

The Jersey Broadcaster

NEWSLETTER OF THE NEW JERSEY ANTIQUE RADIO CLUB

Autumn 1997

Volume 3 Issue 11



MEETING/ ACTIVITY NOTES

Reported by Jim and Ruth
Whartenby

October's meeting opened with a suggestion by Jerry Dowgin that an open forum be incorporated into our meetings where members can describe problems that they are experiencing with radio repair. He suggested that other members may have already solved a similar problem and may be interested in sharing a workable solution. Mike Stoppiello was the first to open the form with a question regarding resistance line cords in early AC/DC sets. When a resistor line cord opens, what is the appropriate fix? If you replace the line cord with the calculated value of resistance, it dissipates a considerable amount of heat which may cause a fire or, at the very least, damage the cabinet. VP Ludwell Sibley suggested that a diode and low wattage resistor series combination would be the best solution. Ludwell offered to provide the specifics over the telephone to all other interested members.

Editor's Note: Restoration questions also make a great addition to the BROADCASTER since distribution is to our entire membership. Please don't hesitate to drop me a line or place a call; we have a very knowledgeable panel of experts ready and willing to offer guidance based on many years of trial-and-error experience

A general question soliciting comments on our last meet at the Freehold Armory was met with very favorable responses. In answer to a specific question regarding whether the truck bay door would remain open to the general public if a future meet was held during bad weather, it was de-



MEETING NOTICE

The next meeting of NJARC will take place on Friday, November 14, at 7:30 PM in the Grace Lutheran Church, corner of Route 33 and Main Street in Freehold. Contact Marv Beeferman at (609)-693-9430 or Jim Whartenby at (908)-271-7701 for directions. This month's meeting will finalize plans for next month's holiday party. "Battery Sets of the 20's" will be Mark Mittlemen's presentation during our technical session.

cided that it would not. Also addressed was the unloading problem resulting from heavy traffic at the truck bay door. It was noted that we initially had a similar problem at the Hightstown location with two doors and many steps, but with experience and a door guard things went smoothly at later meets.

Editor's Note: At future meets, no parking will be allowed at the unloading area and a single file of cars will be maintained.

John Ruccolo's technical talk was well-received. John is a very relaxed and easy-going speaker who has a knack for injecting the right amount of humor while making his point clearly understood. He discussed the dangers of AC/DC sets when the power connection makes the set chassis hot with respect to earth ground. He also discussed isolation transformers and autotransformers and the differences in construction and usage. Also mentioned was a tip to reform a set's electrolytic capacitors using an autotransformer by slowly increasing the applied voltage. This will allow the capacitors to reform without causing damage to the set.

The following proposals from the floor were placed before the membership and approved:

- No fees will be collected at meetings; the proceeds from the 50-50 drawing will be used to defray refreshment and rental costs.
- No parking or buyer's fees will be collected at club sponsored events such as swapmeets, parties or picnics; the proceeds from a 50-50 drawing will be held to supplement these events.
- A holiday party will be held during the December meeting.
- Our next swapmeet is planned for February 21, 1998.
- A Summer picnic/swapmeet at the Clinton Elks Lodge is planned. (A similar event was held last Spring as a mixer between the Delaware Valley Historic Radio Club and the NJARC. It was well-attended and actually made money for both clubs. The location was superb and can easily accommodate an event like that held by the AWA at Schooley's Mountain.)

This month's *Broadcaster* notes the passing of AWA founder and long-time AWA Museum Curator Bruce Kelley and offers a brief history of his many accomplishments. Also included is a follow-up to John Ruccolo's technical talk for members who could not attend the October meeting.

THE JERSEY BROADCASTER, published a minimum of ten times each year, is the newsletter of the New Jersey Antique Radio Club (NJARC) which is dedicated to preserving the history and enhancing the knowledge of radio and related disciplines with special emphasis on contributions made by the state of New Jersey. Dues are \$15 per year and meetings are held the second Friday of each month at the Grace Lutheran Church, corner of Route 33 and Main Street in Freehold N.J.

Submissions are welcome in typewritten or diskette (5-1/4" or 3-1/2") form with formats in ASCII, WordPerfect, Word, etc. Photos in high contrast black and white are appreciated but color photos are acceptable. The Editor or NJARC is not liable for any buying and selling transactions or for any other use of the contents of this publication.

