DVHRC
OSCILLATOR
Official Newsletter of the
DELAWARE VALLEY HISTORIC RADIO CLUB

Vol. 2 No. 12, Jan. 1995 **Editor: Ludwell Sibley**

ELECTION NEWS

DVHRC is now legally incorporated, as announced by Attorney Charles Markofski at the December meeting. He will be drafting a set of proposed bylaws for mailing to the membership in advance of the January meeting, where a vote will be taken on ratifying them. The election of club officers (Dec. *Oscillator*) is "on hold" until the bylaws, which will set the way in which they will be elected, are in place.

MAARC STARTS-UP MUSEUM DISPLAY

The Mid-Atlantic Antique Radio Club now has its public antique-radio exhibit in operation. Located in the City Place Mall in Silver Spring, MD, the club is showing a dozen TV sets and 80-100 radios of all vintages, from a breadboard to '50s plastics, a TR-1, and a cabinet full of other transistor sets. Informative placards give the visitor "the word" on the development of broadcasting and the home sets that went with it. Radios play old-time programming. Two of the TV sets, an RCA 621TS and a Predicta, show a two-hour segment of '50s-'60s commercials provided by the Museum of Broadcasting in New York. The walls carry old-time advertising material. The event opened in December with local radio personalities, civic officials, and the media in attendance, and will run until the end of February.

The location is open, with guides in attendance, weekday evenings from 7 PM to 9 PM, noon to 9 PM on Saturdays, and noon to 7 PM on Sundays. (It is also quite visible from the mall at other hours.) DVHRC members who are in the Washington area may find this a good site to visit. The mall is on Colesville Road, just east of Georgia Ave. (MD 97). It is within walking distance of the Silver Spring Metro stop.

This is intended as only a step toward a permanent museum. Negotiations are under way between MAARC's Radio History Society and the city of Silver Spring for a semi-permanent location. Media coverage has been favorable, and local officials are reported to be impressed.

ARCA WINKS OUT

The merger of the Antique Radio Club of America with the Antique Wireless Association is effectively complete. A special meeting of members took place on Dec. 1 in Charleston, WV. The resulting proxy and on-site votes were 307 to six for the merger. The vote ratifies an ARCA board proposal of last June. ARCA members have received notice that their memberships will be continued via AWA, as either new memberships or extensions of an existing one.

ARCA was founded in 1972 to address a perceived need for a national *radio collectors'* group, as opposed to the early-wireless and old-time "ham" emphasis of AWA at the time. There was negligible local club activity then: CHRS, HARPS, HVRA, MARC, MAARC, NJARC, SCARS, and VRPS - not to mention DVHRC - were embryonic at most. ARCA was fairly successful in its early years, produced a lively quarterly *Gazette* for some years, yet peaked at about 1000 members (vs. AWA's 4000). ARCA always rotated the site of its annual meet, versus the fixed and predictable sites used by such successful national events as Elgin or Rochester.

Absorbing ARCA gives AWA the equivalent of two or three years' growth, after taking into consideration the many individuals who are members of both clubs.

NEXT MEETINGS
Tuesday, Jan. 10 and Feb. 14, 7:30 PM, at North Penn Amusements, 113 Main St. (PA Rte. 113), Souderton.

JOINING THE CLUB
Just send $10 to DVHRC, Box 624, Lansdale, PA 19446.

ADS & SUCH
Please send ads, articles, etc., to Ludwell Sibley, 44 E. Main St., Flemington, NJ 08822-1224, (908) 782-4894.

ON THE HORIZON

Feb. 25	Central PA Radio Collectors indoor meet, 9-1 (tentative date), Williamsport Contact: Frank Hagenbuch, (717) 326-0932; or Mike Heffner, (717) 546-2907
March 4	NJARC indoor meet, Hightstown "Country Club," Hightstown Contact: Jim Fisher, (908) 725-7476
March 25	PARS Spring Fever meet, Washington, PA. Contact: Bonnie Novak, (412) 481-1563
April 29	PARS meeting. Contact: Bonnie Novak, (412) 481-1563
May 6	AWA Spring meet, Bloomfield, NY. Contact: Lauren Peckham, (607) 739-5443
May 13	AWA Schooley's Mountain, NJ meet. Contact: Lauren Peckham, (607) 739-5443
June 9-10	MAARC RADIOACTIVITY, MD (tentative date). Contact: Ed Lyon, (301) 293-1773

WANT ADS

Free exposure for your desired or unwanted stuff! Unless requested otherwise, we'll run each ad for two months, and will send ads to the *NJARC News* for double coverage.

