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Monday, Jul. 23, 1951

## The General

(See Cover)

The public scored David Sarnoff's Radio Corp. of America with a lost round last year in the great color TV fight with Columbia Broadcasting System. Sarnoff did not stay down. Last week he showed the television industry a new tube that receives clear, true color, and he showed the public that RCA's color system can do what CBS's can not: color programs broadcast by RCA can be received in black & white on present sets without any change. It looked as if radio's miracle man had not run out of miracles.

For months, Wall Street speculators have been betting on Sarnoff. So far this year, RCA stock has risen from  $16\frac{3}{8}$  to  $21\frac{1}{2}$ , CBS fallen from 33 to  $25\frac{1}{2}$ . This trend is the more remarkable because six months ago RCA was apparently caught flat-footed when the Federal Communications Commission decided to license the CBS "whirling disc" system for commercial broadcasting. RCA promised a much better system, one that existing TV sets would receive in black & white (unlike the CBS method) without any change in the sets. But the color RCA showed FCC last fall was mushy and CBS's was clear. FCC decided not to wait.

Even then, old radiomen kept their eyes on Sarnoff. He is the man who put radio in the home—and never forgets it for a waking moment. He is boss of RCA with its 52,000 employees (including those of the 238-station NBC radio and television network), of 13 manufacturing plants which turn out millions of radios, TV sets and hundreds of different electronic gadgets, of a research staff which year in & year out develops new wonders. Would Sarnoff, who boasts that he was born about the same time that the electron was discovered (as if they were somehow twins), allow himself to be bested in the next great advance of the industry that he had led for two decades? Those who knew Sarnoff's vast ability—and his vast pride—thought not. They listened when, coldly eying the FCC decision, he said; "We may have lost the battle, but we'll win the war."

Secret Weapon. To get the weapon he needed, Sarnoff prodded RCA, not a nimble organization, into an



amazing burst of speed to improve its color system. Last week, in his Radio City Exhibition Hall, Sarnoff put on a demonstration for some 200 radio and television reporters, who saw a 20-minute program starring Nanette Fabray and Singer Yma Sumac on RCA's new color tubes.\* There was no blurring or running of colors, even in the fastest movement, e.g., a pair of performing lovebirds flapping their wings. As a show topper, an RCA mobile unit focused on a swimming pool near New York where a troupe of swimmers and divers performed. The outdoor telecast, which RCA explained could just as well be a football game or boxing match, came through almost as clearly as the studio show.

Within two months, RCA will start putting on similar public color demonstrations on 100 receivers which will be moved from city to city all over the U.S. By broadcasting its color show last week on its regular channel, RCA also showed TV set owners that its system is compatible, i.e., it could receive the broadcasts in black & white. (RCA can also convert existing sets to color.) The new tube's performance was so impressive that such TV competitors as Allen B. Du Mont, who has opposed any form of color up till now, changed their minds. Said Du Mont: "The RCA picture was good enough to start commercial programs immediately."

Sarnoff is far more cautious. He says:

"Commercial color television on a big basis is still two to five years away. Material shortage, NPA cutbacks on TV production and defense orders will delay it. On top of that, it will take a long time to get the bugs out of mass production of the color tube."

Many a TV man thinks that Sarnoff's five years is too long. One big reason is that when FCC made its decision last fall, TV setmakers were almost solidly against the CBS system, because they were up to their ears in orders and wanted to make no changes that might upset sales. Now,

TV manufacturers are up to their ears in unsold sets, are more likely to grab at RCA's system, which they think will get customers buying again. RCA has already given manufacturers the blueprints of its color system, to make sets (on a royalty basis)—if FCC gives the go-ahead.

Whatever technical or bureaucratic difficulties may lie ahead of RCA's color system, it was clear from last week's demonstration that Sarnoff was fighting his way out of a tough spot.

For more than 50 of his 60 years, Sarnoff has been doing just that. Driving through obstacles is his habit, his joy, his bitter necessity. He says: "There are three drives that rule most men: money, sex and power." Nobody doubts that Sarnoff's ruling drive is power. Says a deputy: "There is no question about it, he is the god over here."

The Hermitage. American business biography abounds in up-from-the-bottom stories; few are quite so dramatic and revealing as Sarnoff's. Owen D. Young said that Sarnoff had lived "the most amazing romance of its kind on record." Horatio Alger himself could hardly have done it in one book; he would have needed *Adrift in New York*, *Nelson the Newsboy*, *The Telegraph Boy* and *Joe's Luck* or *Always Wide Awake*.



Sarnoff was born in 1891, eldest son of a poverty-stricken family in the tiny (pop. 200) Jewish community of Uzlian, in Russia's province of Minsk. His father, who came of a trading family, wanted him to become a trader. His mother, who came of a long line of rabbis, insisted that he become a scholar. Sarnoff remembers that in the world of his childhood, prestige was based not on money but on "the possession of knowledge."

When David was four, the dispute over his future ended; his father departed alone for America. His mother, a strong-willed woman, promptly packed David off to her uncle, a rabbi who lived in a hermitage in Korma, about 150 miles east of Minsk. For about five years David stayed there, the only boy in the hermitage, up at 6 to begin his studies of the Talmud that lasted until 9 at night. He was lonely and he remembers those strange years with bitterness. The grey beards in the hermitage did not teach him to count. But those years trained his memory (2,000 words of the Talmud a day) and his reasoning powers. He was set simple ethical problems to work out. Sample: "If you saw an article lying in the street, what rights would you have to it?"

This tutelage ended when David was 9½. His father in America sent for his family. David, his mother and a brother took a ship at Libau, Latvia. "I had never even seen a picture of a ship," says David. His mother, afraid of forbidden food on the ship, had cooked, according to strict orthodox rules, a great hamper of bread, cakes and pickled meats. She explained that these were to be their only food on the voyage. David saw the food hamper being lowered into the hold. Afraid that it would be lost and he would starve, he dived after it into the hold, dropped 50 feet, scrambled about until he found the hamper and was rescued by a seaman. A sailor who spoke Russian told him: "You'll do all right in America."

He had to. When the Sarnoffs arrived in New York, they found the father broken in health. Ten-year-old David, who could not speak English, became the chief breadwinner for the family, which soon included two more babies. At 4 in the morning, he left the family room on the lower East Side to deliver the Jewish Morning Journal, ran errands for a butcher before going to school. He saved enough money to buy a newsstand, sold papers after school until late at night. David, who had a fine soprano voice, also earned \$1.50 a week singing in the synagogue. At 15, on the day before he was to get \$100 for singing during the Jewish holy days, his voice began to change. It was a disaster. He had to quit grammar school to look for a full-time job.

"Incidentally Me." He found one (at \$5 a week) as an office boy, saved \$1.50 to buy a telegraph key, and taught himself the Morse code. Soon he talked himself into an office job with American Marconi, the U.S. subsidiary of Marconi's British-owned company. The magic of wireless captured the boy's imagination; so did the personality of Marconi. "I carried his bag, delivered candy and flowers to his girl friends. I admired the simplicity of his approach to problems."

Up to this point, David had merely reacted with extraordinary energy to the responsibilities thrust upon him. Luck put him into the communications business, but had nothing to do with his next step. What he did next may have stemmed from the training in the lonely years in the hermitage at Korma: he sat down and thought out the path to his future. He noted that the company's wireless operators knew nothing about the office and that the office staff knew nothing about wireless. He decided that, as the business grew, it would need a man who knew



both.

Sarnoff got his first operator's job on Nantucket Island, a job so lonely that few operators wanted it (\$70 a month, \$40 home to mother). David used his spare time to study books on wireless as tirelessly as he had the Talmud. Soon his expert "fist" could send 45 words per minute steadily for eight hours—a pace not many could equal. After two years there, he got himself transferred to Long Island, at a \$10 cut in pay, so that he could go to night school, where he finished a three-year electrical engineering course in twelve months. When his big chance came, he was ready for it: he was an operator in the Marconi wireless station, atop John Wanamaker's Manhattan store, on the night of April 14, 1912, when he picked up a message from the S.S. Titanic: "Ran into iceberg. Sinking fast." For three days & nights, the nation waited breathlessly while Sarnoff, going without sleep, provided its only news of the disaster and survivors. President Taft ordered all other stations off the air to enable Operator Sarnoff to catch the messages.

Sarnoff notes that the Titanic disaster "brought radio (and incidentally me) to the front." As a result of the disaster, Congress passed a law requiring every ship with more than 50 passengers to carry wireless. American Marconi set up a school to fill the sudden demand for operators; Sarnoff became an instructor at the school, rapidly moved up the ladder to commercial manager.

The Music Box. In 1915 he wrote a historic memo to his boss. Experiments had already proved that wireless could broadcast speech as well as signals,\* but since anybody could "listen in" on such messages, the wireless companies thought the lack of privacy robbed radiotelephony of any commercial value. Sarnoff realized its possibilities. In his memo, he proposed to build a "Radio Music Box ... to bring music into the house by wireless . . . Receiving lectures at home can be made perfectly audible; also events of national importance can be simultaneously announced and received." In the turmoil of World War I, Sarnoff's memo was ignored.

At war's end, the U.S. determined to end the British wireless monopoly. At Government urging, General Electric's Vice President Owen D. Young got G.E., Westinghouse, United Fruit and A.T. & T. to pool all their wireless patents and jointly organize RCA. It took over American Marconi—and Sarnoff. As RCA's chairman, Young was so impressed with Sarnoff's vision and knowledge of wireless theory and practice that he made him general manager.

Sarnoff dug out his old 1915 memo and tried it on Young, who liked the "music box" idea. But RCA's directors were willing to risk only \$2,000. Sarnoff gave a demonstration that woke them up. He borrowed a Navy transmitter and helped give a blow-by-blow broadcast of the 1921 Dempsey-Carpentier world championship fight. It created a sensation; about 200,000 amateur wireless operators and others with homemade sets heard it, and spread the news of the wonder so widely that the public clamored for sets. RCA quickly developed the "music box," and both G.E. and Westinghouse began making it, with RCA acting as wholesaler.

Everyone thought that Sarnoff was foolishly optimistic when he predicted that \$75 million in boxes would be sold within three years. Actual sales: \$83 million. David Sarnoff, a prophet with honor, was soon radio's wonder boy,



teeming with ideas. Why not, he proposed, put radios and phonographs in a single cabinet, save space, cut costs by using the same loudspeakers? Sales of such combinations soared. Why not start a radio network to improve programs, broaden the market for sets? At Sarnoff's urging, RCA founded NBC and the Red network. Two months later, the Blue network was added.

Changing the Tune. The radio field was being invaded by so many newcomers that Sarnoff got worried; he thought RCA should expand into other fields. But RCA's profits were needed to keep pace with the mushrooming radio business; there was little left for the kind of expansion he had in mind. So Sarnoff began his famous series of expansions without cash; he traded RCA products and stock for the companies he wanted. RCA had developed the Photophone, a device for talking movies, and traded rights to it to Radio-Albee-Orpheum and F.P.O. Productions, Inc. for 65% of their stock. The name was changed to the Radio-Keith-Orpheum (RKO). To get into the manufacturing business on its own, instead of remaining only a wholesaler of sets, RCA swung an even bigger deal: RCA took over Victor Talking Machine for \$150 million worth of RCA preferred and common stock, a price that Wall Street thought far too high. RCA profits continued to soar. In 1929, the company that had hesitated to spend \$2,000 on Sarnoff's music box grossed \$176,500,000 as a result of it, netted \$15.8 million, and was one of the sensations of the big bull market.

Radio stock went soaring from \$2.50 to \$549 a share, was split and resplit. Insiders made killings in radio pools, but Sarnoff had a reputation for keeping aloof from such shenanigans. At their height, he sailed to Europe to help Owen Young set up the Young Plan for German reparations.

When Sarnoff came back in 1930, he was elected president of RCA and faced the Depression. It was forcing many a radiomaker to the wall, but Sarnoff kept on driving ahead. In 1932, the Department of Justice forced G.E. and Westinghouse to give up their 51.3% control of RCA (by distributing their RCA holdings to their own stockholders). In this way, RCA achieved independence, but as part of the deal Sarnoff also had to pay off \$17.9 million that RCA owed its parents. He did it partly when he turned over to them RCA's new skyscraper headquarters in Manhattan (which G.E. still uses for its executive office), partly when G.E. and Westinghouse wiped out \$8,900,000 of the debt. RCA had outgrown the building, anyway. For new quarters, RCA took over the biggest building in Rockefeller Center and handed out 100,000 shares of preferred stock as part of the deal.

By then, the Depression had hit hard enough so that Sarnoff decided to lighten ship. He started selling off control of RKO and later, on orders of FCC, sold the Blue network (it became the American Broadcasting Co.). In RCA's stock-swapping years, it paid no dividends. The first one was not paid until 1937, nearly 20 years after the company started. Sarnoff has thought it more important to plow earnings into research to keep up with the electronic world. And profits from research have often been a long time coming.