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THE PRESIDENT'S COLUMN

NOTHING REPEATS LIKE HISTORY

By Jim Whartenby

Like Scotty on Star Trek, I read technical publications for enjoyment - more for the historical information than the technical - but to be honest, I like both. Some I buy to collect and others I read and then pass on to interested parties. When I was given a large donation of radio and television magazines, it took me forever to bundle them for the club's Spring auction, being distracted by one interesting article after another. One of the "keeper" books amongst the paper was one that went by the dry title of "Reliability Factors for Ground Electronic Equipment." Perhaps I was drawn to the title because it was close to my Air Force job description of "Ground Radio Equipment Repairman, AFSC 30454." But as usual, I found some interesting information in it that I would like to pass on.

The book was published by McGraw-Hill in 1956. It starts with some historical background on equipment failures gleaned from World War II records. (This eventually led to the Military Specifications for Reliability which can be unnecessarily tough at times, but that's another story.) Some of the information is directly applicable to our hobby...interesting tidbits like "up to 60% of airborne equipment shipped to the Far East was damaged on arrival. Furthermore, as much as 50% of the equipment and spares in storage became unserviceable before it was ever put into use." If you ever looked at early WW2 electronics, you are struck by the resemblance to commercial equipment. This was natural, since in its rush to prepare for war, the military did use commercial equipment.

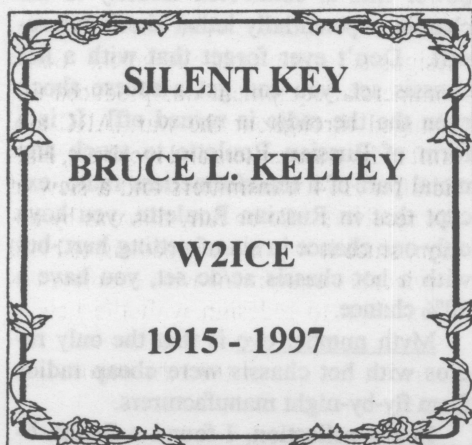
Look into any amateur or commercial periodicals published early in the war and you will find requests by the government for equipment donations, especially communications receivers. These were in very short supply, just like about everything

else. Once production was up to speed, designs still didn't change much. Some commercial equipment was produced unchanged throughout the war...ARC aircraft radio transmitters and receivers, Hallicrafter HT4 transmitters and a slew of SX receivers. To be fair, this was by design, since it was more expedient to build serviceable equipment with obsolete designs than to redesign with the newest tubes and components. I'm sure that these items were built to the best commercial standards of the time but they still could not hold up to the rigors of war. Near the end of the war, the newest radar equipment was built more like what you now expect military equipment to be like.

How does this relate to our hobby? Well, in my opinion, this is why you find old radios in such good condition. They failed for a relatively minor reason and were put away for repair at a later date but then forgotten by our thrifty parents and grandparents. Components like the early electrolytic capacitors, while smaller than their paper cousins, were more prone to failure. Late 20's electric sets are more apt to work than those made a decade later for this reason. Interestingly enough, battery sets seem most likely to fail because of bad audio transformers. True, some of the early sets were put away because many technical improvements such as the superheterodyne receiver and FM (thanks again, Major!) made them inferior. But most were prone to failure because many of the component parts were not of high quality, probably due to competitive pressures and electrical underrating.

So I guess all of these reliability studies have resulted in the great electronics industry that we see today...an industry that produces better quality equipment more cheaply year after year. When a component finally does fail, the equipment is junked since the replacement is less expensive than the cost of repair. But wait...doesn't this mean that even though millions of sets are produced, most go to the dump instead of the attic? Doesn't this provide the basic framework for the evolution of yet another "collectable?"

Hmmm...let's see; if I move the calculators over here and make more room for the cell phones and digital watches, then I can take the hand-held electronic games and...



Background material for this article was provided by Ludwell Sibley...Ed

The NJARC offers its sympathies following the demise of Antique Wireless Association founder and amateur-radio enthusiast Bruce L. Kelley. Bruce organized the AWA in 1952 with George Batterson (W2GB) and Lincoln Cundall (W2LC) but held no higher position than Secretary, concentrating his activities and dedicating his energies to being Curator of the AWA Historical Museum located in East Bloomfield, N.Y. He was a fifty-years plus member of the ARRL.

