

Joining Two Worlds: De Forest and the Development of Radio

by George Colpitts

In March 1912, Lee de Forest — inventor, electrical engineer and wireless promoter — was ushered into a Palo Alto, CA courtroom to face fraud charges. Also arrested were de Forest's patent lawyer and directors from a number of subsidiary wireless telephone ventures, all employed within the inventor's umbrella company, the Radio Telephone Company.

The creator of the "De Forest" telegraph system was not new to courtroom controversy. His designs had been picked apart in patent trials innumerable times, and his first stormy divorce had received much courtroom publicity. But the fraud charges were much more serious, and the press gallery was packed to watch whether the inventor would be discredited, fined and/or imprisoned.

The press knew de Forest well. He had burst into the news as early as 1902 with the Herculean claim that he would "move all heaven and earth to put in at once a broad fundamental patent on telephony without wires by Hertzian waves."

Already by 1905, de Forest seemed to be succeeding, installing

the first wireless communication between Havana and New York City, relaying the messages through stations

in Havana, Key West, Concho, Hatteras, and Atlantic City.

In 1905, de Forest had claimed he could send messages as far as Marconi could with small, 1 kW transmitters and using 20 to 50 x less power. Moreover, a year before Marconi sent the first successful wireless message across the Atlantic, "joining two worlds," de Forest had sent about 500 words of a 1000-word message from Ireland to New York City.

No wonder then that the press was interested in the fraud case: the outcome could clearly upset an American favourite in the wireless struggle. Moreover, as witnesses and company officials took the stand, it became very obvious that directors had either committed, or allowed to take place, fraudulent promotion of de Forest's company.

The stock scam's nature was quite clear. In 1906 the Radio Telephone Company had won contracts to install wireless telephones on board navy ships. But the early phones were unreliable, short-ranged and interfered with on-board telegraph equipment. By 1908, the navy had



De Forest "broadcasting" in 1907, from his Manhattan lab.

abandoned use of de Forest's wireless altogether.

The company, however, had never told stockholders of the failed contract, and to maintain stockholder confidence, some officials had created subsidiary wireless phone companies to attract cash. That cash was used, the prosecutor proved, to pay dividends on the floundering company. The stock transfers and inflated company claims all smacked of fraud.

The *New York Times* devoted prominent coverage to the scandal when de Forest, the tall, handsome inventor finally took the stand as Christmas Day neared, and told about his life and connection to the fraudulent companies. That testimony provided a valuable synopsis of a varied and interesting career.

In the late 1800s, de Forest explained, he had borrowed \$50 after graduating from Yale to go to Chicago, then the centre of U.S. electrical engineering. There he had assisted at a small electrical company before landing an editor job with the *Western Electrician*. He was paid \$10 a week, but the salary was soon cut to \$5 when it became clear that de Forest was spending less time writing than he was experimenting with wireless equipment.

De Forest's testimony described the poverty he experienced while selling stock in his first wireless companies and the harsh working conditions. In the winter of 1904, he connected Cleveland and Buffalo wirelessly, himself manning one of the transmitting stations. "I shall never forget the icy dreariness of that lonely location..." he wrote much later, "the agony of raising again and again that fan aerial after sleet had piled [up on] it and the stiffened hemp halyards an inch thick in ice...."

The testimony filled a full day of court, and included de Forest's demonstration of wireless technology, transmitting a message through one of the courtroom's oak doors. That finished, the trial was adjourned until after Christmas day, when the jury would decide its verdict.

The stock scam had caught de Forest just as he was vying for position in a

wildly speculative wireless race mostly between himself and the Italian Guglielmo Marconi. Both men were using in different ways John Fleming's invention, the Fleming Valve, as a



De Forest demonstrating wireless at the 1904 World Exposition in St. Louis, where he won the Grand Prize and Gold Medal for sending messages to Chicago.

means to detect Hertzian waves. Marconi had bought Fleming's innovation outrightly and used it in all his wireless designs which were floating on Canard ship lines or beaming, somewhat ineffectively, from coastal towers.

De Forest, however, had used some of Fleming's ideas (and got stung for it in patent court) but built on them significantly. Fleming, it should be remembered, had noticed that by putting a metal-wire electrode with a positive charge into a light bulb, a user could detect Hertzian waves. The innovation was the first radio vacuum tube, or the diode.

De Forest eventually added to Fleming's concept a zigzag wire grid between the filament and a metal-plate electrode to carry incoming messages, constructing the first triode. That was by 1907, and he called the device the

"Audion", which he later said was "the granddaddy of all the vast progeny of electronic tubes that have come into existence since."

