The Radio Collector®

September-October, 1995

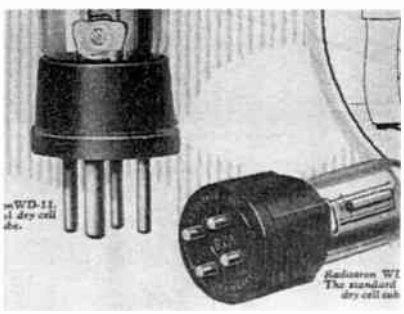
The Receiving Tube Story
Part 6 - Chronology of Vacuum Tube Development

Our discussion of receiving tube development really ended with the conclusion of Part 5 *(The Format Wars)* in the last issue. But before leaving the subject, I thought it might be a good idea to give you a chronological listing of the major developments in the physical and electrical design of tubes during the period (about 1920 through 1940) covered by the series. Almost all of the "landmarks" summarized here have been discussed in some detail in one of the preceding parts of the series, though some new material has been added.

I'd also like to call your attention to the Ken Owens' *Issue Dates of Receiving Tubes* chart on p. 3 of the May, 1994 issue. Ken's chart lists dates of issue by type number, thus providing another insight into the development of the vacuum tube.

1920

RCA releases the type UV-200 (detector) and the type UV-201 (amplifier). These were the first receiving tubes produced for the home radio mass market. Their 5-volt filaments were designed for storage-battery operation.



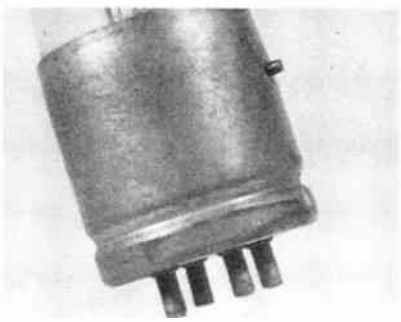
Drawing from RCA ad shows WD11 (upright) and WD12 tubes. Note fat pin (plate connection) at front of WD11 base.

1922

Type WD-11 released by Westinghouse. Its filament operated from a single 1.5-volt dry cell, making it suitable for portable (or at least "transportable") operation. Its unique base pin design was not compatible with any other type.

1923

RCA releases three new types: the UV-201A (an improved version of the UV-201 requiring only 25% of the filament current); the UV-199 (filament operated by three 1.5-volt dry cells); the WD-12 (a version of the WD-11 having standard UV base.

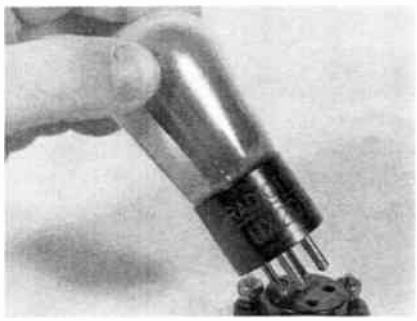


"UV" base had locating/locking pin for bayonet mounting, short contact pins.

Because of the high-efficiency thoriated tungsten filaments in the UV-201A and UV-199 tubes, it became necessary to use a *getter* to remove all traces of oxygen from the bulb. The getter was typically a internal magnesium pellet that was fired off as the bulb was being evacuated. This consumed the oxygen and also left a silvery deposit on the inside of the glass.

An earlier getter compound, used only briefly, left a rainbow-colored deposit. Rainbow tubes are prized by collectors.

Westinghouse and RCA agree that Westinghouse broadcast-radio products, including the WD-11 and WD-12 tubes, will be sold *only* under RCA's (Radiotron) brand name.



After 1930, tube bases lost side pin, could no longer be bayonet mounted. "Push-in" installation became the standard.

1924

The pointed "tip seal" began to disappear from the top of the UV-200, UV-201 and UV-201A bulbs--moving to the bottom, where it could be protected inside the base. However, the bulbs retained their original pear shape. The WD-11 bulb became narrower in diameter, but retained its tubular shape. Bakelite replaced brass as the base material for all tubes except the WD-12.

1925

The long-pin UX-type base (designed for push-in sockets) replaced the short-pin UV-type base (designed for bayonet-mount sockets). But the horizontal "locating and locking pin" was retained so that the new tubes could still be bayonet-mounted into the older sockets.

The WD-11 and WD-12 bulbs lost their pointed tip seals and acquired magnesium getters, making their bulbs silvery inside rather than clear.

The WD-12 tubular bulb was reduced in diameter to match the 1924 change in the WD-11 bulb, and its brass base was changed to bakelite.

New tube types introduced included:

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WX-12 (same as WD-11 and WD-12, but with UX-type base); UX-112, 120, 210 (power amplifiers); UX-213 (full-wave rectifier).

1926

New tube types introduced include: UX-200A (improved version of UV-200 having thoriated filament, long-pin base); UX-171 (power amplifier).

1927

New tube types introduced include: UX-222 (battery-filament, tetrode [screen-grid] amplifier); UX-226 and UY-227 (AC-filament amplifiers); UX-112A and UX-171A (improved versions of UX-112 and UX-171 power amplifiers); UX-280 (heavy-duty, full-wave rectifier).

1929

Release of UX-224 (AC-filament tetrode [screen-grid] amplifier)

1930

Horizontal locating and locking pins began to vanish from tube bases, so the new generation of tubes would no longer fit the old UV-style sockets. At the same time, type numbers are simplified by dropping the old prefixes. For example, the UX-201A became the 01A, and the UY-227 became the 27.

Release of 24-A (quicker-heating version of the type 24).

1931

Release of the first pentodes: type 33 (battery filament); type 47 (direct heated [no cathode], but suitable for a.c. operation); type 38 (for auto radios but indirectly heated [cathode-equipped], so suitable for AC operation as well).

Release of the 35/51 variable-mu screen-grid amplifier

1932

The pear-shaped bulb used on most tubes up to that time began to disappear, to be replaced by the type "ST" (sometimes known as the "taper-top," "dome-top" or "double-dome" style).

Release of the type 39 pentode (r.f. amplifier, companion to type 38), and other indirectly-heated pentodes including the types 59 and 42 power tubes and the types 57 and 58 r.f. amplifiers.

1933

"2-digit" tube numbers are exhausted; new "number-and-letter" system, based on tube function and characteristics is introduced.

1935

First metal tubes released.
First "glass-octal" tubes released.

1936

6L6 beam-power amplifier released.

1938

First "GT" tubes released.

1939

First "single-ended" tubes and first series of "Loktal" tubes released.

1940

First miniature tubes released.

With this "Chronology of Vacuum tube Development" our *Receiving Tube Story* series is completed. Watch for a new topic in the next issue!--**MFE**

FROM THE EDITOR

My apologies on being out a little bit later than usual this month. I was slowed down somewhat by an unusually heavy work load in my consulting business and some illness in the family. However things are back to normal now, and I hope our expanded size (two additional pages) will make up for the delay!

Because of the two extra pages, the half-sheet we usually put in the center of each issue has become a full sheet. That means it is possible to saddlestitch the binding of this newsletter in keeping with the more substantial publication it is now becoming. And so, printer willing, you should see a couple of staples holding the pages of this issue neatly together.

You subscribers have been great in responding to the plea I made last time for more reader interaction. It is your articles and letters that have made this 12-page issue possible. Keep them coming and I'll be delighted to keep sending you a 12-page "RC." Of course, if I can't fill the pages, I'll have to drop down to the smaller size again.

The many reader responses to Julian Jablin's *Monthly Mini Quiz* suggest that there is a lot of reader interest in the early history of wireless. This month, *The Radio Collector* is pleased to bring you the first installment of the three-part article *The Early Development of Wireless Communication*. (See page 4).

Written by my fellow *Popular Electronics* contributor James P. Rybak in collaboration with technical translator and researcher Leonid N. Kryzhanovsky of St. Petersburg, Russia, this work gives us an authoritative picture of the accomplishments of the earliest wireless pioneers.

Please also join me in welcoming a brand new columnist to our pages. Chuck Schwark will be bringing us the very timely *The Internet Connection* (see p. 11). Chuck is an electronics engineer with over 20 years of experience in the design and fabrication of video and audio systems. He has a strong background in physical sciences, mathematics, electronics and computer software.

If you are not on line yet, Chuck will help you get oriented to this valuable

(continued on p. 8)

PLAY IT AGAIN!

