January 27, 1922 - January 27, 2022: Another KDKA Centennial

And an Addendum: a KDKA QSL from 1921

by

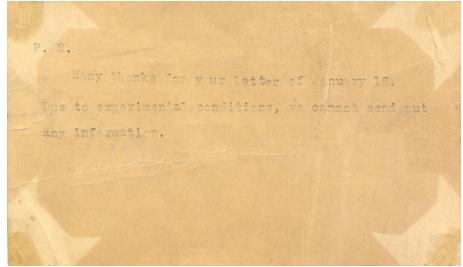
Jerry Berg, jsberg@rcn.com



If you follow radio-related ephemera on eBay you'll probably agree that both quality and quantity are down these days. But there are always surprises, like a QSL-card I purchased recently. Two things made it special: it is from KDKA, a station of historic significance; and it is very old–January 27, 1922. (It was paired with a 1926 QSL from WPA, Fort Worth; see pg. 7.) The KDKA card is shown below. The typing can be seen more clearly in this enhanced image. So today, January 27, 2022, is the card's 100th birthday.

DEAR Accept our thanks for your communication of Lam. 18... concerning your reception of signals from KDKA. During the reception which you mentioned, the wave length was 180 meters; antenna current amperes; antenna height feet. Your comments from time to time, and also your suggestions for the improvement of our service will always be appreciated. Very truly yours, L. H. ROSENBERG, Department of Publicity, Radio Section.

KDKA is generally considered the "first" broadcasting station (there are other strong contenders for the title¹), the inaugural broadcast being the famous November 2, 1920 Harding-Cox election returns. Many more broadcasters followed, seeding a widely recognized "radio boom" in the years 1922-1925, as the number of stations, and public interest in listening, grew exponentially.²



This period of rapid growth is reflected in the QSLing of those years. In even the oldest collections of broadcast band QSLs, the earliest QSLs are almost always from the mid-1920s or later (ham QSLs go back further). This is to be expected, for the earlier the year, the fewer the number of stations, and DXers, and the less likely that the QSLs would have survived. While it is unusual to find collec-

tions going back even to the mid-1920s, BCB QSLs from 1923 or 1924 are scarcer still. This

QSL is from January 1922, roughly 15 months after KDKA's first broadcast, a time when the radio boom was in its early stages.

Authorities vary somewhat on just how many broadcasting stations there were at that time. The StoryMap for January 1922 on the <u>Radio by the Numbers</u> website (Figure 1—wait for the map to reach January) appears to show the number as 22, seemingly measured at the end of the month. Sterling & Kittross, in their major work, *Stay Tuned:* A History of American Broadcasting,³ say that by January 1 the Commerce Department had licensed 30 stations; and according to broadcasting history authority Erik Barnouw, only eight new ones were licensed during January,⁴ making the total 38. Gleason L. Archer, in his History of Radio to 1926,⁵ says that 28 stations had been listed in the Department of Commerce Radio Service Bulletin by January 1, 1922, with eight more shown for February 1, for a total of 36 by the end of January.

The exact number is not important. The point is that the total number of licensed broadcast stations in the entire United States in January 1922 was in the 30's. The numbers jumped quickly thereafter. The Commerce Department reported the number as 67 by March 10.⁶ Per Sterling & Kittross again, citing the *Radio Service Bulletins*, there were 218 stations by May 1–a little more than three months after the KDKA QSL—and well more than double that number, or 556, by March 1, 1923. In the radio boom, January 1922 was "early days."

A Wireless Receiving Station -has been installed in our Play Store, Amateur Wireless Amateur erators and others interested in the subject are invited to come in at any time during the day and "listen in" on any message which may be floating through the air. Our instrument is capable of receiving radios within a distance of 1,000 miles. Amateur Outfits are for sale in this section. -West Basement

An advertisement for the Joseph Horne department store in the *Pittsburgh Sun* for September 29, 1920, which reported on Frank Conrad's test broadcasts and offered for sale radios ("\$10 up") that could receive them, is often cited as the motivation for Westinghouse vice-president H. P. Davis to build KDKA. At right is that ad, as it also appeared in the *Pittsburgh Press*; and above is another *Pittsburgh Press* Joseph Horne ad from two days earlier.

