The ON-LINE Broadcaster
The Jersey Broadcaster is now on-line. Over 190 of your fellow NJARC members have already subscribed, saving the club a significant amount of money and your editor extra work. Interested? Send your e-mail address to mbeeferman@verizon.net. Be sure to include your full name.

Thanks so much for the kind words I received when I notified the club that this issue of the Broadcaster would not make the July meeting date. I guess it’s understood by observant readers that “Volume 26” in the masthead indicates that I have been on the job (for the most part) for 26 years. I have come to expect nothing less from this great group of talented and caring members.

Our July Zoom meeting was again well attended with over 60 members. Thanks to our presenters for holding member’s interest - Prof. Joseph Jesson for his talk on the RCA AR-88 and Alan Wolke for a presentation on 3rd order IMD in radio receivers and an introduction to nano VNA’s. Of course, for those members who still need their NJARC “fix,” Technical Coordinator Al Klase continues to hold recurring Zoom meetings every Tuesday and Thursday until the beginning of September with numerous topics under discussion. The credentials for these meetings are posted on the Communicator.

As evidence of the NIARC remaining an “active” club even during difficult times, a very successful 2020 Field Day was held from June 27th through June 28th. Thanks to members Robert Forte and John Ruccolo for the article and photos in this month’s Broadcaster and all participating members who contributed to a wonderful weekend.

Among upcoming activities is our Tailgate Swapmeet at InfoAge on July 25th (see page 8). This event will be one of the few sponsored during the pandemic so a large turnout is expected. Of course, social distancing, use of masks and all other safety precautions will be insisted on. There will be no coffee and we haven’t quite decided on snacks yet (bagels, muffins, etc.), so it is suggested you bring your own and perhaps something for lunch. Cold drinks will be available. With regard to the summer repair clinic on August 8, an update will be provided in the August Broadcaster.

It has been announced that InfoAge is opening August 1st. However, due to the virus, all visitors will be required to wear masks. Hand sanitizers will be available on site. For the immediate future, social distancing will be required and no strollers will be allowed on site. Visitors under ten are not recommended for health and safety reasons. Visit the InfoAge website at www.infoage.org for further information.

InfoAge is also sponsoring a Space Exploration Week beginning August 17th. This is a five-day space science program for children 10-15 about the earth, solar system, galaxy, universe, rocketry and outer space observation. Each day is divided into two, 3-hour sessions of fun-filled model making, rocket launching, demonstrations and games. On the final day, everyone will have a video of themselves sending a signal to the moon with their voice and hearing their own voice bounce off the moon and return to earth. For more information, call: 732-322-4823, 732-280-3000 or E-mail lorilauber@gmail.com for a registration form.

Instead of an "in-person" conference, the AWA (Antique Wireless Association) is arranging video presentations on the club's YouTube channel on August 11th. There have been a lot of negatives as of late pointed at the AWA but as NJARC member Alex Magoun notes, "let's credit them for adapting and finally catching up to what our own Dave Sica has been doing with NJARC meetings with great skill and grace…" Some of the scheduled presentations include 126 Years of Amateur Radio Innovation, The History of the Amateur Radio Novice Class, The Influence of Hiram Percy Maxim on Amateur Radio, Pre-1912 Wireless and Electrical, Westinghouse Broadcasting and Moonlight Restorations. A virtual People's Choice Contest for historic equipment will also be posted. The AWA YouTube channel is as follows:

https://www.youtube.com/channel/UCX55p6hzerX1aps_VYXdI.BA

Upcoming Events (Tentative)
July 25 - Summer Tailgate/Hamfest on InfoAge Grounds
August 8 - Summer Repair Clinic, InfoAge Bldg. 9032A, 9AM - 4PM
August 14 - Monthly Zoom meeting, Prof. Tom Perera talk on "Phil Weingarten, Master Duplicator"
September 11 - Monthly meeting at InfoAge Bldg. 9032A, Larry Rubins audio demonstration
September 18 - The Master Duplicator's Bowen Hall, talk by Mike Molnar
September 18-19 - Kutztown Radio Show
October 9 - Monthly meeting at Princeton's Bowen Hall, talk by Mike Molnar (topic TBA)
November 13 - Monthly meeting at InfoAge Bldg. 9032A, (topic TBA)
November 20 - Fall Repair Clinic at InfoAge Bldg. 9032A, 9AM - 4PM
December (date TBA) - Holiday Party at West Lake Golf and CC
January 8 - Monthly meeting at InfoAge Bldg. 9032A, Members Only Auction, dues collection
WHEN BRUTE FORCE TRANSMITTERS RULED THE AIR

