

# THE A.W.A. GATEWAY

Volume 3, Number 2, Summer 2013



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*Your Entry to the Fascinating World of Vintage Communications*



The AWA Gateway is an electronic publication of The Antique Wireless Association, downloadable without charge from the AWA website [www.antiquewireless.org](http://www.antiquewireless.org), to stimulate interest in vintage communications history, equipment restoration and collecting.

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#### ABOUT OUR COVER

The scene that is partially revealed behind the gateway is the Marconi transmitter complex at Poldhu, southwest Cornwall, England, that sent the first transatlantic radio signal. The three dots, representing the Morse letter "s," were received by Marconi at St. John's, Newfoundland on December 12, 1901. Shown are two of the four sturdy towers that replaced the two antenna masts used in the original test.

The AWA Gateway cover was created by Will Thomson of Armadillo Arts, Iowa City, Iowa.

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Marconi at his St. Johns receiving station. Courtesy David Read.

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## From The Editor

Welcome to the Summer issue of *The AWA Gateway*! As Bob Hobday writes in his Deputy Director's column, the big excitement around AWA right now is the August 20th opening of the 52nd AWA World Convention and, with it, the Grand Opening of our new Antique Wireless Museum. We've given you just a peek at the new facility in the "Members' Corner" column. But you are invited to attend the convention and see everything for yourself! For more information, see the big display ad on the last page of this issue and also visit the special Museum web site at [www.awamuseum.com](http://www.awamuseum.com).

We look forward to welcoming a new columnist in our next issue. He is Jim Cook, who will also continue

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writing his popular "Radio Ramblings" column in our sister publication, *The AWA Journal*. We're still talking about column content and a column name—but Jim's material will definitely be in keeping with the mission of *The AWA Gateway*, which is to stimulate, inform and assist those just discovering the fascinating world of

vintage communications.

If you would enjoy writing material of this kind — either as a single feature article or a regular column, please get in touch with me at [mfellis@alum.mit.edu](mailto:mfellis@alum.mit.edu) or 847-869-5016.

—Marc Ellis, N9EWJ

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## From The Deputy Director

**H**i Everyone. Well, the new Antique Wireless Museum is coming together at our new location in anticipation of the Grand Dedication ceremony to be held Tuesday, August 20th, at 2 p.m. You are all welcome to come of course. And you are invited to attend the AWA Annual Convention to be held August 20 to 24th at the RIT Inn and Conference Center in Rochester, New York (go to [www.awamuseum.com](http://www.awamuseum.com) for information and to register).

How does a world-class institution like the Antique Wireless Museum happen? For sure, it does not happen by accident. Begun in 1952, it has been over 60 years in the making. The vision, dedication and support of our leadership, members and friends over that time period has been, and is, nothing short of astounding.

The AWA now has over 70,000 cubic feet of artifacts representing a world-class collection which includes many historically significant and unique items. Not only does AWA have the artifacts, but we work extremely hard to make sure we also have the "story" — the history, the provenance — behind each artifact. Without the story, that piece of brass and Bakelite and wires might be interesting, but it is the story that makes its history come alive.

Our world-class museum is also the result of countless days of planning and hard physical work by the volun-

teer Museum Staff. In the last few years, the AWA Staff has moved all 70,000 cubic feet of artifacts, sometimes more than once. If you attend the Grand Dedication you will have a great chance to meet them. Please thank them for their effort. They deserve all the thanks and praise we can offer.

The Museum offers you several great learning opportunities whether you are a new or experienced collector. First, you will be able to see many unique artifacts that were significant to the development of the technologies used in communication and entertainment. Second, your educational opportunity will be enhanced by the knowledgeable docents (museum guides) telling you the "story" behind the artifacts and answering your questions. Third, you can make an appointment to use the extensive Bruce Kelley Research Library and Archives. Fourth, you could volunteer to be a Museum Staff person or a Museum docent. What a super way to learn!

Beyond the opportunities at the Museum, please consider the benefits of becoming an AWA member. The opportunities to make friends and knowledgeable contacts are unlimited and the values of the publications you will receive far exceed the modest \$25 (\$30 outside the US) annual dues. To join the AWA, go to [www.antiquewireless.org](http://www.antiquewireless.org).

—Bob Hobday

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## Book Reviews

By Eric P. Wenaas, [eric@chezwenaas.com](mailto:eric@chezwenaas.com)

### Volumes of Special Interest to New Radio Collectors and Restorers

**How to Repair Old-Time Radios**, by Clayton L. Hallmark. Published 1979 by Tab Books. Pages: 249; 5.1" x 8.25". Paperback: out of print.

**A**lmost everyone who acquires an inoperative antique radio wants to know how to repair and restore it—even if they do not intend do it themselves. This book is a good general guide to troubleshooting and repairing old-time radios, although it does not include restoration or repair of the cabinet—an entirely separate subject from

restoring radio reception. On the back cover of this book, the author advertises that the novice can locate troubles, repair defective parts, and find out how to obtain replacements for obsolete parts without previous knowledge of radio electronics. I believe he may well be correct!

The troubleshooting procedures Hallmark advocates address what he considers to be the two most common receiver types—tuned-radio-frequency (TRF) and superheterodyne. While the regenerative receiver is mentioned in passing, the author considers this type of

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radio to be “mainly of historic interest,” and it is not included in the troubleshooting procedures outlined in later chapters. Also, the book does not address battery-operated radios from the 1920s, a class of radios with unique problems that Hallmark does not cover in his troubleshooting techniques clearly crafted for sets powered by line currents.

“Start Here!” is the title of Chapter 3 where Hallmark outlines a troubleshooting method he claims will never fail. He suggests you begin making a visual and mechanical inspection of the radio, thoroughly clean and lubricate the set, test the tubes with a tube tester and replace those that are defective. The second step is a preliminary assessment in which the set is turned on to identify potential problems based on sound, sight and odor.

He advises you to listen for hum, low volume or no volume, static, distortion, and scratchy noises when rotating the volume control or switches; look for filament lighting, arcs and sparks; sniff for smoke, burning insulation and other acrid odors; and cautiously touch certain parts such as transformers and resistors to check for overheating.

The third step is to localize problems to a specific stage for inoperative or weak receivers using circuit disturbance, signal injection, and signal tracing techniques. The circuit disturbance method requires only a screwdriver or other metallic object to touch the grid of the tube in each stage beginning with the output stage and working backwards through remaining stages while listening for clicks in the speaker.