Air Concert "Picked Up" By Radio Here

Victrola music, played into the air over a wireless telephone, was "picked up" by listeners on the wireless receiving station which was recently installed here for patrons interested in wireless experiments. The concert was heard Thursday night about 10 o'clock, and continued 20 mlnutes. Two orchestra numbers, a soprano solo—which rang particularly high and clear through the air—and a juvenile "talking piece" constituted the program.

The music was from a Victrola pulled up close to the transmitter of a wireless telephone in the home of Frank Conrad, Penn and Peebles avenues, Wilkinsburg. Mr. Conrad is a wireless enthusiast and "puts on" the wireless concerts periodically for the entertainment of the many people in this district who have wireless sets.

Amateur Wireless Sets, made by the maker of the Set which is in operation in our store, are on sale here \$10.00 up

-West Basement

The change in number of receivers and listeners between 1922 and 1925 was equally dramatic. A survey published in 1928 reported that, as of January 1, 1922, there were an estimated 60,000 homes with radio receivers, either factory made or home built, with an audience of 75,000, suggesting that listening was usually a solo experience. Four years later, on January 1, 1926, the number of receivers was five million and the audience 20 million, or four listeners per receiver. Radio had become a family affair.⁷

In his "Ancient DX Report 1922: A Worldwide Boom," <u>Wavescan N600</u>, August 23, 2020 (mid-screen), Adrian Peterson includes these among the noteworthy radio-related events of 1922, in addition to the huge leap in number of stations: the introduction of new radio magazines in different countries and in national languages; the appearance of radio columns in daily and weekly newspapers and periodicals; special, and sometimes novel, radio events to catch public attention; publication of information on how to make your own receiver; the rapid transmittal of important international news from anywhere to everywhere; the establishment of technical training schools that fostered radio experimentation; and the growth of amateur radio as a hobby that could be enjoyed by many.

The gold standard of QSLing that DXers would adopt in later years—a valid QSL should include date, time and frequency of reception, and a statement of confirmation—was a long way off in January 1922 and the years after. Occasionally one would receive such a "full-data" QSL, but often the card was more in the nature of a no-data "thank you for writing," perhaps acknowledging or at least implying that the listener heard the station. The QSL would usually show the station's frequency, and sometimes include schedule information. Overall, the standard was fairly lax, as exemplified by these cards from WKN, Memphis, Tennessee (July 1922) and WOI, Ames, Iowa (November 1922). By the standard of the day, the KDKA card was pretty specific, with wavelength, power, 8 and antenna height typed in.

The KDKA QSL does not contain the name of the recipient. However, the eBay seller advised that it was part of a lot of QSLs that he purchased at an estate auction, and that he believed they all belonged to the same person: S. B. Taylor, 740 Main Street, Stroudsburg, Pennsylvania, which is the name and address on the WPA card. There was a Stewart Bryden Taylor, Jr. at 742 Main Street listed with call letters 8PE in both the June 30, 1924 and June 30, 1925 editions of *Amateur Radio Stations of the United States*, published by the Radio Service of the Commerce Department's Bureau of Navigation. That call was listed for someone in Ohio in 1923, and it is not shown at all in 1926. It is probably safe to assume that the KDKA QSL belonged to Stewart Taylor.

A card that old makes you think about what the world was like when Stewart Taylor wrote to KDKA. America's population was 110 million, a third of today's. World War I had ended three years earlier. Warren G. Harding was president (the 29th). Prohibition was in effect. Universal suffrage for women had been achieved only five months earlier. Nine out of 10 cars sold were Fords, and you could buy a Model T for \$319. It was the year in which *The Great Gatsby* was set, and the start of the Roaring Twenties—a time of prosperity, social change, jazz, and the flapper.

