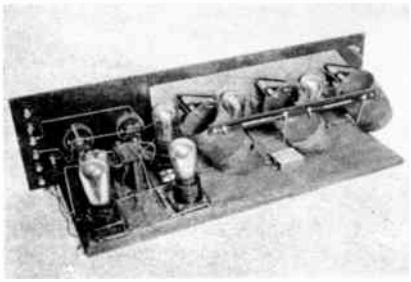
The Radio Collector

March, 1994

Evolution of the Broadcast Receiver

Part 3 - The Radio Becomes a Home Appliance

In the first two installments of this series we followed the evolution of the family broadcast receiver from the crystal and regenerative sets of the early 1920's, through the emergence of the TRF (or "3-dialer") radios that became



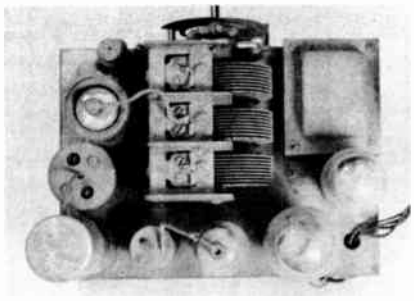
1920's 3-dialer has typical breadboard-style, "straight line" construction.

dominant later in the decade, to the emergence of a.c.-powered and superheterodyne designs. Now we're ready to move into what I think of as the "transition period" of radio development. This extremely interesting evolutionary phase began during the late 1920's and continued throughout the first few years of the 1930's.

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

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

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



On this 1930's chassis, components are grouped in semicircle around single-shaft, three-gang tuning capacitor.

Integration of Parts and Circuitry

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

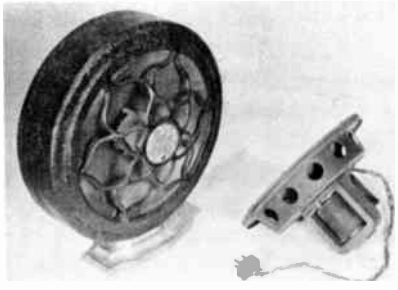
The latter innovation made it possible to change from the "row-style" construction layout to a more compact, roughly semicircular, arrangement. The tubes, coils and other components associated with the r.f. circuits could now be grouped around the capacitor to minimize lead length. The detector, amplifier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

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

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

The Speaker Moves Inside

Changes in the construction and location of the loudspeaker also had a strong effect on the radio receiver's appearance and function. Formerly nothing more than an overgrown



Decorative housings (left) were shed as speakers gained powerful electro-magnetic drivers (right), moved inside.

headset driver incorporating relatively weak permanent magnets, the loudspeaker now was equipped with a powerful electromagnet operating from

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the receiver's d.c. power supply.

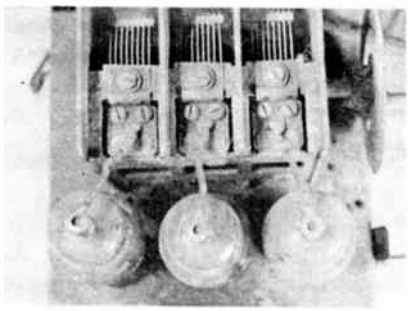
This, coupled with the increased audio output made possible by improved receiver design, made it possible to reduce the size of the speaker's paper cone and still obtain room-filling volume. The new d.c.-powered ("dynamic") speaker also lost its identity as an independent unit, shedding its decorative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

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

Classic cathedral shape was formed when side walls of cabinet wall curved in over top of enclosed speaker.

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

No discussion of "transition" receivers would be complete without mentioning the screen-grid tubes--notably the top-capped type 24-A--that were introduced during this era. These highly efficient r.f. amplifiers breathed new life into the old TRF designs, allowing them to compete just a while longer with the superheterodyne circuits that were beginning to dominate the market. The screen-grid TRF, with the top caps of its three 24-A's connected to the tuning capacitor via rubberized wires, is a commonly-found artifact of this era.



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

Downsizing For the Depression

The radio broadcasting industry thrived during the depression. A nation that had suddenly ran out of discretionary income was trying to find its entertainment at home, and the free programs were a blessing. Some of the most popular radio shows of all time had their beginnings during this period. But in order for radio receivers to be saleable, they had to be cheap; meaning that expensive components had to be eliminated and physical size had to be reduced. This was now quite feasible, because improvements in radio components and designs were making it possible to do more with less, and because radio stations were now more powerful and numerous, making them much easier to pick up.