Brave New World. Television is the best example. In 1923, Dr. Vladimir Zworykin, Westinghouse's Russian-born wizard, invented the eye of the modern TV camera—the iconoscope, and developed the kinescope. Sarnoff then called television "a dream whose shadowy outlines are beginning to appear on the far horizon," and set to work to make it come true. In 1928, RCA opened an experimental TV station in New York and during the next 20 years



poured \$50 million into television. At the opening of New York's World

Fair on April 30, 1939, Sarnoff made the first U.S. commercial telecast with the words: "Now at last we add sight to sound."

But even so it was not until after World War II that the mass production of TV sets began.

Out of RCA's big research headquarters at Princeton, N.J. Dr. Zworykin (who joined RCA in 1929) and his colleagues, under Vice President C. B. Jolliffe, brought many other startling developments: the electron microscope, the infrared "sniperscope" which enabled World War II G.I.s to knock off skulking Japanese troops at night, "shoran" for accurate blind-bombing. In World War II, RCA turned out an estimated \$500 million worth of devices for the armed forces. Now it has big defense orders, many for products no one else can make.

Sarnoff is no scientist, yet of all RCA's activities, research is nearest his heart and he is one of the few top men of the industry who can talk to scientists without an interpreter. And research represents tomorrow, expansion, new success which David Sarnoff, after the painful insecurity of his early life, still seeks.

Collector's Items. Modesty, false or otherwise, does not disguise Sarnoff's power and success. His chill blue eyes shine with impatient energy, his boyish, scrubbed-pink face radiates cockiness. All 5 feet 5 inches of his bullnecked, bull-chested figure bristles with authority and assurance. He dresses with conservative, expensive elegance, even carries a gold frame to hold matchbooks.

At RCA he makes all the top decisions, is brusque with slower-witted underlings. He insists that every memo to him must be no more than a page, but allows himself more latitude, has written memos as long as 30 pages. A collection of his better memos, bound in gold-tooled leather, is a prized Sarnoff possession.

To record his accomplishments more fully, Sarnoff keeps a man working on the history of RCA and his life & times (unpublished, it is now in its twelfth volume). He is proudest of the fact that President Roosevelt made him a brigadier general for his work in organizing communications for SHAEF, and he wears a gold ring with SHAEF's flaming sword insignia. He likes to be called "General," and everybody at RCA does so. Even his wife & sons Robert, an NBC vice president, Edward, an electric-appliance distributor, and Thomas, an ABC employee, so refer to him.

Again & again, he makes two points about his own personality: 1) he loves music, 2) he does not love money.

In the teeth of the realities of commercial radio and TV, he tries sincerely to hang on to his dream of the "music box." Sarnoff gets much of the credit for the fact that radio has helped to change America from musical illiteracy to a nation where millions know and love good music. Sarnoff's original idea was that makers of radio sets would sponsor cultural programs. To this day, he has little knowledge of radio advertising, and he despises cheap radio



entertainment.

Sharps & Flats. Sarnoff's closest friends are from the musical world. Occasionally, such friends as NBC Music Director Sam Chotzinoff, Jascha Heifetz, Vladimir Horowitz, etc., stage elaborate costume parties at Sarnoff's home. At a surprise party for Toscanini, the Maestro was shown to the sixth floor when he arrived, asked if he had a reservation, was finally led into what seemed to be a nightclub. A blare of jazz assailed the conductor's ears. Sarnoff acted as ringmaster in a circus act while Elza Heifetz Behrman, sister of Jascha Heifetz and wife of Playwright S. N. Behrman, rode a make-believe horse. Toscanini sat with his head in his hands all evening, would not look at the show, and was not amused.

Last year, for Sarnoff's birthday, the group staged a satire. Chotzinoff, impersonating Sarnoff, sat at a breakfast table, surrounded by telephones, talked into all of them at once, pounded the table, chewed up cigars. Sarnoff was amused.

Sarnoff likes to tell people that he is not a man of big wealth. Considering that he has been for 20 years at or near the top of an expanding industry, this is a sensational statement—and people who ought to know believe it. He has 5,000 shares of RCA stock and a \$200,000-a-year salary.

His home life is as elegantly comfortable as that of any non-millionaire in the world. The Sarnoff home in Manhattan has six floors, 30 rooms, two patios, a barbershop and a projection room. In almost every room, including the servants', are radio and TV sets, with tuning gadgets concealed among the furnishings.

This menage is presided over by his French-born wife, Lizette, whom he met and married 34 years ago in The Bronx. Sarnoff explains the courtship: "I could speak no French. She could speak no English. So what else could we do?"

Major Weakness. Sarnoff's lack of interest in some of the commercial aspects of radio may account for the fact that RCA's brilliant record in research and financing has not been equaled by its sales record—until recently. The man who has done much to eliminate this weakness is Frank M. Folsom, onetime vice president of Chicago's Goldblatt Bros, and Montgomery Ward, and chief of the procurement branch of the Navy during World War II, who joined RCA Victor in 1944.

As RCA chairman, Sarnoff lets President Folsom handle most executive details. Folsom is thus the empire's only heir apparent, but at 57, he is close to Sarnoff's own age. There are a few able younger men coming up, but RCA's major weakness is lack of a solid second echelon of younger executives. Its size often makes it hard for RCA to turn fast enough to cope with the crack team of Paley and Frank Stanton at smaller CBS.

Slow but Sure. CBS got the jump on RCA, not only in color, but in putting on the market three years ago the slow-playing record that revolutionized the phonograph business. Not long after that, CBS raided NBC's radio shows, snatched away such top stars as Jack Benny, Amos & Andy. At the time NBC lost the stars, it looked as if it




would be hard hit. But Sarnoff has a way of coming out ahead, despite defeats. After the rumpus over the long-playing records died down, business for all record companies, including RCA, picked up. Thanks to the astounding spread of television, the network has hardly missed its radio stars.

To Sarnoff, these were all skirmishes, nothing to scare him from his plans to expand RCA into new territory. He is already itching to put RCA into the electric-appliance business, NBC into the movie business (to make films for television), and is planning a "pay-as-you-hear" TV system which would not depend on telephones as does Zenith Radio Corp.'s system (TIME, June 4). Above all, he is confident that the vast sums he has poured into research will continue to pay off with more spectacular advances than even his color television tube.

"Electrons," he points out, "can supply the brains for the control of machinery, respond to light, color, a wisp of smoke—the faintest touch or the feeblest sound. Today, these electrons can follow a chart, a blueprint or a pattern more accurately than the human eye. Some day, they may even respond to smell and taste. Who would dare predict the future? He is a rash man who would limit an art as limitless as space itself."

\* In RCA's system, the color-television camera breaks a picture down into three colors (red, green and blue). These color impulses are broadcast, picked up by a television receiver circuit, which sets off three electronic "guns" (one for each color) inside the picture tube. They project the picture on the face of the tube so fast (1,800 times a minute) that the three color pictures blend into a single all-color one. \* Reginald Fessenden had made such a broadcast in 1906, when wireless operators at sea were startled to pick up the unearthly sounds.

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# **"Pushing Technology: David Sarnoff and Wireless Communications, 1911-1921"**

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Between the creativity and advocacy of inventors and the realization of need or want by consumers, there exists a wide gulf. How does it happen that an idea, a proof of principle, meets the succession of markets that results in the addition of new technology to society? An inventor, after all, must persuade other technically competent people to join in making an invention practical, and a series of lawyers, investors, manufacturers, and marketers to join in agreeing that it is worthy of bringing to a market of ultimate consumers.

This applies not just to basic inventions, but to their further innovation and application in other markets. The company pushing its diffusion in the market with which it is most familiar may be less interested in bringing the technology to other markets, other consumers, who see its utility for quite different purposes. In that case, it is up to individuals within the company, or at other firms, or among the consumers, to advocate the broader application and try to bridge the space between the push or flow in one direction and the pull or pool of consumers in another.

This was David Sarnoff's role early in his career. During his twenties, between 1911 and 1921, he acted as advocate and medium for the expanded use of what we call radio: for wireless telegraphy, wireless telephony, and for broadcasting—on ships, trains, and overland. His role has been tainted by his own overreaching claims and those of later detractors in response.<sup>1</sup> This paper will attempt to place his claims and his role in a more reasoned perspective, and thereby highlight the role of the middleman in the diffusion of technology.<sup>2</sup>

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<sup>1</sup> Revisionism of claims made by David Sarnoff and repeated by RCA's public relations department for the rest of the twentieth century began with Carl Dreher's Sarnoff: An American Success (New York: 1977); continued with Kenneth Bilby's The General: David Sarnoff and the Rise of the Communications Industry (New York: 1986); and reached a peak with Tom Lewis's Empire of the Air: The Men Who Made Radio (New York: 1991), which accompanied a popular television documentary of the same name.

<sup>2</sup> In many ways this version of Sarnoff's early life reflects that described by Elmer E. Bucher in the unpublished typescript, Radio and David Sarnoff (1943; deposited at the David Sarnoff Library), and Eugene Lyons's authorized biography, David Sarnoff (New York: 1966). Both writers have been discredited as sources because of their uncritical and largely undocumented approach to Sarnoff and their reliance on his patronage. Closer examination of their narratives of Sarnoff's early career and documentation within the David Sarnoff Library and at other sites shows that Sarnoff deserves more credit in the development of radio than his detractors have given him.



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Who was David Sarnoff? Born in a shtetl outside Minsk in tsarist Russia in 1891, he arrived in the Lower East Side of Manhattan nine years later. Sarnoff sold newspapers before and after school to help support his family, until 1906. By then his father's incapacity from tuberculosis forced Sarnoff to give up school and seek a full-time job.

He was especially interested in communication, inspired in part, no doubt, by the contrast between Russian and American experiences in making information available. In the fall of 1906 Sarnoff joined the Marconi Wireless Telegraph Company of America as an office boy. The company and the technology at the time were hardly impressive. Marconi was one of several companies building a wireless business, and a year later a cable telegrapher asserted that wireless transmission enabled "about twenty-five words an hour, and they send it over four times, but before sending they try to get the gist of the thing."<sup>3</sup>

Nonetheless, inventors, engineers, and scientists were improving the means and companies promoted its unique advantages, particularly in shipping communications. By January 1911, Sarnoff had worked his way up to operator at two Marconi stations when his father died.<sup>4</sup> Shortly afterwards, he signed up to install, operate, and promote the use of wireless equipment on the Job Brothers' Canadian sealhunting fleet in Labrador and Newfoundland. Fifteen years after Marconi's first demonstration, its use was still novel; as Sarnoff noted, one of the Jobs thought "it's great business but he'll soon get accustomed to it."<sup>5</sup>

The commercial benefit appeared when Sarnoff signalled the owners' other ship on the location of a large pack of seals; the humanitarian aspects appeared in the course of Sarnoff's arranging medical help for an operator at an isolated outpost.<sup>6</sup> [See Image 1 below] On the other hand, communications between rival ships made less sense since the captains "would no more give a helping advice than they would give away their money yet they continue asking and answering questions, and in answering lie like hell. So even the wireless has been put to an evil purpose tonight."<sup>7</sup>

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<sup>3</sup> E. J. Nally to W. I. Capen, October 25, 1907. Nally Papers, Princeton University Library, box 3, folder 7.

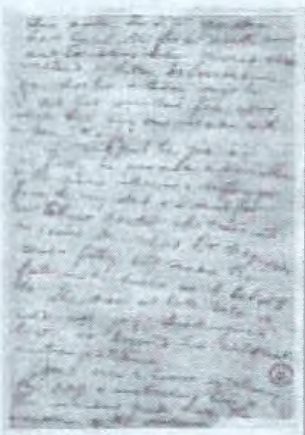
<sup>4</sup> David Sarnoff diary entry for March 20, 1911. Sealing Expedition, Labrador 1911, David Sarnoff Library, Princeton, New Jersey (hereafter DSL).

<sup>5</sup> Idem: diary entry for March 2.

<sup>6</sup> Idem: Wireless log entry for March 22, and diary entries for March 26-April 3, passim.

<sup>7</sup> Idem: diary entry for March 23.

