, circa 1961. Dan Langston, KO4RA, (912) 453-9066, danman@accucomm.net

WANTED: Historical info on development of 12AT7, 12AU7 and 12AX7. Which of these was first, when, production info, etc. Tech info not needed. Kurt Miska, 3488 Wagner Woods Ct., Ann Arbor, MI 48103. (248) 641-0044 (w), Fax 641-1718, khm@tir.com

WANTED: Variometers. Steve Gross, W9OJI, 602 W. First St., Mt. Morris, IL 61054. (815) 734-4255

WANTED: Supreme AF100 or Temco 75GA post WWII desktop xmitters. Robert Perlstein, W1IV, POB 642, Old Orchard Beach ME 04064. (207) 934-9206 , perls@compuserve.com

WANTED: Call-letter automobile lincense plates for collection, will repay you for postage. Thanks, Marvin, 2957 Gaffney Rd., Richmond, VA 23237. (804) 275-1252, wa4tqt@juno.com

WANTED: Collins Amplifier 204H-1, complete and working condx. Could anyone teach me how to operate ARR-15? I do not have control head. shigaki@mxw.meshnet.or.jp

WANTED: MacElroy or Dow Key bug. John, KØYQX, (507) 345-7169, mobeng@mnic.net

WANTED: Case for KWM-2. Haruyama, JA1OZZ, t_haruyama@atg.mitsumi.co.jp.

WANTED: Collins KWM 1, RE 75S3B/C, KWM380/HF380. Any condx considered. Schaaf, (740) 965 5331.

WANTED: Manual for Racal rcvr RA6793; information of any kind on GRC106/A, such as historical, industrial or development. shigaki@mxw.meshnet.or.jp

WANTED: TBX-2 part's set and accessories for restoration. Joseph W. Pinner KC5IJD, 201 Ruthwood Dr., Lafaytte, LA 70503. kc5ijd@sprintmail.com

WANTED: Hallicrafters small remote spkr for later series radios. Jim Riff, K7SC, 9411 E. Happy Valley Rd., Scottsdale, AZ 85255. (602) 473-1098, k7sc@cybertrails.com

FOR SALE: Genuine new surplus: Unused R-390A cabinets #CY-979A/URR w/shock supports and misc hardware package - $305; top and bottom cover sets - $75. Mac McCullough, TX, (214) 324-4849, Fax - 324-4844

FOR SALE: Hallicrafter's manuals, copies starting at $5, some Johnson, WRL, others. SASE for list. DSM Diversified, 909 Walnut St., Erie, PA 16502.

FOR SALE: Vintage radio owners, retire the variac, new solid state SofStart available SASE. Rick Paradise, KE4OCO, 515 Wood Forest Ct. NE, Marietta, GA 30066-3519.

FOR SALE: EHJ Parts: tie bolts for Ranger and Valiant, Ranger set - $8, Valiant set - $9.50; connectors ($6 ea), 9 pin plug, 2 pin mic connector; Invader 2000 w/pwr sply, exc condx, may need painting on cabinet - $600, u-ship; Collins 312-B4, exc condx - $250 + shpg. Cal, N6KYR, 1964 11th St., Los Osos, CA 93402. (805) 528-6805, 7-9 PST, cal.j.eustaquio@lmco.com

FOR SALE: Collins mechanical filters, F250A67, NIB - $20; Heath DX20, parts unit - $20. Dave Roscoe, W1DWZ, 49 Cedar, East Bridgewater, MA 02333. (508) 378-3619

FOR SALE: Aluminum cane metal (has many holes for ventilation) sheets, 17-1/8" x 20" x 1/8", great for covers for tube amplifiers, etc - $12.50/each; Two each, MT-1643/U tripods for Gibson Girl generators - $40./each; Johnson 50 pF @13KV air variable, new condx, great for a high power 6-meter amplifier - $50. Get the K7FF Super-List of ham stuff by e-mail at <k7ff@inreach.com>. Derek, K7FF.

FOR SALE: Transistor Radio Encyclopedia / price guide, 170 pages, ill. large format, Lane/Lane, normally $19.95, special $9.95. Ellsworth Johnson, 364 S. CoeurDalene St., Spokane, WA 99204. (509) 838-2161, eojohnsonww2@worldnet.att.net

FOR SALE: Drake complete catalog for 1977 & Drake complete calatog for 1968. Dusty Rhodes, W8MOW, 1324 N Dorst Rd., Troy, OH 45373. (937) 339-1546

FOR SALE: Collins KWM-1 & 516F, orig manuals; National SW5, sply & coils. W2AO, NY, (914) 691-2957.

FOR SALE: Drake TR-7, PS7, RV7, MN7, 2MS7, exc condx - $650; Eico 730 modulator, good condx - $75. KB5GT, MS, (601) 746-2256 after 2300Z.

