Transcript #64-CAS The de Forest Story
Talk by Thorn Mayes before the Antique Radio Club of America (ARCA) at Mystic, Conn.
1980
64 minutes
Summary: Talk includes these topics: formation of Wireless Telegraph Co. of America in 1901; formation of American de Forest Co. in 1903; followed by a total of eight companies; de Forest's move to the West Coast in 1911 and work at Federal Telegraph on the vacuum tube oscillator and spade detector; interest in radiotelephony using arc transmitter; 1912 demonstration of amplification of 120 times to the Telephone Co.; July 1913 Telephone Co. purchased patent rights to his amplifier patent.

Very poor audio recording.

[002] Gang it looks like we're ready to use Track 2 now, and listen to presentation number 2 here at the Annual Conference of the Antique Radio Club of America in Mystic, Connecticut in 1980. Our second presentation is going to be by our Western allies. Paul Stanley is going to help, is he, by at least coming and listening to the presentation by Thorn Mayes, W6AX. Uh oh - oh, from California, moral support? Oh, I'll be darned. We'll cut this out of the tape anyway, you know, this is just by way of warming up the audience. In a far more serious vein, I'd like to introduce to you all Thorn Mayes, W6AX, who has made quite a study of the very early days of radio particularly out on the West Coast. But that's not his most distinguishing feature. For you, Art, and for you Lorne, his most distinguishing feature is that he's an ex-alumnus of the General Electric Company, a small outfit out of Bridgeport, Connecticut that used to make toasters or some such. Dick Ransley's laughing like the Dickens because he thinks Auburn is the center of the General Electric Company, and I know it's Philadelphia.

Anyway the part that's most interesting is that Thorn has offered to tell us more about the de Forest story, and it's a very exciting one, it's in the center of all radio. So Thorn, please come up here and tell us a wee bit about yourself first, and then bring to us the whole story of de Forest that you've put together for this presentation.

Mayes: This mike is, the one here, huh?.

Yes, the other one's sick, so I put it to bed in the hospital. Otherwise, I'd shoot it.

Mayes: It's certainly a pleasure to be here to the ARCA meet. It's the first time I've attended one of your annual meetings, I've met your members. I've been a charter member myself. I've met most of you at the AWA meetings from time to time. But this is the first, pure ARCA meet I've attended.

As background information, we have at the Foothill Electronics Museum, just south of Palo Alto, California, all of the personal material that Mrs. de Forest had from her late husband. She incidentally is still alive. She is in a mental institution in Southern California. She was living in Hemmet, California, as an amateur, up to about 5 months ago.

What's the matter, Lou?

Now, you know that Kelley is not here, and I left out all the slides because of the way Kelley can mess them up. I've never had trouble with Raph before. [laughing, chortling] The other angle is that de Forest went west in the latter part of 1911 when his eastern empire folded, and he went to work for the Federal Telegraph Company. The chief engineer at Federal Telegraph was Leonard Fuller, who at age 90 is still very much in the act, and I see him at least every couple of weeks. So he supplied first hand information on what de Forest did during the latter part of 1911, '12 and early '13 while he was working in the research lab with the Federal Telegraph Company at Palo Alto. Well, that's just as background information.

[51] In 1973, I gave a paper at the AWA Annual Meeting on the history of early U.S. wireless operating company, which included the seven companies formed by Lee de Forest and Abraham White. All used spark transmitters at that time. That paper also covered the career of de Forest through his forced resignation from the American de Forest Wireless Telegraph Company of November 1906. This paper, after a very brief review of de Forest's early career, starts with his work leading to his patents on the three-element vacuum tube. His experiments with radiotelephony using an arc to generate the carrier, his formation of seven radiotelephone companies, including his trial by the U.S. government by using the mails to defraud in selling stock in his worthless wireless companies, and his development of the Audion amplifier and oscillator while working for the Federal Telegraph Company in Palo Alto. And finally, after selling his patents to AT&T for $140,000, his setting up

manufacturing facilities for building wireless equipment including vacuum tubes which he built for the U.S. government before and after World War I.