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

MARC F. ELLIS

CORRESPONDENCE FROM OUR READERS

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

TESLA PROS AND CONS

We enjoyed reading Harry Goldman's very interesting letter about Tesla and Ken Owen's equally interesting reply. Both are printed here in their entirety and without comment.

Ken Owens' "Early Radio Pioneers" might well have included the contributions to wireless communications by Nikola Tesla. In 1891, Tesla had presented the first of three lectures utilizing inductively coupled high frequency circuits. In 1893, he demonstrated the basic 4-tuned circuit system that was to become so necessary for communications. Tesla's system employed antennae grounded at one end and tuned to the same frequency at both the transmitting and receiving circuits. In 1896, while others were experimenting with damped wave oscillating circuits, Tesla was sending continuous wave signals from his New York City laboratory to a point 26 miles up the Hudson.

L.P. Wheeler, in summing up Tesla's contributions to communications, credited Tesla "with the independent discovery of the principle of inductive coupling between the driving and working circuits, the importance of tuning both circuits, that is, the idea of an oscillation transformer, and the employment of the capacitance loaded open secondary circuit."

It has been quoted so often that I am hesitant in making mention of the fact that the U.S. Supreme Court, in 1943, declared the Marconi 4-circuit system invalid due to prior disclosure by Tesla, Stone, and Lodge. Incidental to this is the fact that Stone held a great admiration for Tesla ("it is difficult to make any but unimportant improvements in the art of radiotelegraphy without traveling part of the way at least, along a trail blazed by this pioneer. . .(Tesla) was so far ahead of his time that the best of us mistook him for a dreamer").

Another who was inspired by Tesla's work was Edwin H. Armstrong. In his tribute to Tesla, he stated that "Tesla was classed as a visionary and his prophecy was forgotten. What harsher terms might, with justice, be applied to many of us who helped produce the instrumentalities with which broadcasting was eventually accomplished! We applied the to point-to-point communication, failing completely to realize the significance of Tesla's words." -- *Harry Goldman, Tesla Coil Builders Association, Queensbury, NY*

Dear Mr. Goldman:

I omitted Tesla's work because there is limited space available for my column and because he did little to bring radio to commercial fruition. He was mainly interested in radio as a precursor to the wireless transmission of power. Loomis was included because he discovered wireless 20 years before Hertz published his work, immediately perceived its commercial value and took steps to realize it. He failed for reasons beyond his control, but not from personal shortcomings. Loomis also signalled over a distance of 18 miles - a feat that would not be repeated for more than 30 years.

Tesla's failure to develop or protect his discoveries in Radio is hard to explain in view of the fact that he did exhibit a practical nature early in his career when he invented the polyphase AC motor and alternator and successfully marketed them to Westinghouse, but Fessenden and Alexanderson, not Tesla, developed the alternator into a commercial source of continuous radio waves. He complained about Marconi's infringement of his tuning patent, but did nothing about it, whereas Lodge sued Marconi and won.

Clearly Tesla realized the value of wireless, but he thought on a grand scale. He announced great plans to transmit from Colorado to Paris in 1900, but nothing happened. He started the ill-fated Wardenclyffe project immediately thereafter. In typical grand fashion, he called it the "World Broadcasting Tower" which would blanket the earth and "bring enlightenment to the masses." After 15 years of eating cash, the project folded without results.

Meanwhile, Marconi and others proceeded in small steps, making incremental improvements and succeeding whereas Tesla was constitutionally unable to work this way. He operated on flashes of intuition followed by grandiose, impractical schemes accompanied by lots of publicity. Unfortunately, in this world, the credit goes to the successful, not the also rans.

Tesla was a genius, a prophet and a visionary. I can't imagine what he would have accomplished had his genius been accompanied by the meticulous work habits, self-discipline and practicality of an Edison. -- *D.K. Owens, Circleville, OH*

READER PLAUDITS

I was delighted to receive the first issue of your "Radio Collector" and look forward to future issues. I also wish you great success in this endeavor. Your first issue happened to feature the R.C.A. Radiola III, a set that I just recently acquired. . . -- *Richard Spratley, Chesapeake, VA*

In addition to a photo of the recently acquired Radiola III, Dick sent along this shot of his home-brew chairside radio. Converted nut-and-bolt keg houses auto receiver and its d.c. power supply.

