

## Wireless Comes of Age on the West Coast<sup>1</sup>

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### ABSTRACT

Radio as we know it had many fathers. California enjoyed unique circumstances that gave rise to independent development. Young men explored and advanced devices and means of communication as soon as they read about earlier advances, especially Marconi's use of wireless spark systems. The arc as a generator of high power continuous wave energy for communications came to California and then the world. Doc Herrold began the first regular broadcasting to a known audience around 1912 in California, using an arc. Lee de Forest perfected his "Audion" triode in California in 1913. Amateur radio trained thousands in the new radio arts. The Navy led the way from the beginning, from the earliest spark systems around San Francisco Bay, to playing music from the Great White Fleet, to its world-wide networks at the time of the First World War. Radio grew up in many places, and the West Coast was one of the more important of those places.

This is a story primarily about young men and what they accomplished in a remarkable time, the first two decades of the 20<sup>th</sup> Century, and in remarkable places – especially in California in the Western United States. Guglielmo (William) Marconi, in his early twenties, electrified the technical world of the late 19<sup>th</sup> Century with his successes using Hertzian electromagnetic waves to communicate at distance, what we now call "radio." He did this without the wired connections to which the world had turned with enthusiasm earlier in the century. The telegraph, including undersea cables, and the telephone, needed wire, and lots of it. Communication without such wires, at first wireless telegraphy, opened new vistas. This was particularly so looking out to the world's oceans. Communication with ships at sea (Marconi's primary initial interest) was now possible. Then, a challenge to the expensive cable monopolies could be mounted. This was so because the new "wireless" meant exactly that: no expensive, capital-intensive investments in cables, only in terminal stations. As the amateurs in these new arts soon showed, wireless also freed communications from pre-existing geographical networks. Men and boys, capitalists and hobbyists, could now explore and stake interests in what inventor Lee de Forest called the "Invisible Empire of the Air."<sup>2</sup>

As a result of the then new networks of communication, the late 19<sup>th</sup> century was blessed with nearly immediate knowledge of many of the world's events. Scientific and technical advances were reported and widely published worldwide. Interested people ranging from university professors, to entrepreneurs, to back-room tinkerers, followed these developments, and sought to replicate them. They were able to do so by reason of the uniformity of the laws of physics. And they sought to go beyond into new devices, new arrangements and new technologies.

San Francisco, from its Gold Rush days, had

been a cosmopolitan world city. Nearby Stanford University (at Palo Alto, California) first flourished in the 1890s. Its electrical engineering department was instrumental in development of hydro-electric facilities for electrical power. It provided a sound foundation for research, technical experiments and what were then high-technology business formations. The people of San Francisco, like much of the world, enjoyed *Scientific American*, *McClure's Magazine* and a host of other publications. Events reported in such publications also catalyzed technical work on the West Coast of the United States. It wasn't "instant messaging" but it was current and thorough explanation of advances.

The independent wealth and the geographical isolation of the West Coast fostered an independent development of communications and electronic technology. These developments ranged from the first American use of wireless at San Francisco in 1899, the first reliable worldwide communications systems from California's Federal Telephone and Telegraph less than 20 years later, even the invention of electronic television in San Francisco by Philo Farnsworth in 1927, up to the Silicon Valley of today's digital world. It is the goal of this note to tell some of the stories of that independent development, from the primitive marine wireless of August 1899 in San Francisco to the advent of radio-telephone broadcasting by Lee de Forest in San Francisco in 1920, with much in between in these 21 years. While there were many regional successes as well, there were not a few dead-ends.

Several important stories stand out through the mists of time – and San Francisco's fogs. The 1899 success in using the first American

maritime Wireless installation (a spark coil on a lightship) for journalism and public notice was seminal in all later developments. This is so because it was such big news, nationwide. The experimental use of the arc technology to generate continuous waves, in which Lee de Forest played a major role, brought on two novel successes. First, the arc succeeded in communications circuits. These high power circuits eventually ranged worldwide. The Federal Telegraph and Telephone Company of Palo Alto, California, the predecessor of ITT, implemented them. Victory in World War One required these reliable circuits. Second, the arc provided the basis of early broadcasting. "Doc" Herrold in San Jose broadcast programs and music well before the First World War. The improvement of the vacuum tube technology of Lee de Forest's three-element triode vacuum tube "Audion," was work largely done by de Forest in Palo Alto at Federal. This work provided the basis for supplanting both the spark and the arc technology of earlier years, at the end of the First World War and by the beginning of the 1920s. The post-war boom of the 1920s saw radio broadcasting, using vacuum tube transmitters and receivers, become a nationwide unifying and standardizing cultural force.

History, said Henry Ford, is "just one damn thing after another." But it's all that the word "after" implicates that is so interesting.

### **GENESIS: AMERICAN WIRELESS TELEGRAPHY IS BORN IN 1899 IN SAN FRANCISCO**

In August, 1899 the *San Francisco Call* newspaper successfully used wireless to scoop a competing newspaper about the appearance of a long-await-

ed troopship in the fog seven miles off the Golden Gate, San Francisco. The *USS Sherman* brought a California regiment back from the 1898 Spanish American War campaign in the Philippines.<sup>3</sup> *Lightship 70* of the U.S. Lighthouse Service, a predecessor of the Coast Guard, signaled the arrival of the troopship to a receiving station near the Cliff House. By 1901, the Lighthouse Service began regular installation of wireless sets in Lightships.

In April, 1899, wireless test signals between San Francisco's Telegraph Hill and its downtown (at the *Call* building), were successful enough to justify further development by the *San Francisco Call*. In 1899, *McClure's Magazine* began to report, worldwide, Marconi's wireless

success in Great Britain.<sup>4</sup> Early newspaper reports told of the use of wireless by the *Lightship Goodwin* to summon aid after a collision. The San Francisco use of the *Lightship 70* as a transmitting station, and the spark and coherer technology employed, appears to derive directly from the report in *McClure's Magazine*. The San Francisco experimenters used the then standard laboratory equipment Rhumkorff inductance coil to generate a high voltage, high current spark. They ran it up a 82 foot long vertical antenna on the *Lightship 70*. At the Cliff House, a similar antenna came down to a coherer and an inker as the receiver. "Sherman in sight" is the text of what is likely the first working wireless message in America. Some of the headlines of the *Call* coverage show the technical impact of the success: "Wireless telegraph Excites Much Interest – Information Solicited Regarding Method of Procedure – Associated Press Asks for Full Details of the recent Successful Experiment by the Call." A "Description of the Apparatus" followed, characterized as "the latest marvel of the 19th Century." Some of the *Call* story appears nearby along with images of some of the facilities



Fig. 1. The site of the April, 1899 tests to Telegraph Hill, San Francisco. Postcard.



Fig. 2. The site of reception of the first American wireless message. The Cliff House, 1899. Postcard.

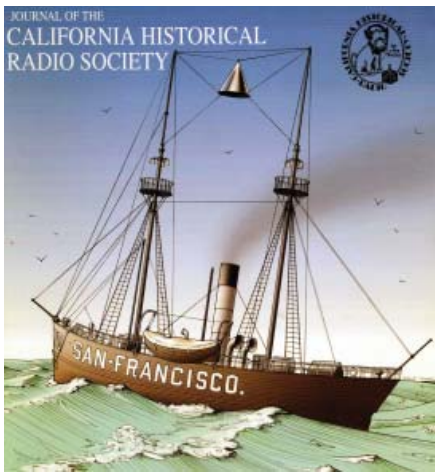


Fig. 3. Lightship 70, San Francisco, 1899. Kent Leach, CHRS, artist, emphasizing “capacity hat” atop vertical wire antenna, as a signal bell. CHRS Journal cover, 1999

used.

In January, 1897, *Scientific American* had reported Marconi’s initial successes with telegraphy without wires in England. “An invention which promises to be of the greatest practical value in the world ... Mr. Marconi had come... with such a system.... [Y]oung Marconi had solved the problem [communication without wires] on entirely different principles, ... ma[king] a successful test on Salisbury Plain at a distance of three-quarters of a mile.” This news, and that of Marconi’s following feats, sparked great attention in both commercial interests and in experimenters. In communicating across the English Channel in March, 1899 Marconi opened the eyes of the world to the potential of wireless. In California, a young Stanford student, Charles D. Herrold (later affectionately known as “Doc”) went to work even earlier. Herrold repeated Marconi’s 1895 wireless-at-a-distance tests the very day he read the newspaper reports of their success. Herrold had observed similar lab experi-

ments of a Dr. Taylor at Stanford. Herrold, in his test, achieved one mile’s distance with a Rhumkorff coil and a Branley coherer.<sup>5</sup> No doubt enthusiastic young men performed such replicating experiments around the country as news of Marconi’s successes spread. The fact that Marconi himself was so young provided a model for ambitious exploration of the new world of communications.

Commercial interests leapt at the opportunities of 1899; in retrospect some were just stock selling frauds but many at least put enough money into their stations to advance the art. In November, 1899, American Wireless Telephone and Telegraph Company, the first such enterprise, incorporated in Arizona. It held the communications patents of Professor Amos E. Dolbear of Tufts University, giving it a patina of technical respectability. (The patents were good enough to require the Marconi interests, ultimately, to buy the rights). American sold a lot of speculative stock. The promoter was Dr. Gustav P. Gehring but the Chief Engineer was Harry Shoemaker. Shoemaker’s pioneering technical work earned the respect of many<sup>6</sup> and he trained several of the next generation of wireless pioneers.

### THE NEW CENTURY OF RADIO BEGINS

By 1901, wireless began to provide real service. In March, 1901: The Mutual Telephone Company of Hawaii linked the main Hawaiian Islands by wireless. Stations began to use call letters on the model of the abbreviations of landline telegraphy; Oahu’s call letters are “HU,” Molokai Island’s call letters are “AM,” Puahoa is “KA,” Lahaina on Maui is “LA,” and Nawiliwili on Kauai is “NW.”<sup>7</sup>

In these early days, companies, and other wireless operations chose their own call signs. Usually they bore some relation to place or provided some clue as to operation, but that is not easy to decipher in retrospect.

The United States Army as early as 1900 and 1901 used wireless to communicate with the Coast Artillery post on Alcatraz Island from Fort Mason in San Francisco,<sup>8</sup> according to radio historian George H. Clark. Three such Coast Artillery forts controlled the entrance to the Golden Gate. The officer in charge was a Capt. Dyer, the engineer Carl Kinsley.<sup>9</sup> Both the Army and the Navy saw the importance of wireless for command, control and communications, and soon for intelligence purposes as well, as others also used wireless communications.

In December of 1901, Marconi's successful transatlantic test received wide publicity on the West Coast as in the rest of the world. He heard the famous "S" – three *dits* in Morse Code – from Polhu in Cornwall in far West Great Britain at St. John's in Newfoundland on December 12 and 13.<sup>10</sup> The news got out quickly. The value of the stock of the Atlantic cable companies fell by half at the prospect of such lower cost competition. Wireless became an even more interesting business opportunity. It also provided an even more promising stock selling proposition. The promoters such as Gehring often modeled the sales pitch on the lucrative returns to early investors in Bell's telephone company.<sup>11</sup> But wireless was undoubtedly opening new technical and business frontiers.

A. Frederick Collins, in 1902 and earlier, published many articles about wireless, in *Scientific American* and elsewhere. In San Francisco, a very young and

commercially ambitious Francis McCarty put together a primitive radio-telephone using the spark coil design by Collins. (His father, "White Hat" McCarty, also dabbled in wireless). Francis McCarty tested his device in Western San Francisco, at Ocean Beach. McCarty interests followed up with an early arc system, known as the "peanut whistle." In 1905 McCarty demonstrated his wireless telephone from the Cliff House in San Francisco. McCarty managed to garner considerable local press for his enterprise, including a 1905 newspaper interview. McCarty's system engendered a great deal of publicity and public interest.<sup>12</sup> In the 1905 interview, McCarty recounted:

"... I'm always reading about this kind of work whenever I find in a book or magazine any report of some man's experiment with a diagram the apparatus with which he made his tests, I set right at building a duplicate to see if I can get the same results. You really can't understand the problem and the way he worked it out unless you do this."

"I had been working for the wireless telegraph company, and it seemed to me that since we could send the wave signals without direct connection we should



Fig. 4. Collins promotional photograph of his wireless telephone, circa 1902. The operator is not Collins. (Author's collection)



Fig. 5. McCarty from his 1905 newspaper interview.

be able to send exact tones. They said this could not be done because the rate of vibration of the human voice was so much lower than of the Hertzian wave, but I was not convinced. If we could only have the right transmitting instrument I thought it could be done, and I kept on trying. Finally, I struck the right plan.

“The first telephone outfit I made was very small and crude. The transmitting instrument was in the front of the house and the receiving on the porch in the rear. The aerial wires were suspended on posts not over five or six feet high and the ground plates were laid on the floor. It worked all right over a distance of about fifty feet and anything that was said, even in a very low voice and with the intermediate doors closed, could be heard plainly.”

McCarty died in a road accident in May, 1906 at age 17. His ambitions died with him but his company lingered on, promoted by his brothers and capitalized as the National Radio Company.<sup>13</sup> Direct successors to McCarty included Cyril Elwell, the later principal of San

Francisco’s Federal Telegraph and Telephone, who evaluated McCarty’s system. Doc Herrold worked for National from San Jose in 1908, perfecting the arc radio-telephone.

July, 1902 saw the first commercial wireless traffic on the West Coast and in America. Gehring had established as part of his nascent and would-be wireless empire the Pacific and Continental Wireless Telegraph and Telephone Company. It was an American Wireless subsidiary. Robert Marriott, the Chief Engineer, had worked with Harry Shoemaker. Marriott went on to a distinguished career.<sup>14</sup> He set up stations on Catalina Island, off the California coast, and in Los Angeles, apparently on his own initiative. He adopted callsign “A” for Avalon on Catalina, and callsign “G” for the San Pedro, Los Angeles station. This circuit carried the first paid wireless traffic, a distance over water of 26 miles.<sup>15</sup> It stayed in operation<sup>16</sup> in various modes including wireless telephone, for many years.

In 1903 the Revenue Marine was a predecessor of the Coast



Fig. 6. Robert Marriott, the Avalon and Los Angeles 1902 circuit engineer, later in his distinguished career.

Guard, as was the Lightship Service. It authorized the Revenue Cutter *USS Grant* out of Tacoma, Washington to install wireless to communicate with Tacoma (and Friday Harbor). The primary purpose was intelligence to suppress opium smuggling and for other law enforcement. By 1910 seventeen cutters were equipped with wireless on both coasts. On the West Coast later, the Revenue Cutter *USS Bear* employed the callsign RCB.<sup>17</sup>

Alaska, by reason of winters and isolation, provided a good opportu-



Fig. 7. Revenue Cutter Grant, first Coast Guard ship equipped with wireless, in 1903. (Photo courtesy Coast Guard Radio)

nity for wireless to prove its worth on the ground. In August 1903 the United States Army established the Alaska Wireless network. It was the predecessor of decades of effective radio networks in Alaska. Stations and callsigns were: FB Fairbanks, FD Nome, FE Mouth of the Yukon, FG Fort Gibson, FK Circle City, FM Fort St. Michael (reported to be the first station in the West), FP Petersburg, FQ Fort Egbert, FX Fort Worden.<sup>18</sup>

In 1903, another San Francisco experimenter, Rev. Richard Bell, sent wireless messages from San Francisco to San Jose, about 60 miles. In 1907 and thereafter, he and Doc Herrold in San Jose communicated by wireless telephone.<sup>19</sup> Wireless telephone attracted both experimenters and stock promot-



Fig. 8. Alaska Station FK about 1905 (SWP).

ers. Established companies (dubious though many were) had implemented wireless telegraphy. But the hope of a wireless telephone could engender both enthusiasm and investment. These early developments came to naught, but provided a foundation for vacuum tube generated carrier wave amplitude modulated broadcasting in the next decades.