I'm indebted to Dr. L. F. Fuller, former Chief Engineer of Federal Telegraph Company, for material on de Forest's development of the audion amplifier and oscillator units while with Federal; to Gerald Tyne, for data on de Forest's work after returning east in 1913, for helpful suggestions in reviewing this paper. As you know, he is really precise and if an "i" is not dotted just right, Gerry will tell you about it. So I'm very much indebted to him. And to Lloyd Espenschied for material on the de Forest trials. I'd like to digress for a moment here. There are a number of Old Timers present and you'd be glad to know that I've been in correspondence with Lloyd Espenschied who for about the last 4 years has been totally blind. He's in a nursing home in New Jersey, but his daughter doesn't live far away, and if you want to contact Lloyd, you send any material to his daughter and she reads it over to him. He enjoys such things very much, because he says he's very much alone being blind, he has practically no contacts with his former associates - most of them are gone - so he appreciates any letters you may wish to send to him commenting on up-to-date radio operations.

[91] Lee de Forest's doctorate thesis at college was on wireless propagation indicating an early interest in this subject. On his first job after graduation from college, he went with the Western Electric Company in Chicago. And there met Edwin Smythe, who was also interested in wireless, so the two began experimenting together. In those days, the only detector, or rectifier for receiving wireless signals, was the coherer, which was insensitive and erratic in its operation. de Forest recognized that this detector was seriously limiting the range of wireless, and for years was looking for a more efficient device. He and Smythe developed an electrolytic detector they called a responder, and using it were able to pick up signals from a spark coil a distance of four miles.

In 1902, de Forest saw the electrolytic detector patented by Fessenden, which consisted of a fine platinum wire dipping into a cup of acid. This device was more sensitive than the responder, so de Forest built and applied for a patent on a variation of the Fessenden design, which he called a spade detector. Fessenden filed a suit immediately against de Forest early in 1903, claiming the spade detector was an infringement of his design. During their studies of various detectors, de Forest and Smythe noted that the flame of a wellsback gas light was affected by the operation of a spark coil. Later, they learned the flickering was due to sound waves. But de Forest for years thought it was due to electromagnetic waves and that hot gases might be a good detector of wireless signals.

In August 1901 de Forest, Smythe and others formed the Wireless Telegraph Company of America with a capital of $3,000. The stock was distributed between the founders so there was none to sell to the public, and there was no way to raise money to continue their experiments. In February 1902 a new company was formed - the De Forest Wireless Telegraph Company - under the laws of Maine, with a capitalization of $3 million dollars. Later that year, de Forest met Abraham White who saw an opportunity to sell a lot of wireless company stock. So the name of the company was changed to the American De Forest Wireless Telegraph Company and the capitalization was up to $5 million dollars.

In 1904 this capitalization was again up to $15 million dollars and stock sales had been good. de Forest and White formed a total of 8 wireless companies ending with United Wireless Telegraph Company, which was capitalized for $20 million dollars. He was the chief engineer of the American de Forest from 1902 through 1906 and during this period, in addition to owning much of the stock of the company, he was paid a salary that he used to support a small laboratory in which he carried out experiments under the direction of John Hogan, who had charge of the lab, building vacuum tubes in the hopes of finding a better detector for wireless signals.

[138] de Forest took out a number of patents on wireless tube detectors, which are reviewed by Gerald Tyne in his series, "The Saga of the Vacuum Tube," published in Radio News in 1943 to '46. Of course Gerry has since published that in book form. Gerry said the most important ones were - there were 3 of them - 979275 applied for in February of 1905 on a heated gas-type detector using heat from a bunsen burner or a lamp filament enclosed in a partially evacuated glass bulb; No. 836070, issued in November of 1906 covered the heated filament in a partially evacuated glass bulb with metallic plate. This was the two-element tube, an infringement of the ? patent, of course. And finally No. 879532 filed January 29, 1907; he was fired from the American de Forest Company in November of 1906. At the end of January of next year he applied for the three-element tube. It was issued in February of 1908, which disclosed a filament heated by an external battery, a rectangular plate, and a grid in between the filament and plate all bounded in a partially evacuated closure. This was a grid audion of 3-element vacuum tube.