A No-Nonsense Course in Radio History, Evolution and Repair

SERVICING A.C. POWER SUPPLIES

A Word About Safety

Let's begin this topic by discussing safety. The Columbus, OH paper of July 19, 1994 reported the death of a man who was installing a stereo in his car. He had installed a second battery in the trunk in series with the car's battery for "extra power". He was electrocuted when he came in contact with the 24 volt output of the batteries. It took only 24 volts to kill this man, and AC sets have hundreds of volts under the chassis.

I could give you a long list of don'ts, but most are simply common sense. Treat that chassis like a nest of snakes and don't handle it or poke your fingers in it while it is operating. Unplug the set when replacing components. Expect the unexpected because faults can put high voltage where it shouldn't be.

Transformer and Resistor Checks

To begin servicing an AC set, first test the power transformer. Remove *all* tubes, plug the set into the lamp test rig you built last time and turn it on. The lamp should not glow at all. If it does, you probably have a shorted power transformer. You can stop here unless you have a replacement or can rewind transformers.

If the transformer is good, unplug the radio and check all the resistors in the power supply with your ohmmeter. Most of these old resistors were wirewound units. The bleeder was usually a single resistor with taps. If any resistors are open, replace them. It is safe to repair open bleeder sections by soldering the replacement across the bad section without disconnecting it. Strange values were used because there was no standardization in 1927. If the calculations called for a 1632Ω resistor, that's what they used. You can use the nearest standard value with no problems.

If the values of the bleeder sections, or other resistors you may find open, are not given on your schematic, they can be determined by experimentation. I'll be discussing this issue in a later column. Use only 10 watt resistors for replacing defective wirewound units. You can't check the center tapped resistors across the filament windings unless you disconnect them. The low resistance of the winding makes readings meaningless. We will check them later when we have the set going.

Establishing B+ Voltage

For your second test, turn off the set, insert the 80 rectifier and turn the set on. If all is well, the lamp will not glow--or will glow very dimly if the set has a bleeder resistor. If the set passes this test, you should be able to detect B+ voltage at all the output points. Referring to last month's diagram, the voltage to the 71A is typically 150-180 with all tubes in place. It and all other DC voltages will measure higher at this stage with no tubes in the set.

If the lamp glows half brightness or more in the above test, quickly turn off the set because there is a short in the power supply. One or more filter capacitors are probably shorted. This is common in old radios. I generally run this test only on sets with paper capacitors. If the set has electrolytic capacitors, they should be replaced on sight. In my experience, 50-60+ year old electrolytics are never good.

It is interesting that RCA paper capacitors are rarely bad whereas Atwater Kent units are rarely good. If *any* of the paper capacitors are bad, replace them all. You will have to use electrolytics because large paper capacitors are no longer made.

Modern electrolytics are superb and are excellent replacements for paper filter capacitors. Watch the polarity when installing them! If you wire them backwards, they will be destroyed when you turn on the set. Early set manufacturers often put all the capacitors in a metal box and filled it with tar. You will have to remove the box from the chassis, melt out the tar and put the replacements inside to preserve the original appearance.

Most old electrolytic capacitors dry out rather than short and have only a fraction of their original capacitance. The set will hum badly with this condition. Since they are not shorted, you may be tempted to wire replacements across the old units because it is easier. *Don't do it*! The old capacitor may short at any time. Disconnect the old capacitor, but leave it on the chassis for appearance if it is the can type. Connect your replacement to the appropriate points under the chassis.

Second B+ Test

We have now located and replaced all bad filter capacitors and resistors. Leaving the 80 in its socket, turn on the set again. You should now get B+ at all points. If some of the voltages are missing, one or more bypass capacitors (labeled "CB" on last month's diagram) may be shorted. If any are bad, replace all of them. Typical values were 0.2-0.5μF. I use 0.27μF/600V "Mylar" units for bypass replacements.

These capacitors may be potted into boxes and require melting out. If 600V capacitors are too large to fit the boxes, you can use 400V units. I use 600V units where possible for the added safety margin. Some bypass capacitors may be on the radio chassis instead of the power supply chassis. Be sure to check them also.

On rare occasions, a choke is open. You can use modern replacements, but you may have to melt tar again. Repeat the test once more to make sure all B+ voltages are present. Don't worry about the actual value of the voltage now because we will fix any additional problems later.

In sets using electrodynamic speakers, the speaker field coil replaces one of the chokes. We will discuss speaker problems next time, when we will power up our set.

Conducted by Ken Owens
478 Sycamore Dr.
Circleville, OH 43113

Ken will be happy to correspond directly with readers who have questions about radio theory or repair. Please include a long SASE with your query.

THE EARLY DEVELOPMENT OF WIRELESS COMMUNICATION

Part I: The Work of Heinrich Hertz and Oliver Lodge

By James P. Rybak and Leonid N. Kryzhanovsky

As the world commemorates the 100th anniversary of Marconi's development of "radio," it is timely to reflect not only on Marconi's early wireless telegraphy achievements but also on the related work of several of his contemporaries. In addition, it is interesting to consider possible reasons why Marconi succeeded in developing a workable wireless communication system while the others, who also were highly talented, seemingly let the opportunity to become known as the "Father of Radio" slip through their fingers.

Marconi's work broke down the existing conceptual barriers concerning the ability to communicate with electromagnetic waves. He achieved what many scientists of the time thought never could be done. It was Marconi's successes with his wireless telegraphy system which ultimately led to the development by others of wireless telephony together with television and the other forms of wireless communication upon which we depend today.

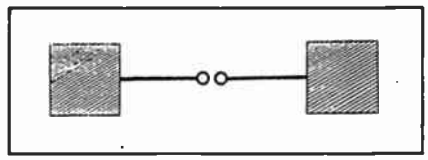
However, it is not correct to think of radio as having been "invented" either on a particular date or as the result of solely one person's efforts. The development of a practical wireless telegraphy system by Marconi is the result of the contributions over a period of time of many other people in addition to Marconi, himself.

Scope of this Discussion

It is not even possible to list all the individuals who contributed in some way to the development of wireless communication prior to Marconi's transmission of signals across the Atlantic Ocean in 1901. Our intention is to demonstrate these points by summarizing the achievements, motivations, and distractions of a significant few of those people whose work contributed to the very early development of what we, today, call "radio."

In the first part of this discussion, the work of Heinrich Hertz and Oliver Lodge will be reviewed. Subsequent segments will describe some of the achievements of Alexander Popov as well as those of Marconi, himself.

The experiments with inductive wireless signaling by others whose work came prior to that of Hertz are interesting but will not be discussed here as those experiments did not employ electromagnetic waves which truly were "radiated." The work of David Hughes (1831-1900) also will not be included in these discussions. While Hughes apparently did generate, radiate, and detect true electromagnetic waves as early as 1879 (nine years before the work of Hertz), he seemingly had very little, if any, true concept of the type of waves with which he was working.



Hertz's exciter or "radiator."

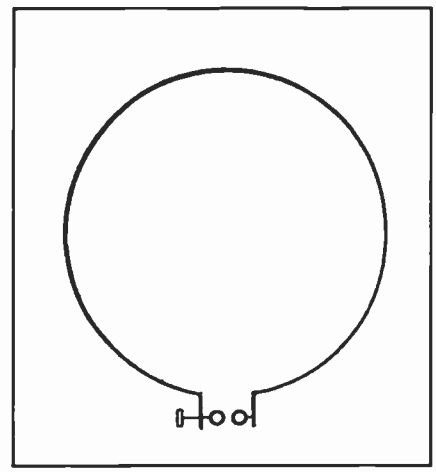
Hertz Confirms Maxwell's "Waves"

In 1887 and 1888, Heinrich Hertz (1857-1894) conducted a series of experiments in Germany which convincingly demonstrated the existence of the electromagnetic waves predicted in 1864 by James Clerk Maxwell (1831-1894). Hertz's exciter, or "radiator" as he called it, was created from a pair of conducting rectangular plates. Alternatively, Hertz sometimes used two conducting spheres measuring 10 to 30 cm in diameter. Each of the two conducting surfaces was connected to a wire rod which was terminated in a small round metal knob.

The large conducting surfaces of his "radiator" were charged by an induction coil. The small metal knobs formed a spark-gap whose spacing could be varied and across which an arc discharge occurred. Increasing the charge put on the exciter increased the spark-gap width across which arcing could occur. This, in turn, increased the intensity of the resulting electromagnetic waves generated.