FOR SALE: TCS-15 xmtr; Hammarlund 4-20; SBE-33; SB-102 w/access; canned 4CX250B's. Bob, KFØAM, SD, (605) 923-5309, kfaam@juno.com

TRADE: Techtronix 7L12 Spectrum analyzer (.1-1.8GHz) plug in for Heathkit SB620 w/5.174 MHz (Swan 350) in. Vernon Fitzpatrick, WA8OIK, 520 Royce Rd., Hancock, MI 49930-2226. (906) 482-2128

FOR SALE: WACO-5NWX telephone filters. Just plug in. 1/$13.95, 2/$25, 3/$34. Money back. Cecil Palmer, 4500 Timbercrest Ln., Waco, TX 76705. (817) 799-5931, w5nwx@juno.com

FOR SALE: Join SPAM, the society for the promotion of AM. Lifetime certificate $1, SASE. W4CJL, 202 Baker Dr., Florence, AL 35630.

FOR SALE: British WW2 Telegraph key, No.2 MKIII - $25 + shpg. George Rancourt, K1ANX, MA, (413) 527-4304.

FOR SALE: Collins 30L1 owners new Cetron 811A's - $19; 32V owners Raytheon 4D32 - $19; major credit cards accepted. Don, W4GJT, FL, (352) 475-3306.

FOR SALE: Presto BD-C recording lathe, nice condx, heavy, 33 & 78's; Presot 92-A recording ampfifier. Fred Clinger, OH, (419) 468-6117 after 6 PM.

TRADE: TMC GPR-90 rcvr for T-368 xmtr delivered to Phoenix, AZ, must be complete. W7RBF, AZ, (602) 864-9987.

FOR SALE: Heath BE-4 battery eliminator, 6V @ 10 amps or 12V @ 5 amps, very good - $25. Mervyn Ellsworth, 2309 N. 25th St., Boise, ID 83702. (208) 345-6878

FOR SALE: Cleaning part of shack. SASE or email for equip & parts list. Earl, K6GPB, 5319 Sierra Vista Rd., Murphys, CA 95247. earlw@goldrush.com

FOR SALE/TRADE: Early HRO low-freq coils - 180, -430 & 480 to 960 kHz. Dave, W3WKP, VA (703) 768-0257, dreese@mindspring.com

FOR SALE: Dentron GLA-1000 10-80M amp, very nice, manual, 8 new xtra tubes - $295; MLA-2500, 160-10M, needs tubes (8875) - $275. + shpg. Mike, WA6NGF, CA, (209) 568-0345 mornings, Mon-Fri.

FOR SALE: Collins 75S-3, very nice, works well, looks great, orig manual, CW filter - $500 + shpg. Mike, WA6NGF, CA, (209) 568-0345 mornings Mon-Fri.

FOR SALE: Collins: 30S-1 - $1250; 32S-1 - $300; 75S-3 - $300; Heath: SB-102, spk, ps - $250; SB-300 - $150; SB-400 - $150; Henry 3K-A - $1500; Swan Astro-150, spk, ps - $400; 500C, spk, ps, VOX - $250. All above excellent to mint. Johnson Ranger II, elect. exc., a few scratches & chips - $275; home brew 500 watt unfinished AM amplifier, a ton of parts - $350. Sid, CA, (949) 498-4988.

FOR SALE: Gates BC-1T broadcast xmtr & Gatesway 80 console. Howard Edson, KK6OB, 1505 North M St., Tulare, CA 93274. (209) 688-8506

FOR SALE: Collins 32V-2 xmtr - $200; Meissner Signal Shifter model EX w/xtal - $100; HP 608D 10 to 420 MHz VHF sig generator - $50. Sev Dvorsky, 380 Morrison Dr., Pittsburgh, PA 15216. (412) 344-6633

ELECTRON TUBES FREE Catalog, over 2,000 types in stock. **Electron Tube Enterprises,** Box 8311, Essex, VT 05451. (802) 879-1844, FAX (802) 879-7764

FOR SALE: T-Shirts w/Johnson Viking logo - $15, state size. Viking Radio Amateur Radio Society, POB 3, Waseca, MN 56093.