In April, 1903 the Mare Island Naval Station just North of San Francisco first employed wireless.<sup>20</sup> It put into service a German Slaby-Arco two kilowatt open gap spark transmitter. Ironically, the Navy sited it in the former homing pigeon loft. The Navy took to wireless with enthusiasm for shore to ship, ship to shore, and ship to ship communications, sometimes to the distress of Captains whose discretion was thus managed by shoreside officers. Wireless offered worldwide central control to the Admiralties of the major naval powers.

By 1904 the Navy established a network of three Northern California stations, San Francisco on Yerba Buena Island in the Bay (call letters TI) and Mare Island (call letters TG) with landline telegraph links, and one on the Farallon Islands 27 miles off the Golden Gate (call letters TH).<sup>21</sup> In November, 1904 the Mare Island and the San

Francisco (Yerba Buena) Navy stations began regular weather broadcasts by wireless telegraph. The ability to gather and to disseminate regionally meteorological information, especially storm warnings, early proved radio's utility. Time signals, so useful for navigation, soon followed. So too, Navy stations soon sent out press summaries to ships at sea. For example, Point Loma near San Diego, established about 1903 with a ten inch spark gap, did so with the preface "CQ de NPL – press." Point Loma used the callsign TL before using NPL.<sup>22</sup>

Commercial interest radio appeared in San Francisco in the summer of 1904. The DeForest Wireless Telegraph Company established its first West Coast station in the Palace Hotel on Market Street in San Francisco. Its operator, Tim Furlong,<sup>23</sup> naturally enough adopted the callsign "PH." Sam (Sydney) Maddams built the station in 1903-04. Maddams had been Marconi's operator at Poldhu in Cornwall in 1901 who first sent the "S" in tests, the "S" heard by Marconi across the Atlantic.<sup>24</sup> In 1904 the de Forest company exhibited at the St. Louis Exposition and successfully got messages through to Chicago.<sup>25</sup> Charles B. ("C.B.") Cooper was de Forest's operator at St. Louis, and he later came west through Denver, Colorado to Cali-

fornia as one of the more colorful wireless personalities. He enjoyed a long career in radio.<sup>26</sup>

Also in 1905, at Fort Mason in San Francisco (the site of the earlier circuit to Alcatraz Island), Major George O. Squire of the Signal Corps experimented with trees as receiver antennas for wireless communications. They worked. He was able to communicate several miles from Yerba Buena Island in the Bay and nearby Alameda and Santa Clara Counties. Squire as a general officer later became Chief of the Signal Corps in World War One.<sup>27</sup>

About 1906, the callsigns used on the West Coast suggest several chains of stations, or proposed stations. Avalon on Catalina Island and Los Angeles had used "A" and "G" respectively in their earliest transmissions under the aegis of the Pacific and Continental Wireless Company. Pacific Wireless Telegraph Company succeeded Pacific and Continental Wireless in August, 1903 and bought the Catalina Island circuit and stations. Pacific's stations included at least: A at Avalon, Catalina Island, California; G in Los Angeles, California; D in Port Townsend, Washington; DA in Seattle, Washington and SF in San Francisco, California.<sup>28</sup>

Continental is reported to have

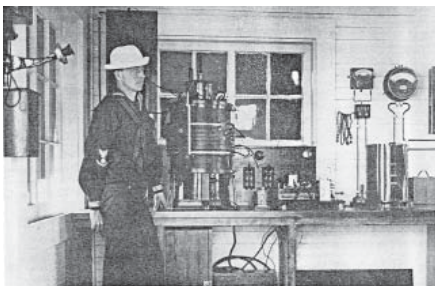


Fig. 9. Navy Mare Island station about 1904 (Signals, 1951).



Fig. 10. Lee de Forest and C.B. Cooper in Colorado, 1905 after working together in St. Louis in 1904 (Mayes).



operated a station at Portland, Oregon that employed the callsign "O-2;" another such station operated out of Seattle with the call "S-2," from Queen Anne Hill with five kilowatts of power.<sup>29</sup>

Another network used callsigns starting with D or P, plus a second letter, in California, Oregon, Washington and Alaska. The "D" stations may have derived from the de Forest name, and the "P" stations from the Pacific Coast on which they were sited by the Pacific Wireless company. The D and P stations ended up as United Wireless stations (some erected by the DeForest Company); United's West Coast headquarters was in Seattle.

RA in Safety Harbor, Alaska is listed to United; the Army Signal Corps established a Safety Harbor station in 1903 with de Forest equipment. Nome, Cordova and Sitka, Alaska operated with callsigns SA, SN and SO, respectively.

United Wireless is reported to have been operating thirty coastal and inland stations between 1900 and 1906. The inland stations were not intended to handle maritime traffic, but rather to compete with landlines.<sup>30</sup> United Wireless, like Pacific Wireless, sold large amounts of stock to the public without significant commercial revenues from its actual, let alone projected, stations. On the other hand, it did operate stations and

employ competent designers, operators and technicians.

As of 1906, the now known primary stations on the West Coast include the United chains, the Navy chain, the Army Alaska chain, PS at the Presidio Army Headquarters in San Francisco, California and PT at Fort Bragg, Oregon (both also listed to United).<sup>31</sup>

## 1906: EARTHQUAKE AND DISASTER

The use of wireless telegraphy in disaster response came early. For example, in March of 1906, a storm took out wired communications between Los Angeles and San Diego. The De Forest Company provided all communications by wireless, earning the gratitude of the disabled companies and the public.<sup>32</sup> This was a precursor to "The Big One."

The next month, April, 1906 the Great Earthquake and Fire leveled San Francisco. The Navy Cruiser *USS Chicago*, at sea, returned and tied up at the docks at the foot of Telegraph Hill. It handled out-bound San Francisco traffic, over a thousand messages. This traffic was managed by a young officer, S.N Hooper, later known as the Father of Navy Radio (and RCA), who had some landline telegraph experience. Yerba Buena Island (TI) acted as a relay to Mare Island (TG). Mare Island connected to the telegraph landlines that conveyed to the world the extent of the disaster.<sup>33</sup>

Station PH was lost with the loss of the Palace Hotel to the Great Fire. An amateur radio operator by the name of Ray Newby lost his 70 foot tower and antenna in San Jose to the earthquake. Newby was later an American Marconi operator and Doc Herrold's station operator in San Jose, holding the license. In San Francisco, McCarty



Fig. 11. A.J. Krenke and the Pacific Wireless crew constructing transmitter equipment (a large helix) about 1906 for the projected Hawaii circuit (SWP).

offered to transmit wireless traffic from the West part of the City.<sup>34</sup>

The 1906 earthquake delayed Pacific Wireless's proposed California and Hawaii circuit. Antenna towers did go up on Mount Tamalpais. The earthquake did not take down the tall towers. Persons unknown, rumored to be associated with a competitor, caused the fall of the towers in December. Haradan Pratt investigated and found that someone had cut the guy wire anchor rods.<sup>35</sup> Pratt later enjoyed a distinguished career in radio at the highest levels.

A.F. Krenke had been the operator at "G" in Los Angeles on the Catalina Island circuit. He was the station manager and in charge of construction for Mt. Tamalpais.<sup>36</sup> Pacific Wireless was regarded by many, then and now, as primarily a promotion to sell stock, hyped by comparison to the success of the Bell Telephone Companies. So too, the Gehring companies and the DeForest companies were then and are now widely seen as fraudulent enterprises. The engineers of such companies, such as Harry Shoemaker and Lee de Forest did, however, make very significant contributions to the art, most importantly de Forest's Audion vacuum tube triode of 1906. Pacific's ambitions for a San Francisco and Hawaii circuit made good business sense, as later developments showed.

In about 1906, as many as 40 commercial wireless stations operated on the West Coast: DeForest - 9, Washington - 9, Oregon - 6, Canada - 3, Alaska - 2; Pacific Wireless, California -3, Washington -2; Massie Wireless had one (in San Francisco); Hawaii had five stations.<sup>37</sup>

## **SAN FRANCISCO RECOVERS, WIRELESS MARCHES ON**

"PH" had been in operation in early 1906, first as a DeForest Company station and then as United Wireless. Formerly at the Palace Hotel, it moved to Russian Hill to the North, just West of Telegraph Hill after the Great Fire after the Earthquake burned the Palace Hotel down. Its site had a magnificent view of San Francisco Bay but it did not carry much traffic for want of wireless equipped ships.<sup>38</sup> It was, however, a nuisance to its residential neighbors, so it shortly moved to Hillcrest in Daly City,<sup>39</sup> South of San Francisco. This site was soon called Radio Ridge on Mount San Bruno (full of radio towers to this day). When American Marconi absorbed United Wireless in 1912, PH at about the same time was destined to migrate North to Marin County for its radio operations. PH became KPH with the assignment by the government of official call-signs. Much later it operated its transmitters from Bolinas and its receivers at Marshall.<sup>40</sup>

Another Pacific Wireless station in San Francisco used the call sign "SF." The Presidio station in the Army installation at San Francisco's Presidio signed "PS."<sup>41</sup> Many amateurs were active as early as 1906 as well. For example, Butler (Bert) Osborne of San Francisco, later W6US, started in 1906 at age 12. In 1908 he was on the air,<sup>42</sup> shortly with five kilowatts of spark and call sign CG.<sup>43</sup>

In about 1907, the legendary Lawrence A. Malarin was known to all by his personal sine "LM." (The sine, as in "sign," was an operator's unique self-chosen personal abbreviated identifier). He began his wireless career as the operator at San Francisco's PH in the Palace Hotel. The Navy insisted that he be fired as the PH operator on Rus-

sian Hill for using so much invective in the ether. He then became the United Wireless Manager<sup>44</sup> downtown. He later became the American Marconi Manager. His idiosyncracies included assigning similarly named operators to the same duty stations: Mr. West would get to work with Mr. East, Mr. Baer with Mr. Wolf.<sup>45</sup> Operators penned doggerel verse about him, for example:

*"LM" once handled the great PH,  
Is what I have been told,  
He did his work, he'd never shirk,  
And now he's the Chief quite bold.*<sup>46</sup>

Navy Commander Richard Johnstone, an early (1907) wireless amateur in San Francisco and later a KPH operator, was first hired by United Wireless after impressing Malarin with his skills. They became friends over the years. Dick Johnstone provides interesting biographical information on Malarin<sup>47</sup> in his colorful 1965 book of wireless reminiscences.

One of San Francisco's first



Fig. 12. The legendary Lawrence Malarin, sine LM, at work as a United Wireless (American Marconi) manager in San Francisco (SWP).

coast stations, the Massie station, operated with the call sign "IAA" in 1907. It used two 200 foot tall masts to support its antenna. Pioneer wireless engineer Arthur A. ("A.A.") Isbell established it for the Massie company. He had just earlier parted ways with Reginald Fessenden's company. Isbell had constructed and operated the station in Scotland with which Fessenden had communicated from Brant Rock.<sup>48</sup> Isbell had been a classmate of Lee de Forest's at the Mt. Hermon School in 1892-93 and in 1902 had worked for de Forest as one of the earliest wireless operators.

Isbell also chose his initials reversed for the Massie stations call letters. He set it up near the Cliff House at Ocean Beach for maritime work. After setting up the Massie station, Isbell found a bullet hole in his residence window, which he attributed to a competitor.<sup>49</sup>

Isbell had arrived in May 9, 1907 on the steamship *SS President* of the Pacific Steamship Company, coming around the Horn. This was the first ocean liner to be fitted with wireless in the Pacific.<sup>50</sup> Isbell was its operator. It used a three-kilowatt Massie system on 400 meters, call sign V-2. It set distance records during its voyage. Isbell went on to set up wireless and radio stations all over the world, initially in Hawaii circa 1908, and enjoyed a long career American Marconi, successor to United Wireless, and then with RCA. Isbell was for a time the United Wireless San Francisco Manager, for whom Malarin worked. He drove one of the first automobiles in the City.<sup>51</sup> With the coming of American Marconi in 1912, absorbing United, Isbell became the Marconi Manager. His San Rafael marriage in 1912 was a newsworthy event, headlined "Belle Elopes With Marconi Mag-



Fig. 13. A. A. Isbell at sea, 1911, on the Lusitania. (Rachel Isbell Branch collection).

nate.”<sup>52</sup> Isbell was all too honest a man. He accused the United Wireless management of chicanery (“liars, cut-throats and thieves”). They sued him for criminal libel.<sup>53</sup> He was, of course, right, and the United Wireless principals went to prison for stock fraud.

The utility of wireless for business coordination became clearer and clearer. In about 1907 the sailing ship *Archer*, which was a bulk carrier, was the first commercial vessel to install and use wireless on the West Coast. It communicated with its home company near Seattle, Roche Harbor Lime Company, station RH, which ran ten kilowatts spark.<sup>54</sup>

In 1907 amateur wireless operators formed the Bay Counties Wireless Telegraph Association.<sup>55</sup> Haraden Pratt of San Francisco was an active member. He was later telecommunications advisor to Presidents Truman and Eisenhower.<sup>56</sup> Another active member was Ellery W. Stone of Oakland, later Radio Inspector, naval officer, and a distinguished technical author.<sup>57</sup> The club issued licenses to operate as club members, along

with club callsigns. They were three letter calls starting with “S.” A member had to copy 20 words per minute in Morse code and pass a technical test in order to qualify. By 1912 some 50 operators held “S” calls licensed by the club. Haraden Pratt, President of the club, held SKH. Ray Newby, who also worked with Doc Herrold, held SEW. The later careers of the members of this club show how important engagement by amateurs with the evolving technology was for commercial success. At each meeting of the Bay Counties club, the President assigned one or more topics for scientific investigation and discussion.<sup>58</sup> The first amateur wireless man in the San Francisco area was Bill Larzelere,<sup>59</sup> a member of the club. His call was SWL; circa 1908, he ran 5KW at 720 meters.<sup>60</sup> His station operated from the second floor of a barn at his home in San Francisco.<sup>61</sup> Many of the amateurs went to sea as wireless operators as

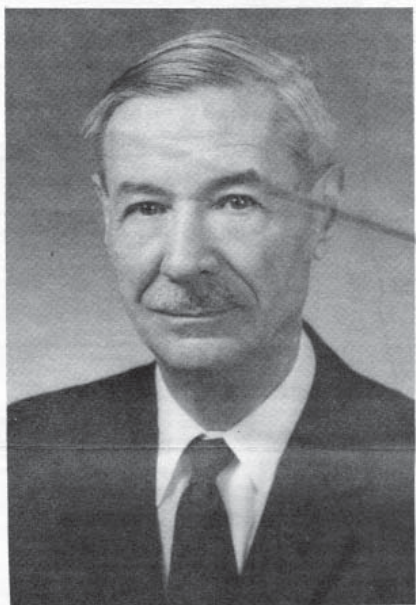


Fig. 14. Haraden Pratt, one of the earliest San Francisco amateurs, later enjoying a distinguished career in radio (SWP).

soon as they could get a license.<sup>62</sup>

In 1908 the Bay Counties Wireless Association pioneered sports radio. It reported by wireless on the "Big Game," to Palo Alto and Alameda from Berkeley.<sup>63</sup> This was (and is) the annual clash of the football teams of Stanford University and the University of California at Berkeley.

Before callsigns were required and assigned after 1910, vessels of varying ownership used calls of the form letter-number like the *SS President*, rather than two letters; for example:

A-2, *SS Acapulco*, Pacific Mail SS Line, A-3, *Tug Tyee*, Seattle and Columbia River Tugs, B-2, *SS Governor*, Pacific Coast SS Line, H-2, *SS Rose City*, San Francisco and Portland SS Co. (Continental Wireless's only shipboard installation), M-2, *SS Geo. W. Elder*, C.P. Doe & Co., P-1, *SS Enterprise*, Matson Navigation Co., P-2, *SS Hilonian*, Matson Navigation Co., P-3, *SS Portland*, (schooner), P-5, *S S Col. E.L. Drake*, Standard Oil Company, P-8, *SS Admiral Watson*, The Admiral (Alexander) Line, S-2, *SS Roanoke*. C. P. Doe & Co. (later lost at sea), U-2, *SS Lurline*, Matson Navigation Co.