I just wanted to drop you a note to tell you that I enjoyed the first issue of the Radio Collector. . . . If anyone in the Southern California area needs help in repairing or restoring an old radio I'd be more than willing to help, as I have a good supply of tubes and parts and a complete set of Riders manuals. -- *Harry Alenik, 14003 Judah Ave., Hawthorne, CA 90250. (310) 643-8100*

Received the first issue of *The Radio Collector* and was delighted. From your description of what you wish to accomplish, it sounds perfect for my needs. I was in radio maintenance during the Korean War, had some training from the Air force then in conjunction with that work, and have been tinkering with tube sets since--but on a very limited basis. Your publication gives me the opportunity to "knock the cobwebs off" and learn. -- *George Gianakaris, Woodbridge, VA*

SAFETY FIRST!

. . .I guess I guess most of us have had at least one close call with harm in our lives. Reading your article "Electrical Safety for Restorers" *(From our pilot issue published in September, 1993--Ed.)* reminded me of when I was a boy about 13 and had a strong desire to learn about radios. I had a five-tube superhet that I had taken out of the cabinet and it worked fine in the house (wood floor). Then one day I took it into our basement and plugged it in. When I went to turn it on (no knobs), I received the worst shock of my life. A lesson I never forgot. -- *Charles Juedemann, President, Antique Radio Collectors and Historians of Greater St. Louis*

Continued on next page. . .

. . .In the pilot issue you were concerned with safety and I can assure you that the subject cannot be over emphasized. However in the early thirties we did not have the isolation transformer readily available, so the "ground line" was our protection. . . .The ground line consisted of a clip lead (well insulated) wired to one terminal of a light bulb (RED was best). The other terminal was connected to a good ground. If the light came on when the clip lead was connected to the radio chassis and/or the negative "B" bus, the power plug was reversed in the outlet to make the set safe to work on. We used this test with transformer-powered sets as well as a.c.-d.c. radios because even the former could have a "hot chassis" if one of the line filter capacitors failed. -- C. Orval Parker, Pocono Summit, PA

SCRATCH-BUILDERS

. . .I have sent along a picture of a radio I built from scratch. I modeled it after a Philco 90 and a picture of a radio from a newspaper story I saved. The case was made from a piece of walnut and I turned the knobs on a lathe. The radio itself was made from scraps of other old sets. I would recommend that people who have the skills build a replicas of models they like but can't find. . . -- *Willy Young, Rt I Box 171A. Smithville, TN 37116. (615) 597-1072*

Here's Wily's fine-looking set. He's also interested in suggestions about publishers who might be interested in a radio-repair book he plans to put together.

I'm interested in some details on the Crosley 50. It looks like a very nice little set to build a reproduction of. From the photo of the back, I assume that the small pancake coil is pulled or pushed by the central knob. The rectangle part next to it looks like a capacitor, Is it? (Yes to both assumptions--Ed.) What I have in mind is to use my DeForest DR-4 as the tube. -- *Alton A. Dubois, Jr., Queensbury, NY*

More details on the Crosley 50 can be found in my antique radio columns of January and February, 1988 in "Hands-On Electronics" (predecessor to "Poplar Electronics"). Also check the January, 1989 column for a look at an amazing Crosley 50 replica built by Dan Damrow of Burbank, IL. You may be able to get copies of these books from Popular Electronics, Back Issue Dept., 500-B Bi-County Blvd., Farmingdale, NY 11735. The tube used in this radio was usually a type 12.

LIKES 30'S, EARLY 40'S SETS

. . .It has seemed to me that most guys want to "play" with stuff they used as kids, and I am no different. I started in the radio hobby at about age 14, when most of the sets I came across were 6-volt tube types from the early 30's to early 40's. They are still my favorites. I still can't get excited over 01-A's! -- *Ray Larson, W. Los Angeles, CA*

I have a soft spot for 30's sets myself, Ray, probably because we're about the same age. However, I can also turn on for the old battery sets, probably because I managed to fish several of them out of the trash when I was a kid!

COMPANY CHRONICLES

Brief Biographies of Classic Radio Manufacturers

BROWNING DRAKE

In the mid-1920's, at the height of the "radio craze," the newspapers and radio magazines were full of trick circuits--often bearing the names of the self-styled inventors, and usually backed by manufacturers with a vested interest in selling parts. To the casual contemporary reader, the Browning-Drake circuit might well have looked like just another over-publicized hookup of doubtful merit. However, it was actually one of the relatively few designs that were competently engineered and lived up to their advertising hype.

The Browning-Drake circuit had its origins in a mathematical study of tuned-radio-frequency amplification carried out by Frederick H. Drake in 1923 during his senior year at Harvard. Later, Drake approached Glenn H. Browning, who was a Research Fellow at Harvard, with the idea of making experimental measurements to confirm the mathematical analysis.

