THE A.W.A. GATEWAY

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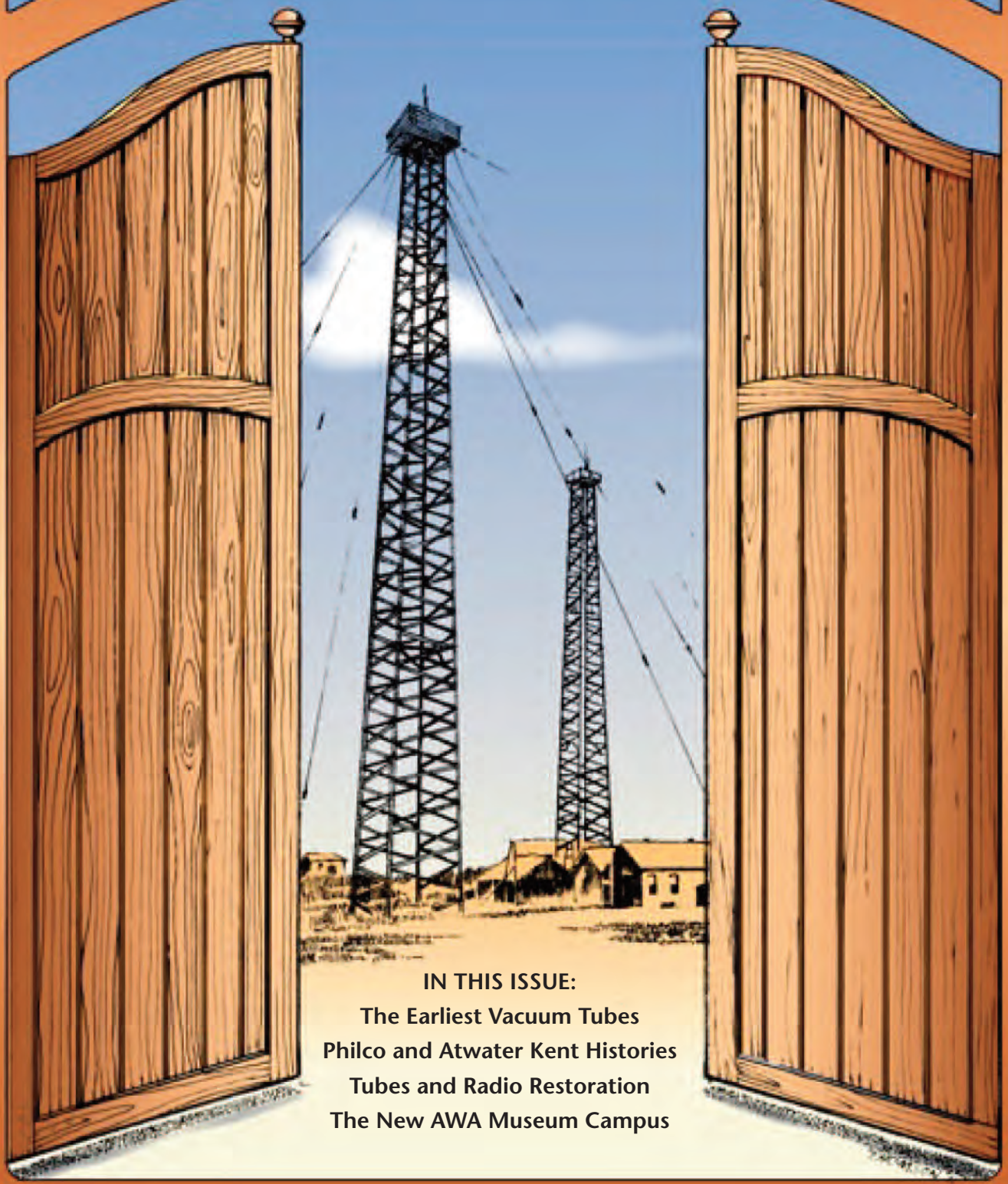

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Your Entry to the Fascinating World of Vintage Communications

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

WEBSITES

Website: www.antiquewireless.org

Special Convention website: www.awaconference.com

Special Development website: www.antiquewirelessmuseum.com

Antique Wireless Association is an IRS 501(c)3 Charitable Organization

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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 Thompson of Armadillo Arts, Iowa City, Iowa.

The AWA Gateway is published approximately four times a year by The Antique Wireless Association. AWA is a non-profit historical society founded in 1952 and incorporated in the State of New York. Antique Wireless Association is a trademark of the Antique Wireless Association.

Welcome to The AWA Gateway!

From The Director

I would like to take this opportunity to thank Richard Neidich for his perseverance in recommending *The AWA Gateway* concept to Trustees and staff. Thanks also to *Journal* Editor Marc Ellis for taking on this additional editorial assignment, supervising the design of our new electronic newsletter, and making available material from his earlier publications. The addition of *The AWA Gateway* to our other two publications, *The AWA Journal* and *The AWA Review*, adds value to AWA membership without added cost for postage or time delay for printing. By providing information about the origin and history of electrical and electronic communications, the publication will encourage newcomers to become involved with the AWA. It also will give us additional opportunities to provide news to our members about the exciting progress in our Development Campaign and museum construction.

From The Editor

I consider it a great privilege to be able to introduce this new electronic publication of the AWA. As the Membership Services Committee Chairman has noted in his welcome, the content of *The AWA Gateway* will be aimed at a broader audience than that of its sister publication, *The AWA Journal*. We'll be adjusting the content as we go along, especially after we begin receiving feedback from you readers. But the general plan is to concentrate on material of interest to newcomers or near newcomers to the ranks of vintage communication enthusiasts.

To give *The AWA Gateway* a running start, I plan to draw on material from a limited-circulation newsletter — also intended for newcomers to our hobby — that I published some 15 years ago. During its publication, we touched on most of the points that will be of interest to *Gateway* readers. The articles chosen for reprinting will have fresh new layouts, taking advantage of the color capability of electronic publication. And, whenever possible the original black and white photos are being be reshot in color.

However, the goal is to encourage and include more reader-written contributions. And I'll very interested in learning your ideas of what the newly-originated material should look like. Please contact me at mfellis@alum.mit.edu.

From The Membership Services Committee Chairperson

Welcome to *The AWA Gateway*, a brand new sister publication to our membership bulletin, *The AWA*

Journal. The Gateway is an on-line publication downloadable from our website www.antiquewireless.org at no charge, It will be published quarterly, between issues of the *Journal.* The new publication is an initiative to expand on our communications capabilities not only to Antique Wireless Association members but also to everyone interested in radio related history and technology.

