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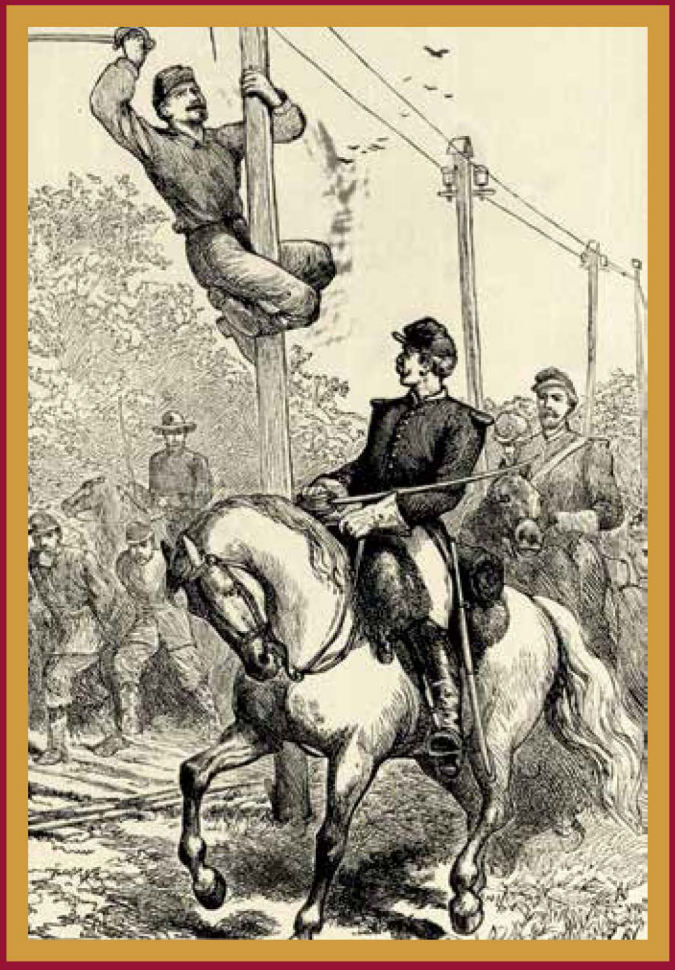

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Mount Hood Calling

The Western Forest Wireless Tests

Abstract

In the early days of the U.S. Forest Service, the agency explored a number of technologies for communicating over vast areas of forestland. The telephone soon became the favored means of communication, and the Service installed a vast telephone network with thousands of miles of wire strung on trees. In 1912, employees of the Service in the Northwest, often referred to as foresters, began to discuss the use of aircraft and radios to detect and report forest fires and coordinate firefighting efforts. Finally, at the end of World War I, radiotelephone technology and manpower became available to test some of these ideas. In 1919, the foresters in the Northwest began testing Signal Corps radiophones developed during WWI to see if they could replace wired telephones. During three fire seasons from 1919 through 1921, wireless sets were tested at selected locations in the forests and cities, including the lookout cabin atop Oregon's Mount Hood. Radio pioneers throughout the West partnered with the Forest Service to conduct the wireless tests and analyze the results. While the results were promising, decision makers concluded that the technology had not yet been developed to the point where it was practical for deployment. The radio would not come into regular use for forest communications until the 1930s. Recounted here are the stories of the foresters and radio amateurs who conducted the Western Forest Wireless Tests.

Introduction

During its first fifteen years, the U.S. Forest Service built and relied on a vast telephone network for communications in the forest (Figure 1). The telephone system had obvious shortcomings associated with cost, reliability, availability, and maintenance. For example, the cost of installing telephone wires was about $100 per mile,[1] and the lines required constant patrolling and maintenance. Although they were placed high to avoid damage from wildlife and minimize hazards to hikers, wires were constantly damaged by falling tree limbs. And, of course, a wired system was impractical for communication along a rapidly moving fire line.

Fig. 1. Forest Service Lookout Lige Coalman (left) atop Mount Hood with an Osborne fire-spotting device. Reports of smoke were reported using the portable phone at his feet. (U.S. Forest Service Photo; courtesy of Mount Hood National Forest)

In December 1912, C. B. Cooper of the Marconi Wireless Telegraph Company's Seattle office spoke about radio at the Western Forestry and Conservation Association's annual Forest Fire Conference. Officials of the U.S. Forest Service listened with interest as Cooper extolled the possibility of using wireless telegraphy in the forests to replace the thousands of miles of telephone lines then in use. The technical realities of the time were far less promising because transmitters were bulky and required substantial power supplies. Cooper described a yet-to-be-designed modular wireless telegraphy system that would be transported by mules—and was effectively limited to code transmission only.

Following the conference, Coert DuBois, who was with San Francisco office of the Forest Service (Figure 2), wrote that in theory, the wireless telephone held promise for replacing the wired telephone network. But he also believed a code-based system, using the bulky and sensitive equipment then available, was simply not practical:

> "The telegraph, both wireless and metallic circuit, obviously fails to meet the essentials of a protection communication system. It requires delicate, specialized, and expensive instruments and equipment; a continuous supply of chemicals not generally obtainable, or else an engine and motor

Fig. 2. Lt. Colonel Coert DuBois in his uniform from World War I. (*American Lumberman*, Nov. 1, 1919, p. 85)

> to generate the sending power; it requires special training on the part of everyone who uses it, and has a wide possibility of error. In theory the wireless telephone most nearly meets the essentials of the ideal forest communication system."[2]

J. R. Irwin appeared on behalf of Marconi a year later at the 1913 Forest Fire Conference in Vancouver, British Columbia, to provide an update. In the years that followed, sporadic tests and demonstrations were conducted. For example, in 1916, Dubois brought Dr. H. Barringer Cox (Figure 3) to the Forest Service's San Francisco offices to demonstrate and further develop an invention that he claimed was a practical portable wireless telegraph. Although early tests were widely touted in the media, the Cox system was not deployed commercially. During the summer of 1916, Ranger William R. Warner who was stationed near Clifton, Arizona, became interested in the potential of wireless communications. With the help of Ray Potter, a local high school student and radio amateur, the necessary equipment was purchased and installed. The first test message was sent from the Baseline Ranger Station on November 26, 1916.

Fig. 3. Dr. H. Barringer Cox demonstrates his vest-pocket wireless telegraph system. A ground connection is made through a spur attached to a shoe. His cane contains the antenna which is raised for better reception. (*The Oregonian*, Oct. 5, 1915, p. 3)

That fall, bids were solicited for radiophone equipment by L. V. Slonaker, the telephone engineer for District 3.[3] One of the respondents was William Hanscom, the chief engineer for the National Radio Company, a manufacturer of receivers and damped-wave wireless telephone transmitters. Though National would eventually have a chance to demonstrate its equipment for the Forest Service as part of the Forest Wireless Tests, the District 3 bids apparently did not result in purchase. A few other wireless trials have been

documented from the prewar period, but nothing was widely implemented by the Forest Service.

The war in Europe necessitated substantial investments in military radio technologies, which included practical portable radiotelephone sets. After the war ended in 1918, there was a temporary surplus of equipment and manpower. Recognizing an opportunity for further testing of wireless equipment, foresters went to Washington D.C. seeking to borrow radiotelephones from the military. On March 3, 1919, representatives of the Forest Service and the Army Air Service met to discuss using airplanes for fire detection. Ultimately, the Army provided planes and pilots during the summer months for fire patrol work and also provided wireless telephones for testing. The phones were to provide not only point-to-point communication, but also to serve as ground receiving stations for the Army planes that carried transmitters.[4] Implementation of the plan fell to forester Col. DuBois, who had recently returned from Army service, and Col. Henry H. "Hap" Arnold, who supervised the expansion of the U. S. Army Air Service during the war.[5] Forest Service telephone engineers in the Northwest and Intermountain Region were selected to conduct the radio tests.

Part 1 describes the tests made in Oregon by Clay Allen's team from 1919 to 1921. Part 2 covers the tests made by R. B. "Ring Bell" Adams and his team in the Intermountain Region during the same period.

Part 1 The Oregon Tests

1919 Fire Season

In 1915, the Forest Service established a fire lookout station on the 11,250-foot summit of Mount Hood, the highest point in Oregon. The first lookout station was a Russian-style arctic tent tied down to a wooden platform in a hollow a few yards from the summit. Elijah "Lige" Coalman (1881–1970) built a permanent wooden cabin that he began in 1915 and finished in 1916 (Figure 4). An external alidade (fire spotting device) remained operational on the summit even after the lookout was finished to provide visibility into the Bull Run Reserve, Portland's main source of drinking water (Figure 1). Lige manned it during the summers of 1916 to 1918 to watch for fires.[6] He also performed search and rescue missions, served as a telephone lineman, a mountaintop host for cold and weary climbers, a weatherman and any number of other roles. After suffering several climbing injuries, he finally resigned in September 1918, but continued to guide climbers occasionally.