For signal injection, a signal generator is applied at key points in the receiver beginning at the output stage and working backwards. For signal tracing, a signal tracer instrument is used to trace a signal injected at the antenna to the stage where the injected signal disappears. A stage-muting technique for identifying sources of hum, modulation and noise is also described.

The fourth step is to isolate the malfunctioning part in a specific stage by making voltage and resistance measurements. Hallmark explains how to do this with the aid of representative schematic diagrams for all stage types found in superheterodyne and TRF receivers. Tips are presented on how to approach specific problems including weak receivers, distortion, hum, noisy receivers, squealing and motorboating sounds, and intermittent symptoms.

Since these techniques require a working knowledge of schematics, the tutorial provided in Chapter 2 will be most welcome. The author suggests you obtain a schematic specific to your set, mentioning John F. Rider’s *Perpetual Trouble Shooter’s Manual* as an option (free download at [www.whateveristrue.com/riders/index.html](http://www.whateveristrue.com/riders/index.html)). I also suggest you consider a Howard W. Sams’ Photofact Folder, which can be purchased on the Internet for sets made from 1946 onwards. Photofact Folders contain schematics, voltages, actual pho-

tographs, parts lists, and alignment instructions (free samples available at [www.TheSchematicMan.com/](http://www.TheSchematicMan.com/)).

Hallmark points out that it is best to use exact replacement parts wherever possible, but he does not address the potential impact of using inappropriate replacement parts on the quality of the restoration or the value of the set. Repairs using obviously inappropriate replacement parts can be very crude and distasteful. Examples include replacing one of a matching pair of transformers with one that does not match, substituting chassis-mounted electrolytic capacitors in metal cans with cardboard versions, replacing tube socket types to accommodate tube substitutions, replacing wax capacitors having axial leads by non-axial versions or ones with a significantly different appearance.

At some point during the repair process, you may have to decide how important original appearance is to you, a decision that will depend to a large extent on the value of the set and your collecting objectives. If your objective is documenting and preserving the history of radio, you may not want to sacrifice original appearance for restoration of function. However, if your set is not rare or you just like listening to old-time radios, then appearance may not be so important. While Hallmark does not address the subject of good workmanship, it goes without saying that good restorations require good workmanship, regardless of whether defective parts are repaired or replaced.

One important subject missing from this book is what you should do before you ever power up any antique radio. Many “All American Five” AC/DC radios made without power transformers between the 1940s and 1960s have one lead of the ac power cord wired to the chassis, either directly or through the on/off switch. Since the power cords on most of these sets were not polarized, there is a 50% chance of having the chassis at 120 volts when one side of the power cord is hard-wired to the chassis. The safest approach for dealing with this hazard is to use an isolation transformer. You cannot rely on Hallmark’s dictum on p. 75 that “the ac power usually is isolated from the chassis.”

Even antique radios with power transformers should not be turned on without taking certain precautions unless the provenance of the radio is known. Antique radios—which may not have been powered up for as many as 80 years—may have filter or bypass condensers that have shorted, or transformers with insulation that has deteriorated to the point that the transformer itself might short and overheat. The best approach to powering transformer sets of unknown provenance is to increase the voltage gradually using a variable-voltage power transformer (e.g., a Variac) while monitoring the current drawn to be sure it does not increase beyond the maximum expected for a given set.

This book covers a great deal of material, and it is unlikely that the beginner will use all of the techniques

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described. The instrumentation alone described in the book would be expensive: multimeter, signal generator, signal tracer, and tube tester. Add to that the cost of tubes for the recommended tube substitution method, the tube manual, schematic diagrams, various resistors and capacitors for the substitution method, and the isolation and variable-voltage transformers recommended here for safety's sake.

However, do not despair. Most of the time, problems in the radios covered by this book will be caused by tubes with open filaments, open on/off switches, bad filter capacitors, noisy IF transformers, speakers with misaligned or dirty voice coils, and open or shorted transformers. Fortunately, these problems can be found

with little more than a multimeter. If you have only one radio to repair, there is a very good chance you will not need the more advanced techniques and associated equipment described in the book.

In the event you do not want to repair your own set or you are unsuccessful in doing so, you can find a number of excellent services on the Internet that repair or restore antique radios. This book will provide the necessary background to enable you to understand the various options, ask the right questions of candidate repair services, and decide exactly how you want the radio repaired or restored. While this book is out of print, it can be found at swap meets, auctions and out-of-print book websites for about \$30 and up.

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## Clubs That Will Welcome You

- The Antique Radio Club of Illinois (ARCI) — Meets bi-monthly. Meets generally held at the American Legion Hall, Carol Stream IL but meets in June in conjunction with the 6-Meter Club of Illinois at the DuPage County Fairgrounds and once per year for Radiofest at the Willowbrook Illinois Holiday Inn. Check website for schedules, details and maps.) Contacts: President, Olin Schuler oshuler@comcast.net; Club Public Contact, Art Bilski, 630-739-1060, clubinfo@antique-radios.org. Website [www. antique-radios.org](http://www.antique-radios.org).

- Antique Radio Collectors of Ohio —meets first Tuesday of each month at 2929 Hazelwood Ave., Dayton, OH (4 blocks east of Shroyer Rd. off Dorothy Lane) at 7 p.m. Also annual swap meet and show. Membership: \$10.00 per year. For more info, contact Karl Koogler: mail to above address; phone (937) 294-8960; e-mail [KARLRAD@GEMAIR.COM](mailto:KARLRAD@GEMAIR.COM).

- California Historical Radio Society—For info on current meetings, call the CHRS hotline: (415) 821-9800.

- CARS, the Cincinnati Antique Radio Society — Meets on the third Wednesday of each month at Gray's History of Wireless Museum, which is part of The National Voice of America Museum of Broadcasting, Inc., located in a building that is now on the National Historic Register at 8070 Tylersville Road, Westchester, Ohio. 45069. For more information contact Bob Sands at (513) 858-1755.

- Carolinas Chapter of the AWA — Hosts four "mini-swap-meets" each year (in January, May, July and October) plus an annual conference, "Antique Radio Charlotte," on the 4th weekend in March. Executive committee meets approximately quarterly. For more info, visit the website at [CC-AWA.ORG](http://CC-AWA.ORG) or contact Ron Lawrence, W4RON, Chapter President, P.O. Box 3015,

Matthews, NC 28106-3015; phone (704) 289-1166; e-mail [W4RON@carolina.rr.com](mailto:W4RON@carolina.rr.com).