Two letter calls were more common. For example, by 1907 The Southern Pacific Company had equipped three vessels with DeForest gear at two kilowatts each on 300 meters. They used the callsigns KA, KM and KR.<sup>64</sup> In 1908 United Wireless equipped and manned its first maritime installation on Union Oil Barge No. 3. Tim Furlong, PH's first operator, had the key.<sup>65</sup> Wireless became an important asset in inland waterways as well as on the high seas.

United Wireless leased its equipment for each vessel (as did Marconi), at \$200 a month and paid its operator \$40 a month, 25%

more than Marconi paid on the East Coast. A five-dollar a month premium was paid for operators in tankers.<sup>66</sup> In today's money, \$40 then is somewhere between \$1,000 and \$5,000 now. It was good pay, although Dick Johnstone did not think so at the time, because ships' officers got more.<sup>67</sup> KPH operators earned \$90 a month.

Early in 1908 the United States Navy stations at Mare Island and in Panama communicated with the fleet in the South Pacific.<sup>68</sup> This was the beginning of transpacific Navy communications. Other potential Naval applications of the new technology were coming to mind. In 1908 Doc Herrold fired explosive mines at a distance using wireless signals, and controlled small boats.<sup>69</sup> Many experimenters explored just how effective wireless could be in managing weapons, including Nikola Tesla. He demonstrated a wireless torpedo in New York in 1907, with attendant publicity.

Shoreside, in 1908 a daily wireless circuit ran between San Francisco's soon to be Chief Electrician, Ralph Wiley, and operator George Kellogg of the Fire-alarm control station at Jefferson Square.<sup>70</sup> Radio has been part of the public works and public safety infrastructure of San Francisco and all other cities ever since. Wiley's "wireless outfit" appeared in *Modern Electrics* in 1909, his photo and description winning First Prize (\$3).<sup>71</sup>

In October, 1908 Lawrence Malarin in San Francisco at PH and Arthur Isbell, now at HU in Honolulu, first established wireless contact between California and Hawaii.<sup>72</sup> Malarin, at PH on Russian Hill, heard "Aloha." He realized it was Isbell testing in Hawaii and responded: "O.K. Isbell Hu 1:35 a.m. Hawaiian Wireless Company: Congratulations. United

Wireless Company”; Isbell replied: “Hu Isbell Cx Dh 1:38 a.m. Hu 11 United Wireless Company, Ph., San Francisco, Thanks. Same to you. Isbell.” Isbell immediately, in his next message, suggested soliciting press traffic. “CX” was Isbell’s sine. HU ran ten kilowatts and PH about five kilowatts.

Hawaii thus joined the union of national communications. This circuit had been the goal of the sabotaged 1906 Pacific Wireless Mt. Tamalpais station. Similarly, in 1908 United’s Monterey, California and Friday Harbor, Washington stations maintain regular nightly contact up the coast.<sup>73</sup>

### MUSIC IN THE ETHER

In 1908 the Navy Battleship *USS Ohio* of Teddy Roosevelt’s world-cruising Great White Fleet broadcast music over its DeForest Company wireless telephone. The ship used a Lee de Forest arc system and the callsign DC. Engineer O.C. (Oscar) Brill was the DeForest technician for the Fleet. When calling on San Francisco on the West Coast leg of the cruise, first the ship’s band went out over the ether, and then phonograph records obtained in port.<sup>74</sup> The broadcaster was Chief Electrician H. J. (Herbert) Meneratti.<sup>75</sup> Sam Maddams at PH early on monitored music from the Fleet, and reported it to the press.<sup>76</sup> Many commercial and amateur operators heard these broadcasts<sup>77</sup> as well as the Navy stations. Chief Meneratti played his records over the radio-telephone in many of the Fleet’s ports of call around the world. Chief Meneratti could thus well lay claim to the title of first radio broadcaster and “disk jockey.” In 1938 he was a Lt. Commander in the Navy and told the story in some detail to historian George H. Clark.<sup>78</sup>

De Forest company engineer Roscoe Kent in San Francisco wanted to set up a test of the wireless telephone with the *Ohio*. In another instance of sabotage, a wireless competitor prevented the test by cutting down the De Forest station’s antenna poles.<sup>79</sup> The *Ohio* did work several Navy and other stations with its wireless telephone, including a more than 40 mile contact with Tatoosh Island and a 30 mile contact with Mare Island. Many other stations heard these and similar contacts, often amazed at hearing a voice (or music) in the ether. Meneratti noted on contact in his log for May 26: “Used phone with Port Townsend. *Scared him out of his wits*. Didn’t know what to make of it. Broke all wireless records ... Longest distance 45 miles.... He



Fig. 15. Navy Chief H. J. Meneratti who used Lee de Forest’s wireless telephone to broadcast voice and music around the world in 1908. (Clark Radioanna collection).

must have a fine receiving set.”<sup>80</sup>

Meneratti had a special record made of a fighting song, played often. One chorus proclaimed:<sup>81</sup>

*Coming round the Horn, boys,  
With a hundred thousand tons  
Of Yankees and their battleships,  
And a hundred ten inch guns.*

This bellicosity, including some “Yellow Peril” lyrics, was directed at the Japanese. This record, however, was not played for the Japanese when the Fleet got to Tokyo. Their wireless operators were proficient in English: this record was “stowed.” The Japanese wireless men enjoyed other music.

Meneratti’s own 1948 memoir<sup>82</sup> notes that: “During the first part of June [1908] we gave music regularly to the Mare Island station about 30 miles distant. We were in San Francisco Bay at the time. The record shows that from 1 June to 5 July we did not miss a day giving out music to the Fleet [i]n the Bay at the time.” On July 6<sup>th</sup>, Meneratti did an interview with a prizefighter: “This is no doubt the first time a fighter broadcast.” When the Fleet got to Hawaii in July, Chief Meneratti continued his playing of music over the radio-telephone. Engineer O.C. Brill, with the [DeForest] “Radio T & T Co.” came “over to test phones. All OK.” The Fleet continued into the Pacific. Meneratti broadcast at each port of call to the delight of wireless men everywhere.

In 1908, Dick Johnstone, as a very new amateur, heard nearby McCarty experimenters sending out voice and recorded music: “— a real first in wireless transmission.”

<sup>83</sup> A year later, in 1909 Doc Herrold broadcast voice and music from “San Jose Calling” using a spark gap. He soon identified his station as “FN.” He then designed his own arc transmitter, which operated as low as 20 kHz and later as high as

500 kHz.<sup>84</sup> In 1909, however, he worked with a spark transmitter. Whether he had heard or read about Chief Meneratti’s “giving out” music into the local ether a year earlier is not known, but probable. The De Forest Company arc on the *Ohio* may also have provided an impetus to explore that relatively successful technology.

### THE YOUNG TECHNOLOGY OF WIRELESS EVOLVES

At least eight West Coast wireless operators died in sinkings and wrecks, “lost at sea at the post of duty” on the Pacific Coast as early as 1909, through 1916: George C. Eccles, *SS Ohio*, 1909; Lawrence Prudhunt, *SS Rose Cranz*, 1913; Donald C. Perkins, *SS State of California*, 1913; Walter E. Reker, *SS Admiral Sampson*, 1914; Harry Fred Otto, *SS Francis H. Leggett*, 1914; Clifton J. Fleming, *SS Francis H. Leggett*, 1914.<sup>85</sup>

In November, 1914 the *SS Hanalei* wrecked off Point Reyes near American Marconi’s station KPH. Its wireless operator Adolph J. Svenson died.<sup>86</sup> In May, 1916 the *SS Roanoke* foundered near San Luis Obispo. Wireless operator George E. Chamberlain’s last transmission, taken by Dick Johnstone at KPH,<sup>87</sup> gave the ship’s position as 90 miles South of San Francisco. Marconi man Chamberlain died at sea. Shortly before, he had written this poem:<sup>88</sup>

*We list through the night, To our comrades afar*

*On the tropical seas, Or beneath the North Star,*

*We flash out glad tidings – Some of sorrow and hate,*

*Of a tempest arising, Or a ship warned too late.*

*Now we’re hearing a ship, And her cries of appeal*

*Of the wave-wrecked reef, That is clutching her keel.*

*Ah! Her set is now still; Not a spark rends the air,*

*And we dream of the story, Of death and despair.*

*We think of a face – He – my pal to his death;*

*It is hard to believe, He has breathed his last breath.*

*He's a man among men, E'en the Devil's defied;*

*He has now met his God, As the wireless men died.*

Other wireless operators in San Francisco and around the world died at their keys at shoreside stations while taking storm distress traffic, especially SOS messages. They knew the risk to their lives from lightning strikes to the high antennas but they stuck to their posts in hopes of helping foundering ships. If they escaped death from a lightning strike, severe injury was likely.<sup>89</sup>

By 1909 the Navy's wireless chain included Tatoosh Island, Washington (callsign SV), and Cape Blanco (TA), Table Bluff (TD), Point Arguello (TK) and Point Loma (TM) in California. These stations used Massie, Telefunken, Shoemaker and DeForest gear as the Navy sought the best technologies. (The Navy refused to lease Marconi gear and Marconi refused to sell it). Some of these stations are reported to have had two "humps" in their wavelengths.<sup>90</sup> This indicates simultaneous although not intentional operation on two center frequencies. These were broad frequency ranges because spark systems centered a band of radio frequency hash at one wavelength or another. Too tight coupling of the last inductances gave rise to the two humps.

In 1909 station United Wireless station "CH" operated from the *San Francisco Chronicle* building.<sup>91</sup> According to Johnstone, it contacted ships coming in for

details of arrival to publish.<sup>92</sup> Such stations, including similar stations in New York, often sent out "press" to ships at sea. Passengers and crews valued these news summaries. "PH" moved from Russian Hill to South San Francisco to "Hillcrest" on what became Radio Ridge, with CH filling in during the interregnum. Engineer O.C. Brill initially supervised the new construction.<sup>93</sup> To the North, the Canadian Government operated a wireless station on Gonzalez Hill at Victoria, B.C., and at a lighthouse at Triangle Island, 45 miles out in the open Pacific. These were its outposts for communications with ship traffic to Japan via the shorter great Circle Aleutian Islands northern route.<sup>94</sup>

In 1909 young amateur wireless operators at the initiative of then 12 year-old Henry Dickow formed the San Francisco Radio Club.<sup>95</sup> Several others clubs also met regularly. A San Francisco newspaper ran a full page story on the young wireless operators of San Francisco associated with Lowell High School, on December 26, 1909:<sup>96</sup>

"This is amateur morning in the wireless world. San Francisco and adjoining suburbs alone have between 200 and 300 young wireless operators; amateurs who rank as such principally in name, who are everywhere dotted about the city and country for a stretch of miles that extends way beyond the city and county boundaries. The handiwork of the young wireless expert is seen all about on house-top and barntop in the form of a pole a few feet long projecting above the gables, with a few wires running to it top window. Such signs denote the residence of a lad who may some day, somewhere, if not in San Francisco, assist materially in perfecting the system of wireless telegraphy that, while considered



by electrical wizards to be still in an embryo condition, is one of the greatest achievements of modern times.”

The 1909 *Modern Electrics* call-book, the *Wireless Blue Book* of the Wireless Association of America, lists only ten of the many amateur operators in California. It includes Ray Newby, as EZM. It also lists the Ozone Wireless Company of San Francisco, as callsign MJ, perhaps its principal's initials. In 1919, ten years after its founding in 1909, the San Francisco Radio Club incorporated. It has met continuously since then (but for wartime interruptions) and uses the callsign of an early member, W6PW, for its club station/repeater.

In 1910 the then new Federal Telegraph Company demonstrated a wireless telephone circuit between Sacramento and Stockton.<sup>97</sup> It used the arc technology that Cyril Elwell had acquired, mostly by gumption, from Vladimir Poulsen of Denmark. Elwell initially succeeded to McCarty's work, and the National Radio Company of San Francisco was formed. Elwell found McCarty's system inadequate. In July 1910, as Federal Telegraph, Elwell put the Ocean Beach Station<sup>98</sup> in operation in San Francisco with the original 12 kilowatt Danish arc (as callsign "FS," later KFS).<sup>99</sup>

Wireless also took to the aeronautical air in 1910. Ralph Heintz, was then 18 years-old and was later a distinguished engineer and successful businessman. He received the messages on the ground from an aircraft temporarily equipped for wireless signaling.<sup>100</sup> Then in 1911 the Army used Tanforan Field just South of San Francisco in San Bruno for the first military tests of air to ground wireless signaling. By 1916, aircraft over the Pacific had signaled 125 miles to shore.<sup>101</sup>

Not all the action was in San Francisco. In San Jose in April, 1910 Doc Herrold and his radio-telegraph signals from his San Jose College of Engineering and Wireless reached out as far as the Farallon Islands and Mare Island, 90 miles to the North. Ray Newby operated a one-inch Electro-Importing (EI) spark coil from Hugo Gernsback's New York company.<sup>102</sup> Doc Herrold certified the feat in an affidavit sent to Electro Importing, which it published in its catalog. Gernsback's *Modern Electrics* in 1910 also featured a photograph of Doc Herrold (at the key) and Ray Newby operating their wireless.<sup>103</sup> Later in 1910 Newby signed on for some sea duty. The Standard Oil tanker *Atlas* installed American Marconi wireless. Newby was the operator<sup>104</sup> using callsign GN.<sup>105</sup>

In Oakland, across the Bay, lived Fong Yee, an immigrant from China. In about 1910 he constructed and operated both a home wireless station and a well regarded portable station for field



Fig. 16. Cyril Elwell, after finding McCarty's system inadequate, acquired the American rights to the Poulsen arc in 1907, and formed his first company, the Poulsen Wireless Telephone and Telegraph Company. He soon changed the name to Federal. This certificate is odd because it is one of a series of about a dozen of the same tenor all made out to Elwell. It may have been something of an experiment in scrippophily.



Fig. 17. The Federal Beach Station, interior, 1910; the first big arc in service (12 KW). (Mayes).

use. He also built and flew a biplane on the model of the Curtis biplane. He was called to China in 1911 in furtherance of the Sun Yat Sen revolution.<sup>106</sup> He died in a crash of his airplane in China in 1912 at age 29.

In Seattle in 1910 William Dubilier, then a young man about 16, demonstrated a wireless telephone.<sup>107</sup> A 300 foot tall antenna mast gave him some range. In 1910 he was also selling his then-novel mica condensers, and by 1916 to



Fig. 18. The first airplane flight to send a wireless signal, to Ralph Heintz on the ground, in artist Edwin Ingalls's conception; a demonstration performed just south of San Francisco in 1910 (Morgan).

the Navy, the beginning of a long and successful career.<sup>108</sup>

Oregon had its share of activity as well. Joe Hallock started as an amateur in Portland in 1906. By 1910 he was an operator at Portland's DZ (and O-2 and KE). He later went to sea in 1911, then to station PC at Astoria, Oregon. Later he became the Portland Federal Communications Commission (FCC) administrator<sup>109</sup> after instituting Portland's first broadcasting station in the 1920s. He also had worked on the 1,000 kilowatt (1 MW) Federal arc station in France. Joe Hallock was one of several old time wireless operators chronicled in *Radio & Television News* in the early 1950s.<sup>110</sup>

At station United station DZ in Portland, Oregon, in 1910 a beautiful young blond woman, Abba Lindsay, worked the day shift, the first trick, in the front office: "...she dressed in a snappy blue marine operator's uniform and made quite an impression on the customers."<sup>111</sup> United Wireless also operated station KE in St. Helens, Oregon, and 37 other West Coast stations.<sup>112</sup>

In Los Angeles in 1910 Howard Seefred as a teenaged amateur



Fig. 19. Doc Herrold, center, at his San Jose arc radio station FN circa 1912 and thereafter, with his wireless school and station engineering staff. (Photo courtesy of Mike Adams, CHRS, Perham Collections image, History San Jose).