During the summer fire seasons from high summer until the fall rains—usually July through September—the lookout communicated observation reports by telephone down the south side of the mountain to Government Camp, about eight miles below. A second telephone line ran down the north side to Cloud Cap Inn. The Forest Service used a single-wire system in which the ground was used as the "return" (second conductor). Because of the weight of the #9 galvanized iron

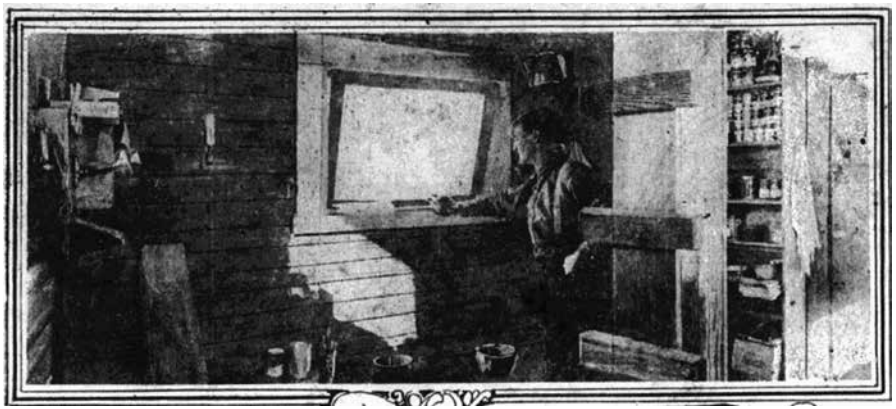

Fig. 4. Interior of the Mount Hood Lookout shortly after its completion in the summer of 1916. Note the telephone mounted on wall to the left and the ladder access to the cupola in the foreground. Lige Coalman stands at the window keeping watch for fires. (*The Oregonian*, Sept. 9, 1916, p. 4)

wire, and for ease of maintenance, telephone wire came in lengths of 250 feet. Incredible as it may seem, the wire lines to the lookout were installed each summer and then rolled back up by hand each September and stored for the winter. In the forest, trees and animals frequently damaged the lines. And on the snowfields of Mount Hood, falling rocks, chunks of ice, and snow slides regularly broke the telephone wires. Using this method it sometimes took two or three days to report a fire, because "one or both of the lines were more often out of commission than in working order."[7]

The Mount Hood lookout was selected as a site for the 1919 wireless tests in order to evaluate the operation of radios at high altitudes and to determine if they would be an efficient alternative to telephones, with all the attendant problems of installing and maintaining wires to the lookout. The year 1919 also marked the inauguration of fire patrol flights over California and Western Oregon using Army aircraft. The Forest Service used these tests as an opportunity to see how a network of ground receiving stations could be utilized as a means of relaying reports from the planes. At the time, only a few Army planes were equipped with telegraph or telephone transmitters. Those planes without radios conveyed their reports by releasing carrier pigeons, dropping weighted messages, or by landing the plane and finding a telephone.

Clay M. Allen, the Pacific Northwest District Telephone Engineer was selected to lead the test team for the radio tests on Mount Hood between 1919 and 1921. Allen began his telephone career at the Chicago Telephone Company and later worked at Pacific Telephone and Telegraph. He started working for the Forest Service in 1916

where he developed innovative new devices and techniques to improve communications in the forest. He shared his knowledge at speaking engagements throughout the west and in the many essays and manuals he wrote.

Because Allen had little radio experience, he solicited help from several local amateur radio operators to help conduct tests in various Portland locations, including the basement of his own home. Chas. L. "Charlie" Austin (1890–1980), one of Oregon's true radio pioneers helped Allen with the tests. As a boy of 13, Austin reportedly built his first receiver using a coherer detector and a transmitter using an induction spark coil. During the summer of 1905, he exhibited a wireless receiver at the Lewis and Clark Exposition in Portland.[8] Newspaper accounts dating back to January 1908 describe wireless demonstrations at local libraries with Austin and amateurs Charles Fine, Rigland Savage and Lee James operating under the auspices of the "Portland Boys' Wireless Telegraph Club." Austin's earliest known call sign circa 1908 was "SN." Later calls included 7DK, 7ZI, and 7ZK. Austin had a lengthy and varied career in radio. Prior to World War I, he served as a ship's radio officer on the steamer *Rose City*.

After enlisting in the U.S. Navy, he was put in charge of the Federal station in Lents, Oregon, located on the southeast edge of Portland. Later, he was appointed Naval Radio Inspector in Portland and recruited ship wireless operators. Following the war, Austin returned to his amateur and commercial radio interests. He organized local amateurs as the Northwest Radio Association and built and installed commercial broadcast stations. In the 1920s, Austin built home receivers under the name Northwestern Radio Manufacturing Company or "Norco." When the City of Portland organized a radio shop, he was hired as a radio technician, retiring in 1955.

The tests in 1919 were performed with a pair of SCR-67-A radiotelephone/telegraph sets that R. B. Adams had obtained from the Signal Corps. Adams shipped one pair to the Forest Service's District 6 headquarters in Portland, Oregon, for use on Mt. Hood, and retained the other pair for tests in Montana and Idaho, which are described in Part 2. Although District 6 received permission to begin wireless tests from the Navy around July 1, 1919,[9] initial tests were performed in semi-secrecy until concerns about the right to use the sets without licenses or permits from state and local authorities were addressed.[10] These tests were conducted between two Portland-area locations throughout the month of

Fig. 5. Radio testing in C. M. Allen's basement showing the BC-13-A. Sixteen-year-old Buford Allen is at the microphone. (*Illustrated World*, Dec., 1919, p. 559)

July. On the evening of July 17, Austin operated one of the sets from his home station and broadcast a concert of phonograph music to an audience at Allen's residence between 8:00 pm and midnight (Figure 5). Twelve local hams responded to Allen's invitation to call him with signal reports.

The SCR-67-A / BC-13-A

The SCR-67-A was a two-way radiotelephone/telegraph set developed by Western Electric during World War I (Figures 6–9). The complete radio kit includes the BC-13-A "set box" and its BD-1-A powerboard, cables, batteries, antennas, etc. In addition to communicating with compatible ground equipment, the sets were intended for use with airplane radiotelephone sets such as SCR-59 or SCR-68. The BC-13-A can transmit between 250 and 450 meters and receive from 200 to 800 meters. VT-2 tubes are used for the transmitter's modulator and amplifier and the receiver uses three VT-1 tubes. The receiver's detector tube is also used in the transmitter's input circuit. (When viewing the photos, consider what it would have been like to transport, set up, and operate this bulky and heavy equipment with all the accompanying batteries in the woods in an emergency.)

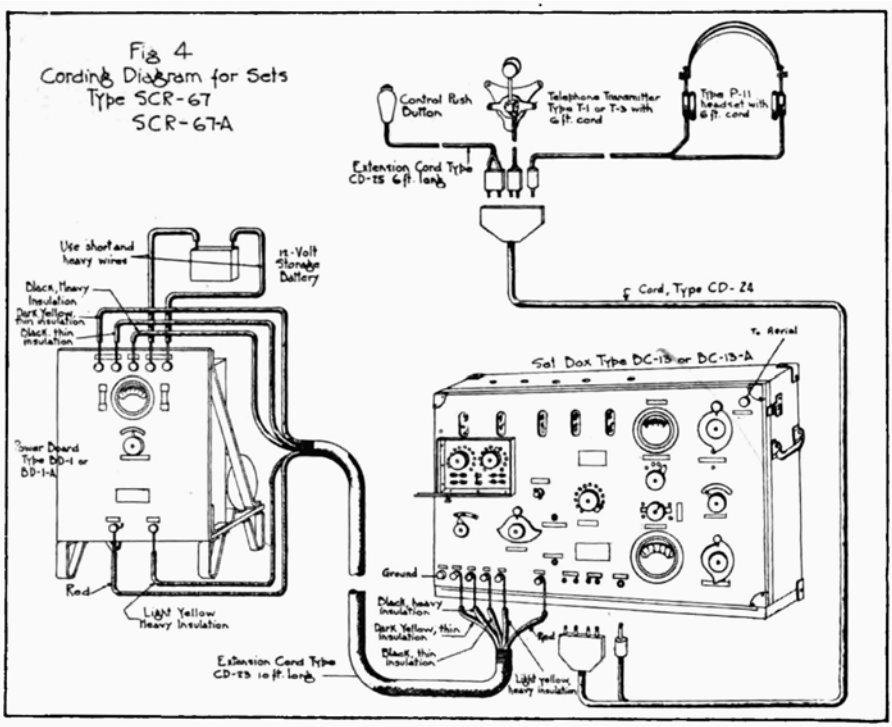

Fig. 6. SCR-67-A cording diagram. (*Radio Pamphlet No. 22,* April 20, 1919, p.11)

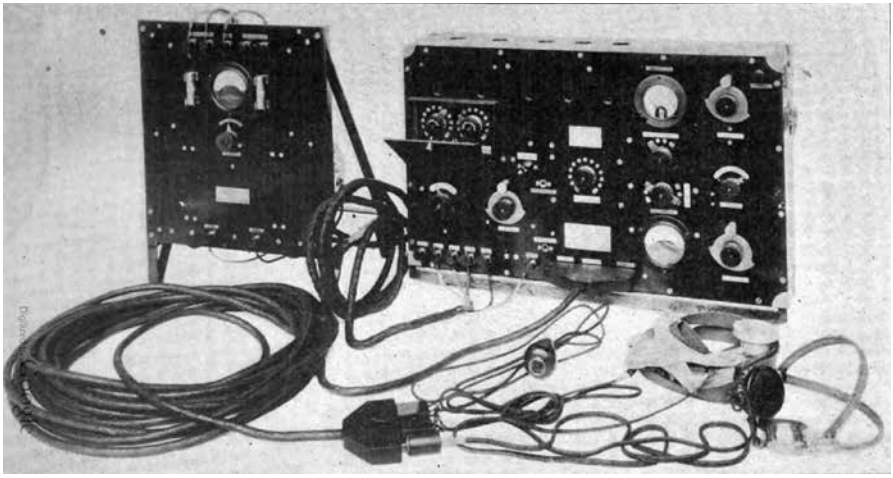

Fig. 7. BC-13-A set box and power board. The long extension cord in the foreground is useful when it is desired to locate the power board remotely. (*Radio Pamphlet No. 22*, p.15)

