Volume 41, Number 1 Spring/Summer 2022

Journal of the

CALIFORNIA HISTORICAL RADIO SOCIETY

Radio Day On The Bay 2021 Aboard the USS Hornet

Auctioneer Rosie Allen

Royal Society Jazz Orchestra

Holiday Music - Ben Fong-Torres & Friends

Radio Play - "Out For Christmas"

FROM THE BIRTHPLACE OF BROADCASTING

California Historical Radio Society

HOME OF THE BAY AREA RADIO MUSEUM & HALL OF FAME

The California Historical Radio Society (CHRS) is a non-profit educational corporation chartered in the State of California. Formed in 1974, CHRS promotes the restoration and preservation of early radio and broadcasting. Our goal is to enable the exchange of information on the history of radio, particularly in the West, with emphasis on collecting, preserving, and displaying early equipment, literature, and programs. Yearly membership is $30 ($40 non-USA).

CHRS Museum in Alameda

CHRS has been fortunate, through the generosity of its donors, to purchase a home for the CHRS museum and education center. It is located at 2152 Central Avenue. The building was built in 1900 as a telephone exchange.

CHRS volunteers are actively restoring the building to make it optimal for use. Our goal is to create an environment to share our knowledge and love of radio and enable us to create an appreciation and understanding for a new generation of antique radio collectors and historians.

Please come visit us any Saturday 9am to 3pm. Visitors and groups welcome at other times by appointment; Contact Steve Kushman.

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Contact us:

CHRS, PO Box 31659, San Francisco, CA 94131
or info@californiahistoricalradio.com

Visit us at: www.CaliforniaHistoricalRadio.com

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Larry Clark	– Technical Advisor & Librarian
Lunch crew:	Cynthia Edwards, Denny Monticelli, Keith Scott, Judy Mears, Betty Cosmos

Contents of the Journal

COLUMNS

FEATURE ARTICLES

Front & Rear Covers: **Images of Radio Day On the Bay, December 2021.**

From the Editor

I wish to thank all the authors for their articles, support, and scholarly contributions. John Okolowicz offers a look at radios cleverly disguised as books; John Staples walks us through measurement of critical characteristics of cables and VSWR and briefly shows how it can be applied in useful ways; Robert Rydzewski takes us back to early wireless in Alameda and a look at an early experimenter/operator; Simon Favre gives a brief description of a useful tool and techniques for its use to tune ferrite rod antennas when a replacement is needed; and Mike Adams discusses early radiotelephone in the Bay Area. Steve Kushman and Mike Adams provide updates and insights about CHRS as we carefully resume after the pandemic. Mike Loper gives us an update of the Central Valley Chapter.

I am always in need of quality content related to broadcast radio, ham radio, and television. If you have something to contribute, I urge you to let me know. I am especially interested in technical content. It can be of two types, a narrow topic in depth or a more broad topic with less depth. Enjoy . . .

Richard Watts, jrchrs@comcast.net

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From The President

by Steve Kushman

Most events over the past two years have been cancelled or modified. Our Radio Day By The Bay event was no exception. Radio Day 2020 was cancelled, and Radio Day 2021 was quite different. We were offered the opportunity to hold Radio Day ON The Bay 2021 aboard the USS Hornet aircraft carrier berthed right down the street here in Alameda. So, we accepted, and Radio Day was held last December 18th and was a great success! We presented a full day of entertainment and a fantastic antique radio auction to an enthusiastic but cold Winter audience.

The event began with a trumpet swing tune and fanfare by Russ Button and the Horns A' Plenty. To set the tone for the day, the Bay Area Broadcast Legends presented a radio newscast from 1969, the year the Hornet plucked 2 Apollo capsules from the ocean. Our newscasters were Legends and BARHOF Members, Peter Cleaveland and Joe Starkey. Our annual fundraising antique radio auction with BARHOF Member Rosie Allen as our auctioneer captured the audience and produced some fine returns for CHRS. Holiday music was performed by Legend and BARHOF Member Ben-Fong Torres with the late George Yamasaki and Kurt Huget. How about Tight Pajamas? A musical treat by Susie Davis, daughter of BARHOF Pioneer, Norman Davis. Our CHRS Radio Dog Theater's live performance of the classic radio play "Out For Christmas" directed by BARHOF Member Peter Finch, was well received, and then Don Neely's Royal Society Jazz Orchestra had people dancing! Plus, our CHRS fulfillment center sent home many restored antique radios, (saved from the landfill), as premiums in exchange for some generous donations for CHRS.

Some important people were recognized and rewarded this day, including CHRS Volunteer of the Year for 2021 Jim Fink, and a belated CHRS Volunteer of the Year for 2020, was awarded to Philip Monego. The 2021 Don Sherwood Award for your favorite Bay Area radio personality went to KCBS' BARHOF Member and CHRS supporter John Evans.

40 people made this event happen. Volunteers and staff worked hard to make sure our first event on the Hornet went well. And, it did! I sincerely want to thank everyone who made this possible. You worked hard and it showed!

We were very fortunate to be able to have Radio Day on the USS Hornet and I want to thank the management and staff who helped us organize the space, handled the gate, and provided whatever we needed during our experience on the ship. I especially want to thank Sam Lamonica, Russell Moore and Eugene Placencia for their leadership, support and patience.

Those of you who know Alameda, are probably familiar with the USS Hornet Museum berthed at the old Alameda Naval Air Station. For those of you who live further away and may not be familiar with it, here is a brief look at the impressive contribution of the USS Hornet during wartime and after.

The USS Hornet CV-12 is one of the 24 legendary World War II era Essex-class aircraft carriers built at Newport News, Virginia. She is one of the most decorated ships of the US Navy, and later was the prime recovery ship for Apollo 11 and 12, the historic first manned lunar landing missions.

During World War II, for 16 continuous months the Hornet was in action in the forward areas of the Pacific combat zone, sometimes within 40 miles of the Japanese home islands. She was under air attack 59 times and was never seriously damaged. Her aircraft destroyed 1,410 Japanese aircraft, only the USS Essex exceeded this record. Her air groups destroyed or damaged 1,269,710 tons of enemy shipping. Her guns shot down 72 enemy aircraft in one day during the famous "Great Marianas Turkey Shoot." The USS Hornet supported nearly every Pacific amphibious landing after March 1944. She scored the critical first hits in the sinking of the super battleship Yamato. She launched the first carrier aircraft strikes in support of the liberation of the Philippine Islands. In 1945 she launched the first strikes against Tokyo since the 1942 Doolittle Raid.

The USS Hornet offers many interesting displays and experiences which include WWII era aircraft, 1940s era collections, a space module from the Apollo program, an astronaut isolation trailer; many of the ship galleys and spaces have been restored. If you haven't had a chance to visit the USS Hornet, we highly recommend it! It's an entertaining and fun way to appreciate this technology that has left an important mark on our Nation's history. See the Hornet's web site: www.uss-hornet.org

The USS Hornet and CHRS are very complimentary, historically and culturally. When the boys from back home were serving aboard her, their parents, girlfriends, wives and children could hear about the Hornet's wartime adventures by listening to the family radio. Also, radio, radio teletype and radar were integral parts of these floating fighting machines.

CHRS Radio Central is busy with projects and volunteer activity. Please see the latest newsletter for the list of projects and volunteer policies. Don't forget our web site: www.chrsradio.com Lots to see, lots to learn, lots of reasons to donate!

Let's make 2022 a great year for CHRS. Please don't hesitate to call or email with any questions or comments.
Call (415) 203-2747 or email Steve@chrsradio.com . Best Regards & Keep Smiling, Steve ◊

From The Chairman

by Mike Adams

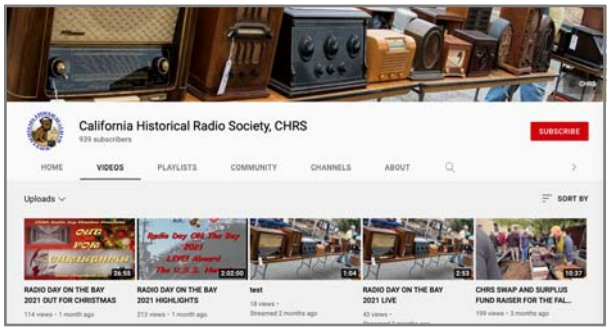
Hello CHRS members and welcome to another Journal. Here you are again "reading" text in the Internet era. Touching paper. You can take for granted as a member that we will be publishing a CHRS "print" communication and that it will appear in your mailbox twice a year. We have no plans to change the way we communicate.

But what if we are in a hurry? How do we "talk" to the membership bypassing the typewriter, printing press and US Post Office? There is a new fangled device that allows us to use a computer to generate stories with photos. This creates a website, and we have three of them. Your CHRS Leadership uses these to give members the latest news.

When you access www.CaliforniaHistoricalRadio.com (below left) you can click on the proper text and find out about our events, go to our eBay site and CHRS Classifieds and buy and sell radios. You can click on the President's Message and get his newsletter, read past Journals https://californiahistoricalradio.com/read-the-chrs-journal/

For broadcast historians we have www.BayAreaRadioMuseum.org (below center) for stories of Bay Area radio, and return to the days when ship-to-shore wireless and spark was king www.SOWP.org (below right). CHRS houses the archive of the Society of Wireless Pioneers. Visit this site for a one-of-a-kind collection of photos and stories. In this Journal issue I have plumbed the depths of the CHRS-SOWP archives for a look at the transition from coded wireless to voice without wires.

We also have CHRS and BARM Facebook sites (right).



But the real news is that under the guidance of CHRS President Steve Kushman CHRS volunteers have also brought what was "virtual," the Bay Area Radio Museum, to the second floor of our Alameda Headquarters, Radio Central. Someday when Covid is just a memory you will be able to make your own memories as you see and operate the equipment and talent that made the golden years of broadcasting a reality.

Our main yearly event, Radio Day, was held in 2021 on the USS Hornet, and the video and photos are accessible on our YouTube site www.youtube.com/CalRadioHistory .

So we didn't replace our printed/mailed word with an online version – we added to our existing communications output three web sites, two Facebook pages, and a YouTube. We are happy to serve you with All Things Radio.

Although we seem to be in the waning days of Covid, we are still planning for a time when your entire family can visit Radio Central when we are better organized as a mini-museum. And we have retained a museum consultant to better guide us through the organization of radio history, a history that teachers of K-12 students can use our museum as a resource of their teaching. We want to continue to be a valuable asset to our community. And because you are reading this, it's likely that you're a CHRS member and you already take advantage of the special interest and hobby part of the radio collecting hobby. For you we'll have much more in the way of parking lot events and Radio Day events.

CHRS Central Valley Chapter News

by Michael Loper

Mike Loper, John Wallin and Jim Silva lounge in front of the radio display case. Jose Bobadilla, who took the pictures, also pitched in to set up the display.

We at the Central Valley Chapter of CHRS have fully returned to enjoying our club. We resumed our Wednesday night radio workshops about 4 months ago, and we are no longer restricting the number of attendees.

After our November club meeting a group of us set up a display of radios at the Ripon Public Library. The hallway location of the display case was perhaps not the best, but what feedback we received was very positive. The display featured Harry Bohl's one tube Crosley Pup, the CHRS logo radio and Jim Silva's Jackson Bell Peter Pan Cathedral, shown on the CVC club emblem.

In December we held our annual Christmas lunch at a restaurant in Modesto which was well attended. Our members and their spouses all appeared to enjoy it.

At our Christmas Luncheon, from left to right; Vern Larson, Scott and Paulette Pierce, Jean and Jim Silva and Scott Scheidt. Photo by Sheryl Wallin.

Our traditional booth at the Model A Club Swap Meet in January was manned by several club members. We sold some radios and we were busy talking with people about their radio related experiences. No one walked by the display of old radios without taking a moment to check them out. We fielded many leads from people wanting to repair or donate their equipment. Many Thanks to John Wallin, who organized and set up our booth.

Our monthly newsletter, "The CVC Radio Buzz" is in its fifth year now. Recently Richard Lane submitted an article about tags that radio technicians would attach to a vacuum tube after it was tested. The tag would include test results with the repair shop name and address. These are not uncommon, but it is always fun to see a tube that tells us where it has been.

Vacuum tubes with testing tags from radio repair shops in San Francisco and Turlock.

Upcoming events include our summer BBQ and the fall swap meet that we host in October at the Stanislaus County Fairgrounds.

CVC Founder Eddie Enrique's family is selling his collection. Rich Lane is coordinating the sale. See the CHRS Newsletter or CVC website for details.

For an update on all our activities, visit CVC at www.cvantiqueradio.com .

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A Radio for Every Library

By John Okolowicz

Dedicated radio collectors like us all probably have one or more, in some cases many more, favorite radio books in our library. Maybe it is Philip Collins' "Radios: The Golden Age," or Alan Douglas' three volume set on "Radio Manufacturers of the 1920s," or Marcus & Levy's "Radio Servicing," or . . . we could go on and on because you know the list is endless. But how many of us can actually say we have a library of radios?

At one point many years ago, that was me. I had a few of them. They are all long gone now, but I would like to take a nostalgic look back at some of these very interesting – some would say kooky – "reading materials."

In the early days packing a radio inside of a hollow book was not a problem at all. Passive crystal detectors with no amplification made it a breeze. After observing the crude cigar boxes and Quaker Oats cylinders that were being used by amateur experimenters, a few innovative manufacturers saw a marketing opportunity. So, in place of the crude cigar box, they re-housed them in classy looking books.

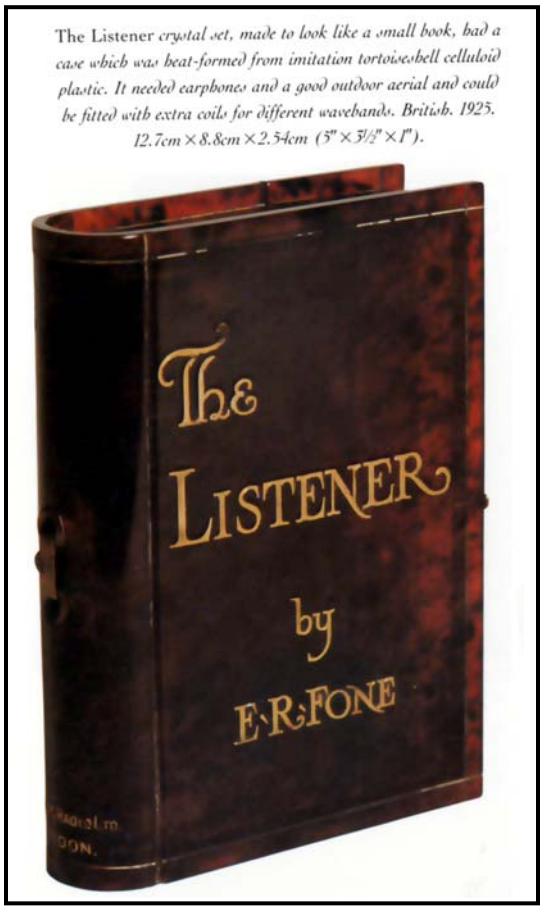

Fig. 2: Image of The Listener Radio adapted from Robert Hawes' book "Radio Art," Green Wood Pub., 1991, p66.

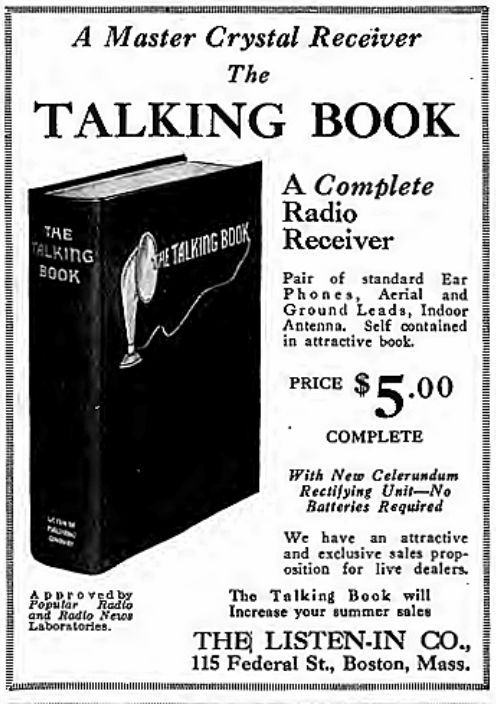

Fig. 1: Listen-In Radio Company ad from *Radio Retailing*, May 1926.

Such was the case in Boston in 1926. A company by the name of Listen-In advertised their compact little radio as the "Talking Book" (Figure 1) and sold it for $5. Likewise in Great Britain, Kenmac Radio Ltd. sold a similar radio in a plastic tortoiseshell case inscribed in gold with the words "The Listener by E. R. Fone" (Figure 2).

Except for the gold inscribed titles both radios are near clones of each other. The U.S. radio promoted a "talking" radio while the British opted for "listening." A cultural difference or just a different marketing strategy? Who knows?