Still in the future when Stewart was "listening in," as radio listening was often called in those days: the first solo, nonstop transatlantic flight (Charles Lindbergh), the first "talkie" (Al Jolson's "The Jazz Singer"), and the start of work on Mount Rushmore, all in

1927; the discovery of penicillin and the birth of Mickey Mouse, 1928; the stock market crash and the start of the Great Depression, 1929.

Many radio accomplishments had preceded Stewart Taylor's report to KDKA. In 1921, the station claimed many "firsts": first church service, first sports broadcast, first broadcast from a theater, first newsroom, first full-time announcer (Harold Arlin). It was about three months before Taylor's report that RCA's huge Radio Central point-to-point facility at Rocky Point, Long Island opened; and about seven weeks before his report that the first proven transatlantic ham reception took place (1BCG, December 9-11, 1921). Confirmed transpacific reception would take another year.

RADIO STATION KDKA

Westinghouse Electric & Manufacturing Company
East Pittsburgh, Pa.

Thank you so much for your commendation of our concert. Hearing from you and many others is our greatest incentive to arrange concerts and other features that will bring enjoyment into your home. We shall welcome any suggestions you may have.

Advance programs are published by the Pittsburgh Post, Pittsburgh, Pa., as a supplement to the Wednesday edition. The subscription price is \$1.00 per year.

WESTINGHOUSE RADIO STATION KDKA

"The Pioneer Radio Broadcasting Station of the World"

Other events still in the future for the listener in January 1922: The first series of International Radio Week tests, where many broadcast band stations on both sides of the Atlantic closed down for a half hour so listeners could try for signals from the other side, would be held from November 25 to December 1, 1923. Broadcast stations were as interested in "applause," i.e. comments on their programs, as in signal reports, and so the applause card was born,

circa 1924. Some stations, including KDKA, replied to "applause" with their own card (above). The Federal Radio Commission, predecessor to the FCC, was still to be established (1927).

Also in the future, and thus unknown to those listening to KDKA on what we now think of as the standard broadcast band, was shortwave broadcasting, a field in which KDKA played a founding role. Frank Conrad had been very much involved with experimentation by amateurs on shortwave, which at the time was often defined as the range around 3.0 MHz. He had a shortwave transmitter (8XS) installed at the Westinghouse plant, and in July 1923 KDKA began regular nightly simulcasts. Soon KDKA was being heard around the world. It was the start of shortwave broadcasting.

KDKA also utilized shortwave to relay signals to two Westinghouse stations for rebroadcast to their local audiences on their regular broadcast band channels. These were KDPM, Cleveland, which rebroadcast the KDKA signals for a time in 1922-23, and KFKX, Hastings, Nebraska, a more substantial setup that relayed KDKA on the broadcast band (and sometimes on its own shortwave transmitter) from November 1923 until the end of 1927. KDKA had attracted little public attention when it first went on the air, but by the time of these shortwave relays, radio, including long-distance radio, had become more newsworthy.¹⁰

What kind of receiver might Stewart Taylor have been using? Much equipment was homemade in those days. There were also factory-built sets (or kits of parts) on the market, although these were intended mainly for amateurs. But things were changing. One author

[I]n September [1921], E. Tunney [probably a misspelling of Eugene T. Turney Labs, Holmes, New York] announced a new receiver that was specifically designed to receive only broadcast band wavelengths and thereby catered directly to the broadcast listener. In December 1921 kits for simple radios appeared in the department stores for the first time. ¶* * * Radio apparatus had meant radio parts for building your own receiver but now [1922] a half dozen receiving sets were on the market. Advertisements for complete radios appeared—Clapp-Eastham in January, Grebe in February, Tuska in June and Crosley in September. Quite a change from the year before when there were only radio parts advertised.¹¹

In his three-volume work, *Radio Manufacturers of the 1920's*, Alan Douglas observed that most of the early radio manufacturers were small. "Some were nothing more than high-school boys working in their attics." It wasn't much different with the stations themselves; many licensees never made it to air, or, once there, could not sustain themselves.