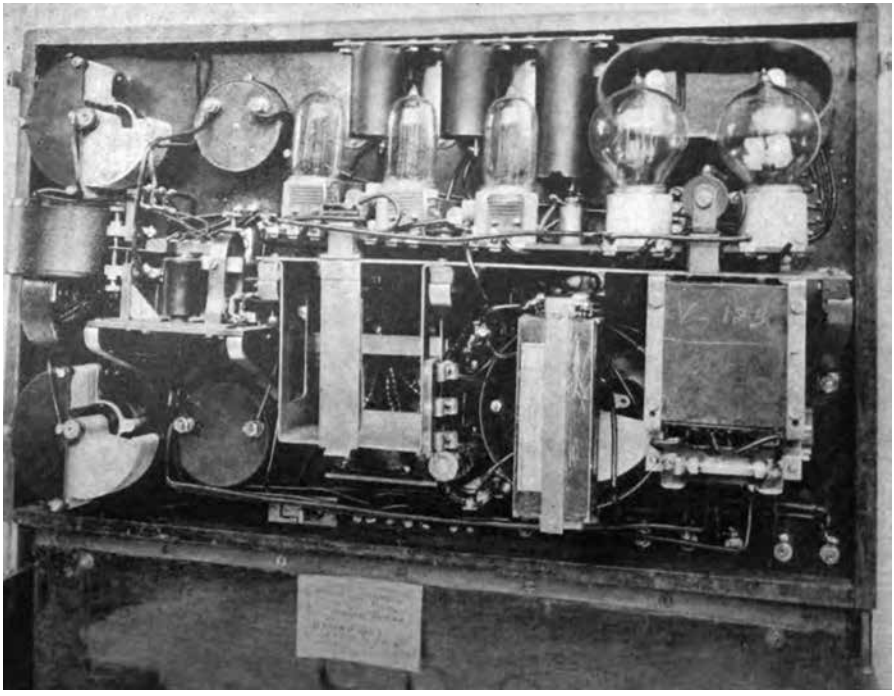

Fig. 8. Interior view of the BC-13-A set box. The three VT-1 receiving tubes are visible at the top center, with the VT-2 transmitting tubes on the right. (*Radio Pamphlet No. 22*, p.18)

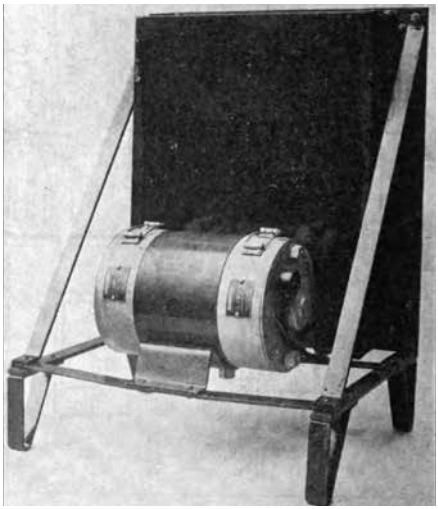

Fig. 9. Rear view of the SCR-67-A powerboard showing the DM-2 dynamotor. (*Radio Pamphlet No. 22*, p.12)

Installing the Radio in the Lookout Station

Despite Lige Coalman's September 1918 resignation, he and his assistant, George C. Maroney, returned to the Mount Hood lookout cabin in early July 1919 to reopen it. This required them to tunnel to the door through the snow, which at the time buried the lookout to the top (Figure 10)!

Shortly after the Portland demonstration tests were finished, Allen's team arranged to transport the radio from Portland to Mt. Hood. The antennas and masts were taken down and hauled by truck to the Zigzag ranger station at the base of Mount Hood. Prior to packing the equipment to the summit, Allen's team assembled and tested the sets at Government Camp and also at Camp Blossom near where the historic Timberline Lodge sits today (Figure 11). In those days, Camp Blossom, situated at an elevation of about 6,000 feet, was little more than a place for prospective climbers to set up camp prior to ascending to the 11,250-foot summit. As such, it made an ideal place to test, stage, and pack the equipment. Packhorses were used to carry the equipment from Camp Blossom up to Triangle Moraine (Figure 12). At that point, foresters divided the equipment into small loads and used pack boards to carry it the last two miles to the summit (Figure 13). A description of how the antenna was set up at the top appeared in *Radio Amateur News*:

> "Two and a half inch bamboo, in 6-½ ft. lengths, was used in the construction of the long mast [Figure 14]. Each piece was reinforced by wrapping bands of

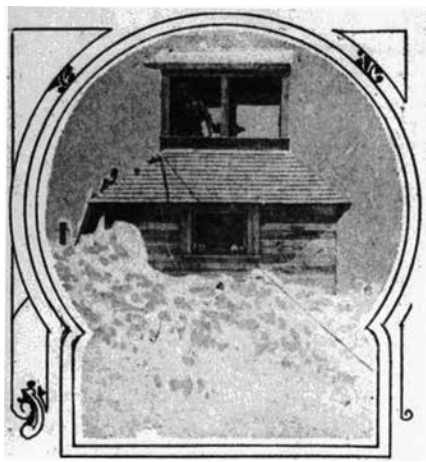

Fig. 10. Exterior of the Mount Hood fire lookout partially covered in snow. The Osborne fire spotting device can be seen through the cupola windows. (*The Oregonian*, Sept. 9, 1916, p. 4)

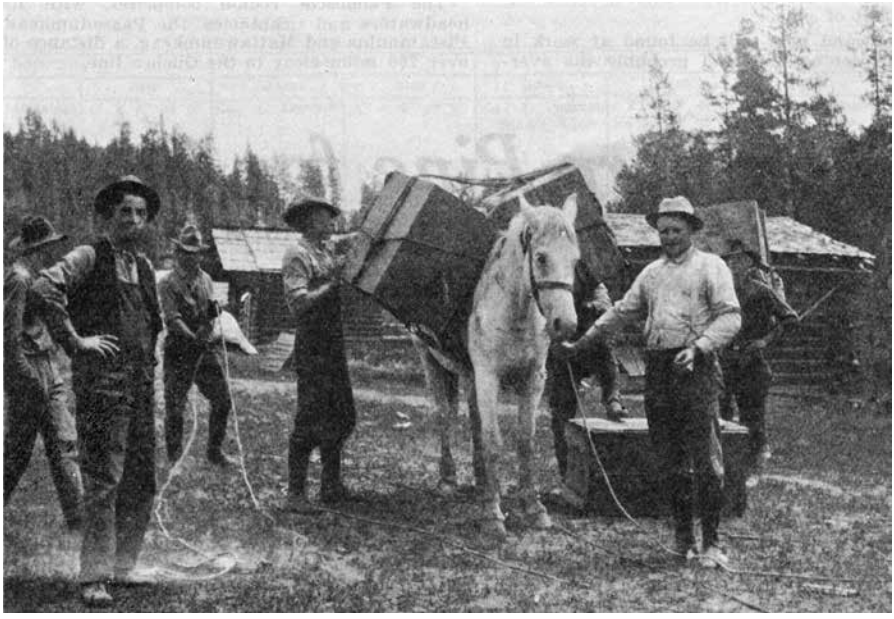

Fig. 11. Supplies being loaded on pack horses. (*The Southern Lumberman*, Dec. 23, 1922, p. 157)

Fig. 12. Foresters packing mast sections and other components of the SCR-67-A from Government Camp to Triangle Moraine July 1919. (*The Oregon Journal*, Aug. 17, 1919, p. 16)

Fig. 13. Coalman and Maroney packing radio materials to the lookout. The jointed bamboo mast weighed "only" 80 pounds. (*The Oregonian*, Aug. 17, 1919, p. 14)

Fig. 14. Assembling a 50-foot bamboo mast on the Mount Hood summit in late July 1919. (USFS photograph, Perham Collection image 2003-33-146; courtesy of History San Jose)

No. 19 spring brass wire about 1-½-in. wide between joints. The lengths of bamboo—eight in number—were joined by fitting oak pieces inside of the ends; and the mast was held rigid by four ⅛-in. special steel airplane cordage truss guys, from top to bottom, these being spread about 36 in. at the center by ½-in. oak spreader arms. The use of oak pins for spreader arms was a mistake, as the first sleet storm coated them to a thickness of about 3 in. which snapped two of them off and almost allowed the mast to crumple up. One-half inch iron pipe was substituted for the oak pins and proved very satisfactory.

"After making a careful examination of the conditions on top of the mountain, it was decided to erect an inverted L shaped antenna 250 feet long, supported at one end by a 50 foot mast erected by the side of the lookout cabin, and the other end attached through strain insulators to wires extending some 50 feet farther southwest to a short mast set in a point of rock sticking up beyond the small glacier.

"A four-wire antenna was used at first, each wire being a No. 10 stranded copper wire 250 feet long, with a spread of 3-½ feet between wires. As it was impossible, due to glacier ice, to make an ordinary earth ground, a counterpoise was used with fair results."[11]

The completed antenna installation is shown in Figures 15 and 16.