FOR SALE: Booklet of 64 pages describes Federal Tel. & Tel's radio operation from the beginning in 1921 to its demise in 1929. Over 60 illustrations, including pictures of early Federal RF and audio amplifiers, all early radios, and many Federal parts. The article and presentation by Dick Schamberger, Federal expert, are included. All Federal models are listed with the year and month introduced, price new, and brief description. Buffalo's first broadcast station, Federal's WGR, is described. There are two pages of references for more Federal info. This is more about Federal than exists in any other spot! Good-quality printing. Send $4.95 + 1.00 S & H to Larry Babcock, 8095 Centre Ln., East Amherst, NY 14051.

WANTED: BC-610 transmitter, pref. "E" or earlier model, in good/restorable cond. Also want BC-683 receiver, BC-924 transmitter, FT-237 mounting for same, TBW HF section or complete transmitter. Steve Davis, 705 13th Ave., Belmar, NJ 07719, (908) 280-9760.

FOUND: Radio Boys on the Pacific, thanks to *Oscillator* Classified. Ten more titles will complete the collection. Dust jackets preferred but not necessary. Needed: Radio Boys: Lost Atlantis, With the Border Patrol, Soldiers of Fortune, and Air Patrol (all by Breckinridge). First Wireless, and To the Rescue (by Chapman), Under the Seas and Flying Service (by Duffield); Cronies and Loyalty (by Aaron & Whipple). Have dupes to trade. Mike Koste, 215-646-6488.

FOR SALE or TRADE: *Telephony* magazine, most issues, 1959-63 (a whole copier-paper carton full), VG condition. Ludwell Sibley, (908) 782-4894.

WANTED: Predicta TV parts. Looking for picture-tube shroud back cover, tuning knobs, stand. Thanks! Dave Sica, 1549 St. Georges Ave., Rahway, NJ 07065-2718, (908) 392-0618.

FOR SALE: Emud 923 console radio-phono console, immaculate working order, $125. Charles Class, (215) 699-7149.

WANTED: Cabinet for Hallicrafters SX-42. Bob Haworth, W2PUA, 112 Tilford Rd., Somerdale, NJ 08083, (609) 783-4175.

INDEXES: Now available for the full 22-year run of the *ARCA Gazette*, an updated eight-page index. Also available: an updated index to AWA publications, on disc, along with the ARCA index. Find stuff on your computer in a flash! Need one? Just contact your friendly editor.

TRANSISTOR COLLECTING

A thought from Bill Overbeck

It's funny how transistor-radio collecting has developed over a span of just a few years. To quote the 1982 edition of the Johnson Antique Radio Restoration Guide, **"Solid-state sets.** These radios, manufactured from 1961 [sic] to the present, use transistors and integrated circuits rather than tubes. They are a whole new ball game, and we have not tried to describe them in this book. *They have no collectibility now* [emphasis added], but may someday." "Someday" wasn't long in coming. The first known article in the collector press on this topic was a story on, appropriately, the Regency TR-1, in the *ARCA Gazette*, Fall 1985 issue. Then the *Old Timer's Bulletin* ran its first story, the beginning of a string of regular features, in February 1987. The *Gazette* began *its* regular column in mid-1988. Before long transistor sets were showing up in price guides, like the 1991 Bunis guide that assigned values of $30 to a typical 1938 table set and $35 to one of the Emerson 888 models. The rest is history.

CORRECTION

Last month's *Oscillator* was missing the critical bottom line from the front page, the one reporting that Dan Schwartzman's "Red Star" radio won the display contest at Buckingham. You can infer that fact from the pictures, but . . . Can't blame it on a Pentium miscalculation either. My regrets. - Ed.

A look back . . .