In carrying out this work, the two researchers found that the usual TRF transformer then in use had far too much capacitance between its primary and secondary windings. This lowered the amplification available from the circuit. To correct the problem, they designed a transformer primary formed of small wire wound in a thin slot. The result was a significant increase in gain.

The Browning-Drake circuit found quick acceptance, and the National Company (a Cambridge, MA neighbor of Harvard's), which had supplied tuning capacitors and vernier drives for the experimental circuits, collaborated on the mechanical design of a consumer oriented radio kit utilizing the design. Towards the end of 1924, it went on the market as the "National Regenaformer" kit.

About a year later, Browning formed the Browning-Drake Corp. to sell complete receivers while National continued to sell the kits. The company did well for awhile, but emerging technologies made the Browning-Drake circuit obsolete and, by 1930, the company was being operated by a creditor's committee.

The firm continued in business in 1937, when Browning founded Browning Laboratories to manufacture a variety of electronic devices. Drake, who had remained at Harvard to earn his MA and PhD, went on to form the Aircraft Radio Corporation of Boonton, NJ in 1929.

The information for this Company biography was obtained from Alan Douglas' three-volume encyclopedia "Radio Manufacturers of the 1920's," published by The Vestal Press, Ltd., Vestal, NY and copyrighted 1988, 1989 and 1991 by Alan Douglas.

PLAY IT AGAIN!

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

THE VACUUM TUBE IS BORN

Edison's Early Work

The vacuum tube had its origins in Edison's early work with the electric lamp, which he had invented in 1879. About a year later he was trying to learn why carbon from the filament deposited on the inside of the bulb with use. Thinking that a mysterious current might be the carrier, he sealed a metal plate into a lamp to see if the current could be collected and measured. He found that current did indeed flow through the plate when it was positive with respect to the filament, but not when it was negative.

Edison didn't know he had created a rectifier (a device for converting alternating to current to direct current) because he had an aversion to working with alternating current. In 1884 he patented the modified lamp as part of a measuring device in which it served no real purpose.

The Fleming Valve

Also in 1884, William Preece, whom we met last month, visited America and was given some of the modified lamps. Back in England, he turned them over to J. Ambrose Fleming, professor of electrical engineering at London University College and scientific adviser to the Edison & Swan Electric Light Co..

Fleming had more lamps made and studied them until around 1890, when he put them aside. He recognized their rectifying ability, but didn't understand their operation because it depended on properties of the electron--which would not be discovered until 1897. In 1899 Fleming became scientific adviser to the new Marconi Company.

One of his tasks was finding a better radio detector. Since detection is a rectification process, he recollected his work of the previous decade, got out his lamps and tested them. They were good detectors. He patented this application in 1904 and the first radio tube was born. Fleming called his device a "valve," the term still used in England for what we call a tube.

As a company employee, Fleming assigned the patent to Marconi. By 1905 Marconi had put Fleming valves into receivers, but they were not widely accepted. They were no better than the mineral detectors already in use and were less reliable, being subject to breakage and burnout.

Let's pause a moment and discuss vacuum tube nomenclature as we know it today. Tubes are classified as diodes, triodes, tetrodes, pentodes, etc. according to the number of active elements in them. The first syllable is Greek for the number and the second is from the Greek "hodos" meaning "path". Fleming's tube had two active elements, a filament and a plate, and so is classified as a diode.

Deforest's Audion

Lee Deforest was the man who invented that tube that made radio what it is today. DeForest had a complex and checkered career. He formed at least eight companies that went bankrupt and had an amazing talent for associating with swindlers in his business operations.

Historians do not have a high opinion of DeForest's ethics. He was once prosecuted for stock fraud, but acquitted. He wilfully infringed the patents of others and was enjoined several times by the courts. When he continued to infringe, he was cited for contempt.

In 1901 DeForest formed a stock company to manufacture wireless equipment. Also seeking a better detector, he had developed one which the courts, in 1906, found to be in violation of existing patents. As a result the stockholders kicked him out.

Continuing his work, he took the Fleming diode (a debt he refused to acknowledge), and experimented with various additional control elements. Eventually he arrived at an arrangement that incorporated a gridiron-shaped piece of wire (the "grid") between the filament and plate.

This tube was an excellent detector, giving a much louder signal than any previously used. Today, we designate DeForest's device as a triode because it contains three active elements. He called it an "Audion" and patented it in 1907, forming several new companies at the same time.