The two large conducting surfaces effectively formed a capacitor and the wire rods exhibited inductance. Together, they formed a tuned circuit which determined the frequency of the electromagnetic waves produced.

Hertz's detector, or what he called his "resonator," was simplicity in the extreme. He used a circular or sometimes a rectangular loop of wire approximately 2 meters in length with the ends arranged to form a spark-gap. The length of this spark-gap, like that of the exciter, could be varied with a micrometer screw adjustment. Needless to say, this arrangement did not produce a very sensitive detector.



Hertz's detector or "resonator."

Nevertheless, Hertz conducted a number of indoor experiments with electromagnetic waves. These experiments clearly showed the reflection, refraction, and polarization similarities between electromagnetic waves and light which Maxwell had postulated. Hertz was able to measure the wavelength of the electromagnetic oscillations produced and showed that their velocity of propagation was finite and equal to the speed of light. Hertz knew that he had proven conclusively that electromagnetic waves do exist and can be produced easily.

Hertz never tried to use electromagnetic waves for signalling and even denied the practicability of such an under-

(continued on p. 8)

About the Authors. . .

James Rybak has been interested in both radio and electronics, first as a hobby and then as a profession, for almost 40 years. He teaches at Mesa State College in Grand Junction, Colorado and holds Extra Class amateur radio license W0KSD. In recent years, Rybak has published numerous articles in the United States and abroad on the history of radio and on the development of electrical technology.

Leonid Kryzhanovsky is a resident of St. Petersburg, Russia. He works as a technical translator, as an information officer in a state-run electronics institute, and as a free-lance researcher at the Popov Central Museum of Communications in St. Petersburg. Kryzhanovsky has published numerous articles in Russia and abroad on the early history of electricity and the origins of wireless telegraphy.

INFORMATION EXCHANGE

This is an open forum for interaction among our readers. Here you can ask questions about some aspect of our hobby, answer a question that's been posed or pass along other information of general interest. Send your questions, answers and information to **The Radio Collector**, P.O. Box 1306, Evanston, IL 60204-1306. Submissions may be edited or paraphrased.

QUESTIONS TO BE ANSWERED

Identifying Meter Movements

Can someone send in a letter or article on how to identify the true range of a meter movement? You can usually tell if it measures a.c. or d.c. voltage or current from the printed scale. But the meter may be designed to work with an internal (or no longer available external) series or shunt resistor. Thus its basic range will be quite different than what is indicated on the scale.--Alan Dubois, Queensbury, NY.

ANSWERS TO QUESTIONS

Another 45 Substitute

Regarding Bob Zinck's question about a substitute for a 45 tube in the July-August issue, you mentioned that a 2A3 could be used. Although that is what the Allied Electronics Data Handbook also suggests, I happened to come across an item in an old issue of Radio Crafts in which the 2A5 cited as a possible substitute..

I really enjoy The Radio Collector and your column in Popular Electronics.--Ray Kilcoyne, Lakewood, CO.

Appreciate the kudos, Ray! Re the 2A5 substitution: it should work, but an appropriate 4-prong to 6-prong adapter, constructed along the lines suggested by Bob, would have to be put together. The 2A3 is a direct plug-in replacement. Actually, though, I'd rather hunt up a 45 rather than waste a (much rarer) 2A3 or 2A5 as a substitute.--Ed.

Response to "VTVM Quandry"

On the VTVM discussion, I owned a (Knight Kit) VTVM long before I had a good VOM. It worked pretty well, but the biggest pain in the neck was waiting for it to warm up when I wanted to make a quick measurement. The next biggest, when I was in a hurry, was chasing the zero drift around.

Said Knight is no longer on my bench. There's a Hewlett-Packard 410C, a hybrid tube/transistor model that cost me $25 at a hamfest, for those occasions when I need an analog VTVM. There's a Simpson 260 VOM that gets used as an ohmmeter for checking intermittents, or as an auxiliary voltmeter or ammeter. I also have an assortment of panel meters in case I need to monitor two or three things simultaneously. But the most-used instrument is a Fluke 79 DVM that I bought new. The Fluke is accurate, rugged and fast. Once you get used to the autoranging voltmeter or ohmmeter, you will never put up with manually switching a VOM or VTVM again. Never! You can read all the pin voltages on a radio-tube socket as fast as you can move the probe around the circle; polarity too.

The only thing it won't do is measure the value of a leaky capacitor; you need a capacitance bridge for that. And for an erratic or fast-changing value, the digital readout is worthless. But overall, I'd recommend a new DVM along with whatever older analog meters you can pick up cheaply (you'll need the new DVM to calibrate the older instruments).--Alan Douglas, Pocasset, MA.

GENERAL

Pilot Precaution

Here is a note I found packed inside the box of a NOS Ken-Rad 35Z5GT rectifier tube:

CAUTION

If the dial lamp in the set in which this tube is to be used is burned out, it is important to replace it before the receiver is turned on. The proper lamp can be identified by the brown glass bead across the filament support leads. A section of the heater in the 35Z5GT tube is overloaded if this precaution is not observed.

This precaution makes very good sense since the typical dial lamp (a #47 or #44) provided a small current drop in the total series string filament current. Substituting an improper dial lamp can shorten the life of the rectifier heater as noted above. The colored glass bead in a dial lamp is a color code for the lamp type and will be very helpful in identifying lamps you may have in your stock.

A table of common lamp bead codes and types is at the bottom of the page.--Chuck Schwark, Chicago, IL.

More on Tube Substitutions

In his article on tube adapters, Bob Zinck suggested that there is no reason that 7- and 9-pin miniatures can't be used as substitutes for larger tubes.

I once encountered a strange "tube" new in an off-brand box. The box was marked 3A4/47, and inside was a miniature tube built onto a male tube base for a 47. I never tried it out, but I once found a similar assembly in a Philco 90 cathedral. It was a 3A4 in its proper miniature socket with copper wires (about #16) running from the socket lugs down through the pin holes of the 47 tube socket. *And* it worked. I restored the set to its original configuration, but the jerry-rigged adapter sure made for some good conversation with my fellow collectors.

In the same vein, I recently needed a replacement 35Z5 tube and grabbed one from my "used" box. It tested good, so I installed it in the set and fired it up. No pilot light, so I installed a new #47 bulb. Still no pilot light! Huh?

Checked out the socket and the wiring and then made sure with the ohmmeter that the lamp was ok. When it passed that test, I pulled the 35Z5, only to find that pins 2 and 3 were connected with a solid wire. Looked like a "quick fix" from WWII. "We can't make the pilot light glow, but at least you'll have radio stations until 35Z5's become available."--Stan Lopes

Pilot Lamp Specifications By Bead Color

Lamp No.	Bead Color	Base Type	Volts	Amps	Use
40	Brown	Screw	6-8	0.15	Dials
41	White	Screw	2.5	0.50	Dials
42	Green	Screw	3.2	#	Dials
43	White	Bayonet	2.5	0.50	Dials & Tuning Meters
44	Blue	Bayonet	6-8	0.25	Dials & Tuning Meters
45	*	Bayonet	3.2	#	Dials
46**	Blue	Screw	6-8	0.25	Dials & Tuning Meters
47	Brown	Bayonet	6-8	0.15	Dials
48	Pink	Screw	2.0	0.06	Battery Set Dials
49	Pink	Bayonet	2.0	0.06	Battery Set Dials
50	White	Screw	6-8	0.25	Auto Radio Dials
51**	White	Bayonet	6-8	0.25	Auto Radio Dials
55	White	Bayonet	6-8	0.45	Auto Radio Dials

* White in GE and Sylvania, Green in National Union, Raytheon and Tung-Sol.

** Frosted Bulb

\# 0.35 in GE and Sylvania, 0.5 in National Union, Raytheon and Tung-Sol.

Loading coil Inventors

Regarding the Mini Quiz in the last issue, the answer you're expecting is Michael Pupin, but the real answer is George A. Campbell. In a nutshell: Pupin got to the Patent Office first, but Campbell probably got his results earlier and certainly understood the mathematical principles better. It was Campbell's work that formed the basis for all later use of the loading coil. However, AT&T preferred to buy Pupin's

(continued on next page)

patent rather than litigate, which might well have resulted in no patent at all. Since Campbell was employed by AT&T he was in no position to complain.

Pupin perhaps redeemed himself by sponsoring Armstrong's early work at Columbia.--Alan Douglas, Pocasset, MA.