Mr. Kelley set up the original AWA Barn Museum in Spencerport, NY, in 1952 and then the Holcomb barn in 1958. He started *The Old Timer's Bulletin* (OTB) in 1960 as an unofficial, mimeographed news sheet which later became an official AWA publication with Vol. 1 No. 4. Bruce edited the OTB until 1989 for which he was later endowed with the AWA "BK-OTB" Award.

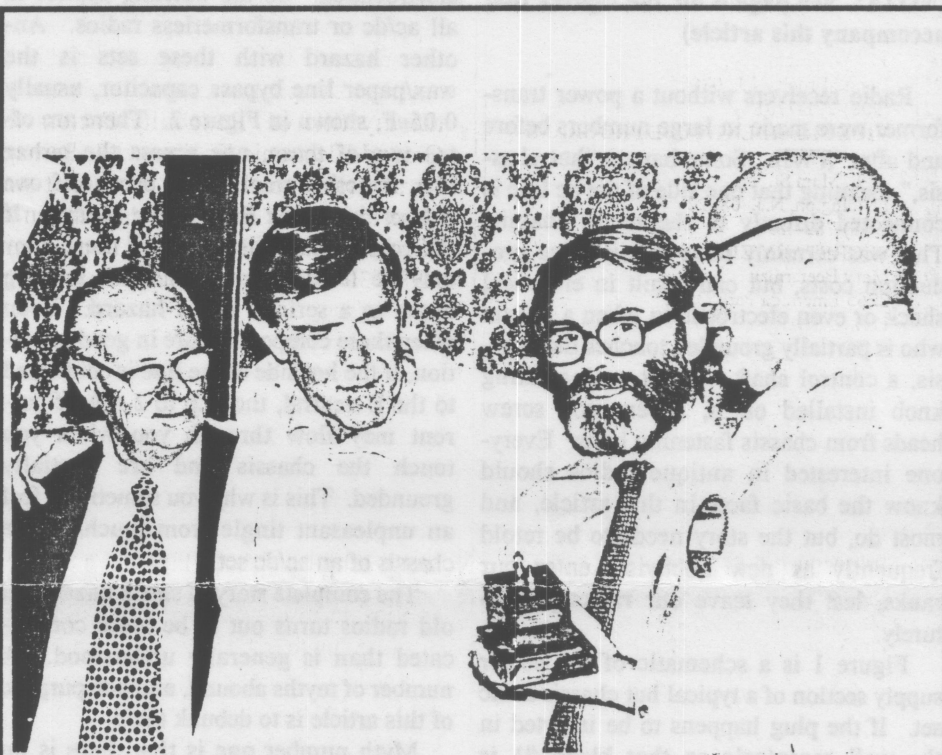
Among his other numerous AWA contributions, Bruce started the AWA Amateur Net based on W2AN, or at least participated in it heavily. He initiated the Old Time Contest in 1971 and the 1929 QSO Party in 1983. He also organized numerous AWA exhibits and slide shows at the Rochester Amateur Radio Association and ARRL events. As an expert photographer, employed long-term by Kodak, Bruce prepared numerous slide shows including "Polar Adventure," "The Golden Years of Radio," "Those Wonderful Magazine Covers," and "The 1921 Transatlantic Tests and IBCG." He maintained an extensive collection of early radio photos, many of which ran in the OTB.

Bruce Kelley started as an amateur operator in high school in 1929 and was licensed as W8ACY at home and W2ICE at his family summer camp. His station was located at 36 Earl St., Rochester and focused on low-power 20-meter DX. Bruce was very successful with Japanese stations and logged 69 countries with 10 watts from a 210 and a two-tube receiver.

Among Mr. Kelley's numerous memberships and awards are included:

- Life Fellow of the Radio Club of America; recipient of its Ralph Batcher Memorial Award (1978) for historical documentation.
- Member of the Society of Wireless Pioneers.
- Holder of the Herrold Award of the California Historical Radio Society, ca. 1977
- Holder of the AWA Houck Awards for Documentation (1972) and Preservation (1989).
- Recipient of the President's Award of the Quarter Century Wireless Association for contributions to amateur radio (1990).