[160] The de Forest spade detector was being used in practically all of the stations of the American de Forest Wireless Telegraph Company and many of them had been sold through the Navy. In mid-1906 after long, expensive litigation, the courts decided that the de Forest design was an infringement of the Fessenden design. American de Forest was forced to change the detectors in all of their stations, ship-to-shore stations. Fortunately, General H. H. Dunworthy, who had received a patent on the use of silicon crystal for a detector, was now an officer of the American de Forest Company, so his detector replaced the de Forest electrolytic.

President White held de Forest responsible for this change, also for the cost of the litigation, so in a heated last meeting in White's office held November 28, 1906, de Forest was forced to resign from the company and return his stock holdings. He was given a severance allowance of $1000 plus the ownership of the patents that had been issued on his audion detectors, plus those he had applied for, as White considered them worthless. The lawyers who drew up the severance paper charged $500, leaving him with $500 in cash and the audion patents.

After leaving the American de Forest Wireless Company, he concentrated on his tube experiments and according to Tyne, in December of 1906, assembled a tube having a filament, plate, and third element between the filament and plate, which he called the grid. This was the three-element tube for which a patent application was filed in January of 1907. For some time de Forest had been experimenting with the radiotelephone using an arc to generate the carrier, which was modulated with a microphone. After completing the three-element tube, his interests shifted to the radiophone and by early 1907 he was able to communicate across his laboratory in New York City. The De Forest Radio Telephone Company was formed in February of 1907 under the laws of the state of New York, capitalized at $200,000 for the purpose of developing, manufacturing and selling radiotelephone systems and parts. The directors were Samuel Darby, his patent attorney, H. S. Bond, E. G. Sammis, G. B.L. Hogan, and Oscar Schell.

This company did not provide money needed to carry on his experiments, so in May 15, 1907, he formed the Radio Telephone Company in the State of New Jersey, capitalized at $2 million dollars. From George Clark's Radioanna 5668 comes this quote from the prospectus of the company, "The Radio Telephone Company capital $2 million dollars all common stock under 10 dollars in the New Jersey Corporation, President James Dunlop Smith, Lee de Forest Vice President, Samuel Darby Secretary, G. T. I. , Treasury, Patent Counsel G. K. Woodward and Samuel Darby." James Dunlop Smith was one of the star stock salesman of the American de Forest Wireless Telegraph Company, so it would appear that de Forest had again reverted to stock selling to obtain money to support his experiments.

[212] Amateurs and others in the New York City area equipped with radio receivers began hearing voices on the air and the phoned in the results of the de Forest experiments. In the spring of 1907, a radiophone was installed on the ferry boat Bergen and a similar installation was made at the Hoboken terminal at 23rd Street Manhattan. The two stations communicated satisfactorily. Radiophone signals were picked up in the New York Navy Yard, which resulted in a request from the Navy to install radiophones on two Navy ships, the U.S.S. Virginia and Connecticut. Specifications called for satisfactory communication over a distance of 10 miles, but under test the vessels could carry on a conversation from a distance of 21 miles.

Based on these tests made in September of 1907 the Navy ordered 26 complete sets to be installed on the main vessels of the fleet that was to make a goodwill trip around the world. These sets were built and installed … and little time was allowed for instructing the operators in their use. The radiophone at that phone was still a laboratory instrument requiring special care and adjustment, not suitable for general use. As a result, Captain Howard states in his book that in March of 1908, Rear Admiral Evans, Commander of the fleet, directed that all radiophone sets except for the U.S.S. Ohio be dismantled as their use interfered with regular radio communications.

In January 1908, de Forest's laboratory in the Parker Building in New York City was destroyed by fire. A complete history, including tube samples showing the development of the audion from 1905 were lost along with records and notebooks. In February of 1908, de Forest worked in Europe to demonstrate the radiotelephone. He had made arrangements to broadcast from Paris using an antenna strung from the Eiffel Tower. For a week he experimented using an antenna from a 125-foot level. He was then permitted to use for one night only the antenna from the top of the tower which went up to a height of 984 feet. From this radiator, his broadcast was heard in Marseilles, a distance of 400 miles. From Paris he went to Germany, where among others he met Dr. Seibert, who was working on the development of the quenched spark gap. He discussed with Seibert the possibility of coming to America to continue his development and test it in de Forest's laboratory.