Ten years later in 1936, Robert Z. Snyder, an engineer who worked on the centrifuge that helped prepare John Glenn, Alan Shepard, Gus Grisson, and the rest of America's earliest astronauts for their rocket rides into space [1], took out a design patent for a book-shaped radio (Figure 3). It may have even been inspired by Listen-In's crystal set. However, his design, unlike our astronauts, never got off the ground. According to his son, Howard, his dad chose not to pursue it. Perhaps Robert felt that the existing technology available was not yet ready for the compact design he was proposing.

As transistors were making the concept of miniaturization possible, Snyder's radio-book concept re-sprouted into Crosley's JM-8, a hybrid tube/transistor radio. Figure 4 shows an ad for it in Time magazine from November 28, 1955. Encased in a pseudo-leatherette binding, it was offered in six elegant styles. Not mentioned, but also offered, was a choice of seven book titles: 1) "The World of Music," 2) "Treasure Island," 3) "As You Like It," 4) "Musical Memories," 5) "Fantasy," 6) "Enchantment" and 7) "Magic Mood."

Crosley was able to conveniently fit everything into the small size (4.4"x 7" x 1.9") of these so-called books because miniature tubes (aka peanut tubes) were now available. The JM-8 used three of them (1V4, 1AH4, and 1AJ5) plus it had additional help from two 2N109 transistors, which further reduced battery sizing requirements.

But we have gotten ahead of our story and inadvertently skipped over some interesting sets that emerged in the intervening years. So, let's drop back to 1933. That's when Crosley and Stewart Warner first got the idea to use books, or more correctly a book set, to disguise their radios. Crosley's radio required a wide facade spanning the width of 8 books to form a suitable cabinet (Figure 5), while Stewart Warner's model R-108 comfortably fit into a smaller two-book package (Figure 6) – which was less than half the size of the Crosley set. Stewart Warner used

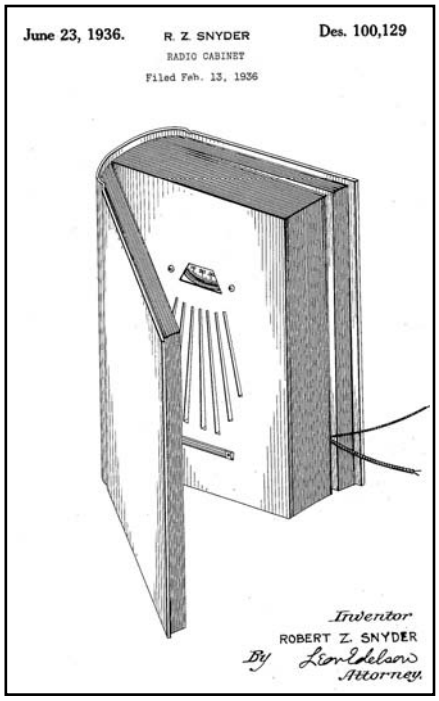

Fig. 3: Robert Z. Snyder's design patent D100,129 for a book radio.

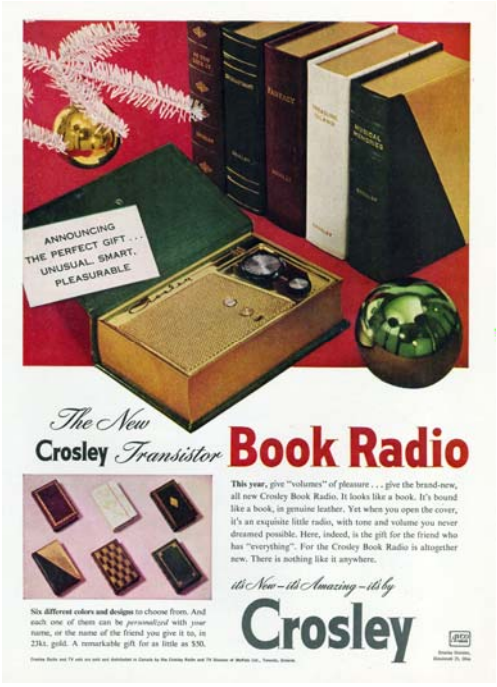

Fig. 4: Crosley book radio ad from *Time*, November 28, 1955.

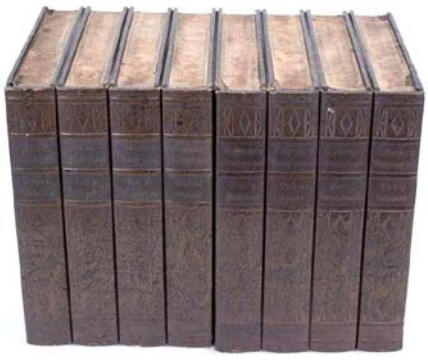

Fig. 5: Crosley book set radio model 141.

Fig. 6: Stewart Warner book radio ad from *Radio Retailing*, March 1933, p9.

only four tubes (39, 36, 38, and 12Z3) and took advantage of a resistance line cord to eliminate the need for a bulky transformer. They also chose a clever title: "Current Events" to appear on the spine. No pun intended I'm sure.

Crosley's large "BookCase" radio (aka "Library Universal") was produced in two different models: 141 and 148. They used different tube compliments as well as different I.F. Frequencies. This was something that *Radio-Craft* magazine pointed out at the time [2] in an attempt to help radio servicemen avoid problems. Model 141 used a 24, 58, 57, 47, and an 80 rectifier with a 181.5 kHz I.F. while the newer model 148 used 58, 58, 57, 42, and an 80 with an I.F. of 455 kHz.

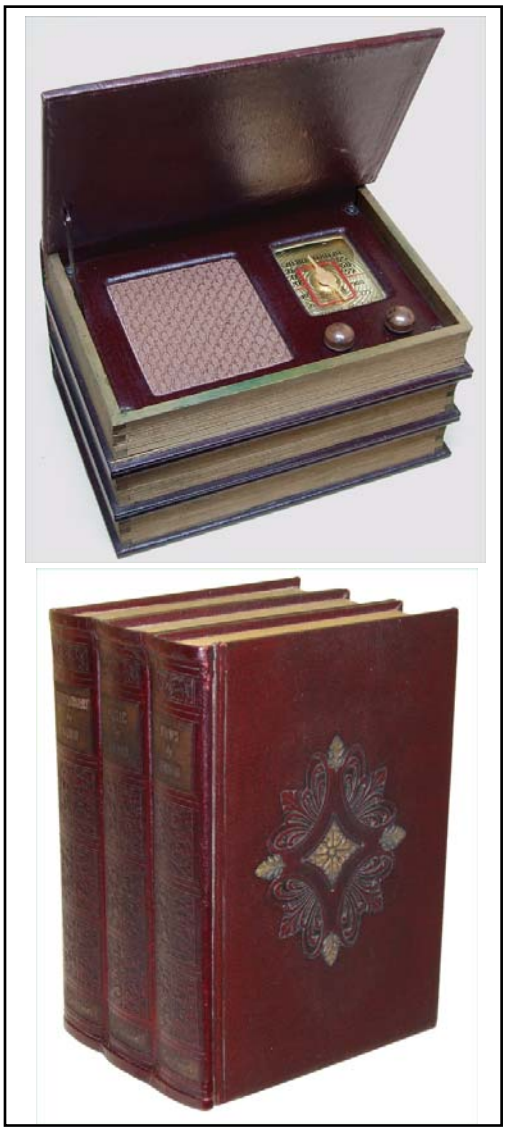

Fig. 7 & 8: Sentinel book radio model 283V from radioguy.com.

While researching this topic, an obscure book radio, which I had never seen or heard of before, came to my attention on the radiolaguy.com website. It is the Sentinel 238V from around 1940. Unfortunately, Rider's manuals do not include this set, but the radiomuseum.org website does. They show that this set uses five octal tubes: 12SA7, 12SK7, 12SQ7, 50L6, and 35Z5. Two pictures of it found on radiolaguy.com are shown in Figures 7 & 8. The three titles Sentinel chose to print on their book spines are: "Entertainment by Radio," "Music by Radio," and "News by Radio."

Chile, of all places, produced one of the most, if not the most, endearing radio in the book-style genre. This small bakelite set (Figure 9) came out around 1947 with a prominent RCA Victor logo painted in white. Just like Sentinel's radio, this set is not listed in Rider's or Sams. Again, radiomuseum.org is of some help. They show that this radio uses an "all American five" 9-pin tube complement of 12BA6, 12BE6, 12AT6, 50B5, and 35W4, typical for many sets of this era.

Fig. 9: RCA Victor bookset X-11.

Not to be outdone, Emerson Radio Co. took note of the book fad and gleefully joined in. Their set was housed in at least three different, but very similar, 8-volume book facades. All had a simulated tan leather look with gold embossed lettering. One set was titled "History of Music" (Figure 10) and another was "History of Nations." Pictures of both can readily be found on the internet.

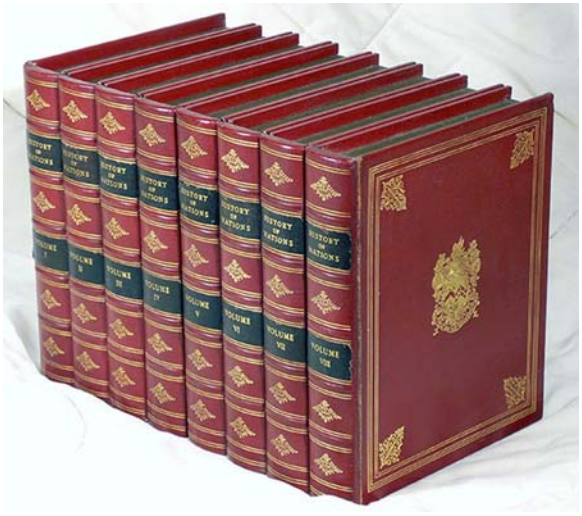

Fig. 10: Emerson "History of Music" book set from radioattic.com.

However, there exists yet another Emerson Library radio. It is a set that I once owned many years ago, and it bore the title "Lowell's Poetical Works" [3] on the spines (Figure 11 & 12). I tried searching for more information on this particular version but kept reaching a dead end. Could it be that there are still even more obscure Emerson titles out there waiting to be discovered?

Strangely enough, no actual model numbers appear on any of Emerson's book radios, so I had to ask my friend, Geoff Shearer, from the Mid-Atlantic Radio Club for help in ferreting out that information. With his help, I was able to find additional info about this set on the radiomuseum.org site. They refer to this radio as the "Library," while I had been fruitlessly searching for "book" or "bookset."

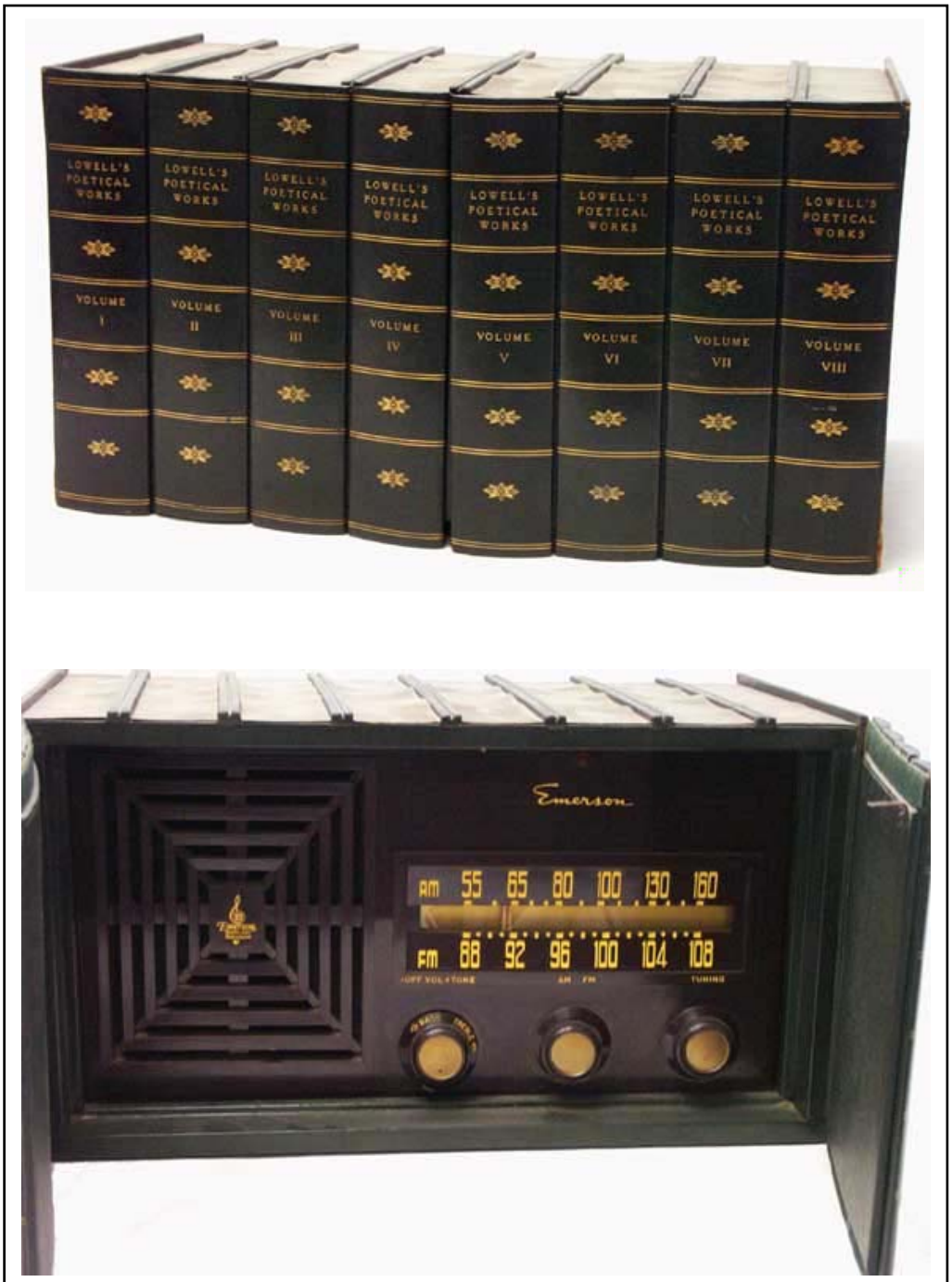

Fig. 11 & 12: Emerson bookset "Lowell's Poetical Works." The image above is the radio with doors closed, the lower image is with doors open.

Emerson's "Library" radio was model 543 (or 544) and used two different chassis. Chassis #120046 used the same lineup of 9-pin tubes as used in the Chilean RCA Victor bookset mentioned earlier. Emersons with chassis #120052 used the same octal tubes as used in Sentinel's book radio. Fortunately for the radio restorer, information for Emerson's Library can easily be obtained from either Riders manual (vol. 16 pages 17-18) or Sams Photofacts (19-30).

Creating many different cabinets for a faddish specialty item such as a book/library radio, which had much lower production numbers, naturally requires lots of extra labor and record-keeping, which naturally cut into profits. But, it must have worked for them, at least in the short term. At a time when the radio market was saturated, manufacturers felt that any gimmick became a potential way to create new sales.

Before we close our library book tour, it would not be complete without mentioning Utah Radio Company's entry. In 1926 they produced a very exotic collectible: a book speaker. It has to be seen to be believed. A few pictures of this very rare antique appear on the web, of which Figure 13 is one.

The *Citizens Radio Call Book* advertisement (Figure 14) for Utah's speaker says: "if it does not produce clearer reception than any other speaker using the same kind of construction in diaphragm, regardless of price, return it and your money will be cheerfully refunded. Has greater tone range than any other speaker using the paper diaphragm. Brings out all low tones as well as high tones. Stands strongest amplification without blasting or distortion."

Radio collecting is an enjoyable hobby, but nothing beats the satisfaction – and snob-appeal – of having your own personal radio "library."

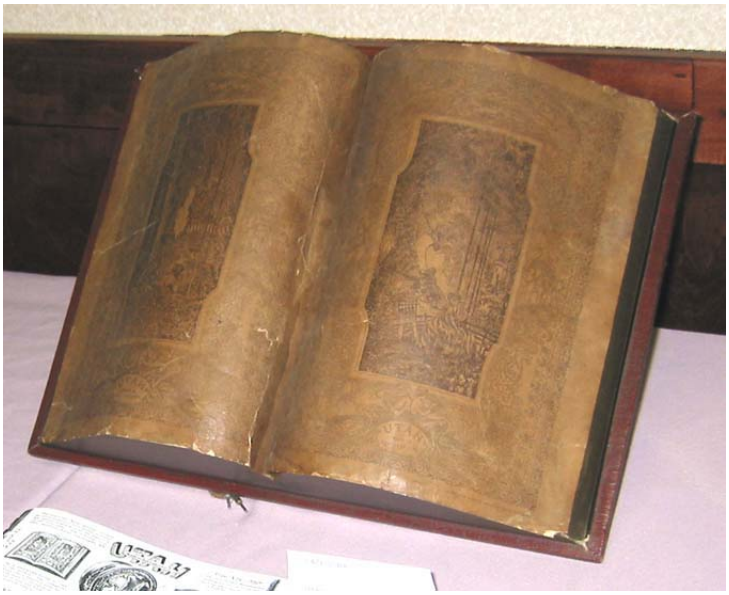

Fig. 13. Utah book speaker from a website.