Fig. 15. Mount Hood lookout cabin. The mast and the inverted-L antenna show in the background over the roof of the cabin. Note the backstay tied off to a rock outcropping. The main floor of the cabin had a single door, visible in this view, with windows on the other three sides. The post to the right of the cabin was used to mount a second Osborne fire-spotting device (alidade). (USFS photograph, Perham Collection image 2003-33-147; courtesy of History San Jose)

Fig. 16. Mount Hood lookout with antenna mast. The inverted-L antenna was supplemented with counterpoise wires stretched along the ground beneath it. Extra lines hanging down from the cabin walls may be telephone lines or climbing aids. (USFS photograph, Perham Collection image 2003-33-148; courtesy of History San Jose)

The First Tests

Preparatory testing at Mount Hood began in early August 1919.[12] As the summit radio installation was being readied, Allen's entire family, including his eight-year-old son, Jack, made an "inspection visit" to the lookout, making Jack one of the youngest people to reach the top of Mount Hood.[13] The second radio was located at the Government Camp Hotel (Figure 17) eight miles from the lookout at an elevation of about 4,000 feet.[14] At Government Camp, a four-wire inverted L antenna 250 feet long and 50 feet high was installed.[15]

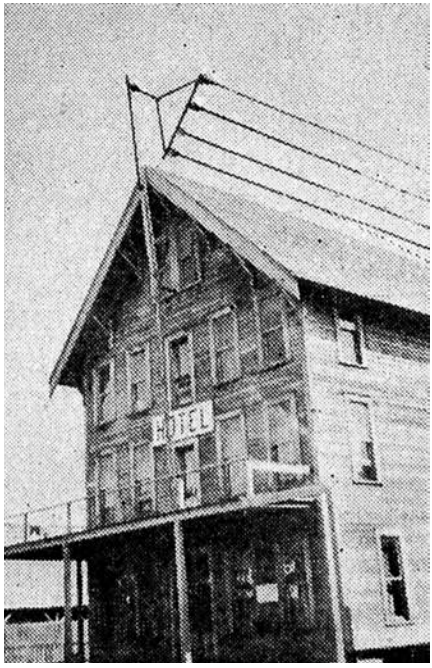

Fig. 17. The Government Camp Hotel in early August 1919. The wireless mast is in front and the four-wire antenna stretches back over the roof. (*Radio Amateur News*, Jan. 1920, p. 336)

The first test from the lookout occurred on Saturday, August 9. Coalman and Maroney operated the set at the summit while Clay Allen operated the set at the Government Camp Hotel. During the Saturday test, the lookout spotted smoke from a forest fire on the reservation of the Confederated Tribes of Warm Springs and reported it by wireless, putting the set into productive use on its first day of trials.

Tests from the lookout continued for three weeks. While the station at the summit remained in place throughout the tests, the set from Government Camp was moved to various locations, including the Forest Service headquarters in Portland. During the initial tests, Allen reported that the expected static interference was not bad, but the BC-13-A sets did experience interference from other stations. Although the BC-13-As had a nominal range of only 12 miles, on August 14 signals were picked up at the lookout from Portland, almost 60 miles away. A few days later, reports were received that transmissions from the Mount Hood station had been heard in San Francisco. It was reported that the lookout station received radiotelegraph signals from stations all over the country at various times.

The National Radio Company Tests

As mentioned previously, the successful radio experiments in Arizona prompted the Forest Service to request bids for a wireless telephone system in late 1916. The National Radio Company based in San Francisco, which owned various patents related to damped-wave arc

transmitters, continued to seek opportunities to market these transmitters commercially despite the emergence of the more modern tube-based technologies. Consequently, William W. "W.W." Hanscom (1869–1956) (Figure 18), the chief engineer for the National Radio Company, responded to a request for bids with a proposal featuring the company's arc transmitters. Hanscom had succeeded Doc Herrold as the company's chief engineer in 1913 after he left the National Wireless Telephone Co.,[16] which became the National Telegraph Company in 1916. Hanscom held an experimental special land station license (6XB) issued in 1914.

There is no record that the 1916 bid led to a sale, but during the intervening war years, Hanscom remained in touch with the Forest Service telephone engineers. After the war, arc transmitters were widely acknowledged as obsolete and inferior to tube transmitters. Nonetheless, in June 1919, Allen rented two sets of National Wireless Telephone transmitters and receivers for testing in conjunction with the SCR-67-As. Hanscom agreed to apply the $50 rental fee toward the purchase price if the Forest Service decided to keep them.

Fig. 18. William Hanscom circa 1902. (*Electrical World and Engineer*, Vol. 39, Mar. 29, 1902, p 540)

The National wireless telephones (Figures 19–22) were shipped to Portland on July 28, but Hanscom himself experienced several delays and did not arrive until August 20. Allen and Austin installed one of the National sets at Austin's home for testing using his existing antenna. Plans to test the second set at Mount Hood were foiled because the necessary 220-volt power source was not available. Allen considered hauling a gasoline-powered generator to the summit, but decided against it because of the ruggedness of the climb.

After Hanscom arrived in Portland, he operated the National transmitter at Austin's home for two nights for about two-hours each time. Buford Allen listened for the test transmissions from the Mount Hood lookout using the BC-13-A telephone set. Over the course of two nights, he reported receiving one partial message "Hello, hello Allen" and some indistinct words from the National Wireless Telephone. Listening to the tests from the homes of various Portland-area amateurs, Clay Allen was able to understand only about 20% of the words sent from the National transmitter.[17] An assistant to Hanscom who was operating the National Radio Company station 6XO on the

Fig. 19. A National Radio Company Wireless Telephone station similar to the ones brought to Portland. The motor-generator sits on the floor with the power panel on the desk above it. The transmitter sits in the center of the desk with the arc chamber to its left. The receiver sits atop the transmitter with a panel-style tuned circuit and a mineral detector in the foreground. (Perham Collection image 2003-33-137; courtesy of History San Jose)

Fig. 20. Close-up view of the arc tank. On the right a solenoid is used so that the arc distance can be maintained as the electrodes erode away during use. The five-point arc is immersed in an alcohol-filled chamber that is encased in a water jacket through which coolant flows. (Perham Collection image 2003-33-141; courtesy of History San Jose)

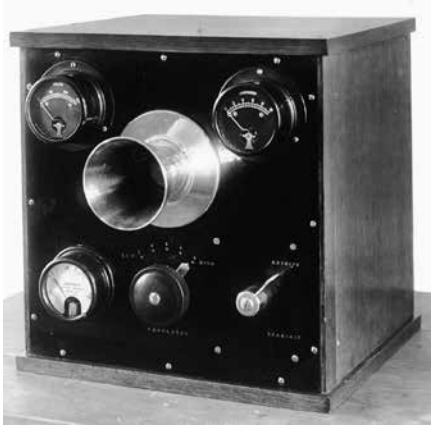

Fig. 21. Close-up view of the transmitter panel showing a voltmeter, two ammeters, the water-cooled microphone, and the regulator and transmit/receive switches. (Perham Collection image 2003-33-140; courtesy of History San Jose)

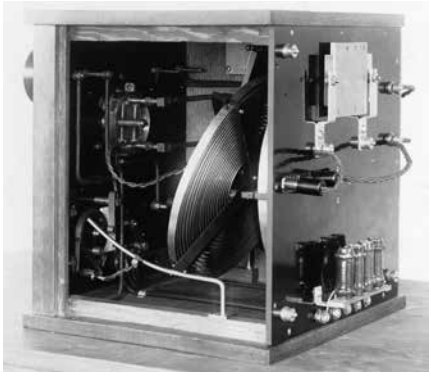

Fig. 22. The National transmitter with the side cover removed to expose the helix. The primary coil is mounted to the inside back of the cabinet. Slots through the back panel are provided for adjusting the taps. The angled secondary coil must be adjusted with the cabinet open. The microphone is water-cooled and the supply pipes can be seen in this view. An external condenser is mounted at the top center of the back. (Perham Collection image 2003-33-142; courtesy of History San Jose)

roof of the Fairmount Hotel in San Francisco reported hearing a conversation between Hanscom in Portland and Buford Allen at the summit, but no such conformation appeared in Forest Service reports.[18]

Hanscom hiked to the Mount Hood lookout on August 26 to examine the installation of the SCR-67-A and participate in some tests. However, interference from intense static during his visit made it impossible to receive signals from Portland on a consistent basis. He returned to San Francisco on August 29, still aching from his climb to the summit.

The antennas and radio at the Mount Hood lookout were disassembled at the end of August as the season came to a close and crevasses began to open, making climbing dangerous. Packing the equipment down the mountain turned out to be a very complicated affair due to an unusually heavy snowstorm. The task was accomplished without mishap by means of an ingenious arrangement consisting of a brake attached to a toboggan.[19]

The Result of the 1919 Tests

In October 1919, the Western Forestry and Conservation Association held its annual convention in Portland at which Allen spoke about the Mount Hood tests. During his talk, a BC-13-A was situated in the convention room on the 2nd floor of the Multnomah Hotel with its antenna strung between 30-foot flagpoles on the 8th floor roof. Using the other BC-13-A located several miles away, Austin sent messages and

phonograph music that were played loud enough to be heard throughout the conference room. Amateurs all over Portland picked up the broadcast of Allen's speech.[20]

The official evaluation of the 1919 wireless tests and forest air patrol by the Oregon State Forester was cautiously optimistic:

> "The United States Forest Service has been successfully experimenting in the use of wireless telephones on Mt. Hood and other lookout points. It is expected that by next season such progress will have been made in the experiments as to make their use practical. However, should it be found impossible to obtain the necessary wireless equipment, message dropping from planes can be successfully developed."[21]
>
> "Carrier pigeons will also be used as a means of communication. Experiments were carried on this season and the Signal Corps has detailed an officer and three men to raise and care for forty-eight carriers which are now at Eugene."[22]

During his speech at the forester's conference, Allen summed up the tests:

> "It is not desired to convey the impression that wireless telephone apparatus in its present stage of development is simple. While tremendous strides have been made in its development, it is still complicated, and requires for its use some training and ability on the part of an operator. However, it is not believed that this is beyond the employees of the Forest Service or kindred organizations who would ordinarily have to do this part of the work.
>
> "There are some problems in considering the general use of wireless that are not so easily solved. For instance, it has been necessary for the Navy Department to refuse many requests for permission to operate wireless apparatus on account of the danger of 'jamming the air'. . .
>
> "Taking a very conservative view of the wireless possibilities . . . it is believed that the benefits derived through its use justify giving it serious consideration."[23]

Winter 1919–1920—The Portland Tests

District 6 was allowed to keep its pair of SCR-67-As and the National Wireless Telephones after the 1919 fire season ended. Allen and his team envisioned testing the sets throughout the fall and winter and training additional operators for the coming season.

Plans were made to construct a semi-permanent station at the Forest Service headquarters in the new Portland post office building in hopes that they could maintain direct communications with the summit lookout in coming seasons. While designing the rooftop antenna system, Allen mailed perspective photos to Hanscom for his consideration (Figures 23 and 24).