DeForest contracted with H.W. McCandless, a New York maker of automobile lamps, to produce his Audions. Between 1909 (the first year Audions were sold publicly) and 1916, McCandless' records show nearly 7000 sold, mostly to DeForest. In 1907 DeForest fitted several Navy vessels with Audion detectors for a trip around the world. The equipment performed so poorly, however, that the Navy refused to buy more.

This is not surprising considering that DeForest didn't fully understand how his Audion worked and had no specifications for it. McCandless used any size or spacing of elements convenient at the moment and, as was common in light bulb manufacture, made the Audions with poor and variable levels of vacuum. The finished products were temperamental, and no two were alike.

In 1911 DeForest went bankrupt and took a job with Federal Telegraph, a wireless company in California. To this date the Audion had only been used as a detector. Federal's engineers, however, thought it should also work as an audio amplifier--which was badly needed for reception of weak radio signals. With their expertise, circuits were quickly developed and a functional amplifier was demonstrated in 1912.

In 1913 DeForest sold rights to the Audion as a telephone repeater in wired service to American Telephone & Telegraph, keeping the wireless rights for himself. In 1914 he sold the wireless rights to AT&T, but retained personal rights to all his patents.

The Patent Wars

Marconi sued DeForest in 1914 for infringing the Fleming patent. DeForest then counter-sued Marconi for infringing his Audion patents, a charge that Marconi immediately admitted. In 1916, the courts upheld Marconi's suit, forbidding him to make and sell Audions for radio use. The result was stalemate. Neither could make triodes without violating the other's patents.

By the outbreak of World War I, the Audion had improved enough to be essential to the military. The government suspended all patent rights and engaged General Electric, Westinghouse, AT&T and DeForest to make tubes for military use. With industrial laboratories and huge resources in action, science quickly caught up with technology. Industry learned how to make reliable, reproducible tubes. After the war, a settlement was negotiated between the DeForest and Marconi interests.

Next time we will cover the development of home radio tubes in the postwar period.

Ken Owens
478 Sycamore Dr.
Circleville, OH 43113

VINTAGE BOOK REVIEWS

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

RADIO FOR ALL, By Hugo Gernsback. First Edition, 1922. Published by J.B. Lippincott. 296 pages. Hardbound.

Hugo Gernsback, perhaps best known for his editorship of *Radio News* magazine, wrote in many forms. He edited a variety of magazines, authored a number of books, and was noted for his technological predictions, an astonishing number of which have come true.

When *Radio For All* was published, broadcasting had been around for only a year and a half. Most of the receivers then in use looked like laboratory instruments and were very intimidating to non-technical persons. Gernsback realized that if radio was going to succeed (and the number of subscriptions to Radio News was going to grow), the new medium would have to be popularized.

The intent of *Radio For All* was to provide its readers with a painless introduction to the mysteries of radio. Gernsback felt that if he could get people to feel comfortable with the new technology and to try building some of the simple receivers and transmitters illustrated, then they would experience the thrill of radio and go on to bigger and better sets.

The book begins with a bit of radio history and theory. Subsequent chapters include coverage on receiver components, aerials and grounds, schematic diagrams and radio telephony. I built one of the simple transmitters illustrated in the latter chapter, a one-tube job using an '01-A, and was heard across the street using only a short piece of wire as an antenna. The circuit was crude, but it worked and I was pleased--and that is what this book is all about.

The next chapter includes information on constructing radio receivers ranging from crystal sets to a simple 3-tuber. The following one, which is quintessential Gernsback, is entitled "The Future Of Radio." Here, the author makes prognostications concerning fax communications, television, transmission of matter and power, and communicating with beings from other planets.

The book ends with some data intended to be of use to the budding radio fan, including the usual charts, tables and lists of current broadcasting stations.

Radio For All is one of the reasons radio made the transition from laboratory curiosity and commercial tool to household necessity. The book is excellent for the beginning collector who wants to learn how the apparatus was made and how it worked. It also gives the historian an insight into the state of radio in the early 20's.

With the exception of the chapter on schematics, all of the circuit drawings are pictorial in style. There are also some rather nice photographs throughout the book. All in all, this is a very pleasant volume to read, and it belongs in the library of any person desiring to own a significant piece of radio history.