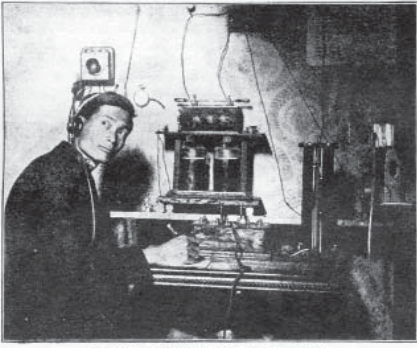


Fig. 20. Oakland, California's Fong Yee, 1910 (*Electrical Experimenter*).

operator monitored stations each a thousand miles North: Friday Harbor, Washington, call sign PD, and Seattle call sign PA.<sup>113</sup> Later as W6EA, he ran the American Radio Relay League (ARRL) Pacific Division. The League, formed in 1914, fostered cooperation among amateurs and created a traffic handling relay network for nationwide distribution of personal and emergency messages. California and the West took considerable benefit from this public service.

By 1910 the commercial chains of wireless stations on the West Coast, operated as United Wireless, included, in two categories:

- 1) Commercial Stations largely intended to compete for landline telegraph business, a challenging



Fig. 21. Dubilier's 1909 radio-telephone in Seattle.

proposition: DA Perry Hotel, Seattle, DB Tacoma, DE Pasadena, DF Santa Barbara, DF Vancouver, BC, DG Sacramento, DK Everett,

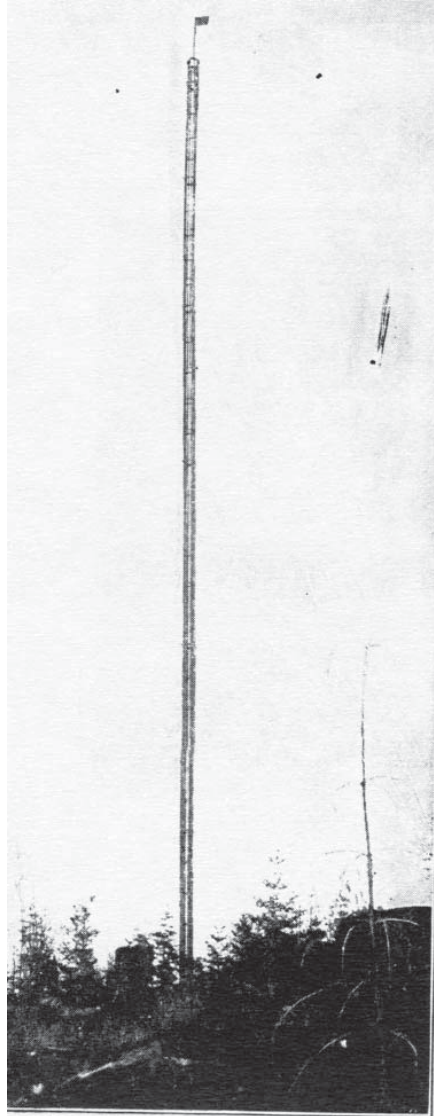


Fig. 22. Dubilier's 1909 tower for his antenna. Like Herrold, his antenna was an enormous amount of wire (6,000 feet of it) as high as he could get it (320 feet) in an "umbrella." Herrold used 7,000 of wire but in a more linear pattern from the top of a San Jose building. These antennas likely primarily provided a large capacity to ground permitting the lead to them to radiate at a low frequency.

DM Salem, DN San Louis Obispo, DO Roseburg, DU Juneau, DV Chelahis, Washington. The “D” in the callsigns derived from the DeForest Company.

2) Maritime Stations for communication with ships at sea: PA Seattle, PB Ketchikan, AK, PB Tacoma, PC Astoria, PD Friday Harbor, Washington, PE Portland, PF Aberdeen, Oregon, PG Gray’s Harbor, Washington, PH Westport, Oregon, PH San Francisco, PI Avalon On Santa Catalina Island (earlier “A”), PJ Los Angeles (earlier “G”), PK San Diego, PM Eureka, PN Katalla, AK, PO Cordova, AK, PQ Monterey, PR Victoria, BC, PU Bellingham, PV Klamath, PW North Victoria, BC, PX Marshfield, Oregon (later called Coos Bay), PY Olympia, Washington.

The “P” in the callsigns stood for Gehering’s old company Pacific. Gehring’s East Coast Atlantic Wireless Company used callsigns starting in “A.” The Marconi company had little West Coast presence. But evolving technology numbered the days of these spark stations, as early as 1910. Stock promotion frauds also doomed these chains. The operators and technicians paid for the sins of the promoters.

United Wireless crashed in 1911 with the indictment of its principals for fraud (vindicating Arthur Isbell). It continued to operate only ten West Coast stations, focusing on maritime installations.<sup>114</sup> It is true that some wireless promoters engaged in much skullduggery, and sometime outright fraud and embezzlement. But it is also true that prosecuting authorities were deaf, dumb and blind to the possibilities of the new technology. Anyone, such as Lee de Forest, who would predict, for example, transatlantic radio-telephone communications, the authorities regarded as

an intentional fraud and maybe a madman. The prosecutors of Lee de Forest argued that the triode Audion was worthless as a device and wasn’t even a very good lamp-bulb.<sup>115</sup>

After the failure of United Wireless, American Marconi in July, 1912 acquired United’s assets, including its West Coast operations.<sup>116</sup> Until this acquisition, American Marconi was primarily an East Coast operation with little West Coast presence. American Marconi’s chief operator in San Francisco was Lawrence Malarin, LM, coming from United. Malarin and American Marconi maintained offices in San Francisco’s Merchants’ Exchange Building, where every seagoing operator checked in when in San Francisco.<sup>117</sup> American Marconi also bought out Massie’s West Coast system including the San Francisco land station and 13 shipboard installations.<sup>118</sup> Also in 1912, the American and the English Marconi companies committed to the Marshall receiving station and Bolinas transmitting station (KET, later KPH) in Northern California, using a powerful but soon obsolete rotary spark system.<sup>119</sup>

As the spark stations continued to hurl Morse code into the ether, the radio-telephone pioneers continued development. In 1911 the Navy station at Tatoosh Island, Washington monitored radio-telephone signals from the Bay Area,<sup>120</sup> probably those of National Radiotelephone Company, successor to McCarty, and a company for which Doc Herrold worked as a consultant. In 1912 National was licensed as 6XE, experimental portable, license number 101.<sup>121</sup> Doc Herrold connected San Francisco and San Jose by radio-telephone daily for eight months in 1912.<sup>122</sup> About this time in San Francisco, another experimenter, H.D. Dwy-

er, tested his radiotelephone, with a receiver in the home of Haraden Pratt. Dwyer later tried to establish a commercial San Francisco to Fruitvale (Alameda County) circuit.<sup>123</sup>

A typical high-quality nautical wireless outfit of 1911 is that of the good ship *Charles Nelson*, a bulk carrier of the Nelson Lumber Company. It employed a Marconi magnetic detector with a wind-up mechanism to move the wire through the silk covered litzendraht coil. Another receiver used a Fleming valve diode detector with two valves connected to a loose coupler. Nighttime reception ranged to 200 miles. The operator listened on Brandes high impedance headphones. Then or soon after, a 240 cycle rotary spark transmitter from a new Seattle company, Killbourne and Clark handled outbound traffic. So reported its operator, R. S. (Russell) Ormsby, still at sea in 1954 (sine RQ) on his 26th ship.<sup>124</sup> Lee de Forest's former assistant in Canada, St. Louis and Denver, C.B. Cooper, was a principal at Killbourne and Clark. By 1915 Killbourne and

Clark began to manufacture wireless state of the art transmitting equipment, and also its highly regarded Type E receiver.

State-of-the-Art in 1912, for those who could afford it, was Telefunken gear: a quenched sparkgap, a sharp-tuning receiver with litzendraht wire coils,<sup>125</sup> and an electrolytic detector; most operators use galena crystal detectors irrespective of patent rights<sup>126</sup> and some similarly used carborundum.<sup>127</sup> Rule number one among wireless operators was: Don't get caught by the company with your real detector.<sup>128</sup>

In 1911 federal regulation had come to wireless. The Ship Act of 1911 required licenses of maritime wireless operators.<sup>129</sup> In a typical success story, Sydney Fass, at 16 years-old in 1911, obtained his marine wireless telegrapher's license. He then went to sea on schooners, crude oil tankers and liners. He also operated for United Wireless at station PM at Eureka, California. Fass was a friend of Haraden Pratt and Dick Johnstone.<sup>130</sup> Fass was active in the San Francisco Radio Club as a young man. Fass was later to serve in the Navy in both wars. He retired as a Commander after 33 years in the Naval Reserve. Fass owned and operated one of San Francisco's largest Radio and TV stores in the fifties.<sup>131</sup>

Similarly, Edwin J. Lovejoy was licensed in 1911 and went on to become the Chief Operator and Manager of United Wireless station PJ in San Pedro at age 18. In 1914 he joined Federal Telegraph and operated KFS in San Francisco and KLS in Los Angeles, and arcs aboard ships as he installed them. After service in both wars in the Navy, he retired with the rank of Commander and had a distinguished career with the FCC.<sup>132</sup>

In July of 1911 a new kind



Fig. 23. United Wireless "franks" that permitted pre-paid messages, usually issued by communications companies as courtesies and perquisites. These tell a story: later indicted C.C. Galbraith issued the 1910 stamp but the Trustees in Bankruptcy issued the 1912 stamp. American Marconi gobbled up the assets and competent staff, establishing thus its West Coast operations. (Author's collection)

of scandal came to wireless. In Los Angeles, teenaged wireless amateur operators, trained at Los Angeles Polytechnic High School, intercepted and disclosed collusion over the Catalina wireless telegraph circuit. This involved the Hearst newspapers, with much attendant publicity from the rival press. The Hearst interests instituted a criminal prosecution but it was later dismissed.<sup>133</sup> The affair garnered a great deal of publicity, and Hugo Gernsback's *Modern Electrics* reported nationally on the prosecution and its dismissal. The Wireless Association of Southern California, over 200 young Los Angeles amateurs, formed as a result of the incident. It operated a two kilowatt spark transmitter using the callsign ALA.<sup>134</sup>

Howard Seefred in Los Angeles in 1912 heard and logged several United Wireless stations and PH, (and he had also heard the first Pacific Wireless stations "A" in Avalon on Catalina Island and "G" in Los Angeles), all on the usual crystal set receiver of the day. He noted the *Los Angeles Examiner* newspaper as using the callsign EX. Seefred also monitored the new state-of-the-art Federal 12 kilowatt arc at Los Angeles, station PLA.

Seefred also logged Marconi-equipped vessels: IAA *SS Lurline*, IAB *SS Wilhelmina*, IAC *SS Hyades*, IAD *SS Hilonian*, IAE *SS Enterprise*, IAJ *SS Jason*, IAK *SS Stanley Dollar*, IAO *SS Cuzco*. And shore stations whose callsigns he recorded as: IAF San Francisco, CA, IAG Seattle, WA, IAH San Diego, CA. The "IA" callsigns suggest assignment for United/Marconi by Arthur Isbell before 1912.

Following in the spark technology lead of Malarin and Isbell, in May, 1912 the Federal Telegraph established the San Francisco and

Hawaii circuit from South San Francisco using an arc.<sup>135</sup> By December, Federal could communicate across country to Washington, DC and to Hawaii by its initial 35 kilowatt arc CW transmitters.<sup>136</sup> This was a fraction of the power of much less effective spark stations. Federal arc stations included: POL Central Point, OR, PFW Fort Worth, TX, PNU Honolulu, HI, PNX Phoenix, AZ, PKC Kansas City, MO, PLA Los Angeles, CA, PSC South San Francisco, PSN Portland, OR, PSO El Paso, TX.

Federal alone could compete with the landline telegraph companies for domestic traffic. Some bigger companies also established their own wireless stations and circuits, especially where landlines were problematic. For example, in 1912 Phelps Dodge operated a wireless station at its main Arizona copper mine.<sup>137</sup>

Federal operators and engineers in this period, including Lee de Forest and Lon Fuller at Federal, also first observed and analyzed ionospheric "skip" propagation. Differences in reception (due to selective fading) of the main wavelength and the back-wave, a higher frequency artifact of the arc keying method, suggested differential reflection of the higher and lower frequencies.<sup>138</sup>

Labor issues arose for wireless in 1912. Some wireless operators called a strike, and harassed operating stations.<sup>139</sup> One such station was PH in South San Francisco with Haraden Pratt at the key. He went out to see what the trouble was, with a revolver in his hand. It turned out to be an old acquaintance, Bill Larzelere.<sup>140</sup> The strike was called by the Commercial Telegraphers Association of America, and resulted in gradually improved working conditions.<sup>141</sup>

At the Hillcrest station, wire-

less telephone tests interfered with reception at station PH, prompting this log entry:<sup>142</sup>

"...Recalling the days of 'Bugs' McCarthy [sic] the Wireless Telephone Capatelist [sic] in the Metropolitan Bank Building. 9:55 p.m. 'Bugs' in with his fone, stronger than usual. Try to get GW but can't hear him through fone, CURSES!!!!"

The Federal arc station PSF, the Beach Station, earned a poem of similar disdain in the 1912 station PH logs:

*There's a station way down on the Beach*

*The noise it turns out is surely a peach*

*The Opps tear their hair, They cuss and they swear*

*But Old Poulsen he sticks like a leach.*

Arcs were notorious for parasitic and other interfering emissions. PSF/KSF wiped out reception at KPH in Daly City until special receiving antennas were devised, according to Dick Johnstone, an operator there.

The log also noted amateur operators on the weekend:

"8:30 a.m. The combined forces of 3,000 ham factories are bursting forth with their weird codes upon the quietude of this lovely rainy morning."<sup>143</sup> The term "ham" for amateur operators probably derives, at least in part, from the old landline telegraphers' description of badly sent traffic as "ham." Hence the description in the PH log of amateur stations a "ham factories." One of Doc Herrold's associates, many years later, closed a letter to Herrold along the lines of "one of your old ham factories."<sup>144</sup>

PH operators could not resist poesy or at least doggerel verse:

*The night was dark,  
The static was bad  
The power went off,*

*GEE, I was glad<sup>145</sup>.*

Nor did manager Malarin or other operators escape versification; a problematic operator engendered this poem:

*He worked Second at PH*

*One long month and a day*

*"LM" was tickled pink when he came,*

*Likewise when he went away.*

*'Twas he that smoked the cigarette*

*'Twas he that passed the "buck",*

*You'd thought he was the finest yet*



Fig. 24. A.A. Isbell working for United in 1911 managed a direct wireless contact with Japan, anticipating the later high power Marconi circuit. Traffic with Japan was the prize sought by the commercial wireless companies because of the prices charged by the cable companies and the limited capacity of the cables. (Rachel Isbell Branch collection)

*From the way he led you up,  
Morse or Continental,  
He left it to their whim,  
The C.Q.D.'s of twenty ships  
Could howl for all of him.*<sup>146</sup>

Malarin's management style, and static – the bane of the long wave operators -- show up in the log:<sup>147</sup> “5:30 a.m. Static very bad. “LM” made a remark at the office the other day to the effect that my nightly reports of static were all bunk. I'd give him my next pay check if he could do as much as clear NPH thru this static.” NPH was the Navy station at Mare Island, 45 miles from PH.

The *SS Titanic* sank in 1912. The use of wireless in the rescue of the survivors was big news. Laws soon required more wireless installations and more wireless operators. The 1912 post-*Titanic* Radio Act required two operators on most ships. In Los Angeles in 1912 American Marconi operated a wireless school at the YMCA and used the callsign YM for its two kilowatt spark transmitter.<sup>148</sup> Maritime and other demand for wireless operators created opportunities for such training schools. Doc Herrold's College of Wireless in San Jose also trained hundreds of operators in this period.