FOR SALE: Used technical books - radio, electronics, math, military, magazines, etc. List: $1 (stamps OK). Softwave,2 Dept ER, 1515 Sashabaw, Ortonville, MI 48462

FOR SALE: Strong steatite antenna insulators. Lengths from two to fifteen inches. SASE for list. John Etter, W2ER, 16 Fairline Dr., East Quogue, NY 11942. (516) 653-5350

FOR SALE: Dial/clock covers. Send bezel, old or drawing, make/model, guaranteed satisfaction - $10 ppd. William P. Turner, WA0ABI, 1117 Pike St., St. Charles, MO 63301. (314) 949-2210

FOR SALE: Free info on many topics related to vintage amateur radio equipment & operations at http://www.mnsinc.com/bry/hamlynx.htm Everyone welcome. Brian Carling, G3XLQ/AF4K

FOR SALE: New Ranger I, Valiant I & Navigator plaster dials, 160-10 freq no's in green, w/all holes like orig - $17.50 ppd. Bruce Kryder, 4003 Laurawood Ln., Franklin, TN 37067. (615) 794-9692

FOR SALE: Collins meatball lapel pin - $5.95 + $.75 S&H. George Pugsley, W6ZZ, 1362 Via Rancho Prky, Escondido, CA 92029

FOR SALE: Heath TX-1 Apache xmtr, good condx - $200. Robert Braza, N1PRS, 23 Harvard St., Pawtucket, RI 02860. (401) 723-1603

FOR SALE: Variac, Powerstat, 7.5 amp, 1 KVA, type 116U, exc condx - $50. Frank S. Law, W8SET, 1 Wildacre Rd, Charleston, WV 25314. (304) 343-0415

FOR SALE: Heath MR-1 Commanchee, (2) MT-1 Cheyenne's, HP-20 pwr sply, all manuals - $400. Gary, WA9IYF, 169 N. Ridge Rd, Versailles, IN 47042.

FOR SALE: Hallicrafters SX-100 - $185; National NC-98 - $115; UTC VM-2 - $85; Kenyon 250 watt modulation xfmr - $195. More, free list. Richard Prester, 131 Ridge Rd., W Milford, NJ 07480. (973) 728-2454

FOR SALE: Hallicrafters SX-117/HT-44/ps, manuals, cables, beautiful condx - $460. L. Franklin Duvall, Jr., K9PYO, 7206 W. 117th Ave., Crown Point, IN 46307. (219) 662-9799

FOR SALE: Magazines, manuals, surplus books, some surplus xfmrs, & other parts. Call your needs. Vic Edmondson, W4MYF, RT 1 Box 2599, Lee, FL, 32059. (904) 971-5580

FOR SALE: Collins 516F-2 bias mod, parts/instr - $12, ppd/US. Cory, N2AQS, 1000 E 14th/178, Plano, TX 75074-6249. hinec@cgate.dl.nec.com

FOR SALE: Sell/Buy/Wanted/Trade: Vintage equip at the "K8CX Ham Gallery." http://paradox2010.com/ham/ a free service.

FOR SALE: Repair, upgrade, performance modification of tube communications & test equip. Accepting most military, all Collins & Drake designs, & the better efforts from others. Laboratory performance documentation on request. Work guaranteed. Chuck Felton, KD0ZS, Felton Electronic Design, Box 187, Wheatland, WY 82201. (307) 322-5858, feltoned@coffey.com

FOR SALE: HRO50C (rack cabinet, coils A-D, & spkr), very rare - $800; BC348Q w/nicely done ACTS - $175; Wells-Gardner RBL-5 - $200; National RCK (FAA NC100) - $300; Russian VEF-202 (Transoceanic copy) - $125; 32S-1 - $225, CP-1 - $150. All exc cosmetically & working. Call for honest description. John, MD, (301) 829-3734, wbepoz@mcione.com

Trade: HQ-180X for orig Hammarlund SP-600 cabinet. Les Locklear, 1122 36th St., Gulfport, MS 39501-7116. (228) 864-8384

FOR SALE: 7 & 9-pin tubes, my choice, untested - 10/$1; Xmtg tube sale, list free. L. Gardner, 458 Two Mile Crk Rd., Tonawanda, NY 14150.

FOR SALE: Dr. Radio repairs vintage ham gear. Steve Trimble, K5DJH, Box 73, Weston, TX 75097-0073. (888) 73-K5DJH. k5djh@texoma.net

FOR SALE: Knight T-60 xmtr - $60; Hammarlund HQ-110 w/clock - $100; Swan Cygnet 270B xcvr - $140; Gonset G-76 xcvr w/ps & orig manual - $140; RME 4350 rcvr - $140; Harvey-Wells TBS 50D xmtr - $75; Harvey-Wells TBS 50C xmtr - $70; B&W model 600 grid dip - $40; B&W ant tuner VS300A - $60; Heath IG-5280 RF OSC, sig gen - $35; Heath IB-5281 RLC bridge - $35; Linear Systems 500-12M ps - $50; Bell & Howell 6 ch audio mixer - $25; Drake T4XB xmtr w/ps - $150; pair 4CX250B's w/SK636B sockets - $40; MFJ model 16010 QRP ant tuner - $20; Hammarlund SP-400X rcvr - $140. Ray, K6VX, CA, (530) 398-4377.