Fig. 14: Utah book speaker ad from *Citizen's Radio Call Book*, September 1926, p37. Image from www.americanradiohistory.com.

Footnotes:

1. Obituary, *Philadelphia Inquirer*, February 14, 1992.

2. *Radio-Craft*, March 1933, p531

3. For those interested in minutiae, here's what I found on the internet regarding Lowell's Poetical Works: "This work has been selected by scholars as being culturally important and is part of the knowledge base of civilization as we know it." First published in 1877 by James Russell Lowell (1819-1891) in 11 volumes. (A very strange title to use on a radio book set. Wouldn't you agree?)

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Check Your Cables (and your VSWR) !

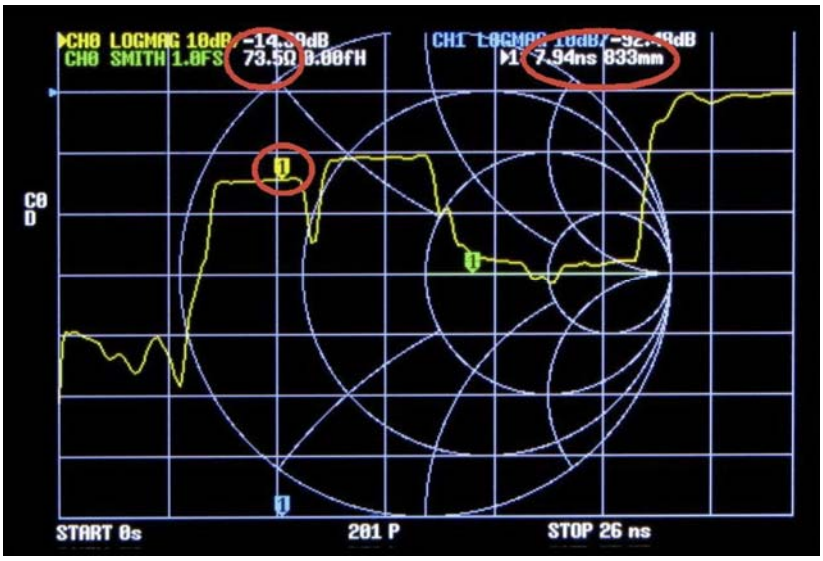
By John Staples, W6BM

Do you have a box of unknown coaxial cables that you would like to identify?

A technique known as Time Domain Reflectometry (TDR) sends a signal down a cable, looks at any reflections back to the feed point and reports impedance changes along its length. This technique is used to measure a wide variety of things such as bridge cable breaks, blood flow in arteries or water levels in the soil.

A coaxial cable's impedance (the surge impedance) is a function of its geometry and the dielectric between the inner and outer conductor. A 50-ohm cable terminating in another impedance will reflect some power back to the source. Today's solid-state transceivers can be finicky about impedance mismatches at what they are driving, and they work best into 50 ohms.

I'm going to show you how to use one of these inexpensive but high-performance analyzers recently on the market, the SAA2N, to perform some functions in addition to its normal use as a Vector Network Analyzer (VNA).



VNAs have been an expensive mainstay in research labs for decades used to measure the characteristics of filters, amplifiers (and particle accelerators).

Measuring Cables

Here's an example. I connected several short pieces of coax together and TDR'd it.

Starting with 21.5 inches of 50 ohm cable, it was followed by 16 inches of 75 ohm coax, 20.5 inches of 93 ohm coax, and finally an open-ended 31 inch piece of 50 ohm coax. The junctions occur at 546, 952, 1473 and 2260 millimeters from the start.

The 50-ohm barrel between the 75 and 93 ohm coax is the dip at about 2.3 divisions in on the plot on the SAA2N, at 952 mm, just to the right of the yellow cursor. The distance resolution is a little better than 1% of the length of the cable tested.

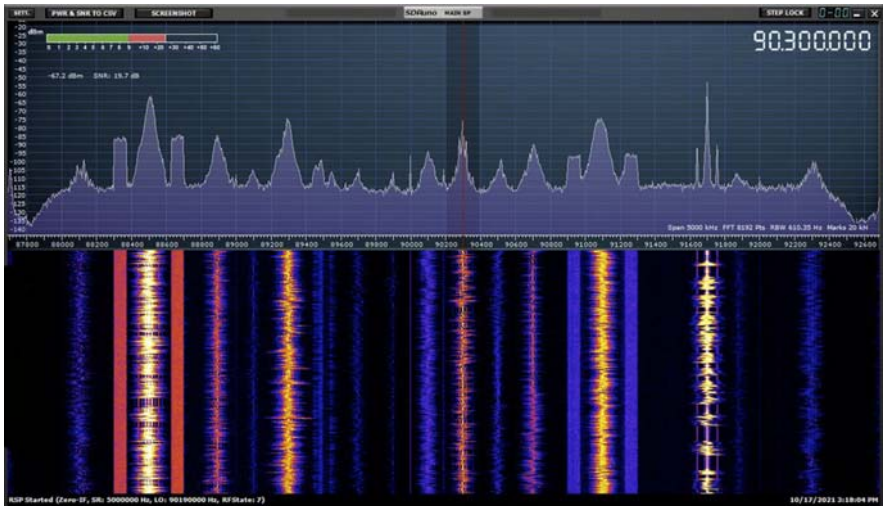
The cursor along the impedance plot is 833 mm (top right) from the start, with an impedance of 73.5 ohms indicated (top left). As the cursor is dragged along the yellow line, the location and impedance is indicated at each point. The 7.94 nanosecond value (also top right) is the time for the pulse to go down to the 833 mm distance and reflect back. Since the propagation speed along the cable is slower than the speed of light, 70% in this case, the round trip is 7.94 nanoseconds.

The velocity factor chosen for this test is 70% the speed of light, an average for the cables used. That factor is normally between 66% and 80% the speed of light. If you know the velocity factor of the cable being tested, for example 66% for 50 ohm RG-8, you can enter it into the VNA to get an accurate length measurement. If you don't, but know the length of the cable, you can compare the measured length to the VNA calculated length and calculate the velocity factor. This is useful in identifying unknown cables.

The horizontal length scale is given by the bottom right number, or 26 nanoseconds round trip for a velocity factor of 70%, corresponding to a maximum measured length of 2.73 meters, almost 9 feet.

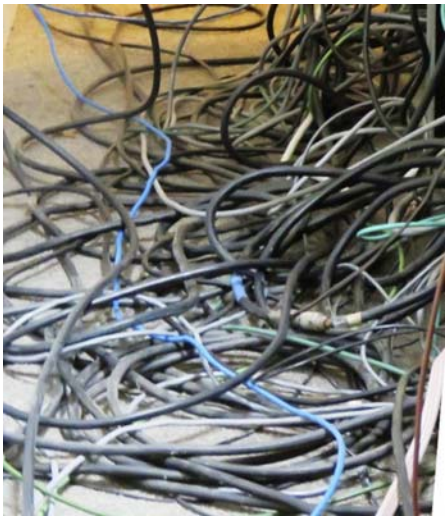
(For experts: the amplitude of the yellow line is actually the log of the S11 reflected wave. It will be at a minimum for 50 ohms, higher for anything else, as the VNA is calibrated for a 50 ohm matched load. The green cursor near the center is the real component of S11 on the Smith chart plot)

So how does this work to measure the impedance along a stretch of cable?



The VNA generates a sweep of frequencies to measure the impedance and transmission of the Device-Under-Test (DUT) connected to it. To simulate a pulsed TDR measurement, the Fast Fourier Transform (FFT) algorithm converts data from the frequency domain into the time domain (or conversely). This is how your Software Defined Radio (SDR) is able to receive a swath of frequencies as a time-varying voltage and convert and display it as a frequency spectrum. This VNA uses this FFT technique to transform from the frequency domain to simulate a pulse in the time domain to calculate the TDR.

I have used the VNA to sort through boxes of unidentified cables collected through the years, sorting them out by impedance, length and velocity factor. Our ham transceivers like 50 ohm loads, but TV technology, both RF and baseband video prefer 75 ohm cables, and I have found various other impedances in my cable bins.



I used the TDR technique to quickly find a bad connector buried in a pile of cables behind the row of relay racks in the ham shack.

This VNA is the SAA2N, which can be obtained for as little as $100 dollars. It covers the frequency range of 50 kHz to 3 GHz without using harmonics and uses robust N-connectors. Other inexpensive units on the market use SMA connectors, which are delicate and prone to failure.

The SAA2N TDR configuration optimally uses 201 frequency points, the maximum capability, a start frequency of 50 kHz and a stop frequency given by the formula

$$F_{max}[\text{MHz}] = 0.2 \cdot \frac{n^2}{Length[\text{meters}]}, \quad Length[\text{meters}] = 0.2 \cdot \frac{n^2}{F_{max}[\text{MHz}]}$$

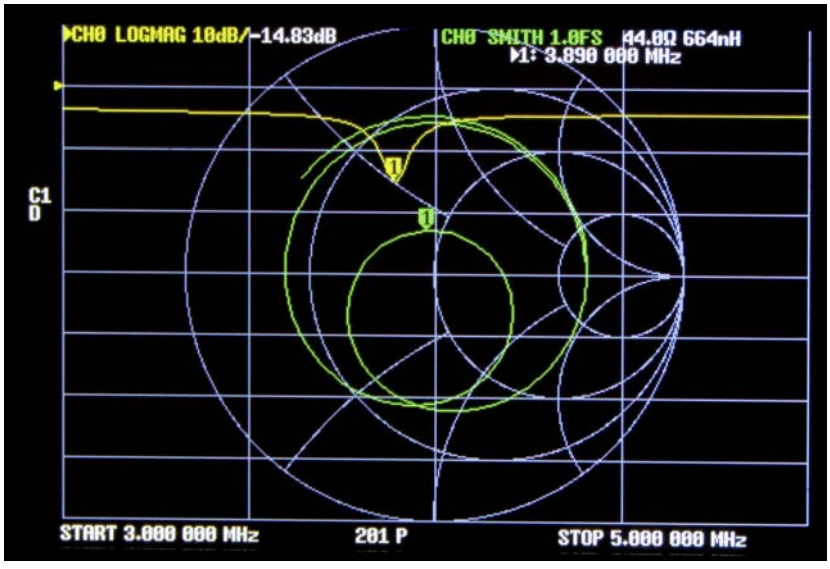
where *Length* is the maximum cable length in meters to be measured and *n* is the number of frequency points, 201. The maximum stop frequency of 3 GHz corresponds to a maximum cable length of 2.69 meters that can be measured, or about 8.8 feet for a velocity factor of 70%. To measure longer cables, the maximum frequency will be lower as given by the above formula.

What else can this marvelous VNA do?

It is an excellent antenna analyzer, and less expensive than many others on the market. All antenna analyzers are able to measure the Voltage Standing Wave Ratio (VSWR), as does the SAA2N. But it also measures and displays the real and imaginary values of the antenna impedance, for any frequency between 50 kHz and 3 GHz.

Knowing two parameters, R and X, instead of just one parameter, VSWR, may be useful for adjusting most two-knob antenna tuners. The antenna impedance may be displayed on a Smith Plot, a two-dimension display of the real and imaginary parts of the antenna impedance.

The plot at the right shows the VSWR of my 75 meter antenna, after a good rainstorm that left the ground saturated.



The frequency span is from 3 to 5 MHz, and the cursor is at 3.89 MHz. At this frequency, the VSWR is 1.44:1.

In addition, the real and imaginary parts of the antenna impedance can be displayed on a Smith plot, which is a two-dimensional representation of the complex impedance.

The yellow line is the logarithm of the return power from the antenna. It is at a minimum at the antenna resonance of -14.83 dB less than the forward power. Away from resonance, more power is returned to the source (transmitter).

The green circles represent the real and imaginary parts of the return signal on the two-dimensional Smith plot. The load is modeled as a resistance and a reactance in series. At the top right, the resistive part is shown as 44.0 ohms, and the reactance is indicated as a 664 nanoHenry inductor in series with the 44.0 ohm resistor. At 3.89 MHz, the reactance of a 664 nanoHenry inductor is 16.22 ohms, using the formula $X_L[\text{ohms}] = 2\pi \times Freq[\text{MHz}] \times L[\text{microHenries}]$. So the impedance of the antenna at this frequency is (44.0 + 16.22*j*) ohms in complex notation, a little off from a pure 50 ohms.

Just the VSWR won't tell you if the real component of the antenna impedance is greater or lesser than 50 ohms, but the complex impedance measurement will.

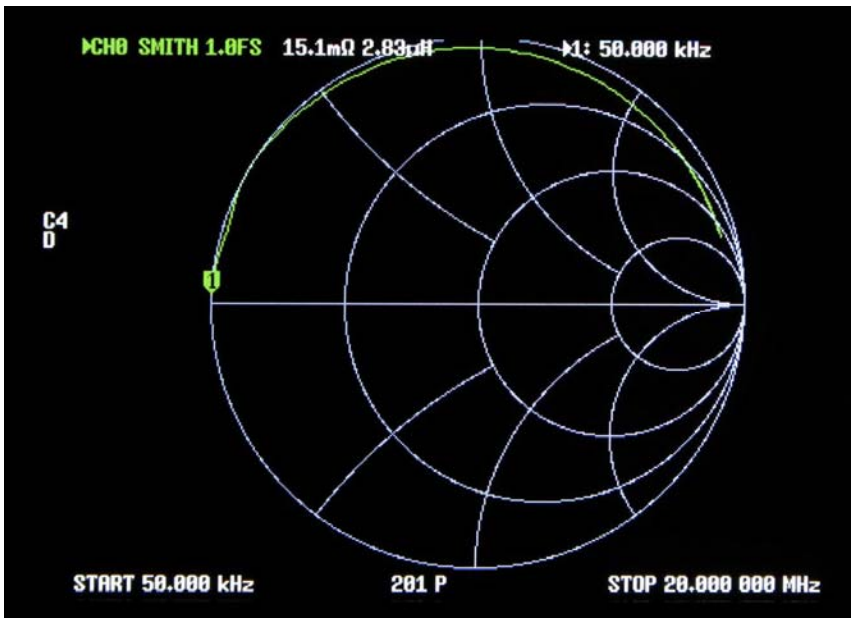
Anything else?

Yes. The VNA is an excellent device for measuring the inductance of small coils, as used in various RF filters. It makes an excellent Q-meter. These coils may have an inductance in the microHenry range. Standard LCR bridges, such as my venerable General Radio 1650A measures inductance at 1 kHz, which would have to measure a reactance of much less than one ohm for a microHenry inductance.

The VNA can measure a coil's inductance over a wide range of frequencies.

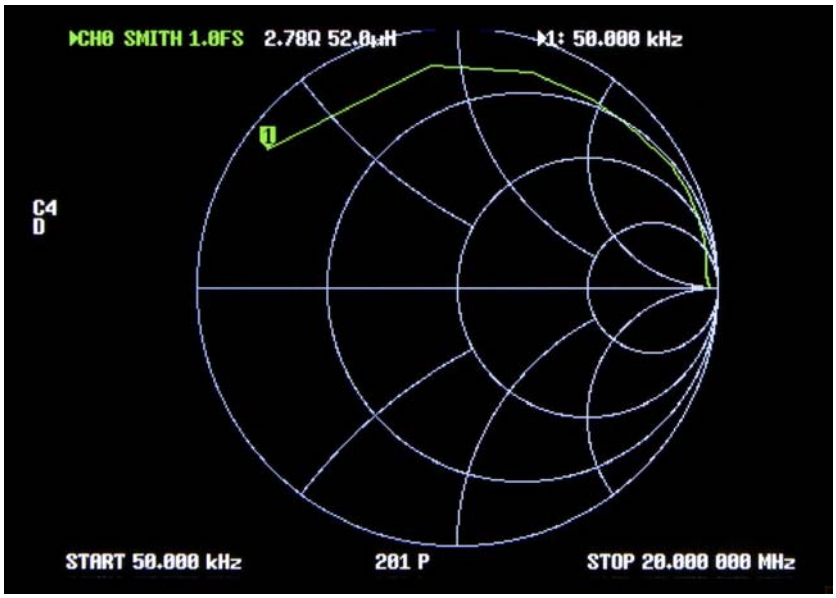
Toroidal inductors provide a nice way to construct RF coils with little field outside the ferrite itself, so they are essentially self-shielding. But not all ferrites or powdered ion cores are the same, and they may be lossy at high frequencies.

The VNA, besides measuring the inductance, also measures the RF resistance of the coil as a function of frequency. Some ferrite cores have a high magnetic permeability, so they can provide a large inductance with a small number of turns, but they may also be lossy at high frequency, which may not be observed with a 1 kHz measurement on a LCR bridge.