More Loading Coil Lore

The answer to the Mini Quiz in the last issue is Michael Idvorsky Pupin. In the AIEE Volume 16 (1899), Pupin published a paper on "Propagation of Line Electric Waves," and in Volume 17 (1900) another Pupin paper dealt with "Wave Transmission over Non-Uniform Cables and Long distance Air Lines." This lead to the theory of loading telephone lines to reduce line loss.

George Ashley Campbell of Bell Laboratories also independently developed a theory of loading, but it was Oliver Heaviside who predicted it first in 1887.

By using distributed inductive loading, frequency and lime delay distortion is greatly reduced, as is line attenuation. In modern cable circuits, loading coils reduce loss by 1/4 (6db).--Charles F. Brett, Colorado Springs, CO.

Book Reviews

CRYSTAL CLEAR, Volume 2 by Maurice L. Sievers. Sonoran Publishing, 116 N. Roosevelt, Suite 121, Chandler AZ 85226. ISBN 1-886606-03-X. 255 pages. 8 1/2" X 11". Softcover. 1995. $29.95.

An amazing variety of crystal set models were produced during the early years of the radio era. Just how many is anyone's guess, but this volume includes 172 sets plus over 110 crystal detector assemblies and individual crystals. *Volume 1*, its predecessor, identified 570 sets and 540 related items.

Collectors will find this volume (and its predecessor) most helpful in the always challenging exercise of identifying and dating a find. But *Crystal Clear, Volume 2* is more than a catalogue. It includes much useful background information about various devices and manufacturers mentioned in the text.

A major feature is the "graphics" section, which contains hundreds of photos and sketches arranged alphabetically by manufacturer. The "tables" section, organized in a similar manner, provides an easy to use reference for determining manufacturer, model, case type, detector type, original price and year made.

The fact that individually-sold crystals and crystal detectors are described as well as complete sets is quite helpful. While very many crystal sets were sold as complete "plug and play" units, there were countless tinkerers who were building their own sets using purchased parts.

The very comprehensive index covers both volumes of this series.--Julian N. Jablin, Skokie, IL

A RADIO BROADCAST BIBLIOGRAPHY, Parts 1 and 2 by Frank Bequaert. Rainy Day Books, P.O.B. 775, Fitzwillim, NH 03447. Each volume 42 pages, 5 1/2" x 8 1/2", soft cover, 1995. $10.00 each, $16.00 for both (postpaid).

The titles of these books tell you almost everything you really need to know about them: **Part 1** Books and Paper on Broadcasting History, Radio Yearbooks, the Radio Business and Broadcasting Techniques. **Part 2** Biographies of Radio Personalities, Books and Paper on Radio shows, Radio Scripts and Radio Fiction.

A great deal of information is stuffed into these two volumes; better than 1,300 items are listed. A sampling of subjects includes histories of broadcasting, pioneer stations, radio broadcasting in wartime, the social impact of radio, pirate stations, radio personalities, radio humor, broadcast-related fiction and more.

With so much available, selecting and organizing the material must have been a massive undertaking. Bequaert was up to the task. Selection was probably the easier job, "merely" listing almost everything published on the subject in English. the organization of the material--to make it accessible and useful to the reader--is the real accomplishment. Bequaert's unique system of codes and designations is a major aspect of the work.

Having noted that these two volumes are a valuable reference, add that they are just plain fun to scan. Almost every page listed one or more articles of more than passing interest, books that "one must read" one day.--Julian N. Jablin, Skokie, IL

THE RADIO COLLECTOR'S GUIDE TO PHILCO BAKELITE BLOCK CONDENSERS, 2nd.Edition, by Ray Bintliff; 1995; Beta-Tek Publications, 2 Powderhorn Lane,Acton, MA 01720-2014; 52 pages; 8-1/2" x 11" softbound booklet; $9.95

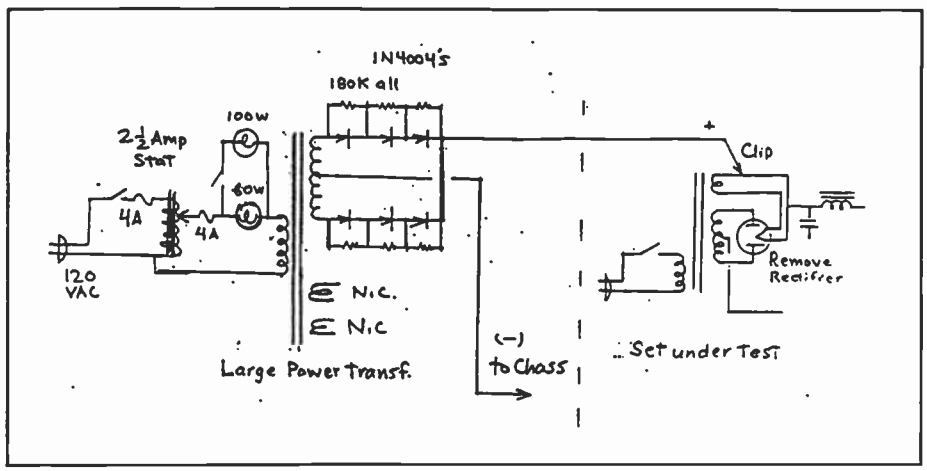
Up to this point in time, the only knowledge I had gathered on this subject was from schematics and one reference page from a Ryder's manual describing just a few of the more common block condenser types used by Philco in their 1930's and 1940's radio models. Mr. Bintliff's Guide gives a short history of the use of the bakelite blocks and describes the different types and styles. This booklet is a very good resource for any serious Philco collector and restorer. The amount of information gathered together in this one publication makes searching through numerous schematics and references unnecessary. It also has an extensive listing of all types manufactured, a pictorial section showing all terminal and component combinations and a part number cross-reference section as well.

The detailed descriptions of the terminal types, part numbering and construction are very helpful, but it would have been more convenient if the author had included, within the body of the text, illustrations for the various examples discussed. I found that flipping back and forth between the text and reference sections was a bit tedious. I would also have liked to see a little more detail on how to get the old components out of the bakelite shell.

Overall, The Radio Collector's Guide is a well researched publication and a very good reference and resource for any radio collector. -- Chuck Schwark, Chicago,

Start-Up Power Supply

Here is a "start-up power supply" that I find useful in powering long-dormant sets for the first time. First remove the set's rectifier tube, then clip the B+ line from the power supply to one of the rectifier filament connections. Slowly bring up the voltage with the variac (*labeled "stat" on the drawing--ed*) and watch for any signs of trouble. If one of the set's power-supply filter capacitors lets go, you wont be risking the radio's power transformer. And the well-fused oversized transformer in the "start-up supply" can take quite an overload without incident.--Ray Larson, West Los Angles, CA.



Ray Larson's "Start-Up Power Supply"

Another advantage of this "start-up supply" is the fact that it uses semiconductor diodes instead of a rectifier tube. With no filament to heat up, the rig begins delivering d.c. to the set's filter network even at very low settings of the variac. This allows the set's electrolytic caps to be "formed" much more gradually and effectively.--Ed.

CORRESPONDENCE FROM OUR READERS

letters may be paraphrased, shortened, or otherwise edited so that everyone gets a chance at the floor!

The Last Radio Store in New York

Some of you more mature (?) East-Coast readers will fondly remember New York City's "Radio row" -- comprising the four city blocks along West Cortland Street and its side streets. In the days before and after World War II, it was wall-to-wall surplus. If you were lucky enough to live in the area, this was the place you went on Saturday afternoons to find all of the bits and pieces needed to complete that home-brew radio.

As a teenager I counted pennies carefully until I saved enough for a ride on the subway (five cents then!) and a few carefully-selected radio parts. Shopping for those treasures took most of the afternoon, and trudging from store to store was half the fun.

It's all gone now, replaced by the massive World Trade center complex. But one radio landmark survives, off the main drag on Broadway. It's Barry Electronics, an old friend from the halcyon era of surplus. Barry himself died some years back but wife Kitty, a spry golden ager, still carries on.

The surplus market has dried up--no more mysterious black boxes reputed to have cost the government untold thousands to make. Barry's shelves couldn't produce a single power transformer or oil capacitor.

Walk-in customers are few, but mail-order is big, with names like Yaesu, Icom, Hallicrafters and Drake appearing on the invoices. Barry also sells a lot of Motorola communications gear, largely in South America.