But the fact that he had used a vacuum bulb was enough to incite court battles with Marconi, and from 1905 to the end of the First World War, and long after the fraud trial, newspapers kept abreast of appeals and new charges, most of them laid by Marconi.

The earliest patent disputes had shown de Forest's legal slipperiness. For instance, Marconi won a suit in 1906 proving de Forest's first company had clearly infringed on a number of patents. By then however, Marconi, was aghast to find his rival had begun a second company, the American de Forest Wireless Telegraphy Co. with a new president, and the court process would have to begin all over again.

It wasn't until 1915 that Marconi was able to secure an injunction against de Forest to stop him from using pirated parts, and more particularly, from using the Audion. By 1917, Marconi had won a more important case proving that he had the rights to any "vacuum detectors" and de Forest's Audion was "merely an improvement on the Fleming Valve," and therefore a patent infringement, the *Times* reported after the trial.

But there was a difference between the two detectors, mostly in principle, which was difficult for early courts to recognize. The Audion, for instance, was able to amplify weak electrical currents and by 1912, de Forest found the Audion could obtain a range of musical tones in the receiver. It was at that time de Forest had added "feedback" interconnection between the input and output circuits, creating "regeneration."

The Audion, therefore, became an integral component in de Forest's first wireless phone or radio demonstrations when he transmitted music into the main lobby of the Hotel Astor in New York in 1916.

By 1920, de Forest was transmitting the "bottled wireless" (a term given to the modulating circuit in the tube), 900 miles using low wavelength, low-power transmissions.

New York Times.

THE WEATHER.
Fair to-day; fair, colder to-morrow;
fresh westerly winds.

DEC 18, 1907.—EIGHTEEN PAGES. And Part I of Atlantic Review of Books. ONE CENT. In Greater New York, (New York, Jersey City, and Newark.) (New York, TWO CENTS.)

FIRST WIRELESS PRESS MESSAGE ACROSS THE ATLANTIC

Signaling the Opening of the Marconi Service to the Public, and Conveying a Message of Congratulation from Privy Councillor Baron Avebury, Formerly Sir John Lubbock.

THE WESTERN UNION TELEGRAPH COMPANY.
\$4,000 OFFICES IN AMERICA. CABLE SERVICE TO ALL THE WORLD.
RECEIVED AT 813 Sixth Ave. Corner 48th St.,
18th St. N. W. & 53rd St. N. W., P. R., Land Lines,
London Via Marconi Wireless: Glace Bay N.S. Oct 17th,
Times, New York.

This message marks opening transatlantic wireless handed Marconi company for transmission Ireland Breton limited 50 words only send one many messages received Times signalize event quote trust introduction wireless more closely unite people states Great Britain who seem form one Nation though under two governments and whose interests are really identical.

ALWAYS OPEN. MONEY TRANSFERRED BY TELEGRAPH. CABLE OFFICE.
The above message was immediately followed by others which appear in another column of The Times this morning.

MARCONI CONGRATULATES THE NEW YORK TIMES

GLACE BAY, NOVA SCOTIA, Oct. 17.—Mr. Marconi says: "Congratulate New York Times on having received first westward press message."

FROM THE PRIME MINISTER OF FRANCE.

WEST STRAND, London, Oct. 17, via Marconi Wireless Telegraph to Glace Bay, N. S.—The New York Times's Paris correspondent forwards to me the following message for transmission across the Atlantic by Marconi wireless telegraph:
"Dans l'inauguration du merveilleux mode de communication mis désormais à leur disposition, les deux grandes républiques ne peuvent que trouver une heureuse occasion de se féliciter et de formuler les vœux les plus cordiaux pour le maintien de la paix dans le travail pour le bonheur des peuples dans la solidarité."
[Translation.]
In the inauguration of the marvelous means of communication put at their disposition from this time forward, the two great Republics could not but find it a happy occasion to congratulate themselves and to express the most cordial wishes for the maintenance of peace in the work for the happiness of the people in the joint responsibility.
CLEMENCEAU.

WIRELESS JOINS TWO WORLDS

Marconi Transatlantic Service Opened with a Dispatch to The New York Times.

MESSAGES FROM EMINENT MEN

Prime Minister Clemenceau, the Duke of Argyll, Lord Avebury and Others Send Greetings.

10,000 WORDS THE FIRST DAY

Marconi in Personal Supervision at Glace Bay and Greatly Pleased with the Results.