The *Gateway* will add value to our current membership and expand our audience beyond it. It will reach out to those who might be new to the vintage communications hobby and would like to know more about about it and the activities of our organization.

We will be publishing articles of general interest targeted to a broader audience than *The AWA Journal*. And we hope that members and non members alike will find our content interesting. Please feel free to forward a copy to interested friends or suggest that they visit www.antiquewireless.org for a free download of the current issue. Mention that Joining AWA is as simple as clicking on the PayPal button on our site.

As we get the production underway, we invite everyone to comment on features they would like to see in the publication. Please contact Marc Ellis, our Editor, at mfellis@alum.mit.edu.

The AWA is undergoing a major expansion of its museum facilities and activities. You'll find an article outlining this development elsewhere in this issue. You are also invited to visit our development website, www.antiquewirelessmuseum.com for more details. Future issues of *The Gateway* will provide ongoing news about the Museum's expansion efforts.

Richard Neidich, RGNeidich@aol.com
Membership Services Committee Chair

From The Deputy Director

Hi everyone, and welcome to *The AWA Gateway*. As I write this article we are having yet another big snowstorm in upstate New York. This winter has been relentless with over 100 inches of snow in the Rochester area. Whoever is praying for snow can please stop.

I want to update you on the development of the new

The 10,000 square foot former antique mall that will become the AWA Museum.

Our staging building, used to house exhibit creation and repair facilities, now also serves as temporary artifact storage. The green container at left holds more temporary storage.

The Max Bodmer Media Center.

AWA Museum and Research Campus. To date we have had over 200 donations and pledges totaling nearly $1.2 million. That is great so far, but we have a long way to go to reach our goal. Please consider joining us in sparking the museum forward. Your donation will make a difference. Donations can be made through the Museum Development website www.Antiquewirelessmuseum.com

The museum campus consists of three buildings. The largest building, approximately 10,000 square feet, was recently an antique store operation and will be redeveloped into the museum proper. The proposed floor plan of the new museum is featured in our Development Campaign brochure and can also be viewed on the www.Antiquewirelessmuseum.com website. The antique store operation has recently moved out of the building.

The second building is the two story Dr. Max Bodmer Media Center, which houses the AWA library, photograph and document files, the Radio Club of America archives, a large meeting room, the AWA Store operation, and artifact storage. The Media Center is completely developed and in operation.

The third building is the Staging Building, which houses the artifact repair center and parts departments, the Membership Services office, and an overflow of artifacts. Once the Museum has been developed, a large part of the artifact collection will placed in the displays. This will relieve the overflow storage problem we have in the interim. At that point, the Staging Building will then be used to repair, create and stage exhibits for rotation in the Museum as well as to store artifacts.

Although major construction of the Museum will not commence right away, our expected opening date is in mid-2013. We are currently in the final stages of the engineering design required to make application to the Town of East Bloomfield Planning Board for a building use permit. Officials of the Town have been extremely supportive of the project and we view their support as one of the key elements in the success of the project. Ron Roach, AWA Operations Manager, has done an excellent job of keeping the Town apprised of our plans and progress.

Now that the volunteer work crew has almost caught their breath after moving a mountain (no, two mountains) of artifacts and shelving out of its original storage facility, Ron Roach is planning to have the crew do some of the required demolition of the internal rooms and offices in the museum building. This will allow us to turn over a "clean" building to the contractor when construction begins sometime in the future.

This is my 27th year as a member of AWA and these Museum plans are very, very exciting. We hope to have your support as we create a world-class museum to display our world-class collection of artifacts and preserve and share the powerful human stories that make those artifacts so important. You can be part of it and we hope you will!

Bob Hobday, Deputy Director
Antique Wireless Association

By Marc F. Ellis, N9EWJ

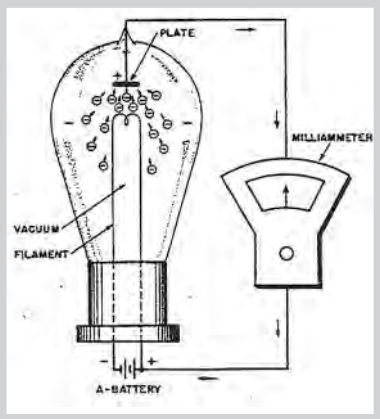
The Receiving Tube Story

Part 1: The Earliest Vacuum Tubes

THE EDISON EFFECT

Historians generally agree that the vacuum tube era dawned in the 1880s when Thomas Edison went to work on some annoying phenomena he had encountered during his early development of the electric lamp. The primitive carbon filaments of his lamps were burning out too soon. At the same time, the interiors of the glass bulbs darkened rapidly with use, becoming coated with a deposit of carbon from the filament.

Seeing that the filaments were being weakened by the carbon "evaporating" from them onto the glass, Edison sealed a metal plate into a bulb, between the filament and the glass, to see if he could intercept and study the flow of carbon.



The "Edison Effect" test circuit. Milliammeter indicates current flow through bulb when connected to positive filament lead.

During his work with such experimental bulbs, Edison tried connecting a milliammeter between the positive side of the power source feeding the filament and the metal plate inside. He got a reading on the meter, which meant that an electric current was somehow flowing between the filament and the plate through the vacuum separating them. When the meter was switched to the negative filament connection, no current flowed.

Edison never got around to investigating the meaning of the odd phenomenon he had discovered, but in 1899 the eminent British Scientist J.J. Thompson theorized that the current was, in fact, the flow of infinitesimal negative "particles of electricity" which he termed electrons.

Emitted by the heated filament of the bulb, the negative particles were attracted to the plate when it was connected to the positive side of the filament through the meter. Hence an electron current flowed from the filament to the plate, through the meter and into the positive filament connection. When connected to the negative side of the filament, the plate became negatively charged, which meant that it repulsed the electrons emitted by the filament and no current could flow.

THE FLEMING VALVE

But it remained for John Ambrose Fleming, working for British Marconi, to put the Edison effect to practical use. After duplicating Edison's original experiment he connected a source of alternating current between the filament and plate of the test lamp. Current then flowed through the bulb only during the portion of the AC cycle when the plate was positive with respect to the filament. When the cycle reversed, and the plate was negative with respect to the filament, no current flowed. This, of course, is the principle of rectification; the alternating current was changed to a pulsating direct current.