[254] Four radiotelephones were purchased to be installed in Italian warships, so de Forest went to Rome to supervise their assembly and test. In September, the British purchased two sets for installation in their naval vessels, so he went to London to supervise that job. A New York commercial of October 2nd 1908 tells how their satisfactory communication of over a distance of fifty miles. Emil J. ? came to de Forest's laboratory late in 1908 and Dr. Siebert came in January of 1909. The two of them concentrated on the quenched spark gap development using a 500 cycle power supply.

Later extensive testing was carried on which proved this design appreciably increased the range of a given powered spark transmitter. In addition the 500 cycle note carried through static much better than the lower tone of the usual rolling gap transmitter. According to George Clark, Dr. Siebert filed for a patent on the quenched spark gap system in December 1909. A small shop in Newark, New Jersey was leased at which amateur and navy gear was built for sale to amateurs and the Navy. Sales of radiotelephone company stock were not good, so the directors decided to try the system that had worked so well increasing sales of the De Forest Telegraph stock. A number of stations were built along the shore of the Great Lakes and the Atlantic Coast to show to prospective customers what the company was in operation and exchange of messages.

First, the Great Lakes Radio Telephone Company was formed in early 1909 and capitalized for a million dollars to operate the stations and provide stock for sale. The publicity campaign was started in *Modern Electronics* magazine. The August 1908 issue carried a two-page story on the new de Forest audiophone, the October issue had a picture of a large antenna on top of a twelve-story building in New York City that was to be used for development work. The article goes on to say that the Radio Telephone Company is getting ready to install a chain of stations all along the Atlantic Coast from Eastport, Maine to Pensacola, Florida and west along the Gulf of New Orleans, to New Orleans, Mobile and Galveston. The December issue carries a two-page article, "Aerophoning on the Great Lakes," which I quote in part as it is written like a brochure to be used by a stock salesman. "The use of aerophone upon the Great Lakes proves so effective to safeguard shipping, that we may expect it to act as a great object in giving the necessary impetus to the completion of the Great Inline Waterway System that the nation needs so badly. Some 25 long-distance stations will stand ready to carry on the great work when navigation begins this coming spring. Includes stations now under contract from Chicago, Toledo, Cleveland, Detroit -- and they go on to mention the 25 locations where these stations would be located -- and we may look forward during the summer to the equipment of at least 100 intermediate stations, each having a range of about 75 miles, thus enabling every one of the thousands or more residents to be equipped to keep in constant touch with the shore. The owners of several thousand players are anxiously awaiting installation of the aerophone, realizing that under the peculiar conditions governing the crowded commerce, the aerophone is as essential to the economy of the trade as is ships built of steel."

[316] Some people feel that de Forest never participated in the publicity of the material for selling stock of his companies. I think this is [an exact] of the degree that he got into it. Later in the Issue is an ad for the Elsworth Company stock brokers which states, "The Great Lakes Radio Telephone Company using the de Forest Wireless System is erecting stations upon the Great Lakes and plans to have over 100 stations and 1,000 boats equipped by the middle of the coming summer. If you can invest $10 or more per month, write us before you take interest."

Under the caption "Wireless Banker," *Modern Electrics* for April 1909 carries the following story, "At a banquet here in February 17 last in the historic ? Tavern, New York City, in honor of Dr. Lee de Forest's work in aerophoning, and on account of the successful financing of the Great Lakes Telephone Company, inventor Dr. De Forest spoke of his achievements. Mr. Smith, the president of the company, announced plans for the immediate erection of a chain of wireless stations along the Atlantic and Pacific coasts, as well as in certain parts of the interior. Over 100 wireless men attended the banquet."