Yes, it *is* the last radio store in New york, but the good old days are definitely gone.--Julian N. Jablin, Skokie, IL

NYC's Radio/TV Museum

When visiting New York City, you might want to consider spending a couple of hours or more at The Museum of Television and Radio. You won't find any old "hardware" at this institution, but the five-story building does house a rich collection of broadcasting-related memorabilia.

In addition to these exhibits, you can attend regularly-scheduled live radio broadcasts and TV screenings. Or pick a program of your choice from the museum's 60,000-item database and review it privately in the Radio Listening Room or Video Console Room.

The museum is in Manhattan in the Radio City area (25 West 52nd St.). Admission is $6.00 for adults, $4.00 for students and seniors, $3.00 for children under thirteen. Phone them at (212) 621-6800 for scheduled activities and visiting hours.--Julian N. Jablin, Skokie, IL

Pfanstiehl/Fansteel

It was interesting to read your note on Pfanstiehl (*Company Chronicles, July/August 1955*). I just purchased a Pfanstiehl Overtone Model 20 (page 226, Volume 2 of Alan Douglas' *Radio Manufacturers of the 1920's*). I also remember using tantalum capacitors made by Fansteel Metallurgical Corporation all through the 1950's. Enclosed is a copy of an advertisment for these caps, which took me quite a while to find!--Charles F. Brett, Colorado Springs, CO.

Source of Crystal Set Lore

Those who are drawn to crystal set construction projects should consider joining The Xtal Set Society. The Society is ". . .*dedicated to once again building and experimenting with radio electronics, often - but not always - through the use of the crystal set, the basis for most modern day radio apparatus.*"

Detail from Charles Brett's Fansteel Ad

To join the society and receive one year of the bi-monthly newsletter, remit $9.95 to the Xtal Set Society. Canadians US $11.00. Those outside the US and Canada US $16.00. Contact the Society at PO Box 3026, St. Louis, MO 63130. Phone (314) 725-1172; Fax (314) 725-7062;E-mail 73653.1064@Compuserve.com.--ed

Tube Series Comments

Regarding your Part 5 tube story in the last issue, I'm certain you know that a 6H6 is a dual diode, not a dual triode. You probably put that there as a test to see if anyone is reading your articles.--Tony Jacobi, Ralston, NE.

No test, just an embarrassing typo. But it is nice to know that you read the article!

Here are a couple of comments on the tube story in the last issue. One good reason for the popularity of glass octals over metal was the radio manufacturers' insistence on using socket pin 1 for a tie point; there could be up to 300 volts on it. If you ever grabbed a metal 6L6 in one of these sets with the power on, you would quickly decide to use only glass in the future.

The locking feature on "Loctal" tubes was a necessity because the short, small prongs used in this design had little "stiction." I have repaired many a car radio by simply pushing a loose Loctal back into its socket. Remember, some of these tubes were mounted sideways or upside down.--W.R. Cobb, Laguna Hills,CA.

I guess the point I was trying to make about Loctals was that the whole concept was redundant because the standard octal base prongs tended to remain seated in their sockets without much help. Of course, that was a moot point because Philco's motivation for introducing the Loctal was really promotional rather than functional.

By the way, Loctal tubes may have tended to seat loosely when they were new, but I've had a devil of a time removing stuck-tight Loctals from the sockets of vintage radios. I assume the problem is caused by corrosion. Haven't had enough experience with this to determine whether the hangup is in the prongs or the locking device. Has anyone else had similar problems?--Ed.

Liked the tube article. Those who want more info on the 6L6 might want to look up the June, 1936 issue of QST. It contains an article by George Grammer outlining the features of beam power tubes in general and the then-new 6L6 in particular.

On the 7-pin miniature a.c.-d.c. tubes, I didn't really see many of these until about 1949. By then, octals had all but disappeared in small sets. There have been cases where the same model set had octal tubes during its 1948 production run and 7-pin miniatures (12BE6 etc.) in 1949.--Ray Larson, W. Los Angeles, CA.

Philco Cap Article Comments

There is one point that I overlooked in my recent article on Philco caps (July//August 1995 issue). It came to my attention when reader Fred Braddock (Editor of the Southern California Antique Radio Society *Gazette*) wrote me about the discrepancies he found in the accompanying table and block condenser drawing.

Fred noticed that there was an extra lug on some types that was not accounted for on the terminal listing. What I failed to mention was that Philco blocks often have an extra terminal with no internal connection. It's simply there to be used as a tie point for external circuit connections.--Chuck Schwark, Chicago, IL.

(continued on p. 11)

WIRELESS COMMUNICATION
(continued from p. 4)

taking. Hertz died at the age of 36 before he could reconsider that contention.

Lodge's Improved Detector

In Britain, independently of but concurrently with Hertz, Oliver Lodge (1851-1940) also experimentally verified the existence of electromagnetic waves. Hertz, however, published the results of his work prior to Lodge. In 1894, Lodge improved Hertz's experimental apparatus by using, as the wave detector, a filings tube coherer based on that developed in 1890 by Edouard Branly (1846-1940).

Perhaps Lodge's most important improvements to the filings tube coherer were the evacuation of the air from the filings tube and the development of an automatic "tapping back" device which utilized a rotating spoke wheel driven by a clockwork mechanism. The mechanical impulses provided by the tapping back device thereby restored the filings tube coherer to its non-conducting state at regular intervals, independent of the detection of electromagnetic waves. This filings tube coherer detector was considerably more sensitive than the wire loop "resonator" with a spark gap used by Hertz and was more convenient to use than was the spherical knob coherer detector Lodge had previously developed.

Lodge used his improved coherer together with a Hertzian oscillator as part of a demonstration for a commemorative lecture entitled "The Work of Hertz" given in London at a meeting of the Royal Institution in June of 1894. A sensitive mirror galvanometer was connected to the coherer so that the detection of the electromagnetic waves was visible to the audience. Later that same month, Lodge used a small portable receiver connected to a mirror galvanometer to demonstrate the detection of electromagnetic waves at the annual "Ladies' Conversazione" of the Royal Society in London.

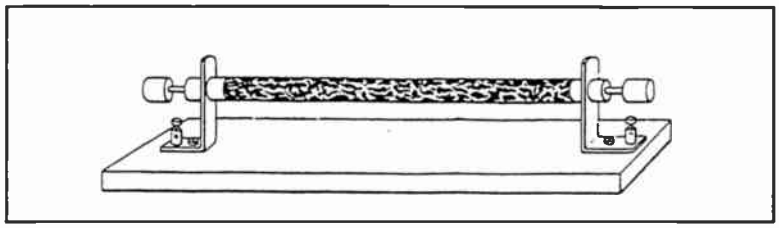
Oliver Lodge demonstrated essentially the same apparatus at a meeting of the British Association held at Oxford in August of 1894. For that demonstration, however, he replaced the mirror galvanometer with a marine galvanometer of the type normally used for the detection of submarine cable telegraphy signals. Lodge's source of electromagnetic waves, located in another building some 55 meters away, consisted of a Hertzian oscillator energized by an induction coil. A telegraph key connected to the primary winding of the induction coil was used by Lodge's assistant to send both long and short duration trains of waves corresponding to Morse code dots and dashes.

Lodge clearly had all the necessary elements of an elementary wireless telegraphy system. While it can be argued successfully that Lodge did indeed achieve signalling of a sort, there is no indication that the sending of any "messages" was accomplished or even attempted with this apparatus. It was not his intent to do so.

Oliver Lodge never considered using his equipment for communicating, although the idea of wireless telegraphy had been suggested two years earlier by William Crookes. The purpose of Lodge's demonstration at Oxford was to propose that perhaps there exists an analogy between the way a coherer responds to electromagnetic waves and the way the eye responds to light.

Lodge later admitted that, at the time, he had not seen any advantage in using the relatively difficult process of telegraphing across space without wires to replace the well developed and comparatively easy process of telegraphing with the use of connecting wires. He, like virtually all of his contemporaries, believed at the time that electromagnetic waves travel only in straight lines as does light. (Maxwell, after all, had shown that light is nothing more than electromagnetic waves with very short wavelengths.) Consequently, Lodge assumed that the maximum possible range attainable using wireless signalling would be very limited. These reasons help us to understand why, in Oliver Lodge's own words, ". . . stupidly enough no attempt was made to apply any but the feeblest power so as to test how far the disturbance could really be detected".