Here, a toroid is tested from 50 kHz to 20 MHz. The Smith chart shows that the impedance over this frequency range given by the green line that hugs the edge of the upper half of the plot, showing very low series resistance. The 2.83 microHenry inductance is calculated and shown on the top line as well as a series resistance of 15.1 milliohms. As the cursor is dragged over the frequency range, the measured inductance will remain almost constant and the equivalent series resistance will remain low. This is a coil that should work well at high frequency.

The next plot shows the impedance of a lossy 52 microHenry toroid which has an inductive reactance of 16.3 ohms at 50 kHz using the equation on the previous page. The impedance trajectory breaks away from the zero resistance outer edge of the plot, showing that at 50 kHz an equivalent series resistance of 2.78 ohms. At this frequency the Q of the coil is only 5.9, the ratio of the reactance to the series resistance, even worse at higher frequencies. The losses are due to both the DC resistance of the wire and to loss in the ferrite core material.



Since the VNA is a two-port device, it will measure the transmission of transformers and amplifiers. Combined with excellent filter design software as found in the circuit simulator *qucs*, the SAA2N facilitates the winding of coils to a specified inductance, and then can be used to validate the design of the constructed filter.

The SAA2N and its calibration standards

The Author

John Staples, Ph.D, W6BM, has been designing and producing particle accelerators at the Lawrence Berkeley Lab since 1971. He received his Amateur Extra Class and RadioTelephone First Class licenses in 1958 and is particularly interested in early television technology.

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The Wireless Boys of Alameda:

Part 1 - Fred Mudgett, Amateur Radio, and the Great San Francisco Earthquake

By Robert Rydzewski, KJ6SBR

Before Lee DeForest had invented the triode and a decade before QST published its inaugural issue, just a short walk from today's CHRS Radio Central, teenagers Fred Mudgett, Henry Heim Jr., and Albert Wolff Jr. built some of the earliest amateur radio stations in the Bay Area. Along with another Alamedan, George S. Hubbard, the spark signals these local boys sent out had repercussions that reached from San Francisco to Washington D.C. to the East China Sea. In the Wild West of the airwaves prior to the Radio Act of 1912, their accomplishments anticipated both the best and the worst of what amateur radio could become. Their names have long since been forgotten, but what these young local pioneers did helped shape amateur radio as we know it today. Who they were and what they did deserve to be remembered.

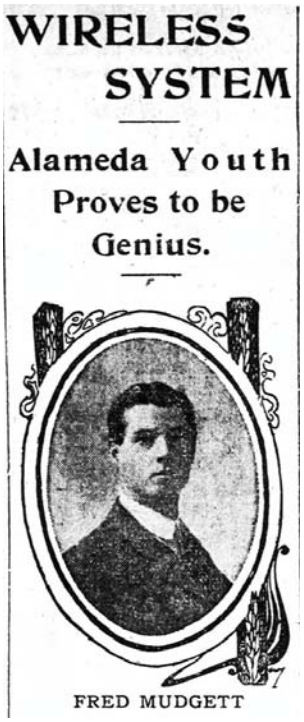
A Short Trip Down Memory Lane

Imagine yourself at 2152 Central Avenue in Alameda, California. Not so different than an ordinary Saturday, you say? Well, except that in this case you're there in the fall of 1905. The "old" radios in the Great Hall are not yet even a futuristic dream. Instead, telephone switchboards line the walls and women phone operators are busy saying "Number, please," and plugging in phone jacks. Now go out the front door and turn right to stroll down Central Avenue. Hopefully you're wearing boots: the still dominant mode of transportation, horse, gives off a different kind of pollution than the exhaust fumes you're used to breathing. But things aren't totally primitive—look, there's a man delivering a nickel's worth of ice for someone's icebox, a most modern convenience! On your right you still pass Alameda High School, but this one's older and much more modest than the one found there today. And the Alameda Theatre? There's no line for tickets yet: first show starts in 27 years!

Now you've reached Park Street (figure 1) and have turned left. Interested in getting some candy or ice cream? Wander down the block to Heim's Confectionery at 1426. There are plenty of telephone and telegraph wires around, but what's that wire stretching all the way from Heim's roof to the water works tower? Ah, your future self remembers now: it's an aerial! Now, walk down to Santa Clara Avenue and turn left. There's Alameda's City Hall. It's same red brick building as in your time but in these pre-1906 earthquake days it still sports a tall central tower. Straining your neck, you see that there's a flagpole atop the tower to which is attached, yes, another aerial! This one stretches clear across Oak Street to a house on the next block. Walk a few blocks over to Clinton Avenue and you'll see a third aerial, one end of which is attached to a windmill.

Fig 1: Park Street looking toward Estuary, 1900. Shown is the old water tower at right. Courtesy of Alameda History Museum.

At least two years before Lee DeForest put the "tri" in triode and decades before the golden age of radio, back in the dark age of sparks, self-assigned callsigns and complete freedom of the airwaves, amateur radio was already alive and well and living in Alameda not half a mile from the present-day CHRS museum. You might even say that Alameda *was* Radio Central long before CHRS got there, thanks to the pioneering efforts of young enthusiasts like Fred Mudgett.


WIRELESS SYSTEM

Alameda Youth Proves to be Genius.

FRED MUDGETT

Fig. 2: Article from the *Oakland Tribune*, September 21, 1905.

Meet Fred Mudgett

Today, more than a century later, it's hard to say who had the very first amateur wireless (radio) station in Alameda, but the most likely candidate is Fred Mudgett. Fred was born in 1885 in Salt Lake City, but by the turn of the century the young man was living with his parents at 2305 Santa Clara Avenue in Alameda, just a block away from City Hall.[1] "When I was a boy," he recalled, "I was always taken up with electrical toys and that wonderful power attracted me. I began the study of electricity about eight years ago [circa 1897] as a pastime."[2] Described as quiet and studious, Fred delved into the wireless experiments of Marconi, Arco, Braun, Tesla, Slaby, DeForest, Fessenden, Massie... all the leading figures in the emerging science.[3] This required real dedication in the days when books on the subject were few, magazines like *Modern Electrics* did not yet exist, and newspapers, the most immediate and available of media, were generally worse than useless in explaining how it actually worked.[4]

Fred graduated from Alameda High in 1904 and soon enrolled in the Mining Engineering Department at UC Berkeley.[5] His wireless activities (all done from his home in Alameda) were first reported in the *Alameda Daily Argus* for May 19, 1905, which noted that he and an Oakland amateur who lived about 3 miles away, Ernest Webster, were regularly communicating by wireless telegraphy.[6] There was a later article in the Oakland Tribune (see headline in figure 2). Their stations were completely homebrew, and as Mudgett continued to improve his, its reach was extended to other amateurs, Pacific Wireless Telegraph stations OD (Oakland) and SF (San Francisco), some ships at sea, TI (Goat Island aka Yerba Buena Island), and TG (Mare Island, which is really a peninsula, see figure 3), and TH (the Farallon Islands), the last of these about 40 miles distant.[7] With relatively few stations making ether waves in those days, almost always radiotelegraphy (dots and dashes) rather than radiotelephony (voice), Mudgett and the other operators formed a sort of exclusive club. They came to know each other and could probably recognize one another by their "fists" (idiosyncrasies in their Morse sending).

Fig. 3: US Navy Station TG, Mare Island, 1906. Source: Naval History and Heritage Command UG 21-03.02.

The First FM Station in California?

Few details of Mudgett's station are available. Perhaps most notable was his antenna: "My aerial wire runs to the top of the flagpole on the City Hall, and is thus suspended from the highest point in Alameda."[3] As mentioned before, Alameda's City hall in 1905 (figure 4) was essentially the same one you see there today, but with a very tall central

Fig. 4: Alameda City Hall some time prior to the 1906 earthquake. Library of Congress photo.

tower that's now long gone. Since Mudgett lived a block away, his antenna must have been several hundred feet long, stretching clear across Oak Street to his house. Just try getting permission for such a thing today! Its length and height were probably key to his success at the time since the types of detectors available back then were hugely insensitive.

What little information we have on Fred's station was provided by an Oakland ham, Lewis Clement, who knew him and who would go on a distinguished career in electronics. Among other accomplishments, Clement helped develop the first aircraft radiotelephone for Western Electric, RCA's first superheterodyne receiver, and the proximity fuse that would find use in World War II.[8] In a letter to Society of Wireless Pioneers historian (and pioneer himself) Henry Dickow, Clement recalled that Fred had a 1000-watt spark station in Alameda, with callsign FM (his initials).[9] In those early days, amateurs could use whatever callsign they wanted, there being no FCC and no licensing requirements. Alameda amateurs would be involved in changing that too, but that's a tale for next time.

That Fred was skilled in the design and assembly of his rig is attested to by the fact that he'd made something like a Morse inker for unattended reception: "I have arranged a paper tape in connection with the plant, so that if I should not be present the dispatch will be indicated by the usual dot and dash method common in telegraph offices."[3] In those days the dots and dashes could either be in American Morse (aka "telegrapher's code") or the "Continental" (aka "International") code that we think of today, which was then beginning to be more widely adopted in the US.

An Accidental Death

Having novices experimenting with kilowatts of electricity with no training in and little concern for safety—not to mention the teenager's innate belief in his own immortality—could be a recipe for disaster. Although Fred managed to avoid major injuries, one local amateur whose station he had communicated with, Charles Grenelle, was not so lucky. Two different accounts of what happened to Grenelle are given by the *San Francisco Call* and the *San Francisco Examiner* of January 28, 1906. Both agree that it happened in Oakland on 9th Avenue near 15th Street the day before, and both agree that he died. But beyond that they might as well have been talking about two different incidents.

According to the *Call,* Grenelle, who was 15, was trying to reconnect a private telegraph line strung up between the homes of himself and his friends.[10] The line had been cut when a new segment of the Oakland Traction Company overhead trolley line was put in. He climbed a power pole, apparently intending to use it to support his telegraph wire (a very big NO-NO). He then slipped, reached out and grasped a 1500V line, screamed "Catch me!" to his friend below, and fell into his arms, dead.

According to the *Examiner*, Grenelle, who was 14, was trying to tap into the Bay Counties power lines (an even bigger NO-NO) and bring 4000 volts into an electrical lab to use in experiments with apparatus the boys had already set up.[11] "Having adjusted himself across the beam at the top of the pole, Grenelle began removing the insulation from the feed wire... by cutting the rubber tape away with his knife. There were other wires carried by the same pole, and as he worked his body came in contact with them... the insulation was broken... and the contact completed. The boy grasped the wire and was held there momentarily. The muscles soon relaxed and he fell to the ground, breaking his neck by striking against the stone curbing." You can decide which scenario seems more likely, but keep in mind that other amateurs had been known to illegally tap into power lines for their own use in those days.

The *Call* was more invested in promoting wireless and this may have led them to a more sympathetic interpretation, facts being whatever your favorite paper said they were in those days.[12] In any case, Grenelle's tragic death was a brutal lesson in the dangers of wireless for Fred and the others, but even so it didn't scare them out of the field. Just a few months later, this turned out to be a very good thing for the city of San Francisco and the United States Navy.

The Great Earthquake of 1906

At 5:12 AM on April 18, 1906 the San Andreas fault gave way, with the Pacific and North American plates striking and slipping their way to a new temporary accommodation. The earth shook, buildings collapsed, and several thousand people in San Francisco and surrounding areas died. More lives were lost, and more damage was done by the fires that followed the earthquake than the big shake itself. These were fed not only by the original destruction but by homeowners torching their own houses to collect on insurance policies as well as a misguided attempt to dynamite buildings to create a firebreak. See figure 5 next page.

Among the many problems San Francisco experienced was a total inability to communicate with the outside world. All long-distance telephone and telegraph wires (and many operators) were down, and all San Francisco wireless stations, including PH at the Palace Hotel and PS at the Presidio,[13] were destroyed or inoperable. Within hours of the quake, with fires still advancing, Captain Leonard D. Wildman, departmental officer of the US Army Signal Corps, and his men had already begun to restore telegraph lines within the city.[14] Wildman was a master of both wired and wireless communications, having recently established Alaska's first wireless communications link, a job that had sent American Marconi and Reginald Fessenden's company packing with their tails between their legs.[15] In San Francisco, Wildman's "flying" telegraph lines soon re-established some bare bones local military and emergency service communications. One of the lines connected the network terminus at Fort Mason, General Funston's headquarters, with a pier near the Ferry Building.[16]

But for the next 36 or more hours not a single shore station or ship nearby was capable of sending or receiving a wireless except for Yerba Buena Island, which was a short boat trip (about 3 miles) away. Notably, young Francis J. McCarty,[17] inventor of the first wireless telephony (voice) station in the western US, contacted Captain Wildman with an offer to let the U.S. Army use his McCarty Wireless Radiotelephone Company antenna and station house in the Outer Sunset district, which had apparently withstood the earthquake[18] (figure 6). This offer may not have reached Wildman for some time after the quake. In any event, he turned it down, thanking him but saying, "This is useless at present on account of the fact that all wireless instruments in the immediate vicinity of San Francisco were burned."

Post-earthquake Emergency Communications

A word about the equipment used at U.S. Navy wireless stations in 1906 is in order. All of it was spark, and at Yerba Buena and Mare Island most of it was from the German company Slaby-Arco, which had merged with another to become Telefunken. See figure 7 for Slaby-Arco schematic.

Fig. 5: Fires following the 1906 San Francisco earthquake.
Library of Congress photo.

Fig. 6: McCarty Wireless Station, circa 1902-6, was located near 45th and Lawton Street in San Francisco. Courtesy of Society of Wireless Pioneers.

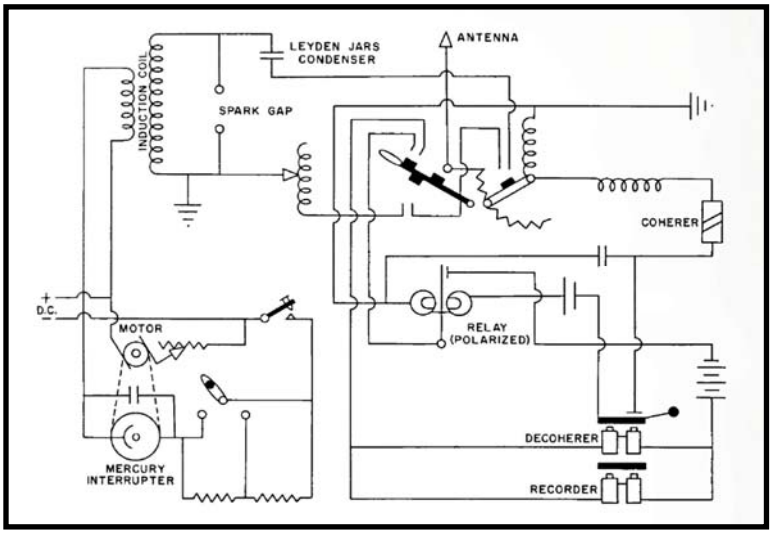


Fig. 7: Schematic for Slaby-Arco equipment purchased by the US Navy in 1903.
From Howeth, *History of Communications-Electronics in the United States Navy*, p. 56.

But a lot of mixing-and-matching with other brands went on. For example, in the Mare Island station interior photo (figure 8), to the left of the pad of paper is a DeForest responder, a type of electrolytic detector that replaced the original, less sensitive coherer and decoherer shown in the schematic. The transmitter only had a reliable range of about 50 miles,[19] which Fred's station could probably beat at times. In those early days, amateurs and professionals were more closely matched since "both classes of wireless workers used apparatus almost equally crude."[20] The crudeness of the equipment also meant that transmission frequencies were relatively broadband and imprecise. Frequencies would have centered somewhere in the range of 100-1000 kHz, depending on the "personal whim of the Chief in Charge."[21]

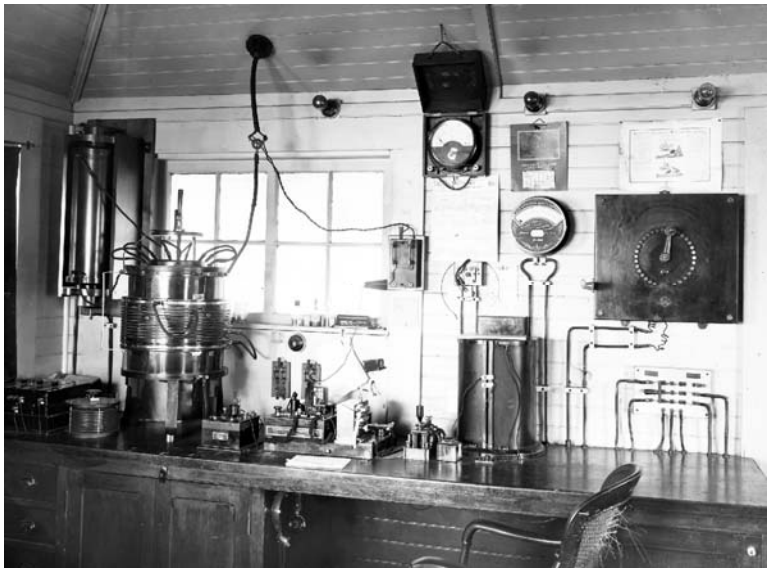


Fig. 8: The interior of the Mare Island station (TG) in 1906. The vertical handle to the right of the pad of paper is the unwieldy Slaby-Arco key. The paper on the wall at upper right tells how to resuscitate a victim of electric shock. Source: Naval History and Heritage Command UG 21-03.03.