- Central Ohio Antique Radio Assn. —Meets at 7:30 p.m., third Wednesday of each month at Devry Institute of Technology, 1350 Alum Creek Rd., Columbus. (1-70 Exit 103B.) Contact: Barry Gould (614) 777-8534.

- Delaware Valley Historic Radio Club —Meeting and auction begins 7:30 p.m. on the second Tuesday of each month. Location: Telford Community Center on Hamlin Ave. in Telford, PA. Annual dues: \$15.00, which includes a subscription to the club's monthly newsletter The Oscillator. For more info contact Delaware Valley Historic Radio Club, P.O. Box 5053, New Britain, PA 18901. Phone (215) 345-4248.

- Houston Vintage Radio Association (HVRA) meets the fourth Saturday (January thru October) at Bayland Park 6400 Bissonnet, 9 a.m. in SW Houston. Each meeting includes an auction and program. Annual two-day convention held in February includes three auctions, old equipment contest, technical talks, swap meet, and awards banquet. One day MEGA auctions held in the spring and fall. A newsletter, The Grid Leak, is published bi-monthly. Event postings, announcements, photos and other features are available on HVRA website: [www.hvra.org](http://www.hvra.org). Membership is \$20/yr. Address: HVRA, P.O. Box 31276, Houston TX 77231-1276 or call Bill Werzner, 713-721-2242; email: [werz1943@gmail.com](mailto:werz1943@gmail.com).

- Hudson Valley Antique Radio and Phono Society [HARPS] meets the 3rd Friday of the month 7:30PM at the Episcopal Church of Suffern Annex, 65 Washington Ave., Suffern N.Y. 10901 for info contact Rev. Dale Cranston at (845) 357-1615 or [dale.cranston@gmail.com](mailto:dale.cranston@gmail.com).

- Indiana Historical Radio Society — Active since 1971. Meets in Feb. (Lawrence), May (2-days, Kokomo) and

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Oct. (Greenfield). Flea market, old equipment contest, and auction at all events. Meet details and club info at website [www.indianahistoricalradio.org](http://www.indianahistoricalradio.org). \$15.00 annual dues includes the IHRS Bulletin published quarterly. Contact Herman Gross, W9ITT, 1705 Gordon Dr., Kokomo, IN 46902, 765-459-8308, email [w9itt@comcast.net](mailto:w9itt@comcast.net).

- London Vintage Radio Club — This Ontario, Canada club meets in London on the first Saturday of January, March, May, and November. Annual flea market held in Guelph, Ontario in June. Contact: Dave Noon, VA3DN, 19 Honeysuckle Cr., London, ON N5Y 4P3, Canada. Email: [va3dn@execulink.co](mailto:va3dn@execulink.co). Website: <http://lvrc.homestead.com/index.html>.

- Mid-Atlantic Antique Radio Club (MAARC)—Meets monthly, usually on the third Sunday of the month at the Davidsonville Family Recreation Center in Davidsonville, MD. (But meets once or twice a year in Northern Virginia—check website for schedules, details and maps.) Contacts: President, Steve Hansman, 855 Arundel Drive, Arnold, MD 21012, (410) 974-0561, email: [shans01a@comcast.net](mailto:shans01a@comcast.net); Membership Chair, Geoff Shearer, (703) 818-2686, email: [gshearer2@verizon.net](mailto:gshearer2@verizon.net). Website [www.maarc.org](http://www.maarc.org).

- The New Jersey Antique Radio Club Meets the 2nd Friday of the month 7:30 pm at either Info Age 2201 Marconi Rd. Wall Township N.J. 07719 or Bowen Hall, Princeton University. We hold three annual swap meets and four seasonal repair clinics. Visit the club's website for details [www.njarc.org](http://www.njarc.org) or contact NJARC President Richard Lee (914) 589-3751 or [president@njarc.org](mailto:president@njarc.org).

- Northland Antique Radio Club (Minneapolis/St. Paul)—hosts four events with swap meets each year (in February, May, September and November) including an annual conference, "Radio Daze," for two days in mid-May. Annual dues are \$12.00, which includes a subscription to the club's quarterly newsletter. For more info, visit our website at [www.northlandantiqueradioclub.com](http://www.northlandantiqueradioclub.com).

- Northwest Vintage Radio Society — Meets the second Saturday of each month at Abernethy Grange Hall, 15745 S. Harley Ave. Oregon City, OR. Meeting starts at 10:00 a.m. Membership \$25.00 per year. Guests welcome at all meetings and functions except board meetings. Spring show, the second Saturday in May. For more information, contact Mike McCrow 503-730-

4639; e-mail: [tranny53@comcast.net](mailto:tranny53@comcast.net).

- Oklahoma Vintage Radio Collectors—Meets second Saturday of each month, (except for April, October, and December), at Hometown Buffet, 3900 NW 63rd St., Oklahoma City, OK. Visitors welcome. Dinner/Socializing, 6 p.m., meeting, 7 p.m. Swap meets on second Saturday in April and October at 8 a.m., Midwest City Community Center, 100 N. Midwest Blvd., Midwest City, OK. Membership \$15/year including monthly Broadcast News. Info: contact Jim Collings at (405) 755-4139 or [jrcradio@cox.net](mailto:jrcradio@cox.net). Website: [www.okvrc.org](http://www.okvrc.org).

- Ottawa Vintage Radio Club — Meets monthly (except June and July) in the Conference Room, Ottawa Citizen, 1101 Baxter Rd., Ottawa, Ontario, Canada. Contact: Lea Barker at (613) 829-1804 or check [www.ovrc.org](http://www.ovrc.org). Membership: \$10 Canadian/yr.

- The Pittsburgh Antique Radio Society welcomes visitors to our Saturday flea markets, contests and clinics held at least four times yearly. A fall auction is included in September and our annual luncheon program is on the first Saturday in December. An annual Tri-State Radio Fest is held in April. Our journal, The Pittsburgh Oscillator, is mailed quarterly. For more information visit us at <http://www.pittantiqueradios.org>, email President Chris Wells at [radioactive55man@comcast.net](mailto:radioactive55man@comcast.net), or phone Treasurer Tom Dixon at 412-343-5326.