Stewart Taylor may have been using a receiver with a crystal detector. If he had a tube set, it would have been regenerative, and battery operated (AC radios did not come along until mid-decade, and then only slowly). He would have been listening with headphones, and his antenna was probably a wire, either outdoors or draped around the room. If he was a more experienced "radiotrician" he may have had a loop, whose directionality was already known.

What programs did Taylor hear over KDKA? We know what the station's programs were like, thanks to *Radio Broadcasting News*, a weekly, four-page Westinghouse publication which focused at first on KDKA and later other Westinghouse stations. (You can find all the issues at the <u>worldradiohistory</u> website.) The inaugural issue appeared on January 1, 1922, just a few weeks before Stewart Taylor tuned in. At right is the schedule for the week of January 15, which is when Taylor must have been listening.

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PROGRAM FOR THE WEEK
The Westinghouse Electric & Manufacturing Company
announces for its fifty-sixth week of broadcasting from sta-
tion KDKA, the following program:
                                          Sunday, January 15, 1922
                                   Sunday, January 15, 1922
Services of the First Presbyterian Church,
Sixth Avenue. Pittsburgh, Pa. Sermon by
Rev. Maitland Alexander, Minister.
Radio Chapel at Station KDKA by the Rev.
W, F. Silveus, Pastor, First Presbyterian Church,
Duquesne, Pa.
Services of the Calvary Episcopal Church
Shady Avenue, Pittsburgh, Pa. Sermon by
the Rev. Edwin J. Van Etten.
Monday January 16, 1922
  3:00 P. M.
  7:45 P. M.
                                    Monday, January 16, 1922
Roger Babson Letter on Business Conditions
Kilherd Morris, tenor
Mrs. Webster Hinnau, soprano
Mr. Wenzel, violinist
 Tuesday, January 17, 1922
7:45 P. M. Children's Story by Miss Louise Guiraud of the Carnegie Library.
8:00 P. M. "Dress and Latest Fashions" by Mrs. Chester
                                    Joseph J. Bowman, baritone
Mrs. Robert King, soprano
Fred Wise, concert basso
   8:30 P. M.
                                     Miss Harriet Merwin, contralto
                                     Miss Anna Scally, soprano
Miss Juliet Bartletti
Miss Edna Marriott
  Wednesday, January 18, 1922
8:30 P. M. Singers from Le Suer Studio
  Thursday, January 19, 1922
8:30 P. M. F. S. Gray, Orchestra of Canonsburg
                                           Friday, January 20, 1922
Ischuco Trio, Auspices of Art Society of
   8:30 P. M. Elschuco
                                            Pittsburgh
  Saturday, January 21, 1922
8:30 P. M. Soloists from Carnegie Tech Band.
                                   Soloists from Carnegie Tech Band.
Sunday, January 22, 1922
Services of the First Presbyterian Church,
Sixth Avenue, Pittsburgh, Pa. Sermon by
Rev. Maitland Alexander, Minister.
Radio Chapel at KDKA, by the Rev. S. W.
Bell, Pastor, South Avenue Methodist Episcopal
Church, Wilkinsburg, Pa.
Services of the Calvary Episcopal Church
Shady Avenue, Pittsburgh, Pa. Sermon by
the Rev. Edwin J. Van Etten.
10:45 A. M.
   7:45 P. M.
                                                    Week Day Schedule
Week Day Schedule