QST for July 1936 has a story and photo covering W8ACY and the May 1959 issue of QST has an early story on Bruce and his association with the AWA.



Bruce Kelley (second from left) with Dave Brodie, Tony Constable and past President Chuck Brelsford at 1981 AWA Conference. The AWA is being presented with a teak-boxed condenser from a Brookman's Park Transmitter by the British Vintage Wireless Society.

HOT CHASSIS REFRESHER COURSE

By Charles Rhodes

From time-to-time, a topic comes up that's worth repeating. John Ruccolo's talk at the October meeting discussing the dangers of AC/DC sets unfortunately was limited to attending members. In an effort to get the word out to the entire membership, the following article is being offered with the kind permission of the Mid-Atlantic Antique Radio Club as published in the October 1977 issue (Vol. 22, No. 10) of RADIO AGE.

(NOTE: See page 6 for the figures that accompany this article)

Radio receivers without a power transformer were made in large numbers before and after WWII. Some have a "hot chassis," meaning that one side of the ac line is connected directly to the metal chassis. This was certainly done to minimize production costs, but can result in electrical shock or even electrocution when a person who is partially grounded touches the chassis, a control shaft without an insulating knob installed on it, or exposed screw heads from chassis fastening bolts. Everyone interested in antique radios should know the basic facts in this article, and most do, but the story needs to be retold frequently as new hobbyists enter our ranks, lest they leave our ranks prematurely.

Figure 1 is a schematic of the power supply section of a typical hot chassis ac/dc set. If the plug happens to be inserted in the wall receptacle so that blade #1 is "hot," then blade #2, wired to the chassis through the power switch, is "cold." In this case, *even with the radio off*, you can get a very serious shock by touching the chassis if you are partially grounded, such as standing on a damp concrete floor in your basement or garage. The shock results from current from the hot side of the power line flowing through the tube heaters to the chassis and through your body to ground. The maximum current that you might get under worse case condi-

tions is roughly 300 mA, which is about six times what is believed to be lethal. (Lethal levels vary with the individual, differing for children and adults.) This is why you should never attempt to repair ac/dc radios without an isolation transformer! More on this later.

This dangerous situation led some manufacturers to use the less dangerous "floating chassis" design shown in Figure 2. Here the cold side of the power line, usually via the switch, is wired not to the chassis, but to a neutral buss wire feeding B- to the appropriate circuit parts. This neutral buss is insulated from the chassis. However, don't think that you are perfectly safe with such a design. There are cases where deteriorated old rubber insulation has crumbled off wires, creating a short to the chassis, and the potential for electrocution. So the warning applies to all ac/dc or transformerless radios. Another hazard with these sets is the wax/paper line bypass capacitor, usually 0.05 μ F, shown in Figure 2. There are often two of these, one across the power line, the other from the B- buss (and one side of the power line) to the chassis. If the original capacitors are still there, they may be leaky or even shorted, leading again to a serious shock hazard. Even when these components are in good condition, if the hot side of the line is connected to the B-neutral, then up to 2 mA of current may flow through you when you touch the chassis and are partially grounded. This is why you sometimes feel an unpleasant tingle from touching the chassis of an ac/dc set.

The complete story of shock hazards in old radios turns out to be more complicated than is generally understood. A number of myths abound, and one purpose of this article is to debunk them.

Myth number one is that there is no danger with any a/dc radio if you plug the two-prong plug in the right way so that the grounded side of the wiring is connected to the chassis, not the hot side of the line.

Wrong! In hot chassis ac/dc sets, the line bypass capacitor, as noted above, can provide sufficient current to give rather an unpleasant shock when the radio is switched off and the grounded side of the power line happens to be connected to the chassis. Of course, if the hot side of the

power line is connected directly to the chassis, a potentially lethal shock can result. Don't ever forget that with a hot chassis set, you can get a severe shock even the the radio is turned off! It is a form of Russian Roulette to touch any metal part of a transformerless radio, except that in Russian Roulette, you have only one chance in six of getting hurt; but with a hot chassis ac/dc set, you have a 50% chance.

Myth number two is that the only radios with hot chassis were cheap radios from fly-by-night manufacturers.