SIR HIRAM MAXIM'S TRIBUTE

His Message to Peter Cooper Hewitt in New York, Who is Trying to Pick Up the Overseas Messages.

By Marconi Transatlantic Wireless Telegraph to The New York Times.

LONDON, Oct. 17.—This message marks the opening of the transatlantic wireless service. It is handed to the Marconi Company here for transmission to Ireland, and thence to Cape Breton, Nova Scotia, and New York. As it is limited to fifty words, I can send at present only one of the many messages received for transmission to The New York Times to signalize the event. This message, from Privy Councillor Lord Avebury, formerly Sir John Lubbock, follows:

"I trust that the introduction of the wireless will more closely unite the people of the United States and Great Britain, who seem to form one nation, though under two Governments, and whose interests are really identical. AVEBURY."

MARCONI'S CONGRATULATIONS.

The New York Times 1907 announcement of Marconi's trans-Atlantic wireless message. De Forest and Marconi were rivals in the industry, both competing for patents on the "vacuum detectors."

But de Forest's real legal battles began during the 1920s, not with Marconi who eventually had to drop the issue, but with a number of other innovators who claimed to have invented the regenerative circuit. In particular, de Forest weathered ten years of legal battles with Edwin H. Armstrong, finally ending with the Supreme Court decision in 1934 that de Forest was the first inventor of the "so-called feedback circuit."

While de Forest's professional life was a perpetual struggle (he was later sued, albeit unsuccessfully, for \$500,000 by one of his company's presidents) the inventor's love life swirled with controversy also.

His first marriage was to magazine editor Lucille Sherdowne after a short "wireless romance," as newspapers termed it. De Forest, as most hobbyists would, had wooed Lucille by setting up a wireless apparatus in her mother's

home and sending Lucille love messages in Morse Code. Eight months later, the *New York Times* reported that de Forest was filing for divorce, and suing a brewer for \$50,000 for the "alienation of Mrs. De Forest's affection." Sherdowne pleaded that de Forest was simply a jealous madman and pointed out that he had once tried to storm a New York hotel room with four detectives to prove her unfaithfulness.

The inventor's second marriage, to the militant suffragist Nora Stanton Blatch, was breaking apart by the time the fraud case was decided. By 1911, de Forest would be suing for divorce claiming Blatch spent more of her time winning the vote for women and studying to become a hydraulic engineer, than being a wife to him. Moreover, Blatch's suffragist campaigns often gave de Forest the wrong type of publicity. When he had constructed a wireless telephone on the top of New York city's Terminal Building, (he had also installed them on airplanes and race cars with long detector poles angling out of them) Nora demonstrated the invention by phoning suffragist messages to curious onlookers, sufficiently offending them to complain to the *Times*.

De Forest's personal problems seemed heightened by his electrical developments. By 1922, when de Forest was in court trying to transfer financial support of his daughter onto Nora's new husband, the inventor developed another exciting innovation, the "Phonofilm", which introduced the "talking" movie to the motion picture industry. He had printed soundpaths along the margin of films and used a "photon", or a glass tube emitting violet light to "read" the sound. Newspapers, sensing correctly the dawn of a new age, printed page-long stories about how de Forest's "Talkie" films worked.

It wasn't until the age of 57, by then removed from the maelstrom of electrical work, court trials and experimenting, when de Forest seemed to find happiness. He married the young film star Marie Mosquini, whom he lived with and loved until his death at the age of 87.

When the Palo Alto case reconvened just before New Year's Eve, and

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de Forest found his chair behind the defendant table, the judge instructed the jury to differentiate between fraud and what company officials — de Forest included — might have felt as legitimate optimism for an infant industry.

When the jury returned, it had found guilty two company directors who were eventually imprisoned for two and a half years. De Forest, however, had been found not guilty on three of the four charges. On the fourth, the jury had been undecided. It was determined that the scientist had been promoting the possibilities of his wireless design, and the awesome potential it represented.

The jury probably decided correctly. Early in his life, de Forest had recognized the great future in the Audion and the power of the radio age. As early as 1908, he told the *Times* that his wireless telephones would someday allow anyone in New York city to hear operas sung in the city's theatres. One day, he said, music, news and advertising would be brought into every home.

“The apparatus will be so cheap that it will be in the reach of everyone,” he said. And he saw the wondrous consumer simplicity of the radio age. “.... All the subscriber will have to do is put up a [receiver] flagpole on his dwelling.” □