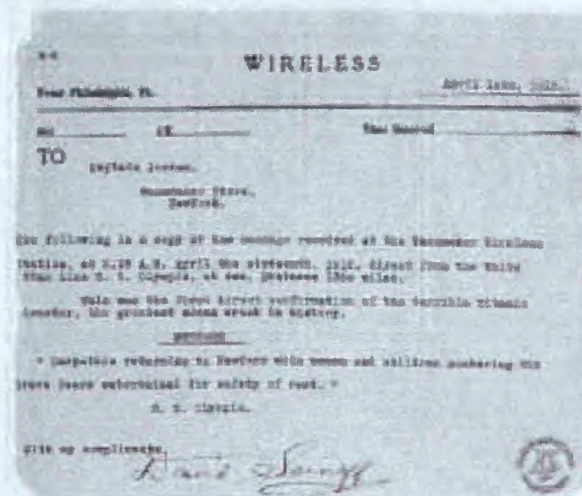




*Page from David Sarnoff's diary on board the Job Brothers' seal-hunting ship, the Beothic, in which he describes his relaying the dialogue between the ship doctor and the radio operator at Belle Isle, Labrador, March 26, 1911. David Sarnoff Library.*

A year later, Sarnoff was manager of the Marconi station atop the Wanamaker's department store at Broadway and Eighth Street. Sarnoff exaggerated his role in the aftermath of *Titanic's* sinking, but he was involved, first in working with two other operators at the Wanamaker station to obtain the number of survivors and then in trying to get their names from the Marconi Seagate station before the *Carpathia* arrived with the survivors in New York City.<sup>8</sup>

*David Sarnoff's telegram to "Captain Jordan" giving total number of survivors from Titanic, April 16, 1912. David Sarnoff Library.*



In the wake of the *Titanic*, American Marconi expanded its business by a factor of twenty over the next two years. This occurred partly from legislation mandating continuous staffing of shipboard radio stations and partly from the

<sup>8</sup> "American Gets Wireless News in New York City," *The Boston American*, April 16, 1912, p. 4, reproduced in *Extra Titanic: The Story of the Disaster in the Newspapers of the Day, from the Collections of Eric Caren and Steve Goldman* (Edison, NJ: 1998), n.p. See also <http://www.marconicalling.com/museum/html/indexes/titanicmessagelist.html>, visited July 31, 2001, for two links to messages received at the Marconi Seagate station by Sarnoff on April 18, 1912. The scans are from originals in the Marconi Collection, donated by Marconi plc to the Essex Record Office in Chelmsford, England.



acquisition of the United Wireless Telegraph Company, which gave Marconi control of virtually all American coastal stations. Nonetheless, at a time of expanding opportunities within the company's standard market, Sarnoff, as radio inspector and assistant engineer, was advocating two other applications.

First was that of radio communications with railroads. In November 1913, Sarnoff worked with the Lackawanna Railroad's telegraph superintendent to design, install, and demonstrate a mobile system between the stations at Binghamton, New York, and Scranton, Pennsylvania.<sup>9</sup> This led to major demonstration in January 1914, and Marconi obtained contracts for five stations on the line over the next nine months.<sup>10</sup> While it appears that few other railroads joined in adoption of the technology, Sarnoff continued to campaign on its behalf until 1927, through annual appearances at the meetings of the railway telegraph superintendents and the American Railway Association.<sup>11</sup>



The wireless telegraph installation.

*David Sarnoff in radio cabin on board Lackawanna Railroad passenger car, November 1913. From Scientific American article, December 6, 1913, no page number, David Sarnoff Library.*

<sup>9</sup> Scientific American, December 6, 1913, n.p., in DSL, David Sarnoff Papers, box 1, "Railroad Wireless" binder.

<sup>10</sup> David Sarnoff to E. J. Nally, January 26, 1914, idem; E. J. Nally to Board of Directors, Marconi Wireless Telegraph Company of America (MWTCA), October 13, 1914, Nally Papers, box 3, folder 7.

<sup>11</sup> See Wireless Telegraphy in Railroad Service, passim, DSL.



Nineteen fourteen proved to be a busy year for Sarnoff, during which time he was promoted to contracts manager for the company, which provided him with contacts not just within the company, but with the commercial and technical competition faced by the Marconi company. Concerned with the limited resources for R&D within Marconi, therefore, he not only reported on E. Howard Armstrong's demonstration of his regeneration circuit, but arranged a field test at the company's station in Belmar. In this he was accompanied by Roy Weagant, who was equally impressed by the quality of reception. Sr. Marconi, when apprised of the results, was not because he thought engineer H. J. Round had already accomplished a similar improvement, and the rest of the company's senior management expressed unhappiness over the unauthorized use of corporate facilities by an unaffiliated inventor.<sup>12</sup>

Later that spring, the Marconi Company in England announced the development of a wireless telephone system, based on H. J. Round's hydrogen arc transmitter. This was installed experimentally at the Wanamaker station in New York. From there, Sarnoff arranged to have phonograph music played into the microphone, which he and his group en route to a railroad convention in New Orleans could as they steamed some sixty miles away.<sup>13</sup>

*David Sarnoff and associates on board S. S. Antilles, May 13, 1914. That evening, some sixty miles out of New York harbor, Sarnoff worked with the ship's operator to tune in phonograph music transmitted via Harold J. Round's experimental hydrogen arc transmitter, below. David Sarnoff Library.*



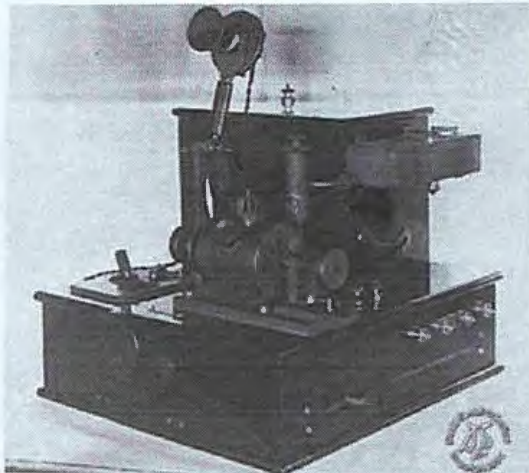
The next year saw AT&T demonstrate voice programs transmitted from Arlington, Virginia and received in Paris, San Francisco, and Hawaii. These took place in September and October 1915, and it would hardly be surprising for Sarnoff to propose a home receiver as another business opportunity to his superior, E. J. Nally. Given Nally's work in rationalizing American Marconi during its enormous expansion in the previous three years, the company's conflicts with the U. S. Navy, and the expanded trans-Atlantic traffic occasioned by the outbreak of World War I, it is equally unsurprising that he should ignore it.

<sup>12</sup> See the copies of the correspondence between Sarnoff and others at Marconi in January-February 1914 in Early Reports on Radio, Section 5, "Armstrong Inventions," DSL; and George H. Clark, The Life of Roy Weagant (1943), 29-31, in Nally Papers, box 4, folder 3.

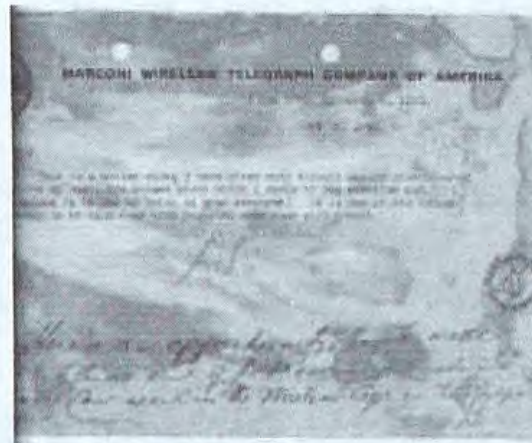
<sup>13</sup> See the correspondence in Early Reports on Radio, Section 1, "Radio Telephone Tests," DSL; and correspondence between Godfrey C. Isaacs, E. J. Nally, the Admiralty, and the Naval Department in April-May 1914, Nally Papers, box 3, folder 7.



The original memo on Sarnoff's "radio music box" does not exist—at least not in his papers, where there is reference to it in 1922 and evidence of a search in 1925.<sup>14</sup> Nor have I found it yet in Nally's papers. Nonetheless, in November 1916, Lee DeForest's election broadcasts moved Sarnoff to remind his boss of an earlier discussion.<sup>15</sup>



*Newspaper clippings of Lee DeForest's broadcast of election night results from the Bronx, November 7, 1916. Sarnoff evidently sent them to his boss, E. J. Nally, along with the note referring to his earlier proposal. David Sarnoff Library.*



<sup>14</sup> Louise Benjamin analyzed the circumstances of the missing memo without being able to visit the DSL in "In Search of the Sarnoff 'Radio Music Box' Memo," *Journal of Broadcasting and Electronic Media* 37, 3 (Summer 1993), pp. 325-35. After reading of the circumstantial evidence at the library (see [http://www.cinemedia.net/SFCV-RMIT-Annex/rnaughton/SARNOFF\\_BIO.html](http://www.cinemedia.net/SFCV-RMIT-Annex/rnaughton/SARNOFF_BIO.html)), Dr. Benjamin visited in the summer of 2000. She read her follow-up, "In Search of the Sarnoff Music-Box Memo: Nally's Reply," at the Broadcast Education Association meeting in April 2001. She is waiting to hear if it will be published in the *Journal of Radio Studies* this winter.

Reprints of later memos exist in the DSL, and originals can be found in Owen D. Young's papers at the Owen D. Young Library, St. Lawrence University, Canton, New York. For references to the earlier memo, see David Sarnoff to Alfred Goldsmith, August 2, 1922, David Sarnoff Papers, box 1, "Individual Radio 'Radiolette,'" and T. N. B. (E. J. Nally's secretary) to David Sarnoff, May 22, 1925, *Early Reports on Radio*, Section 9, "Broadcasting—The 'Radio Music Box,'" DSL.

<sup>15</sup> Idem.



Four days earlier, Sarnoff looked beyond current business as well in a memo on the consequences of the court decision validating the Fleming patent. If Marconi needed to buy the three-element valve rights from DeForest, Sarnoff thought that "a good field can be worked up in the amateur line." Direct sales alone from the 5,000-bulb annual market would mean \$10,000 net profit, while the company could also "license amateur concerns, such as Sears Roebuck . . . to sell bulbs to amateurs, we to manufacture and supply them at a good profit."<sup>16</sup>

Again, a survey of Nally's correspondence for the period indicates his focus on current customers and markets, as well as control of American Marconi's technology by its British affiliate. The amateur market was not significant to a company whose net profits were in the midst of more than doubling to \$434,000 between 1915 and 1917.<sup>17</sup> Nally kept in touch with other companies' advances, in particular those of General Electric Company, to which he proposed a joint monopoly of production and operation of wireless communications in 1915.<sup>18</sup> He also continued to promote Sarnoff, who became second vice-president and commercial manager and a member of the company's board in 1917.<sup>19</sup>

With the conversion of American Marconi to the Radio Corporation of America under the ownership of GE in the fall of 1919, Sarnoff had to summarize business prospect to GE executives who knew very little about the technology or its applications. In a twenty-eight page review, Sarnoff discussed his home receiver only after reviewing current marine and government markets. He distinguished it from "Sales to Amateurs" who were already buying components and making their own radios for the pleasures of distant reception, and his estimate of gross profits suggested that the company could multiply its earnings by an order of magnitude.<sup>20</sup> A broader, less technologically oriented population would need content, however, and in the summer of 1921, Sarnoff acted as patron for an event that helped accelerate interest in broadcasting as a mass medium.

In a thorough history of the Dempsey-Carpentier boxing match broadcast, Thomas White credits Sarnoff with "the ability to spot good ideas."<sup>21</sup> Sarnoff and the broadcast, however, had more effect than he gives them credit for. J. Andrew White, who oversaw the development of the broadcast program by acting as intermediary with the National Amateur Wireless Association and RCA, submitted a twenty-three page report on the event to Sarnoff, who promptly circulated it among management sympathizers and superiors at RCA

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<sup>16</sup> David Sarnoff to E. J. Nally, November 4, 1916, p. 2, Nally Papers, box 4, folder 2.

<sup>17</sup> E. J. Nally to Board of Directors, MWTCA, October 9, 1917, Nally Papers, box 3, folder 4. The amount is for the first eight months of each year.

<sup>18</sup> E. J. Nally to E. W. Rice, jr., June 4, 1915, Nally Papers, box 3, folder 6.

<sup>19</sup> E. J. Nally to G. C. Isaacs, p. 4, October 25, 1917, Nally Papers, box 3, folder 4.

<sup>20</sup> David Sarnoff to O. D. Young, January 31, 1920, pp. 13-5, Early Reports on Radio, Section 8, "Prospective Radio Business," DSL.

<sup>21</sup> <http://www.ipass.net/~whitetho/WJY.htm>, visited July 21, 2001.



and GE.<sup>22</sup> Recently promoted to general manager, Sarnoff made available \$1,500 for organizational expenses, a high-power GE transmitter, and the Lackawanna Railroad terminal antenna in Hoboken.

The eight pages of listener responses indicated the positive word-of-mouth that broadcasting received as a result, notwithstanding the long wavelength and lack of support from the American Radio Relay League. Whether or not 300,000 people in the region between Pennsylvania and Massachusetts heard the fight, the fact remains that tube and component sales continued to build in the fall of 1921, when Sarnoff also helped open RCA's station WJY in Roselle Park, New Jersey.



*This is one of a series of photos taken at RCA's first broadcast station, WDY, which went on the air December 14, 1921. None of them identify the men in the studio and all include the individual at the cloth-covered microphone. Why David Sarnoff never acknowledged his presence at this shortlived station is a mystery, but it would be difficult to find another individual connected with WDY with the round face, relaxed disposition, and French cuffs. David Sarnoff Library.*

By the following spring, the interest in and demand for broadcast radio made even Sarnoff's superiors realize that wireless technology had wider applications than they had given it credit for, and began to look to the thirty-year-old Sarnoff on guidance as to how to exploit it further. At that point he concluded his role as a technology bridge from one type of application in one market to other markets and other applications. For the next thirty years, he became a technology pusher, advocating the development of broadcast technologies in the home market he had helped create, particularly in the form of electronic television.