MID-'20s: THE RADIO NETWORKS REACH PENNSYLVANIA

Ludwell Sibley

Radio stations in Pennsylvania shared only lightly in the earliest experiments in network or "chain" broadcasting in the '20s. These first operations included RCA's WJZ in New York sending material to WRC in Washington. Another was AT&T's Red Network trials of 1923-24, with WEAF in New York City sending programs to WNAC in Boston, WMAF in South Dartmouth, MA, and WCAP in Washington). Yet another was General Electric's New York State Network, ca. 1925 (WGY in Schenectady feeding WFBL in Syracuse, WHAM in Rochester, and WMAK in Buffalo). About the earliest such experiment in PA was a WEAF feed in June 1923 to KDKA in Pittsburgh, plus WGY and KYW (the latter, a Chicago station at the time). However, once network operation got started, Pennsylvania stations were fairly well represented. The Red Network had expanded to Pittsburgh by 1924. A special National Defense Day program on July 4, 1925 was fed from New York to Philadelphia and Pittsburgh. Pittsburgh was a service point on the broadcast of the Tunney-Dempsey fight in 1927.

On the night before the 1928 presidential election, a "coast-to-coast hookup" organized by the Democratic National Committee originated programs from Pittsburgh, New York, Little Rock and Palo Alto, CA. Feeds were provided to 85 stations, including some in Philadelphia, Pittsburgh, and Oil City (WLBW).

The company carrying the networks was, for our purposes, the Long Lines Department of AT&T. The country's other communications carriers tried to get into network services, but played only an minor role: the New York State Network initially used Western Union wires, and the WJZ-WRC link was on Postal Telegraph Co. facilities. The two telegraph companies provided broadcast lines in a few other places in the country (Seattle to Spokane, Boston to Springfield, and some points in Texas), but AT&T captured a market share of something like (literally) 99%.

CBS got started in 1928 as United Independent Broadcasters, then Columbia Phonograph Broadcasting System, then finally Columbia Broadcasting System. Not serving a station in the eastern part of the state at the time, the network fed from New York through repeaters at Morristown, NJ; and Allentown. At Reading, it joined the cable toward Harrisburg and the west.

As of 1929, stations in the state regularly receiving network service were Philadelphia's WCAU, WFAN (both CBS), WFI, and WLIT (both NBC); Oil City's WLBW (CBS); and Pittsburgh's KDKA (NBC Red and Blue), WCAE (NBC Red), and WJAS (CBS). CBS added WHP in Harrisburg in 1930.

Besides the permanent networks, there were "recurring" hookups. One such, providing service one hour a week, was the People's Pulpit Association network. Beginning about 1929, it grew into coast-to-coast size in the '30s. As of late 1933 it fed stations in Philadelphia and Pittsburgh as usual, but also in Reading (WRAW), Altoona (WFBG, served from Pittsburgh), and Williamsport (WRAK, fed from Buffalo). Another "recurring" network was dedicated to the weekly broadcasts of the fire-breathing politician Father Coughlin, the "radio priest" whose words were carried from Royal Oak, MI to stations in Pittsburgh and Philadelphia in the mid-'30s.

A one-time network was set up for a nationwide celebration of President Roosevelt's birthday on January 30, 1934. Among its 178 stations were one each in Philadelphia, Lancaster, Wilkes-Barre, Erie (WEDH), and Altoona (WFBG); and three in Pittsburgh. (Was this an index of Roosevelt's popularity? Imagine a special "birthday" network set up for any later president!)

AT&T program feeds to the rest of the country relied heavily on facilities across Pennsylvania. The New York - Chicago telephone cable, completed in 1923, was something of an engineering marvel at the time. Wire pairs in the cable - of 16-gauge wire, the very best available - were adapted for 5-kHz program transmission early on. Audio from New York went through the repeater station at Princeton, NJ; then passed through repeaters at Philadelphia, Reading, Harrisburg, Shippensburg, Bedford, Ligonier, Pittsburgh, and New Castle. The repeaters used Western Electric "tennis-ball" tubes of the style prized by collectors today. The once-famous NBC "round robin" from New York to Chicago and back originally routed northwest through Rochester and Cleveland. It returned via the Pittsburgh-Harrisburg-Reading route, then ran east through Allentown. There was also an NBC Blue Network feed from New York via Scranton and Elmira to Rochester and points west.

Pennsylvania shared in the ill-fated Atlantic Seaboard Network, which comprised a group of then-small stations between New York and Washington. They constituted the short-lived Amalgamated Broadcasting Sys-

tem. The network expanded to 100 stations late in 1933, using Western Union lines; then promptly went bankrupt.