In my collection, I found a Zenith 6-volt dc/110-volt ac farm radio in which one side of the ac power line was directly connected to the chassis. This was quite a surprise, because at first glance the radio had what appeared to be a conventional power transformer. When a 6-volt dc farm radio was operated from a storage battery, the set had to have a vibrator to convert the 6-volt dc from the battery to ac, which was stepped up to about 135 volts ac by a transformer and then rectified to provide the B+ voltage. The catch is that the "power transformer" in my radio turned out to be an autotransformer, where the primary and secondary are the same winding with taps. The circuit detail for this type of radio is shown in Figure 3. An autotransformer does not provide the shock isolation that you get from a normal power transformer. Not all dual-powered farm radios have hot chassis, but don't assume that you are safe if you have one and see what appears to be a power transformer.

There is only one foolproof way to determine whether you have a hot chassis radio. Use your ohmmeter to detect a current path between the chassis and the power plug, and check each blade of the plug separately. Very inexpensive volt-ohmmeters are available at Radio Shack and hamfests. Don't try to get by without one just because you are not a skilled radio technician. Every collector needs to run this simple safety check. I was really surprised when the Zenith described above failed this routine test.

OK, when you find a set with one side of the power line connected to the chassis, what can you do to make it safe?

Replace the original two-blade plug with a *polarized* power plug. Usually the

original line cord is frayed and/or brittle, so typically you replace the cord/plug with a new line cord having a polarized plug molded onto it. Polarized plugs come in a two-bladed version, where the grounded side is the wider blade, and the larger three-wire type used in most modern appliances, as shown in Figure 4. For radios, we typically use the former. In either type, the wider blade, usually silver-colored, is the one to be wired to the chassis. The smaller, usually gold or brass-colored blade is the hot side. When you finish rewiring the cord/plug, use your ohmmeter to verify that the wider silver-colored blade is actually connected to the chassis.

While you are doing this, I recommend strongly that you replace the line bypass capacitors, especially if they are the original ones. I use Radio Shack 0.01 μ F ceramic capacitors rated at 1000 volts. Why such a high voltage rating? Transient voltage spikes of several hundred volts on power lines are not uncommon these days, and they can break down capacitors with lower voltage ratings.

Myth three: One side of the power line is always connected directly to the chassis of a hot chassis radio.

Not so. There were some radios in which the chassis is about 130 volts dc off ground no matter which way they are plugged into the power receptacle. In other words, with these sets the odds are 100% for electrical shock if you are grounded and touch such a chassis. How can you recognize this kind of radio? If you are familiar with power supply designs, look for a full-wave voltage-doubler circuit. A typical circuit is shown in Figure 5.

Neither side of the power line is tied to the chassis, but when operating, the chassis turns out to be about 130 volts dc off ground. Voltage-doublers require two rectifiers. Since most ac/dc sets used a half-wave rectifier such as the 35Z5 or the 35W4, one clue that can alert you to the possibility that your set may have a voltage-doubler circuit is the use of a tube containing two rectifiers, such as the 25Z5, 25Z6, 50X6, 50Y6, and 117Z6, for example. If you are not sure whether your set is one of these, ask a more experienced technician to advise you.

When I encountered one of these radios, I rewired the power supply to a half-wave voltage-doubler type circuit as shown in

Figure 6. This eliminated the 130 volts off ground situation, and with a polarized plug, the chassis couldn't be hot at all.

Myth four: AC/DC sets with the floating B-buss insulated from the chassis never present a shock hazard.

Such sets are said to have a "cold" chassis. While this is certainly true, there is nearly always a noise bypass capacitor, typically 0.05 μ F, between the chassis and the B-wire (which is one side of the power line). If this capacitor has deteriorated (and the originals are more often than not bad in old sets), it can convert a cold chassis set into a hot chassis set.

And then there was the cold chassis TV set where the repairman lost one of the chassis bolts and replaced it with a bolt from his junk box that was somewhat longer than the original. The bolt touched a portion of the B-circuit (connected to the power line) and BINGO, a cold chassis set became hot. That killed a child.

In addition to not trusting manufacturers to do things right, don't trust previous repair technicians either. If you do your own restoration work, approach each new set you acquire cautiously, as though it were trying to kill you, because it might. If you don't do your own radio restoration, have a competent technician check over each new radio you get, even if it is playing well, to make sure it is not potentially lethal to you.