Part III

By James E. O'Neal

NJARC member James O'Neal (K4XAR) has been involved in broadcasting for nearly 60 years including a 37-year-long career in television engineering. This included more than 30 years with the television side of the Voice of America. In 2003, he launched a second career in journalism including editing "TV Technology" and writing for "Radio World," and other periodicals, concentrating largely on radio's colorful history and the individuals who helped make it possible. Mr. O'Neal is the editor of "IEEE Broadcast Technology" and serves on the boards of two radio and television museums. The complete article, with Part I printed in the May 'Broadcaster' and Part II printed in June, was first published in the April 26th issue of "Radio World" and is carried here with the kind permission of the author and editor of "Radio World"...Ed.

SIDEBAR: THE PHYSICS OF ARC CONVERTER OPERATION

Aside from producing a continuous wave oscillation, an arc transmitter, or converter, is differentiated from a spark transmitter in a number of other ways. A spark machine can be powered from either an AC or DC source, while an arc device must have direct current. Spark transmitters utilize a fairly wide gap between the discharge electrode; those in an arc device are relatively close together.

Typically, both electrodes in a spark transmitter were made of the same metal (in many cases, tungsten), and while erosion does occur, the electrodes had a fairly long useful life. In an arc converter, the anode was almost always copper with a concave end, and the cathode was always graphite with a pointed end. Due to the very high currents involved, the cathodes had to be changed on a regular basis (in many cases, tungsten), and while erosion does occur, the electrodes had a fairly long useful life. In an arc converter, the anode was almost always copper with a concave end, and the cathode was always graphite with a pointed end. Due to the very high currents involved, the cathodes had to be changed on a regular basis; typically, every few hours. The copper anode lasted longer, but had to be water-cooled, something not practical with the graphite electrode, which was rotated by a small motor during operation to equalize wear.

Another major difference between the spark and arc machines was the requirement for a strong magnetic field across the arc chamber and also a steady source of hydrogen during operation. As mentioned, this magnetic field was necessary for extinguishing or "blowing out" the arc during the RF oscillation cycle. Hydrogen, the lightest and most mobile element, was used during these RF cycle "down times" to help clear the space between electrodes of residual ions generated by the intense arc plasma. The phenomenon of arc "blowout" may be familiar to those who have done DC arc welding on, or close to, a steel structure. The arc plasma constitutes a conductor, and the magnetic field induced into the ferrous material tends to push the arc aside, sometimes making it tricky to control the weld.

Early in the evolution of the arc converter, the effect of the external magnetic field on arc performance was not well understood (leading to some major problems when it was desired to construct transmitters with increased power outputs). However, experimenters were aware that such a field greatly affected the performance and efficiency of the converter. One experimenter noted that without a magnetic field, the maximum RF current that could be delivered to the transmitting antenna was eight amps or so, but with the addition of the field, and everything else equal, an antenna current of 100 amps was easily obtainable.

Federal Telegraph’s Cyril Elwell, the American arc converter entrepreneur, was able for a while to build increasingly more powerful machines by simply scaling up the mechanical parameters (proportionally including the size of the arc electrodes, chamber, cooling system and electromagnetic field). But he hit a major stumbling block when trying to go beyond 30 kW. This difficulty was not resolved until a young man with a recently-minted electrical engineering degree and a strong interest in arc technology, Leonard Fuller, was hired by Federal about the time that Elwell made a decision to exit the business. Fuller devoted much time in developing a sound physical understanding of what was really going on within an arc converter. (He eventually took Master’s and Ph.D. degrees based on his arc technology research.)