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<sup>22</sup> J. Andrew White, "Report: Radiophone Broadcasting of Dempsey-Carpentier Fight on July 2, 1921," and Sarnoff's cover notes in "First Broadcast—Dempsey-Carpentier Fight," David Sarnoff Papers, box 1, DSL.



# RADIO

By DAVID SARNOFF—AS TOLD  
TO MARY MARGARET McBRIDE

IT IS paradoxical, but true, that as radio sets get more complex, delicate and precise, they are more easily operated. It took an engineer to run the early sets, and even more recently timid folks, when tempted to go in for radio, were discouraged by the multiplicity of dials and the intricacy of the various accessories and control arrangements.

Several things have made operation simpler. The built-in loop aerial, now used instead of the outside aerial 50 to 100 feet in length, helps. So do built-in loud-speakers, dry cells instead of wet batteries, and lamp-socket power supply. But the most confusing feature of early sets was the system of separate tuning dials for each of the several stages of amplification. Frequently there were three dials to be turned for tuning and several dials for other adjustments as well. No operator could be found with more than two hands to turn these dials, and two hands were at a distinct disadvantage. Finally use was made of an ingenious device for the operation of all the tuning apparatus by means of a single dial. The original idea was worked out by Fessenden and was perfected by John V. L. Hogan, radio engineer, who worked out the details of the single dial while he was still in college. He intended it for ships at sea, where sometimes speed in operation might save a life.

The device was used by ships, but did not become a part of broadcasting until 1923. It is indicative of the extreme caution with which radio manufacture advanced that this invention, which seems now so obviously useful, should not have been snapped up at once. As a matter of fact, Mr. Hogan offered the patent to at least one large company for exclusive license at a price which was less than the same company now pays him for a nonexclusive license under the patent, shared with a score of other companies.

## A Husky Five-Year-Old

AN UNEXPECTED problem was created by the sensitive new receiving sets. The same delicacy of perception that let them reproduce the faintest incoming impulses from distant broadcasting stations also enabled them to reproduce the impulses from electrical machinery and from other man-made disturbances.

Late in 1924, so many complaints regarding interference of this kind were received that the Radio Corporation organized a special staff to investigate. During 1925, 300 cases of interference caused by electrical machinery were tracked down and remedied.

Among the sources of interference which have been traced are: Street railways, are lights, motion-picture machines, electric grills, elevators, defective house wiring, vacuum cleaners, electric heating pads and silent traffic policemen—that is, electric signals which control the traffic.

Another source of interference has been the use of regenerative receivers without devices to prevent radiation. Where too much regenerative amplification is used, such sets begin to whistle—that is, they cease to act

as receivers and begin to create and radiate oscillations of their own. In this way the whole receiving set becomes a small transmitter and its waves can be heard over other sets in the neighborhood, to the annoyance of owners of those sets. This radiation is being prevented by loop aerials—coupling tubes, which include one or more amplifying tubes without feed-back, used between the aerial and the oscillating circuit to prevent the oscillations from reaching the aerial, and counter feed-back devices which automatically stop regeneration from building up to a point where oscillation begins.

From all this it may be seen that in five years receiving sets have advanced through six or seven stages. First came the simple crystal sets, or sets with one or two tubes but without substantial amplification. Then came sets with regenerative amplification. Tuned radio-frequency sets with several successive tube circuits and a fairly high degree of amplification and selectivity were next. There followed, in quick succession, the superheterodyne set with very high degree of amplification and selectivity; the completely self-contained set, with loop aerial and inclosed loud-speaker; and the set with lamp-socket power supply and a very powerful loud-speaker.

The most recent and, for many reasons, most interesting development is the combination of the radio and the phonograph, operated electrically and with the electric pick-up.

Naturally, this is only a rough classification of set growth, since some of the attributes of one set may have been combined with some of the others, but it serves to show what can be done in five years when the public takes an innovation to its heart.

So many are the changes that it seems it must have been further back than the fall of 1921 that crude affairs, operated with long outside aerials, heavy wet batteries and head phones, and appealing only to scientific amateurs who

were enthusiastic over the chance to experiment with something new, were offered for sale. Yet it was 1921, and in those days plenty of people thought that radio was a fad, soon to be outworn.

At the transmission end engineers have been at work analyzing and studying sound as strenuously as their coworkers at the receiving end. The early imperfections of radio apparatus—distortion of speech and music, elimination of overtones, the accentuation of certain letters and the partial elision of others—have been overcome through better methods of modulation and transmission. Studio equipment also has been improved by the desired extent of elimination of echoes and the avoidance of over-accentuation of one instrument at the expense of others.

To get precise results, measurements of people's hearing of speech and music have been carried out. More faithful transmission has been achieved by transmission in a longer range of pitches. Originally transmission was 50 to 3000 cycles a second. Now it is 50 to 6000 cycles or more. This will be increased undoubtedly. Advances these days are made on the strength of scientific measurements. The old cut-and-try method has gone out in the laboratory.

## The Microphone

RADIO owners hear much of the microphone, affectionately called the mike, into which music or speech is poured. The microphone goes back to the first decade of the history of telephony. In the form we know it, it was invented by a man named Blake, who used plates of polished carbon with granular carbon grains between. The microphone that is in use today substitutes gold plating for the carbon and has a diaphragm of stretched duraluminum, the same material of which the frames of dirigibles are made. This increases smoothness of response to notes of all pitches.

Study of the microphone has been carried to such a point that Dr. Phillips Thomas, a research engineer of the Westinghouse Company, has produced an instrument so sensitive that it is said to be able to "hear insects talk." It can also be used to help doctors locate defective organs in the human body through vibration. This is a valuable discovery, since it has been demonstrated that once the normal vibrating periods, or characteristic sound of healthy organs are known, the defective ones can be discovered by sound variations.

The early broadcasting stations used only a small fraction of one kilowatt. Then stations of 500 watts to 750 watts were introduced. Later stations of 5000 watts were built, and later still superpower stations, such as KDKA, WJZ and WGY, began to operate experimentally on power up to 50,000 watts.

This enormous increase in power required the development of water-cooled tubes of the high-vacuum type, with copper bulbs and special filaments.

Crystal-controlled transmitters reduce interference and make possible the close spacing of wave channels, by preventing stations from wabbling off their wave lengths and crossing with one another. The so-called piezo-electric effect of a thin slice of quartz crystal, which can be made to vibrate rhythmically at any desired frequency, controls the wave length of any station with accuracy, even when the oscillations run as high as 15,000,000 a second. In other words, a waferlike slice of crystal of almost diamond hardness of about two one-hundredths of an inch in thickness holds radio transmission constant.

ILLUSTRATED BY  
WYNIE KING



There is Something Terrifying in the Utter Silence, the Total Lack of Facility for Determining What the Audience is Like





It is difficult to give proper credit for a great many radio inventions, because so far the courts have handed down all too few decisions that really settle ownership of patents. The romance of radio is tremendously attractive to every man of imagination. We have had all sorts of would-be inventors—from the farm, from the schoolroom and even from the telephone switchboard. Most radio inventors are men, but women go in for it, too, sometimes.

The uncertainties of the field are such that leading engineers insist that a patent must have been applied for before they inspect an invention. They don't want to deal with helpless people, who may later accuse them of having stolen an idea. The truth is, many inventions are the re-inventions of older methods. When a science has gone as far as radio has now, the amateur in the proverbial attic is not so likely to make a revolutionary invention as is the trained worker in a well-equipped laboratory. This is because the big laboratories are working overtime to turn out mechanical perfection, and their engineers and scientists are provided with the necessary facilities for orderly experimentation. It is almost too bad that this is true, for it spoils the story. Even I would rather believe the thrilling tales about amateurs who wake up in the middle of the night with ideas for inventions that will net them many millions. But I can't remember any actual case of this kind in recent radio history.

Inveterate inventors are not, however, to be discouraged. One man has visited a certain radio-engineering department twenty-three times, always with a new scheme. Every one has turned out to be either useless or a reinvention. He never seems to be fazed by the inevitable report and always pops back serenely with something else. All sorts of interesting suggestions are made. A number of persons seem to have conceived recently the idea that it would be nice to paint domestic scenes on the side of radio receivers to give a pleasant homelike atmosphere. Others suggest painting studio scenes on the sides of the loud-speaker to make the listener think he is really in a studio. The wildest dreams of a futuristic furniture maker are tame beside the cabinets designed by some would-be inventors. They are so grotesque that if a timid person awoke and saw them in his room at night he would shriek for help. One man wants them carved to represent lions and panthers. Another brought in a skeleton model. A woman suggested that a phosphorescent glow about the cabinet would produce a delightful eerie sensation on long winter evenings with the lights turned off and radio turned on.

#### Amateur and Professional Inventors

A FAVORITE type of invention is what we call gadgets—things to be attached to some part of the receiving instrument to make it sound better. Often these attachments will cost more than the entire receiver, but this is a mere detail to the proud inventor. Tubes exert a strange fascination too. All sorts of arrangements have been suggested for coloring them so that they will glow with a soft light.

Everybody, it seems, must, at some time or other in his life, try building a loud-speaker out of wood in such

a way as to get perfect tone. Sometimes the architect relies upon the shape of his instrument, sometimes upon the kind of wood or the veneer to produce this tone. There are some pathetic cases. I remember one gray-haired elderly man of the stoop-shouldered, deprecating, perennial-failure type who came into the laboratory accompanied by a determined-looking wife. He had a crinkly horn which he was sure would solve all loud-speaker problems. We tried to soften the blow, but had to tell him not to invest any money in the project. As he slowly took in what we meant, he seemed to crumple up before our eyes.

Although all are carefully examined for fear something may be missed, there is an astonishingly small percentage of workable ideas among those submitted. Out of 1000 suggested inventions there may be one or two that can be used—usually with modifications.

The great inventors and scientists I have known have been plain, friendly, humble men. My chief impression of Marconi was always of democracy. I remember one day an Italian boy came in to shine his shoes. Marconi got interested in something the boy said and detained him for half an hour, talking to him eagerly in Italian and shaking hands when they parted.

The greater the scientist is the humbler seems to be his attitude. If you asked Steinmetz "What is ether?" he told you that he wished he knew. A college sophomore, on the other hand, would answer glibly that ether is a medium through which electric waves travel. That reminds me of a story told to me by Melville Stone, counselor of the Associated Press, about Heinrich Hertz, discoverer of the theory of electromagnetic waves, which is at the basis of radio.

Hertz was a teacher of physics in a German university. One day a student asked, "What is electricity?" Before Hertz had a chance to reply, a boy in the back of the room held up his hand. When the teacher rather sardonically said, "All right, you tell him," the boy's knowledge seemed suddenly to vanish into thin air and he stammered that he had forgotten.

Hertz looked at him for a moment without speaking, then shook his head sadly. "What a pity!" he commented. "The only man who has ever known what electricity is has forgotten!"

When Albert Einstein, of relativity fame, was in this country in 1922, I gave a luncheon in his honor and invited Steinmetz, Irving Langmuir and other leading scientists. It was

a rather thrilling event for a layman, seeing so many great men together. Einstein was shown through our radio station at New Brunswick. Queerly enough, I cannot recall any prophecy of his about radio. I am inclined to think that he did not make one. It seemed to be rather awed by the magnitude of the concrete development of theories that he understood better perhaps than any of us.

Doctor Goldsmith took Einstein, Steinmetz and Langmuir out to New Brunswick in his automobile, and they carried on an astonishing conversation in three languages—German, English and French. A rapid fire of ideas went back and forth, and the three promulgated theories and problems enough to keep the rest of the scientific world busy for a generation. They discussed the internal structure of atoms and the inmost secrets of science in about the same manner that we ordinary mortals would debate what to have for dinner.

Two inventors of especial interest to present-day radio fans are Armstrong and John Hays Hammond, Jr. Armstrong worked out his regenerative while he was still a student at Columbia University. In fact, he began inventing in his own attic when he was fifteen. His invention practically revamped the manufacture of radio sets. When he gave his first demonstration before officials of the Marconi Company, I remember that the tall young fellow carried all his equipment in a black box and each part was painted black. This was a camouflage arrangement to make sure that nobody should pirate his idea.

#### Seeing Things Up Gloucester Way

HAMMOND is a latter-day descendant of a long line of gentleman scientists, men of means who might have been content to live without work, but who have wanted to invent for the joy of it. Cavendish and Faraday were among this group; and so was the Marquis of Worcester, who built one of the original steam engines.

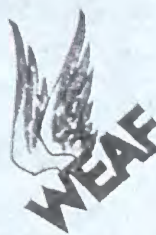
Hammond is a graduate of Yale and a democratic, unpretentious man, very pertinacious where his work is concerned. Two types of problems appear to interest him—national affairs and music. In teledynamics, the science of remote control, or controlling things at a distance, he has always worked with the idea of military defense in mind.

It is an uncanny sensation to stand on the shore of Gloucester Harbor and watch Hammond's unmanned boat start out at top speed when a button is pressed. As it sails along on top of the water it draws near another craft. A touch of the button swerves it to the side and it passes in safety, while the eyes of the persons in the other boat bulge out from astonishment. To end the exhibition Hammond wills his creation to do stunts and it begins to cut figure eights in the water.