- Society for Preservation of Antique Radio Knowledge (SPARK) — Meets monthly at Donato's Pizzeria, 7912 Paragon Rd., Centerville, OH. Annual swap meet. Membership, \$18/year. Write SPARK Inc., P.O. Box 292111, Kettering, OH 45429; e-mail [sparkinc@juno.com](mailto:sparkinc@juno.com) or call John Pansing at (937) 299-9570.

- Texas Antique Radio Club — Meets alternate months in Kyle and Shertz, TX. Contact: Doug Wright, 625 Rolling Hills Dr., Canyon Lake, TX 78133. Email: [dwjw@gvtc.com](mailto:dwjw@gvtc.com); website [www.gvtc.com/~edengel/TARC.htm](http://www.gvtc.com/~edengel/TARC.htm).

- Vintage Radio and Phonograph Society (VRPS) meets monthly on the third Saturday. Located in the Dallas, Fort Worth Metroplex, our current activities are annual convention, auctions, swap meets, repair training sessions and monthly programs. For details visit our website [www.vrps.org](http://www.vrps.org), or by contacting VRPS President Jim Sargent at (817) 573-3546 or [bsargent@swbell.net](mailto:bsargent@swbell.net).

# Evolution of the Broadcast Receiver

## Part 3: The Radio Becomes A Home Appliance

By Marc F. Ellis, N9EWJ  
© 1994 & 2013 M. Ellis

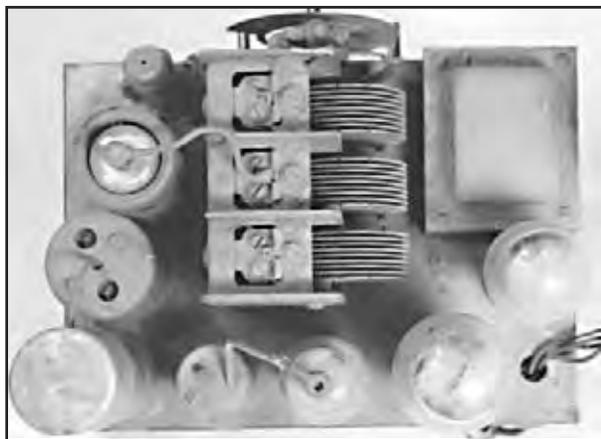
### THE TRANSITION PERIOD

In the first two installments of this series we followed the evolution of the family broadcast receiver from the crystal and regenerative sets of the early 1920s, through the emergence of the TRF (or “3-dialer”) radios that became dominant later in the decade, to the emergence of AC-powered and superheterodyne designs. Now we’re ready to move into what I think of as the “transition period” of radio development. This extremely interesting evolutionary phase began during the late 1920s and continued throughout the first few years of the 1930s.

As this period began, most of the basic radio circuitry had already been invented. Though innovations would certainly continue to be made, some very striking and important things were now happening in the area of mechanical and physical design. The family radio was moving out of the “breadboard” stage, and taking on the look of a mass-produced appliance.



*1920s 3-dialer has typical breadboard-style “straight line” construction.*



*On this 1930s chassis, components are grouped in semi-circle around a single-shaft, three-gang tuning capacitor.*

In the late 1920s most sets still looked as if they had been put together as laboratory demonstrations. The individual parts were beautifully constructed and finished. And the various stages of the receiver, interconnected in simple “building block” fashion, were easily identifiable as discrete units.

There was the “power pack,” built as a separate unit and connected to the radio proper via a thick umbilical cord. On the radio chassis itself, there was (at least for TRF sets) the usual row of three coil/variable capacitor assemblies with the two RF amplifier tubes interspersed between them. Then came the detector tube, with its fuse-style grid-leak resistor mounted in a clip. And finally, the two audio amplifier tubes with their associated audio transformers.

### INTEGRATION OF PARTS AND CIRCUITRY

By the end of this era, receiver circuitry was much more integrated. The power pack had disappeared, its components now being installed on the main radio chassis. And the three belted-together tuning capacitors had become a single, three-section unit having just one driveshaft.

The latter innovation made it possible to change from the “row-style” construction layout to a more compact, roughly semicircular, arrangement. The tubes, coils and other components associated with the RF circuits could now be grouped around the capacitor to minimize lead length. The detector, amplifier and power-supply tubes completed the semicircle.

Parts tended to become more generic in appearance as the engineers worked to bring their costs down. Audio transformers, for example, lost their decorative shells and binding-post connections, evolving into uncased units equipped with wire leads or solder lugs.

The chassis itself became deeper, allowing more components to be mounted underneath and contributing further to compactness of design. The details of a radio’s circuitry were no longer obvious to the casual observer. Construction had become so integrated and individualized that repairmen were having to rely more heavily on the manufacturer’s documentation.

### THE SPEAKER MOVES INSIDE

Changes in the construction and location of the loudspeaker also had a strong effect on the radio receiver’s appearance and function. Formerly nothing more than an overgrown headset driver incorporating relatively weak permanent magnets, the loudspeaker



*Decorative housings (left) were shed as speakers gained powerful electromagnetic drivers (right) and moved inside the cabinet.*

now was equipped with a powerful electromagnet operating from the receiver's DC power supply.

This, coupled with the increased audio output afforded by improved receiver design, made it possible to reduce the size of the speaker's paper cone and still obtain room-filling volume. The new DC-powered ("dynamic") speaker also lost its identity as an independent unit, shedding its decorative metal housing and moving inside the radio.

Radio cabinets now went through still another striking change. Because of the more compact chassis design, they no longer needed as much room on the table. But they became taller to accommodate the loudspeaker now mounted above the chassis. At the same time, wood once more became the preferred cabinet material, possibly because of its superior resonant qualities. The ventilation issue was handled by leaving the cabinet back open, or virtually so.

Collectors call the table model cabinets of this era "cathedrals" or "tombstones," depending on whether the cabinet sides curve inward to form an arch over the loudspeaker or continue straight up to form a simple rectangle. But this was also the era of the magnificent floor-model consoles. Such living-room showpieces typically contained a more powerful chassis and much larger speaker than the more plebeian table-model designs. In these sets, the speaker was mounted beneath the chassis, elevating the dial and controls to a more convenient height.

No discussion of "transition" receivers would be complete without mentioning the screen-grid tubes—notably the top-capped type 24-A—that were introduced

during this era. These highly efficient r.f. amplifiers breathed new life into the old TRF designs, allowing them to compete just a while longer with the super-heterodyne circuits that were beginning to dominate the market. The screen-grid TRF, with the top caps of its three 24-A's connected to the tuning capacitor via rubberized wires, is a commonly-found artifact of this era.