In spite of the large number of radiophone stations that were to be built by the radio telephone company, according to the articles in *Modern Electrics* for 1908, none were listed in the power books of 1909. Fifteen were listed for 1910. Fourteen for 1911, and there were no stations listed by the de Forest companies in the 1912 book or thereafter. All the stations except the two of New York City were equipped with spark transmitters. A few had in addition short wave radio phones. A total of 11 stations were built on the shores of the Great Lakes, five on the Atlantic Coast, and none on the Pacific Coast. Five kilowatt quenched gap spark transmitters using 500 cycle alternators had been installed in the New York and Philadelphia stations which were demonstrating unusually good performance and were being watched carefully by our Navy. George Clark, the historian, in his book, "The Life of John Stone Stone," states that Stone in 1908 while developing the principles of .. or had discovered the principles of the quenched gap, but at that time did not apply for a patent to the design. He continues, that when Dr. Seaman proposed the 500 cycle quenched gap system, the Navy bought samples, adjusted them, and immediately accepted the design. This spelled the end of the Stone Wireless Telegraph Company. They say he had specialized in building equipment for development and now their market for spark transmitters was gone.

[366] Two other companies were formed by de Forest in 1909 to sell more stock: the Atlantic Radio Telephone Company to operate stations on the Atlantic Coast, and the Pacific Radio Telephone Company to operate the West Coast stations. Each was capitalized for $2.5 million dollars. Late in 1909, at a director's meeting, President Smith announced that the radio telephone companies were bankrupt with debts of over $40,000 and no cash to pay them. Also, that he was resigning as president. After Smith left the director's meeting, several possible plans were discussed. One was to report Smith's raiding the treasuries of the companies to the federal officials for prosecution. Burlingame -- he was the new president -- however, disagreed with this plan as it would seriously hurt future stock sales. He proposed that a new company be formed of the three radio telephone companies. This plan was accepted, so on November 1, 1909, the North American Wireless Corporation was formed under the laws of the state of Maine, capitalized for $10 million dollars. It took over the assets and operations of the Great Lakes, Atlantic, and Pacific Radio Telephone companies. Stock outstanding in these three companies was replaced with North American stock. In the formation of these new companies, de Forest turned over to Burlingame his stock in the radio telephone company, thus losing clear title to his audion patents. This transaction would later seriously interfere with his sale of these patents to telephone company.

[396] Stock of bond sales were hurt by the demise of the Great Lakes Atlantic and Pacific companies. Operations had to be reduced, so a number of stations along the Great Lakes were closed, but the laboratory and New York plant were kept open, as the Army and Navy were beginning to buy the quenched gap transmitters. Income from these sales, however, was small compared to income normally from stock sales. de Forest installed a one half kilowatt transmitter in the Metropolitan Opera House in January 13th, 1910, and broadcast a performance of several opera stars. Unfortunately he had selected a wavelength of 850 meters for the broadcast, which was the same as used by a busy United Wireless station in New York. This spark station DF was operated most of the time, so no opera was heard by the amateur audience because of this interference. He continued the transmission of voices of various opera stars ? before they were heard in the radio telephone company station XAW in Newark, New Jersey. The Signal Corps bought two quenched gap transmitters to be installed on U.S. Army transports, one in Seattle, one in San Francisco. So de Forest came west in 1911 to supervise the installation. Before the work was completed, he heard from the east that stock sales were very low. The radio telephone company went into bankruptcy in March, and its assets excluding patents and stocks were sold to the Gardner? company. The Newark New Jersey factory and New York City labs were closed and his paychecks discontinued, so he decided to stay on the West Coast.

C. F. Elwell, then Chief Engineer of the Federal Telegraph Company, in the first draft of his autobiography, says that Dr. de Forest came to San Francisco early in 1911 where he opened an office for the purpose of selling stock in his various radio telephone companies. Sales were not good, so in July he came to Elwell saying he would like to work for Federal. Elwell commented that de Forest had invented the three-element tube five years earlier, but so far had found only one use for it, as a detector, and he felt that there were other things that he would be able to accomplish.. An amplifier was badly needed to help him receiving weak radio signals, so he hired de Forest to head a team to concentrate on the development of a circuit that would cause an audio tube to amplify.