While I have stressed the hazards of ac/dc sets in this article, even a set with a power transformer can have a short between the transformer and the chassis. Sets with a power transformer should have a fuse installed in the primary side of the power transformer to protect that hard-to-replace transformer from damage if something in the radio shorts. You can use an enclosed screw-in type fuse holder if you don't mind cutting a hole in the rear chassis apron. Or you can install an open-type fuse holder in a convenient spot under the chassis where it won't show. Both are available at Radio Shack. I recommend Slo-Blo fuses because they won't blow out due to a brief power surge. (If the fuse is under the chassis, it is a nuisance to have to pull the chassis to change the fuse.) A 1-amp fuse is about right for a smaller set with up to six or seven tubes. For a larger set, 1.5 to 2 amps is about the right rating.

So, in summary: All ac-operated radios pose a potential electrical shock hazard. The older sets, particularly the older ac/dc sets are especially dangerous. In addition to using an isolation transformer when working on such radios, I urge you to install a polarized power cord and plug. Ohmmeter checks should be made to detect continuity between the power plug blades and the chassis, and appropriate steps taken when significant leakage is found. Line bypass capacitors should be replaced with good new ones with a high voltage rating, because failure of them is to be avoided. And, finally, fuse your ac radios.

From the Radio Age editor:

Charlie has done a very thorough job of alerting you to the dangers of old radios. But here are a couple of additional hints: Sometimes people think that they will protect themselves from shocks by placing a rubber mat under their feet at the basement workbench. That may not work. Some rubber doormats are filled with carbon black to give them that nice black color, and the carbon fillers make them rather good conductors. But, even if you ARE standing on a good insulating mat and touch an ac/dc radio not plugged into an isolation transformer, your elbow may brush against the metal case of a piece of test equipment on the bench that is plugged in with a three-prong plug so that the cabinet is grounded. (I know..I did it once and learned my lesson.) Also, don't assume that your radio is wired exactly as the schematic says and as it was when it left the factory. Now and then you will find that some previous incompetent radio servicer took the radio apart and connected up the wires wrong in putting it back together. I recall one butchered radio in which the line cord was connected to one of the potentiometer terminals on the volume control/on-off switch rather than to the switch. And, finally, buy one of those inexpensive little electrical testers that you can get at any good hardware store that checks whether an electrical outlet is wired correctly. There is always the possibility that some amateur handyman/electrician who lived in your house previously replaced a broken receptacle and arbitrarily connected the black and white wires to the screw terminals.

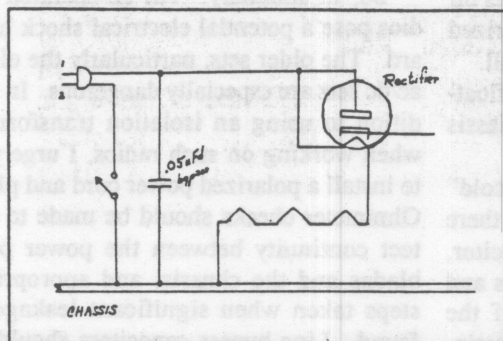


Figure 1. Typical pre-WW II ac/dc "hot chassis" power supply schematic.

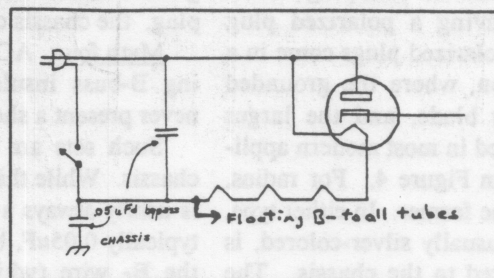


Figure 2. Typical floating chassis ac/dc power supply.

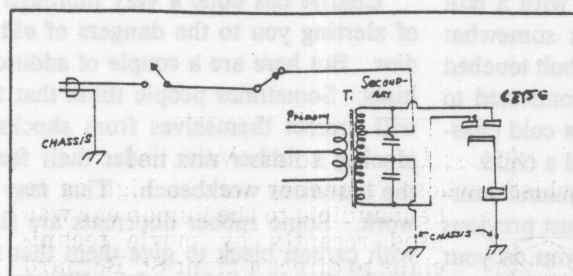


Figure 3. Zenith 6-VDC/110-VAC farm set power supply described in the text.