In fairness to Lodge, however, one should never think that he was lacking in either insight or in astuteness. His exceptional perceptiveness and keenness of mind when conducting experiments had been demonstrated time and time again. What likely is the principal reason he failed to investigate any practical possibilities for wireless signalling is that Lodge, first and foremost, was a scientist and a teacher. He was interested in advancing science and teaching others about science, not in the development of commercial applications of science.



Lodge's Iron Filings Coherer (Early Form)

The work of Alexander Popov in Russia as well as that of Marconi in Italy and England will be discussed in the second part of this three part article.

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[9]J. Mulligan (editor), *Heinrich Rudolph Hertz (1857-1894) - A Collection of Articles and Addresses*, Garland Publishing Inc., New York and London, 1994.

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FROM THE EDITOR
(CONTINUED FROM P. 2)

meeting ground and resource for antique radio hobbyists. He'll also be sharing interesting pieces of information that have been posted to the Internet.

If you are already on line, and have information and insights about the net to share with our readers, be sure to contact Chuck (e-mail CASchwark@aol.com)

That's about all I have for now, but in the meantime thanks again for your support and be sure to keep those contributions coming!

MFE

VINTAGE BOOK REVIEWS

Books from the era when vintage radios were new! Look for them at swap meets, flea markets and used book stores.

RCA RECEIVING TUBE MANUAL. Published by the Tube Department, Radio Corporation of America, Harrison, NJ. Published periodically beginning circa 1935. This review based on Editions RC-14 (1940, 256 pages), RC-15 (1947, 256 pages) and RC-16 (320 pages). All 5 1/2" x 8 1/2", softcover.

Working on a vintage radio without some type of tube manual is like driving in a strange city without a road map. You might find your way, but not without running into a lot of blind alleys.

There are a number of vintage manuals to be found at radio meets, but the well-known RCA Receiving Tube Manual provides more useful information than most. It's a highly recommended addition to any radio collector's library.

The RCA manual is more than a mere listing of vacuum tube types. It is, indeed, a short course on vacuum tube theory and practice. The opening sections of the book present a brief, but comprehensive, introduction to electron tube elements, tube characteristics, applications and installation. Also provided are notes on vacuum tube installation and classification.

The bulk of the book contains the material of most immediate interest to the radio collector--pages upon pages of "Technical Data For Each tube Type." This is where you go to look up tube pinouts as you follow manufacturer's schematics or to get a picture of typical element voltages when you have no specific service data to go on.

But before using this section for the first time, don't be tempted to jump immediately to the data on the tube you are interested in. Take a few moments to study the sections titled "Interpretation of Receiving Tube Ratings" (Manual RC-14) or "Interpretation of Tube Data" (Manuals RC-15 and RC-16). These will give you a much better idea of what you are looking at as you study the ratings and application notes in the manual proper.

Also often overlooked is the essential "Key to Terminal Designations of Sockets" found at the beginning of the tube data section of the RC-14 or the "Key to Socket Connection diagrams" on the inside front cover of the RC-15 and RC-16. Knowing where to find this section means that you won't have to guess at the sometimes cryptic letter codes used to identify the various tube socket terminal connections.

Additional pages following the tube data section contain useful information on tube testing, resistance-coupled amplifier circuit parameters, typical vacuum-tube circuits and typical tube envelope dimensions.

Each of the three editions of the manual reviewed here provided very adequate information on the 1920-1940 vintage tubes likely to be of greatest interest to collectors. In addition, the 1950-vintage RC-16 which, at 320 pages, contains some 64 additional pages over the previous two editions, contains information on types likely to be of interest to early TV collectors.

Very late editions of the manual (such as the RC-30 [1975] edition in the author's possession) will also be of interest to collectors, but tend to provide only sketchy information on the early tubes.

RADIO SET SOCKET LAYOUT GUIDE. Published by RCA Radiotron Division, RCA Manufacturing Co., Inc., Camden, NJ. Second edition, 1935. 256 pages. 4 1/2" X 8", softcover.

This second edition, covering sets manufactured between 1921 and 1935, incorporates most of the key data from the First Edition (1921 to 1932, 196 pages). There may very well have been later volumes, but so far none have come to the author's attention.

As the title implies, this is essentially a guide to tube layouts only, though some associated information is provided. Tube complement information is given in two formats: tabular and diagrammatic.

The tabular section is an alphabetical list of more than 100 manufacturers, giving individual models (many with dates of introduction). The basic circuit (TRF, superhet, etc.) for each set is mentioned, as well as both the tube lineup (by function and type) for each set and the pilot light style. Certain additional information (including whether the set is equipped with AVC) is listed in a "Misc." column. The diagrammatic section includes the same radios, giving a pictorial tube position layout of each.

The volume is indexed by manufacturer at the front of the book. And at the back will be found a seven-page section containing technical data and basing information for some 75 tube types, possibly all of the types in production at that time.

The *RCA Radio Set Socket Layout Guide* is certainly a worthwhile find for any radio collector. It's an interesting antique in its own right, and would certainly be invaluable as a quick reference to which tubes should be plugged in where in that stripped Sterling *Minstrel*.

Your editor (left) with Bart Lee, Vice President of the California Historical Radio Society, during a quiet moment at the (1994) AWA Rochester meet. Photo by George Durfey, Los Altos, CA.

Guest Reviewer
Julian N. Jablin

Editor's Note: Reprints of the RCA Receiving Tube Manual RC-19 (380 pages, 1959, $10.95) and of the RCA Radio Set Socket Layout Guide 1921 to 1935 (256 pages, $9.95) are available from Antique Electronic Supply (see ad on back page).

Conducted by Paul Bourbin, 25 Greenview St., San Francisco, CA 94131
e-mail address:
paulbourbin@delphi.com.

Please feel free to correspond with me at any time about old radio books.

COMPANY CHRONICLES

Brief biographies of Classic Radio Manufacturers

CROSLEY RADIO

BETTER · COSTS LESS

Born in 1886, Powel Crosley was the son of a prominent Cincinnati attorney. He was fascinated by automobiles from an early age, and also had a strong entrepreneurial streak. By 1913 he had started up, and failed in, three different automotive manufacturing ventures--most of which were undercapitalized with borrowed money.

That same year, regrouping with a less grandiose plan, he started a mail-order automobile accessories business with a $500.00 investment of his own money. This proved successful, and he was soon able to buy out the company whose products he was selling. He also purchased a printing company so that he could produce his own advertising materials and diversified by acquiring a phonograph cabinet manufacturing plant.

In 1921, Crosley became aware of the radio market through shopping for a receiver for his son. He was shocked by the high prices and he and his son eventually built their own set.

Crosley had been bitten by the radio bug and was also quick to see the potential in low-priced radio apparatus. He designed a few basic radio parts, which he sold along with the products of his phonograph cabinet plant. By now, the latter was also making cabinets for radio manufacturers, including Grebe.

Desiring to manufacture complete, simple sets for the low-priced market, Crosley required an Armstrong regenerative license. His first "Harko" brand sets were manufactured by Tresco (Tri-City), a licensee firm. But the entrepreneur soon (early in 1923) purchased Cincinnati-based Precision Equipment Company, which also possessed an Armstrong license.

Because of licensing technicalities Crosley had to maintain the Precision radio trade name ("Ace") in addition to his own. However, by 1924, the Crosley and Precision firms were merged and Crosley was able to drop the "Ace" trademark.

Merger accomplished, the new firm soon branched out of the one-tube niche with the Crosley 51--which boasted a stage of audio amplification in addition to the regenerative detector. This was probably developed to compete with the similarly configured RCA Radiola III, which was just coming out.

Because of the popularity of the 51, other sets were added to the line--including the one-tube Crosley 50 and the three-tube 52. There were also add-on amplifiers for making a 50 or 51 into the equivalent of the 52. Also in the new line was the Trirdyn, a 3-tube receiver which used reflexed circuitry to approximate the performance of a 5-tube set.

1924 was a peak sales year for Crosley, enabling the firm to purchase a large interest in Deforest/Canada. And late the following year, Crosley bought the assets of the distressed Amrad Company, including the trademark, manufacturing plant and Neutrodyne license.

1926 saw the first model of what was to become a successful line of refrigerators. In 1927, the firm began an association with DeForest Radio which--though financially troubled--had a substantial portfolio of patents and a profitable tube manufacturing business. Crosley's interest in this firm was apparently instrumental in giving him the leverage needed to secure the favorable patent license agreement with RCA signed the same year.