Fig. 23. Ground view of the new Portland post office building at the corner of NW Broadway and Glisan Street. C. M. Allen provided these pictures to W. W. Hanscom so that they could collaborate on a plan to install a rooftop antenna. (Courtesy of History San Jose)

Fig. 24. Rooftop perspective photo with Allen's notes. The Union Station clock tower and the Broadway Bridge show clearly. (Courtesy of History San Jose)

After first being denied permission to install an antenna on the roof, Allen's crew was allowed to install the masts on February 15, 1920. Using two 54-foot masts and the building's flagpole to support it, the crew erected a triangular four-wire center-fed antenna. The Forest Service, operating at the pleasure of the Navy, had first asked to conduct tests at 900 meters, but this request was denied. Consequently, the rooftop antenna was cut to resonate at about 300 meters, but it was designed so that it could be extended if and when permission was granted to test at longer wavelengths. The radio station was installed in the mimeograph room of the Forest Service offices.

Although the Mount Hood lookout would remain inaccessible until the summer due to snow, the foresters installed and used the equipment from various other locations through the winter and spring. In March 1920, Horace G. Whitney, the District 6 chief of maintenance, erected an antenna between two 100-foot bamboo masts at his Portland home and installed one of the BC-13-As in his basement where he made contacts with local amateurs.[24] Whitney used the radiophone to read test messages, but most amateurs were limited to reply by code.

Allen continued directing tests of the National equipment from the post office station. One such test took place on the evening of Saturday April 3, 1920, when John Pearson (7GD) operated the station at the post office. Ralph T. Galyean (7CR) was joined by Austin (7ZI) and other amateurs at his station in Sellwood, a neighborhood of Portland located about 6 miles away (Figure 25). In a typical test, the equipment was operated from 8 p.m. to 11 p.m., alternating the National Wireless Telephone and a BC-13-A with one-minute readings. On average, only one in three words sent over the arc transmitter was understood by the receiving stations. In contrast, text read over the BC-13-A was consistently clear and distinctly audible.[25]

Fig. 25. Ralph T Galyean (7CR) at his home station. In addition to his amateur activities, Mr. Galyean taught Morse code at the Oregon Institute of Technology radio school in Portland. In the photo, the BC-13-A set box is on the table before him, and the power panel is at his feet. (*The Oregon Journal,* Sept. 1920, p. 5)

On the evening of Tuesday, April 13, the BC-13-As were tested between the homes of Galyean and John B. Herts (7ZB) eighteen miles away in Vancouver, Washington. Two nights later, Galyean's signals were picked up at the station of Olfan DeGuire (7CW) in Silverton, Oregon, forty miles to the south using a one-tube regenerative receiver. In early May, one of the BC-13-As was installed at DeGuire's Silverton station for a week of two-way phone testing.[26] Reportedly, plans were even made to install and test the equipment on a riverboat plying the Willamette and Columbia rivers. Those tests, if any, were not documented.

Allen hoped to interest and employ local amateurs in the coming season to receive and relay wireless telegraph messages from air patrol planes by broadcasting practice code messages from the post office station. He also made plans to start a training school to teach rangers about wireless.[27] Although the antennas had only been in place on the roof of the Post Office for two months, the Forest Service was asked to remove them in early April 1919.[28] The National wireless telephones were boxed and shipped back to San Francisco on April 14.

In Allen's report back to Hanscom, he said that they had experienced great difficulty controlling the arc, which caused inconsistent results. At times some voice transmissions were received clearly. On the whole though, only about 30% of the words of the test messages were received correctly. Allen suggested that Galyean, an officer of the Northwest Radio Association who helped him conduct the tests, could provide a more complete and detailed report on the tests and the results. In an internal memo, Allen concluded:

> ". . . the principle of the set is wrong as I do not believe that it will be possible to make an electric arc steady enough for voice transmission. Assuming that the arc could be regulated, the quantity of energy required for operation of the set is too great . . ."[29]

The Northwestern Radio Association

The Northwestern Radio Association was organized by Portland amateurs in December 1916 under the name Northwestern Audion Association. Membership grew until the stations were closed

when the United States entered World War I. After the war, the club became the Northwestern Radio Association.[30] Members met on Friday nights at the *Oregon Journal* newspaper building in downtown Portland.[31] In 1920, Charlie Austin (7ZI) was the President and Chief Inspector responsible for ensuring that members operated their stations within the law. Elmer Berk was the first vice president and chief justice, John N. Hurtt (7JH) was second vice president, Percy W. Dann (7JP), secretary, Ralph Galyean (7CR), treasurer, and B.A. Montgomery, sergeant at arms.

Correspondence continued throughout 1920 and into 1921 as Galyean, Allen, and Hanscom exchanged letters. Galyean and Allen detailed the tests and the results; Hanscom refuted their procedures and placed blame for the failures on issues beyond his control. In the end, the Forest Service did not purchase any of National's wireless telephones.

The 1920 and 1921 Fire Seasons

The Mount Hood lookout station was reestablished August 15, 1920. Clay and Buford Allen and Austin used pack horses to carry the SCR-67-A as far as Turtle's Neck, and then packed it the rest of the way themselves (Figure 26). William C. Kelly, a Forest Service lookout, and Alfred T. Maas operated the station. This season a two-cycle gasoline engine was used at the lookout to keep the batteries charged. However, the lookout was only operated on alternate days during the 1920 fire season to save power and fuel.

After radio operations were reestablished at the lookout, Buford Allen stayed behind at the lower reaches of the mountain. Along with John A. Calvary, Allen operated the second BC-13-A from the Summit Ranger Station east of Government Camp, only about 10 miles from the lookout and well within the set's nominal range (Figure 27). During the 1920 fire season, fires spotted from the lookout were reported by radio to

Fig. 26. Clay Allen and Charlie Austin outside the Mount Hood lookout after installing the radiotelephone, August 1920. (*The Oregon Journal*, Aug. 15, 1920, p. 22)

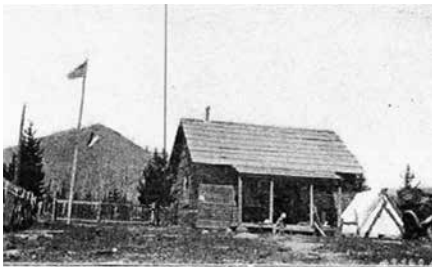

Fig. 27. Summit Ranger Station with antenna. USFS photograph #49560-A "Radio Helps Fight Forest Fires," *Radio News*, Aug. 1921, p. 94. (Courtesy of Americanradiohistory.com)

the ranger station, and the reports were relayed to the Portland headquarters by telephone. Even though the Forest Service did not push for distance during the 1920 tests, Galyean reported communicating directly with the stations by radio during the summer from his Sellwood station.[32] The Mount Hood lookout was closed for the season in October 1920 and the equipment was removed.

In 1921, the Forest Service established radio-equipped air bases at several Oregon locations and additional patrol planes were equipped with transmitters for spotting and reporting fires. During the patrol season, a station was established at Zigzag for the purposes of receiving reports from the air patrol, which were then relayed by telephone to locations throughout the forest.[33] F. S. Flesher (7NI, later W7ESA) was the assigned operator at Zigzag.[34] Unfortunately, local interference blamed on Portland-area amateurs caused so much frustration that pilots had to rely on the Forest Service air base in Eugene to receive and relay reports by telephone and telegraph.[35] There is no record of the radio being reinstalled at the summit lookout; presumably, fires were reported once again by wired telephone.[36]

Part 2 The Intermountain Region Tests

1919 Fire Season

Wireless telegraphy had the potential to do away with the necessity for maintaining forest telephone lines, but for most foresters, sending and receiving code was a barrier. Thus the Forest Service was understandably eager to experiment with the Army's telephony-capable SCR-67-A radios, which they hoped to use literally as telephones without wires. Ralph. B. "Ring Bell" Adams, who was responsible for performing the radio test described in Part II, was the telephone engineer for both District 1 based in Missoula, Montana, and District 4 headquartered in Salt Lake City, Utah. These two districts covered the Intermountain Region of the United States, including the states of Idaho, Montana, Utah, and parts of Wyoming, Nevada, and Arizona. Adams describes how he made arrangements to obtain these sets:

> "Early in the winter of 1919 I discussed briefly with the Forester the possibilities of obtaining some of the wireless telephone equipment which had been manufactured for other government departments during the war. The Forester called me to Washington, where I was able to get in touch with offices of the Signal

> Corps and the Navy Department and through the courtesy of the United States Signal Corps, I was a able to borrow four wireless telephone sets for experimental use. Two of these I shipped to the telephone engineer of District 6, and two I sent to Missoula. This was done with the idea of testing out this equipment under two entirely different conditions."[37]

Adams, former superintendent of construction for the Intermountain Telegraph Co., and H. Everett Cutting (7LY), builder and operator of the Beaver Ridge station, installed and tested a pair of SCR-67-As along the Montana/Idaho border in July 1919. Cutting, who held amateur licenses (7HC, 7LY), an experimental license (7XL), and a commercial broadcasting license (KFDO), brought his radio experience into the test program. In the teens Cutting studied electrical engineering at Montana State College in Bozeman and was teaching wireless telegraphy there at the time of the 1919 tests. In the 1930s he was licensed as W7EXG and working as the chief technician at KVI in Tacoma, Washington.