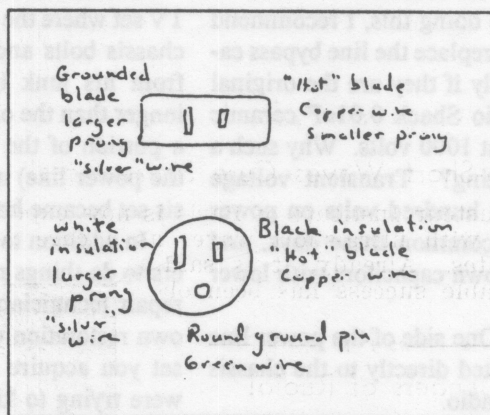


Figure 4. (Top) Two-prong polarized plug. (Bottom) Three-prong polarized plug.

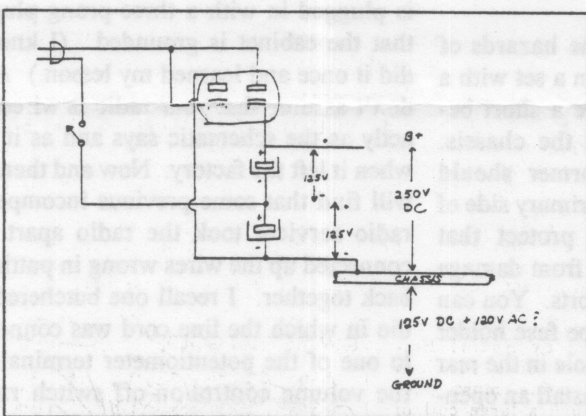


Figure 5. Full-wave voltage doubler circuit.

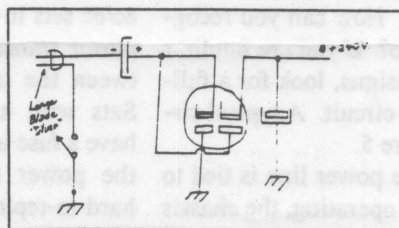
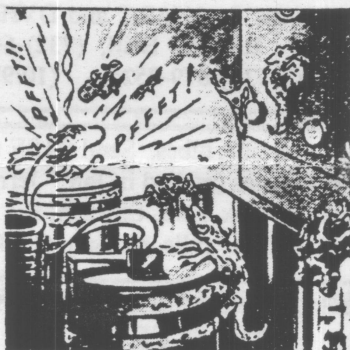


Figure 6. Rewiring of power supply in Fig. 5 into a half-wave voltage doubler as described in the text.

Novel Radio Items

—BY L. J. MARKUS—



RADIO FRIES LIZARDS in Hawaii! One of the many problems of technicians at Radio station KGMB of Honolulu is that of preventing lizards from frying themselves on the high voltage wires of the transmitter. The two-inch long lizards are welcome guests, however, for they eat annoying mosquitoes.

—n r i—

Ultra-Short Waves Cure Snake Bites!

The Pasteur Institute of Paris is now experimenting with ultra-short waves as a cure for snake bites. Already, it is said, considerable success has been obtained.

—n r i—

Dangers of Radio!

Radio reports on horse races proved almost disastrous to a certain barber in Sweden who had heavily backed a certain horse. So elated was the barber when news of his horse's victory flashed over the air that he gave a violent jerk, cutting off one of his fingers with the razor. The customer, thinking perhaps of his own neck, departed hastily.

—n r i—

Why Radio Sets Go Dead!

A policeman solved the problem of why Radio sets in a section of New York's Harlem suddenly became silent, by arresting a 17-year-old boy who had been cutting down the copper aerials and selling them to a junk man.

—n r i—

Noises for Sale!

For those who want more noise — peculiar noises like those made by train crashes, whining dogs, earthquakes, wild animals, bugle calls—a series of twenty phonograph records, each containing dozens of different headache-producers, is now on the market. Radio dramatists and theatrical producers are prospective customers.

Spirits Broadcast in Canada!

Radio station CKCL of Toronto, Ontario, recently placed on the air a spiritualistic seance lasting 1½ hours. During the broadcast, conducted by a world-famed medium, voices which presumably came from spirits were clearly heard, and weird blue lights were seen traveling around the studio walls—so say the reports!