The inventor has also controlled torpedoes and airplanes by radio, and has constructed a dog of metal which will follow him about the house until the neighbors think they're seeing things.

In connection with his torpedo control, he has perfected one item that seems like doom itself. There was always a possibility that persons on a boat toward which a torpedo

(Continued on Page 91)



Keeping on the Farm the Boy and Girl Already There is the Ultimate Service the Radio Will Render to Rural Communities





## RADIO

(Continued from Page 25)

was being sent by radio might see it coming and deflect it by turning toward it a powerful transmitter. By an ingenious and final locking system, Hammond makes it possible to operate a switch—when the torpedo has gone a certain distance—that will render it impervious to any radio control.

Thus it must fly straight on to its destination. Not even Hammond himself could stop it or call it back.

Hammond has for some time been engaged on a system of remote control of trains. This works so that if a train runs past a block signal, radio stops it regardless of what the engineer does. In connection with this line of experimentation, a sad incident happened last November. G. Y. Allen, of the Westinghouse Company, a clever investigator, who had been working on the remote control of trains through the radio block system, went to Washington to attend a conference. When he was coming back another train crashed into the one in which he was riding and killed him. If the invention upon which he was spending all his time had been in force the accident probably would not have happened.

Speaking of accidents, although it wasn't the same kind at all, I am reminded of something that happened recently when short-wave experiments were being conducted by Alexanderson in Schenectady. His station was sending short waves to Riverhead, Long Island. For the purpose of recording the signal strength, certain instruments of measurement are used. When these were brought out on this particular day, no strength showed at all. Evidently something had broken down.

## Illustrious Boy Inventors

Alexanderson's assistants examined everything. No, nothing was wrong. The signals should be going over well—only they weren't. Just as Schenectady was about to telegraph apologies to Riverhead, Riverhead telegraphed that the signals were coming in stronger than usual. When Alexanderson looked over the hook-up he found the antennae hooked wrong.

The result was that, instead of the usual vertical wave, a horizontal wave was going out. These waves are now in practical use for talking to South America.

I hope I have not, in speaking of the thousands of unavailable inventions conceived by amateurs, given the impression that the amateur is not of immeasurable value to the art of radio. On the contrary, he has played a great part, and without him we should never have gone so far today.

In the first place, the amateur of one day has frequently become the professional of the next. Radio has grown so rapidly that

it has used up professionals at a ravenous rate. When there are no more professionals available, the reservoir of amateurs must be drawn upon; and in a number of cases this has happened, particularly in the assembling of the radio personnel of the Navy during the recent war.

The amateur is of value, too, because he conceives and often begins striking experiments which professionals can carry on. In the short-wave field especially he has done good work both in stimulating interest and in working out the machinery of experimentation. Among illustrious amateurs who have become professionals we may mention Marconi, E. H. Armstrong, J. V. L. Hogan, Hiram Percy Maxim, Alfred Goldsmith, Frank Conrad, and many others.

## The Institute of Radio Engineers

The American boy is the greatest amateur of all—great in the sense that he is the eager, intrepid seeker for new adventures. He has made an appreciable contribution to radio lore in the way of isolated facts which later have been coordinated by trained minds. There is no doubt that the scope of the American scientist will increase with the gain in scientific precision of thought brought about by millions of boys getting interested in something that makes them think.

In this connection it is interesting that many of our most important inventors began to invent while they were still boys. Armstrong, as we have already seen, had perfected one of his most important devices before he was out of college. Marconi himself made many important experiments while in his teens. Hogan was another of the college-boy inventors. Langmuir is said to have had a laboratory of some kind since he was eleven years old. Dubilier began to work on his condenser while he was still selling newspapers. His invention displaced the condenser then used—in the form of a fragile jar—by a compact and robust device which does the work of several of those jars.

We must not leave the subject of radio aids without mentioning the Institute of Radio Engineers, now fourteen years old. This is one of the leading engineering organizations in the world and one of the greatest existing forces for promoting radio. It was formed first as a Boston group and called the Society of Wireless Telegraph Engineers. As befitted Boston, it was exclusive and staid. New York had the Wireless Institute, and when each society had accumulated a good many debts and difficulties, a scheme was set on foot to unite them. A combination name was evolved and the organization grew rapidly from a few dozen to

3000 members, with sections in nearly all the large cities.

The institute now publishes each year almost 1000 pages of scientific material here and abroad. At its meetings engineers speak on new discoveries and methods. Practically every radio improvement of any importance has come before this organization prior to its presentation to the world.

The institute is noncommercial and devotes itself to nonpartisan activities such as standardization, measurements, and the like. In view of the fact that radio has been called the young man's game, because of the youth of many of its executives, it is interesting to know that the average age of members of the Institute of Radio Engineers is ten years below that of any other group of engineering men.

The regulation of radio broadcasting was accomplished from the first by a sort of gentlemen's agreement which is unlike anything ever known before. It was obvious from the start that an enterprise which expected to give such direct service to the public must be subject to certain rules which should conserve that ideal. To work out these rules in definite form, the Department of Commerce, in 1922, called together representatives of the industry.

## A Program of Self-Rule

Secretary Hoover explained the need and appointed those present an advisory body, asking them to make recommendations as to how they thought the matter could best be handled. In 1923 he called them into conference again, for as radio had grown, so had the problems. All broadcasting waves were originally 360 meters, because that number was between two ship waves, 300 and 450; but by the time of the second conference the number of stations had so increased that interference was intolerable. It was evident that a new wave zone must be opened up.

Secretary Hoover's unofficial advisory committee suggested that the 360-meter wave length for all stations be abolished and that a 220 to 550 meter zone be opened. The committee also proposed regulations for assigning frequencies. When Secretary Hoover looked upon these plans he pronounced them good and said he would adopt them.

He also decided that radio should rule itself, with the fewest possible restrictions. The result of the unusual experiment has justified his confidence. The assigning of wave lengths, the granting of broadcasting licenses and the general oversight of the industry has fallen under the province of the Department of Commerce, but the inner government has gone on largely of itself.

(Continued on Page 94)



## BI-SPUN

HOSIERY FOR MEN

a developme

that had to come

THIS remarkable age that made such progress in manufacturing has brought forth a and amazing development Hosiery that is invisibly reinforcing above the shoe-line as well as heel and toe.

Think of it! No more scrambling through a drawer of socks, prayerfully hoping to just one presentable pair that has no visible holes.

The amazing new Bi-Spun process strengthens every thread without weight or thickness. The result is a sheer hosiery in a wide variety of men and master's varied patterns. Hosiery is guaranteed to outwear your own stockings.

You will find Bi-Spun Tru-fab hosiery most good shops at unbelievably modest prices ranging from

35¢ to \$1

Bi-Spun has eliminated the neglected area from Tru-fab hosiery.



Tru-fab  
Bi-Spun HOSIERY FOR MEN



CLIMAX HOSIERY MILLS

Founded 1902 ATHENS, GEORGIA

New York Office 366 Broadway



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A Scene on the Nova Scotia Coast



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By 1923 stations had begun to multiply. WJZ followed KDKA into the field in October, 1921. WEAF was opened a little later. By this time the dream of 1918 seemed at last to be taking on real substance. An entire new world of entertainment and instruction was being discovered. Singers, pianists, violinists, ministers, lecturers and actors were performing before the little microphone, and were being heard not only in their own but in surrounding cities.

A feature that early drew the man of the house toward what at first he was inclined to regard as a plaything was the prospect of hearing descriptions of his favorite athletic events broadcast by expert announcers. The pioneer in this field, so far as I know, was J. Andrew White, who, on July 2, 1921, announced the Dempsey-Carpentier fight from the ringside in Jersey City.

White worked out a scheme to equip theaters throughout the Middle Atlantic States to receive a blow-by-blow description of the battle, which he sent by way of a temporary station constructed at Hoboken. He had to use makeshift paraphernalia and trust to luck. Two nights before the fight he called me up.

"Well, I'm in the soup," he announced cheerfully. "So far, we haven't been able to get a sound to register beyond Newark. We are averaging a complaint a minute just now."

That night, with White sick from worry, whatever was wrong with his transmission system—and he doesn't know to this day what that was—righted itself and his patrons were able to assure those to whom they had sold tickets for listening-in to the event that the show would come off as planned.

My remembrance of that fight is vivid. I went with White to his place at the ringside. It was a torrid day and we all fried slowly in the sun. White was dripping with perspiration and his throat was parched. In the excitement a boy who had been brought along expressly to supply him with iced water forgot all about his duty, and when White, who could not speak except in his rôle of announcer, signaled for the vacuum bottle containing the precious fluid, the boy merely cried, "Yes, ain't it a bully fight!"

#### A Well-Timed Smash

An exciting feature of the day for radio was that one news agency scooped the whole journalistic world by wireless. The reporter who had been listening to White at a downtown office flashed the word of Dempsey's victory by radio to Paris, and in spite of the many cables which had been leased by powerful newspapers, beat everybody by thirty-three seconds.

As a dramatic ending to the fight, the very instant that White finished pronouncing the words, "Dempsey remains the champion of the world," his transmitting set went smash. He could not have sent another syllable over it.

It was estimated that nearly 400,000 persons attended the Dempsey-Carpentier fight by proxy. This number seems infinitesimal in view of the millions who would listen-in on a similar event now, but it was a high-water mark for those days and pointed the way to the prospective popularity of at least one kind of broadcasting.

Among WJZ's earliest broadcasting stars were Marguerite Namara, Johanna Gadske, Marie Sundelius, Marie Rappold, Frieda Hempel, Cecil Arden, Percy Grainger and Lydia Lipkowska. At the invitation of station directors, these great artists came half timidly, half eagerly to perform before an invisible audience. Nearly all of them were accustomed to making records and it would seem that the microphone could hold no terrors for them. Yet it did. Many who had long since forgotten the meaning of stage fright trembled before the little round disk which represented a vast unseen audience.

Mike Fright originated with the first broadcaster. There is something terrifying

for determining what the audience is like, that often robs a veteran speaker or musician momentarily of all his mental control. The announcers say that men are harder hit than women.

Some of the bravest among political speakers have gone down before that awesome velvety stillness. Mike McTigue, at that time light-heavyweight champion of the world, was bathed in perspiration before he finished a five-minute talk over the radio in the early days. Capt. René Fonck, French ace of aces, who brought down seventy-five enemy planes, was seized with a nervous chill when he was put before the microphone.

Eddie Rice, violinist and first person to broadcast over station WGY at Schenectady, discovered a novel way to assuage his panicky nerves. He closed his eyes and kept them closed all the time he was playing.

Madam Gadske was one of the calmest broadcasters. She composedly folded her hands and said, "Well, let's begin!" If she was trembling inwardly, not even the announcer knew it.

#### Sincere Appreciation

Lydia Lipkowska, excited and exalted, related a dream of her childhood while she waited her turn to go on the air. "Many times when I was a little girl, I dreamed that some day I should sing before an audience more vast than any that could be gathered into the largest concert hall," she said. "Over and over I have seen myself singing to this great throng. Only, I did not know that when the time came I should not be able to see them face to face."

The performances of these musicians brought hundreds of letters from listeners in. These came from farm and city, desert and frozen waste. The ecstasy of fulfilled longing they revealed surprised and half-saddened the artists and their sponsors. The bedridden, the isolated and the despondent vied in praising the new voices of the air. A lonesome boy in Labrador, shut away from any human contact for months by glittering stretches of ice and snow, with only his dogs for company, was amazed and thrilled by the voice which came to him out of the night, singing The Snow Maiden.

A woman who had studied to be a concert pianist, but had become a paralytic before her debut, heard good music, she said, for the first time in six years. A man who had made unfortunate investments contemplated suicide and was saved, he vowed, by hearing an old favorite of his mother's sung over the radio. These and similar tales, almost too fantastic to be related, came through the mails as fact stories to the radio station.

Babies were named for stations; and so, incidentally, were cows, chickens and pigs on remote farms. After the bedtime story became popular, one station had a letter from a listener in Canada, who said: "Please ask the bedtime story-teller not to tell any more stories about bears. We really have bears up here and the children meet them on the way to school. It frightens them to hear that bears sometimes eat boys and girls."

In the meantime, with the new fad taking hold upon the public imagination, manufacturers saw a chance to get rich quick. Following the war, it had seemed as if everyone who could turn a lathe, and even some who couldn't, had rushed pell-mell into the radio industry, regardless of patents, fitness or experience. At one time in this country more than 3000 manufacturers of wireless supplies and equipment were listed, and the public apparently accepted anything offered in the name of radio.

The situation was to be expected. In every new industry there are those who build for permanency upon the solid basis of safe financing and continued experimentation, and others who ride in upon the crest of high finance, craving a hectic in-

By the spring of 1925 the market was flooded with inferior radio products. What happened was inevitable. Poor receiving equipment disorganized trade outlets and inadequate broadcasting programs contributed to a temporary loss of public interest in the radio.

When the flood of liquidation had subsided, many unsound elements had been swept away and there remained a wiser and a better industry.