Accounts of how wireless communications worked (or didn't) in the aftermath of the quake are confusing and sometimes contradictory, reflecting in part the chaos of those days. The following narrative relies on the best evidence found so far in multiple sources and calls out possible inconsistencies and downright unknowns.

Just minutes after the quake, at 5:20 AM, the Navy wireless station at the Farallons, which had felt the jolt, sent a wireless message to the Yerba Buena station inquiring about conditions in and around the city.[22] At 5:30 AM the latter "waved" (sent by wireless?) a status report to Mare Island and the Farallons. Mare Island's wireless station and its telegraph lines to the outside world were still intact; from there, communications with Washington D.C. (and anywhere else) were possible. Somehow, either via wireless from the Farallons or wire from Mare Island, the Yerba Buena report was received 220 miles south at the Navy station at Point Arguello (TK). The message got from there, probably via Point Loma (TM), to the wireless-equipped cruiser *U.S.S. Chicago* (CO), then located 25 miles from San Diego (figure 9). Few Navy ships had wireless sets at that early date; the *Chicago* was the closest one.

According to the first-class electrician on board, Mr. L.M. Wright, the Navy report of the earthquake was already old news: the *Chicago* had already gotten word from the DeForest station in San Diego (PK) saying "Earthquake had about demolished San Francisco and fires breaking out."[23] Rear Admiral Goodrich, commander of the Pacific Fleet, received wireless confirmation from the San Diego mayor, who noted that the San Francisco fire department was "helpless" and that requests had been made for transportation to take dead bodies to sea for burial.[24] The *Chicago* then turned about, and made for the city at full steam. An interesting aside is that the *Chicago*

Fig. 9: U.S.S. Chicago, undated photo. Note the faintly visible antenna and spreaders between the masts. Source: Naval History and Heritage Command NH 61855.

carried one Past Midshipman Stanley C. Hooper, who had once done a little railroad telegraphy. He had also taught himself the slightly different Continental code because the spark equipment on the *Chicago* was so loud it could be heard all over the ship![25] Hooper would end up as Rear Admiral Hooper, "the Father of Naval Radio" not to mention the Radio Corporation of America (RCA), which was his idea. The San Francisco earthquake would provide the Past Midshipman his first experience with wireless telegraphy.

In the immediate aftermath of the quake, with the *Chicago's* wireless set not yet available to the city, messages pouring in from seven sections of the city through Wildman's "flying" telegraph lines were received at Fort Mason and sent over to the Ferry Building (*1* on map in figure 10), then probably ferried over to the Yerba Buena Island station (*3*) for wireless transmission. If everything went well, Mare Island (*4*), about 30 miles away near Vallejo, would receive them and pass them on via telegraph lines. Once the *Chicago* (*2*) reached San Francisco, dropping anchor early in the evening of April 19th near either Fort Mason or the Ferry Building (there being two different accounts),[26] the ship's wireless acted as a relay to the Yerba Buena station. This eliminated the delay in getting messages to and from there by boat. The *Chicago's* wireless transmitter had a more limited range than the one at Yerba Buena, which itself was listed at only 3000 watts a few years later,[27] so it was best used as a relay station.

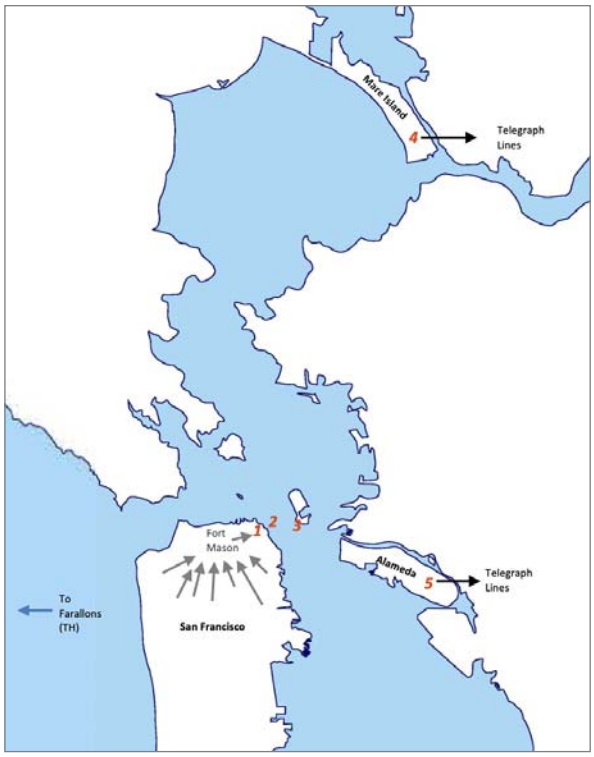


Fig. 10: Wireless communication routes after the 1906 San Francisco earthquake. See text for explanation. This is from a modern map: Treasure Island to the north of Yerba Buena Island (3) didn't exist in 1906.Courtesy of https://d-maps.com/carte.php?num_car=6076&lang=en.

The *Chicago's* crew (and later, the *Marblehead's*) were sent ashore to help fight the fires that were still raging and to curb rampant looting. In the two weeks that it was there, the *Chicago* would send and receive more than 1000 messages.[23] These would have included the status of the fires, Army and Navy personnel requests and present dispositions, numbers of casualties, and requests for (and offers of) supplies such as tents, food, and medical equipment. One example was the Point Reyes lighthouse keeper's request: the earthquake had knocked its Fresnel lens out of alignment and special equipment for its repair was needed to prevent shipwrecks as supplies from Portland and Seattle poured into the city.[28]

The Only Link to the Outside World: Alameda's Fred Mudgett

With this complicated and rather official military communications network falling into place, what role could a "boy" (who was actually 21 at the time) from Alameda and his homebrew amateur station possibly play? First of all, working for a local Alameda paper, the *Daily Encinal*, his monitoring of the big event allegedly allowed the paper to give "the only full accounts of the fire and the conditions which have so appalled the civilized world."[29] When the only wireless sets around belonged to amateur operators, newspapers were quick to cozy up to them, as we'll see in other parts of this series. Messages were still being sent "in the clear" (unencrypted) or Fred would have only received gobbledygook. Because he worked for them, little Alameda's *Encinal* was likely the first paper in the country to get the scoop and perhaps the only one to get actual messages from Yerba Buena Island (Goat Island) like the one below.[30]

Special by Wireless to Daily Encinal

Call Building Gone AND South of Market is Burning

Latest on Loss and Horror of San Francisco

From Goat Island by Wireless System to F.G. Mudgett

Goat Island (by Wireless) 2:45 p.m.

Report to Washington severe earthquake in San Francisco. City in flames. Have sent for assistance. Am in readiness to furnish other assistance when demanded from Goat Island. Loss of Life is enormous. Estimated that loss of life in San Francisco is from 5,000 to 6,000 souls. Apparatus is slightly damaged. Communications to and from the city is all out.

Alameda too suffered damage and injuries from the earthquake, but these were minor compared to the calamities in San Francisco and other East Bay cities (figure 11).[31] There were no major interruptions to Alameda's electricity. Soon more than a thousand displaced refugees from San Francisco began to arrive, welcomed in the spirit of charity at first, then later watched carefully by a volunteer "Alameda Citizens Protective Association".[32] The quake had caused some structural damage to the tall City Hall tower, to which Fred Mudgett had attached his aerial. The papers noted that it would have to come down and sure enough, just 31 years later, it did.[33] There must be a story there, but that's for another time and place.

Fig. 11: View of Post and Grant Avenue in San Francisco in the aftermath of the 1906 earthquake. National Archives and Records Administration photo.

Whether still using his City Hall aerial or working with a backup antenna, Fred's Alameda station continued to operate after the earthquake.[34] At least nine articles in local and national publications, including official U.S. Navy reports, acknowledge the vital service that Mudgett provided in the aftermath of the great earthquake.[35] What he did could be divided into two categories. First, his station enabled communications—at one point providing the *only* link—between the wireless station at Yerba Buena and Navy and government officials, and second, it allowed for official reports of the earthquake and fire to make their way to the press.

"Soon after the earthquake," said W.B. Carroll, chief Navy electrician at Yerba Buena (figure 12), "the clerk to the commandant reported by wireless from the Alameda station [Fred Mudgett's] and was informed that our water supply was cut off and instructed to request that repairs be made as soon as possible. Several commercial telegrams to the East were dispatched via Alameda wireless, and throughout the days following this station shared the benefit of our bulletin service concerning the fire."[36] So valuable was this link that it was suggested that all commercial and private wireless stations should be provided with Western Union and Postal Telegraph forms for just this kind of event!

According to the *Army & Navy Register*, "It is a notable incident, of which mention is made in the official communications to the Navy Department, that a young lad in Alameda with an experimental wireless station established for his amusement came to be of inestimable value in the transmission of messages. He is referred to in this communication as Master Fred Mudgett, and his station where messages were passed along furnished *the only means of communication from Yerba Buena, the U.S.S. Chicago and Fort Mason to the outside world.*"[37] [Italics added]

Fig.12: US Navy wireless station TI at Yerba Buena Island (1904), then called Goat Island. Source: Naval History and Heritage Command UG 21-13.04.

Trying to understand the gap in official Navy wireless chain that Mudgett was able to bridge is tricky. A probable explanation is that at some point the Yerba Buena wireless station was down or just unable to get through to Mare Island, where messages were passed along by wire. If Mudgett could still receive Yerba Buena or the *Chicago* and either relay wirelessly to Mare Island or send them off via wired telegraph lines that were apparently still working in Alameda, his station would have been the link that completed the chain. This *Chicago* to Yerba Buena to Mudgett to telegraph lines route is suggested by several accounts.[38] Keep in mind that if all else failed, messages could still have been ferried across the bay by ship to Alameda or to Oakland (which also still had functioning telegraph lines), but that would have introduced a longer delay at a critical time.

Fred's role was quickly acknowledged: "A number of officials came to this city [Alameda] to thank the talented young man who was busy day and night at his post."[39] He received no medals or awards as far as we can tell, but the role that the wireless system of which he was part played in disaster response had important implications for the future: "...wireless stations work very efficiently and render such aid as is not to be reckoned in dollars and cents. Under such circumstances it is only natural that there should be implicit faith in the wireless operations as a means of protection and relief."[40] This in turn supported a request for the construction of five other Navy wireless stations along the Pacific coast from San Francisco to Puget Sound.[41] Initially estimated to cost $65,000, it was approved and, this being a defense appropriation, finally completed for $600,000 (about $18 million today).[42]

Epilogue

In one of the 1905 articles, Fred Mudgett noted that he was a student in the mining engineering department of the University of California (figure 13) and "the study of wireless is somewhat of a pastime for me. Should it develop that there are better prospects for me in the field of electricity I may decide to devote all my time to it."[43] So which direction did he take? Decades later, he ended up as secretary and treasurer for Zenith! The Zenith Mines company, that is, which was working the Mother Lode in Amador County.[44] Most of his career appears to have been in corporate accounting. So far, no record of his activities in the area of amateur radio/electronics after 1906 have been found; it seems he completely disappeared from the field. He died in 1951 at the age of 65 in southern Illinois after living in various parts of the country including San Francisco, Seattle, Los Angeles, Illinois, and Kansas.[45]

Fig. 13: Portrait of Fred Mudgett from the 1909 University of California (Berkeley) yearbook.

Eight years before the formation of the American Radio Relay League, Fred Mudgett of Alameda, California and his homebrew station on Santa Clara Avenue provided a vital link in the military and government response to the catastrophic 1906 San Francisco earthquake. Although possibly the earliest example of the value of amateur radio in disaster relief, this was quickly forgotten and has gone unacknowledged for more than a century. And as remarkable as it was, it was far from the only contribution the "Alameda wireless boys" would make in shaping the directions radio communications would subsequently take, for good or ill. Just a few blocks away from Mudgett's station, what a couple of other lads were up to with their wireless sets would soon echo through the halls of Congress, and not in a good way. But that's for next time, so stay tuned...

Acknowledgements

My sincere thanks go out to Bart Lee, Mike Adams, and John Staples of CHRS and to Valerie Turpen (Alameda History Museum) for their help. And to my wife, Dr. Jan Rydzewski, for not questioning my sanity.

Footnotes

[1] Fred Grant Mudgett Social Security application, December 1936; Twelfth Census of the United States (1900) Supervisor's District No. 1, Enumeration District No. 312, Alameda, California, p. 39. B
[2] "Young Alamedan's Success With WIreless Telegraphy," *Alameda Daily Argus*, September 25, 1905.
[3] "Intercepts the Waves of Wireless System," *San Francisco Call*, September 25, 1905.
[4] One item entitled "Wireless Telegraphy" in the *Alameda Daily Argus* for March 24, 1900 equated it with an animating force in bodily fluids, turning the article into an ad for Hostetter's Stomach Bitters which, among other things, is said to cure malaria.
[5] "Record Mid-Year Class to Graduate," *San Francisco Examiner*, December 15, 1904; "Intercepts the Waves of WIreless System," *ibid.*
[6] "Alameda's Wireless Telegraph Station," *Alameda Daily Argus*, May 19, 1905.
[7] "Wireless System," *Oakland Tribune*, September 21, 1905; Lewis Clement, "Operating Experiences of a Pioneer," *Sparks Journal* Vol. 7 No. 4, June 21, 1985, p. 7; Bart Lee, "Wireless Comes of Age on the West Coast," *AWA Review*, 2011 (Vol. 24) p. 241.
[8] Lewis Mason Clement - Pioneer of Radio. http://cprr.org/Museum/Radio.html.
[9] Letter from Lewis Clement to Henry Dickow dated February 9, 1970, Society of Wireless Pioneers archives, Alameda, California.
[10] "High Voltage Brings Death," *San Francisco Call*, January 28, 1906.
[11] "Charles Grenelle is Killed by Current of Bay Counties Power Company's Cable," *San Francisco Examiner*, January 28, 1906.
[12] Attempts to find the coroner's report on Grenelle's death were unsuccessful.
[13] "West Coast Call Letters Before 1910," *Sparks Journal*, Vol. 4 No. 4, 1982, p. 7.
[14] Rebecca Robbins Raines, *Getting the Message Through: A Branch History of the U.S. Army Signal Corps* (Center of Military History, United States Army, Washington, D.C., 2011) p. 124.
[15] Edmund H. Marriner, *Old Time West Coast Wireless Stations, Ships, and Operators*, pp. 10-18. Available at: http://www.sowp.org/wp-content/uploads/2018/06/LR-2306031801-Old-Time-Stations-Marriner.pdf; H. L. Chadbourne, "Leonard D. Wildman and the First Alaskan Radio (Safety Harbor - St. Michael), *unpublished manuscript, Society of Wireless Pioneers archives*.
[16] "'Wiggwaggers' Do Great Work," *San Francisco Call*, May 10, 1906.
[17] For more about Francis McCarty, see http://www.sowp.org/wp-content/uploads/2018/09/LR-The-McCarty-Wireless-Telephone.pdf. Also notably, McCarty has an Alameda link too. As Mike Adams has pointed out, at least one newspaper article states that he lived in Alameda at one time ("Test Invention of Dead Youth,"*Oakland Tribune* October 8, 1906) and several document a demonstration of his wireless telephone system that he gave in Alameda in 1904. This may have even been the inspiration for some of the local wireless enthusiasts.
[18] See http://www.sfmuseum.org/hist/mccarty.html.
[19] Captain L.S. Howeth, USN (Retired), *History of Communications-Electronics in the United States Navy* (Bureau of Ships and Office of Naval History, Washington, D.C., 1963), pp. 109-10.
[20] "Amateur Radio and the A.R.R.L.," *Radio Pioneers 1945* (Institute of Radio Engineers, New York), p. 30.
[21] George B. Todd, *Early Radio Communications in the Twelfth Naval District, San Francisco, California*. Available at https://www.navy-radio.com/commsta/todd-sfo-01.pdf; Floyd E. Dunklee, *U.S. Navy Wireless Telegraphy on the West Coast, circa 1908*, available at https://www.sowp.org/wp-content/uploads/2021/04/LR_Navy-Radio-1908-Dunklee-Lee-RR-edit-v-4.pdf.
[22] "Naval Wireless Work," *Army and Navy Register*, Vol. XL No. 1386, July 12, 1906, p. 1.
[23] "Wireless in San Francisco," *Electrical World*, Vol. XLVII, No. 22, June 2, 1906, p. 1110; "By Wireless Squadron Is Set in Motion," *Los Angeles Herald*, April 19, 1906, p. 3.
[24] Ed Stevens, "They Used to Call it 'Wireless'," *Society of Wireless Pioneers Yearbook 1971*, p. 23
[25] Quotation from S.C. Hooper in Howeth, *History of Communications-Electronics in the United States Navy*, op cit. p. 114. One inconsistency in Hooper's account is that he recalls the *Chicago* leaving San Francisco just hours before the quake and being able to return quickly. Other accounts agree that this was not so.
[26] Hooper's account (*ibid*) says they docked off the Ferry Building while "Naval Wireless Work," *Army and Navy Register*, Vol. XL No. 1386, July 12, 1906, p. 2, says it anchored off Fort Mason.
[27] *First Annual Official Wireless Blue Book of the Wireless Association of America* (Modern Electrics Publications, New York, 1909), p. 11.
[28] "Naval Wireless Work," *Army & Navy Register*, Vol. XL No. 1386, July 12, 1908, p. 1.
[29] *Daily Encinal (Alameda, Cal.)* April 20, 1906.
[30] *Daily Encinal (Alameda, Cal.)* April 19, 1906, p. 2.
[31] "Alameda Least Hurt of Any," *Alameda Daily Argus*, April 19, 1906.
[32] Myrna van Lunteren, "When the Ground Shook," *Alameda Museum Quarterly*, Issue No. 2, June 2021, p. 2.
[33] See https://www.hmdb.org/m.asp?m=62216; "City Hall Tower Is to Come Down," *Alameda Daily Argus*, April 25, 1906.
[34] "Situation in This City," *Daily Encinal (Alameda, Cal.)* April 20, 1906 p. 4.
[35] "Boy Ran the 'Wireless'," *Baltimore Daily Sun*, May 10, 1906; "Tells World by Wireless," *Berkeley Gazette*, May 14, 1906; "Fine Work of Fred Mudgett," *Alameda Daily Encinal*, May 14, 1906; "Wireless on Pacific," *Electrical World*, Vol. 48 No. 2, June 14, 1906, p. 81; "Mudgett Wireless System," *Barre (Vt.) Daily Times*, May 23, 1906; "Coast Affairs at the Capital," *San Francisco Call*, June 25, 1906; "Naval Wireless Work," *Army & Navy Register, op. cit.;* "News and Comments," *Army & Navy Register*, Vol. XL No. 1387, July 14, 1906, p. 9; "Chain of Wireless," *Baltimore Sun*, July 22, 1906. It should be noted that several accounts do not name Mudgett, and a couple locate him in Oakland rather than Alameda.
[36] "Boy Ran the Wireless," *Baltimore Sun*, *op. cit.*
[37] "Naval Wireless Work," *Army & Navy Register, op. cit.*
[38] "Wireless on Pacific," *Electrical World*, op. cit; "Coast Affairs at the Capital," *San Francisco Call*, op. cit.
[39] "Fine Work of Fred Mudgett," *Alameda Daily Encinal*, *op cit.*
[40] "News and Comments," Army & Navy Register, op cit.
[41] "Tells World by Wireless," *Berkeley Gazette, op cit.*
[42] "Chain of 'Wireless'," *Baltimore Sun, op cit.*
[43] "Intercepts the Waves of Wireless System," *San Francisco Call, op. cit.*
[44] Anon., *Mining Journal*, January 1939, p. 22.
[45] Fourteenth Census of the United States, Supervisor's District No. 1, Enumeration District No. 217, Seattle, Washington, Sheet 1A.; "Deaths: Fred Mudgett," *Parsons (Ks.) Sun*, August 17, 1951. ◊