FOR SALE: Heath SB-400 xmtr, VGC - $150; Heath HW-17, 2 meter xcvr - $50; Heath HW-100 parts unit - $60. All + shppg. **WANTED:** Tempo I xcvr in exc condx, reasonable. Doug Sanders, W3FYA, 8923 Reisterstown Rd., Baltimore, MD 21208. (410) 484-1103

FOR SALE: HRO-60 with A-D coils, matching spkr cabinet, orig manual, good working/cosmetic cndx - $400; 75A2 - $300. Carter, (804) 979-7383.

FOR SALE: Repair! Radio repair, tube or solid state, reasonable rates. Jim Rupe, AB7DR, Western Amateur Radio Repair Co., (WARRC), 998 Whipple, Grayland, WA 98547-0697. (360) 267-4011

FREE SAMPLE: Transistor Network Magazine for collectors of regular & novelty transistor radios, & related items. Articles & ads. Subscribers get a free 50-word ad monthly. Subscription: $17 (US); $28 (Canadian); $36 (Foreign). POB 43, Live Oak, FL 32064-0043. Visit our Web Site at: http:www.suwanneevalley.net/~rmorison/

FOR SALE: Military and commercial communications items: www.maxpages.com/murphyjunk. For up to date lists: murphy@cts.com. Mike Murphy's Surplus, 401 N. Johnson Ave., El Cajon, CA 92020. (619) 444-7717

FOR SALE: Multi-Elmac PMR-6 rcvr - $60; A-54 xmtr - $50; M-1070 ps - $40; TBS-50 Bandmaster - $75; TCS rcvr - $125. Gary, MN, (612) 496-3794.

FOR SALE: Heath Lunch Boxes, HW29 & HW30 - $75 ea; CV89A - $75 + shpg; Collins KWT-6 - $750. Steve Berg, FL, (407) 699-9433.

FOR SALE: Measurements 1118 xtal calibrator - $25; connectors, meters, relays, xfmrs, manuals, books, list - $1. Joe Orgnero, VE6RST, Box 32 Site 7 SS 1, Calgary, AB T2M 4N3, Canada (403) 239-0489

FOR SALE: US Army Flameproof key, J-5-A Brach mfg - $45 + shpg. Ron, WA2EIO, NY, (516) 546-9884. wa2eio@ibm.net

FOR SALE: Collins 51J series drum overlay - $10 ea, specify which. Ron Hankins, KK4PK, 555 Seminole Woods Blvd., Geneva, FL 32732. (407) 349-9150

FOR SALE: Collins repair: FCC Licensed Technician, we repair the Collins Gray Line i.e. S-Line, KWM-2/2A etc. & other select models. Merle, W1GZS, FL, (352) 568-1676

FOR SALE: R-390A Repro nameplates - $9 shpd. N5OFF, 111 Destiny, Lafayette, LA 70506. trinit69@idt.net, (318) 989-3430

FOR SALE: Collins 32S-1, 516F-2, 75S-1, CW, rejection - $750; GPR-90 - $400. Ron, K1BW, MA, (413) 538-7861.

FOR SALE: Large stock air xmtg capacitors, meters. SASE for lists. Bill Riley, W7EXB, 863 W. 38th Ave., Eugene, OR 97405-2375

FOR SALE: (2) Gonset Communicator II, (2) meter xcvrs - $70 + shpg for the pair. Robert Martin, 111 Bancroft, Rochester, NY 14616. (716) 663-4182

FOR SALE: HT-45 - $300, prefer PU; Ranger - $190; Valiant, needs work - $150. Tom, KD4EMG, TN, (615) 791-1355.

FOR SALE: Parting out SX43 (knobs are gone); Heath Q-mult QF-1 - $18 + sphg. Henry Mohr, W3NCX, 1005 W. Wyoming St., Allentown, PA 18103.

FOR SALE: R390As no meters, not tested - $100 ea. Pete, PA, (610) 847-2214 eves, Fx 847-8671.

TONY'S LIST AT LAST!!

Tony Snider has finally compiled his complete list of vintage/military gear.