Those who had attempted to roll into one the periods of experimentation, development and stability met economic retribution. The same thing has happened in other industries. It had happened not so very long before to the automobile.

During the period of maladjustment, too, the radio ceased to be a novelty to artists as well as audience. Musicians who had been anxious to give their services for the sake of the extraordinary publicity they could get, now hung back, claiming that free radio appearances hurt the box office receipts at pay concerts.

Owners of theaters and concert halls who up to this time had been glad to place their stars before the microphone, complained that the radio was killing business. Phonograph companies joined in the general opposition. Even the newspapers looked slightly askance at a strange, still-untested rival.

The public cried that the radio was becoming commercialized; that the programs were mere advertisements for this tooth paste and that safety razor, and uninteresting to boot. It was a time of general disaffection, and if there had not been staunch enthusiasts and optimists in the business, the setback would have been more serious. With these stout hearts hanging on grimly to hopes of better days, the development of radio continued through all difficulties, until, measured by the record of other industries, it seems sensational. So fast have technical improvements followed upon one another during the past three years that it is surprising we can take them calmly. I suppose the reason we can is because they do not burst upon us as the startling output of any single individual, at any given minute, but come by degrees as the cumulative result of the effort of many minds.

#### Pictures by Electricity

Some idea of the tremendous growth of broadcasting, at least, can be obtained by recalling that less than six years ago there was only one broadcasting station in the United States organized for the service of public programs while today there are more than 600. In 1920 the total expenditure in the industry was not much more than \$1,000,000. For 1925 the total was approximately \$350,000,000.

The initial step in the transmission of pictures electrically was made in 1842, by Alexander Bain, an English physicist. His plan was so basically correct that present-day experimenters are following, in the main, in his footsteps. He arranged two pendulums electrically in such a manner that if one preceded the other by a slight amount of the time of a stroke, it was held until the other reached the same position, when both then started a new stroke.

These swinging pendulums were the basic synchronizers necessary in any picture work. On each swing a tablet descended a notch at a time at the side of the pendulum. At the transmitting station the swinging arcs of the pendulum carried a small contactor which rode over type faces, making the appropriate electric contacts to be transmitted to the distant receiver, where a similar swinging pendulum was tracing a path across a piece of paper. By chemical action the electricity received from the transmitter would discolor the paper at the receiver to give an impression of the original.

It has taken eighty years to come to commercial operations, because in addition to requiring exactly the conditions necessary to sending the voice or a telegraph message through the air, picture transmission must also do the additional job of indicating the

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points on an area for which values must be represented.

There have been at least 1000 workers in the field since Bain, but present-day experimenters have had a tremendous advantage, because the advance of radio has produced more accurate instruments.

When the Navy first took up the invention of available types of equipment capable of transmitting pictures, sketches and handwriting, the work was carried on by the Bureau of Engineering and the Naval Research Laboratory. Naval engineers transmitted photographs over a distance of ten miles. Now these same pictures may be sent over 4000 miles with less trouble. The process which we now call photo-radio is that of sending a single picture from one point to another by electricity in three to twenty minutes.

The recent stunt of New York newspapers in producing part of a page of a London newspaper of the day before, sent by radio, reminds me of a speech made several years ago by Owen D. Young. Mr. Young was speaking to a group in which there were a number of engineers. He said he was impatient for the time when they would stop fooling with dots and dashes that had to be retranscribed after they were sent across the ocean at such a waste of time.

"What you ought to be able to do," he urged, "is to send the whole front page of a paper across the Atlantic all at the same time."

The engineers in that audience were inclined to remind Mr. Young of all the technical difficulties in the way of such a proceeding.

"I know there are difficulties," he admitted, "and I don't know how to overcome them. That's your job." It was their job and they performed it well.

Television is the process of sending a number of pictures so rapidly that they will have the effect of motion pictures. I was amazed to discover, not long ago, that a good many intelligent persons have an idea that television may in some mysterious way eventually make it possible to see the actual figure of a friend at a distance, unbeknown to him. This accounts for the frequent remark, when television is mentioned, "Oh, I hope they'll never come to that. I wouldn't want anybody to see me the way I look around home in the morning."

To reassure the fearful one, it is safe to say that no method at present under investigation is likely to wait your image through the air unless you are making an effort to have it sent. The machines for such transmission will undoubtedly be in plain sight.

### Radio's True Mission

Capt. R. H. Ranger effected the first completely automatic radio transmission of pictures across the ocean in 1924. The photo-radiogram transmitter was located in London. The pictures sent were those of President Coolidge and former Secretary Hughes. During the recent labor strike, pictures were received daily by radio from London.

The year 1926 opened with the United States undisputed leader of world-wide wireless. Radio circuits are now in operation between the United States and England, France, Germany, Italy, Poland, Sweden, Norway and the Argentine. Across the Pacific, radio connects us with Japan, Hawaii and the Dutch East Indies. It has lowered the rates in all classes of international communication. It has sped up the service of messages across the seas. It has established direct links of communication with countries heretofore connected only by numerous relays to the seaboard.

I believe that service is the true mission of radio. It began as entertainment, just as motoring started as a sport. But the automobile industry went to its highest point when the motor car became an essential element of transportation. The telephone was a toy at the beginning of its

history and little more than a novelty for twenty or twenty-five years.

Yet for all that, I am fully aware of the significance of each new invention in the great program of radio service. I get my own thrills not from the inventions themselves but, like everybody else, from their effect upon me and my daily life.

Thus when on a certain Sunday at home I listened to a sermon delivered by radio by Doctor Foster, of Newark, I thrilled to what he said. It was a sermon on religion. The introduction ran something like this: "I cannot address you as citizens of Newark, because my voice is being heard beyond the limits of the city. I cannot address you as fellow Americans, because my voice is being heard perhaps in Cuba, in Canada and in Central America. I cannot address you as brethren of my faith, because only a very insignificant part of the great number who are listening to me are of my own faith. Therefore I must address you as fellow human beings."

### Hearing Myself Talk

Perhaps mine was a sentimental reaction. If it was, I am not ashamed of it. On a day when we can all be addressed as fellow human beings may we not hope that something finer and more tolerant will come into our attitudes, one toward the other? Anyway, I believe so.

I was thrilled again when I talked over the telephone to Captain Rind, of the steamship America, 800 miles at sea. I was at a neighbor's house when the call came. During the conversation I was cut off. I jiggled the hook and said to the operator, "You've cut me off."

She murmured suavely, "What number were you calling?"

"I was talking to a man on the Atlantic Ocean," I told her. I distinctly heard a gasp which I am sure is not part of the telephone regulations, and then a scared voice almost whispered, "I will give you information." I suppose she thought she had a lunatic to deal with.

While I was talking with Captain Rind, the Irish maid in my home happened to tune the radio receiver to the wave length of Deal Beach, the station through which we were put. Suddenly she heard my voice, and after listening for an incredulous moment, began to look all around the house to see if I had come home. When she was convinced I was nowhere about, she decided she was hearing a ghost, and fell forward on her knees.

I got almost the same kind of shock myself not long afterward. I had made an address on the pallaphotophone, a device for photographing the voice, and the address had been recorded by the instrument itself. Two months afterward, at my home in Mount Vernon, I tuned in on WGY at Schenectady, 150 miles away, just in time to hear the announcer say, "The next speaker will be David Sarnoff, who will talk about the pallaphotophone." So there I sat in eerie silence, listening to myself lecture from 150 miles away!

I could not help thinking, as I tuned myself out, how wonderful it would have been if the pallaphotophone had existed in the time of King Tut or Cleopatra. Suppose that, instead of a good deal of furniture of doubtful value, King Tut's tomb had been filled with pallaphotophone records! We should no longer have to wonder whether he worried about income taxes and flappers. And Cleopatra might have passed on to us direct her beauty secrets.

Carrying a little further forward this whim of measuring present-day inventions backward, how much better it would have been if Lincoln's Gettysburg Address would have been canned and served as a Lincoln's Day speech, instead of many of these we get! Incidentally, the newspapers of the day failed to recognize that address as of vital importance. They recorded in full other efforts that now are forgotten, and in the main ended their accounts with: "The President also delivered a short address."

Since the mysteries of the air constantly excite me, who have more or less grown up in touch with at least their outer borders, I can sympathize with those who meet these wonders for the first time. It is truly remarkable what a hold the radio has taken upon many who at first were seemingly unsuspensible to such influences. An engineering friend of mine says he makes people take him to the theater when they ask him out to dinner these days, otherwise he knows they will ask him questions about radio all evening.

At the broadcasting stations I have been told that men and women are so anxious to go on the air that they beg, browbeat and even try to bribe their way in. Many insist that they must broadcast to reach a brother, sister or friend who has run away from home. Again, a woman will confide to the announcer that she expects to win back a straying lover by wooing him through the air. These personal appeals are not permitted, of course, and I expect in most cases they are manufactured to serve as an aid in the effort to become, for once, part of the great enchanting air game.

The mail that pours into the stations reveals the extent of the radio infection. Some of the letters are almost like love letters. "You cannot know what it means to me to listen for your signal every night. I wait for you all day, and tune in at least fifteen minutes ahead of time so that I shan't miss a word." So runs one heartfelt message from a middle-aged woman who teaches school in the Ozark Mountains. Another paragon of thanks comes from a man in Maine whose vision is impaired. He rode three miles to reach somebody who could write a letter of appreciation for him. A Montana rancher telegraphs a Sunday-night broadcasting group to say, "We regard you as our week-end guests and welcome you as such."

A farmer in Kansas, so cut off from the main highway that sometimes he and his wife see nobody but each other for a week, says his radio was worth the three steers he had to sell to buy it.

"And those steers took considerable feed to fatten," he adds.

A wife writes to thank the inventor of radio for reforming her husband. "He hardly ever gambles evenings any more, now that he has the radio to listen to," she rejoices; adding, "The radio is as good as a revival meeting."

### A Boon to the Isolated

A doctor in the backwoods speaks a word for electricity. "I know something of all kinds of light," he writes. "Last week I operated by a pine torch at two in the morning, on a patient with hernia. He is getting well and has just paid me with a bushel of walnuts and three gallons of wild honey. Sometimes I operate by oil lamp-light, sometimes by candlelight. So I know what electricity means."

A woman in the South who has not visited her home in New York for fifteen years thanks singers, actors and announcers indiscriminately for the breath of Broadway they have brought to her.

"Remember that every night we shall wait for you," she concluded; "my husband and I two under the magnolias."

The initials under which the announcers of various stations hide their identities have become household names. People write to these men and women as if they were intimate friends, asking for advice and making confidences. A great deal of the mail comes from women, even the announcer of sporting events getting his share from the fair sex. The first of these epistles were regarded as curiosities, but now wives are almost as interested in baseball, football and boxing as their husbands.

The announcer has a rather difficult job. He must be friendly enough to give an informal touch to radio soirées, and yet he must not so overdo the informality that he grows tiresome and rowdyish. Whatever he does, he is pretty sure to reap both cheers and brickbats, for the radio audience is a

FREE: The Saturday Evening Post



## BEFORE shaving.

Small text: "The Saturday Evening Post" and "FREE" are visible in the background of the image.

Here are actual photographs retouched. Notice the skin before shaving. It has had a chance to partly from the effects of shaving 24 hours.

Now notice the other photograph shaving. (Torn open pores. Nicks! spikes!) Men that's what makes face smart. Burn! And, men, that's there's a demand for this new skin shaving cream!

A cream that cools and soothes the skin.

A brand new principle in the cream away with the necessity of hot towel soothing lotions—all the fancy wasters that formerly had to be applied to burning faces!

And in just a little while you get rid of all the bubbles that take the right out of stubborn bristles.

Be sure of this cream. Let it itself to you and has to thousands of men. Don't buy—accept it. Your tin containing 1 free shaving cream is waiting for you. Send for it today—an

Frederick I. Ingram Co.  
112 Broadway, New York

Frederick I. Ingram Co.  
112 Broadway, New York

## AFTER shaving.

Truer skin, milder. Now the whole—rather than skin. Ingram's helps this.




Frederick I. Ingram Co.  
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## The NEW Air Catching Feature

makes home clipping  
even easier

Brown & Sharpe clippers are favored among the two million people who use clippers in their own homes to keep the hair of the whole family in trim between visits to the barber's and hairdresser's. Their air-cutting, easy action makes hair trimming a quick, simple job for anyone.

BROWN & SHARPE have added an air catch feature to their Model that makes home clipping more simple and convenient. The air catcher prevents the clipped hair from falling down the neck or onto the floor. It catches the hair as you clip it. When it is full you simply shake the hair into convenient receptacle. You can slip it off the clippers when you want to clean them, and attach it again with a mere turn of a wing nut.

The Model clipper with this convenient attachment is packed in a neat case, and you can be glad to send the mother or daughter to the family our booklet on bobbed hair. "Keeping the Smart 'Bob Smart'."

# BROWN & SHARPE



Brown & Sharpe Mfg. Co., Providence, R. I., U. S. A.

severe critic. The sporting announcer must really act as umpire or referee in order not to let his hearers miss any of the excitement. He must have a clear head and a keen eye, for his eye will have to transmit to his brain faster than the average. He must also put his description into words a novice will understand, yet at the same time give the expert the concise technical points.