Looking at the early network situation, it is clear that the early networkers CBS and NBC preferred to sign up the high-power, big-city stations. By contrast, the Mutual Broadcasting System, founded in 1934 as the Quality Group, signed up a much wider variety of stations whose line charges would often have been much higher. At the end of land-line networking in the late '70s, Mutual served the following stations, in the central and eastern parts of Pennsylvania alone: Allentown, WHOL; Chester Heights, WQIQ; Gettysburg, WGET; Harrisburg, WFEC; Lebanon, WVLV; Lykens, WQIN; Mexico, WJUN; Philadelphia, WCAU and WWDB; Pottstown, WPAZ; Towanda, WTTC; Washington Crossing, WTNJ; Wellsboro, WNBT; and Wilkes-Barre, WYZZ.

ATLANTIC SEABOARD NETWORK

New York:	WBNX-WCDA-WMSG, 250 W, 1350 kHz
Trenton:	WTNJ, 500 W, 1280 kHz
Philadelphia:	WPEN, 250 W (day), 100 W (night), 1500 kHz
Wilmington:	WDEL, 500 W (day), 250 W (night), 1120 kHz
Baltimore:	WCBM, 250 W (day), 100 W (night), 1370 kHz
Washington:	WOL, 100 W, 1310 kHz

There were other wireline networks, some of which doubtless served Pennsylvania stations, but details are scarce. Examples are the American Broadcasting System (1934 - today's American Broadcasting Company wasn't in business until 1943); the Associated Broadcasting Corporation (1945); and the Liberty Broadcasting System (1950-52).

In the early years of FM broadcasting, Allentown's WFMZ formed the start of the WQXR Network. It was the first station to rebroadcast WQXR's FM classical-music programming off-the-air from New York. Between about 1948 and 1963, the WQXR Network grew to the point of feeding the Rural Radio Network in upstate New York, which chained its way all the way to Niagara Falls without AT&T lines. Further growth extended via Bridgeton, NJ to Philadelphia and thence to Baltimore and Washington. Extensive off-the-air networks generally failed from problems of poor service reliability and insufficient local revenue. By contrast, they are thriving today in "educational" FM, as for example the New Jersey Network's WWFM, which is carried on five of-the-air translators including one as far away as Scranton.

SOURCES

A. B. Clark, "Wire Line Systems for National Broadcasting," *Bell System Technical Journal*, Jan. 1930, p. 142-143.
R. T. Barrett, "Network Broadcasting - Historical Summary," *Bell Telephone Quarterly*, April 1934, p. 93-94.
"Chronology 1931-1981," *Broadcasting*, 50th Anniv. Issue, Oct. 12, 1981, pp. 147-152.
-, "Amalgamated Broadcasting System," *Radio Engineering*, July 1933, p. 19.
E. M. Sanger, Rebel in Radio - The Story of WQXR (New York: Hastings House, 1973), pp. 162-168.
Citizens Radio Call Book Magazine, Sept. 1929, pp. 10-30; and Nov. 1930, p. 8.

OLD-TIME REPAIR HINTS

It's fun to read the "service hints" that appeared in literature directed to the radio service trade of past years. These give a feel for the times: small independent service merchants trying to keep their customers' radios working despite inadequate spare parts, especially during WW II. Better yet, there's a lot of "wisdom of the elders" that applies to fixing radios today. Here are a few such ideas from the past.

Eliminating "Cut-Outs." Receivers which "cut-out" often present service jobs requiring the expenditure of time and labor for which adequate compensation cannot be secured. Condensers are, of course, first suspected, then resistors, tubes, connections, and windings. Yet we can quite often eliminate each of these potential sources of the trouble - and the receiver is still intermittent.

Frequently, the particularly difficult intermittents can be speedily cured by proper attention to trimmer and padding condensers. Sometimes it is only necessary to remove the adjusting screw and clean and free the mica separator and plates of dust and filings. Most often, however, these capacitors cause "cutting-out" through a leaking mica separator and, in such instances, a new piece of mica will terminate the erratic performance of the receiver.

A signal tracer may be required to accurately locate the offending trimmer instrumentally. Occasionally, the receiver can be made to "cut-out" at will by turning the adjusting screw or by squeezing the plates together by pressing on the top plate with a screwdriver or other tool. *(C-D Capacitor*, Sept. 1940)

Loudspeaker Fields. The next time that you get a call and find an open speaker field, don't be in too much of a hurry to replace the field. Take the field out and remove the paper coating. Ten-to-one you will find the field open where the fine wire is joined to the heavy wire that is brought out from the field. All that is necessary is to re-make the connection and the field is as good as new. *(RCA Radio Service News*, Feb. 4, 1935)

Screw Alignment Pointer. Adjustment of trimmers and controls of TV sets can result in quite a bit of extra work if the trouble is found elsewhere and it is necessary to return the adjustments to their original positions. It is easy to lose track of where they were before, especially in the case of recessed adjustments.