The list can be accessed at the webpage below. Just click on the button that says "online classified". It has "Marine", "Communications" and "Test Equipment" sections. It will be updated every 2 weeks with new items and people can sign up for a e-mail update right on the page.

http://www.meob.com

WANTED: Hallicrafters Village/Hamlet radios TR-5/TR-20 & Gonset Civil Defense 6m radios/accessories, manuals also. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. Fx/msg (310) 398-7159 or danielc411@aol.com

WANTED: Japanese WW2 Chi 4 radio plugin coils. Yes, Chi 4 not Chi Ichi. Stan, JA1DNQ fwgf8431@mb.infoweb.or.jp

WANTED: Command sets ART-13's; Collins radios & all accessories top $ paid; most radios repaired reasonable. FCC licensed. WIDEJ, MA, (781) 485-1414 eves, hobfact@tiac.net

WANTED: EV638, 641, 605; Shure 520/707/CR41, CR88, 705; Turner VT-73; Astatic UT-48, JT-30/40, T-3. Tom Ellis, Box 140093, Dallas, TX 75214. (214) 328-3225 or tomsmics@flexcomp.com

WANTED: Sherwood 5 kHz filter SD-5K/8 for 5645 kHz IF Drake SPR4. Wies (Germany) phone +49.5923.2646, Fx +49.5923.5761

WANTED: Stock ticker; WWI ± spark rcvr; Baird Televisor; telephone w/Blake xmtr; reproduction of Bell's first telephones. James, SC, (864) 639-2939. jac34358@aol.com

WANTED: Diagram/info on Fisher Reseach Labs "Shipmate/Mate" marine AM Tx&Rx from 1950s; also looking for 5, 6 & 12V Mercury wetted relays. K5AJZ, 3009 E 90 Pl, Tulsa, OK 74137. dlestourgeon@ci.tulsa.ok.us

WANTED: Kleinschmidt teleprinter models: 311, 321, (AN/FGC-40, AN/GGC-16, AN/UGC-39...) Tom Kleinschmidt, 506 N. Maple St., Prospect Hts., IL 60070-1321. (847) 255-8128

WANTED: Old tube amps & xfmr's by Western Electric, UTC, Acro, Peerless, Thordarson; Jensen, JBL, EV, Altec, WE spkr's. Mike Somers, 2432 W. Frago, Chicago, IL 60645. (312) 338-0153

WANTED: Military survival communications equip: radios, beacons, manuals, books, historical info/photos. Daniel Cahn, 3444 Greenwood Ave., Los Angeles, CA 90066. (310) 398-7159. danielc411@aol.com

WANTED: Any military entertainment radio (Morale rcvr), manuals, accessories, or data plates. Henry Engstrom, KD6KWH, POB 5846, Santa Rosa, CA 95402. ph/fx (707) 544-5179

WANTED: Visitors and tubes by museum. Old and odd amateur or commercial tubes, foreign and domestic purchased, traded or donations welcome. All correspondence answered. K6DIA, Ye Olde Transmitting Tube Museum, POB 97, Crescent City, CA 95531. (707) 464-6470

WANTED: WW II Japanese, German, Italian radios & communication equip for display in intelligence museum. LTC William L. Howard, 219 Harborview Ln., Largo, FL 33770. (813) 585-7756, wlhoward@gte.net

WANTED: Copy of MIL-T-27A spec, RCA, Gates, Langevin B'cast gear. R. Robinson, 868 S. Main St., Plantsville, CT 06479. (860) 276-8763, richmix@erols.com

WANTED: RCA 140, 141, AVR5A. GE K80, K80X, K85. Any condx. James Treherne, 11909 Chapel Rd., Clifton, VA 20124. treherne@erols.com

WANTED: Broadcast gear; tube or solid-state, compressors, limiters, equalizers, microphones, consoles, micpreamps, recorders. Mike States, Box 81485, Fairbanks, AK 99708. (907) 456-3419 ph/fax or mstates@polarnet.com

WANTED: National HRO 500 & LF10, Hammarlund SP600-JX21A; Johnson AN/FRT-505. Ric, C6ANI, POB N4106, Nassau NP, Bahamas.

WANTED: Drake 1A spkr (1AS) & Kenwood R599 spkr (S599). Pay reasonable price. San, K5YY, AR, (501) 756-5010, weekends only.

WANTED: E.H. Scott Philharmonic rcvr. EA4JL, Contact in the States, Kurt Keller, CT, (203) 431-6850.

WANTED: WW-2 Japanese military radio of any kind. Takashi Doi, 1-21-4 Minamidai, Seyaku, Yokohama, 246 Japan. Fax 011-8145-301-8069 or taka-doi@kk.iijtu.or.jp

WANTED: Hammarlund HQ100 rcvr, need not be working, reasonable. Noonan, SC, (843) 726 5762.

WANTED: Anything related to Tecraft & Ameco, cheap stuff only; Tecraft pwr sply & manuals. Bud Fritz, N3SFE, 104 2nd St., Montgomery, PA 17752.

WANTED: Collins R389, 30K-, 310-, 399C-1, KW-1, HF80 i.e. HF8014, 851S-1, Hallicrafters SX-115. Richard, WAØAKG, NE, (402) 464-8682.