One radio was set up first at the Mud Creek Ranger Station about 30 miles west of Missoula in Montana's Lolo National Forest (Figures 28 and 29). Cutting packed the other set on horseback to the Beaver Ridge fire lookout in Idaho about 13 miles away. Vic Miller helped install the 100-foot high antennas.[38] The Bitterroot Divide, a 9,000-foot high ridge, separated the two

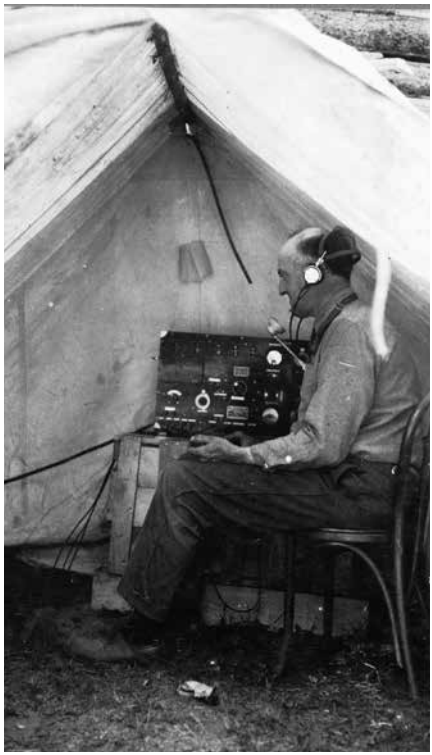

Fig. 28. R. B. Adams shown July 15, 1919 with a BC-13A at the Mud Creek Ranger Station in the Lolo National Forest, Montana. (U.S. Forest Service Photo 45520-A; courtesy of National Archives Online Public Access)

Fig. 29. A second view of R.B. Adams at Mud Creek with the power panel showing at left. (U.S. Forest Service photo; courtesy Bud Moore Papers, University of Montana)

stations. Cutting's pack train left Mud Creek on July 8 but the radio batteries were lost along the way when the horses repeatedly fell. Replacement batteries arrived at Beaver Ridge on July 14 and communications were established on the morning of July 15. R. B. Adams described the accident:

> "One pack horse (the last one) started pulling back. She kept pulling until she pulled the rest of the horses over and all rolled down the mountain about 100 feet to where a tree stopped them. Finally righted them again and started up. In a short time the horse repeated the performance, and this roll completely put the storage batteries out of service, the electrolyte having completely run out."[39]

In late August 1919, a forest fire threatened the Beaver Ridge lookout. Before fleeing to a nearby lake for protection, the operator disconnected the BC-13-A and took it with him. Upon arriving at the lake the operator loaded the radio on a raft and paddled out from shore. When the danger had passed, the set was returned to the lookout and put back into operation. The fire had destroyed the telephone lines in the area and they were not rebuilt for several days. Adams seized on this dramatic story and mentioned it frequently when describing the successes of the Montana tests.[40]

Among the several locations Adams used for testing was the Bitterroot Valley ranch of Ashley C. Dixon (Figure 30). According to Dixon's 1948 autobiography, the Forest Service tests at his home inspired him and his son, Ashley Jr. (Figure 31), to begin studying radio.[41] Dixon (7ACP) and his son (7IT) held amateur, experimental (7XAF), and broadcast licenses. On September 23, 1923, Dixon's station KFJR began broadcasting two nights a week

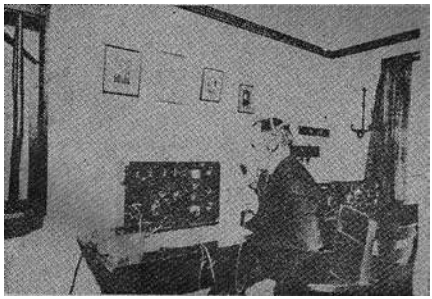

Fig. 30. Ashley C. Dixon operating a BC-13-A ca. August, 1919 at his residence near Stevensville, Montana, about 25 miles south of Missoula. Following the Forest Service tests, Dixon and his son earned amateur and commercial radio licenses and went into broadcasting. ("KPOJ Celebrates A Birthday: Station Born in Crystal-Set Era," *The Oregon Journal - Ours Ahead*, Nov. 1958)

Fig. 31. Ashley C. Dixon Jr. and Sr. (*Radio Broadcast*, July 1924, p. 276)

on 1160 kHz using a transmitter assembled from RCA parts. Dixon explained his methods in his article "How to Build a Good Low-Power Transmitter" which appeared in the July 1924 issue of *Radio Broadcast*.[42] Dixon brought the station to Portland in 1925, where it was installed for a time at his Eastmoreland home. (Later, professional studios were constructed in an office building downtown and the transmitter was moved to a local mountaintop). Although the KFJR call sign is no longer active, its successor station (KKPZ, 1330 kHz) is still on the air in Portland.

The Montana field tests ran for about six weeks from mid-July through late August 1919. Adams appeared at the Montana State Fair in Helena during the week of September 8 demonstrating the SCR-67-As and publicizing their achievements (Figure 32). Fairgoers listened in as messages were exchanged between the two sets and a third unit exhibited by another branch of the U.S. Government. The sets were exhibited again a month later at the Utah State Fair in Salt Lake City October 6–11. Following the Utah fair, Adams installed them temporarily at the Forest Service building in Ogden.[43]

The Montana tests were intended to evaluate the effectiveness of the SCR-67-A sets when they were separated

Fig. 32. R. B. Adams posing with an SCR-67-A wireless telephone at the Montana State Fair in Helena. The accompanying sign is titled "Wireless Telephone," followed by the text, "This was the first to be used on the National Forest in the U.S. and has been in successfull (sic) operation in W. Mont. during the past summer and played an important part in the Fire Organization." (U.S. Forest Service Photo 44191; courtesy of National Archives Online Public Access)

by mountains and operated in areas with significant metallic mineral deposits. Although the SCR-67-As proved successful over short distances, Adams ultimately concluded that they were underpowered for his needs, and that wired telephones would be cheaper and easier for short distance communication.

The Power Problem

Clay Adams recognized the power problem form the outset:

> "Am not sure yet about getting a gasoline engine and generator to the top but am very much in hopes. Last 1,000 ft. up is 80% grade—about 150'—right up the glacier . . ."[44]

Whether in the mountains, woods, or other locations without available power, batteries proved to be one of the biggest challenges to using the BC-13-As for forest work. Power at the Mount Hood lookout was provided by a combination of storage batteries and a hand-cranked dynamotor. And packing heavy replacement batteries up the mountain was a real problem. Various alternatives were considered with a wind charger seeming to have the most promise for the wind-whipped summit. To that end, Allen reached out to the Aeromotor Company for a solution, but nothing panned out. For areas that were accessible by horse, Adams requested some gasoline-powered charging plants weighing 115 pounds each. Of course those were heavy to pack and required supplies of fuel (Figure 33).

In Montana, the power consumed by the dynamotor was also an issue. S. R. Winters described a solution to the vexatious power problem:

> "Temporarily, the Forest Service solved the problem by using 270 No. 2 Burgess dry cells, connecting these in series and using them on the plate circuits. By this makeshift arrangement, the motor generator was eliminated and the storage battery employed in heating filaments only. The discharge from the storage batteries was decreased from 12 to 3.6 amperes. Likewise by the use of dry batteries the transmission values on the wireless equipment were enhanced 25 percent. The No. 2 dry batteries were in use for four weeks, or until the radio equipment was dismantled for the summer, at which time they

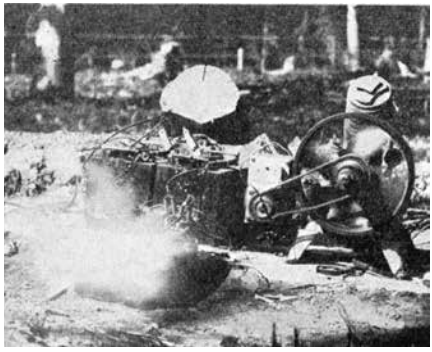

Fig. 33. Radio batteries being recharged at a portable gasoline-powered charging plant. (*The Southern Lumberman*, Dec. 23, 1922 p. 155)

evidenced a slight deterioration. Storage-battery 'deaths' at Beaver Ridge were averted by providing a bank of 48 super-six Burgess dry batteries. These were connected in series parallel, in six different banks of eight, which were used to heat the filaments or drive the motor generator, in the event of an accident, to the storage or high-voltage battery."[45]

Harry Kylie and the Denver Trials

Following the 1919 fire season, Harry R. Kylie, the telephone engineer at the Forest Service's Denver office, also ran radiophone trials utilizing a BC-13-A with the output boosted by an amplifier of his own design (Figure 34). One demonstration took place on the evening of February 18, 1920, when more than a dozen musical selections ranging from jazz to classical were broadcast. Stations from as far away as Colorado Springs reported listening to the concert.[46] Following the concert, Kylie used a second BC-13-A to conduct distance trials, moving it from place to place by truck to test the signal strength from the Federal Building base station.

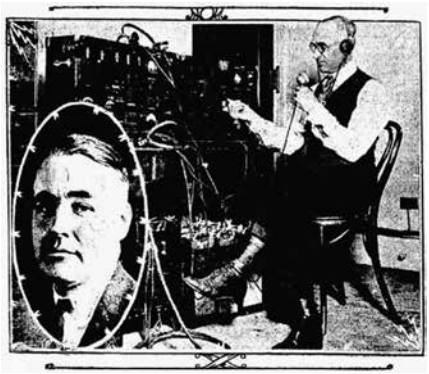

Fig. 34. William P "Paul" Pagett broadcasts using a BC-13-A at the Forest Service's Denver office. The output is boosted by an amplifier designed by Harry Kylie, the district Telephone Engineer (inset). (*Rocky Mountain (Denver) News,* February 2, 1920, p. 8)

Winter 1919-1920—The SE-1370 and SE-1414 Navy Sets

Adams returned to Washington D.C. in December 1919, and based on the successes of the tests that summer, requested the loan of 24 additional radiophones from the Signal Corps for the 1920 fire season with plans to distribute them throughout the region. The Signal Corps denied his request but the Navy provided Adams with five SE-1370 transmitters and five SE-1414 receivers that were modified by General Electric for 800-1000 meter use.[47] However, the Navy sets were not used until the end of the year. The chief problem proved to be the improper wiring of the SE sets. Pressed for time, Adams was unable to identify the cause of the problem until the fire season was well underway.