To simplify this, I use common bobby pins and solder the open end by wrapping around some fine tinned wire and soldering. This makes a pointer with good tension that can be slipped on the shaft of an alignment tool and moved up or down the shaft for best position.

During trimmer alignment I insert the tuning tool into the adjustment screw and then move the pin down the shaft of the alignment tool close to the chassis, marking the chassis to coincide with the end of the pin as a reference point. By observing the movement of the pointer it is easy to see whether the adjustment is 1/4 turn, etc., and right or left. (*Sylvania News*, March 1956)

Short-Circuit Leads. In many models of sets manufactured a year or two ago rubber covered power transformer leads were employed which often caused short circuits as the result of the older type of rubber insulation melting or breaking off after hardening. Sets will thus be found inoperative, the power transformer will overheat and smoke, or filament of tubes will not light.

To service such jobs, first inspect the leads from the power transformer to tubes. Then separate them, or if necessary, replace the leads with heavier insulated wire. (*C-D Capacitor*, Sept. 1940)

Neutralizing. In neutralizing some of the old sets, a good tube from which one filament pin has been cut off is often used. However, due to the fact that tubes vary in their internal capacity, this does not always work. A better way is to use the tube that is to be used in the stage under test by slipping a short length of drinking straw over the filament pin. This never fails to work and permits a more accurate neutralization job that avoids possible oscillation. (*RCA Radio Service News*, Dec. 1935)

Cover Switches on Battery Portables. The switches which open and close the "A" and "B" circuits of personal-type portables are usually operated by opening and closing the cover. Many times the switch is not pushed down far enough to cut off the circuit, thereby running down the battery. I add a bead of solder to the exposed part of the switch on sets which have this trouble. The longer lever will insure that the switch opens every time. (*Sylvania News*, March 1956)

Leaky Capacitor Blocks. If abnormal voltages appear on cathodes of audio tubes, or hum prevails even though individual sections of a capacitor block check OK., test for leakage between sections of the unit. Leakage between sections in many of the capacitor blocks used in the lower priced sets seems to be a common fault. Neon leakage test between capacitor sections will reveal the definite source of trouble encountered. The remedy, obviously, is to replace faulty sections with individual units such as C-D "Beavers" or multiple section units of the same values and voltage ratings. (*C-D Capacitor*, Oct. 1940)

Midget Speakers. When you have a midget speaker on the bench that is hard to center, just hook the field coil and the output transformer in series and connect to the 110-volt AC line. Proper centering is indicated when you hear nothing at two feet. However, if the cone is rubbing, the sound will be very bad. (*RCA Radio Service News*, Dec. 1935)

"Oh, but I must have my radio fixed for my evening to be a success."

Repairing Phono Drive Wheels. For emergency repairs on working phono drive wheels which do not have any holes or dents in the rubber rim, but are worn sufficiently to slightly change the speed of the turntable, or if worn where insufficient drive pressure is maintained, the following tip may be worth while. We have found some of them going strong a year after this "temporary" repair is made. Carefully peel the rubber from the rim of the wheel and cut a narrow piece of white physician's tape just long enough to reach around the periphery in the slot without overlap, and with the sticky side toward the wheel. Then replace the rubber ring in its original position on the wheel, smoothing it down carefully and evenly. This will increase the diameter very slightly and also the pressure against the driven turntable. This stunt can be used in recorders and other units using the same type of drive. (*Sylvania News*, Feb. 1953)

Locating Defective Capacitors. In the intermittent jobs which are usually so puzzling to servicemen, the writer has employed a very simple method to locate defective capacitors quite satisfactorily.