WANTED: Test equipment & tube audio amplifiers. Mike Nowlen, WB4UKB, 2212 Burgee Ct., Reston, VA 20191. mike@3dnet.com

WANTED: McKay Dymek radio literature & info. Gene Peroni, KA6NNR, POB 58003, Philadelphia, PA 19102. (215) 665-6182.

WANTED: Collector/builder seeks lge & small vacuum tubes & vacuum tube collections, sockets, etc. Will pay good prices. Please call Marc, OR, (800) 330-2004.

WANTED: Keys - keys - keys - keys - keys - keys - keys - keys - keys - Jim, KØYLW, KS, (785) 364-3989.

WANTED: Cash for Collins: SM-1, 2, 3; 55G-1; 62S-1; 399C-1, 51S-1; 75S-3A, C 32S-3A; any Collins equip. Leo, KJ6HI, CA, ph/fx (310) 670-6969, radioleo@earthlink.net

WANTED: 2 main tuning knobs & a selectivity knob for SX100 rcvr. WØYEQ, ND, (701) 845-0601.

WANTED: Heath RX-1 Mohawk rcvr & HX-10 Marauder xmtr, dead or alive. Grayson, KJ7UM, AZ, (520) 749-1770. grayson@trainingdept.com

WANTED: TM listing communication equipment, (similar to TM-487H for test equipment). David Boardman, 10 Lemaistre, Sainte-Foy, Quebec G2G 1B4. Canada. (418) 877-1316.

WANTED: MusicMaster 21" Bell Horn, have neck & driver, will purchase or trade for items of interest. Sev Dvorsky, 380 Morrison Dr., Pittsburgh, PA 15216. (412) 344-6633.

WANTED: Electric Radio; Antique Radio Classifieds; Old Timers Bulletin. Alan Mark, POB 372, Pembroke, MA 02359.

WANTED: Military electronics, RDF, radar, communications, test, manuals, literature, etc. What have you got? William Van Lennep, POB 211, Pepperell, MA 01463. (508) 433-6031.

WANTED: Watkins-Johnson or Communications Electronics Inc. info, catalogs, manuals or equipment. Terry O'Laughlin, WB9GVB, P.O. Box 3461, Madison, WI, 53704-0461, 608-244-3135.

WANTED: Hallicrafters HT-1, HT-9, HT-31, 5-T, SX-11, SX-17, SX-25; Howard rcvrs; Harvey xmtrs. Ken Seymour, KA7OSM, 9115 SW 176th Ave., Beaverton, OR 97007. (503) 306-7439 24 hrs. ken.seymour@attws.com

WANTED: Manuals, manuals, manuals for radio-related equipment to buy or swap. Catalog available. Pete Markavage, WA2CWA, 27 Walling St., Sayreville, NJ 08872. (908) 238-8964.

WANTED: Navy xmtrs: MQ, TCA, TCE, TCN, TCX, TDE; rcvrs: RAW, RAX, RBD, RBJ. Steve Finelli, 37 Stonecroft Dr., Easton, PA 18045. (610) 252-8211. navrad@enter.net

WANTED: Squires-Sanders SS-1R, SS-1T, SS-1V, SS-1S, see my web page tulsa.oklahoma.net/~wd5jfr. Hank, WD5JFR, OK, (800) 364-4265.

WANTED: Information-WW2 TCS Radio System: Design, Manufacturing & Operation for article. Any help appreciated. Thanks. Greg Greenwood, WB6FZH, POB 1325, Weaverville, CA 96093. (707) 523-9122 (message) greg6fzh@aol.com

WANTED: Tektronix memorabilia & promotional literature or catalogs from 1946-1980. James True, N5ARW, POB 820, Hot Springs, AR 71902. (501) 318-1844, Fx 623-8783, james.true@ibm.net

WANTED: TMC GPT-750, TAC Tuner, GPR-90/92 & GSB-1. Alan Gray, W3BV, PA, (215) 795-0943.

WANTED: Atlas Model DD-6 Digital Dial & info on VOX accessory for a 210X. Gerry, K4LVZ, FL, (407) 679-4244.

WANTED: Collins 310B3; spare 70E8A linear glass scale; Bud JEL coils any band & Chicago 500W CMS-3. Jerry, W8EGD, CO, (303) 979-2323.

WANTED: Mount FT-151 for BC-375 or BC-191 xmtr; 23280 remote control unit for ATD xmtr; aircraft loop antenna for Bendix MN-26Y radio compass; tech info for PE-204A vibrator pwr sply for telephone repeater EE-99A; instruction manual for Ballentine 302C meter, copies OK. Ray Chase, 1350 Marlborough Ave., Plainfield, NJ 07060. (908) 757-9741, enrpar@erols.com

WANTED: Limpanders or other equip by ESECO. Richard P. Robinson, POB 1425, Wallingford, CT 06492. (203) 949-0871, richmix@erols.com

WANTED: Drake 1A spkr (1AS). **FOR SALE:** Exc Hallicrafters HA8 splatter guard/manual, rare - $90; Heath manuals - $3. K5YY, AR, (501) 756-5010.