“Magic Wand” for Tuning Loopstick Antennas

By Simon Favre

For quite a few years, some AM radios used a ferrite rod antenna, also known as a ferrite loopstick antenna. Ferrite loopsticks are usually a round or rectangular cross section rod of ferrite material with one or more coils of wire wound on them. Sometimes in the course of radio repair it is necessary to make adjustments to the loopstick antenna. This usually only happens when the loopstick has to be replaced with an alternate, or if an adjustable loopstick has slipped. Some radios do have instructions for aligning the loopstick, many do not. This article presents a technique and homemade tools for this purpose.

Fellow CHRS member, Arden Allen commented on the CHRS forum about his "magic wands" for radio tuning. I duplicated one of his and used it to retune a loopstick that was a substitute for one that was missing in a Grundig radio. The tool is simple to make. A radio grade ferrite is easily salvaged from a scrapped radio. The one I used is from a small transistor radio. I mounted the small loopstick on a phenolic rod with hot melt glue. The wire should be stripped off the old ferrite, but it didn’t seem to affect the usefulness of it. On the other end I mounted a closed loop of wire. The rod needs to be nonconductive and long enough to keep human body capacitance from influencing the antenna.

How is it used? When the radio is basically working and the normal alignment is complete, the wand is placed near the

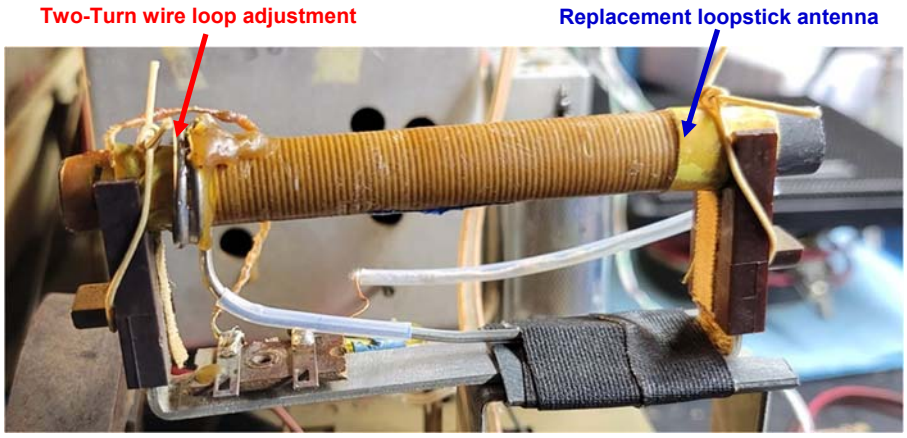
loopstick to determine if adjustment is needed. If the radio has a magic eye or other tuning indicator, that is a great way to see the effect of the wand. Another other way is by monitoring the AVC voltage, which is what tuning indicators do anyway. The ferrite end will increase the inductance of the loopstick. Conversely, the wire loop will decrease the inductance of the loopstick. The loop of wire has to be placed around one end of the loopstick to see its effect. The ferrite end concentrates the magnetic lines of force thereby *increasing* inductance. The wire loop acts as shorted turns thereby *decreasing* inductance. Both ends of the loopstick need to be checked for the effect of the wand. If the ferrite end makes the signal stronger, the loopstick needs more inductance. If the wire loop makes the signal stronger, the loopstick needs less inductance. If the loopstick is correct, neither end of the wand will make the signal stronger, instead both ends may make it worse.

How do you adjust the loopstick? Some have two coils mounted so that one can be moved up and down the rod. The original Grundig loopstick had two coils, but this was missing. Some loopsticks have one coil that can be moved up and down the rod to adjust it. Some have no adjustment.

In the case of the Grundig, I was consistently finding that the different loopsticks I tried had too much inductance. I settled on one that fit the original mount and had the least inductance. This loopstick was non adjustable with the winding sealed in wax. The “loop of wire” principle was adapted to become an adjuster for the fixed loopstick. A loop of stiff wire was formed to fit closely around the loopstick. The end of the loop was attached to a cardboard piece that could slide up and down the mounting for the loopstick. The wand had revealed that one end of the loopstick was more sensitive than the other. I made the wire loop as a coil of two turns soldered so it was closed all the way around. Once the

optimal position for the wire loop adjuster was determined, the loop was fixed in place with wax. With the adjuster in its optimal position, both ends of the wand gave no improvement.

In the case of a loopstick that needs more inductance, a small coil could be put in series, or more wire could be wound on the loopstick. Once the loopstick is adjusted, a final trimming is typically done using a trimmer capacitor. The trimmer may be mounted to the loopstick or connected to it under the chassis.



There you have it. You can use magic wands to fix radios, and you don't have to take classes at Hogwarts!

The Author

An inveterate tinkerer since the age of 8, Simon Favre graduated from U.C. Berkeley in 1975 with a BS EECS, then received an MS EECS in 1977. After college, Simon moved to Silicon Valley to work as an engineer. Radio and test equipment repair became a hobby concentrating on oscilloscopes, home audio gear and car radios. After joining CHRS, Simon expanded his interests into late 40's to late 60's radios, phonographs and others.

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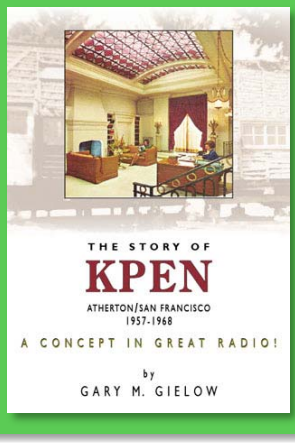
CHRS Publications

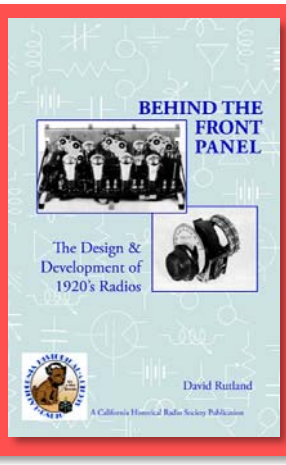
The Story of KPEN: A Concept in Great Radio! Gary Gielow has written a book chronicling the tales of two young men from Stanford, he and James Gabbert, who brought Stereo and new ideas to the FM radio band in the late 1950s and 1960s. This book is the definitive history of KPEN 101.3 FM, the 2015 BARHOF Legendary Station. 100% of the proceeds benefit CHRS.

Available in the Museum Store or on the website.



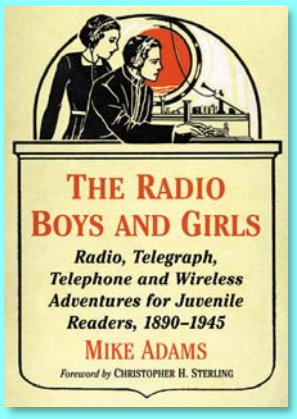
Behind the Front Panel: The Design and Development of 1920's Radio by David Rutland has been remastered by Richard Watts for CHRS. With emphasis on radio technology, Rutland describes the development of 1920s tubes and radio circuitry designs by De Forest, Marconi, and other inventors and manufacturers. A classic!

Buy at Amazon.com



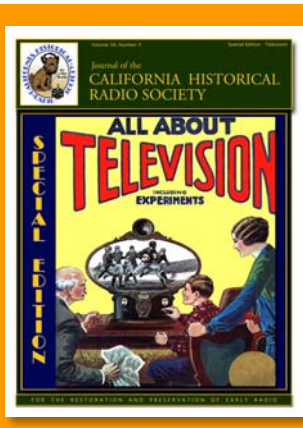
The Radio Boys And Girls—Radio, Telegraph, Telephone and Wireless Adventures for Juvenile Readers 1890-1945 covers more than 50 volumes of wireless and radio themed fiction, offering a unique perspective on the world presented to young readers of the day. The values, attitudes, culture and technology of a century ago are discussed.

Available at Amazon.com



CHRS Journal Special Edition — Television a compilation of original articles on television, including articles by Malcolm Baird on his famous father, British television pioneer-inventor, John Logie Baird, Don Godfrey's historical bios on CF Jenkins and Philo Farnsworth, plus restoration and technical articles from CHRS members

Available at Amazon.com



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The Rise of the Radiotelephone in the Bay Area, 1900-1915

By Mike Adams

Early radio researchers speak reverently of the significance of two generally accepted high points, Marconi's 1900 wireless and the first licensed broadcasting station KDKA in 1920. Yes, it is an easy shorthand, a George Washington-chopped-down-the-cherry-tree- moment, but it misses the important 100 developmental years beginning with the wired telegraph and the wired telephone, with these devices leading to the wireless telegraph and telephone, the latter leading to radio broadcasting post WWI. Each of these communications devices had a purpose, each sought to better the existing technology by improvement in distance or clarity of message, and each grew out of a need for something greater, the best example being a system of wireless communication that allows a message for help to be sent from a sinking ship hundreds of miles out to sea. Within a span of 15 years in the early 20th Century, experimenters were finding novel uses for their version of a talking wireless. Several of them were in the Bay Area. In this story Francis McCarty, Lee de Forest and Charles Herrold told in perspective.

Communication. It seems civilized man has always found a need to communicate. The simplest form of communication is two people talking to each other using a common spoken language, call them sender and receiver. It is something we do everyday. Add to the path of your spoken word as it reaches the receiver "noise," making clear communication difficult. Once the noise problem is solved and clear communication resumes, the receiver nods his head to the sender meaning I can hear you and I agree with you. This is the part of the communication process called "feedback." This is the basic model of communications, beginning as interpersonal and developing into broadcasting for an audience.

Wave the Flag, Beat the Drum

But what if we want to talk further, or send a message across the street or country? First to overcome some of the distance limitations of the basic sender-receiver model we created some primitive methods like signal flags or smoke signals, drums, flashing lights, all with limitations both visual and aural, the question being how far can you see or hear a message? Apart from the inventors of the wired telegraph, Morse, Field and others, there were those who visualized a "talking telegraph." The telephone would remain wire-dependent but with the ability to send and receive audio, the human voice. It would take the work of Fessenden, de Forest and others to free the telephone from the limitations of the wire. The turn of the century found dozens of experimenters using Marconi's spark and Poulsen's arc to send voice wirelessly. By 1915 the oscillating Audion improved by de Forest in Palo Alto, enabled the wireless telephone and broadcasting by radio and television. It was also in 1915 that AT&T used the de Forest amplifying Audion to carry the wired telephone from coast to coast.

Telephone switchboards were the original use for the CHRS RC building in Alameda.

With each new technology distance limitations were being solved. The discovery of electricity, and how to create and store and it, began the introduction of the familiar communication methods

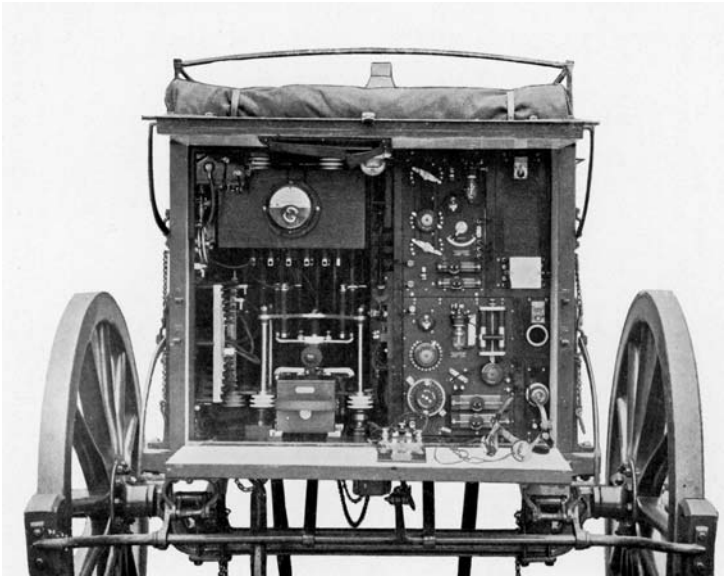
of the wired telegraph followed by the wired telephone. First, wires were strung on poles that often followed the tracks of the railroad, thus leading to the exchange of messages whenever the train stopped at a station. Eventually the wired telegraph connected continents with the undersea cable. But as significant as the wired land and underwater transmissions using wires was it did not allow, for example, ships at sea to send out an SOS during a deadly storm. And while the wired telegraph was a significant breakthrough, it was mostly limited to commercial use and short messages. Because wires were already in place and the uses of electricity to facilitate point to point messages were known, it would be up to inventors like Bell and others to send the human voice over wires. Imagine a device, the telephone, in your home, that would make it possible to talk with a far away acquaintance over a wire.

The Importance Of Marconi

Guillermo Marconi.

A young Guillermo Marconi, born into wealth of British mother and Italian father, observed in the late 1890s the past and present of communication technologies. He knew that in the past 50 years inventors had solved the distance limitations of communication by sending code and the human voice over wires on poles using electrical signals. One day Marconi was pondering all this while piloting his 60 foot yacht off the coast of the Atlantic. He had just read a newspaper story about the latest ship fire and how over 100 souls met their watery grave. It would be a month before a ship would spot the wreckage and another few weeks before the details of the carnage would reach shore. It was a current day problem needing a future solution.