10:00 to 10:10 A. M. Music

12:30 to 1:00 P. M. Music

*2:00 to 2:10 P. M. Music

*4:00 to 4:10 P. M. Music

*On Saturdays no broadcasting done at these periods.
 *On Saturdays no broadcasting done at these periods.
7:30 P. M. Uncle Wiggily Bedtime Story from the Pittsburgh Sun and Music for the Kiddies, and Grown-ups who still enjoy them.
7:45 P. M. Special News, Government Market Reports, Summary of New York Stock Exchange, Weather Report
8:30 to 9:00 P. M. Musical Program
9:00 to 9:05 P. M. News (United Press Service)
9:05 to 9:30 P. M. Musical Program
9:55 to 10:00 P. M. Arlington time signals
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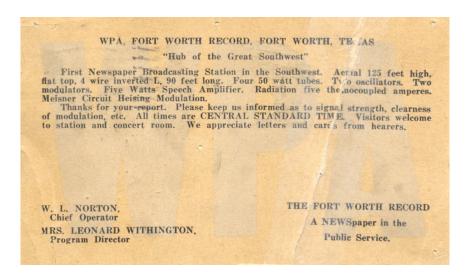
After five months, *Radio Broadcasting News* expanded to 16 pages, dropped its Westinghouse parentage, and enlarged its scope to include non-Westinghouse stations, as well as advertising and various radio-related articles. In 1923 it was acquired by *The Pittsburgh Post*, which, on April 4 of that year, began publishing it as a sizeable Wednesday radio section, retaining the *Radio Broadcasting News* name and the original masthead.¹³



What might a radio fan have been reading in January 1922? It was a transitional period. Before World War I, discussion of radio was often treated within the broader topic of electricity. After the war, when publication of magazines resumed and amateur radio looked like it would survive after all, radio became its own topic. There was no broadcasting as we think of it today—at least no licensed broadcasting—so radio magazines were oriented toward technical topics that would appeal to radio amateurs and hobbyists, and toward the point-to-point transmissions that "were" radio at the time. This began to change in 1922. Until then, the very small fraternity of broadcast listeners usually was considered a subset of the larger "amateur" community. *QST* even had a column devoted to broadcast listening ("With the Radio Phone Folks," later "With Our Radio Phone Listeners"). But from June 1922, the ARRL began treating listeners basically as transmitting amateurs in waiting, and dropped coverage of broadcast listening.

Publications intended to appeal to a wider, popular audience started appearing, although even these were surprisingly technical. New hard-cover titles in 1922 included Radio for All, Radio for Everybody, Practical Radio, Radio Phone Receiving—A Practical Book for Everybody, and The Home Radio—How to Make and Use It. Among the magazines that appeared were Radio (November 1921; called Pacific Radio News before that), Radio Age and Popular Radio (both May 1922), and Radio in the Home (June 1922). Later came Modern Wireless (February 1923), Radio Review (May 1925), and many others. In September 1922, one of the most successful publications, Radio News (prior title, Radio Amateur News), observed that over 40 new radio magazines had appeared since January 1 of that year.

What do you suppose Stewart Taylor asked that prompted the reply on the back of the KDKA QSL? Might he have been asking about the KDKA shortwave experiments? We can never know, of course. Whatever it was, it looks like his log of KDKA helped keep him listening and reporting to other stations, at least during the next few years, as the 1926 WPA QSL on the next page demonstrates.





For an excellent recounting of KDKA's birth, read "The Centennial of KDKA's Historic 1920 Broadcasts" by David and Julia Bart in the <u>AWA Review</u>, v. 33, 2020, p. 25. For more, go to pg. 77 of the Barts' article where you will find a list of first-hand descriptions of KDKA that were published in various places during the years 1920–1955.

Addendum: a KDKA QSL from 1921

The only thing better than a 1922 QSL from KDKA is one of even earlier date, and here we have one. Addressed to a "Mr. McCartney," it is shown on the next page. It is dated May 18, 1921, which is about eight months prior to Stewart Taylor's 1922 QSL, and six and a half months after the station's famous November 2, 1920 election broadcasts.

The McCartney card is similar in design to the 1922 Stewart Taylor QSL (which bears the printed number 91-A). The language of the 1921 card (numbered 91) is slightly different, and the back, rather than left blank, contains printed schedule information. (The referenced Calvary Episcopal Church broadcasts commenced on January 2, 1921.)