### DOWNSIZING FOR THE DEPRESSION

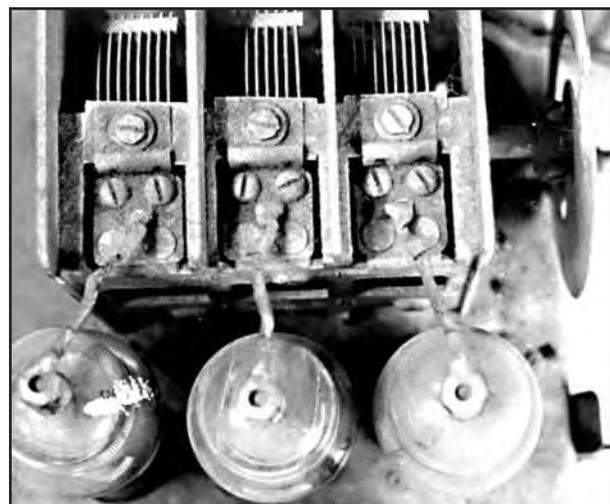
The radio broadcasting industry thrived during the depression. A nation that had suddenly run out of discretionary income was trying to find its entertainment at home, and the free programs were a blessing. Some of the most popular radio shows of all time had their beginnings during this period. But in order for radio receivers to be saleable, they had to be cheap; meaning that expensive components had to be eliminated and

physical size had to be reduced. This was now quite feasible, because improvements in radio components and designs were making it possible to do more with less, and because radio stations were now more powerful and numerous, making them much easier to pick up.

The radio designers managed to produce a new generation of modestly-priced table models running perhaps one third the size of the original tombstones and cathedrals. The midget sets were enormously successful, selling by the hundreds of thousands to an entertainment-starved nation. Next time we'll take a look at exactly how the downsizing was accomplished, so stay tuned in!



*The classic cathedral shape was formed when the side walls of the cabinet wall curved in over top of enclosed speaker.*



*The typical screen-grid set had three top-capped 24-A's wired to individual sections of a three-gang tuning capacitor.*

# Play It Again

## A No-Nonsense Guide to Vintage Radio Restoration

By Ken Owens  
1932-2009  
© 1995  
The Radio Collector

### PART 10—AC SETS: THE SPEAKER AND AUDIO STAGE

#### TROUBLESHOOTING THE SPEAKER FIELD

Like the battery sets that preceded them, the earliest AC sets used a separate high impedance magnetic speaker or horn. Majestic pioneered the later practice of employing low-impedance electrodynamic (sometimes called simply “dynamic”) speakers for better sound quality. Such speakers have a field coil which replaces one of the power supply chokes. The B+ current through the coil generates the speaker’s magnetic field. Much later, PM (permanent magnet) speakers—which do not have a field coil—replaced the dynamics.

If your set uses such a speaker, its field coil must be connected to the power supply before you can make the tests described in the installment on servicing a.c. power supplies. Check the coil with your ohmmeter; it may be open or shorted to the frame. If so, you have several options: replace the speaker with a modern PM and add a separate choke; rewind the coil yourself; have it done. Coil winding is beyond the scope of this series.

Because the electrodynamic speaker is normally mounted away from the chassis, a short between the field coil and the speaker frame will place the full B+ voltage on the frame—creating a serious hazard. Be sure to check for this condition. If there is no apparent short, test further by connecting a wire from the speaker frame to the chassis. (After you apply power to the set as described below.) If the field winding breaks down at this point, it will blow the fuse I will tell you about later instead of endangering you.

#### THE AUDIO OUTPUT STAGE

In battery sets, plate voltage for the output tube was usually fed through the horn or magnetic speaker. Makers didn’t feel that 90 volts or so on the cord and speaker would be hazardous. But the higher plate voltages of AC sets were a different matter. RCA used an output transformer to isolate the plate voltage from the speaker. (Voltage was fed to the plate of the tube through the primary of the transformer; the audio signal flowed to the speaker

through the secondary.)

Atwater Kent used the arrangement shown in the diagram. Note that the 71A plate voltage is fed through choke CH, which blocks the audio signal—preventing it from being shunted away through the power supply. Instead, the audio goes to the speaker through paper capacitor C.

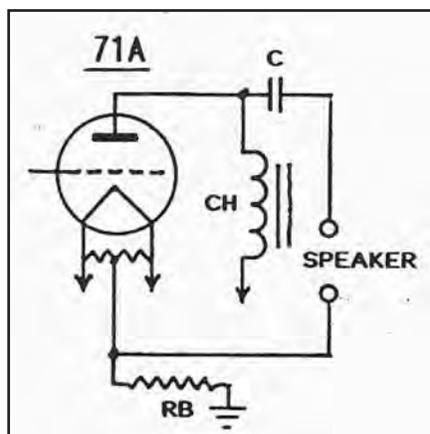
If C shorts, the resulting presence of B+ (plate voltage) on the 71A filament will prevent the set from playing. Check this capacitor. If it shows any leakage at all, replace it with a 0.47  $\mu$ F “Mylar” unit. The AK capacitor is potted into a flat metal box and can be melted out. You will have to use a 400V capacitor to replace it; because a 600V one won’t fit in the box.

#### POWERING UP

With the rectifier tube plugged in and using the lamp test rig described in the installment “Power For A.C. Sets,” connect the power supply to the set (if it was disconnected) and turn the set on. From here on, use the same procedure you learned for battery radios. Measure the voltage at each tube socket to make sure that B+ and filament voltages are present. B+ will be higher than with the tubes inserted. Turn off the set and insert the tubes. Be careful! If you mistakenly put a type 26 into the 71A socket, its filament will receive 5 volts instead of 1.5—and burn out when you turn on the set.

Connect the test speaker you built earlier and turn the set back on. When it has warmed up, the lamp will glow at about 1/3 brightness. Measure voltages. The 71A should have 140-180 volts on the plate and the RF amplifiers 125-150V. The 27 detector should have 20-40V on its plate. You can remove the lamp test rig now and plug the set directly into the power line.

Missing voltages indicate faulty AF transformers or RF coils. Locate and repair such faults before proceeding. If the set is still dead, measure the bias voltage from the center tap of the filament resistors to ground. The voltage for the 26 tubes should be about + 13V and



Atwater Kent output stage uses capacitor and choke to isolate speaker from plate supply. Courtesy of Pat Owens.

the 71A about + 30V. The 27 will be 0 since this center tap is grounded.