Conducted by Paul Joseph Bourbin

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.*

Answers to Questions

Q The volume of many antique a.c.-operated radios will abruptly increase or decrease when a lamp or appliance is turned on or off elsewhere in the house. Can anyone explain? -- *S. Weller, Skokie, IL*

A *Following are explanations from three different readers.*

I believe this is due to oxidized contacts somewhere in the radio (tube sockets, band switch, line switch, volume control, riveted ground connections or even the line plug prongs). When anything on the line is turned on or off, there is a momentary surge or spike induced in the line which is also apparent to the receiver circuitry. This can improve a faulty connection or make it worse. -- *Tony Jacobi, Ralston, NE*

What is happening is that all the appliances are attached to the same common ground as the radio. When an appliance is turned on, it adds to the ground circuit in the house, allowing it to pick up more r.f. R.f. is present on all telephone and power lines. For some years, my radio used the telephone dial finger stop as an antenna. -- *Alan A. Dubois, Jr., Queensbury, NY*

The cause is the voltage drop in the house wiring caused by the load of the additional appliance. The amount of the drop depends on many factors, including the size of the load and the length and resistance of the wire coming into the building. I tried an experiment with an old tube radio drawing about 50 watts and a 250-watt light bulb. Before the light was plugged in, the radio pulled .41 amps at 120 volts. Afterwards, it dropped to .35 amps at about 118 volts. -- *Willy Young, Smithville, TN*

Editor's note: all of these effects would be more apparent in older radios lacking automatic volume control circuitry that would compensate for differences in reception. Any other ideas or comments?

General Information

Vintage Books

Paul Bourbin's popular Vintage Book Review column has inspired several

Continued on next page. . .

readers to write up their own favorites. Here's this month's crop.

Reader Ray Larson (W. Los Angeles, CA) sent along a copy of the title page from *Theory and Applications of Electron Tubes* by Herbert J. Reich, Ph.D. Published by Mcgraw-Hill Book Co., Inc., New York and London. Second Edition, 1944. He says it's an excellent book and that the sections on Class A, B and AB audio stages are the best he's come across.

And the following short review comes to us courtesy of Alton A,. Dubois, Jr. (Queensbury, NY) :

Basic Electronics, U.S. Training Courses Navpers 10087. Prepared by the U.S. Navy and the Government Printing Office, 1955. 728 pages. 5" X 7 1/2".

This is a fat little book filled with details and math covering tube-era theory and operation. Straight language text with quizzes at chapter ends. Intended for issue to Navy personnel in electronics training schools, it covers every phase of electronics from TRF radios through transmitters and radar with some excellent theory on antenna design.

Those Mallory Bias Cells

A few weeks ago, reader Jack Iverson called to let me know that, in condensing his Antique Radio Club of Illinois article on Mallory Bias Cells, I had inadvertently introduced some inaccuracies. All of the problems occurred in the first paragraph, which should read as follows:

"Here's something to keep in mind when trouble-shooting a.c. and farm radios of the late 30's and early 40's, particularly if hum and/or distortion is present. Some of these sets had small clip-mounted or wired-in button-type cells to supply grid bias voltage for tubes used in certain first audio and automatic volume control circuits. . ."

Tony Jacobi, who is well known for his "Ballast Tube Handbook" and "Ballast Tube Substitution Guide," also noticed the Mallory item and contributed some additional information:

. . .It is also interesting to note that the cells were intended to be mounted so that they would be on their sides during operation. Thus, the liquid inside would contact both the case and the black button. However, all this is moot, as today these cells are 20 to 30 years old and I would not waste time testing or using them if the set is intended to be put in working condition. I usually replace them with AAA or N cells in Bakelite holders. There is usually room under the chassis for these.

I also have been guilty of soldering leads directly to the battery and wrapping with tape in tight situations. Trying to use modern button cells, with their reversed polarity, in the original mounting brackets is a tricky situation. For the die hards, there are small brackets available for button cells from the larger distributors like Newark Electronics or Allied. These would have to be mounted on a small piece of circuit board first.

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WANTED

Schematics and manuals for Realistic PRO2002 scanner. Will pay photocopying and mailing costs. Thanks, David. (916) 788-0624.

Schematics and service information for Zenith Model 105668. Donald L. Rapp, 745 Gettinger, Ste. Genevieve, MO 63670. (314) 883-7128.

Info or schematics on Crosley 739-A. G. Boston, 4341 Tahitian Gardens, Apt. #C, Holiday, FL 34691.

Heathkit DX-100 good condx. Will pay shipping. David, K4ZZB, 417 Rio Dr., Darlington, SC 29532. (803) 395-0414.

Chrome chassis radios by McMurdo Silver, Zenith, Lincoln, Scott (some). Also brochures & booklets on same. Have cash or excellent trades. Don Hauff, Box 16351, Minneapolis, MN 55416. 1-800-769-9980.

Jewell radio test panel Pattern 579. Finder's fee for non-seller. C. Orval Parker, HCR Box 133, Pocono Summit, PA 18346. (717) 646-2750.