De Forest was hired at $300/month and went to work in the Palo Alto laboratories of Federal. Two capable men were assigned to work with him, C. V. Logwood and H. Van Etten. Logwood was a radio amateur and a born experimenter. Barnett had worked with the telephone company so understood the circuits that they used. After starting work on the amplifier de Forest began the study of the problem of increasing rate of transmission between the Federal stations in San Francisco and Los Angeles. With the arc system, the arc burns continuously generating a radio frequency carrier. Communication is accomplished by changing the carrier frequency with some device connected to a telegraph key. A common method was to, through a relay, short circuit turns and the antenna tuning in darkness. As he resolved it, the transmitter frequency was higher than the stand-by frequency, or as it was called, ? The operators of both Los Angeles and San Francisco had learned that under certain conditions, they could communicate better if they used the lower stand-by frequency and had switches on the operating table for making this change. de Forest observed this phenomena, studied it, and was the first to report on selective fading on different frequencies. He prepared a paper on this subject, which he gave at one the first meetings of the Institute of Radio Engineers.

Later, Dr. L. F. Fuller made a detailed study of selective fading between the Federal Stations in South San Francisco and Kia, Hawaii. On March 1912, de Forest was served a warrant by two U.S. Marshals, which said that he, Captain Darby, his patent attorney, Smythe and Burlingame had been indicted in the U.S. Government for using the mails to defraud in selling worthless stock in his radio telephone companies. Beach Thompson, president of the Federal Telegraph company, raised the $10,000 bail so that de Forest could continue work. Elwell continues in his autobiography that in August of 1912, Logwood invited him to witness a performance of a cascade amplifier using three audions, and as an aside here, Dr. Fuller

in Federal in 1912 tells me that in his opinion, Logwood was the brains of developing the audion amplifier. However, he was working under de Forest's supervision, so it was perfectly all right for de Forest to claim credit for developing the audion amplifier even though Elwell did the job.

[502] It amplified the ticking of a watch held in front of a microphone so that it could be heard all over a large room through the headphones, as there were no loudspeakers available at that time. Dr. Fuller says that when he came with Federal in September 1912, the amplifier circuits were completed. Several amplifiers were built by Federal for tests in the South San Francisco station. Performance was not dependable for sometimes they amplified and sometimes they did not. Fuller had come from the National Electric Signaling Company where he had been working on the development of a small arc generator for supplying the carrier for Fessenden's recently designed heterodyne receiver. He said the operation of these small arcs was erratic, and told Van Etten and de Forest that if an audion could be made to oscillate it would be a much more satisfactory source of signal. de Forest, Van Etten, and Logwood immediately began work on the development of an oscillator circuit.

Later that year Elwell took the amplifier with him to Washington, where he demonstrated it to Dr. Louis Cohen, radio expert for U.S. Navy, who was so impressed with its performance that he took it to the Bureau of Standards, where tests showed an amplification using the tubes of 120 times. de Forest knew that the telephone company was trying to build an amplifier for their long lines, so based upon the Bureau of Standards test, he decided to take it to Western Electric for demonstration. John Stone Stone was a friend of de Forest's, then a consulting engineer in New York City. But he had been a former telephone employee. He arranged for a demonstration which de Forest gave on October 30 and 31st, 1912. Dr. Arm, the telephone company high vacuum specialist, was working on the problem of developing a suitable amplifier. He was not present at the de Forest presentation, but he did witness an amplifier's performance the next day when Paul Pierce, the Western Electric assistant, operated the equipment. Mr. W. R. Boward, a patent attorney for the telephone company, writing in the Bell Laboratory Record for July 1931, made these comments on the tests: "The performance of the tubes was far short of what they knew would be necessary for practical telephone repeater operation. Any attempt to handle loads comparable to those in commercial telephone circuits resulted in choking, blue glow, and unintelligible reproduction. Nevertheless, they were greatly impressed with the performance of the audion when the power levels were kept low and the variations in voice current were strong."

He continued that Dr. Palmer felt that tube's performance could be greatly improved by pumping it in a higher vacuum. Arnold immediately started constructing and testing a tube pumped to a higher vacuum, and by late spring 1913, was sure that satisfactory factory repeater tubes could be produced. According to Lou Bell's article in *The Saturday Evening Post*, de Forest had given Stone a six-month option to sell patent rights for use of the tube as a repeater to the telephone company for $100,000. He had expected to hear from the phone company in a short time, but after not hearing by January of 1913, de Forest returned to California to his job with Federal Telegraph, after Federal Telegraph told him he damn well better get back if he wanted to stay on the payroll.