One announcer assigned to report hockey matches went to Canada with the teams and stayed during several weeks of practice. He had to learn to know each man so well that he could pick anyone out even in a time of hectic excitement.

The same announcer has what he declares is an infallible recipe for telling when a fighter is weakening and ready for the knock-out blow.

"I look at the knees," he explains. "I have seen men grinning gamely when they were so groggy they could hardly stand. Fighters are actors. Their faces tell nothing. It is the tendons of their knees that throb and give them away."

Entirely apart from my connection with the industry, I am an incorrigible optimist about radio, as must all too plainly appear. But I do not claim for it any superaccomplishments in the way of reforming the world. I do not think it can ever make over human nature. I doubt if it can even make over a husband, in spite of the wife who said hers had quit gambling to listen to it. It seems unlikely that overnight, at least, it will produce a new kind of politician, and I imagine it would be saying too much to predict that at an early date it will change our educational system. Children need the association of other children when they are growing up. That is part of their education. Training them by radio exclusively would not therefore be ideal.

Yet something even better than we can at this time see must surely come out of the capital, science and brains which have been poured into radio development. Literally hundreds of millions of dollars and the best efforts of our keenest scientists and business men have been the American contribution toward perfecting mankind's newest servant. Some notable results along the line of entertainment and information we have just considered. On the service side there are important additions in the making.

Not long ago a nation-wide survey was made of agricultural colleges, farm publications and organizations of farmers to determine the effect of the radio on the farm. The conclusions reached were that the radio relieves the farmer and his family of the sense of isolation—harsh handicap of agricultural life—that it broadens the social, spiritual and religious influences; copes with class and sectional differences and develops greater national unity as between the farmer and other human beings.

### How to Keep 'Em Down on the Farm

Specifically and practically, it can be employed to furnish accurate time signals and weather reports, broadcasting warnings of approaching storms and floods. It can, and does, provide accurate news of price and trade conditions. Several agricultural colleges are trying out radio-extension courses. Perhaps some day there will be a radio-extension university for farmers. Even without it, there are countless ways in which the whole family may be aided in its daily work of cooking, sewing, plowing and tending the stock.

But the human problem is of larger importance. Will radio help to keep the boy on the farm? I believe it will. Owen D. Young recently said: "Those of us who left the farm did so because of the things which the city man had and the farmer had not. The attraction of an occupation out-of-doors, of productive labor, of good food and comfortable living conditions, was not enough to offset the cultural advantages of the city; but now the city man may leave the city for the things which the farmer has and he has not."

Whether the city man migrates to the country or not, keeping on the farm the boy and the girl already there is the ultimate service the radio will render to rural communities. It is too early to call for statistics, but they will show, I am convinced, that the new movement has already begun.

For radio carries the farmer to the scene of world events. The backwoods dwindles and fades. The boy coming in from his milking twists a dial and is in New York, the city of glittering lights and life, of giant buildings and never-ending crowds. He is there listening to a famous band. He is one of an audience applauding eagerly the rapid-fire repartee of a popular comedy; or he is watching a football match and cheering loudest of any. Imagination has bridged the gap between sight and sound.

### At His Hearers' Mercy

Can the radio bring about better government? Perhaps. Popular interest in government would, I am sure, be enormously increased if great national issues were fixed for debate by Congress at special night sessions and broadcast by radio. Of course, the man who is not political-minded would not be made so by hearing a congressional debate, but he would at least pick up scraps of information which, since his own interests are involved, might lead him eventually to an intelligently onlooking part in national affairs. I think the radio is making the speaker watch his step, and his word too.

The man who talks politics through a microphone has got to talk sense. If he doesn't, his audience will walk out on him and he won't even know it. Radio audiences are quick to condemn as well as praise. If they think a speech is terrible, they say so unhesitatingly—often by telegraph. They never used to be quite so frank when they had to sit as part of a bored audience which was compelled to listen whether it liked what it was hearing or not. It is possible that orators, knowing that they may be cut off by the mere twist of a wrist in the prime of an utterance, may be a little careful what they say. It has been estimated, although, of course, radio estimates are as unstable as any—that in five years radio listeners will number 50,000,000. No orator during his entire lifetime was ever heard by so many.

Perhaps it is not a service to be rejoiced over that radio has added 5000 new words to the language, but it is true. The war added 6000. More than 200 of the radio additions to Americanese have the prefix radio. The others run all the way from autodyne to zymodyne.

Sooner or later all radio roads lead back to the question of who will pay for broadcasting. Yet I do not see that this question is so difficult to answer. The best programs now put on the air are contributed by those interests which have the most to gain from public goodwill. Notwithstanding the fact that, in the main, broadcasters have found no way of obtaining direct returns from the listening public, the indirect returns are in many cases of sufficiently impelling motive for the continuation of broadcasting.

Electrical devices in the home and power-transmission lines sometimes give rise to electrical disturbances which interfere with the reception of weak radio signals. The ideal then is to produce a strong signal from distant stations, thus eliminating the detrimental effect of natural and artificial electrical disturbances. Sufficient power also must be provided at the transmitting station to meet the more difficult condition of daytime summer reception, as well as the comparatively easy necessities of nighttime winter reception. High-powered broadcasting will do this. Once a reasonable number of these stations are in operation, every listener will get reliable service at any time from one or more.

Furthermore, those listeners who are within the normal range of the low-powered purely local station may listen to its program, since the Third National Radio Conference has recommended that such

stations shall be located outside of and at some distance from population centers. The broadcast station of the present one-kilowatt type emits a signal more powerful in its vicinity than a signal received in the same neighborhood from a station fifty times as powerful located twenty-five to fifty miles away.

It is clear that nationally interesting programs can be sent out economically only from stations of such power that they reach vast bodies of listeners. Superpower broadcasting will deserve the sanction and support of the Government, the public and the radio industry itself. There is no question in my mind but that once the physical agencies are in existence and have proved their value to the public, the industry will cooperatively support this agency.

I hope that wire-line networks and radio-relay systems for the interconnection of broadcasting stations will also be developed side by side with superpower broadcasting. Each method has something of value to contribute to the ultimate picture.

In a recent survey eight out of ten persons voted for the high-powered station. People in isolated regions want it. Some of those in crowded cities, believing that it will interfere with the reception of local stations, do not want it. At the moment, in the broadcasting art, the two great problems upon which research is being directed are: First, improved modulation that is, the most precise control of the product coming from the microphone and the molding of the electrical impulses into the exact values of music or speech; and second, the problem of emitting more efficiently greater power from the antenna system of the broadcasting station.

The industry thus recognizes that not only public but national interests demand the system of nation-wide broadcasting. Regardless of the number of local stations—and the local station, like the local newspaper, theater and concert hall, will be permanent—there is need for a system of national broadcasting, ready for any public emergency, with facilities adequate to cover the entire country and to reach across the ocean whenever desired.

### Superpower Broadcasting

True, a sufficient number of stations to cover a considerable part of the country may be, and often are, interlinked by wire to act as one transmitting unit; but the fact must be faced that, whereas the President of the United States may pick up his telephone in Washington tonight and talk across the continent to San Francisco, he could not, without vast preparation, considerable expense and the voluntary cooperation of many broadcasting stations owned and operated individually, talk to even half the nation by radio.

Nor can we expect to receive regular programs broadcast to us through the powerful stations of Europe unless our own voice is strong enough to span the Atlantic with reciprocal programs.

We have already come a long way from the day when President Wilson appeared before Congress to urge the entrance of the United States into the World War. At that time there was no way for his message to reach the people direct. It had to be recopied by news associations in Washington, sent over a network of wires to the cities and towns of the country, reprinted by 20,000 papers and distributed by a vast delivery force to 25,000,000 homes before its import could be generally known. To day with some advance preparation, President Coolidge may, in his own voice, announce to millions a crisis which confronts the nation. With the superpower broadcasting system perfected, he will be able to do it instantaneously and without any advance preparation.

I have said that superpower broadcasting will help to do away with interference. I mean, of course, that more power will override man-made obstacles, and even some of those for which Nature is to blame.

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Interference may be the fault of a swinging antenna or a loose connection. If one antenna is too close to another, especially if the wires are parallel; the signals are likely to sway and sometimes disappear. This happens especially in the case of New York apartment houses.

Radio fans are frequently curious about the factors which cause night reception to be clearer than that of the day. Radio travels in part by the aid of a region in the upper air 100 miles or more above the earth's surface, which acts as a great mirror to the electromagnetic waves. The varying properties of this zone explain many so-called freaks of reception. Here the atmospheric gases are ionized—that is, their atoms are partly disintegrated into their component electrons. This region causes radio concerts to fade, giving far-away stations great volume for several moments, then swinging them into silence.

### The Golden Age of Broadcasting

Night reception from stations outside a 100-mile radius is generally by means of sky waves, and because there are no absorbing objects on the mirror surface such as exist on the earth, sound travels much better. The absence of sunlight is another factor which increases night-reception range. Concerts picked up during the daytime are generally from stations within a fifty-mile radius. They are thought to travel by ground waves, which die out quickly because they are absorbed by trees, steel structures and electric wires.

Although I went in for prophecy back in 1918, I find it hard to assume the rôle in these remarkable days. The years have taught me a certain discretion. I know that either I shall fall so short of the mark as to make what I say archaic in a few years, or else I shall overshoot the mark and be convicted in time to come of partisan exaggeration.

I have mentioned some of the things that radio probably will not do. To sum up, it will not bring about the millennium. Neither, I think, will it revolutionize industries using electric power by transmitting power itself. The energy received by a radio set used continuously during an entire year on a good signal would serve only to light the average incandescent lamp for one second. The talk of transmitting power by radio then is much like talk of carrying water several miles by means of a garden-hose spray. On the other hand, judging by the developments of recent years, it seems a risk to place any limitations on scientific development in any field of activity.

But let us see what the golden age of radio broadcasting may reasonably be expected to bring forth. Certainly, unless and until the best programs in the air can be received and heard in every home in the country—until, in a national emergency, a single voice is able to deliver its message to every home equipped with a radio set—we shall not have achieved the ideal of radio public service.

There should be, too, in the golden age, cooperation between stations so that no listener-in would be compelled to miss the big feature of one station while listening to the big feature of another.

What will be the language of the golden age's broadcasting? I do not know. Assuredly, with international broadcasting, there must for convenience arise a dominant language. I believe this language will be one already in use—perhaps English. The problem of broadcasting in our own country, where only a single language is generally spoken, is comparatively simple; but on the European Continent the programs of any one country can easily be heard by six other nations; and in India, where broadcasting is getting a start, there are nineteen different languages. In Scandinavia last summer I visited at the home of a farmer who every evening tuned in upon London, Paris and Berlin. Music was the only language he could understand of those which came to him from the air.

The day is surely coming when, as a matter of course, a message written by a newspaper correspondent in London will be flashed photographically by radio to the newspaper office of New York when a photographic copy of an editorial in a French newspaper can be transmitted the whole length of the ocean in a fraction of the time that it now takes to send a summary.

A facsimile message that can be flashed across the sea, instead of being woven letter by letter and word by word into a completed sentence and paragraph, is opening a new era in international communication. Letters, drafts, notes, checks, contracts and other commercial and legal documents can be almost instantaneously reproduced thousands of miles from the sending point. This greatly adds to the momentum of business, economy and convenience. For some time we have been operating photograph circuit from Honolulu to San Francisco, and from San Francisco to New York daily for test purposes, and now service to and from Europe has been worked out. So the appallingly cumbersome and uneconomical attempt at communication of civilized man has been crystallized into an expeditious, convenient method.

### When We Can See by Radio

The greatest day of all will be reached when not only the human voice but the image of the speaker can be flashed through space in every direction. On that day the whole country will join in every national procession. The backwoodsman will be able to follow the play of expression on the face of every leading artist. Mothers will attend child-welfare clinics in their own homes. Workers may go to night school in the same way. A scientist can demonstrate his latest discoveries to those of his profession, even though they be scattered all over the world.

An explorer may use television to reveal the wonders of desert and wilderness. His lecture room will come to be whatever spot he finds most appropriate as an illustrative setting for what he is about to say. I have argued that the radio will not affect to a great degree the education of children, but certainly such agencies as these cannot fail to supplement the classroom to everybody's satisfaction.

Will the radio oust the newspaper? An average big-city newspaper prints 100,000 words of news a day. To speak the same

amount of material over the radio would require eight to ten hours.

The impracticability of this is seen at a glance. To get the news fresh off the tap, the subscriber to a radio newspaper would be compelled to listen in all day, and all night too. It is possible, of course, that the radio will be able eventually to bring news pictures of what is happening in the world into the home, but even here the service will be only supplementing and not supplanting the picture sections of the newspapers.

I do not think it is fantastic to see in the future great radio universities broadcasting certain courses, perhaps all courses, and granting degrees on the basis of written examinations. When I speak of these things, of course, I do not mean that the plan of action is already worked out. It is only possible to sketch the high lights and to depend upon time to take care of the rest.