General Electric designed and manufactured the SE-1370 transmitter (Figures 35 and 36). The companion SE-1414 receiver (Figures 37 and 38) was designed at the Washington Navy Yard's Radio Test Shop and was manufactured by Westinghouse Electric and Manufacturing Company. Both sets were intended for use on the Navy's World War I era flying boats, but their designs also made them useful as field radios.

The SE-1370 was a two-tube transmitter capable of about 100 watts output (telegraph mode) and 50 watts output (telephone mode). Like the SCR-67-As, the transmitter ran on batteries but also required an outboard dynamotor.

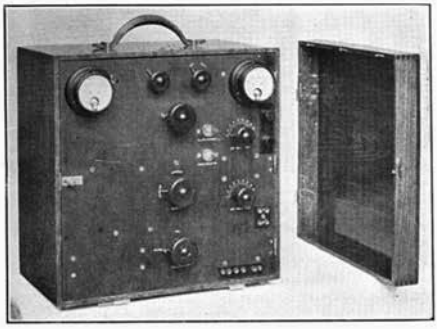

Fig. 35. The SE-1370 transmitter measures 15" high and wide by 8.25" deep and weighs 17.6 pounds. The external dynamotor adds another 17 pounds. (*Proc. of the IRE*, April 1920, p. 95)

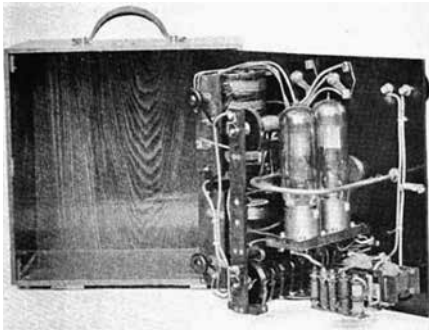

Fig. 36. Interior view of the SE-1370 transmitter showing the two fifty-watt CG-1144 (VT-18) tubes, one for the oscillator and one for the modulator. (*Proceedings of the IRE*, April 1920, p. 95)

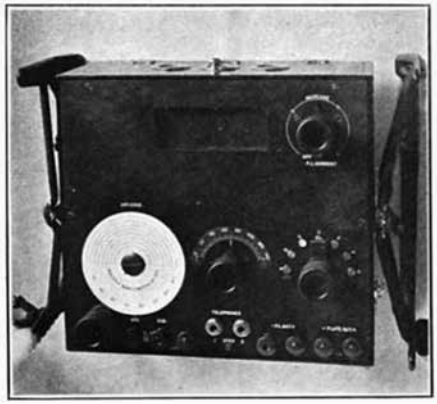

Fig. 37. Front view of the SE-1414. The cabinet measures 11" wide by 10" high by 5.13" deep and the receiver weighs 10.75 pounds. The entire receiver hangs from the unusual rubber suspension shown on the sides of the cabinet. (*Proceedings of the IRE*, April, 1920 p.116)

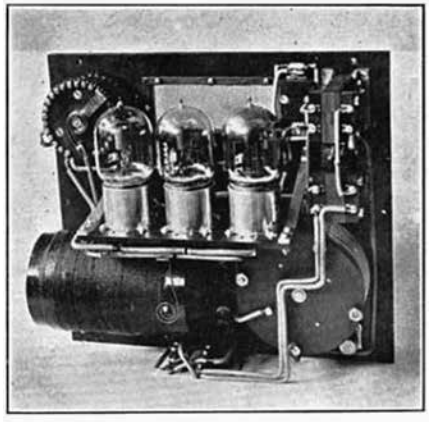

Fig. 38. Interior view of the three-tube SE-1414 receiver, which used Moorehead type SE-1444 tubes. (*Proceedings of the IRE*, April, 1920 p.116)

The 1920 Tests

Since Adams needed time to resolve the technical issues with the Navy sets, he used the SCR-67-As he had borrowed in 1919 to establish stations for the 1920 fire season in the Payette National Forest near the Oregon border. In late July, one station was set up at National Forest headquarters in McCall, Idaho, and the other was packed to Thunder Mountain about forty miles east. The radiophones provided a key link from the Thunder Mountain lookout, which looked out over 1.2 million acres of virgin timber, to McCall from which firefighting resources could be dispatched. Despite the BC-13-A's low power and minimal range, conversations were picked up 100 miles away in Kuna, Idaho, southwest of Boise.[48] The set on Thunder Mountain took a beating while being transported and needed repairs by the end of the summer. Following the fire season, Adams had the station from McCall relocated to Salt Lake City, and the station from Thunder Mountain was repaired and returned to the Forest Service building in Ogden.

Adams made several wireless demonstrations for students and various civilian leaders over the winter of 1920-1921 in Utah and Nevada that received positive reviews. At different times, two-way communications were established between the airmail field at Salt Lake City and Ogden, a distance of 35 miles, and between Salt Lake City and Elko, Nevada, a distance of 200 miles.[49] Setting up the demonstrations also provided the opportunity to address the issues with the Navy equipment and prepare for the 1921 summer fire season.

The 1921 Idaho Tests

During the 1921 fire season, the Navy sets used in the forests of Idaho handled 200 official messages during 6–8 weeks of operation.[50] Stations began service July 15 at Moore's Ranger Station (on Buffalo Hump) in the Nez Perce National Forest (Figure 39), and at Warren, Idaho, 35 miles away. A station was also established briefly at Edwardsburg, Idaho, but was put out of commission due to equipment mishaps. Mr. Ira Kaar (6ZA) assisted Adams with building the stations.[51] The more powerful sets "made it possible to maintain regular communication 205 miles overland by telephone . . ." and sometimes up to 450 miles.[52]

At the end of the fire season, one of the radiophones was loaned to the Boise High School Radio Club (7YA/7XT),[53] and the students used it to converse with Nampa, Idaho, 20 miles away. The students also reported receiving broadcasts from cities across the west, including Denver, Sacramento, and from the National Radio Company station 6XO at the Fairmount Hotel in San Francisco.[54]

In 1921 the more powerful Navy equipment gave impressive and encouraging fire reporting results. However, these achievements were not given much value, as they were perceived as merely an extension of the forest wireless tests. Adams was still relying on borrowed equipment, and the upper management of the Forest Service made

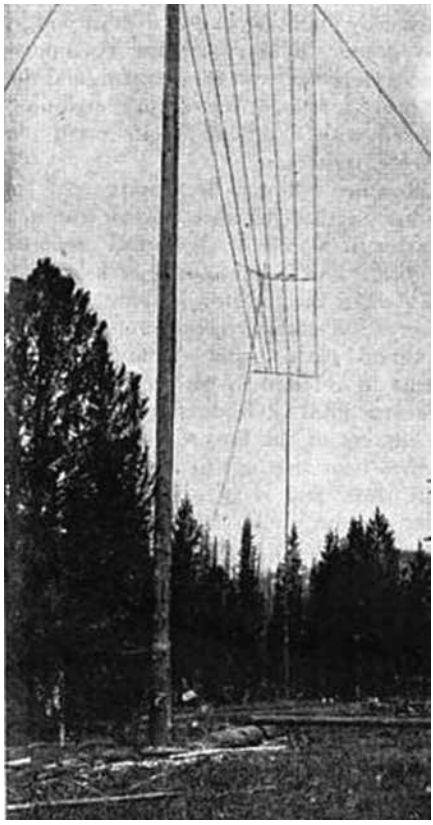

Fig. 39. The antenna at Moore's Ranger Station in the Nez Perce National Forest. The masts are 98 feet high and 210 feet apart and the seven antenna wires are spaced 34 inches apart. (*The Southern Lumberman*, Dec. 23, 1922, p. 155)

no long-term commitment to the program. Every year the very existence of the wireless and air patrol programs were at the mercy of budgets and appropriations.

Conclusions

After three seasons, the formal wireless tests and regular forest air patrols were discontinued. Reasons cited were technology issues, costs, and other challenges. However, the Western Forest Wireless Tests did answer several questions for the foresters. They clearly showed that radio would work in mineral zones and at high altitudes. They also showed that radio could penetrate heavily forested areas. Although the wireless sets were not tethered by expensive wire lines like telephones, they were not exactly "portable" either—essentially requiring a mule train or truck to carry the radios, batteries, and the accessories. The foresters embraced the concept of wireless telephone communications, but freely admitted that the technology was still not practical for their use in the forest. Gary Craven Gray, who wrote the classic, *Radio for the Fireline,*[55] published by the Forest Service in 1982 summed it up this way:

> "The main lesson learned by the Washington office during the 1919, 1920, and 1921 fire seasons was that radio as a communications tool was expensive—at least on the limited Forest Service budget. . . . Similarly, radio air patrols were of no benefit if, after 3 years, they were not found to produce results in first discoveries of fire great enough to justify the burden of keeping it up."[56]

By the 1922 Oregon fire season, the use of radio and routine airplane fire patrols were abandoned. According to Gray, "*Instead, special flights were made during periods of high fire hazard.*

State and Forest Service observers rode in planes, obtained firsthand knowledge of the fires, and made direct reports after landing."[57]

Today we know that a few more years both radio and airplane technology development would allow these tools to realize their potential to manage forest resources.

Epilog

In a July 1921 letter to one of National's shareholders, Hanscom continued to assert that the company's arc wireless telephone could have performed reliably in a commercial setting. And he continued to blame the failure of the Portland tests on inexperienced operators who did not operate the set according to his instructions. But, tellingly, he concluded the letter by acknowledging that tube transmitters held the most promise for the future.