The Radio Act of 1912 also required licenses of all operators and consigned amateur operators to wavelengths of 200 meters and down, 1.5 MHz and up, thought to be useless short waves.<sup>149</sup> Haraden Pratt made a point of obtaining one of the first new radio operator's licenses from Radio Inspector R.Y. Cadmus in San Francisco.<sup>150</sup>

In 1912 the terminology of the technology evolved: the Navy first employed the term “radio” rather than “wireless.” Lee de Forest first used the term “radio” commercially in the De Forest Radio Telephone Company, organized in

1907.<sup>151</sup> The term derived from the notion of radiating Hertzian waves. It caught the imagination.

The wireless telephone evolved into the radio-phone. As a telephone substitute, the wireless telephone faced the challenge of no privacy.<sup>152</sup> With as little as a crystal set, any young man, Navy operator or business competitor could listen in. Then in about 1912 Doc Herrold in San Jose began to broadcast musical and other programs on a regular basis to a known audience, using an arc of his own design.<sup>153</sup> The vice of the wireless telephone became the virtue of the radio-phone broadcaster: all could listen with as little as a crystal set. Herrold had started with a spark system in 1909, shortly after the visit of the great White Fleet to San Francisco and Meneratti's use of the de Forest Company arc to broadcast for the Navy. As one of the first radio stations as the technology is known now, ten years later in 1919 Herrold renewed his broadcasting activity soon after the end of the First World War, using DeForest vacuum tubes.<sup>154</sup>

### **THE TECHNOLOGY ABOUT TO DOMINATE THE 20<sup>TH</sup> CENTURY: 1913**

In 1912, Lee de Forest in Palo Alto working at Federal Telegraph perfected the new vacuum tubes, his triode Audions. These eventually provided the catalyst by which “wireless” became “radio” as we know it. He built a two-stage and then a three-stage cascade audio amplifier at Federal. It provided a gain of 120. Federal demonstrated these amplifiers to the Navy in September, 1912.<sup>155</sup> Soon thereafter de Forest and Charles Logwood (a brilliant engineer who had worked with McCarty) experimented with feedback circuits. This was short-



ly before Edwin Howard Armstrong,<sup>156</sup> in New York, discovered regeneration.<sup>157</sup> Armstrong had the benefit of the 1911 experiments of the United Fruit Company wireless operators with the de Forest Audion in the Wallace detector in a regenerative mode.<sup>158</sup> De Forest's defeat in 1934 of Armstrong in the ensuing patent litigation turned on de Forest's work at Federal in Palo Alto. Hard feelings persist to this day among partisans.

Lee de Forest invented radio as we now it in 1913 in California:<sup>159</sup> he got his new vacuum tube to oscillate at radio frequencies, proving it by heterodyning a transmitted Federal arc carrier wave. "On Ap[ril] 17, 1913, he rec[eive]d signals at SF from Palo Alto by oscillating audion" as George H. Clark put it.<sup>160</sup> In ruling for de Forest over Armstrong in 1934, Justice Cardozo wrote for the Supreme Court:

"... on April 17, of [1913] at Palo Alto, California, he received a clear note, the true heterodyne beat note, from the radio signal station at San Francisco Beach... [thereafter in 1914, de Forest] recorded in his notebook ... that he 'had full proof that the audion acts as a generator of high frequency currents.'<sup>161</sup> The audion oscillating doomed both the primitive spark and the sophisticated arc.

It would, however, take a while for the new technology of the vacuum tube to triumph. In early 1913, the Navy operated 16 radio-telegraph stations on the West Coast (Pacific Ocean), ranging in power from two to ten kilowatts, including seven in Alaska. Call-signs ranged from NPA through NPS, both on the Pribilof Islands. Mare Island used NPH. The Navy also operated stations in Hawaii (NPM), Guam (NPN), the Philippines (NPO, NPT) and China

(NPP). The Navy's 27 East Coast and Caribbean stations (Atlantic Ocean) used call-signs in the NA series, from the flagship station, NAA at Arlington, Virginia at 100 kilowatts down to one kilowatt at NAY in Panama.<sup>162</sup>

The Navy, however, also maintained its interest in the radio-telephone. In September of 1913 the Navy did radio-telephone tests between Point Arguello and Mare Island (300 miles). Doc Herrold did these tests with an arc. NAA in Virginia and Bremerton, Washington monitored these transmissions. Herrold's private music broadcasts were monitored off San Pedro and heard as far south as San Diego.<sup>163</sup>

American Marconi aggressively pursued new spark stations, seemingly oblivious to new technologies such as the arc. For example, Marconi expanded its station in Eureka, California 280 miles up the Coast from San Francisco<sup>164</sup> for marine work.

On September 24, 1914 American Marconi officially opened its Bolinas, California rotary spark station of about 300 kilowatts power, call-sign KET,<sup>165</sup> known as the "rock crusher." It was powerful and advanced for a spark system because it created almost a continuous wave. It provided the first leg of the San Francisco to Hawaii to Tokyo circuit. But the arc and the coming vacuum tube transmitters had already obsoleted it. In 1914 young Howard Armstrong in New York, when demonstrating his new vacuum tube regenerative Audion circuit, picked up a San Francisco wireless station. This was likely the KPH "rock crusher."

KET's receivers were somewhat isolated at Marshall across the Bolinas lagoon, where the operators lived. Its Marconi-standard operators' hotel at Marshall,<sup>166</sup>

refurbished now as part of the Marconi Cove State Park, was known among the operators as the Hotel De Gink.<sup>167</sup> “Gink” was an old land-line telegraphers’ disparaging term for a bad operator.

The San Francisco Panama Pacific International Exposition of 1915 featured wireless. AT&T and Lee de Forest exhibited there, with AT&T trying to ignore de Forest’s contribution in the invention of the vacuum tube triode, so important to AT&T’s transcontinental long-lines. At de Forest’s “Wireless Telephone Booth” he monitored Doc Herrold’s San Jose music broadcasts,<sup>168</sup> made to San Francisco at Radio Inspector Lt. Ellery Stone’s request.<sup>169</sup> This astonished the fairgoers.

In September, 1915 AT&T via the Navy station at Arlington, Virginia (NAA) conversed over radio-telephone with Mare Island using a vacuum tube transmitter. Wireless pioneer Lloyd Espenscheid monitored this traffic in Hawaii. This test provided a preliminary success leading to the successful

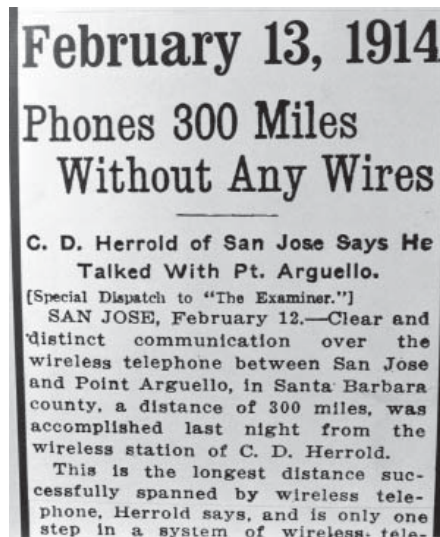


Fig. 25. Doc Herrold’s 300 mile radio-telephone tests of 1914. (Clipping from Mike Adams, CHRS)

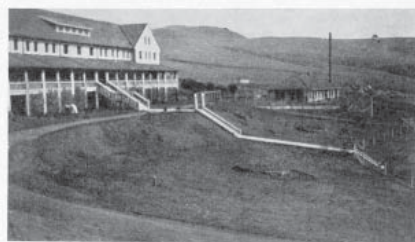


Fig. 26. The Marshall, California Marconi operators’ hotel when it opened about 1917.

transatlantic radio-telephone tests in October.<sup>170</sup> The transmitter used massively parallel triodes for maximum carrier power.

In this period, Amateur radio continued to call out to the young and technically adept. In 1915 Charles V. Litton, then 11 years old and the later founder of Litton Industries, operated his own amateur radio station in Redwood City.<sup>171</sup> The official callbook of 1913 listed just over 300 amateur operators in the Sixth District (California, Nevada, Utah, Arizona and Hawaii) perhaps 10% fewer than the Second District (southern and central New York and northern New Jersey); Seattle’s Seventh District had about 75 licensees for Washington, Oregon, Alaska, Idaho, Montana and Wyoming.<sup>172</sup> In 1914 an amateur radio station at the University of California at Berkeley began to operate, with Haraden Pratt as the principal.<sup>173</sup> Somewhat later, in 1917 Frederick E. Terman, later the Vice President of Stanford University and the father of electronics development in what became Silicon Valley, as a teenager operated an amateur radio station in Palo Alto.<sup>174</sup> Amateurs quickly heard the virtues of Lee de Forest’s audions. He wrote: “By 1915, the cult of radio “hams” was growing rapidly...” making demands on de Forest’s first manufacturer, McCandless. Westinghouse put McCandless out of the vacuum tube business. As a

result, wrote de Forest: “several bootleggers sprang up over the country, chief and most mischievous of whom was Moorehead of San Francisco.”<sup>175</sup> He referred to O.B. (Otis) Moorehead, manufacturer of the “audiotron” triode.

Broadcasting also began to appeal in 1915, although the audience was limited to wireless operators, both professional and amateur. A student of Herrold’s, Robert J. Stull, set up a radio-telephone broadcasting station at the University of California at Berkeley.<sup>176</sup> De Forest in New York put the oscillating triode vacuum tube to work in



Fig. 27. The genesis of the Cyril Elwell and Lon Fuller’s world-wide Federal arc enterprise: Amateur wireless operator Douglas Perham’s garage next to his Palo Alto, California house (the first “Silicon Valley Garage”). Later the company used all of this property. Lee de Forest did his 1911-13 Audion development work here. Perham worked for Federal and later established the Perham Collections of early wireless and radio artifacts, maintained with the support of David Packard and other industry leaders, now part of History San Jose. (Photo in Perham Collections, History San Jose)

1916, notably in broadcasting the 1916 early election results.<sup>177</sup>

Seasoned operators pushed the limits of old technology. In 1916 Dick Johnstone, as a Marconi operator at KPH on Hillcrest, and Tom Lambert on the tanker *J.A. Moffett*, callsign WRE, communicated for the whole voyage to China, 5,000 miles, each using only a galena crystal set for a receiver.<sup>178</sup> KPH handled much of the Marconi company’s marine work but did not use a vacuum tube receiver until 1917. While KPH ran five kilowatts power, the wireless on the *J.A. Moffett* cannot have been more than a few kilowatts. Johnstone was a popular operator at KPH. Other well known KPH operators were Haraden Pratt, Frank Shaw dating from PH days and “Pop” Hyde, who like LM was an old landline telegrapher and a very early associate of Lee de Forest. In 1916 Howard Seefred also used a Galena crystal set for transpacific reception. He logged Funabashi, Japan, some 6,000 miles away.<sup>179</sup> The ether was likely a whole lot quieter in those days, with little man-made noise and favorable geomagnetic conditions.

In October, 1916, *Electrical Experimenter* magazine featured a young woman wireless operator on its cover in full color.<sup>180</sup> The magazine declared Miss Kathleen Parkin of San Rafael, California to be an “Expert Radio Operator at Fifteen Years of Age.” She held a First Grade Commercial license and the amateur callsign 6SO. She made all of her own instruments including her ¼ kilowatt spark transmitter.

In November, 1916 the Navy’s transpacific radio telegraph circuit opened to commercial traffic. In January, 1917 San Diego’s Navy 200 kilowatt arc station first went on the air (S.N. Hooper, the early



Fig. 28. One of a few young women interested in wireless, Ms. Kathleen Parkin of San Rafael, shown as the cover-girl of the *Electrical Experimenter*. She held both a commercial and an amateur license at 16 year of age.

Navy wireless manager for San Francisco Earthquake traffic and now a high officer, worked the silver key).<sup>181</sup> Hawaii and Canal Zone transmitters followed at the end of the year. These arc stations as the Navy's transpacific chain provided the backbone of the Navy's Pacific communications.<sup>182</sup>

In late 1916 Henry Dickow founded the magazine *Pacific Radio News* in San Francisco, the first issue of which was published in January 1917. He started as an amateur in 1907 and went to sea as a newly licensed teenager in 1914, after LM told him to wear long pants. Dickow also helped, in 1909, to found the San Francisco Radio Club,<sup>183</sup> and was an officer in 1921.<sup>184</sup> *Pacific Radio News* evolved into the monthly *Radio*. *Radio and Television News* in the 1950s ran a series honoring early wireless operators such as Dickow, mentioned in this note. The ARRL's *QST* magazine from 1915, Gernsback's publications, and Dickow's

publications, and many others, all popularized radio developments and enthused thousands of young men (and a few women) about the new art both before and after World War One.

In April, 1916 Kilbourne and Clark's manufacture of wireless gear in Seattle led to litigation with American Marconi. Lee de Forest's old assistant C.B. Cooper acted as a principal in the trial.<sup>185</sup> Killbourne and Clark won in 1917.<sup>186</sup> Marconi as a British company faced disadvantages in the United States. Only its absorption as part of the Navy-created RCA "naturalized" it as American.

The technology was changing rapidly. In San Francisco in 1916 Otis B. Moorehead<sup>187</sup> established what became his vacuum tube manufacturing company in San Francisco, with backing from Elmer T. Cunningham. He manufactured the earliest high vacuum tubes. Irving Langmuir at AT&T had discovered that high vacuum improved triode performance, contrary to Lee de Forest's expectations. But de Forest explains Moorehead's post 1918 success as a result of a complex patent deal to make audions<sup>188</sup> as the only manufacturer. Thousands of Morehead tubes were produced for use in the First World War during the domestic patent-war truce, notably the Type B on a four-pin base, and the tubular "Electron Relay."

Cunningham and George Haller formed Haller-Cunningham Company in San Francisco to manufacture wireless gear, primarily the Impulse Excitation transmitter and also the HALCUN Type B receiver.<sup>189</sup> Haller was the first to suggest a cylindrical plate for the triode audions that he and others were bootlegging in San Francisco very early.<sup>190</sup> Cunningham later made a deal with RCA, using the

leverage of a defect in an RCA-owned patent, that gave him the right to cherry-pick its vacuum tube production as his own product<sup>191</sup> (e.g., the type 301 tube; RCA made the 201, de Forest made the 401, all the same triode). Cunningham was known as a hard-nosed businessman who later went to work for RCA.<sup>192</sup> Cunningham founded the Remler Radio Company (“Elmer” backwards with a couple of “r” let-

ters for “radio”) in San Francisco, which used the Scotty dog logo, and which lasted until about 1972.

The West Coast saw much other manufacturing activity. For example, in Los Angeles, A.J. Edgecomb opened The Wireless Shop as a successor to Edgecomb-Pyle of Pennsylvania. The Wireless Shop produced elegant “Audiotron” receivers.<sup>193</sup>



Fig. 29. Otis B. Moorehead of San Francisco, an early (1915) bootlegger of Audions, whom Lee de Forest considered the most “mischievous.” (Photo courtesy *Radio Age*). He worked with B.F. McNamee who had better equipment (and who went on to become the 1922 San Francisco Chronicle radio editor). His colleague George Haller suggested the cylindrical plate around a cylindrical grid in the tubular “Audiotron.” Elmer Cunningham financed him and saw the patent flaw that permitted the enterprise to flourish, and de Forest, as a result of the complex patent situation, was able to use him to manufacture his triodes circa 1918, thus making a friend of an old adversary.

## WORLD WAR ONE’S RADIO SILENCE

In early 1917 the war in Europe

**NEW PRICE**  
The Only Original and Genuine Double Filament  
**AUDIOTRON**  
(TRADE MARK)  
DETECTOR—AMPLIFIER—OSCILLATOR

HAS MET WITH SUCH A WONDERFUL SALE THAT WE CAN NOW OFFER IT AT THE  
EXTREMELY LOW PRICE OF

**\$5.25** **\$5.25**

(Patent Applied For)

Recent—most modern—tests prove the Audi-Tron to be at least 100 per cent more sensitive and stable than any other detector. It also has an average life of 1000 hours.