[584] de Forest had taken a second amplifier to New York and had interested the officers of the American Telegraphone Company in exploring the possibility of recording sound on the wire that was synchronized with the taping of motion pictures. That was his start of the motion picture industry. In April 1913 that company advised that they had enough money to start experiments, so de Forest quit his Federal job and returned to New York City, taking Logwood with him. His wire recordings were so poor that American Telegraphone soon lost interest, and de Forest was again out of a job.

Meanwhile, the telephone company after determining that a successful repeater tube could be made, investigated de Forest's patents and found that he did not have a clear title, for in giving title of his radio telephone stock to Burlingame, in the formation of the North American Wireless Company, he had lost control of the patent. The telephone company hired an outside lawyer to try and straighten out the situation. This job was turned over to Sidney Myers, who after four months work was able to get all those involved to sign papers agreeing to sell the telephone repeater rights for $50,000. In July 1913, the telephone company acquired the audion patent rights for repeater service for $50,000. de Forest was later able to get a clear title to his patents, but only after considerable difficulty with former officers of his companies.

[623] Using part of this money, de Forest re-established his New York City laboratory, and with Logwood's help, began making RJ4 detectors for sale to amateurs and ultra audion regenerative detectors for the Navy. In March 1912 de Forest had been served with an indictment by the U.S. Government on four counts of using the mails to defraud in selling worthless stocks and bonds in his wireless telephone companies. October 14th, 1912, he pleaded not guilty. December 1, 1913, the trial of de Forest, Captain Darby, James B. Spen, president of the Radio Telephone Company and Elmo

Burlingham, began in the First District Court of New York City. It was brought out at the trial that from January 5 - July 6, 1909, stock sales in the various radio telephone companies amounted to $844,000. December 10 evidence was submitted by the government witness that of $1,507,000 in stock sales in the companies, only $340,000 went to treasuries of the companies, $1,160,000 again going to agents and promoters. Dividends on radio telephone company stock were paid from money received from the sale of other radio telephone stock. The companies did not build the stations they promised in their advertisements, they had not set up substantial operating companies as promised, and the whole scheme was selling worthless wireless stock to the company. The radio telephone company in the North American Wireless Corporations, which had been formed from the Great Lakes, Atlantic, and Pacific Companies, had a total capitalization of $12 million, yet the only asset was the ownership of the patents on the de Forest audion detector, which at that time was considered worthless.

[676] December 30 the case went to the jury. After deliberating until 1 a.m. the following morning, they returned the following verdict. Smythe and Burlingame guilty on counts 1 and 4 - disagreement on counts 2 and 3. Darby and de Forest not guilty on counts 1, 2, 3; disagreement on count 4. January 7, 1914, the Judge Hung gave the final sentencing: Burlingame 2 ½ years in prison, fine $10,000. Smythe - 1.5 years in federal prison, fined $5,000. Darby and de Forest no more prosecution.

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[004] Lloyd Espenschied attended many of the sessions of the trials and made these comments: “The prosecution, assistant district attorney Stewis? was noticeably easier on de Forest and his patent attorney Darby than apparently the other two defendants. This resulted from recognition that de Forest had been a rather noteworthy inventor. A fact brought out to Stevenson by a petition that met by members of the Wireless Institute headed by Robert Marriott. But the extent to which de Forest had been infringing other people’s [sound cuts out momentarily] association with wireless and radio communication companies. Its operations from hereon were limited to developing, manufacturing and selling radio equipment. No more sales of stock and radio communication companies. Initially, the telephone company had purchased rights to use the audion as a repeater. But in October 1914, for the sum of $90,000, they purchased additional rights. With this money, de Forest enlarged his manufacturing facilities at High Bridge, including the installation of glass-blowing equipment and high vacuum pumps. Up to this time, all audion tubes for sale had been manufactured for sale by McCandliss? of new York City, but now de Forest could produce his own tubes, and McCandless had sold his business to the Westinghouse corporation.