RADIO STATION KDKA WESTINGHOUSE ELECTRIC & MFG. COMPANY EAST PITTSBURGH, PA.

May 18 192 1

DEAR Mr. McCartney:

Your communication in regard to reception of signals from KDKA has been received, for which please accept our thanks.

During the reception which you mentioned, the wave length was......330 meters; antenna current.....3.5.......amperes; antenna height......90........feet.

We shall be pleased to hear from you from time to time regarding our signals, together with any suggestions that you may have.

Very truly yours,
L. H. ROSENBERG, Publicity Dept.

Westinghouse Elec. & Mfg. Company.

Post Card 91

SCHEDULE

We send out concerts every week night between 8:00 and 9:00, Arlington time. On Sunday nights we transmit the services of the Calvary Episcopal Church, Pittsburgh, between 6:45 and 8:00, Arlington time. Every evening we send out the baseball scores at 5:05, 6:05 and 7:05, Arlington time.

The years 1920 and 1921 are difficult years to research—most of the early radio literature hails from 1922 or later. Erik Barnouw says that only five broadcast licenses were issued from January to November 1921, 23 in December of that year.⁴ Thomas White's numbers differ somewhat.¹⁴ And there were other voices in the air as well—stations that were licensed for other purposes and had drifted into part-time, impromptu or experimental broadcasting, or broadcast stations that were entirely unlicensed. But whichever numbers you use, in April 1921, when Mr. McCartney must have been listening, it appears that the number of licensed broadcast stations was in single digits, or nearly so—a world almost unimaginable today.

END NOTES

- 1. Donna Halper, *When Broadcasting Really Began–Refuting the KDKA Myth (Again)*, online at The Broadcasters' Desktop Resource, July 2020.
- 2. For an interesting, well-illustrated talk on the growth of broadcast radio in the 1920s, with an emphasis on the stations, see "Broadcasting's Turbulent '20s–From Hobby to Big Business," a video presentation by Scott Fybush at the 2021 Antique Wireless Association Conference.
- 3. Sterling & Kittross, *Stay Tuned: A History of American Broadcasting* (Mahwah, NJ: Lawrence Erlbaum, 3rd ed. 2002), p. 66.
- 4. Erik Barnouw, <u>A Tower in Babel: A History of Broadcasting in the United States to 1933</u> (New York, NY: Oxford Univ. Press, 1966), p. 91.
- 5. Gleason L. Archer, <u>History of Radio to 1926</u> (New York, NY: The American Historical Society, Inc., 1938), p. 393.
- 6. <u>Radio Service Bulletin No. 59</u>, Bureau of Navigation, Dept. of Commerce (March 1, 1922), pgs. 13-14.
- 7. "Statistical Survey of the Radio Business, as of January 1, 1928," <u>Radio Retailing</u>, March 1928, pg. 36, reprinted in Alan Douglas, *Radio Manufacturers of the 1920's* (Vestal, NY: Vestal Press, 1989), vol. 1, pg. xx-xxi.
- 8. This brief note appeared under "Strays" in the June 1922 issue of <u>OST</u> (pg. 56): "KDKA has an acknowledgment card with a blank space for filling in the height of their aerial at the time they were reported. Maybe they get different wavelengths by hoisting or lowering the antenna."
- 9. <u>The Story of the First Trans-Atlantic Short Wave Message</u> (Proceedings of the Radio Club of America, Inc., 1BCG Commemorative Issue, October 1950); "1BCG Conquering the Atlantic," a video presentation by Edward Gable and Mark Erdle at the 2021Antique Wireless Association Conference.
- 10. See, in one file, "Short Wave Relaying is Innovation in Radio Broadcasting" [KDPM], *The Pittsburgh Daily Post*, March 4, 1923, p. 17; and "Will Pick Up Eastern Concerts" [KFKX], *The Pittsburgh Daily Post*, November 25, 1923, p. 35.
- 11. David Rutland, <u>Behind the Front Panel–The Design and Development of 1920's Radios</u> (1994; California Historical Radio Society reprint, 2013), p. 4.
- 12. Douglas, note 7 above, pg. vi.
- 13. An interesting historical note from *Radio Broadcasting News*: The issue for Sunday, January 15, 1922, in which the schedule reproduced on pg. 5 above appears,