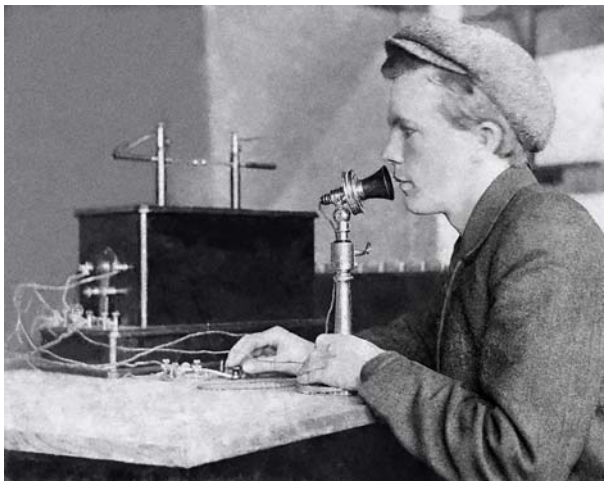
He has an idea that will change an entire future for ship safety. What if he could harness and improve upon the experimental work now being carried on at the major European universities. It was said that professors were sending electrical spark messages without connecting wires, some up to a mile. So Marconi fashions his plan for claiming the future by freeing the telegraph of wires so it crosses the world's lands and waters. Imagine that every yacht and cargo vessel can send a message calling for help and therefore save lives and cargo. It would be a more secure future, this idea of messaging without wires, and thus limitless distance. Using current science he would develop a useful system of wireless communication using electrical signals and turn the professor's one mile into 100 and beyond. Ships and shore stations would be connected with an invisible net, forever without wires. An added bonus: As code Marconi's wireless messages were private.



Instrument Cart, Marconi 1.5 kw. Cart-type Station.
Society of Wireless Pioneers archive.

Guillermo Marconi didn't just "see" the future – He made it. And to make it come true he created a start up and funded it with a grant from the British Post Office. Thus begins "The Wireless Century." If Marconi owned wireless communication for business and public safety during the first decade of the 20th century, the second decade was a prelude to the entertainment medium to be called "radio" by 1920. The quest for a practical wireless telephone started its development as a replacement for the wired telegraph. Its most important use would become the entertainment media of radio and later "radio with pictures," or television. The 20th Century began with experimenters searching for a wireless solution for the voice telephone used for one to one communication. It ended with broadcasting of music and news to an audience, communication from one to many.

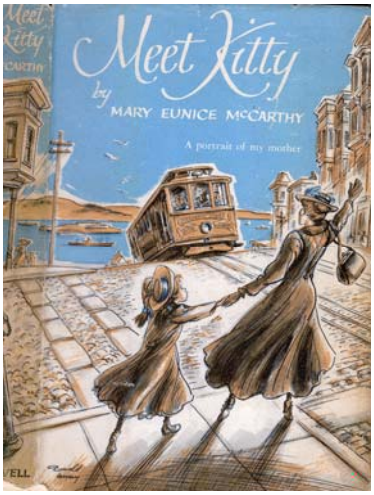
The Radiotelephone Experimenters



McCarty operating his spark telephone, 1902. Francis J. McCarty at 15 years of age the inventor of The McCarty Wireless Telephone. This is the only photograph ever taken of the inventor at his transmitter. The telegraph key he is seen manipulated served merely as a switch to turn the current off and on. Society of Wireless Pioneers archives.

There were a number of stories of mostly young boys who seemed to understand that beyond the coded wireless dots and dashes of Morse Code for business and public safety uses, there was a possibility of the development of a talking wireless. This device could improve upon the wired telephone, bringing the same advantages that the wireless telegraph added when its delivery was wireless. Experimenters from young boys to large corporations began the quest for the talking wireless using the spark of Marconi, and later the arc as its technology. All of these young voice experimenters would quickly abandon spark and arc for easier ways to modulate the high frequencies generated by the oscillating vacuum tube. First, crude beginnings.

It begins with modifications to the existing technologies of Marconi's spark gap transmitter to which a carbon telephone microphone was added. Enter 15 year old San Francisco hobbyist Francis McCarty (1888-1906). In August 1906, this headline in the San Francisco Call, "Experts Testing Wireless Telephone." We learn that "United States Government experts are secretly investigating a wireless telephone apparatus, the invention of Francis J. McCarty, a boy who formerly resided in Alameda, where from the age of 15 to his death at 18 years a few months ago, had been working to perfect one of the marvels of modern science." It is the perfect Who, What, When and Where of reportage. It introduces a Bay Area boy inventor, who just happened to live his experimenter days in Alameda, now the home of the California Historical Radio Society wireless museum.



Book Cover, "Kitty." SoWp archive.

In the story of McCarty's extended family, the book "*Kitty*," it was written that child Francis made money doing electrical work. He dropped out of school, telling mother Kitty "I want to know all there is about science and electricity, and soon after at the age of 15, he invented the first wireless telephone and secured patents on the invention, that unfortunately had already been invented by Marconi." Francey, as he was called, "only two weeks of being 18, was fatally injured in Oakland in a runaway horse and buggy accident."

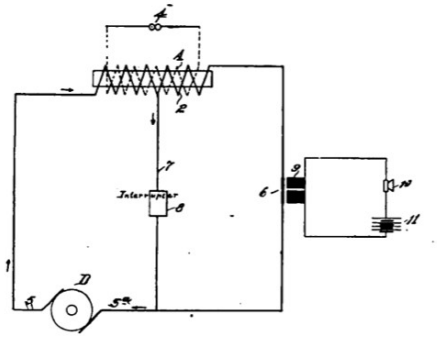
A 1925 historical exhibit at a San Francisco radio convention, McCarty device lower center. SoWp archive.

McCarty was early among a group of radiotelephone experimenters during a time when the technology level of the wireless spark was too primitive to be practical. But the photographs and newspaper stories show that in 1902 the 15 year old Francis had some knowledge and desire, and did construct a spark-based radiotelephone which he used to send his voice and music from a gramophone to a San Francisco audience of fellow experimenters. His work was reported in several dozen stories in local newspapers,

all describing a young man's desire to make the wireless talk. But there were others, most famous of these Canadian professor Reginald Fessenden who in 1901 was sending out music and voice using a carbon telephone microphone and phonograph and the device du jour, the spark. The quality was below that of the useful. Fessenden was first, but the news may not have reached McCarty 3000 miles to the East.

So McCarty's work begins with promise only to end with sudden accidental death. His device was given a fair hearing by Stanford engineering graduate Cyril Elwell, who originally wanted to buy the McCarty process, although he had yet to try it out.

867,896. WIRELESS TRANSMISSION OF SONOROUS VIBRATIONS. HENRY A. MCCARTY, San Francisco, Cal., administrator of Francis Joseph McCarty, deceased, assignor to McCarty Wireless Telephone Co., San Francisco, Cal., a Corporation of California. Filed Sept. 20, 1906. Serial No. 335,397.



McCarty Patent. SoWP archives.

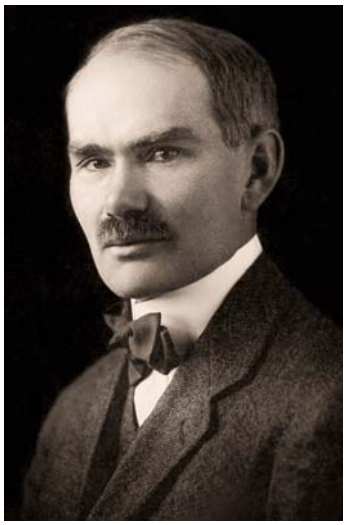
Demonstrations given on August 29, 1908, were reported in the San Francisco, Oakland, and Palo Alto newspapers in glowing terms. Like the auto, airplane and other new inventions of the time, the idea of telephoning without wires had appealed to the popular imagination and so any notoriety at all was good newspaper copy. But Elwell had to report to his potential Stanford funders that the McCarty patent was not practical for commercial exploitation.

Like other experimenters of the era soon realized, the spark would never be good enough for a practical wireless telephone. Writes Dickow: "the early McCarty transmitter, with a high-voltage spark activated by the movement of the microphone current through an induction coil, was discarded in favor of what was known as an 'Arc' transmitter. This arc used carbon rods similar to those of the ordinary street-lighting system, and the voice was impressed upon the flame; it was then sent into the ether and ground." Of course, it was not an original invention because Poulsen had already used his high-frequency "singing arc" successfully in Denmark.

A final mention of Francis McCarty was written in the San Francisco Chronicle in 1914: "If young McCarty had lived, the wireless telephone today would be employed throughout the world. With his brilliant mind young McCarty would have been able to perfect the work we have been years accomplishing." The truth? The spark as a carrier of voice telephone was proved basically useless. It was the vacuum tube of de Forest that led to broadcasting using radio and television.

De Forest Knew

While the under-educated hobbyists were still trying to make the sows ear, the spark, into the proverbial silk purse, the arc and tube, the more enlightened experimenter was ready to throw in the towel on the arc. It's the reason your parents said, "go to college." It was Yale Ph.D. Lee de Forest who bypassed the spark and in 1907 began voice and music transmissions using a Poulsen arc. The recently-deceased Francis McCarty died never knowing his spark technology was not to be.



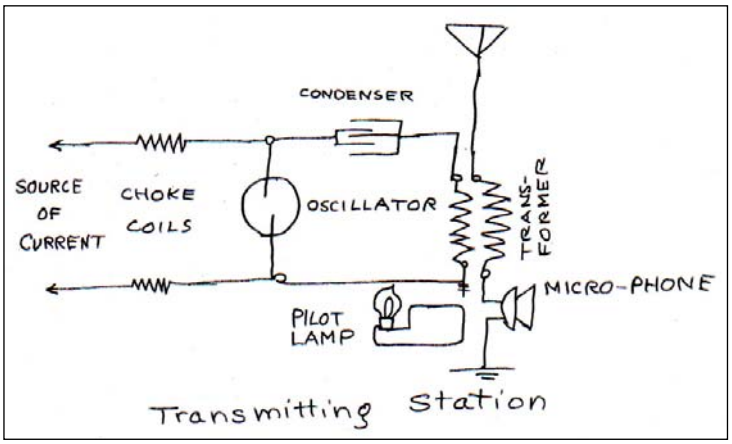
Lee DeForest. SoWP archives.

Lee de Forest was perhaps the most significant of the wireless voice experimenters. Working at Federal Telegraph in Palo Alto he improved his Audion first as an amplifier of voice. The patent for this use of his tube was sold to A.T. & T. , the telephone company for a very practical purpose. It seemed that the phone company was not able to talk over wires the roughly 4000 miles from East to West, meaning if you wanted to communicate using voice, you couldn't. With de Forest's amplifier you could. This was a major communications breakthrough. But returning to New York in 1916, de Forest was carefully carrying his Oscillion, the final significant use of his tube, that of a high frequency oscillator of radio. This made all other audio transmitting technologies obsolete. It can be noted here that his 1919 patent for sound on film used the oscillating audion for "writing" sound on film in the form of light. For that he received an Oscar.

Charles Herrold of San Jose

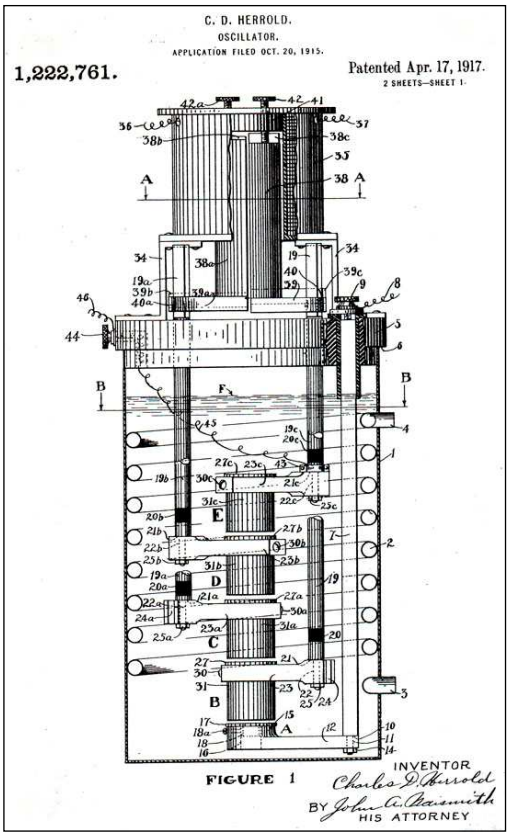
A second Bay Area inventor was wireless college proprietor Charles Herrold. There exist in the Herrold Papers several printed references to what Herrold later called "Broadcasting," the first of these in the Gernsback "Electrical Importing Company" catalogue published in 1910. It shows in 1910 what we later understood to be broadcasting entertainment to a small audience of hams using wireless technology, in this instance a spark coil transmitter. The notarized text by Herrold: "We have been giving wireless concerts to amateur men in the Santa Clara Valley." Crude it was, but a beginning nonetheless. This fulfills the generally accepted definition of radio broadcasting, sending entertainment to a small group (an audience).

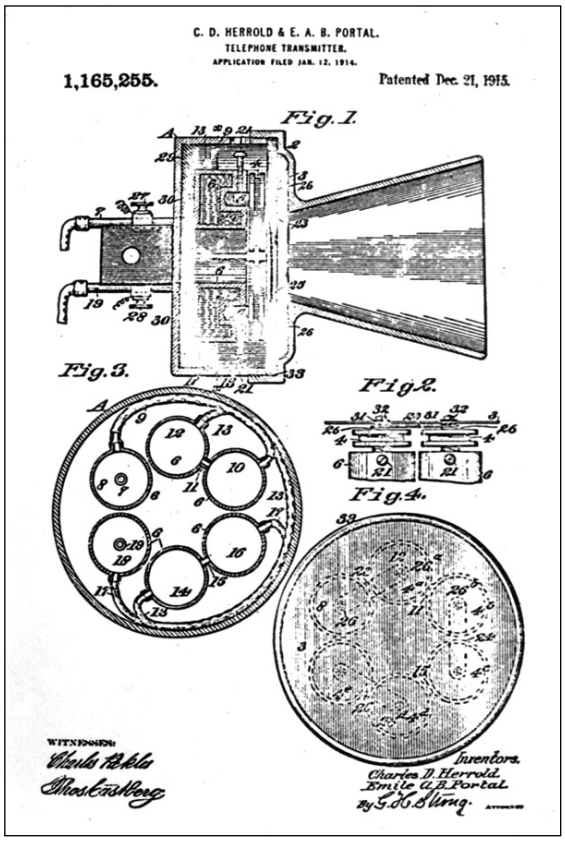
Probably the oldest complete reference to a "broadcast" can be found in the San Jose Herald dated July 22, 1912, under the headline: "Concert by Wireless Telephone a Success," The reporter wrote, "Professor Charles Herrold of this city, assisted by his operator, E.A. Portal, successfully demonstrated yesterday afternoon that wireless telephone is a reality and a fact. For more than 2 hours they conducted a concert which was heard for many miles around. The music was played on a phonograph . . . Immediately after the first record was played numerous amateurs from various points in the valley notified Mr. Portal that they had heard the music distinctly . . . Mr. Portal gave the names of the records he had on hand. One listener asked for 'My Old Kentucky Home,' which was furnished." Sounds like modern day college radio.



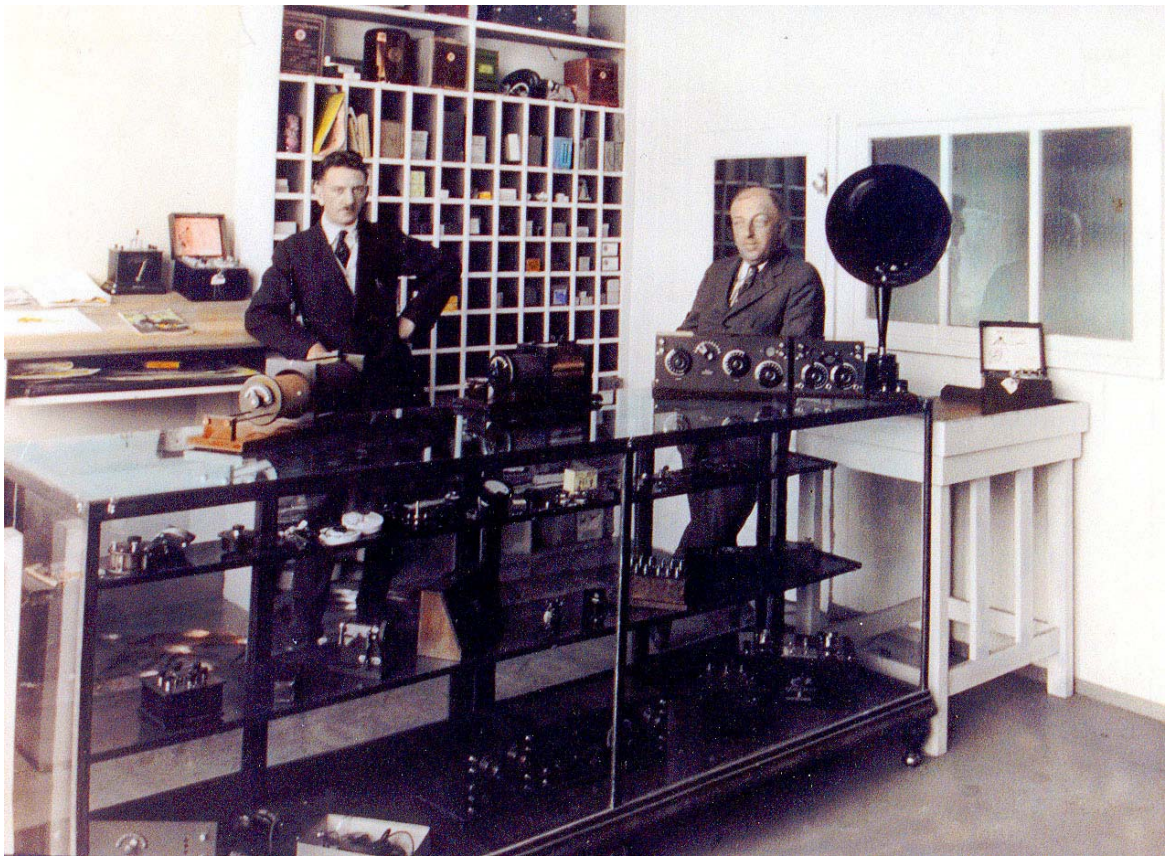
Herrold drawing of a transmitting station with his oscillator and microphone.