[24] While on trial December 1913 formed the Radio Telephone & Telegraph Company under the laws of the state of Delaware, capitalized for $3 million dollars. This company was formed from the old Radio Telephone Company from 1907 that had gone bankrupt in 1911. In January 4, 1914, just two months later, the name of the company was changed to the De Forest Radio Telephone & Telegraph Company, but many of the RJ 4 audion detectors produced after that time carried the old nameplate, the Radio Telephone Company, because he refused to change the nameplate in stock. So you can’t depend on the nameplate to determine the date at which your RJ4 detector was manufactured.

With these new facilities he developed, manufactured and sold an expanded line of receiving and power tubes, also a complete line of amateur receiving equipment; during World War I radio gear and tubes for the U.S. Government. This was the end of de Forest’s work with communications companies. And, as you know, shortly after this period, de Forest became interested in the production of 35mm ? sound, and moved to Southern California, and from then on specialized in that equipment.

Again, as an aside, I would like to point something out. de Forest in his book, “The Father of Radio,” bemoans the fact that the telephone company only paid $50,000 for the audion patents, which was a lie, because it is documented they paid him $140,000. Lloyd Espenschied told me that after World War II, when copper was so scarce, at that time de Forest in Los Angeles was building the equipment for ? and he could not get the necessary priorities to buy any copper at all, so his company went broke with no assets. Lloyd Espenschied went to the contact(?) here in California and said “Now look, this man has made long-line telephony possible. You certainly owe this man something.” As a result, de Forest was put on the payroll of the telephone company as a consultant for $1500/month and he was on that for about 3 years. When de Forest died he had liquid assets telephone company of ?

Did I mention that before that the telephone company **did** pay de Forest, ? and take care of him, for which they have never received any notice at all. If you have any questions about that period, I will try and answer them.
[Audience clapping]

[065] [Host] That was an excellent presentation, but I'm shocked at how little I know! My goodness, I'm amazed at how completely Thorn has researched those early years. He's - I can almost see a diagram of the different companies and the flow from one to another - it's hard to believe, the man was completely prolific in terms of these organizations and attracting people around him, wasn't he. As prolific with those kinds of things as he was with his - purely a ? person.

[Audience question] Was he involved in any of the de Forest training schools?

[Mayes] That I do not know. ? … training schools formed with the de Forest name, I'm sorry I can't shed any light.

[Audience question] Where was the … [unintelligible]

Mayes: I have papers on de Forest and I have been scrupulous not to get.?..at all..?. I will make this comment. Probably the closest friend that he had on the East Coast was Gerry Tyne. de Forest, when he decided that he wanted a little more publicity and wanted a biography written, asked Gerry if he wouldn't write it. Gerry said, "No, Lee, I know your personal life too well." He also made the comment that on the first trip that de Forest made to Europe just before he boarded ship he was married to a girl that has not been heard of since and there has been no mention of her in his book.

To answer the other part of your question, I don't feel that de Forest was a scientist. Reading his papers, reading the material that he published, he did not ?? the science at all. For example, I had hoped to get a lot of material from his book, "The Father of Radio," but the names of the company that he formed were badly jumbled up, the dates of certain events were off as much as 3-4 years, so I could only use material in his book to indicate de Forest's feelings about a given situation. And the same applies to the series that was in the *Radio News*, I believe it was about '36 (?46) on de Forest. There, again, he was not dependable at all on any statistics.

It's not (now?) generally known that de Forest didn't hesitate to private use of someone else's idea and was an avid reader of the patent digest to keep up on what was being done throughout the world...? I'm not trying to detract from anything de Forest did, certainly, long litigation ?? he had the patent on the audion …? Dr. Fuller tells me that when he was chief engineer, he went into Van Etten's laboratory and he actually heard two of the tubes developing a sound the carrier from the Federal Telegraph Station ?? but they didn't know how they'd accomplished it. It's no question that Armstrong was the man who first understood what the vacuum tube ? and built the first controlled oscillator, although de Forest did have an oscillated ? in Palo Alto.

Question: What formal education did he have?

Mayes: He was a phD at Yale University.

Question: [Unintelligible question]

Mayes: Well, de Forest came East to demonstrate the amplifier to the phone company, and again in 19?0 and he brought two amplifiers …? telegraphy ? late in 1913, which was not satisfactory. Now Dr. Fuller says that the loose truth characteristics and so unpredictable that the amplifiers developed at Federal Telegraph...