describes that week as the station's 56th week of broadcasting (top of column). (The issues for January 7 and January 1 cited those weeks as the 55th and 54th week respectively; this "count" was dropped after January 15.) Counting backwards, that means KDKA's first week of broadcasting would have been the week of Sunday, December 26, 1920. What event was it that warranted the denomination of the "first week of broadcasting," and what did the station consider its first day of broadcasting? It is by no means clear. The start of church relays on January 2, 1921 was a major event in the station's history, and may have had something to do with it. An article in *The* Pittsburgh Post of January 2, 1922 starts, "Pittsburgh since December 28 [some may say the 8 is a 3 in the newspapers.com image, but I believe it is an 8] popularizing of a new science of entertainment and instruction-radio telephone broadcasting, which has introduced the name of Pittsburgh and with it the broadcasting station KDKA...into the homes of thousands throughout the country." It gives no specifics as to what happened on that date, but December 28 was at least within the week of December 26. Another source suggests another date: December 1, 1920: "Semi-weekly programs were put on from [November 2, 1920] until December 1st, 1920, when regular evening programs were commenced," says D. G. Little in "KDKA-The Radio Telephone Broadcasting Station of the Westinghouse Electric and Manufacturing Company at East Pittsburgh, Pennsylvania," *IRE Proceedings*, June 1924, p. 255 (Little was the engineer who worked with Frank Conrad on the design of the KDKA transmitter).

Whichever week or date is correct, the point is that KDKA apparently considered its "official" start of broadcasting to have occurred some number of weeks *after* the famed transmission of November 2.

14. Thomas H. White, "United States Pioneer Broadcast Service Stations: Actions Through June, 1922," United States Early Radio History.

RESOURCES IN ADDITION TO THOSE REFERENCED IN THE END NOTES

Ronald J. "Noah" Arceneaux, <u>Department Stores and the Origins of American</u> <u>Broadcasting</u>, 1910-1931, Ph. D. Dissertation, Univ. of Georgia (Athens, Georgia: 2007).

Michael Brown & Corley Dennison, <u>"Integrating Radio Into the Home, 1923-1929,"</u> Studies in Popular Culture, v. 20, n. 3, April 1998, p. 1 (note "Alternate access options," 100 free reads).

Michael Brown, "Radio Magazines and the Development of Broadcasting: *Radio Broadcasting* and *Radio News*, 1922-1930," *Journal of Radio Studies*, v. 5, n. 1, February 1998, p. 68.

Susan J. Douglas, *Inventing American Broadcasting 1899-1922* (Baltimore, MD: Johns Hopkins Univ. Press, 1987).

Donna L. Halper, "Navigating Two Worlds: The Amateurs and the Story of Commercial Broadcasting," *The AWA [Antique Wireless Assn.] Review*, v. 34, 2021, p. 51.

James E. O'Neal, <u>"Radio at 100: 'KDKA: The Morning After'-What do we do now?,"</u> *Radioworld,* December 23, 2021, reprinted in *The NASWA Journal,* North American Shortwave Association, January 2022, p. 17.

Leslie L. Page, Jr., "The Nature of the Broadcast Receiver and its Market in the United States from 1922 to 1927," *Journal of Broadcasting*, v. 4, issue 2, 1960, p. 174.

E. P. J. Shurick, <u>The First Quarter Century of American Broadcasting</u> (Kansas City, MO: Midland Publ. Co., 1946).

"List of Oldest Radio Stations," Wikipedia

January 27, 2022

Addendum: October 23, 2022