If there is B + on the plates, but no bias voltage at the center taps, both halves of one or more of the center-tapped filament resistors are open. This condition can also result from open bias resistors although you should have checked them earlier. If you have a defective filament resistor you can replace it with a pair of 330 1 W carbon resistors wired in series.

Remove and discard the bad resistor. If only half the resistor is open, the set will play, the voltages will be correct, but there will be a loud hum. Replace the entire unit. Any remaining problems can be located with the

troubleshooting procedures described earlier.

Once the set is operating properly, record all voltage readings. In case of future trouble, the record of the proper voltages for that particular set will simplify troubleshooting.

Finally, find a place under the chassis where you can mount a fuse holder. Cut one lead to the transformer primary and route it through the fuse holder. Install a 1.5A fuse. Sets with more than 8 tubes may need a 2A fuse. You will be adding a non-original component to the set, but one that will protect irreplaceable transformers. If the fuse blows, repeat the check out procedures described in this installment to find out why.

# Enjoying Antique Radio

## FM and Recordings

By Andy Ooms  
oomspine@msn.com

### THE TWO FM BANDS

**W**e have been looking at the radio frequency spectrum up to 30 megahertz in past issues of *Gateway*. Now we will begin discussing the frequencies above 30 megahertz. With the exception of the FM receivers beginning to appear in the late 1930s, very few antique radios cover these frequencies. But in concluding our spectrum review it is appropriate to make some general comments about this very important emerging mode of broadcasting.

The original FM radios, sold before or shortly after the Second World War, covered the frequency range 42 to 50 MHz; later ones covered 88-108 MHz. A really nice find would be a set with both FM bands, rare because the transition period from the lower range to the higher one was quite short. In fact, the 42 to 50 MHz FM band lasted for six years at most. In descriptive literature and price guides for radios with both bands, the lower band is sometimes known as FM 1 and the higher one as FM 2.

Why two bands? Quite a lot of complex FM history is involved. The system of FM broadcasting was developed in the mid 1930s by electronic genius Edwin Howard Armstrong, who had earlier invented the regenerative and superheterodyne circuits. He had proven that modulating the frequency of radio waves instead of their amplitude would result in reception with less atmospheric interference and much improved fidelity.

### THE CLASH WITH SARNOFF

Standing in Armstrong's way, however, was David Sarnoff, an electronic industry tycoon who controlled the Radio Corporation of America for many decades.

Sarnoff's company had benefited greatly by owning the rights to key electronic circuits—requiring radio manufacturers using them to pay licensing fees to RCA. In this way, Sarnoff gained the financial resources and influence to have a major impact on the development and utilization of radio in the United States.

Sarnoff failed to support FM for some time after Armstrong had introduced it. In fact he used his influence to block its development. When he finally did come around, he gave Armstrong very little credit for his work and even challenged his patents. This deprived Armstrong of much deserved recognition and denied him a tremendous amount of potential income. After spending large amounts of cash and emotional reserves in court actions against RCA, which had virtually limitless financial, legal, and technical resources, Armstrong lost heart and jumped from a building ending his life.

The preceding is a very brief synopsis of some history about which many books and documents have been written. One excellent book, *Empire of the Air* by Tom Lewis, published in 1991 by Edward Burlingame Books, An Imprint of HarperCollins Publishers, covers the Armstrong-Sarnoff stories, including their clash over FM. The book also has a lot of information about Lee deForest, another early day radio personality whose name surfaces frequently in discussions of radio history. Also, the April 2013 issue of *Popular Communications* contains a fine informative article on FM history by Bruce A. Conti entitled "Understanding 'Fighting Modulation,' and a DXing Challenge."

Prior to World War II, FM receiver production for the consumer market was slow in being developed. Most

of the American public was enamored with the ever-expanding growth of AM broadcasting and programming and the improved AM sets available. There was not much of a niche for FM listening. By the time that manufacturers and programmers were ready to establish and capitalize on an FM listeners' market, the government had shut down consumer radio production for the duration of the war. The materials and production assets were needed to build military equipment.

Although the original FM band was at 42 - 50 MHz, that portion of spectrum was also being used for VHF television channels. So the FCC moved the FM channel assignments to 88-108. According to Bruce Conti's article, the FCC approved the lower band from 1941 to 1948. The upper band was approved in 1945, and low-band FM was terminated in 1948. So simultaneous bands existed for only three years, explaining why not many two band FM radios exist.

### SARNOFF VS PALEY

The Sarnoff involvement in the development of FM is an example of his having taken sides on many technical or entertainment issues related to radio. For instance, he was very competitive with William Paley, Chairman of CBS. Paley had less electronic background than Sarnoff (who, if not a developer or inventor in the radio field, certainly controlled major numbers of engineers and research projects). Paley however seems to have had a better feel for the entertainment Americans wanted.

Paley and Sarnoff both controlled major broadcasting networks, but viewed radio broadcasting differently. Sarnoff was not sure that television would become the predominant popular entertainment vehicle and stayed focused on radio programming while Paley was emphasizing TV.

During the late forties, while sponsors were beginning to divert their advertising dollars from radio to TV, Paley made a huge dent in the radio status quo by hiring for his CBS Network a significant number of entertainers from RCA's NBC. Jack Benny was the most famous example.

This was undoubtedly a blow to Sarnoff's ego. After all, he had started a broadcasting network some time before CBS had done so. In fact NBC actually had more than one network until the FCC forced it to divest itself of its Blue Network (the forerunner through some name changes to today's ABC). CBS and NBC are still rivals in television programming although Radio Corporation of America has not existed since the mid-eighties.

CBS continues its radio network, which now consists primarily of news and sports programming. NBC Radio has come and gone through various phases since RCA disappeared and does not now have much impact in the radio programming field.

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It will open up to you an entirely new range of richness, and fullness, and color... entirely free from static noise as all come... so thrillingly real that you'll swear the performers in the studio or on records are right in the room with you!

FM's development is an important part of radionics, the vast new science in which many discoveries are as sensational they cannot yet be disclosed to the public.

Zenith, world's leading specialists in "RADIONICS EXCLUSIVELY," will bring you genuine FM, not an imitation. And it will be Zenith Radionic FM, born of the world's longest, broadest, most intensive experience in the field of **new frequency!**

You see, Zenith pioneered this field. It was Zenith that years ago introduced short

wave communications into the U. S. Navy, and has been developing Short Wave FM and Television since their very birth!