It was Fuller who realized that the intensity of the magnetic field needed for arc blowout was not directly proportional to the size of the machine or the desired output. He developed the concept of “tuning” the magnetic field strength to maximize output at a given operating frequency. With longer wavelengths there is
more time available to clear the residual ions from the arc gap than at shorter wavelengths, thus a stronger magnetic flux is needed for higher frequency operation. (In the larger arc transmitters, magnetic fields upwards of 16 kilogauss [1.6 Tesla] were required. Most modern medical nuclear magnetic resonance imaging machines operate with a field strength in this range.)

Once Fuller understood fully the action of the magnetic flux, it became possible to design and build arc converters without any upper limit in operating power. Federal delivered a number of one megawatt machines, and plans were drawn up for two and five megawatt models, but due to the rapid pace of high-power vacuum tube transmitter technology, and the increasing relocation of long-distance radio communications from long wave to HF spectrum, these very high-power converters never made it into production.

Even though Federal rated its products in terms of DC power consumption, their 1,000,000-watt model produced about a half-megawatt of RF — still a very impressive number with antenna currents measured in hundreds of amps! The downside was the requirement to get rid of the other half megawatt of heat, which was usually solved by outside spray cooling ponds.

**AN EARLY FEDERAL TELEGRAPH EMPLOYEE DESCRIBES HIS EXPERIENCES IN WORKING FOR THE COMPANY**

This article on arc converter technology was inspired by a 1963 oral history in which a former Federal Telegraph employee, Archie M. Stevens, was interviewed by Erwin Rasmussen, who captured some of early radio’s history from those still alive who had been a part of it. The recorded audio interview (actually a two-part session with another pioneer, Ken Laird, and available online) begins with Stevens’ remembrance of the 1906 San Francisco earthquake while he was a student at nearby Stanford University. After earning an engineering degree from that school in 1909, Stevens was approached by one of his former instructors about a job with a startup company. As he recalled in the interview:

“Just about that time, I ran across Elwell, who had been my instructor in electrical engineering. He said ‘Why don’t you come with me? We’re starting a radio company down here called the Poulsen Wireless Telephone and Telegraph Company and we’ve got some very intelligent Danish engineers and machinists and a whole mix of stuff.’”

Stevens accepted the offer and rather quickly was assigned a position of responsibility in the fledgling enterprise.

“He made me chief draftsman and put me in charge of the machine shop,” said Stevens. “And then made me assistant engineer. That was a pretty big title, as I think we had 15 men all told.”

Stevens recalled that he was responsible for engineering drawings for both equipment manufactured and complete stations constructed with it. This included the massive towers used for the very low frequency antenna systems employed with Federal arc converters.

“I used to design the towers,” said Stevens. “In order to get the job done quickly, I would order the lumber and then take my drafting board out in the field and sit there and draw them [the towers], because we’d have to change the bolts and splices and that stuff [so much]. Elwood got the big contract for the 800-foot wooden towers in Rome. Mind you, people kept saying, ‘You can’t build wooden towers that are 600-feet high.’ [Well] we built them 800-feet high and they stood for 30 years. [We used] select first-quality pine from Oregon with 20 to 21 or 22 rings per inch. We made sure that it was kiln-dried lumber. That was the most important thing. Then we’d give them two or three coats of first-grade white lead paint… we put them together and we put in plenty of white lead.”

(Stevens recalled that at one station an airplane crashed into one of his towers and the tower withstood the impact, trapping the aircraft and saving its pilot from possible death if the plane had fallen all the way to the ground.)

In reflecting on the ever-present danger associated with using hydrogen and hydrogen-bearing compounds, Stevens recalled an episode when he was testing a new station installation, communicating with the operator of another arc station, and almost destroyed it the new facility.

“Sometimes we used pure hydrogen,” he said. “Well, I started out with pure hydrogen, but I didn’t blow enough air and set off a tremendous explosion which broke about a two-quart container of wood alcohol. I was alone at night and I went back and said I’m on fire; hold up a minute until I can get the fire out. I was scared that time.”

He also provided some insight on audio modulating the “fire-breathing” arc machines.

“The difficulty in modulating the arc was that you had this tremendous magnetic field with reluctance so big you couldn’t change it exactly as the voice of the speaker. So, the only way to do it was with what we called a closed oscillatory circuit with the arc and loosely coupled to an antenna — sometimes 10 or 15 feet away — with an inductance … you could modulate the current in the antenna, but you couldn’t modulate the arc itself. That’s how we used to telephone. We used to talk to Stockton and San Jose … but we had to stop the telephone [service] because there was no money in it.”