The price of the Double Filament Audi-Tron, with full instructions for making and operating, is only \$5.25. Terms: Cash or C.O.D.; Transportation Prepaid; Safe Arrival and Satisfaction Guaranteed. You can send your own quantity with your order.

Warning of Substitutes. The genuine—authentic—guaranteed—Audi-Tron is not a “so-called Audi-Tron,” “imitation,” “Electron-Audio,” “Tremmer Audi-Tron,” or any other “Tron.”

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**B Battery Potentiometer Unit**

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<b>B Battery Potentiometer complete</b>	<b>\$1.50</b>
Less Lever and Knob	.25
<b>Filament Rheostat complete</b>	<b>1.50</b>
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**Largest Line of Loose Couplers on the Market**  
All Styles, 200 to 15,000 M. All Prices, \$4.00 Up

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Best for catalog

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TERMS: Always Transportation Prepaid, Satisfaction Guaranteed, Cash  
**AUDIOTRON SALES CO., 315 Lick Building, San Francisco**

Fig. 30. A 1916 advertisement for Moorehead’s Audiotron and Cunningham-financed Audiotron Sales Company in San Francisco.

had been waged for almost three years. America joined in April, 1917. Interception by British Intelligence of the wireless Zimmerman telegram from Germany to Mexico triggered the declaration of war. Haraden Pratt was in charge of wireless on the West Coast for the Navy. Working from San Diego and Los Angeles, and Texas, he triangulated the location of a German wireless station transmitting from Mexico.<sup>194</sup>

America's entry into the Great War shut down all radio stations after April, 1917, especially amateur stations. There was great and justified fear of German espionage and sabotage at the time. The war shut down even commercial radio in the United States, except that of the armed forces or stations operated by them. Widespread wireless and radio experimentation stopped dead, but corporate



Fig. 31. A Los Angeles 1916 Audion bootlegger, Harry Roome. Roome had been one of the boy wireless interceptors of the Catalina circuit in 1911. Whatever the patent situation, the flood of triode vacuum tubes before and after World War One made the technology available to everyone with an interest in communications and its advancement, from RCA to every young man wanting to graduate from a crystal set.

improvement and manufacturing of radio equipment and components such as vacuum tubes flourished. So too did schools. In 1917 and 1918 Doc Herrold at his school in San Jose trained a thousand wireless operators for the Navy and Army in World War One. His College of Wireless earlier had earlier trained 1,200 maritime and

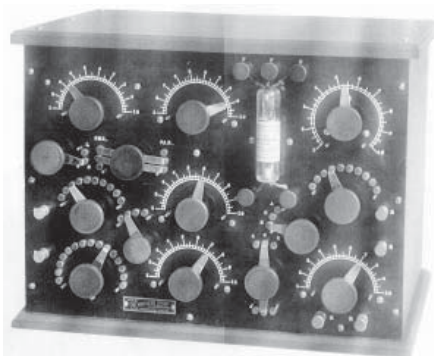


Fig. 32. An Audiotron receiver made by the Edgecomb Wireless Shop in Los Angeles, a successor to Edgecomb-Pyle back east. (Photo from Adam Schoolsky, CHRS collection)

commercial operators.<sup>195</sup>

Circa 1919 after the war the U.S. Navy was the largest user of wireless, with over a dozen stations in California (11th & 12th Districts), more than 20 in Oregon, Washington and Alaska (13th District) and three in Hawaii (14th District), as well as a large station at Darien in the Canal Zone in Panama.<sup>196</sup> In this period as many as 400 vessels equipped with wireless plied the Pacific Coast.<sup>197</sup> American Marconi, like the British Marconi company, enjoyed a near monopoly in commercial maritime wireless. The Navy-created Radio Corporation of America (RCA; initially 80% General Electric, 20% Marconi) soon swallowed American Marconi, as a result of the Navy's discomfort with such a facility being owned by foreign interests. American Marconi's operations provided the

foundations for RCA's worldwide communications networks, including the Radiomarine Corporation of America as of 1927.

In September of 1919 amateur radio operators came back on the air after World War One's prohibitions.<sup>198</sup> The San Francisco Radio Club was incorporated in May, 1919<sup>199</sup> in anticipation of the lifting of the wartime ban. It had been active well before World War One as well but went dormant in 1917<sup>200</sup> along with all other radio amateur enterprise. The club operates today as it has continuously

**FOR THE NEW YEAR—  
JAPAN LINKED WITH AMERICA**

Commercial wireless service between the Orient and Occident is Marconi's latest triumph in long distance communication.

From the new powerful and dependable duplex stations in California, near San Francisco, messages now flash daily across 6,512 miles of the Pacific Ocean to Fumabashi, in Japan.

At Hawaii, the Crossroads of the Pacific, the largest wireless station in the world instantaneously relays these transoceanic messages—signaling the union of the United States' prosperous island community with two continents.

One more link has been forged in the Marconi world-wide chain of service. With reliability, accuracy and economy, proven by performance, Marconi wireless offers the utmost in service and satisfaction.

*The new rates to the Orient are one-third and two-thirds lower than existing cable charges. Similar noteworthy reductions were made with the establishment of service to Alaska. Each year has ushered in new perfections and economies.*

Marconi wireless service is pre-eminent. For eight years trans-Atlantic service has been in daily operation—continent to continent—direct.

Within nineteen years of commercial life, Marconi wireless has become indispensable in the maritime field, invaluable in others. Regular communication has been established with ice-bound settlements and desert communities, and official running orders transmitted to moving railroad trains. Its service is dependable under all conditions, and embraces activities and locations inaccessible to any other telegraph system.

*More than 1,800 ships are equipped with Marconi wireless and its shore stations are landmarks in practically every country on the globe.*

Various types of Marconi equipment are designed for the merchant marine, warships, submarines, pleasure craft, motor cars and railroad trains; also portable signal corps sets, apparatus for aircraft, cavalry sets, knapsack sets and high-power installations for trans-ocean communication.

*Messages for transmission by wireless at reduced rates are accepted at the Marconi Office, 42 Broad Street, New York, and at all Western Union Offices in America and Canada.*

**Marconi Wireless Telegraph Co. of America**  
EDWARD J. HALLY, VICE-PRESIDENT AND GENERAL MANAGER  
Woolworth Building, NEW YORK

Fig. 33. American Marconi advertised its high power circuit to Japan in early 1917. A.A. Isbell was the construction and operations superintendent of the Bolinas/Marshall "rock crusher" trans-pacific station KEI. This was the last but loud last gasp of spark technology. The Navy took over the station in World War One. After that RCA put in Alexanderson alternators in its high power long wave operations. The Navy used Federal arcs, then vacuum tubes as they evolved and communications went to short waves needing less power.

for over one hundred years since 1909; it is now known as the San Francisco Amateur Radio Club.

In the twenty years since the 1899 message "Sherman in sight" wireless on the West Coast had evolved into major international communications circuits, reliable ship to shore messaging, and the beginnings of broadcasting. Almost everyone involved had enjoyed amateur radio operation as his introduction to the art. At the November, 1920 Pacific Coast Radio Convention, a hundred or more men sat for a group portrait. Several clubs help up placards including: "SF Radio Club," the "Bay Counties Radio Club" and the "Polytechnic Radio Club S.F."<sup>201</sup> (Dick Johnstone had attended Polytechnic High School).

Typical of the new companies coming to the fore in the maturing technology of radio, Colin B. Kennedy founded his radio company in San Francisco in 1919. Wireless pioneer R.S. Ormsby was one of his engineers. Kennedy made custom as well as production models and was known as the "wireless tailor" for his custom work.<sup>202</sup>

After World War One, vacuum tube receiver technology dominated. Commercial stations often used a one-tube receiver; regeneration could make for high sensitivity. For example, the Daly City, California station on Radio Ridge, known as the Hillcrest Station, used a tubular audion detector in 1919.<sup>203</sup>

## THE BEGINNING OF BROADCASTING

In March of 1920 Lee deForest established a broadcasting station, call sign 6XA, at the California Theatre in San Francisco with a vacuum tube transmitter he developed in 1915 and used in New York in 1916. He moved the station to Berkeley in the Fall.<sup>204</sup>

Doc Herrold and Ray Newby took out a license for broadcasting as 6XF (and 6FE portable) in San Jose. They also now used vacuum tubes.<sup>205</sup> Broadcast radio as we know it had come to the West Coast, 21 years after the San Francisco 1899 demonstration of the potentials of wireless.

De Forest and Herrold in Northern California provided the leading edge of what was soon to be the national radio broadcasting mania of the prosperous post-war 1920s. It was facilitated by the triode vacuum tube circuits derived from Lee de Forest's Audion invention of 1906. Cheap reliable receivers (and transmitters) could now be constructed and then mass-produced, benefitting from the advances in production during the war. "Radio" took off as an American institution of culture, news and entertainment.

At the same time, alternative means of generating continuous waves as carriers or as signals by interruption (such as Morse code) fell by the wayside. Federal's massive arcs of World War

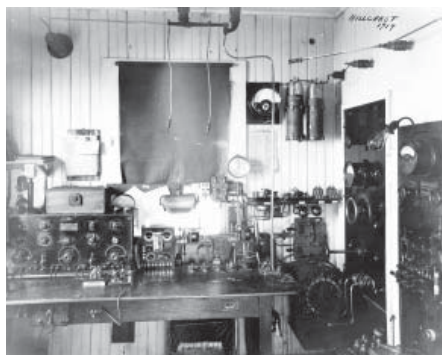


Fig. 34. The American Marconi soon to be RCA KPH Hillcrest, Daly City station in 1919, with its vacuum tube receiver. (Hal Layer, CHRS photo). KPH got its first triode receiver in 1917. KPH handled most of the marine traffic while KEI in Bolinas handled the long distance Hawaii-Japan circuit. KPH eventually relocated to Bolinas.

One could not compete with advancing vacuum tube technology, especially as shorter wavelengths and high frequencies were found so useful for distance work in the early 1920s. The Alexanderson alternators of the early decades (first conceived by Reginald Fessenden around 1904 and built at G.E. by Ernst Alexanderson ) also went obsolete. In the 1920s they were, however, for a while the backbone of RCA's high power long wave transpacific service from Bolinas to Hawaii and Tokyo, installed at KET in 1920 and 1921, operating at 13.1 KHz and 15.6 KHz. That very low frequency technology re-appeared in World War Two for communications from Hawaii to submarines.

A typical early radio broadcasting station of 1922 brings the story back to Telegraph Hill in San Francisco. Ralph Heintz (having formed his own radio company in 1921) established an AM Broadcasting station, KFDB, on the North side of Telegraph Hill:<sup>206</sup>

"Two [50] foot wooden towers and several smaller buildings appeared on the [Lombard and Kearny] corner in 1922. One building contained electronic gear, the other a well-padded studio, and all were for the radio station built by Ralph M. Heintz for the Mercantile Trust Company (now the Wells Fargo Bank). With its permit dated August 23, 1922 in hand, KFDB began broadcasting from its [1,000] watt transmitter (then considered the most powerful on the Pacific Coast) and under favorable conditions [it] could be heard as far away as Honolulu or Atlanta. Broadcasting time was brief: only one hour each morning, afternoon and evening during weekdays, while on Sunday the station was silent. The life of KFDB was short; by August 18, 1923 it was off the air. The towers and



the buildings were removed and in their place six flats were completed in the summer of 1925.”

The KFBD site was within blocks of the site of the first wireless experimentation in April, 1899 from the *Call* building to the South side of Telegraph Hill. KFDB looked out over the San Francisco Bay as had PH on Russian Hill more than a dozen years earlier.

Heintz recalled his 1922 radio station sixty years later in 1982:<sup>207</sup>

“The Mercantile Trust Company wanted to be able to broadcast produce, market quotations for advertising purposes, so I built them a transmitter. It was on Telegraph Hill, with the call letters KFDB. They put out the stock market and beef quotations: so much for prime, so much for something else, and so much for baloney bulls. Apparently, bulls were used for baloney in those days. And then eggs and all that, all the commodities, they did that, and then they put on a program in the evening of phonograph records, mostly. They gingerly tried studio broadcasts. This was in an old residence up on top of Telegraph Hill. It turned out pretty well as the first American broadcast station, as far as I know,



Fig. 35. The Bolinas, California American Marconi station low frequency antennas in 1917. The 1920-21 KEI alternators used a different antenna system of a line of radiating vertical towers with long lines of wire between them acting as a high capacity “hat” to permit very low frequency operation in the range or 15 KHz.

that had been heard in Australia.”

The Age of Radio Broadcasting had dawned with stations in California as well as the rest of America and the world.

#### ACKNOWLEDGEMENT

Many people have helped me with the research for this note. I am especially indebted to the late James Maxwell, ARRL, for his encouragement and sources from his collection and library, and I dedicate this note to his memory. I have tried to acknowledge particular people in the notes, especially photos and clippings and the like from Hal Layer and Paul Bourbin of CHRS. But I thank all those who have helped me, especially those I may have inadvertently omitted from the references, gathered over more than 20 years. It is an honor to belong to this community of scholars, historians and collectors.

#### NOTES AND SOURCES

<sup>1</sup> Thorn L. Mayes, *Wireless Communication in the United States* (New England Wireless and Steam Museum, East Greenwich, R.I., 1989) is the definitive text with respect to commercial operations. Arthur Goodnow, and Robert W. and Nancy A. Merriam of the Museum prepared it for publication.

So to, Linwood S. Howeth, (Captain, USN), *History of Communications-Electronics in the United States Navy* (USN Bureau of Ships, Washington, DC, 1963) tells the complete story of the Navy’s wireless and radio activities and much else. It is now available on line: <http://earlyradiohistory.us/1963hw.htm>.