Volume control for Crosley Model #124. Must be V.G. or N.I.B. replacement. Stuart Humphreys, 600-C Brookwood Ct., Blue Springs, MO 64014. (816) 229-4394.

Driver for A.K. Horn Speaker Model H. A.A. DuBois, Jr., 67 Peggyann Rd., Queensbury, NY. (518) 792-3130.

Schematic for an H.H. Scott 325R Stereo or Sams MDH-232 folder containing same. Charles Juedemann, 2015 Hickory Ridge Rd., Union, MO 63084.

Info on ac-dc sets, car radios, etc using 5-pin 6-volt tubes 36-37-38-39. Ray Larson, 12241 1/2 Gorham Ave., W. Los Angeles, CA 90049-5214.

Hallicrafters speakers: R-44 for SX-43; R-42 for SX-42; PM-23 for SX-28; black cabinet with wooden letter "h" on grill for SX-17. Charles Furtak, 241 Oak St., Elmhurst, IL 60126.

Crosley "book" radio, small leather book model, JM-8 series. Jim Warner, 75 Saybrook Rd., Essex Junction, VT 05452. (802) 879-7967.

Daven 1 1/2" x 1 1/2" neon TV tube (Kinolamp). Don Joyce, 8088 Whalen, Maineville, OH 45039. (513) 683-7013.

Dial glass, small knob for Zenith 7S633; plastic dial for Silvertone 9005; plastic dial window for Crosley 635; knobs for Airline 62-318 (P.E. 7/93 p. 67). Terry Schwartz, 340 Oakwood Dr., Shoreview, MN 55126-4821. (612) 483-4173.

Home-study radio course with demonstrations and experiments. Have test equipment and tubes to swap. See my ad under "For Sale." Claude Jordan.

Volume control for Philco 37-620. It is a 2-megohm with a 1-megohm tap. Carlos Martinez, #21 Colonel Irizarry St., Cayey PR 00736. (809) 263-2741.

Zenith 6D455 book case. Last on "most-wanted" list. George W. Carr, 5885 Wilson Rd., Lancaster, OH 43130-9510. (614) 687-6190 9-9 ET Machine 4th ring.

Continued on next page . . .

Zenith knob to complete restoration. Need center knob for shutter eye dial that drives motorized tuner model 12S265. Sam Zuckerberg, (212) 354-7407 (M-F 11 a.m.-4 p.m.).

General Television Model 534, looks like a grand piano, inner dial, lift top, 5 tubes. Marie Cyr, 162 Culbert St., Syracuse, NY 13208. (315) 476-8491.

Speaker for Atwater Kent radios. Please send price info to R.W. Wondoloski-Eaton, RD4 Box 432 Lewis Rd., W. Pittston, PA 18643.

Need old Coca-Cola radio. Geary Boston, 4341 Tahitian Gardens Cir. #C., Holiday, FL 34691-3728. (813) 786-3061.

Power transformer for Jackson-Bell Model 62; antenna coil for Philco 625; electric tuning motor for RCA Model HF6. Harry Alenik, 14003 Judah Ave., Hawthorne, CA 90250.

Script for "Jimmy Wants a Jar of Electricity." Talk given to Ham Club early 1960's by J.D. Booth, W3IBW. (History of Ham Broadcast). David Booth, Jr., 831 Fairfield, Westminster, MD 21157. (410) 848-4025.

Looking for Instructograph code machines and/or tapes. Will consider any condition. Tony Bender, N8LDX, 7456 Annin St., Holland, OH. (419) 865-4723.

Rider Manual number 15 any condition. Would also like to find 21 and 22. Willy Young, Rt. 1 Box 171A, Smithville, TN 37166. (615) 597-1072.

1 & 2 tube superregenerative radios. Stephen Kalista, 9 Maple Dr., Jim Thorpe, PA 18229. (717) 325-4120.

Black Kurtz-Katch vernier dial (need the knob and shaft); Jewell pattern 135 d.c. voltmeter 0-5 or 0-8 volts, or any other two inch hole rear mount d.c. voltmeter. Paul Bourbin, 25 Greenview Ct., San Francisco, CA 94131.

FOR SALE

First user-friendly circuit on early BC-348's. On two 8X14 sheets. Send $2.00 and three 29-cent stamps. Ray Larson, 12241 1/2 Gorham Ave., W. Los Angeles, CA 90049-5214.