FOR SALE: Copies: Hard to find schematics for radios, also kit radios 1922-1950; manuals: test equip. ham gear. Contact me for prices, availability. Duane Ballew, KB7QZK, 6813 152nd St. Ct., NW, Gig Harbor, WA 98332. (206) 851-4505

FOR SALE: Portable Spectrum Analyser, BK Precision 2625, (HAMAG), like new, 10 hours use, w/manuals & orig box - $1500; Hallicrafters SX-42, good condx - $250. P. Jay Spivack, N7JDT, 325 S. Washington Ave., #244, Kent, WA 98032. pipilot@aol.com

FOR SALE/TRADE: Knight Ocean Hopper 740 w/manual. **WANTED:** Tube amps. Dynaco Heath W4AM, W5M, W6A, W7M. Bill, KB8IJC, WV, (304) 842-4635.

FOR SALE: Hallicrafters SX71 rcvr w/spkr, very good condx - $150; Hallicrafters SX43 rcvr - $175; Johnson AM mobile xmtr, pair 807 finals. Cliff, W3LVC, MD, (410) 796-1070.

FOR SALE: Vibroplex Deluxe Bug (1954) - $125; Tentec model 243 VFO - $85; Drake WH-7 wattmeter - $75. Larry Wright, N4QY, 170 Heritage Ln, Salisbury, NC 28147. (704) 633-3881

FOR SALE: We make plug-in coil forms, SASE for literature. ARL-USA, 5355 S 275 W, Cutler, IN 46920.

FREE: Encyclopedia of Amateur Radio Equipment. Hundreds of photos & descriptions spanning over 80 yrs. http://www.aade.com/hampedia/hampedia.htm

FOR SALE/TRADE: Transmitting/Rcvg tubes, new & used - 55¢. LSASE for list. I collect old & unique tubes of any type. **WANTED:** Taylor & Heintz-Kaufman types & large tubes from the old Eimac line; 152T thru 2000T for display. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR TRADE: (2) good RCA 833A's for one Taylor 833A. Also looking for Taylor 803, 813, 875A. John H. Walker Jr., 16112 W. 125th St., Olathe, KS 66062. (913) 782-6455, johnh.walker@alliedsignal.com

FOR SALE: Communications, military & test equip. Send long SASE for revised list w/lots of new items. No sales until you have received my list. Ray Chase, 1350 Marlborough Ave, Plainfield, NJ 07060 (908) 757-9741.

FOR SALE: Uniden (Tempo) 2020, exc condx w/mic & manuals - $450; Tempo One exc condx w/mic (silver front) - $150, PS - $60; Heath 100 w/SB104 front panel, CW filter - $150, PS - $60; Heath HW 12 works - $100; HT37 - $200; Swan 350 w/ps - $210; Systron Donner 6152A counter - $200; B&W 410 distortion meter - $140; Spectrum analizer TS1379A 1.3 Mc to 30Mc - $400; Tektronix RM31A oscope, good w/two plug-in units -$250; (2) used 572 - $50. All + shpg. Jim Rupe, POB 697, Grayland, WA 98547. (360) 267-4011, w7ddl@yahoo.com

FOR SALE/TRADE: Numerous vintage manuals including many Johnson, National, WRL/Globe, Hallicrafters, B&W, Lafayette, Allied/Knight, National, Heath, McMurdo Silver, Howard, RCA, Millen, Polycomm, Clegg, Hammarlund, Ameco, Drake, Morrow, Gonset, EICO, Elmac, B&K, Collins, Harvey Wells, Conar, RME, Swan & others. List available. NI4Q, Box 690098, Orlando, FL 32869-0098. (407) 351-5536

FOR SALE: B&W coaxial ant switch - $20; RF rotary switch 7000V - $15; Johnson kilowatt ant match box - $65; 5V 16A xfmr - $25, 1614 tube - $12; EICO grid dip meter, new - $40. Joe, W6CAS, CA, (916) 731-8261.

FOR SALE: Classic gear - SASE for list. **WANTED:** Vintage rigs. The Radio Finder, Joel Thurtell, 11803 Priscilla, Plymouth, MI 48170. Tel/Fax (313) 454-1890

FOR SALE: Hundreds of books: ARRL; Rad; Lab; RCA, Receiver Design, 2-stamp SASE for list. Charles Brett, 5980 Old Ranch Rd., Colorado Springs, CO 80908. (719) 495-8660

FOR SALE: Books, all electronics related; 200 titles; SASE. Paul Washa, 4916 Three Points Blvd, Mound, MN 55364. wøtok@email.msn.com

FOR SALE: Tube list, new & used, wide variety audio, ham. Recently expanded. SASE 52¢. Bill McCombs, WBØWNQ, 10532 Bartlett Ct., Wichita, KS 67212-1212.