Interestingly, Stevens sheds some additional light on the large WWI-era communications facility planned for Monroe, N.C. and mentioned in my own April 19, 2017 Radio World Engineering Extra story about insulator manufacturer Arthur Austin. According to Stevens, the station was to have been located much further north, possibly Maine, but Secretary of the Navy Josephus Daniels, a North Carolinian, insisted that the facility be constructed in his home state. Federal produced, but never delivered, the giant arc converters ordered, as the war ended before station construction could get under way. Stevens noted that one of these “war surplus” transmitters was given to Ernest Lawrence to be used as the foundation for the first large cyclotron.

The complete interview with Stevens and Laird is available online. Even though the audio quality is less than perfect, it provides much insight into what it was like to work for Federal Telegraph and the pre-vacuum tube era of radio in general.

**FURTHER READING**


July 2020


NOTE: In celebration of “Radio at 100,” Mr. O’Neal is posting a series of articles for "Radio World." I highly suggest one of his latest from May 15th titled "They Set the Stage for the Birth of Radio." For ease of access, just Google the article's title and it will immediately appear...Ed

MY FIRST RADIO

Edited by Marv Beeferman

Last month, a string of "first radio" postings on the NJARC Communicator were captured in the Broadcaster. Lack of space did not allow publishing all of them, so they are being continued this month. It seemed that the "first radio" topic could be interpreted in two ways - it could be the first radio that someone purchased with his own funds or it could mean the first radio that someone was initially aware of.

I requested additional contributions for this month but only received one. So, I'm still inviting members to dig into their subconscious and send me a paragraph or two describing their memories. A photo would be a nice addition, but if the original radio is no longer in existence, an example from the internet would work just fine. Please send your examples to:

mbeeferman@verizon.net

Sheldon Greenspan's first radio was a Heathkit crystal set. Sheldon said "It was a big deal that my parents spent about 10 dollars for it." He was about 10 years old and not good at soldering so his older brother's friend had to redo his work. Living in an apartment, Sheldon did not have the best antenna but he remembers getting WNEW AM and WOR. The radio "sits next to my desk reminding me of those early days."

The Knight kit that Sheldon got for his Bar Mitzvah at 13 was his first kit built with a Weller 8200 gun. "I put up an antenna on the roof with standoffs from Lafayette radio in Brooklyn - the landlord didn't find out about it for about 4 years when he made me take it down or pay 2 dollars per month to keep it up. I loved the shortwave at night, huddled in a corner of our tiny apartment listening to the BBC, Radio Havana and Voice of America. I learned so much about the world outside."

The Communicator postings jarred Aaron Hunter's memory as to what was actually his first radio. "I kept thinking of collector radios or my first transistor radio (have it somewhere) but the following is my first. I was in the Cub Scouts about 1955 when I got it. When my son became interested in electronics, I gave it to him to experiment with. He mounted the components on a piece of Masonite. From the looks of the layout, it never worked. He lost a couple of parts before I was able to reclaim it, but the main parts are there."

Member James Doran offered a great "first radio" story:

"My own first radio was a crappy Japanese transistor job that I adored and slept with on my pillow, falling asleep listening to some corny DJ who did Hitler impressions and waking up to some sort of radio drama - until one night I knocked it on the floor after an hour, by which time I would be asleep! I enjoyed listening to WMCA's "The Good Guys," Cousin Brucie when he..."
moved to WABC and eventually FM radio and WNEW."

"But that wasn't what made me love radio; it was the huge European console at the home of my cousins' grandfather, which I only saw once, but that had knobs and buttons and the names of distant, foreign, romantic places - Moscow, Berlin, Stuttgart - that I suddenly yearned to visit, or at least listen to. So when I saw a shortwave radio for sale at a flea market, I bought it. Alas, there was no manual, and no one to show me how it worked. I connected the ground to the radiator (I had no idea at the time that worked). I connected the ground to the manual, and no one to show me how it worked. I connected the ground to the radiator (I had no idea at the time that worked). I connected the ground to the manual, and no one to show me how it worked. I connected the ground to the radiator (I had no idea at the time that worked). I connected the ground to the manual, and no one to show me how it worked. I connected the ground to the radiator (I had no idea at the time that worked)."