> "I have had a chance to gain considerable information during the past year which has been released from war work, and to hear the results obtained by experimenters working with the tubes now available for radio telephony and telegraphy, and I have come to the conclusion that the NR [National Radio] apparatus will have a very difficult time to make any headway in competition with them."[58]

Notes

1. S. R. Winters, "Wireless in Forest Fire Fighting," *The Wireless Age*, Oct. 1920, p. 12.
2. Coert DuBois, *Systematic Fire Protection in California Forests*, 1914, U.S. Department of Agriculture, Forest Service, Washington, p. 66.
3. Read the full story in L. V. Slonaker, "Apache National Forest 1916 Report on the Baseline Wireless Station," *Journal of Forest History*, April, 1974.
4. In addition to the ground tests described in this article, the use of aircraft for forest fire patrols necessitated the development of airbases across the west and the installation of many receiving and transmitting stations. A future article is planned that will tell that fascinating story.
5. Major Arnold went on to enjoy a storied career as a military aviator and leader.
6. After his death in California at age 88, Lige Coalman's ashes were returned to Mount Hood. The Coalman Glacier, just below the summit on the southerly climbing route, was named in his honor. A veteran of hundreds of ascents, Coalman's exploits are legendary. For more information on Lige Coalman and the history of the Mount Hood lookout see the list of additional sources.
7. "Wireless Phone on Mt. Hood Success," *The Oregonian*, Aug. 17, 1919, p. 14.
8. Craig Adams, "Charles Austin: Father of Oregon Radio," http://archive.pdxradio.com/radio/history/messages/995/179217.html.
9. Permission to operate these sets was required by the U.S. Navy even though they were manufactured for the U.S. Army Signal Corps. As Michale Marinaro explains in his recent *AWA Journal* article, the Navy had been placed in charge of all U.S. radio licensing and regulation at the time. This authority lasted through World War I and beyond. On September 26, 1919, authority shifted back to the Department of Commerce - Bureau of Navigation. Michael W. Marinaro, "Tracing the Birth of RCA," *The AWA Journal*, January 2016, pp. 45–48.
10. Oregon Department of Forestry, "The Wireless Telephone," *Ninth Annual Report of the State Forester to the Governor for the Year Ending December 31, 1919*, 1920, p. 36.
11. Clay M Allen, "Radio Telephone on Mount Hood," *Radio Amateur News*, Jan. 1920, p. 336.
12. Ibid.
13. "Wireless Telephone on Hood," *The Oregon Journal*, Aug. 12, 1919, p. 1.
14. (Oregon Dept of Forestry) p. 36.
15. Clay M. Allen, "Letter to W. W. Hanscom," Aug. 14, 1919. (Courtesy, History San Jose).
16. Gordon Greb and Mike Adams, *Charles*

Herrold, Inventor of Radio Broadcasting, 2003, McFarland and Company, Inc., Jefferson, NC: 86.

17. In responding to the disappointing reception reports for the National Radiophone, Hanscom said that the antenna at Charlie Austin's house was too long and was mismatched to the operating wavelength of the transmitter. Ironically, Hanscom later asserted that his transmitter performed better at longer wavelengths. (W. W. Hanscom letter to C. M. Allen Nov 18, 1919). In subsequent correspondence, the Forest Service replied that the National Radiophones were impractical for their needs because they required antennas that were too long to deploy practically in the forest. (A. O. Waha, Asst. District Forester, USFS District 6 by Shirley Buck (acting) letter to James H. Boyer, Attorney for National Radio, June, 1920). (Letters courtesy of History San Jose).
18. "Bay City Hears Mt. Hood Talk," *The Oregon Journal*, Aug. 28, 1919, p. 1.
19. Clay M. Allen, "Wireless Telephones in Forest Protection Work: part 2," *The Forest Patrolman*, Mar. 10, 1920, p. 3.
20. Ibid.
21. (Oregon Dept of Forestry) p. 26.
22. (Oregon Dept of Forestry) p. 28.
23. Ibid., p. 73.
24. "Whitney Wireless Tests," *Six Twenty-Six*, Mar. 20, 1920, p. 17.
25. John Pearson "Report on Arc Set" (undated) included as attachment to July 9, 1920 letter from Northwestern Radio Association (R. L. Galyean) to W. W. Hanscom. (Courtesy, History San Jose).
26. "Wireless Telephone Tests are Planned," *The Oregon Journal*, May 8, 1920 pg. 6.
27. "District 6," *The U.S. Forest Service Bulletin*, Apr. 25, 1920.
28. Clay M. Allen, "Letter to W. W. Hanscom."
29. A.O. Waha, Asst District Forester, USFS District 6 by Shirley Buck (acting), "Letter to James H. Boyer, Attorney for National Radio," June 1920. (Courtesy, History San Jose).
30. "Northwest Statistics," *Pacific Radio News*, Vol. 2, No. 12, July 1921, p. 417.
31. "Amateur Radio Operators Master Wireless Secrets," *The Oregon Journal*, May 20, 1920, p. 57.
32. R. T. Galyean, "The Operating Department—Northwestern Division," *QST*, Oct. 1920, p. 26.
33. "Wireless Station in Operation," *The Oregonian*, July 1, 1921, p. 11.
34. "Flesher is at Forest Station," *QST*, Sept. 1921, p. 39.
35. "Radio Amateurs Annoy," *The Oregonian*, July 9, 1921, p. 4.
36. The lookout cabin at the summit of Mount Hood continued to be staffed during fire season for many years. Finally abandoned at the end of the 1933, the lookout fell into disrepair and tumbled over a cliff in the early 1940's.
37. R. B. Adams, "The Use of Radio Telephones in the Forest Service" (paper presented at the Missoula section, Society of American Foresters, Jan. 22, 1923), p. 2. (Courtesy Forest History Society).
38. J. H. "Bud" Coats, *Communications in the National Forests of the Northern Region: A History of Telephone and Radio*, 1984, U.S. Department of Agriculture, Forest Service, Washington: p. 37.
39. (R. B. Adams) p. 3–4.
40. Versions of the story were also retold in contemporary children's fiction such as "The Radio Boys with the Forest Rangers" by Allen Chapman.
41. Ashley C. Dixon Sr., "KPOJ Started in Bitter Root Valley Back in 1922," *The Oregon Journal,* June 6, 1948, Pacific Parade section.
42. Ashley C. Dixon, "How to Build a Good Low-Power Transmitter, "*Radio Broadcast*, Vol. 5, No. 3, July 1924, pp. 254–260.
43. "Wireless Phone in the Local Forest Service Office," *The Ogden Standard*, Oct. 15, 1919, p. 7.
44. Clay M. Allen, "Letter to W. W. Hanscom."
45. S. R. Winters, "Radio Helps Fight Forest Fires," *Radio News*, Vol. 3, No. 2, Aug. 1921, pp. 94, 144, 146.
46. "Radiophone Gives State and Denver Jazz Concert," *Rocky Mountain News*, Feb. 19, 1920, p. 1.
47. No rent was charged. However, the Navy asked Adams to report the results of his testing.
48. Royal Mumford, "The Operating Department—Northwestern Division," *QST*, Sept. 1920, p. 31.
49. U.S. Department of Agriculture, Forest Service, "Wireless Phone Success in Idaho Forest Service," *Weekly Newsletter*, Sept. 7, 1921 p. 4.
50. (R. B. Adams) p. 5.
51. R. T. Galyean, "The Operating Department—Northwestern Division," *QST*, Oct., 1921, p. 40. Ira Johnston Kaar (b. 1902) was licensed as 6ZA in 1919. In the next few years, he

built several broadcast stations in Salt Lake City: KFOO—Latter Day Saints University, KDYL (KFNZ)—Salt Lake Telegram, KFUT (KUTE)—University of Utah. In the mid-1920s he began a 31-year career at General Electric during which time he was granted several patents for radio technology. Later he was Engineering Director and Vice President at Hoffman Electronics in Los Angeles.

52. "100-Watt Radiophone Works 450 Miles in Daylight," *The Wireless Age*, June, 1921, p. 12.
53. The Boise High School Radio club was initially licensed only to perform amateur and experimental communications. Harry E. Redeker, the school's chemistry teacher, was granted a commercial broadcasting license (KFAU) in 1922. Using a home-built 2-kW transmitter and a De Forest unit panel receiver, the club produced radio broadcasts several nights a week that were received coast-to-coast. Redeker moved on in 1927. In 1928, the Boise school district sold KFAU and the call letters were changed to KIDO. Today, KIDO is generally acknowledged to be Boise's first broadcast station.
54. U.S. Department of Agriculture, Forest Service, *Forest Service Bulletin*, Jan. 30, 1922.
55. Gary Craven Gray, *Radio for the Fireline: A History of Electronic Communication in the Forest Service, 1905–1975*, 1982, U.S. Department of Agriculture, Forest Service, Washington.
56. Ibid., p. 29.
57. Ibid., p. 23.
58. W. W. Hanscom "Letter to J. J. Scrivner," Aug. 7, 1921. (Courtesy, History San Jose).

About the Author

Dan Howard lives just outside of Portland, Oregon.

Today, few Oregonians realize that there was ever a lookout cabin on top of Mount Hood. And the story of the wireless tests has been all but lost. Researching this story has not only given me the chance to learn and share a little about local history, but also to draw together several different story lines from Oregon's radio past.

My interests in ham radio and radio collecting date from the 1970s. I became interested in the history of Forest Service radios about ten years ago after realizing that many were manufactured here in Oregon. In fact, the Forest Service Radio Lab was located in Portland until the 1950s.

The accompanying photograph shows the Mount Hood summit as seen from Timberline Lodge in late October. Not far from here, in 1919, Camp Blossom was used as a staging area as the radios were being packed to the summit. As you can see, 2015 was a very dry year. In contrast, the foresters were fighting summer snow and ice storms as they sought to put the lookout on the air.

Thanks to my family for their assistance (and indulgence) with this project.

Dan Howard