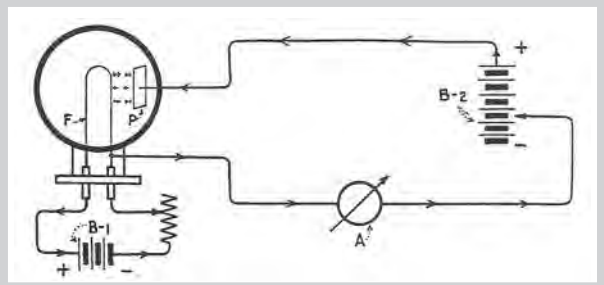
It was already well understood that the crude mineral radio detectors of the era operated by rectifying the received signal. Fleming found (1904) that his device would work in place of a mineral detector, receiving signals more reliably at some sacrifice in sensitivity. He had, in effect, developed the first radio diode (two element tube). It was known as the Fleming valve because of its ability to control the direction of the current flowing through it.

THE AUDION

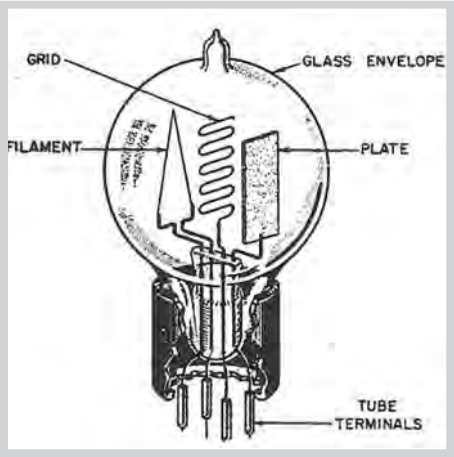
The epochmaking innovation in vacuum tube technology was patented by Lee de Forest in 1906-07. Physically, it was nothing more than a few turns of fine wire surrounding the filament and positioned between the filament and the plate. This new element was dubbed the grid, and de Forest had created the first three-element tube, or triode.

With nothing connected to the grid, the new tube behaved like a Fleming valve: making the plate positive caused a current of electrons to flow from filament to plate. However, connecting a small positive voltage to the grid would attract and accelerate the electron stream flowing to the plate. As a result the plate current would increase. Conversely, making the grid negative would have the opposite result. But the significant thing was this: very tiny variations in the voltages on the grid would cause similar, but much larger, variations in plate current.

The implication of this is that, properly connected, de Forest's triode (or Audion as he called it) would act not only as a detector of radio signals but as a very sensitive amplifier. It could accept the minute radio frequency voltages present at the antenna and strengthen them to the



A Fleming Valve demonstration circuit. When an AC source is connected in place of battery B-2, rectification will take place—converting AC to pulsating DC.



Simplified drawing of de Forest's 3-element "Audion." The original tube had no base.

The 6-volt storage batteries used to light early tubes were similar to automotive units.

point where they would provide comfortable volume in the headphones.

The fact that the tube could amplify, as it was very soon discovered, also made it very adaptable for use as an oscillator, or generator of a radio signal. Though in this series we are concentrating on the receiving tube applications, it's important to say that this was a major breakthrough.

Radio signals could now be generated in a more controlled manner and tuned more easily; the equipment to generate them could be relatively lightweight and easily constructed; no longer would radio signals have to be generated by ferocious arcs or heavy rotating machinery. Further, the way was paved for the development of effective and reliable methods for the transmission of voice and music.

Though the Audion was a watershed development in the evolution of radio and from the beginning de Forest gave many flashy demonstrations of his invention in that application, the first practical, large scale use of the device was in telephony. De Forest had sold telephonic rights to AT&T, whose engineers quickly improved the Audion, notably by evacuating the bulb to a higher vacuum. De Forest's brainchild was then quickly put to work as a voice amplifier on long distance phone lines, including the first U.S. transcontinental line (1915.)

Large-scale commercial development of the vacuum tube for other applications was hindered for some time because of divided ownership of the patents. Marconi held the patents on the basic two-element tube (Fleming having been a Marconi employee,) but de Forest held the patent on the grid. The stalemate was broken during World War I, when vacuum tube development was considered critical and the U.S. Navy offered to indemnify tube manufacturers against patent infringement.

RCA's tube types '200 and '201 (released in 1920), which were the first radio receiving tubes produced for the mass market, were products of the technological advances made in tube design during World War I. They were produced under a key cross-licensing agreement that enabled the major patent holders to pool expertise.

Now that we've touched on the historical beginnings of vacuum tube technology, we will be concentrating on American tube types, beginning with the ones first mass-produced during the early 1920s for use in home broadcast sets. By the end of this series of articles, we'll take the discussion up through a few years after the resumption of civilian radio production at the end of World War II. These are the tube types you'll be most likely to encounter in the sets that you'll be collecting.

Though there's no way that every tube type designed during this period can be covered, we will discuss the development of all major families of vacuum tubes (diodes, triodes, tetrodes and pentodes) as well as the innovations in tube "packaging" (physical design of bases, tube elements and envelopes) that took place during these years. And since the development of the radio receiver depended on, and paralleled, the development of the vacuum tube, the information you'll pick up in this series will assist you in understanding the sets you find and placing them in the proper historical perspective.

EARLIEST COMMON RECEIVING TUBES

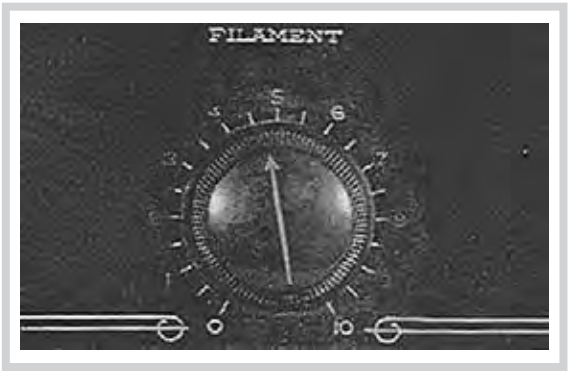
Let's go back to a point just before the excitement of the "broadcast boom" began, the year 1920 to be exact. In that year, the fledgling RCA company placed its first two receiving tubes, the types '200 and '201, on the market. Products of technological advances made during World War I, these tubes were manufactured under the cross-licensing agreement.

Both tubes were triodes, like de Forest's Audion. They contained three basic elements: a filament, grid and plate. When such a tube is connected to appropriate external circuitry, the filament generates a stream of electrons (or electric current) which flows, via the plate, through an

One of the first receiving tubes to reach consumers in quantity was the UV-201.

external load.