Steve Cafiero and his dad built a Heathkit AR-29 stereo receiver in 1970. Steve was 10-years-old at the time and was the first of many electronic kits built by the team. "Heathkits started my interest in electronics. I restored it a few years ago and still use it regularly. You can see my restoration on YouTube - search "Heathkit AR-29."

FIELD DAY
2020

By
Robert Forte & Nevell Greenough

This year's ARRL Field Day was held from 2:00 PM Saturday, June 27th, through Sunday, 2:00 PM, June 28th. It was an on-the-air contest where the objective was to contact as many participating stations as possible from temporary radio installations. The underlying motivation was to foster a community of hams who can establish communications in case of disaster. NJARC participation was impressive with Neville Greenough and Al Klase leading a team of five members.

Friday, the day before the contest, was setup day for generator power, antennas, tents, transceivers, SWR meters, keyers and cabling. "Miles" of duct tape played an important role. Four antennas were raised - two verticals and two 100-foot untuned dipoles (one East-West, one North-South), both about 30-feet high. The two verticals were different lengths, with corresponding centerpoise radials.

The dipoles were raised using a bow and arrow to get them high into the trees. Then, the connection was completed using a balun between a ribbon feed line and automatic antenna tuner. The arrangement worked well with an SWR of around 1.2. This year, we got our antennas up higher than last year and it showed. Both stations were able to get on a frequency and defend it from invaders. Most of our contacts were on the 80 and 40 meter bands, with a few on 20 meters.

Four generators provided power but unfortunately only two survived. Darren Hoffman's sixty-year old unit lasted until the very end of the outing until it died from carburetor issues.

Two open-sided tents, about 10' x 10' shielded participants from the sun and rain, one weighted with 50-lb weights on its legs. The area was fitted with dusk-to-dawn lighting. Social distancing was established with transparent shower curtains used to separate the operator from the logger in the pop-up tent. Masks were required although out in the fields, masks matter less if chairs are 20-25 feet apart.

The fun began on Saturday afternoon. Ted Copp on the YAESU 950 (which was one of our main and dependable transceivers) was lightening fast, a real pro, and seemed to rack up two contacts per minute on 20 meters. All was going well until a front came through late in the afternoon with high winds and rain. I was not there but was told that it took seven guys to hold down one tent as the stormed passed.

Logging was done by a second operator, with a laptop using N1MM's free software. The two station setups were linked via the Museum's cellular modem. Copies of N1MM talk to each other over a network and keep track of duplicate contacts. Frequent swap-over between logger and operator was encouraged. Both phone and CW contacts were attempted with some help from keys from our Radio Technology Museum.

Neville kept the contest going through the night and it continued through Sunday. Ted tried to get his old Globe transmitter on the air but oscillator problems interfered. But John Ruccolo's Gonset G-76 transceiver obtained from the Joe Cro estate worked well on 75-meter phone with two AM contacts at about 3885. One was with WB2GCR who was run-
"It probably blew 40 for a while. We were really happy that the "Navy Guy" had placed the side curtain on the windward side."

Chef extraordinaire Annie Coff, N2LAL.

CQ CQ CQ

Field Day 2021!
TIPS AND TECHNIQUES
Edited by
Marv Beeferman

In a May 26th article in "Radio World" by John Bisset ("Let Your Dryer Work Out the Kinks"), a reader named Bill Fike wrote in to say that quite often he will receive, with a new piece of equipment, a power or audio cable or some other special test or connection cable. More often than not, the cable has been folded and tightly tied with a cable tie. Even after removing the tie, some of these cables will remain kinked indefinitely. Bill has read that a heat gun can be used to warm up the cable and remove the kinks - but that seems like a lot of work to go over the length of a long cable. Bill also worried about the risk of melting the inner conductors; some heat guns can get very hot.