Remove all tubes from the set and apply a DC voltage to the plate

causing the intermittent will readily be located be sizzling, and finally breaking down. Thus the stage causing the trouble can be located, and the defective capacitor replaced with a new unit. *(C-D Capacitor*, Oct. 1940)

Emergency Reception. On some superheterodynes, emergency reception may be provided by connecting the grids of the first and second detectors together, thereby eliminating a defective oscillator or IF amplifier, and making the receiver work as a TRF job. *(RCA Radio Service News*, Dec. 1935)

Cracked Plastic Cabinets. Cracks on radio or television receivers may be easily and neatly repaired by following the steps listed. First, apply carbon tetrachloride *[today, trichloroethylene!]* along the crack on the inside of the cabinet, to remove any grease or other substance. Second, apply radio cement the full length of the crack and about 1/2 inch on either side of the crack. Third, place one-inch gauze bandage over the crack, press smoothly and apply a little more cement on top of the bandage. While drying, a weight should be applied to keep the crack closed tightly. This will do a neat, clean and permanent job. *(Sylvania News*, March 1952)

An Improvised Ballast. A 150-watt Mazda electric light bulb makes a dandy ballast for many models of sets such as the Silver model 30. The writer uses an old 4-prong tube base and removes two of the prongs diagonally. Short flexible wire connections are then soldered from the bulb to the two prongs of the tube base. The bulb base is then carefully inserted into the tube base so that connections do not short, and held in place by filling with hot sealing wax. *(C-D Capacitor*, March 1941)

Magic-Eye Tubes. If the 6E5 tube is operating but the screen is a very pale shade of green, check the 1-megohm resistor before condemning the tube. Very often this resistor will be found to have changed its value. *(RCA Radio Service News*, March 1936)

Field-Coil Burnouts. I spent much time on a Crosley Model 58 trying to increase the volume to normal, but nothing seemed to help much. Finally, another dynamic speaker was plugged in in place of the regular speaker, and the volume appeared to increase. Checking the regular speaker, I found that at some time the field coil had apparently burned out, and instead of repairing or replacing it, the connections from the speaker to the plug had been rearranged so that the 45 output tube received its positive voltage through the output-transformer primary, but no current flowed through the field coil to energize the speaker.

A quick and entirely satisfactory repair was made on the field coil, by checking it with an ohmmeter to discover where the circuit was broken, which in this case was very near the core end of the winding. Then, by scraping the enamel insulation from a few turns of the winding along the outside of the coil near the core, and tapping it, the entire winding from the tap to the outside of the coil was OK, and when the connections were returned to normal, the radio performed normally, with very good volume and tone. The few turns at the inner end of the coil that were bypassed in this way have no effect, and the change in resistance is not noticeable. To check the coil for the break, I connected the ohmmeter to one end of the winding, and, using a sharp prod, scraped through insulation along the side of the winding until a point was reached where the indication changed. Repairs could also be made near the center of the coil, simply by shunting the break along the edge of the coil, after which the coil is retaped. *(Sylvania News*, April 1944)

Prevention Against Short Circuits. A majority of AC-DC receivers *[well . . . just a few bad actors, including two of the most popular Catalins - Ed.]* have one side of the power line tied directly to the chassis through the on-off switch. On such receivers, particularly those encased in thin plastic cabinets, the chassis holding bolts protrude sufficiently so as to present a short-circuit hazard, since many people place these sets on top of unprotected radiators. Whenever tests of this type come in for repairs the writer places two or three strips of adhesive tape over each screw head of the chassis bolts so as to completely overlap both screw and washer. *(C-D Capacitor*, Sept. 1941)

Color Code. Radio servicemen are often unable to determine the value of a coded resistor because they do not know the color code and have lost or misplaced their trick color-code cards. All of them can tell how many days are in each month by the old ditty, "Thirty days hath . . . etc." The following catchphrase is almost as simple. It is necessary only to remember the code begins with black ("0") and ends with white ("9"), and that "Mr. BROYG wears BVGs." The letters BROYGBVG can then be counted on the fingers of one hand, and - presto! - there is the value of the unknown. *(RCA Radio Service News*, March 1936) *[This must predate "Better Be Right Or Your Great Big Venture Goes Wrong" or "Bad Boys . . . " - Ed.]*

Replacing The BH Rectifier Tube. The BH rectifier tube in some of the old-timer radios can be replaced by changing the socket and using the 0Z4 or 0Z4G. The voltage and current conditions will nearly always be within the limits of the 0Z4; however, these operating conditions should be checked to make sure that there will not be an overload on the tube. The large pins are the plates on the BH and No. 2 is the cathode. *(Sylvania News*, Oct. 1942)