The grid (a spiral of wire surrounding the filament and placed between it and the plate) controls the flow of electrons. As described in the discussion of the Audion, small voltage changes on the grid can cause large changes in the tube's plate current, which makes it possible for the tube to amplify radio or audio signals.



Rheostats were used to maintain filaments at proper voltage as the battery ran down.

The type '200 was primarily a detector, designed for the job of separating the audio information in a signal from the radio frequency carrier wave; the type '201 was primarily an amplifier. Construction of the two was virtually identical, except that the glass envelope of the '201 contained only a vacuum, while that of the '200 contained a small amount of argon gas introduced after the air was pumped out.

A source of direct current (typically an automobile-type storage battery) was required to light the tungsten filaments of these tubes. Alternating current, supplied from the power lines via a small transformer, would have been much more convenient and economical—but would have introduced an unacceptable hum into the signal. The filaments of both types operated on five volts at one ampere.

The operating voltage was selected to work with the six-volt storage batteries of the era. When a battery was freshly charged, its voltage was reduced appropriately by a heavy-duty rheostat (adjustable resistor) wired in series with the filament. As the battery became depleted, the resistance of the rheostat could be decreased to keep the filament voltage reasonably constant.

BIRTH OF THE 'OLA

The one-ampere current draw of the '200 and '201 filaments was a bit of a problem. Frequent battery recharges were required, particularly if the set contained several tubes.

In 1923, however, General Electric released the '201A which was equivalent to the '201 but required only 25 percent of its filament current (.25 ampere). This was accomplished by introducing a small amount of the element thorium into the tungsten filament. The '200A (thoriated tungsten filament version of the '200) was not released until a few years later, and never saw wide distribution.

The '201A (or 01A, as we usually refer to it) became very widely used both as an amplifier and a detector. In fact it was probably one of the most manufactured tubes of all time, having been sold under at least 500 different brand names.

TYPE NUMBERS AND BASE STYLES

You've probably wondered at the apostrophe we've been using as a prefix to the tube type numbers mentioned so far. That convention is also employed in a lot of early radio literature, with the apostrophe substituting for omitted parts of the nomenclature. Such shortcuts were often taken with the elaborate nomenclature system originally used for tube types. The system was eventually scrapped by the radio industry, and isn't even much used in discussions among collectors, but you should have a working knowledge of it.

In its complete form, a tube type designation included one or two letters followed by a three-digit number. One of the letters and the first digit of the number were arbitrarily assigned by the manufacturer and had nothing to do with the characteristics of the tube. The other letter (or in some cases, the absence of same) served to indicate the base style. The final two digits of the number always identified the tube type.

As cases in point, the RCA UX201A and Cunningham CX301A were identical as were the RCA UV201A and Cunningham C301A (NOTE: absence of the "V" in the Cunningham number is not accidental). Eventually, however, RCA's prefix letters came to be used generically to represent a tube's base style.

A horizontal locating/locking pin and stubby contact pins are features of the UV-type base.

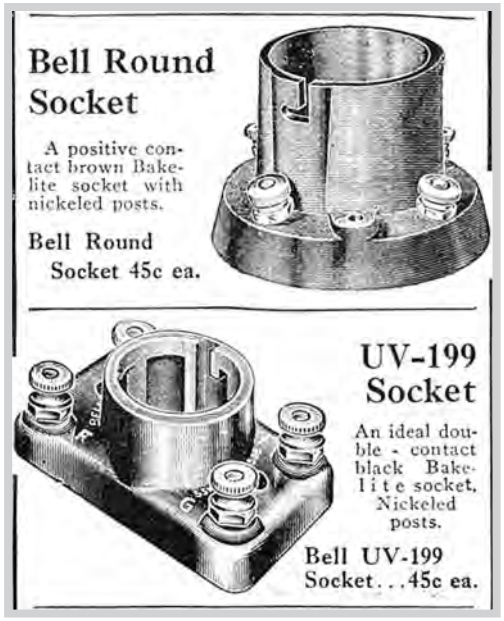
Long contact pins on the UX base slid into matching holes in the tube socket.

As originally manufactured, the '200, '201 and '201A had a standard base with four stubby contact pins at the bottom and a horizontal locating/locking pin sticking out of the side. The latter slipped into a bayonet-style guide in the socket, ensuring correct orientation of the base. It also served to lock the base in place when the tube was pushed down against the socket contacts and twisted to the right (in the manner of the older auto taillight bulbs). This base style was

identified by the prefix "UV" in the tube type designation.

But in 1925 the standard "twist lock" base style was changed to a "push-in" design, the pins being made longer so that they could slip into friction-type spring contacts via mating holes in the bottom of the socket. Two of the four pins were made fatter than the other two to make sure that the tube could be inserted only one way. These new sockets were much more compact, provided more positive electrical contact and were probably cheaper to manufacture. The revised base design bore the designation "UX."

For a time, the new "UX" bases retained the locating/locking pin, which was moved to a higher position so that the bases could still be "bayoneted" into "UV"style sockets even with their longer pins. That meant that a person who had to replace a UV-201A in an older set could substitute a UX201A with no problem.



Detail from 1920s ad shows standard UV base (top) and a smaller version for the UV-199.

THE DRYCELL TUBES

When General Electric released the UV-201A in 1923, another type was released along with it. It was the UV199, a brand new design. Like the '201A the new tube had a thoriated tungsten filament. But this filament drew only .06 amperes at its rated battery voltage of 3.3. It was designed to be on operated from three l.5-volt dry cells connected in series, with a series rheostat to reduce the 4.5 volts to the value required by the tube.

The dry cells could not be recharged, of course, and had to be discarded when exhausted. But they were much easier to handle than the clumsy storage batteries, being less bulky, less heavy and containing no easily-spilled corrosive acids. Sets using these tubes were much easier to move around than those employing '01-A's, and could even be built (as either "living room" or portable models) with internal storage compartments for all batteries.

It should be noted that the "UV" designation on the '199 is a bit misleading. The UV199 base is similar in design to the standard "UV" base as used on the '201A, but is scaled-down in size to match the '199's much smaller bulb size. Interestingly enough, when the UX199 came out, it was equipped with the large, standard size "UX" base.

The UX120 was released in 1925 as a companion to the UX199. It looked similar to the '199 and operated from the same filament voltage. Maximum plate voltage was higher, however, and the filament drew more current. The '120 was intended for use as an audio output tube, and could deliver more "punch" to the speaker than a '199. Many '120's have a factory-applied sticker reading "USE IN FINAL AUDIO SOCKET ONLY."