Jane Morgan, *Electronics in the West* (National Press Books, Palo Alto, CA, 1967) is also very helpful. Hugh G. J. Aitken, *Syntony and Spark [and] The Continuous Wave* (Princeton, 1985), tells a complete story of the early technologies with attention to West Coast

- developments in two magisterial volumes.  
 Richard Johnstone (Commander, USN, Ret.), *My San Francisco Story of the Waterfront and the Wireless* (Privately printed, Sebastopol, California, 1965) charms with color and detail from 1899 forward, but Commander Johnstone's recollections after as many as 65 years fuzzed some of that detail; I am indebted to Diana Osborne, daughter of early wireless amateur Butler (Bert) Osborne, later W6US, for my copy as annotated by her father for greater accuracy.
- 2 Lee de Forest, *Father of Radio*, (Self-published, Chicago, 1950) introduction at 4. De Forest provides a wealth a detail about early wireless and radio but his agenda to promote Lee de Forest is clear and leads to omissions; nonetheless de Forest may deserve even more historical honors that he was willing to bestow on himself.
  - 3 *San Francisco Call*, August 24, 1899, front page; also Morgan, Ch. 1, *Wireless Waves and a Wild Welcome*, at 7. According to a sidebar in the *Call*, Charles M. Fisher was the telegrapher on board *Lightship 70*. Ashore, Lewis McKisick and H.J. Wolters at the Cliff House managed the receiver. The actual message as reported then was: "Sherman in sight." They had suggested the experiment.
  - 4 Cleveland Moffett, Marconi's Wireless Telegraph, *McClure's Magazine* (New York and London, June, 1899) at 99 (a thorough technical exposition); *Lightship East Goodwin* with antenna (and story of use) at 108-09. This issue of *McClure's* is archived in the Maxwell Memorial Library at the California Historical Radio Society. On April 28, 1899 the *Goodwin* suffered a collision and used its wireless to summon help, which was widely reported in the newspapers of the day. See <http://www.ramsgatelifeboat.org.uk/first-radio-distress-call.htm>
  - 5 This and much else about Charles D. ("Doc") Herrold comes from archival materials selected preserved by Professor Gordon B. Greb of San Jose State University, available on microfilm. The pages are not numbered. Professor Greb in 1959 documented his conclusion that Herrold was the first regular broadcaster. Gordon B. Greb, the Golden Anniversary of Broadcasting, *Journal of Broadcasting*, (Vol. 3, Winter 1958-'59) at 3 through 13. Professor Mike Adams of San Jose State University and Professor Greb followed up with the book *Gordon Greb and Mike Adams, Charles Herrold, Inventor of Radio Broadcasting* (MacFarland, Jefferson, N.C., 2003). Adams also did a one-hour video *Broadcasting's Forgotten Father* for PBS in 1995, including a late 1970s video interview with Herrold associate and early wireless amateur (and professional) operator Ray Newby. The title of the Bay Microfilm archive in five reels is: *Papers on the Origin of Radio Broadcasting in San Jose, Calif: 1909 [etc.] #740883*.
  - 6 Mayes, *supra*; the index provides 21 references, all favorable, to Shoemaker. He was widely respected then and now.
  - 7 Johnstone, *supra*, at 86; SWP (see *infra*); Tom Kneitel, *Radio Station Treasury, 1900-1946* (CRB Research, Cormack, N.Y.).
  - 8 Clark Radioana Collection, Smithsonian, SRM 101 052 p. 1, -101 017 ("daily schedule"). George H. Clark (USN, Ret.) devoted his working life to documenting radio history and gave his files, in hundreds of boxes, to the Smithsonian in the 1930s as the Radioana Collection. The equipment had first been tested in New York in August 1899 to communicate with a lightship. This experiment was also likely stimulated by the *McClure's Magazine* report of Marconi and newspaper reports regarding the *Lightship Goodwin*. Regarding Alcatraz, Dick Dillman, W6AWO, now a principal in the Maritime Radio Historical Society at the KPH site in Bolinas, has reported a substantiating interview recording

- archived at the San Francisco Maritime Museum.
- 9 Society of Wireless Pioneers publication(s) especially Spark Gap Times (California) -- hereinafter SWP – this published archive primarily of reproductions and reminiscences is also voluminous but random and scattered. Much of the information relevant here appears to come from Richard Johnstone (see note 1, *supra*).
  - 10 This widely studied event is accessible in Bartholomew Lee, Marconi's Transatlantic Triumph – A Skip into History, 13 AWA Review 81 (2000) and Bartholomew Lee, The Marconi Beacon Experiment of 2006-07, 21 AWA Review 1 (2008). See, *e.g.*, *The San Francisco Call*, December 15, 1901, front page: "Marconi Solves the problem of Signaling Across Atlantic Ocean Without Wires" (SWP).
  - 11 See, *e.g.*, the solicitation of investment in the Atlantic Radio Company, *Modern Electrics* (March, 1909) at 419: \$100 invested in Bell became \$200,000.
  - 12 John Schneider, *Voices Out of The Fog*, accessible on the California Historical Radio Society's Bay Area Radio Museum site, tells the McCarty story in detail. [www.bayarearadio.org/schneider/mccarty](http://www.bayarearadio.org/schneider/mccarty). The web Virtual Museum of the City of San Francisco has archived McCarty newspaper articles of the day, *e.g.*, [www.sfmuseum.org/hist/elwell](http://www.sfmuseum.org/hist/elwell), recounting Cyril Elwell's work on the McCarty system in 1908; [www.sfmuseum.org/hist/mccarty](http://www.sfmuseum.org/hist/mccarty), recording McCarty's April 1906 offer of wireless telegraphy facilities in earthquake response. A 1905 laudatory newspaper account in the *San Francisco Call*, September 24, 1905, at 9, appears at <http://chroniclingamerica.loc.gov/lccn/sn85066387/1905-09-24/ed-1/seq-9/>, reappearing at <http://earlyradiohistory.us/1905mcca>.
  - 13 In 1920, The San Francisco Chamber of Commerce noted: "... the National Radio Company has purchased property at Twentieth St., ... having a frontage of 245 feet by a depth of 95 feet. A modern factory building will be erected containing 48,000 square feet of floor space which will be devoted to the manufacture and perfection of wireless and radio equipment of all kinds. San Francisco Chamber of Commerce Activities, (Vol. 7 No. 14, April 2, 1920), accessible at [www.archive.org/stream/sanfranciscocham71920sanf/sanfranciscocham71920sanf\\_djvu.txt](http://www.archive.org/stream/sanfranciscocham71920sanf/sanfranciscocham71920sanf_djvu.txt).
  - 14 Robert H. Marriott, "As it Was in the Beginning" [his quotes in title] – A Personal Narrative ... Radio Broadcast (May, 1924) at 51; see also *Radio Pioneers*, (Institute of Radio Engineers (IRE), New York, 1945), Marriott was an IRE founder. See also *Radio-Craft* (March, 1938, reprinted Vestal press, 1987 as Jubilee Souvenir Number) at 559 along with reminiscences of many other early radiomen. See also Orrin E. Dunlap, Jr. *Radio's 100 Men of Science* (New York, 1944, reprint 1970). Norwood Teague and Joe Knight, *The 1902 Wireless Connection – Santa Catalina Island to San Pedro, California*, 20 AWA Review 97 (2007) tells the story in detail relying in part on Marriott's account, which is, however, somewhat more colorful in *Radio-Craft* (March, 1938) *supra*, at 560. Lee de Forest also quotes Marriott in the more colorful version in *Pioneer Radio Operators, CQ – The Commercial Radio Magazine* (Vol. II, No. 8, April 1933) at 21, 27.
  - 15 Mayes, *supra*, at 27ff.
  - 16 See, *e.g.*, photo of George S. Corpe, later W6LM, operating the Long Beach Station circa 1912 (from the collection of Paul Bourbin, CHRS).
  - 17 James T. Pogue, *Coast Guard Radio – A Guide ...* (Tiare Publications, Lake Geneva, WI, 1990) at 15; Johnstone, at 93.
  - 18 SWP.
  - 19 Haraden Pratt, *Sixty Years of Wireless and Radio Reminiscences* (typescript in the Perham Collections now at History San Jose, circa 1968). I am indebted to Will Jensby, WØEOM, CHRS, for my copy. Both Mayes and Morgan,

- supra* note 1, rely in part on Pratt.
- 20 Signals photo showing the Mare island installation as of 1904 and a radioman.
  - 21 Howeth, *supra* at 555; time from Mare Island at 109.
  - 22 Ed Marriner, *Wireless Point Loma*, Ham Radio magazine, (April, 1969) at 54.
  - 23 Furlong had been a San Francisco amateur wireless experimenter as early as 1903 according to Haraden Pratt, *supra*, at 2, getting five miles out a spark set and a detector of “two carbons and a needle.”
  - 24 By December 12, 1901, John Ambrose Fleming, although he designed the Poldhu station, had been sent back to London at the time of the test. Accounts claiming he worked the key are wrong.
  - 25 *Father of Radio*, Ch. 15: Overland Wireless, at 163.
  - 26 SWP, and C.B. Cooper sources and photos.
  - 27 *San Francisco Examiner*, January 2, 1905, front page (I am indebted to George Patterson, CHRS, for this original newspaper); Hugo Gernsback, Editorial: Tree Wireless, *Electrical Experimenter*, (Vol. VII, No. 74, June, 1919) at 98: wartime tree transmitter and receiver circuits worked for three miles, and trees as antennae permitted reception of European stations, all of which General Squire reported to the Physical Society, according to Gernsback.
  - 28 Johnstone, *supra*, at 5.
  - 29 SWP.
  - 30 SWP.
  - 31 Tom Kneitel, *Radio Station Treasury supra*; SWP.
  - 32 *Denver Post*, March 30, 1906, DeForest Wireless Telegraph Company advertisement: “DeForest Wireless Telegraph Company Comes to the Rescue of the Western Union Telegraph Co., The Postal Telegraph Co., the Telephone Co., Businessmen and Citizens of Los Angeles and San Diego” noting the service at the request of the landline companies, and reproducing newspaper stories about the event. Early wireless man E. N. (Elmo) Pickerill was the 1905 De Forest operator at Colorado Springs. He preserved this article in a remarkable scrapbook. The large scrapbook, full of contemporary published accounts of wireless success, is in the Clark Radioana Collection at the Smithsonian, Box 43.
  - 33 Howeth, *supra*, at 113, quoting S.N. Hooper.
  - 34 McCarty articles, *supra*.
  - 35 Herrold papers.
  - 36 SWP and photos.
  - 37 SWP.
  - 38 Pratt, *supra*, at 2.
  - 39 Photograph of PH radioshack circa 1915 looking to the West from Hillcrest; from George S. Corpe via the Paul Bourbin collection. Johnstone, *supra*, at 54, reports: two antenna poles, 250 feet high, a 500 foot long antenna between them, the shack in the middle, a galvanized wire groundscreen, and a 5 kilowatt rotary soak gap at 240 cycles.
  - 40 KPH still operates (as KSM and also as K6KPH) at Bolinas under the aegis of the National Park Service, as a historical site, administered by the Maritime Historical Radio Society and its principal Dick Dillman, W6AWO. See generally MHRs at [www.radiomarine.org](http://www.radiomarine.org) for KPH history.
  - 41 *Radio Station Treasury, supra*; Mayes, *supra*, at 75 for Pacific’s station SF.
  - 42 *Richmond Banner* [San Francisco newspaper], (August, 1908), from the Osborne family records courtesy of Diana Osborne.
  - 43 Conversation with Diana Osborne, Sonoma, California.
  - 44 Pratt *supra*; SWP.
  - 45 SWP.
  - 46 *Glorious Days at Old “PH,” Pacific Radio News*, (Vol. 1, No. 2, February, 1917) at 58.
  - 47 Johnstone, *supra, e.g.*, at 11, 21, 67, 75-76. Malarin, despite or perhaps because of his seniority, later found himself abused by RCA company politics (connectedness over competence) and went back to sea, after warning his friend Johnstone. Soon Johnstone suffered the same sort of RCA company abuse, so he

- rejoined the Navy in 1946.
- 48 *North Adams Herald*, [Mass.], Arthur Isbell Gets Wireless, (October 23, 1906), tells the story; the clipping comes from the Rachel Isbell Branch collection of family records, in the possession of Ms. Branch, their curator, who has made a video about her great uncle Arthur A. Isbell's career and archives: *KeySpark* (Privately produced, 2010, with support from Robert Merriam's New England Wireless and Steam Museum, which holds the first Massie station). Isbell asserted himself to be the fourth wireless operator in the history of the art, going back to August, 1902 with Lee de Forest.
- 49 Isbell kept a photograph of the window with the bullet hole; Rachel Isbell Branch collection, *supra*.
- 50 Howeth, *supra*, at 109; Mayes, *supra*, at 79 ff; see A.A. Isbell letter in Mayes at 221.
- 51 Johnstone, *supra*, at 22 in 1912; before 1912 Isbell "covered the waterfront in those days by horse and buggy."
- 52 *San Francisco Call*, April 3, 1912 in the Rachel Isbell Branch collection, *supra*; the bride's picture as it appeared in the newspaper appears in Ms. Branch's *KeySpark* video.
- 53 Pratt, *supra* at 8.
- 54 SWP
- 55 The late Jim Maxwell, W6CF, ARRL, CHRS, maintained an extensive library of radio history publications and archives. He assisted in the research for this note over the years; sources he provided are denoted "Maxwell papers." I am especially indebted to him for providing me with materials from Pacific Radio News as well as the archives from the Bay Counties Wireless Association and other specific research assistance. Much of his library is now housed at the California Historical Radio Society (CHRS) museum in the KRE building in Berkeley. Maxwell's copies of many early BCWTA documents apparently came from the estate of Kenneth V. Laird, who used callsign SAL running 5 kilowatts on 975 meters before 1912.
- 56 Pratt, *supra*.
- 57 Ellery W. Stone, *Elements of Radio Communication* (New York, 1919; 3d ed. 1926).
- 58 Maxwell papers, BCWTA archives, Constitution and By Laws, Art. III, Sec. II.
- 59 Edward D. Stevens, They Used to Call it Wireless, San Diego Historical Society Quarterly, (Vol. IX, 1963) reprinted SWP, Society of Wireless Pioneers, Year Book 1971, at 23. Stevens asserted himself to have been the second amateur wireless operator in San Francisco after Larzelere.
- 60 Pratt, *supra* and Maxwell papers: BCWTA archives 1907 membership list.
- 61 Maxwell papers: BCWTA archives, Minutes, January 3, 1913 (74<sup>th</sup> meeting). By March of 1913, the club had held 76 meetings over more than five years.
- 62 Johnstone, *supra*.
- 63 SWP.
- 64 List of Wireless-Telegraph Stations of the World (U.S. Navy, Bureau of Equipment, G.P.O., Washington, D.C., 1907).
- 65 Glorious Day at Old "PH," *Pacific Radio News*, (Vol. I, No. 2, February, 1917), at 58. Pacific Radio News, which became a Radio Magazine, and similar publications, played an important role in interesting young men and the public in general in the radio arts. This was foundational to the broadcast radio craze of the early 1920s.
- 66 SWP.
- 67 Johnstone, *supra*, at 8, and a \$10 premium for tanker service (at 32); KPH operators got \$90 a month, with a \$10 premium for the third trick, Midnight to 8 AM (at 57).
- 68 *Modern Electrics* (Vol. I, No. 1, April, 1908; reprinted 1958) at 18 and map.
- 69 Herrold papers.
- 70 Pratt, *supra* at 5; SWP. The Bay Counties Wireless Association membership list circa 1908 shows Ralph Wiley with the callsign SRW at 5 KW and C. Kellogg with the

- callsign SCM at 2 KW, both in San Francisco operating spark sets (Maxwell papers).
- 71 Wireless Telegraph Contest [monthly], *Modern Electrics* (Vol. II, No. 8, November, 1909) at 377.
- 72 Gap to Hawaii Bridged by Wireless Men, *San Francisco Call*, Oct 12, 1908; this clipping comes from the Rachel Isbell Branch collection, *supra*.
- 73 SWP, Pratt, *supra*, at 7.
- 74 Howeth, *supra*, at 171.
- 75 SWP & photos.
- 76 Pratt, *supra*, at 15.
- 77 SWP.
- 78 George H. Clark Radioana Collection. Meneratti's recollections and his log from the 1908 period are indexed as SRM 134-469A and pages following. I thank Mike Adams of CHRS for retrieving these materials. Haraden Pratt also heard Meneratti's music, but not well; Pratt, *supra* at 5.
- 79 Clark Radioana, SRM 134-469A at paragraph 15.
- 80 Rough Log of Herbert J. Meneratti ... 1908, Clark Radioana SRM 134 517 p:1 [ff] at May 26 [1908].
- 81 Clark Radioana, SRM 134-469A at paragraph 19.
- 82 Clark Radioana, near 1345-469A but unnumbered.
- 83 Johnstone, *supra*, at 10-11.
- 84 Herrold papers.
- 85 Wireless Operators Monument, Battery Park, New York; Veteran Wireless Operators Association photograph, 1992.
- 86 SWP.
- 87 Johnstone, *supra*, at 62.
- 88 The Sinking of the Roanoke, *Wireless Age* (July, 1916) at 691, poem at 692; stories of rescues follow at 695ff.
- 89 For example, San Francisco (Fort Miley) Massie station operator Duncan died from a lightning strike, electrocuted while transmitting, according to Bert Osborne's notes on Johnstone, *supra*, note 1. Cf. All Radio Heroes are Not Found at Sea, *Electrical Experimenter*, (Vol. IV, No. 42, October, 1916) at 413: Astoria, Oregon operator severely burned manning his post in a storm. Dick Johnstone at KPH was blown out of the shack and stunned by a lightning strike in 1916, coming "to out in the rain"; Johnstone, *supra*, at 55. KPH was destroyed and operated for a while at the Army Presidio station WVY.
- 90 List of Wireless-Telegraph Stations of the World, 1907, *supra*.
- 91 Pratt, *supra*, at 7: CH took over for PH when it discontinued at Russian Hill and moved to Hillcrest in Daly City; photo from Mayes.
- 92 Johnstone, *supra*, at 11.
- 93 Glorious Day at Old "PH," *supra*, at 58.
- 94 *Radio News* (September, 1931).
- 95 Morgan, *supra*, at 23.
- 96 Ross G. Miller, Youthful Wireless Operators in San Francisco, *San Francisco Chronicle*, December 26, 1909 at 3. The story appears to be generic, into which San Francisco details have been inserted.
- 97 Morgan, *supra*, at 42.
- 98 See Federal Telegraph Company pamphlet for the Pacific Radio Exposition, circa 1920, with a photograph of the Beach Station. Federal calls itself: "Builders of the world's largest radio stations." It offered radio-telegraph service between Seattle and San Diego and cities in between at "15 words for the usual price of 10." For communications with ships at sea, it listed its stations KFS San Francisco, KEK Portland and KOK Los Angeles.
- 99 SWP.
- 100 Morgan, *supra*, at 32.
- 101 Stone, *supra* (1919 ed.) at 202.
- 102 Herrold papers, EI affidavits.
- 103 *Modern Electrics* (Vol. III, No. 5, August, 1910) at 274, photo.
- 104 *San Jose Mercury News* interview, Herrold papers. Johnstone notes Newby's service on eleven vessels to 1925, at KPH at Hillcrest, and at TK in Nak Nek, Alaska in 1911; Johnstone, *supra*, at 136.
- 105 SWP; Johnstone, *supra*, at 83;
- 106 Fong Yee, the Wireless Expert, *Popular Electricity* (Vol. IV, No. 2, June, 1911), reprinted as High Power Wireless Equipment (Lindsay Publications, Bradley, IL, 1988) at 94. His exploits gave rise to the legend of "Dragonwings" in