Have Fada Catalin 252; 652 chassis, no speaker cloth, $400. Dewald Catalin A501; yellow dial, glass not original, $350. Frank Brewster, P.O. Box 615, Baxter Springs, KS 66713.

HRO-M (5) with 9 coils, boxes, p.s.; NC 100A; Scott 23. Call. Jack Iverson, N9KYT, 1110 Old Mill Dr., Palatine, IL (708) 359-0941.

Assortment of test equipment to sell or swap, send SASE for list. Antique radio tubes, send needs. Claude Jordan, 3010 Acorn Rd., Augusta, GA 30906.

Sell or trade novelty radios. Send SASE for current list. Gary Arnold, 615 Oak St., Marion, NC 28752. (704) 652-6893.

Over 200 books and magazines from early 1900's to 1940's-1950's. SASE for lists. Also, ask for my want list. Goldman, 3 Amy Lane, Queensbury, NY 12804.

Radios, parts, literature. Long SASE for list. Stan Lopes, KB6LGV, 1201-74 Monument Blvd., Concord, CA 94520. (510) 825-6865.

Rider's Vol. 11, $15.00 postpaid. "BUD" trademarked metal file box for QSL cards; 3" x 3.5" x 5.5"; olive enamel w/yellow printing; pretty nice shape but no index cards; $8.00. HEADPHONES, "BUSH" with plastic shell & fabric cord, e/plug; excellent condx; $22.00. "CANNON-BALL" with nickel plate (?) and plastic shell; fabric cord with possibly later plug; very good condx; $22.00. R-F transformer "TRI-COL" (?); terminals marked "P C B F"; stamped "TYPE" AND "W"; all Bakelite (?) w/mounting base; $5.00. A-F transformer KELLOGG S. & S. CO. CHICAGO CODE 501-A; marked PRIM P - & SEC G F; as new; $8.00. TUBE SOCKET, 4-pin w/mounting, metal; "WALMART ELECT CO CHICAGO," terminals marked "P G - +";$5.00. J. Jablin, 9124 N. Crawford, Skokie, IL 60076.

Canadian antique radio collector, interested in Hallicrafters, Hammerlund, Zenith, Sparton, Marconi, Emerson, Pilot, Crosley, Philco, National, RCA-Radiola, or any "good old radio." Rodger Henly, VE7DZD, 1635 Kings Rd., Victoria, BC CANADA V8R 2N7.

Original operator's manual for B.K. model 3020 sweep-function generator. Will sell or swap for "Conar" meter manual. (See my ad under "Wanted"). F. V. Bernauer.

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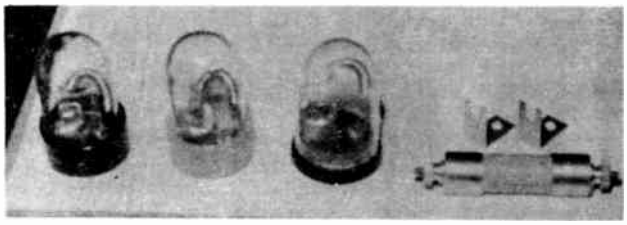

Crystal Detectors, three models. Send SASE for details to: Dick Mackiewicz, 1549 N. River Rd., Coventry, CT 06238. (203) 742-8552.

SERVICE DATA AND HARD TO FIND PARTS Original SAMS photofacts, TSM, CB, MHF, TR and AR. Manufacturer's Data, FREE Catalogue. A.G. Tannenbaum, P.O Box 110, East Rockaway, 11518. Phone (516) 887-0057. 24 hour FAX (516) 599-6523.

Alpha-numeric index to Stokes' book "70 Years of Radio Tubes and Valves." $3.50 each, postpaid in USA only. Anthony Jacobi, 8053 Maywood St., Ralston, NE 68127-3729.

Radio Parts. New and used tubes, test equipment, service data, 1000's of parts. Write your wants. SASE for reply. Krantz, 100 Osage Ave., Somerdale, NJ 08083-1136. (609) 783-0400.

Buying WWII military surplus radio sets and accessories. Highest prices paid. Over $6,000 cash paid in 1993. America's WWII radio surplus leader. Sam Hevener, W8KBF, "The Signal Corps," 3853 Everett Rd., Richfield, OH 44286-97623. (216) 659-3244 before 8 p.m.

Regency TR-1 radio schematic. Reproduction of the original factory blueline. $3.75 postpaid in tube. Paul Bourbin, 25 Greenview Ct., San Francisco, CA 94131. (415) 648-8489

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.

During World War I, this American engineer developed the mica condenser ("capacitor" in today's parlance) -- a component still widely used in electronics today.