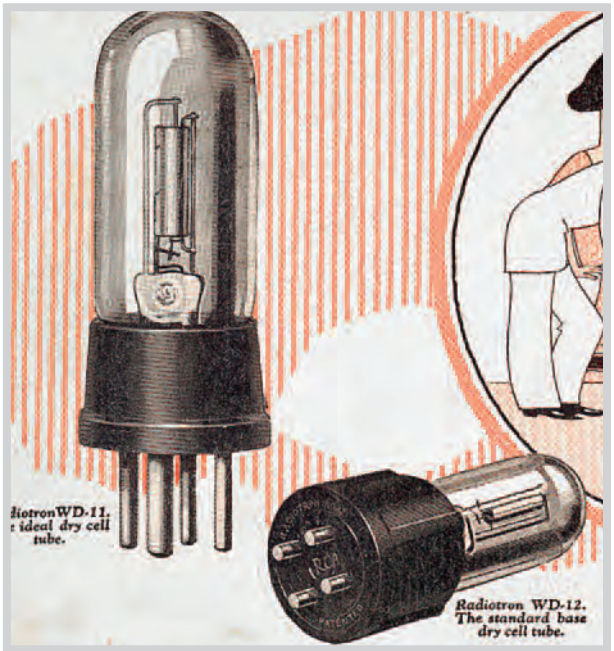
Another variety of dry-cell tube was marketed by Westinghouse beginning in 1922. Designated the WDll, this tube had a filament designed to be operated from a single dry cell drawing .25 amperes at 1.1 volts. The WDll filament was not thoriated as in the General Electric designs; its enhanced electron-emitting performance came, instead, from an oxide coating.

The base of the WD11 was a bit unusual. First of all, it had long pins designed for friction contact at a time when most tube bases were of the stubby-pin, bayonet-mount variety. Secondly, it had only one "fat" pin, instead of the usual two, to ensure proper orientation in the socket.

The following year, a version of the WD-11 having a standard "UV" base was introduced. It was designated the WD12. Eventually a version having the "UX" base (the WX12) was introduced. If the logic of these designations escapes you, you're not alone!

The "W" obviously stands for Westinghouse and the "D" for the unique base of the type 11. But it seems that the WD12 and WX12 would have been better designated the WV11 and WX11, respectively. I also have no idea why Westinghouse chose not to prefix the type number with the usual proprietary extra numeral (making the '11' s full designation "WD411," or something like that).

We hope you've found this ovedrview of the earliest vacuum tubes interesting and useful! The Receiving Tube Story continues in the next issue with "The First AC Tubes."



Detail from a 1925 RCA Radiotron ad illustrates the WD-11 and WD-12.

Company Chronicles

If we could survey all collectors and historians to determine the most beloved brand name of radio's golden age, Philco would probably be the hands-down winner. For some reason, the brand seems to have acquired an unusually strong friendly and "homey" connotation. The picture of a family "gathered around the living room Philco" is called up again and again in works of fiction and nonfiction dealing with the 1930s. And if you don't believe that the classic Philco cathedral is one of the most popular radio designs ever created, I invite you to see how many times you can spot its familiar image in the antique radio related advertising pieces now on your desk and workbench.

But besides being a "friendly" radio company, Philco was also known for its hi-tech innovations. Its "Mystery Control" radios, "Music on a Beam of Light" phonographs and living room disc recording equipment fascinate the radio collecting community now as much as they did the radio buying public for which they were created. For these reasons, then, it seems very appropriate to kick off our "Company Chronicles" column with a Philco biography.

Philco was organized in 1906 to make storage batteries for electric vehicles, its familiar brand name being an acronym for "The Philadelphia Storage Battery Company." As gasoline edged out electricity as the motive power of choice for cars and trucks, one of Philco's competitors, the Exide company (also Philadelphia-based,) got and kept the edge as a supplier of original equipment batteries. However, Philco's effective marketing tactics gained it a significant piece of the replacement business.

The growth of the radio industry, beginning in the early 1920s, gave Philco the opportunity of getting in on the ground floor of a brand-new market storage batteries for powering radio receiver filaments. Seizing the opportunity, Philco tackled the new market and developed $4.7 million in sales by 1924. Later, the company diversified in the radio area, adding battery eliminators (known as "Socket Powers") to its line. By 1927, sales amounted to $15.4 million.

The introduction of the AC-powered radio in the late 1920s made Philco's batteries and battery eliminators obsolete. But the company had penetrated the radio industry with an established name and a network of dealers. So it decided to stay on, moving to the manufacture of complete receivers. Philco made the change in a careful and methodical manner, beginning as a radio assembler, purchasing engineering services and components on the outside.

Eventually, it brought engineering and major component manufacture inside, enlarging the plant and converting it to full assembly-line operation. Philco's aggressive marketing tactics and careful manufacturing controls made it a sales leader, gaining third place in the industry (behind Majestic and Atwater Kent) by the end of 1929 and first place by 1930.

Over the next 10 years, Philco dominated the radio industry, but in 1939 it began to diversify into other household appliances. Later, as a result of wartime government contracts, Philco expanded into basic research and actively sought government business. During the 1950s, profits declined and Philco sold out to Ford in 1961. In 1974, because of tough Japanese competition, Ford sold the Philco Consumer Products Division to GTE Sylvania, retaining the Aerospace Division. In 1981, GTE sold the Sylvania Consumer Electronics Division to North American Phillips.

Atwater Kent Radio

If the prototypical living room radio brand of the 1930s was probably Philco, Atwater Kent might be said to have filled the same role for the 1920s. Ask an average person with some knowledge of early technology to name the radio make that Grandpa's grandpa might have purchased, and the answer will likely be "Atwater Kent." Like the Philco organization, Atwater Kent was Philadelphia-based and had been engaged in the manufacture of automotive products before moving into the radio business. Atwater Kent, the founder, was actually the inventor of the mechanical ignition system (points, condenser and centrifugal advance) used in autos and trucks prior to the development of electronic ignition.

His highly successful ignition unit, the "Unisparker," was sold for aftermarket installation in gas vehicles, and eventually the Atwater Kent line was expanded to include starting and lighting systems. Because of the economic slump after World War I, and the fact that more and more vehicles were being supplied with factory-installed ignition, the company's business began to suffer. Kent saw the burgeoning radio market of the early 1920s as the perfect opportunity for diversification.