- the Bay Area Chinese community, including a book, Laurence Yep, *Dragonwings* (Harper Collins, New York, 1975) and a play by Yep of the same title at the Berkeley Repetory Theater in 1992. San Francisco Chronicle, December 17, 1992 at C-3. Fong Yee's name is also reported as Fong Joe Guey, Feng Ru, Fong Yue and variants.
- 107 Seattle Boy Takes World Record, *Seattle Sunday Times*, (October 30, 1910) front page (reprint, Radio-Craft (August, 1935) at 121; see also photo of Dubilier's 300 foot high antenna mast in *Electrical Experimenter*, reprint: High Power Wireless Equipment, *supra*, at 93.
- 108 Radio's 100 Men of Science, *supra*, provides a biography at 231.
- 109 SWP.
- 110 C. Howard Bowers, *Wireless Operators of Old*, *Radio and Television News*, 1953-54: "Carbon Copy," March, 1953 -- Bowers as the 1915 operator on the "Yankee Mail Boat" *Sonoma* between San Francisco and Sydney; "Mr. Wireless" Edwin W. Lovejoy, December, 1953 at 173; John O. Ashton, of Palo Alto, sine JO, who enjoyed a distinguished career and who was a member of the IRE, and who claimed to have heard Marconi's "S" from Poldhu in 1901, March, 1954; R.S. Ormsby, since 1911, who also recalled the strike of wireless operators, April, 1954 at 83; Ralph L. Hazelton, since 1910 in Santa Cruz, starting with gear from the 1910 EI catalog, later a high official of the Civil Aeronautics Board, April, 1954; Sydney J. Fass, since 1909 with Haraden Pratt and Dick Johnstone, June, 1954 (with photos); John M. Boyle, who recalled checking in with Lawrence Malarin (LM) at the Merchant's Exchange Building in San Francisco for assignments circa 1912, June, 1954. This series is cited herein as TVRN.
- 111 SWP; TVRN.
- 112 Mayes, *supra*, at 67. In 1912 Marconi took over 70 United Stations.
- 113 Howard Seefred log, in the Perham Collections, now archived at History San Jose.
- 114 Mayes, *supra*, at 67.
- 115 Cf. Mayes, *supra*, at 55.
- 116 Mayes, *supra*, at 69.
- 117 TVRN.
- 118 SWP, Pratt, *supra*.
- 119 Perham Collections, now archived at History San Jose. Mayes, *supra*, at 113.
- 120 Perham Collections, now archived at History San Jose.
- 121 Herrold papers, License.
- 122 Herrold papers.
- 123 Pratt, *supra*.
- 124 TVRN, SWP.
- 125 Photo from the collection of Hal Layer, CHRS
- 126 SWP, Pratt *supra*.
- 127 See Bartholomew Lee, How Dunwoody's Chunk of 'Coal' Saved Marconi and De Forest, 22 *AWA Review* 135 (2008).
- 128 Johnstone, *supra*, at 45ff; Rule number two prohibited unnecessary talk between operators at sea.
- 129 SWP, Pratt, *supra*.
- 130 Johnstone, *supra*.
- 131 TVRN.
- 132 TVRN.
- 133 Seefred log, *supra*, newspaper clippings; *Modern Electrics* (September and December, 1911); see Bartholomew Lee, Radio Spies, 15 *AWA Review* 7, 9 ff.
- 134 Seefred log, *supra*.
- 135 Mayes, *supra*, at 145; Federal charged two cents a word vs. 16 cents a word by the cable companies.
- 136 SWP.
- 137 Mayes, *supra*; as of 1915, the Marconi company operated station KDC at the Cooper Queen mine in Douglas, Arizona with a range of 75 miles. The Yearbook of Wireless Telegraphy and Telephony – 1915 (Marconi Publishing Corporation, New York, 1915) at 347.
- 138 Father of Radio at 277 ff. De Forest for this circuit also invented what we call frequency division multiplex transmission, which he called "diplex," using a fast switch alternately to provide two operators of one arc with

- two different frequencies for simultaneous operation.
- 139 SWP.
- 140 Pratt, *supra*.
- 141 TVRN.
- 142 Glorious Day at Old "PH," *supra*, at 58.
- 143 Glorious Day at Old "PH," *supra*, at 60.
- 144 Herrold papers.
- 145 Glorious Day at Old "PH," *supra*, at 58.
- 146 Glorious Day at Old "PH," *supra*, at 58.
- 147 Glorious Day at Old "PH," *supra*, 58; cartoons in the log illustrated static and caricatured the operators.
- 148 Seefred log, *supra*.
- 149 Clinton B. DeSoto, Two Hundred Meters and Down (ARRL, Newington, Conn., 1936, 1981) at 31ff.
- 150 SWP, Pratt, *supra*.
- 151 Howeth, *supra*, 150: De Forest Radio telephone Company, 1907.
- 152 Experimentation continued. In December, 1912 successors to McCarty (probably National) conducted wireless telephone tests between Los Angeles and Point Loma, San Diego, 135 miles. Herrold papers.
- 153 Herrold put the arcs into liquid hydrocarbons, which permitted a sustained arc. Herrold (like de Forest and especially early wireless pioneer John Stone Stone) was also quite mathematical in his approach to many problems. Herrold papers.
- 154 Herrold papers.
- 155 Institute of Radio Engineers, 50th Anniversary Proceedings, (IRE, 1962).
- 156 Radio's 100 Men of Science, *supra*, provides a biography at 250.
- 157 Father of Radio, at 375, Ch. 40: Historic Litigation, regarding the dispute with Armstrong.
- 158 Gerald F.J. Tyne, The RJ-4 Mystery, Antique Wireless Association (AWA) Monograph (NS. No. 1, 1978).
- 159 And rightly proud of it he was; Father of Radio, at 293ff: "... a discovery which was destined a few years later to completely revolutionize the entire art of radio transmission." See also 303ff, recording his notebook entry: "This day I obtained the long-sought-for *beat note* phenomenon." It was on this entry that the dispute with Armstrong turned.
- 160 George H. Clark typescript "About DeForest 1924 +-", Radioana Collection, unnumbered, near SRM 124-973A. This event persuaded the Supreme Court of the United States (Justice Benjamin N. Cardozo writing for the Court) to give de Forest patent priority over Edwin Howard Armstrong because oscillation was primary and earlier invented and regeneration but an application of it, as next set forth.
- 161 *Radio Corporation of America vs. Radio Engineering Laboratories*, 293 U.S. 1-14 (1934), *i.e.*, volume 293 of the United States Reports of Supreme Court cases at pages 1 through 14; the quotes comes from 293 U.S. at 14.
- 162 *Electrician and Mechanic Magazine* data reported in Mayes, *supra*, at 19.
- 163 Herrold papers.
- 164 New Wireless Plant is Being Installed Here, *The Humboldt Times*, October 29, 1913, front page: "...a duplicate of the Hillcrest station in San Francisco." I am indebted to Sterling K. Jensen for this story. See photo, "Radio Eureka Calif - 1913 - " from the collection of Hal Layer, CHRS.
- 165 Marconi companies Yearbook ... - 1915, *supra*, at 33, 346.
- 166 Marconi Conference Center, Marshall, California advertisement and photograph of the refurbished hotel.
- 167 Conversation with pioneer wireless operator William Brenniman, a principal of SWP. "Gink" was a 19<sup>th</sup> century term for as hobo as well.
- 168 Morgan, *supra*, at 64.
- 169 Herrold papers. Ellery Stone had been a member of the Bay Cities club as of 1912. His personal amateur callsign was LM. (Another later San Francisco Radio Inspector in the club was Bernard Linden, callsign HP). BCWTA, Minutes, April 12, 1912 in Maxwell papers. True to form,

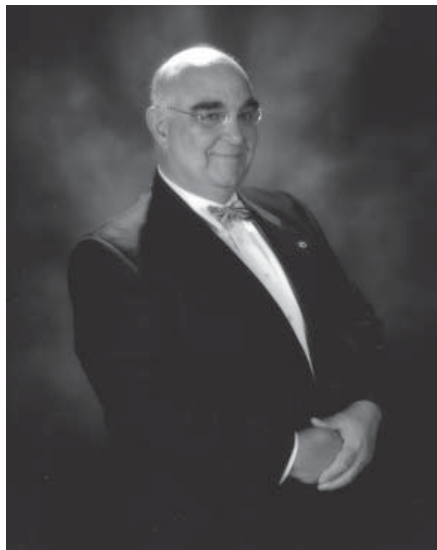


- de Forest in his autobiography does not mention this 1915 event, but rather concentrates on how he had to claim credit for the vacuum tube amplifiers that made transcontinental telephony possible because AT&T did not mention his contribution. Father of Radio at 328ff. Similarly he risked death on the wartime high seas to travel to Paris to claim due credit for the transatlantic radio-telephone tests of 1916. Father of Radio at 333ff. Lee de Forest was not one to keep his candle (or audition) under a bushel, cf. Matthew 5:15: "Neither do men light a candle, and put it under a bushel, but on a candlestick; and it giveth light unto all that are in the house." (King James version).
- 170 Howeth, *supra*, Appendix A Timeline, 1915, at 525-26.
- 171 Morgan, *supra*, at 68, 95, 145.
- 172 Callbook of 1913 and Supplements 1, 2 & 3, reprint Old Old Timers' Club (circa 1960s), from Maxwell papers.
- 173 Morgan, *supra*, at 58
- 174 Morgan, *supra*, at 68, 89.
- 175 Father of Radio at 332.
- 176 Herrold papers.
- 177 Father of Radio at 338
- 178 Johnstone, *supra*, at 54-55, 60.
- 179 6000 Miles on Galena, *Pacific Radio News*, (Vol. 1, No. 2, February, 1917) at 61.
- 180 The Feminine Wireless Amateur, *Electrical Experimenter*, Vol. IV, No. 42 (October, 1916) at 396 and cover.
- 181 Howeth, *supra*, at 224.
- 182 Howeth, *supra*, at 224.
- 183 TVRN.
- 184 *Pacific Radio News* (Vol. III, No. 3, October, 1921) at 103.
- 185 SWP.
- 186 Killborne & Clark, *Pacific Radio News*, (Vol. I, No. 1, January, 1917).
- 187 Moorehead had been a wireless operator working for A.A Isbell on Alaska stations that Isbell put into service with the lower forty-eight, before Moorehead got into the vacuum tube bootlegging business. Pratt, *supra*, at 19.
- 188 Father of Radio at 326, 354; before this deal the "mischievous" Moorehead bootlegged triodes (at 332). Articles with photos of the factory appear in *Radio Age* (Vol. 16, June & September, 1991) and cover.
- 189 See, e.g., Haller Cunningham Company Closes Important Marine Contracts, *Pacific Radio News* (Vol. 1, No. 2, February, 1917) at 61.
- 190 Conversation with Thorn Mayes, Jr.
- 191 SWP, Pratt, *supra*, at 20.
- 192 Pratt, *supra*, at 20.
- 193 I am indebted to Adam Schoolsky of CHRS for providing me with a large series of photographs that tell the story of Edgecomb.
- 194 Pratt, *supra*, at 18.
- 195 Herrold papers.
- 196 Howeth, *supra*.
- 197 SWP.
- 198 De Soto, *supra* at 55, Ch. 9: Back on the Air.
- 199 Incorporation document from the archives of the California Secretary of State, 1919.
- 200 The S. F. Radio Club, *Pacific Radio News*, *supra* (Vol. I, No. 1, January, 1917) at 7. Pacific Radio News publisher and editor Henry Dickow, a founder, was very active in the club.
- 201 *SWP Sparks Journal* (Vol. 8, No. 1, Sept. 20, 1985) at 20-21.
- 202 SWP.
- 203 Photo from the collection of Hal Layer, CHRS.
- 204 Father of Radio, at 354ff.
- 205 Herrold papers; the vacuum tubes were made in San Francisco, likely by Moorehead.
- 206 David Myrick, San Francisco's Telegraph Hill (Howell-North Books, Berkeley California, 1972) at 201.
- 207 Ralph M. Heintz: Technical Innovation and Business in the Bay Area, 1982 interview by Art L. Norberg, Bancroft Library, University of California, Berkeley, History of Science and Technology Program; I am indebted to the late Hank Olson, W6GXN, CHRS, for the Heintz quote and source.

## ABOUT THE AUTHOR

**Bartholomew (Bart) Lee, K6VK, xKV6LEE, WPE2DLT**, is a long time member of AWA and the California Historical Radio Society, for whom he serves as General Counsel Emeritus. He has enjoyed radio and radio-related activities in many parts of the world, in the last year in Italy and Sicily (radio from North Africa is fascinating even though it's mostly in Arabic). Radio technology and history have fascinated him since he made his first crystal set with a razor blade and pencil lead more than 50 years ago. He is especially fond of those sets of which it is said: 'Real Radios Glow in the Dark.' Bart is a widely published author on legal subjects and most recently on the history of radio. He has, in many forums, including most recently the annual meeting of the American Vacuum Society, written about and lectured on early radio technology, radio intelligence activities ('episodes in the ether wars') from 1901 into the latter 20<sup>th</sup> Century, wireless telegraphy especially Marconi's early work, wireless developments in California and the West Coast since 1899, short wave radio, radio ephemera including radio stamps, and radio in emergency and disaster response. Since 1989 he has made some 20 presentations to the AWA conferences on his research interests including the development of television in San Francisco in the 1920s. The AWA presented its Houck Award for documentation to him in 2003 and the California Historical Radio Society made its 1991 'Doc' Herrold Award to him in connection with his work for the Perham Foundation Electronics Museum. In 2001, during disaster recovery operations in New York after the '9/11' terrorist enormity, he served as the

Red Cross deputy communications lead from September 12 to September 21, (the 'night shift trick chief'). He has served as the Liaison Officer for the San Francisco Auxiliary Communications System (ACS – RACES) and as an ARES Emergency Coordinator. He presently serves as an ARRL Government Liaison and Volunteer Counsel. Bart is a litigator by trade, having prosecuted and defended cases in both state and federal court. He also taught Law & Economics for 20 years, including the economic history of telecommunications. He is a graduate of St. John's College (the 'Great Books School') and the University of Chicago Law School. Bart's son Christoffer Lee is also a licensed amateur radio operator and is now finishing law school. Bart invites correspondence at: [KV6LEE@gmail.com](mailto:KV6LEE@gmail.com)



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