FOR SALE: Our new 54 pg 1999 catalog of WWII military communications items - $3. Sam Hevener, W8KBF "The Signal Corps", 3583 Everett Rd., Richfield, OH 44286-9723. (330) 659-3244

FOR SALE/TRADE: HW-16 - $125; HR-10B - $125; QF-1 - $45; HW-101 - $100; SB-301/401 - $400; HQ-145A/sp - $300. Sam Timberlake, KF4TXQ, POB 161, Dadeville, AL 36853. (256) 825-7305 stimber@lakemartin.net

FOR SALE/TRADE: LS-454 - $25; DY-134/GRC-9X - $35; amplifier-multiplier, RF AM-1178/GRC C-band - $150. Trade for RBL, RBA, RBB, R-45/ARR-7. Ronnie, N1UDI, CT, (203) 371-6691

FOR SALE: QST's: Any issue 1930 to date - $6, ppd; Bakelite panels & straightened lengths of #10,#12,#14 tinned wire - SASE for info. Parker, W1YG, 87 Cove Rd, Lyme, CT 06371.

FOR SALE: Boatanchor paints; Heathkit Tech Journal Subscriptions; phone filters - call or write for free catalog. R&R Designs, 202 Midvale, Marshall, WI 53559. (800) 372-4287

FOR SALE: Convert any wattmeter to read PEP! Perfect for AM/SSB - $19.99 ppd for complete kit! HI-RES, 8232 Woodview, Clarkston, MI 48348. (248) 391-6660, hires@rust.net

FOR SALE: RIT for KWM-2 and S-Line. No modifications for KWM-2. $59.95 tested/42.95 for kit. SASE for details and order info. John Webb, W1ETC, Box 747, Amherst, NH 03031.

FOR SALE: Collins: 18S-4 scvr; KWM-1 mic; 490Ts antenna coupler manuals; 514S-1 manual; radio teletype writer manual; (2) chrome spkr strips; (1) xmtr; MBF radio accessory case; 60s-70s US & foreign radio amateur call book mags; 150 20s-50s tube sockets; (3) home brew xmtrs by Collins ham. Bill Coolahan, 1450 Miami Dr., NE, Cedar Rapids, IA 52402-2933. (319) 393-8075

FOR SALE: Collins manual for coupler monitor CU-737/URC - $20 pp 1st c. Harry Blesy, N9CQX, 95740 Clarendon Hills Rd., Hinsdale, IL. 60521. (630) 789-1793

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WANTED: For HRO-50R1, 5 mtr (NC125 OK) coils AC AD EFG, xtal calib. Jim, K7BTB, POB 50355, Parks, AZ 86018. (520) 635-2117

WANTED: Pwr sply, National 200 xcvr; manuals for Knight (Allied Radio) Universal Auto Analyzers, models KG-375 or a-1707; BC-1000 battery cases, CS-128A. Allan Lurie, W9KCB, 605 E.Armstrong Ave., Peoria, IL 61603. (309) 682-1674

WANTED: Collins filters: F500Y-120-526-9575-00; F500Y-94-526-9468-00; F500E-94-526-9472-00; F500F-94-526-9216-00. Walter M. Chambers, K5OP, POB 241371, Memphis, TN 38124-1371. (901) 761-9381

WANTED: Instruction sheet, diagram for Gonset 3001 noise clipper accessory for early mobile converters. Geoff Fors, WB6NVH, POB 342, Monterey, CA 93942-0342.

WANTED: Cabinet handles for HQ-120X rcvr. **FOR SALE:** Hallicrafters S40B rcvr, works good, needs cosmetics - $45. Bernie Doermann, WA6HDY, 300 James Way, Arroyo Grande, CA 93420. (805) 481-6558

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FOR SALE: Globe King 500C, restorable - $650; 1 KW HB AM xmtr - $550. Bill Sgambati, NY, (914) 356-6553.

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FOR SALE: Central Electronics 10B w/manual copy, exc - $85 +shpg. Chuck, NZ5M, (806) 798-1452.

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WANTED: Gearshift for Teletype Model 28, or complete machine with one. Ivan, WA6SWA, POB 248, Reno, NV 89504. (702) 329-7738, idh@cs.unr.edu

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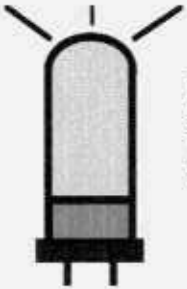

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