He already had the equipment and know-how for metal forming, Bakelite molding and coil winding, all essential operations in the manufacture of radio sets. He also had a national reputation as a manufacturer of quality electrical items, not to mention a network of dealers who would be quite comfortable handling radio equipment.

The first Atwater Kent radio products, advertised in mid-1922, were individual components: variometers and audio transformers. Later that year other components were added, as well as sub-assemblies such as detector and amplifier units. By the end of 1922, the company was building and advertising complete factory-wired breadboard-style radios.

By the mid1920s, Atwater Kent was marketing more sophisticated breadboard, or "open model," receivers, including the models 5, 9, 10 and 12 so prized by today's collectors. Around that time, yielding to public demand for sets with less of a "laboratory apparatus" look, Kent

also offered the Model 20, which was enclosed in a mahogany cabinet with the now-familiar brown crinkle-finished metal front panel.

Mr. Kent's marketing instincts were right on the money and his company became an industry leader. In 1924, having outgrown the previous quarters, he built a brand-new, two-million dollar, 5-acre (eventually expanded to 32-acre) factory.

In 1926, Kent introduced a belt-ganged, one-dial tuning set (the model 30) and to stay price competitive switched to an all-metal cabinet. His first plug-in receiver incorporating the newly-developed AC filament tubes (the model 37) also used a metal cabinet. It was an instant success and its updated successor of the following season (the Model 40) sold over a million units.

During the years since Atwater Kent first entered the radio business, public acceptance of expensive sets had been increasing and radio price tags had been steadily growing. For the 1929-1930 season, Kent decided to downplay the table models that had been the backbone of his line and go after the higher priced console market. He didn't anticipate the stock market crash and subsequent depression, however, and sales of his expensive Model 55 and 60 screen-grid consoles plummeted.

Philco, which had been able to quickly convert to the manufacture of inexpensive midget sets, soared to dominance. But the Atwater Kent firm went into decline and eventually closed its doors in 1936.

The information for these company biographies was obtained 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.

MARCONI'S TRANSATLANTIC FEAT

When we were considering various ideas for the cover of this publication, we thought of a large gate that would be shown partly open to reveal a scene representing the panorama of electrical and electronic communications history. The gate was easy, but it was a little more difficult to decide on what the scene should be. The most obvious idea, a montage of vacuum tubes, microphones, antennas, transmitters and the like seemed not only trite but hard to frame in the gate opening. We needed something simpler, preferably something that could be considered to be the beginning of serious wireless communication.

That's why we chose to show a portion of the Marconi transmitter complex at Poldhu, southwest Cornwall, England. This is the station that sent out the first transatlantic radio signal. That signal was simply a repetition, over and over of the three dots representing the Morse letter "S." It was received by Marconi in a temporary station at St. John's Newfoundland on December 12, 1901. This event could certainly be considered to be the genesis of the radio industry that has been a subject of such great involvement by so many of our members.

Our scene includes two of the four 200-foot wooden towers that, the following year, replaced the two 157-foot masts supporting the antenna array used in the test. Power for the transmitter came from a 2000-volt, 25 kW alternator driven by a 32 hp oil engine. The output was stepped up to a demonic 20,000 volts by a pair of transformers. This was fed to a bank of condensers that discharged through the spark gap that generated the signal.

Marconi's receiving station at St. John's was set up in a disused hospital made available to him by the local government. The property was on a rise of land, appropriately named Signal Hill, located at the mouth of the harbor. To hold up his antenna Marconi had brought with him some 14-foot balloons, with hydrogen tanks to fill them, as well as a number of 9' x 7' kites. A ground connection was made by means of buried zinc plates.

The detector for Marconi's receiver consisted of a coherer connected in series with a telephone-type receiver. A standard coherer consisted of metal filings sealed into a tube with electrodes at each end. In the presence of a radio signal, the filings would clump together, or "cohere," causing a precipitous drop in the resistance across the electrodes and closing a circuit through the connected apparatus—in this case the telephone receiver.

At intervals, the filings would have to be "decohered" by tapping the tube—either manually or by means of an electromagnetic "tapper." Marconi had on hand not only a standard coherer, but also an "Italian Navy" model that employed a drop of mercury in place of the iron filings.

During the period of the tests, the Poldhu station had been instructed to send the "S" signal from 11:30 a.m. to 2:30 p.m, St. John's time, daily. The first test, on December 11, was aborted when a strong wind carried away the balloon. Success came the next day using a kite to suspend 500-foot aerial wires. In the words of Marconi's assistant George Kemp:

"We received the three dots or the S signal repeated. We lost the first kite with 2 wires, each 510 feet long, after it had been the means of giving us one hour for reception which was better than yesterday. Another kite was raised with one wire 500 ft., long which appeared more in harmony with the earth's electric medium and the signals from Poldhu Station. We were able to keep this kite up for three hours and it appeared to give good signals."

Remarkably, for the December 12th tests, Marconi had bypassed the tuned circuit of his receiver, wiring the series connected coherer and telephone receiver directly between aerial and ground. Rather amazing, considering the 1800-mile distance spanned!

REFERENCES

Marconi's Atlantic Leap, by Gordon Bussey, Marconi Communications, 2000

Marconi In Newfoundland: The 1901 Transatlantic Radio Experiment, by Henry M. Bradford, as posted on the internet.

Play It Again

A No-Nonsense Guide to Vintage Radio Restoration

By Ken Owens
1932-2009

PART 1—VACUUM TUBE ISSUES

Probably the best way to begin a series on restoring vintage radios is to talk about tubes. Certainly the most obvious first step in doing a restoration is to test the tubes. If your set has a bad one, there's no way in the world that you'll be able to make it play again!

Yet, though the condition of the tubes has to be taken into account, they are not the most common cause of malfunctioning radios.

Back before the coming of transistorized sets, the average radio owner blamed most malfunctions on weak or dead tubes. In reality, tubes were at the root of only about 35% of the problems.

Those of us in the repair business replaced weak tubes because the customer wanted and expected us to and there was profit in tube sales. But in reality there is hardly any audible difference between new and weak tubes unless the latter are nearly dead.

Those new to the radio restoration hobby are also tempted to suspect bad tubes as the cause of poor performance in a radio. But with tubes becoming scarce, we cannot now afford to discard usable ones just because they test weak.

FATAL DEFECTS

There are certain types of defects that will make a tube unusable. These are open filaments, short circuits between elements, and gas. Sometimes an apparently open filament is caused by poor connections at the base pins. It is worthwhile to try resoldering the filament pins of such a tube. If that doesn't cure the problem, the tube is useless.