In 1928, the firm enjoyed record sales and profits with a line of single-dial metal-cabinet table models patterned after Atwater Kent's. Like the AK firm, Crosley then geared up for high-priced console production just in time for the Crash. Though ringing up four years of deficits, the firm did survive the Depression and was sold to Avco in 1945. The appliance, radio and TV lines were discontinued in 1956.

The information for this company biography was obtained from Alan Douglas' three-volume encyclopedia "Radio Manufacturers of the 1920's," published by Sonoran Publishing, 116 N. Roosevelt, Suite 121, Chandler, AZ 85226, and copyrighted 1988, 1989 and 1991 by Alan Douglas.

DICK'S CORNER

Tips and Tidbits from the World of Antique Radio Collecting and Restoring

Tube Manuals-A Collector's Essential

I strongly suggest that an RCA tube manual be one of the first books placed in the your library. If possible, get copies from the early 30's 40's, 50's and 60's, as the manuals feature the tubes most commonly used at the time of publication. They also include schematics of radio circuits typical of their periods.

When you must attempt to troubleshoot a radio without the aid of a schematic diagram, your tube manual will at least identify the filament, plate and grid base pins. Quite often typical operating voltages will be given for these elements, and you can compare them with the voltages actually observed.

Sometimes you may find that a set has been rewired--either professionally or amateurishly--so it doesn't match its schematic. A lot of this was done during World War II in order to substitute for unavailable tubes. Again, the tube manual will help you sort out these modifications.

You may also find that a tube of the wrong type has been substituted in one of the sockets. The set may or may not be still playing well, but--in any case--the manual will help you determine if the substitute has the appropriate base connections and operating characteristics. You will discover other uses for your tube manual as you spend more time in this hobby.

Now we'll discuss a second type of tube manual, the tube substitution manual. The information in such a manual may make it possible for you to substitute a tube you already have on hand, or one that is easier to obtain, for a tube you require to put a set in working order. A good manual will tell you whether each proposed swap will give excellent, good or only fair results.

Substitution manuals also often provide cross references between commercial and industrial; foreign and American; and military and civilian designations. Generally speaking, the later the manual, the more information it will contain.

Another manual that can be a vital asset to the collector is Anthony Jacobi's ballast tube handbook. Ballast tubes are high-wattage resistors, usually housed in plug-in housings resembling metal tubes. They were used in place of line-cord resistors, or chassis-mounted power resistors, to drop the line voltage to the proper value to operate the series-wired filament string in early a.c.-d.c. sets. There was little standardization of types or numbering systems for ballast tubes, though some manufacturers produced "universal" ballast tubes that--with slight modification--would substitute for a multitude of different numbers. Worse yet, many cheap "house brand" radios with ballast tubes were sold only for limited periods of time, and no schematics are now available.

Jacobi's manual, reproductions of certain RCA tube manuals, newly compiled and reprinted tube substitution manuals and other helpful references are available through Antique Electronic Supply and other dealers in literature for antique radio restorers.

Conducted by Dick Mackiewicz

THE INTERNET CONNECTION

Information From and About Antique Radio in Cyberspace

By now, you've heard many things about the Internet. There are as many opinions on what the Internet is (or is not) as there are people who offer them. Granted, there are good points and bad points. But whether you "surf the Net" or don't know a floppy disk from a slipped disk, there is a vast array of information and knowledge out there just waiting to be tapped.

Where does all this computer stuff fit in with antique radios? I thought you'd never ask. There are many places on the Internet that are of special interest to restorers and collectors like ourselves. Through this column I will be guiding you through this territory and pointing out interesting sites to visit and information that can enhance your enjoyment of this growing hobby.

First, there are some new words, phrases and acronyms to become familiar with, and here are a few of the most often encountered:

E-Mail: Electronic mail; a text message sent from one computer to another computer via a network.

FAQ: Frequently Asked Questions. Usually a file in question and answer format. FAQ's are mostly associated with newsgroups.

Internet: The world wide network of other computer networks and individual computer users.

Newsgroup: A chartered Usenet discussion group centered on a specific topic where messages are posted and replied to.

Online: Connected to a remote network or information service like America Online, Compuserve, Genie or the Internet.

Usenet: Specific computer networks within the Internet used for worldwide distribution of news and discussion groups.

World Wide Web (or *The Web*): A network of computers that deals with text documents and graphics on the Internet. These documents, or pages, have links that interconnect with other pages -- hence the name Web.

You may be saying to yourself, "I don't own a computer." or "I leave my computers at work." But this column should still interest you because we will be offering information on collecting and restoring that has appeared on the Internet. For example the chart on this page, providing the civilian equivalents of military receiving tube designations (including many early types), was edited from a list posted to the net by Ken Schroyer of State College, PA.

Those who already have a connection to the Internet will be interested in our recommendations concerning net resources and sites to "visit" If you are just getting started, I'd recommend visiting the newsgroup *rec.antiques.radio+phono*.

The name may be a little confusing at first. The '*rec.*' stands for recreation which is a hierarchy in the newsgroup realm. Other titles are: *sci.* for science, *comp.* for computers, *news.* for news. Under the recreation title there are many other sub-titles of which '*antiques.*' is just one. The '*radio+phono*' relates to the specific newsgroup created by and for radio and phonograph restorers and collectors. Topics on this newsgroup range from the simple "Where can I find..?" questions to complex technical discussions of circuitry and troubleshooting techniques. Having been on this newsgroup for a year and a half, I have increased my knowledge and gained a better appreciation of this hobby. *Rec.antiques* has become my home base on the Net.

Like many other Usenet newsgroups, *rec.antiques.radio+phono* maintains and updates a FAQ list that is posted in five parts, usually at the beginning of every month. Downloading these is a must for any serious collector. There are listings of parts suppliers, tube sources, print resources and the like. If you are new to *rec.antiques* I'd bet that many of your questions have already been discussed and answered and now appear in the FAQ's. Reading these first will save you much time you would otherwise spend re-asking the same old questions.

That's about all for now. Remember this column is for you, the reader. I welcome your suggestions and comments as well as any tidbits you may have come across on the Net that can be shared with everyone. This column will, no doubt, be evolving as new information becomes available and as you (and I) learn more about the Net.

Conducted by Chuck Schwark
e-mail address CASchwark@aol.com

VT-7	WX-12	VT-92A	6Q7G	VT-166	371A
VT-24	864	VT-93	6B8	VT-167	6K8
VT-25	10	VT-93A	6B8G	VT-167A	6K8G
VT-25A	10 Spl.	VT-94	6J5	VT-168A	6Y6G
VT-26	22	VT-94A	6J5G	VT-169	12C8
VT-27	30	VT-94B	6J5 spl.	VT-170	1E5-GP
VT-28	24, 24A	VT-94C	6J5G spl.	VT-171	1R5
VT-29	27	VT-94D	6J5GT	VT-171A	1R5 Loc.
VT-30	01A	VT-95	2A3	VT-172	1S5
VT-31	31	VT-96	6N7	VT-173	1T4
VT-33	33	VT-96B	6N7 spl.	VT-174	3S4
VT-35	35/51	VT-97	5W4	VT-176	6AB7
VT-36	36	VT-98	6U5/6G5	VT-177	1LH4
VT-37	37	VT-99	6F8G	VT-178	1LC6
VT-38	38	VT-103	6SQ7	VT-179	1LN5
VT-40	40	VT-104	12SQ7	VT-180	3LF4
VT-44	32	VT-105	6SC7	VT-181	7Z4
VT-45	45	VT-107	6V6	VT-182	3B7/1291
VT-47	47	VT-107A	6V6GT	VT-183	1R4/1294
VT-48	41	VT-107B	6V6G	VT-185	3D6/1299
VT-49	39/44	VT-112	6AC7	VT-188	7E6
VT-50	50	VT-114	5T4	VT-189	7F7
VT-52	45 spl.	VT-115	6L6	VT-190	7H7
VT-54	34	VT-115A	6L6G	VT-192	7A4
VT-56	56	VT-116	6SJ7	VT-193	7C7
VT-57	57	VT-116A	6SJ7GT	VT-194	7J7
VT-58	58	VT-116B	6SJ7Y	VT-196	6W5G
VT-63	46	VT-117	6SK7	VT-197A	5Y3GT/G
VT-65	6C5	VT-117A	6SK7GT	VT-198A	6G6G
VT-65A	6C5G	VT-124	1A5GT	VT-199	6SS7
VT-66	6F6	VT-125	1C5GT	VT-201	25L6
VT-66A	6F6G	VT-126	6X5	VT-201C	25L6GT
VT-67	30 spl.	VT-126A	6X5G	VT-205	6ST7
VT-68	6B7	VT-126B	6X5GT	VT-206A	5V4G
VT-69	6D6	VT-131	12SK7	VT-207	12AH7GT
VT-70	6F7	VT-132	12K8 spl	VT-208	7B8
VT-74	5Z4	VT-133	12SR7	VT-209	12SG7
VT-75	75	VT-134	12A6	VT-210	1S4
VT-76	76	VT-135	12J5GT	VT-211	6SG7
VT-77	77	VT-135A	12J5	VVT-213A	6L5G
VT-78	78	VT-145	5Z3	VT-214	12H6
VT-80	80	VT-146	1N5GT	VT-215	6E5
VT-83	83	VT-147	1A7GT	VT-221	3Q5GT
VT-84	84/6Z4	VT-148	1D8GT	VT-223	1H5GT
VT-86	6K7	VT-149	3A8GT	VT-229	6SL7GT
VT-86A	6K7G	VT-150	6SA7	VT-231	6SN7GT
VT-86B	6K7GT	VT-150A	6SA7GT	VT-233	6SR7
VT-87	6L7	VT-151	6A8G	VT-239	1LE3
VT-88	6L7G	VT-151B	6A8GT	VT-241	7E5/1201
VT-88A	6R7	VT-152	6K6GT	VT-243	7C4
VT-88B	6R7GT	VT-152A	6K6G	VT-244	5U4G
VT-89	89	VT-153	12C8	VT-247	6AG7
VT-90	6H6	VT-161	12SA7	VT-264	3Q4
VT-90A	6H6GT	VT-162	12SJ7	VT-268	12SC7
VT-91	6J7	VT-163	6C8G	VT-288	12SH7
VT-91A	6J7GT	VT-164	1619	VT-289	12SL7
VT-92	6Q7	VT-165	1624		