And what happened to all those pre-1915 wireless voice experimenters? In the Bay area, Charles Herrold of San Jose faced WW1 by converting his Wireless College into a school to train young men to be radio


C. D. HERROLD.
OSCILLATOR.
APPLICATION FILED OCT. 20, 1915.
1,222,761. Patented Apr. 17, 1917.
2 SHEETS—SHEET 1.
FIGURE 1
INVENTOR
Charles D. Herrold
BY John A. Beaumith
HIS ATTORNEY


C. D. HERROLD & E. A. B. PORTAL.
TELEPHONE TRANSMITTER.
APPLICATION FILED JAN. 12, 1914.
1,165,255. Patented Dec. 21, 1915.
Fig. 1.
Fig. 3.
Fig. 2.
Fig. 4.
WITNESSES:
Charles D. Herrold
Emile A. B. Portal
by G. G. Blum.

Two Herrold Arc Fone patents. Herrold papers, History San Jose, KCBS



Herrold pictured on the right at store counter. History San Jose, KCBS

operators in the very short war that American conscripts were fighting in Europe, while at the same time he set up a radio store selling parts. His days as the first radio station, at least on the West Coast, would have to wait until post-war licensing, and then while he was early (KQW in 1921) he was not the first. His Achilles heel was his transmitting technology, the arc, would only ever serve two-way communication, like world-wide dependable commercial coded wireless signals.

Other American Radiotelephone Experimenters, 1912-1915

After 1912 many radiotelephone stories appeared in the public press, Here are 25 of them, a sampling used for the Herrold book, the collection from the end notes of the Herrold book research:

> "A New 100 Watt Wireless Telephone," Electrical Experimenter, July 1915; "Aids Wireless Telephony," Detroit Free Press, 29 June 1913; "Conversations and Music by Wireless," Illustrated World, Dec. 1915; "Eagle Men use Wireless Phone," Brooklyn Eagle, 19 June 1913; "Famous-Barr Installs Wireless Phone Music," St Louis Post-Dispatch, 26 Oct. 1913; "Fined for Testing New Wireless Phone," New York Evening Sun, 23 Oct. 1913; "Fined for Wireless," New York Journal, 24 Oct. 1913; "Human Voice Heard 700 Miles by Wireless Phone," Savannah News, May 1913; "May Talk Soon from Europe to America," New York World, 17 Nov. 1912; "Perfects Wireless Telephone System," Brooklyn Standard-Union, 17 Oct. 1912;"Receives Wireless Telephone Messages with the Aid of Auto," Los Angeles Examiner, 29 Sept. 1912; "San Jose Inventor Claims Perfect Conversation with Santa Barbara," San Jose Mercury Herald, Feb. 1913; "To Extend Wireless Phone," New York Times, 6 Mar. 1913; "Trinity Men's Club Hears About Wireless," San Jose Daily Mercury, 16 Jan. 1913; "Two-Way Wireless Phone Between Rome and Paris," New York Times, 6 Mar. 1913; "University of California Doing Good Radio Work," Electrical Experimenter, Apr. 1914; "Wireless Telephony is Near at Hand," Little Rock Gazette, 2 Nov. 1913; "Wireless Talk Across The Atlantic," Boston Transcript, 22 Nov. 1913; "Wireless Telephones," Omaha Herald, 10 Oct. 1913; "Wireless Telephone," Macon (GA) Times, 30 Oct. 1913; "Wonders of The Wireless Phone," Savannah News, 10 Jan. 1914.

Prior to 1912, there were two systems of sending wireless telephone audio — spark or arc; McCarty in 1904, Herrold in 1910, and de Forest in 1907. To summarize: All three profiled inventors used spark, Herrold and de Forest tossed out spark for arc, but only de Forest went to the vacuum tube. McCarty and family were serious about the profits that could be realized by first spark and later arc, but always in the service of a replacement for the wired telephone. De Forest, who in 1907 used the Poulsen arc as a transmitter, wrote poetry as homage to sending opera music to wireless receivers, mostly ship and shore stations; in 1916 he was using his vacuum tube to send election results in New York. Charles Herrold claimed he was giving his students a fun activity, allowing, even encouraging them to send radio programs to the Santa Clara Valley community of their fellow hams.

A Hollywood Ending

No invention is complete without a compelling story. This one is in the form of a movie told using another incomplete media, the silent movie, to tell about another incomplete and evolving media, the wireless telephone. This long lost film is the 1914 two-reeler silent "The Wireless Voice." From the 1914 Moving Picture World, "To Director Fred A. Kelsey of the Reliance-Mutual forces goes the honor of introducing wireless telephony in an absorbing photoplay entitled 'The Wireless Voice.' In producing this picture the wireless telephone station as well as the apparatus of J.P. McCarty – a well-known radio telephone experimenter – was employed. Not only did McCarty instruct Director Kelsey and the actors in the use of the apparatus, but he also played an important role in the production."

The reviews describe the story: "The Wireless Voice, a two reel Reliance Melodrama with electricity in the leading role." A two-reeler, in silent film parlance refers to the footage for each reel, about twelve minutes. The reviewer, Louis Reeves Harrison, suggests that the plot includes the two lead actors share the screen with "a wireless apparatus which has all the appearance of being the real thing, and there are glimpses of a wireless station that contribute to the realistic atmosphere." The two actors, a man and a woman, establish communication between their houses and cars using a portable set. The couple want to interest a promoter, who is a known shyster. But he is also the girl's father. Odd. "These young inventors do not care to be robbed in that highly respectable way, so they decline the proposition." So promoter/dad decides he'll just steal the invention, and he employs a crooked engineer to assist. He visits the station when the owners-experimenters-couple-daughter-parents-boyfriend are out and the bad guys see this as the opportune time to strike.

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"The Wireless Voice"

Two-Reel Reliance Melodrama with Electricity in the Leading Role.

Reviewed by Louis Reeves Harrison.

CAST:

Hastings, a young inventor.....Frank Bennet
Mary Manners, his sweetheart.....Irene Hunt
Sykes, a crooked electrician.....Vester Pegg
Warren, partner of Hastings, and
Manners, father of Mary.

TWO live wires, Hastings and Warren, are shown engaged in perfecting a wireless apparatus which has all the appearance of being the real thing—it might as well be, so far as the layman is concerned—and there are glimpses of a wireless station that contribute to the realistic atmosphere. One almost feels a sensation of educational

Scene from "The Wireless Voice" (Reliance).

rectitude in contemplating the intricate devices handled by the team of young inventors. They succeed in establishing communication between their two stations and demonstrate that they can keep in touch with either by means of a portable apparatus carried on the back of an automobile.

Hastings visits the house of his sweetheart to tell her of the good news, and interests her father, a promoter and capitalist. An inspection follows, during which the work-

Scene from "The Wireless Voice" (Reliance).

ings of a dangerous high-voltage switch are made conspicuous, one of the kind that electrocutes without other trial than careless handling. Manners decides to finance a company for exploiting the invention, but he demands 51 per cent. of the stock. The young inventors do not care to be robbed in that highly respectable way, and they decline the proposition. Manners is vexed, and he decides to get it all by a lower form of thievery. Enter villain, Sykes, a crooked engineer.

Sykes is ready and willing to do the dirty work, and a moment is chosen when Hastings is off on an auto excursion with his sweetheart and chauffeur for purposes of trying out his portable machine. Sykes and Manners go in another motor car to the main station, that the former may secure sketches of working parts and secure a patent before the investors make application, running many risks thereby in eluding an interference suit and criminal action. Sykes is discovered at his dastardly work by Warren, partner of Hastings, and a rough-and-tumble fight results in triumph for the villain. He puts it all over young Warren, and makes a quick getaway in the motor car with Manners.

Do they escape? Ah, no! Young Warren drags himself to the keyboard and signals. Hastings at the portable hears him in time to intercept the villains. He holds them up at the pistol point, very much to the embarrassment of Miss Manners (poor girl) and carts them off to jail. Like a flash—this is an electric play—Manners is condemned and serves a term in prison. Sykes probably gets his deserts, but he is of no particular consequence from this time on.

Manners comes out of jail with revenge in his heart. He breaks into the unguarded station and suddenly develops into an expert electrician, showing thereby that he should not have hired Sykes in the first place. If you want anything well done, especially a crime, better do it yourself. On this general principle, and that of one bad turn deserves another, Manners arranges a wire system and steel plate so that Hastings will be electrocuted on entering the station door. Manners turns on the full current at an outside box and lies in a field to watch results.

Hastings appears, but he is with his sweetheart, Mary, the daughter of Manners. Horrors! Manners will murder his own daughter! No! He will save her! He rushes to the high voltage box to turn off the current, but he reaches beyond the handles, his own body deflects the current, and he is instantly killed. Hastings gets his daughter and it is to be hoped, for the sake of their children, that evil tendencies are not hereditary.

"Even Unto Death"

A Three-Reel Tragedy Made by the Albuquerque Film Company and Released Through Warner's Features.

Reviewed by the Rev. E. Boudinot Stockton, S. T. B.

EXCELLENT production, almost perfect photography and some of the most beautiful marine scenes that we have ever seen are marred in this picture by a too loosely constructed plot and the "unhappy ending." The relationship of the characters is not clearly established until the end of the second reel, and in the case of the two sons of the minister is still further confused by calling one of them Jack and the other John and having them so much alike in appearance that it requires close watching and hard thinking to realize which is which when they appear by themselves in a scene. As the story in no way hinges on this similarity of name or appearance, it is a mistake that could and should have been avoided.

The unhappy ending is also unnecessary, because the story is of too light and sentimental a character to warrant three deaths and the tragic overshadowing that blights the latter days of an old and godly minister"s home. By slightly changing the plot at the time of the quarrel between Jack and Walter, all this could have been avoided and the story brought to a happy ending and made incomparably better. Instead of being killed, Walter should have been severely wounded and then have indicted Jack for assault with intent to kill. This would have permitted the same development of the story with the exception of the ending, which as it stands involves the very unpleasant situation of a girl dying for love of her brother's slayer and the subsequent suicide of the slayer.

Apart from these flaws the picture is an exceptionally good one. The author, Miss Dot Farley, and the director, G. P. Hamilton, have done careful and painstaking work well deserving of all praise. The settings and locations are decidedly attractive and unusually well chosen, especially in the scenes depicting Dorothy's sketching the seals sporting on the rocks, her getting caught and washed away by the rising tide and her subsequent rescue by Jack, the last of which we understand nearly cost the lives of the actors and the director.

Another exceptionally well developed thing is the trial, which results in Jack's being held for the grand jury. The skillful alternation of courtroom scene, leader and bust develops the evidence plainly and in a highly dramatic manner; and the having the verdict hinge, not on evidence as to the killing, but on the balance of probability deduced from the popular opinion as to Jack's personal character is quite new and refreshing. Altogether, the workmanship of the production is so good and appealing that it is with distinct and fervent regret that we find it winding up in a tragedy with which we cannot sympathize.

Film promo page for 1914 silent film, "The Wireless Voice."

The couple returns home armed and catches the promoter and his engineer in the act. (He was released from jail and seeks revenge.) Unknown to the bad guys, the lead actor (our hero-boy-friend-girl's-boyfriend) prepares a warm, actually hot, welcome, leading to a shocking conclusion as the father of the inventor-couple prepares a steel plate where the unsuspecting bad man (the girl's father) is sure to touch. The current is on. The father "rushes to the high voltage box to turn off the current, but he reaches beyond the handles, his own body deflects the current, and he is instantly killed." How many films have the good guy killing the girl friend's father? It is confusing without actual film and titles, but to be semi-certain, in this case good triumphs over evil.

Probably, but there is not enough character development to care. If you know of a way to search for a copy of this film, please contact the author of this story. The Library of Congress was consulted and found the story in text but not the film. And the Eastman House in Rochester did not answer queries or offer to search.

Summarizing, the Bay Area, like other American population centers, was a virtual hotbed of radio telephone experimentation, the sending of voice and music wirelessly to a small amateur audience, their friends. And even though the spark gap wireless telephone of Herrold, McCarty and de Forest evolved however briefly into an Arc-based telephone, neither was good enough until the November 1916 broadcast of de Forest of the Wilson-Hughes election returns, this to a small audience of mostly newspaper reporters. And while these "trailblazers" told their biographers that they were inventing radio broadcasting for an audience, this was not true. The truth was that all three of these men were inventors with the singular goal of creating a two-way wireless substitute for the wired telephone. At the conclusion of America's involvement in WW1 ended by early 1917, a few of the former radiotelephone inventors led by Frank Conrad and KDKA, used vacuum tube technology and the industrial might of General Electric and Westinghouse to create the government-sanctioned monopoly RCA and thus was the door open to radio in the 1920s.

The author of this article also wrote the de Forest biography. If de Forest were alive today, he would thank Adams allowing him to hold the de Forest Oscar for sound on film, now proudly displayed with the de Forest papers at History San Jose. Thanks Lee.

The author holding the Oscar Lee De Forest received for "sound on film."

End notes

- Mike Adams, "The Race For Radiotelephone," AWA Review, vol 10, 1996.
- SF Chronicle, June 1914, "Boys Dream of a Great Invention Comes True, "
- From the book *Meet Kitty, by* Mary Eunice McCarthy, New York, Thomas Crowell, 1957. Francis McCarty claimed to be first as a wireless telephone inventor on the West Coast. He may have been.
- Robert H. Marriott, "United States Radio Development," Proceedings of the I.R.E. , v. 5, pp. 179- 198; June, 1917
- FJ Mann in "Federal Telephone and Radio Corporation 1909-1946, in SOWP archives number 3
- Henry Dickow, The McCarty Wireless Telephone, (from SOWP Archives) *Sparks Journal*, Vol 2, No. 1, no date supplied
- Mike Adams and Gordon Greb, *Charles Herrold, Father of Radio Broadcasting*, 2003, McFarland.
- Gernsback "Electrical Importing Company" catalogue published in 1910.
- San Jose Herald, July 22, 1912,: "Concert by Wireless Telepohne a Success,"
- The Society of Wireless Pioneers archive are available to researchers at the California Historical Radio Society library, Alameda CA. www.SOWP.ORG
- The story of Elwell and Federal Telegraph was told by Robert H. Marriott, "United States Radio Development," Proceedings of the I.R.E. , v. 5, pp. 179- 198; June, 1917
- Alameda Daily Argus, Aug 24, 1908, :Developing the Wireless Telephone" about Elwell
- SF Call: "Experts Testing Wireless Phone." Francis was 18, just died
- The stories of early voice wireless experimenters in San Francisco, San Jose and Stanford, the work of McCarty, Elwell and Charles Herrold, come from two sources: the California Historical Radio Society and its affiliate, the Society of Wireless Pioneers, and the Perham Foundation archives at History San Jose. This work has been organized by Bart Lee, Bob Rydzewski and the late Gordon Greb.
- Patent information? 1902, Dickow, pictorial, coil, dry cell, carbon mic, so-called Mercury "coherer" for receiver. "Extremely inefficient receiving device" writes Dickow. The rest of the device was Marconi's. Patent was issued in 1906, and by then the spark telephone had already been made obsolete by the arc. Fessenden and Collins also received patents for their early wireless telephones.

The Author

Mike Adams, a noted author, frequent contributor to the CHRS Journal, and lifelong "Radio Boy." Mike is the Chairman of the CHRS Board of Directors.

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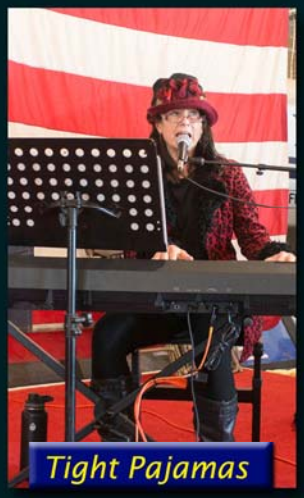
Philip Monego
Volunteer of the Year 2020

Jim Fink
Volunteer of the Year 2021

More Radio Day On The Bay

Sherwood Award winner John Evans
with Holly Quan, Peter Finch, Alisa Clancy

Peter Cleaveland & Joe Starkey
Newscast of 1969



Tight Pajamas

Elaine Leung & Steve Kushman

Checking Out
the Auction Items