Among the world's first and finest FM stations, for example, is the transmitter owned and operated by Zenith in Chicago. And Zenith has never scanned its energies over untested fields such as refrigerators, washing machines, cooking ranges, vacuum cleaners. They have specialists of their own. Zenith concentrates its leadership in engineering and precision manufacture on "RADIONICS AND OVER RADIONICS!"

This is the big reason why you will enjoy

the world's clearest, most beautiful radio tone in the coming new Zenith Radionic FM Radios and Radio-Phonographs... the reason they will combine advanced engineering and precision quality at low cost, as never combined before!

The day radios are again available for your home, it will give you an idea—no just your money on a vacuum. Keep your eye on Zenith for genuine FM at its finest—and on Zenith first!

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Mid 1940s Zenith ad—probably early postwar—announcing the coming of Zenith FM radios and advising the public to buy Zenith "the day radios are again available for your home."

Sarnoff, however, did emerge as the winner in a hard-fought battle to standardize color television modes. CBS proposed a color system involving a sort of revolving wheel apparatus; NBC felt that an electronic approach was more practical and less problematic. The NBC mode won FCC approval and, refined immensely since the inception of color broadcasting, it is still the basis of our current television circuits. Although I cannot defend all of Sarnoff's business practices, I do believe that we are fortunate that RCA won the color TV contest.

(Disclaimer: I worked for RCA Corporation from 1966 to 1975 at its Indianapolis Consumer Electronics division headquarters and television and radio factories. I met Robert Sarnoff when he was RCA Chairman, having succeeded his father, David, for a time.)

### RECORDING RIVALRY

Another RCA versus CBS contest involved recording technology, an area of interest to many vintage electronics collectors. Early records were recorded and played at the speed of 78 rpm. This speed resulted in a playing time per disc of less than 5 minutes. Both companies had a long active involvement in the recorded music business; in fact CBS had evolved from a phonograph company.

Both companies experimented with recording tech-

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nology at lower speeds than 78 in order to produce longer listening periods per disc side. When CBS came out with a 33½ rpm system, it was poised to dominate the recorded music business for a time. RCA countered with the 45 rpm system. Although introduced as a stop gap, 45s became immensely popular, leading to sales of millions of 45 players and billions of the small discs with the big holes. Responsible was the growing influence of rock and the increased spending power of teenagers.

However as we all know, eventually long play records (known now as vinyl) won out. By the end of the sixties, 45's were gone. 33½ vinyl remained the predominant record medium until vinyl and tape were replaced in the top spot by CDs, which themselves are now virtually obsolete. The fact that 33 plus 45 equals 78 is an interesting coincidence but has no scientific significance.

In the next edition of *Gateway*, I plan to have a few more comments about FM and some other aspects of the spectrum above 30 MHz.

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## ABOUT THE ANTIQUE WIRELESS ASSOCIATION

The Antique Wireless Association is an organization of about 2000 international members linked by a common interest in the history of electrical and electronic communications. AWA members come from all walks of life and our ranks include teenagers, octogenarians, and beyond in both directions. At one of our meets, you might find yourself shaking hands with a retired broadcast executive or military electronics specialist, an engineer in a high-tech electronics firm, or an eager young person looking for advice on restoring his or her first radio.

The organization was started in 1952 by Bruce Kelley, George Batterson, and Linc Cundall—amateur radio operators and radio collectors from upstate New York. Their initial goal was to establish a museum where they could collect and preserve early wireless and radio equipment and historical information before it was lost to future generations. Decades later, their legacy continues to motivate our members.

Some of us are most interested in the technical background behind the epoch-making discoveries that now make it as easy to communicate across the globe as around the corner. Others enjoy the romance surrounding the men and institutions that put these discoveries to work: the maritime radio operators who averted disasters with their alert ears and quick thinking; the short-wave stations that radiated glimpses of exotic cultures and mindsets; the giant radio networks that delivered unparalleled entertainment and timely news to our homes while hawking toothpaste, cigarettes and soap flakes.

Though AWA members share this common interest, which many can trace back to early childhood, they express it in different ways. Some of us collect radio-related literature and manuals. Others collect and restore hardware: Morse keys and sounders, battery radios of the 1920s, telephones, advertising signs, cathedral and console radios—you name it! Collections can become very specialized, restricted to such things as radio components crafted of shiny Bakelite and gleaming brass or perhaps the fragile and intricate vacuum tubes that made the communications miracles possible.

Among our members are meticulous craftsmen who enjoy replicating vintage receivers and/or transmitters.

Those who are licensed amateurs frequently operate such equipment in special communications events sponsored by the AWA.

In addition to the commitment to the preservation of historical artifacts and background materials at the Museum, AWA also publishes *The AWA Journal* and *The AWA Review*. The *Journal* is a quarterly publication that gives our multi-talented members an outlet to share their historical research, equipment restorations, troubleshooting and servicing tips and other information of common interest. *The AWA Review*, which also publishes member contributions, contains more extensive and scholarly papers. It is published once a year.

*The AWA Gateway* is the latest addition to the AWA family of publications. It's delivered electronically and free of charge—downloadable from our web site [www.antiquewireless.org](http://www.antiquewireless.org).

Our content is targeted at those who may not be familiar with the AWA and who perhaps are just becoming interested in the history, collecting or restoration of vintage communications gear. For that reason, our technical articles are more basic than those in our other publications and our articles about AWA generally do not assume knowledge that that only those familiar with our organization might have.

The AWA also sponsors a four day annual convention in August featuring technical presentations and forums, a large auction, an awards banquet, an equipment and artifact competition, a book sale, and an active flea market. The convention affords attendees plenty of time to renew and make friendships, time to engage in long conversations on collection, preservation and all other aspects of the hobby.

The AWA is chartered as a non-profit organization in New York State, an IRS 501(c)(3) tax-exempt corporation, and is a member of the American Association of Museums. To learn more about AWA or to join our organization, visit the AWA website at [www.antiquewireless.org](http://www.antiquewireless.org).

### DONATING ARTIFACTS TO THE AWA

You may have artifacts that you are interested in donating to the AWA. We would be pleased to discuss any possible donation. Please call us at (585) 257-5119.