Another variety of open filament is the "blinker." Such a tube has a broken filament which makes contact when cold, but opens when hot and thus cycles on and off. Some claim the break can be welded by applying a heavy current, but I've had no luck with this technique.

Short circuits usually occur between filament and grid or between heater and cathode. The first results when the filament sags into contact with the grid and often shows up only when the tube is hot. This defect is common in certain early tubes for 1920s battery sets, like the UV199.

The heater-cathode short is due to a breakdown of the insulation between these two elements. It seems to be most common with tubes in AC-DC sets and usually appears only when the tube is hot.

Never use a shorted tube in any radio.

Power output audio tubes seem to develop gas more frequently than other types. Gassy tubes often exhibit a blue glow within the elements. Don't confuse this with the blue glow sometimes seen on the inner surface of the bulb. That is caused by stray electrons striking fluorescent materials on the glass and is harmless. Gassy tubes are dangerous because they draw excessive current and may damage transformers and other components. Do not use them under any circumstances.

NOISE AND MICROPHONICS

Tubes can develop frying or crackling noises. To see if such a tube can be salvaged, try cleaning the base pins and tube socket contacts. Failing that, you might also try resoldering the base pins and grid cap.

A microphonic tube is sensitive to vibrations. Its elements are loose and the change in their spacing due to vibration modulates the electron stream. Some microphonic tubes are so sensitive that the set howls from acoustic feedback between the tube and speaker. Early tubes are apt to have this problem more often than modern ones because their elements are not well braced.

Don't discard a microphonic tube if it is good otherwise. The tube may work fine in another position or another

Don't Rub off Your Tube Numbers!

Chances are, the tubes of most every vintage radio that comes into your hands will be covered with some sort of grime. And you may very well be tempted to use a cloth and some detergent to clean off the glass and make the tube look new again. But if you do that without taking precautions, you could very well clean off the tube number along with the grime. Those tube IDs may look as if they are permanently etched into the glass—but in reality they are usually stencils that are quite water soluble. Your best bet: leave the grime on the number, cleaning carefully around it.

If the number is already very faint, postpone any cleaning until you've done your best to identify it with a magnifying glass under various types of lighting. If you are able to do that, put the ID on an adhesive sticker attached to the base or somewhere on the bulb. Conventional wisdom is that you can temporarily intensify a very faint number by exhaling on it or brushing the area through your hair. But I've never had a bit of luck with either technique.

—Ed

set. The detector stage is especially sensitive to microphonic tubes, and many manufacturers provided "shock mounting" for the detector tube socket on rubber cushions or springs.

LOW EMISSION

The oxide coating on a filament or cathode eventually becomes exhausted and can no longer emit enough electrons to form a space charge. When this happens, the tube is worn out. Power amplifier and rectifier tubes are more critical in this regard because their emitters must supply large currents. Small voltage amplifier tubes are less affected by low emission problems.

Early tubes used tungsten filaments activated with thorium. When the emission declined due to depletion of thorium at the filament surface, more could be brought up by briefly applying an overvoltage to the filament. These tubes could be rejuvenated quite successfully.

Many articles have been written claiming that oxide-coated filaments and cathodes can be rejuvenated in similar fashion. I have tried it countless times with little success. When I did succeed, the rejuvenation lasted only a few hours.

TUBE TESTERS

If you plan to repair many radios, you should have a tube tester, otherwise you may locate someone who will let you use theirs. There are two types of testers: one measures transconductance and the other emission. The first type is expensive, but it tests the tube under dynamic conditions. The emission test is a static test. However, emission testers are cheaper, more available and perfectly satisfactory for servicing work because emission and transconductance are related.

The emission tester measures plate current under a fairly heavy load and displays the result on an arbitrary 0-100 scale. The division between "Good" and "Bad" is usually at 50. Both types of tester will test for shorts and gas. If you buy a tester, get an older model that has the 4- and 5-pin sockets and lists the settings for antique tubes.

Some testers made in the 1950's or later considered these tubes obsolete and didn't provide for testing them. Be sure you get the operating manual also.

Don't skip any tests, especially the shorts and gas tests. If a tube tests weak, don't discard it. The best test is to replace the suspect tube with a known good one to see if it makes a difference. If not, use the weak tube.

In fact, you should make a practice of saving all your bad tubes, even those that can no longer be used in radios. Some older ones make interesting displays, and the bases are good for making adapters and plugs. Next time we will discuss the rest of the equipment you will need to get started in radio repair.

ABOUT THE ANTIQUE WIRELESS ASSOCIATION

The Antique Wireless Association is an organization of over 2100 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.

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; 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.

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!

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.

You are now reading the first issue of *The AWA Gateway*, the latest addition to the AWA family of publications. It's delivered electronically and free of charge—downloadable from our website 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 publication.

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 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 ww.antiquewireless.org.

Members' Corner

News of Particular Interest to the AWA Membership

MUSEUM HAPPENINGS

FROM BRUCE ROLOSON, W2BDR, CURATOR

For all of you who did not get the opportunity for snow, well we have had our share. Even as I write this report, yes, it is snowing once again. Only 12" of snow in the forecast by morning, oh joy!

Good progress has been made in organizing the collections at the Max Bodmer Library. The voluminous Vacuum Tube data from the RCA Harrison Plant has been organized and placed on new shelving. These books hold the specifications for all tubes manufactured at that plant. Ron Roach and Jack Roubie took the job on and have completed it. It took them some time to figure out the original coding.

Progress is also being made on the Radio Club of America's archives. New files have been prepared for all the material, which has been organized for research and scanning.

In the tube loft of the Gauss Road Facility (exhibit preparation building), the pre-octal tube types have been organized, boxed and stored in specially made drawers made for them. On to the octal tube types! Thanks for the hard work of Ron Walker, Joe Granica, Sandy MacMillan and Gib Buckbee. I think Dan Waterstraat is getting to the bottom of the pile of parts to be put away. Any time we need a part for a piece of equipment to be repaired Dan can find it very quickly.

It has been good to walk through the test and repair area of the building just to see what is going on. One one typical Tuesday (the regular volunteer day), I saw Lynn Bisha and Joe Granica putting final touches to the AWA Museum ham station. On the next bench Tom Ely was testing a pair of 3-500Zs to go into a linear.

(From left) Jim Kreuzer, Lynn Bisha, Ron Roach and Bob Hobday look over recent donations to the museum.