—n r i—

Radio Calls Volunteers to Fire!

In at least one city in France, short-wave Radio calls volunteer firemen to headquarters when a fire alarm is turned in.

—n r i—

Movies Use Noiseless Whistle!

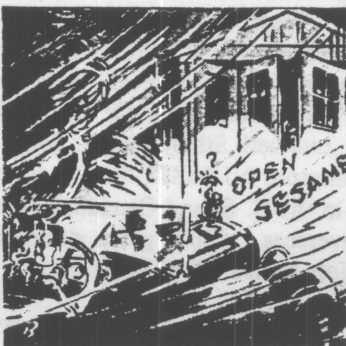
A whistle whose frequency was so high as to be inaudible to the human ear was used recently by movie technicians to direct a giant St. Bernard dog. Although no impression was made on the sound track, the dog's sensitive ears instantly picked up the high frequency note.

—n r i—

"Mikes" Protect Miners!

Microphones in a British coal mine pick up any noises caused by sliding rocks. The amplified sound then operates a relay which sounds a warning.

—n r i—



CODED RADIO SIGNALS OPEN GARAGE DOORS! Touch a control on the dash as you drive up to your garage and Presto! the doors open—swiftly, silently, automatically; at night the garage lights flash on as well. Radio is the secret; a tiny spark coil transmitter mounted on the car transmits coded impulses to the receiving antenna buried in the driveway. These impulses are picked up and amplified by the receiving set, then fed to a selector which determines whether the proper car is signalling. If the code is correct, relays then operate the electric door opener. If the car lights are on, the transmitter sends different code which turns on garage lights, too!

STOLEN GOLD detected by Radio! Employees of a Mexican gold mine must pass through a large coil of wire before leaving the mine. The coil is connected to a balanced high frequency Radio oscillator; even the smallest piece of precious metal upsets the balance of the apparatus and produces squeals in the headphones worn by the guards.



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Free exposure for buyers and sellers! Unless requested otherwise, each ad will run for two months in both the *Jersey Broadcaster* and the *Delaware Valley Oscillator*. All buying and selling transactions are the responsibility of the parties involved.

FOR SALE

BEST OFFER: Mikes: EV 660A, Altec 686A, Vega Model 10 Wireless, AKG D190M, Sony ECM 22P, 2-Shure 55 S-1's 2-EV 664's; RCA MI122987 PA amp (1950's), Rauland-Borg 1916 PA amp (1950's); RCA T2K transistor radio (late 50's); assorted 1A2 telephone equipment: phones, KSU's, cards, speakerphones, adapters, power supplies; American Concertone 6054R tube reel-to-reel recorder; extensive Commodore computer equipment; garage full of other "junk." Michael Muderick, (610)-449-6970, Michael@Muderick.com

Tektronix oscilloscopes 535 and 547 with extra plug-in units and Scopemobile. Tektronic 575 transistor curve tracer. General Radio 805B RF generator, 1021P2 UHF generator. GE TV alignment sweep and marker generator set. Manuals for all. Other test gear and surplus equipment coming up for sale - stay tuned. Mark W. Hilliard, N3NBL, 921 S. Edward St., Allentown, PA 18103, 610-432-8089. (7/97)

The ever-handy reference *Tube Lore* gives 186 pages of insightful scoop on about every North American tube there is. Reviewed by Eric Barbour in *Vacuum Tube Valley* as "an instant classic." The book is available from the following hip sources: (A) the DVHRC book program (B) DVHRC's A. G. Tannenbaum, 215-540-8055 (C) W7FG Vintage Manuals, 800-807-6146 (D) Antique Radio Classified, 508-371-0512 (E) Antique Electronic Supply, 602-820-5411 (F) Fair Radio Sales, 419-223-2156 (G) Angela Instruments, 301-725-8823 (H) Antique Radio Components, 916-878-1780 (I) Paul Washa, 612-472-3010, and (J) the Museum of Radio & Technology Bookstore (charleston, WV). Or...its available from Ludwell Sibley, 44 E. Main St., Flemington, NJ 08822 for \$19.95 post-paid in the U. S. and Canada, \$24.95 by air overseas. Clubs get a discount on multiple copies. (7/97)

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