Civilian Equivalents of Military "VT" Designations edited from list posted to Internet by Ken Schroyer (State College, PA).

CORRESPONDENCE *(continued from p. 7)*

I have a Philco Model 71 with three condenser blocks not listed among those in Chuck Schwark's article in your last issue. They are as follows:

3615-AF (twin 0.05, lugs 4-8 and 7-8); **3903-AA** (0.01, lugs 7-1); **4989-L** (0.09 plus a 200-ohm resistor, lugs 4-8 and 3-8 respectively).—W.R. Cobb, Laguna Hills, CA.

The cap list in Chuck's article was taken from a Rider's manual chart of the most common Philco block condenser types used during the thirties and forties. Surprised we struck out on every one of the blocks in your Model 71! However, for a much more comprehensive block listing, you might like to pick up a copy of Ray Bintliff's book (reviewed by Chuck in this issue's Information Exchange column). Also see Tony Jacobi's comments below.

A couple of addenda to Chuck Schwark's Philco cap rebuilding article in the last issue. I prefer to unsolder the internal leads first, then heat the block case with a heat gun until the whole mess can be slid out. Be careful not to apply too much heat; you don't have to melt the potting compound to free up the insides. Absolutely do not pry against the side walls of the block as they are thin and extremely brittle.

(continued on next page)

CLASSIFIED ADVERTISING

Subscribers may place one free classified ad, up to 30 words long, in each issue. Count your name, ham call (if desired), complete address and one phone number as six words. Do not count the words in the boldface heading. Additional words are 15 cents each per issue. Non-subscribers pay 30 cents each per issue for all words. Free ads will be automatically run in two issues, but expire after their second insertion unless renewed by mail or phone. Those wishing to run the same ad for extended periods of time may want to use a "business card" space (see Display Advertising Dimensions and Prices table elsewhere in this issue). This is a boxed area in which we can print your business card or any advertising message that will reasonably fit (no charge for setting type). We reserve the right to make editorial adjustments in classified ads without advance notification and to refuse advertising at our discretion. We will reprint, without charge, any ad containing typographic errors, but assume no other financial responsibility.

Wanted NE-51 neon lamp (bayonet style base). Gary Berlucchi, 67 Vincent St., So. Portland, Me. 04106. (207) 799-8860.

Wanted tuning knob w/insert, or just insert, and volume knob, for Emerson 707 Series B. Also tuning knob for Y600 (or similar) Trans-Oceanic. Terry Schwartz, 340 Oakwood Dr., Shoreview, MN 55126-4821. (612) 483-4173.

Wanted to borrow service manual/schematics for Singer/Gertsch FM10CS Station Monitor. Marvin Moss, Box 28601, Atlanta, GA 30358.

Wanted 5-tube radio kit similar to the one that was provided in the NRI home-study course. Claude Jordan, 3010 Acorn Rd., Augusta, GA 30906. (404) 793-9079

Wanted Old headphones, headphone parts, plugs, adapters, junction boxes, paper. I will purchase any amount, or trade for phones not in my collection. Dick Mackiewicz 1549 N. River Rd., Coventry, CT 06238. (203) 742-8552.

For Sale Radio collection database for IBM XT or above. Stores information on each radio and your spare tube collection. Prints out list of tubes used by radios and comparative list of spare tubes used in your stash so you know what you need when you go to a swap meet. Requires dBaseIII--demo included. $20.00. Allan Brown, 3934 Stonecrest Rd., Woodlawn, On. KOA 3MO.

For Sale Old-style crystal radio kits. Includes face panel, base board, variable capacitor, prewound coil, many parts. Remit $22.50. Carl & Grace Ent., 5636 Romeyn, Detroit, MI 48209.

For Sale Reproduction crystal detectors, replacement Philmore domes, new loop antenna wire, grille cloth - more! SASE for details. Need some oddball part or information? Drop me a note. I'll try! Dick Mackiewicz, 1549 N. River Rd., Coventry, CT 06238. (203) 742-8552.

For Sale Crystal Radio Kits, complete with face panel, base board, variable capacitor, prewound coil amd many parts for old style radio. Remit $22.50, Carl & Grace Ent., 5636 Romeyn, Detroit, MI 48209.

CORRESPONDENCE
(continued from previous page)

I believe Chuck is going into overkill in refilling the blocks with hot glue after replacing the parts. That would present quite a problem if one of the *new* capacitors ever had to be replaced. Modern capacitors are usually molded types that don't require additional protection from moisture.

These block capacitors came in various voltage ratings from 200v. to 1200v. For anyone interested in obtaining a fairly complete listing of them, Gordon Rolston at Frankenstein's Radio Lab in Pasadena, TX has one available. Ray Bintliff also has a nicely laid out book on them, available from Antique Radio Classified in Carlisle, MA. Contact them for prices. For some reason, Mr. Bintliff did not list any voltage ratings in his book--at least not in the edition I have. Frankenstein's does list the voltages.--Anthony Jacobi, Ralston, NE.

Don't Take Tube Complement for Granted

A short time ago, I chanced on a small table model about 30 years old. It had the usual line-up of five 7-pin miniature tubes: 12BE6, 12BA6, 12AV6, 50C5 and 35W4--or so I thought. On pulling the tubes and looking them over, I found a 12GA6 instead of the usual 12BE6 mixer.

A 1966 tube manual showed that the 12GA6 mixer was intended for the 12-volt tube/transistor hybrid car radios of the late 1950's. The set was working with the 12GA6 and it also worked with 12BE6. So what?

The 12GA6, designed to work with a maximum of 16 volts on the plate, drew about 20 ma. at the 150-odd volts available in the a.c.-d.c. circuit (far less than the 12BE6, which was designed to work at the higher voltage). This significantly loaded down the B+ line and, no doubt, shortened the life of the tube.

Moral: don't take it for granted that the right tube is in the right socket when trouble-shooting radios. Even a set that plays fine can hide surprises!--Ray Larson, West Los Angeles, CA.

MONTHLY MINI QUIZ

Match wits with our quiz editor! See next month's issue for the answer, as well as the names of all readers who responded correctly.

This American Nobel-prize-winning physical chemist was a man of many achievements. His work was instrumental in the development of early vacuum tube and light bulb technology.

Answer to last month's quiz--Michael Pupin. Correct answer sent in by Charles F. Brett, Alan Douglas.

Conducted by Julian N. Jablin