Bill came up with an easy alternative method to relax the cable so it can be coiled or wrapped. His clothes dryer has a rack for drying sweaters, sneakers or other items that can't be tumbled. He places the cables on the rack in the dryer, sets the dryer to high and runs it for about 10 minutes. Some cables need longer dryer time. When you pull out the cable, it's warm and relaxed. It can then be coiled or wrapped properly, and it won't have kinks.

Racks usually are sold as an accessory to the dryer, although some models may include the rack with purchase. The method may also work with cables that have taken a set after being stored for some time but I'm not sure if it would be safe for use on very vintage ones.

The first time Bill did this, his wife asked why the drying rack was out. When she heard the answer, she just slowly shook her head and walked away. Some people just don't appreciate a good idea when they see one.

Some months ago, I included in the Broadcaster an article about repairing corrosion caused by leaking batteries. Member Dave Sica recommended a simple thing he does to prevent the problem in the first place:

"Since many of my radios and other battery-powered gadgets are not used on a regular basis, I remove batteries from any device I may not be using again right away. Obvious, right? But then, what do you do with them? The problem is that you don't want to throw away these still-good batteries, but you don't want to mix them up with your stash of fresh batteries either. And, if you store them with the radio, they can still leak and cause damage even if they're not inside."

"I keep a supply of small dollar store zip-lock bags handy and I seal the used batteries in one to store along with the radio. When I go to use the radio again, I take the batteries out of the bag and put them back in the radio. If they should happen to leak before I use the radio again, no problem as the bag keeps the leakage contained so there's no damage."

Finally, the subject of radio belts came up at a recent Zoom meeting. Member Bob Bennett reports that Adams belts out of Michigan is no longer in business. He has bought belts from the following company in Rhode Island twice with no issues:

https://www.qualityradiobelts.com/order-here.html

CHRISTMAS IN JULY
Edited by
Marv Beeferman

In an article by Michele Debczak (July 9, 2020), it was noted that with many businesses still closed due to the COVID-19 pandemic, and the virus still spreading throughout the country, the summer doesn't feel like summer for many. Several disc jockeys agree, and they've decided to skip ahead to December. Some radio stations are now celebrating Christmas in July with classic holiday music.

The idea behind the festive programming is to spread some Christmas cheer to listeners during this stressful period. Stations like KEZ 99.9 in Phoenix, Arizona started playing holiday tunes when lockdown first started in March. Since then, radio stations from San Diego, California to Ireland have joined the trend. If you don't hear "Winter Wonderland" or "Jingle Bell Rock" on your local airwaves, head to the internet.

The early return of Christmas music isn't just a mood-booster for listeners - it's also good business for radio stations. Like many industries, radio has been hit hard by the pandemic as people have been spending less time in their cars and sports broadcasts have disappeared. Christmas is always a popular time for radio, and by celebrating it a few months early this year, stations are hoping to boost their ratings.

However, not everyone is cheered up by hearing Christmas music before December. If the opening notes of "Jingle Bells" fill you with dread, you're not alone; a significant portion of listeners find the seasonal soundtrack grating, and hearing it too early may be taking a toll on their mental health.

In a 2011 Consumer Reports survey of more than 1000 people, 23 percent of respondents cited seasonal music as the thing they dread most about the holidays, placing it above holiday parties and disappointing gifts. A Research Intelligence Group poll from 2014 found that holiday music can be so bothersome that 36 percent of people have admitted to leaving a store because of it.

Luckily, with radio there is always a choice. Anyway, the holidays are a happy time of year for many people, and seasonal music is a reminder of that. If that applies to you, feel free to search the airwaves and start blasting your favorite Christmas tunes before Thanksgiving. Just keep it at a low enough volume so it is out of your neighbor's hearing range - they may think they lost a few months while self-isolating.
New Jersey Antique Radio Club's
Summer Tailgate Swap Meet

InfoAge Science History
Learning Center and Museum
2201 Marconi Road
Wall, New Jersey 07719

Saturday July 25th, 2020
Refreshments Available

40 spaces available
$25.00 for members
$30.00 for non-members
Bring your own tables

Open to the Public
8am to 12 noon
Vendor setup at 7:15 AM
$5.00 Entrance Fee
Club Donation

For Directions
Visit our website: www.njarc.org
or Mapquest
2201 Marconi Road, Wall NJ 07719

Vendors Make Your Reservations Now!
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