Next to him, Roy Wildermuth and Duncan Brown have just got a military radio working; the same model used on President Truman's "Independence" plane They ask, would I like to hear it working? Next is John Atwood repairing one of our signal generators. All this in a 20-foot space! Just around the corner Ed Gable is updating the donated materials list on a PC. A very active place!

The dealers in the Antique Shop (New Museum building) have moved out to a new shop across the road. I'm

Ron Roche examines one of the newly-organized specification books from the RCA Harrison, NJ tube plant.

A portion of the new museum building. With the antique dealers gone, Ron Roche's crew will soon be be demolishing various internal partitions to make way for new construction.

including a photo to give you an idea of just how big the building really is. Ron Roach's crew is beginning the work of demolishing various internal partitions to make way for the exciting museum construction to come.

I will be making some organizational changes, especially the naming of new Assistant Curators, in my next report. This is to get us ready to assign responsibilities for the areas and displays to be developed in the New Museum.

FROM RON ROACH (W2FUI) MUSEUM OPERATIONS MANAGER

Twenty-one volunteers are currently gathering each Tuesday to work in the Gauss Road Facility or at the Media Center. New volunteers Jay Golden, George Haupt and Bill Tolan focus their efforts at Gauss Road while Amy Brandlin, our first woman volunteer, works at the Media Center, organizing the print material on the shelves in the library. Jack Roubie and Ron Roach completed the fabrication and placement of the open shelving needed in bay 3 downstairs to facilitate the sequential organizing of the complete tube archives from the RCA Harrison, NJ plant. This collection awaits its inclusion in the print data base by Warren Wiedemann. The upcoming 2011 Spring Meet will take place on Saturday, May 7th, opening to sellers at 7:00 a.m. and the general public at 8:00 a.m. Inside tables and outside spaces will still be priced at seven dollars, but there will be no registration fee. Instead, participants will be asked to contribute a free will donation which will be added to the development fund for the new museum. At the Meet, the annual AWA sale and auction will take place and the latest information on the development of the new museum will be presented by Bruce Roloson, Curator.

In April the engineering firm and the architectural firm will present site plans for approval at a meeting of the East Bloomfield Planning, subsequent to a review by Ontario County, allowing construction on the Museum site to begin.

RECENT MUSEUM DONORS

Robert Stiles
Hydraulic Lift table for use in warehouse
Ron Nelson KA2GLG
TenTec, Yaesu and more amateur radio equipment
Richard Mayne
NIB Conn Organ spares; 12AX7, 6L6GC, etc
Claude Peters
Webster Chicago type 18 wire recorder
Dale Rowekamp
Teletype 28KSR, box NIB ribbons and paper, manuals
Adam Czepiel
Early documentation from WBZ radio, RCA Radiotrons, more.
Bonnie Gamache
Vivitar USB SD/HC Card Reader, NIB, for use in library
Jack Roubie K2JDD
Large collection amateur radio and test equipment
Louis Leone
Panasonic and Epson printers for use in conference office
Jim Haynes
Nice selection of new hardcover books on telegraphy
Jan Perkins N6AW
Large collection of items from the estate of Don Wallace W6AM
Paul Beyer
Optimus portable color TV, working
Doug Dunlap KC2MJB
BC-348, BC-312 MIL receivers
Fran Greetham K2KK
Huge amateur radio collection: Viking Ranger, SX-117 with LF converter, Matchbox, Vibroplex and Lional bugs, NC-98 and speaker, TenTec Scout with 10 bands, MFJ Balanced tuner, TX and RX tubes, much more…

Compiled by Ed Gable
Curator Emeritus

Clubs That Will Welcome You

• 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 Koogle: mail to above address; phone (937) 294-8960; e-mail KARLKRAD@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, "Spring Meet in the Carolinas," on the 4th weekend in March. Executive committee meets approximately quarterly. For more info, visit the web site at 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.

• 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 Oscilla-

tor. 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 web site: www.hvra.org. Membership is $20/yr. Address: HVRA, PO Box 31276, Houston TX 77231-1276 or call Bill Werzner, 713-721-2242; email: minggi53@sbcglobal. net.
- Hudson Valley Antique Radio & Phono Society—Meets third Thursday of month, 7 p.m. Meeting, swap meet, and membership info: Peter DeAngelo, President, HARPS, 25 Co. Rt. 51, Campbell Hall, NY 10916. (914) 496-5130.
- Indiana Historical Radio Society—Meets quarterly in Feb., May, Aug. and Oct. Flea market, old equipment contest and auction at all events. The IHRS Bulletin has been published quarterly since 1971. For meet details and information about the club and our Indiana Historic Radio Museum in Ligonier, IN. see our website at www.indianahistoricalradio.org, contact Herman Gross, W9ITT, at 1705 Gordon Dr., Kokomo, IN 46902-5977 (765) 459-8308, or email w9itt@ sbcglobal.net.
- London Vintage Radio Club—This Ontario, Canada club meets in London on the first Saturday of January, March, May, June and November. Annual flea market held in Guelph, Ontario in September in conjunction with the Toronto club. Contact: Lloyd Swackhammer, VE3IIA, RR#2, Alma, Ontario, Canada N0B1A0. (519) 638-2827. E-mail contact is Nathan Luo at lvrceditor@ yahoo.com.
- 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 web site for schedules, details and maps.) Contacts: President, Geoff Shearer, 14408 Brookmere Dr., Centreville, VA 20120, 703-818-2686 e-mail gshearer@cox.net; Membership Chair, Paul Farmer, 540-987-8759, e-mail: oldradiotime@ hotmail.com. Website www.maarc.org
- New Jersey Antique Radio Club—Meets second Friday each month, 7:30 p.m. Holds three annual swap meets. Visit the website, www.njarc.org or contact Phil Vourtsis, 13 Cornell Pl., Manalapan, NJ 07726, (732) 446-2427, pvourtsis@ optonline.net.
- Northland Antique Radio Club—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 web site at www.geocities.com/northland. geo/; contact Ed Ripley at (651) 457-0085; or write NARC, P.O. Box 18362, Minneapolis, MN 55418.
- 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 Sat. in May. For more information, contact Mike McCrow 503-730-4639; e-mail: 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. Website: 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. 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, 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 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. e-mail dwjw@gvtc.com; website www.gvtc.com/~edengel/TARC.htm
- Vintage Radio and Phonograph Society (VRPS) meets monthly on the 3rd 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, or by contact VRPS President Jim Sargent at 817-573-3546 or bsargent@swbell.net
- The Antique Radio Club of Illinois (ARCI)—Meets bimonthly. 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 web site 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