# Company Chronicles

*See copyright statement at end of article.*



The Pfanstiehl story is interesting for a couple of reasons. First it throws light on two pairs of similarly-spelled brand names that many of us have come across: Pfanstiehl and Fansteel; Balkite and Balkeit. Second, Pfanstiehl's activities were a little more subtle than those of many of the radio firms we have chronicled here; firms that simply jumped into the field during the broadcast boom of the 1920s and folded during the Depression.

Carl A. Pfanstiehl, the enterprising son of a Presbyterian minister, was born in 1888, brought up Highland Park, Illinois and attended Armour Institute of Technology. In 1907, he and a friend organized the Pfanstiehl Electrical Laboratories to manufacture induction coils. This activity was an outgrowth of some work with X-ray machines done by Pfanstiehl during his high-school days.

In a few years, the firm diversified into automotive spark coils and magnetos. These products required the use of expensive platinum contact points—until Carl worked out methods for making them out of tungsten. By 1914, Pfanstiehl was producing its own tungsten and beginning to diversify into other refractory metals—which were to become the company's chief product line.

In 1917, because of the anti-German feelings aroused by World War I, the company name was Anglicized to "Fansteel"—though the Pfanstiehls weren't German at all, but Dutch.

The Company's entry into the radio field came about through some work with tantalum done by Dr. Clarence Balke, who had joined the operation in 1916. Because of the metal's acid-resistant properties, Balke had attempted to use it as an electrode in chlorine cells. The project failed, because current would pass through the electrode only in one direction.

It was quickly realized that Balke had discovered a new method of rectification, and the "Balkite" line of

rectifiers, chargers and battery eliminators was developed. Sales of these products amounted to \$73,263 in 1923 and soared to over four million dollars in 1926.

By the time this product line had been created, Carl Pfanstiehl had already left the firm (1919) to form The Special Chemicals Company. Apparently he wanted to spend more time on experimental product development than on production. However by 1923 he was also in the radio manufacturing business, having formed the Pfanstiehl Radio Service Company.

At first, Pfanstiehl Radio Service manufactured patented adjustable coil mountings, and related components, for use in Montgomery Ward's "Tri-city" radios. A matching accessory amplifier was also supplied. In 1924, the firm came out with its own radio, changing its name to Pfanstiehl Radio Company. By 1927 Pfanstiehl had decided to leave the radio field to pursue other interests, selling its RCA license to Majestic.

Meanwhile, at Fansteel, things weren't going too well. The battery eliminator business had been destroyed by the introduction of AC-operated sets, and a loss of almost \$323,000 was posted in April, 1928. However, the firm came out with a complete Balkite brand radio of its own a few months later, apparently having purchased at least a share of Gilfillan's RCA license. Sales of this set seem to have been lukewarm.

In 1929, continuing to slug it out, Fansteel set up the Balkeit Radio Company (note difference in spelling) as a subsidiary. The new company continued to sell the old radios and introduced a new one, the Model C. Most of these were high-priced consoles, the market for which ended abruptly with the Crash. Balkeit went out of business in 1930. But at least as of 1989, Fansteel was manufacturing space shuttle components and still supplying electrical contacts for the automotive industry. *Fansteel is still in the specialty metals business as of 2013—ed.*

*This company biography, used with permission, was abridged from Alan Douglas's three-volume encyclopedia Radio Manufacturers of the 1920s, published by Sonoran Publishing, 6505 West Frye Rd., Suite 15, Chandler, Arizona 85226, sonoranpublishing.com, and copyrighted 1988, 1989 and 1991 by Alan Douglas.*

# Members' Corner

Photos by Richard Neidich

## News of Particular Interest to the AWA Membership

The first Saturday in May is traditionally the date of the Spring AWA Board Meeting as well as the annual Spring Meet. The latter includes a talk on some interesting facet of antique radio, an auction of surplus items from the AWA Museum, and a lively flea market with plenty of room for tailgating. But this year a new activity was added to the schedule of events: an oppor-

tunity to take part in the first public viewing of the new AWA Museum. Essentially a preview of the Grand Opening to take place on August 20th, the opening day of the 2013 AWA World Convention, we called it the "Phase I Opening." In this issue of "Members' Corner," we share with you some images from that eventful day.



Roy Wildermuth making a presentation on military mobile equipment.



Ed Gable auctions off a reel-to-reel tape recorder.



Tailgating is one of the most popular activities at the Spring Meet.



Our just-installed museum sign. The museum's temporary front entrance is in the background.



The museum's first visitors enter the reception area.



One of the main exhibit corridors.



Exhibit of 1920s radio receivers and accessories (right) is tucked in near the back of the museum.



Another view of the equipment in the 1920s exhibit.



The Teletype exhibit under development.



Speakers and advertising signs are displayed on soffits throughout the museum.

## READER INTERNET SITES

In the April issue of *The AWA Journal*, we mentioned an idea proposed by reader Steven Johannessen. He felt that *Gateway* readers might find it interesting and stimulating to look at collections our readers might have posted on line. We agreed and solicited URLs. We received and included three of them last time. Here they are again along with some additions received since then. Four readers have responded so far. Additions to the list are always welcome!

Allie Lingo (radiodoc@windstream.net) sent two:  
**Radios:** <http://www.radioatticarchives.com/contributor.htm?code=499>  
**Test Equipment:** <http://www.oldtestequipmentarchives.com/contributor.htm?code=26>

Mike Adams (mike.adams@sjsu.edu) has recently redesigned his Lee de Forest website. Look it over at [www.leedeforest.org](http://www.leedeforest.org).

Ron Lawrence sent several URLs featuring his collections and interests:  
Radio Heaven Page  
<http://radioheaven.homestead.com/menu.htm>

Clough-Brengle test equipment page  
<http://cloughbrengle.homestead.com/>  
Civilian Conservation Corp. page  
<http://radioheaven.homestead.com/CCCradio.html>  
Ron's YouTube channel—with video tours of his collections  
<http://www.youtube.com/user/w4ron>

The Tube Collector's Association Tube Photo Gallery  
<http://radioheaven.homestead.com/TCA.html>

Don Ignatius Collection  
[www.radionutzantiqueradios.com](http://www.radionutzantiqueradios.com)



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Directions: From Exit 46 of the New York Thruway (I-90), take I-390 North to NY 253 West to NY15 South. Look for the RIT building about 0.7 miles on the right.

**For more information and to register online, visit [www.awaconference.com](http://www.awaconference.com)  
Questions? Call Chairman Roy Wildermuth at 585-899-6703**