### Ousting Jazz

It looks now as if it would not be too much to expect that other waves will diminish crime waves. Many local police departments are using the radio to spread alarms when a crime has been committed or a criminal has escaped. Perhaps in time a network of broadcasting and receiving stations such as will make it possible to give a national alarm almost instantaneously may be established.

At present broadcasting gets its artists from the opera, the stage and the concert hall. It is not unlikely that in time the broadcasting station will comb the field of original talent, creating new reputations instead of capitalizing old ones. When that day comes, the opera, the stage and the concert hall will draw from radio in response to the demand of the public to see as well as hear its favorite artists. It may be that broadcasting will eventually compete with music publishers for original compositions and not only buy but sell music-publishing rights.

Undoubtedly radio symphonies and radio grand-opera companies are conceptions not too far-fetched to be visualized. Radio employment agencies—that is, bureaus for the placement of artists—will come as a matter of course. One thing cannot be questioned: The musical taste of the country is improving. Even the casual surveys which have been conducted to discover, if possible, what the radio audience want reveal that jazz is losing its place at the head of the list of favorites.

What I see then for the future of radio is a steady development of the resources already known. I have not the imagination of a Jules Verne, and must stick to probabilities. Perhaps the possibilities, and even what seem improbabilities to me, will become facts of the future. At least it is safe to conclude that, seated by our own firesides, we shall some day see the world in action, as well as hear it. It is to be expected that our scientists will find new and better ways of bringing to our fireside retreats information, entertainment and instruction from the remote corners of the earth. What those ways will be and what new wonders they will open we must leave to a Verne or to time to reveal.

Editor's Note—This is the second of two articles by Mr. Sarnoff and Miss M. Bride.

## Rust-Proof Because PARKERIZED

"RUST is playing havoc with my car," wired one of the world's famous automobile builders several years ago from the seashore at Miami.

His engineers investigated—they found the solution—they "discovered," like hundreds of other manufacturers have, that all iron and steel parts can be rust-proofed by Parkerizing.

Today this big plant has an immense rust-proofing installation. Other motor car manufacturers, including those who make the finest cars in America, Parkerize all iron and steel parts which are in any way exposed to the insidious attack of rust—

Parkerizing is simple and efficient. PARCO POWDER added to a tank of boiling water makes a rust-proofing solution in which cleaned articles of iron or steel are immersed.

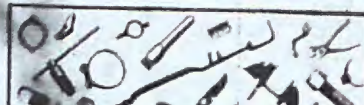
You can rust-proof the smallest nut or the largest part—size makes no difference. Parkerizing is commercially practical for large or small production. Innumerable articles, many of them nationally known, are now Parkerized.

Why risk your industrial reputation with the ultimate consumer and user, by exposing your product to rust action, when there is a positive, economical process which will rust-proof iron or steel without affecting the physical characteristics in any way?

Service plants for Parkerizing are located in seventeen industrial centers to serve manufacturers not having their own installations.

Get all the facts—THE PARKERIZER, our monthly publication, and our book, "The Parker Rust-Proofing Process," are well worth reading. Write for them.

PARKER RUST-PROOF  
COMPANY  
Detroit, U. S. A.





# RADIO

By DAVID SARNOFF—AS TOLD  
TO MARY MARGARET McBRIDE

ILLUSTRATED BY WYNIE KING

ON A STEAMING day in the summer of 1906, a chubby, excited boy slouched down lower Broadway in New York City behind a slim young man, who darted amid the traffic at real peril to life and limb.

Although the young man was obviously too absorbed in his own thoughts to notice anybody, the boy took care to hide himself well in the crowd. Being a romantic youth, he believed that the man wished to keep his destination a deep, dark secret.

"He's got a den somewhere and he makes lightnin' out of nothin' at all," a fellow office boy had volunteered zestfully that very morning. "Prob'ly he's figgerin' how he'll make thunder next."

This hint of mystery was all I needed—for it was I to be straightway turned into a detective. I had more than my share of curiosity—and I simply had to see that den. Call it fate, or what you like, that very afternoon I was let off just as the reputed manufacturer of lightning, who was none other than Guglielmo Marconi, went out the office door.

Red and perspiring after sundry escapes from being run over by dray horses, I finally tracked the inventor to a little place on Front Street where there was no forge of Vulcan at all, but only a small, not very well equipped laboratory, where he spent most of his time in New York.

That day's adventure was the dawn of radio for me. It was little past the real dawn of radio, for that matter, since it was only six years after Marconi had thrilled the world with his announcement that, by means of a wireless apparatus, he had received signals on two successive days over a distance of 1800 miles, and had begun to make history that hasn't stopped growing yet.

The signals consisted of three dots—the famous Morse letter S—repeated twenty times and were sent on December 13 and 14, 1901, from Poldhu, Great Britain, to St. John's, Newfoundland.

I say the world was thrilled by this announcement. I doubt if this was precisely true. The innovation probably sounded too outlandish and unreasonable to be believed by most folks. The newspapers featured it for one day on the front page, and scientists were interested. I imagine that was about all, for who could suppose that in less than twenty years people would be getting pictures and voices out of the air and regard it all as commonplace?

## Dave, the Telegrapher

CERTAINLY no precocious premonition that I was close to history in the making entered my head as I tracked Marconi to his little laboratory. All I felt was a boy's curiosity about a man who could work miracles with machines.

I might never have seen Marconi if I had not early in life decided to be a newspaper man. This ambition is as common to boys as the stage fever is to girls. My connection with wireless and radio, which has now lasted for twenty years, grew out of it.

As a matter of fact, I went into the newspaper business early in life. That is, I had a paper route and later a news stand on the West Side, so I thought I knew a thing or two about journalism. Then ambition stirred and I abandoned the news stand to search for a real newspaper job.

I went down to James Gordon Bennett's old Herald office at Broadway and Thirty-fifth Street and walked into the first door I saw. It happened to be the entrance to the Commercial Cable Company. A red-haired man was there.

"I'd like a job on the Herald," I announced with a good deal more boldness than I felt.

"We need a messenger here at five dollars a week, ten cents an hour for overtime," the man answered doubtfully. They had been advertising that very day for a boy.

My heart was going like a pile driver, but I managed to stammer, "All right, am I hired?"

He said yes. Of course it wasn't really a newspaper job, but I did carry messages to the Herald office and was duly thrilled by my slight contribution to the printed page. I had only one ambition then—to become one of Mr. Bennett's bright young men.

Pretty soon, though, I got interested in the telegraph. I saved up two dollars and bought an instrument, which I learned to work by watching the operators. Then I took my new toy home. The thing increased my standing on the block tremendously. Everybody wanted to see the queer contraption, and for several days, whenever I was



there, our flat was filled with an awe-struck group of neighbors "watching Dave telegraph." Seeing that I didn't get on very fast with such an audience, my mother locked the other children away for a certain period each day while I practiced my Morse code.

I worked eight months with the cable company, and then, because I was genuinely interested in wireless and in Marconi, I got a job with the Marconi Company of America.

It still wasn't exactly what I wanted. I aspired to be an operator and was only an office boy, but at least my wages were increased fifty cents a week. Furthermore, I now felt privileged to hang around the laboratory on Front Street whenever I had a spare moment. James Round, known to me as Jimmy when I got over my first bashfulness, was boss there; and since there was a good deal of dirty work a boy could do to help about the place, he let me mess to my heart's content. I blew out hundreds of fuses and have calluses on my fingers to this day where I burned them.

Sundays and evenings, it was natural that I should read about Samuel Morse and his feat on May 24, 1844, of transmitting the famous message, "What God hath wrought,"

over an experimental telegraph line from Washington to Baltimore and of his early attempts to send wireless messages across a canal at Washington, using the slight conducting power of the water to carry the electric-telegraph current from one side to the other.

The history of the decade which followed, when others tried the same plan, some succeeding but none getting beyond the experimental stage, interested me, too, as did the story of Alexander Bell, who, in 1882, used his telephone receiver connected to plugs below the water's surface to send messages from the land about a mile and a half to a boat on the Potomac River. My reading skipped as nimbly from one country to another as did the progress of invention itself.

## A Swivel-Chair Sea Captain

I READ that Thomas Edison and his associates, in 1888, were proposing to support, high above the earth's surface and at some distance from each other, two metallic plates, which should be a sending and a receiving machine between which electric rays were supposed to extend, and that Heinrich Hertz, working at Karlsruhe, Germany, was at the same time creating and detecting electromagnetic waves, confirming the theory of Professor James Clerk Maxwell, of Edinburgh, and laying the foundation for radio as it is today.

As I read, my head was filled with dreams of high accomplishment. I watched Jimmy Round working what seemed to me wonders in his laboratory, and saw the operators coming into the Marconi office from their ships, browned by exposure and so full of tales of adventure that you had only to tap them craftily with appropriate questions to enjoy an Arabian Nights feast.

I resolved then and there that I would never be an official—a dullard in a swivel chair, issuing orders to better men. Alas for boyish dreams! To-day I am an official, tilted back in a swivel chair, giving orders to men who go down to the sea in ships. Yet I had my little adventurous fling first, as you shall see.

One day I heard that we were to send two operators to an electrical show in Louisville, Kentucky. I happened to know that the company was short of operators, so I begged to be taken as assistant to an experienced man.

For the first time in my life I rode in a Pullman and slept and ate in a hotel. The man whom I assisted must have spoken a good word for me, for when we came back I was made operator of a telegraph line connecting the main office with our Sea Gate station. It wasn't a very important post, and I was only sixteen, but I felt that the whole company would go to pieces on the hypothetical day that I should fail to report for duty.

As I look back now, I realize that it wouldn't have done a great deal to blow up that company. The wireless business was not making money in those days. Sometime, indeed, when Saturday pay day came around, I, as new office boy, would be sent out to friends of John Bottomley, our general manager, to borrow funds to pay off. Bottomley, poor fellow, did the best he could, but it was hard going, for there were only four ships—the New York, the St. Louis, the Philadelphia and the St. Paul—equipped with Marconi wireless, and only four land stations—Sea Gate at Coney Island; Sagaponack, Long Island; Siasconet, Nantucket, Massachusetts; and South Wellfleet, on Cape Cod, Massachusetts. There were, too, all sorts of patent tangles, and the courts were never free of wireless litigation that dragged on and on, eating up profits.

The public had at that time no particular stake, and therefore no great interest, in wireless. It is difficult today just how far away present-day broadcasting was from the average mind then. True, there were a few amateur wireless-telegraph sets in existence, and some embryonic attempts had been made with experimental wireless telephony. Of this, however, the public knew little. We heard a good deal of it at the Marconi Company's, because wireless was naturally shop talk with us.

I heard enough, at least, to make the routine round of a city office irksome, and in 1908, when I found they needed an assistant wireless operator for the coastal station at Siasconet on Nantucket Island, I applied for the place. Not only that, I pleaded for it. I didn't have a great deal of opposition, for it was a dreary station, except for a few





weeks in summer, and men hated to stay there. That did not discourage me, nor did the fact that I had never been away from home before.

I got the job chiefly because

it was only for a month, to relieve Jack Irwin, later to become famous in the history of wireless when he went up in 1910 as an operator in Wellman's airship. That party consisted of six men who tried to cross the ocean in a ship equipped with an equilibrator. They fell into difficulties off the Bermudas and Jack had to sound the CQD signal. They were all picked up by the steamship Trent.

Jack's roving spirit, or perhaps the prospect of some similar enterprise, had caused him to apply for a month's leave of absence, and so I got my chance. My reception at that station was something to remember. The other men greeted me with exaggerated politeness, pretending to defer to my opinion about this and that. They were all twice as old as I was, and our most experienced operators.

Since I was accredited by the main office, the manager finally decided that I might be allowed to stand the regular eight-hour trick. He was not convinced about my ability, however, and stood at my elbow most of the time.

When the month was up I went back to New York, and Irwin being still away, was promptly ordered to Siasconset again; this time for eighteen months. It was winter then and not a bit of fun. We had to generate our electricity and look after our own equipment. There was no steam heat, electric lights or running water. I lived alone in a barnlike two-story house and ate at a near-by farm. My only social life came from romps with Alma, four-year-old daughter of the station's manager, A. H. Ginman. She was a gay, pretty little thing whose frolicsome ways made life half bearable.

There was one other compensation—I had plenty of time to read. It is astonishing how much a boy can learn about things he is interested in, and conversely, of course, how little about things that bore him. By that time I had forgotten my itch for newspaper work and was resolved to follow wireless as a profession. I read with eager absorption such meager accounts as I could get of experimental demonstrations of the wireless telephone made here and there. These tests showed that speech carried through a wireless station could be broadcast on the wings of the electromagnetic wave, to be received with ordinary wireless receivers and heard through head sets.

#### A Big Day in Wireless History

I LEARNED a lot about practical engineering in the Siasconset period, too, for when the dynamos and motors went wrong I was allowed to fix them up. At this time, also, although it may be an irrelevant detail, I met Abraham Lincoln in my reading and took him for my model of the ideal American.

After a while, though, I grew restless again and had just been transferred to Sea Gate, which offered less salary but more adventure, when on January 22, 1909, came an event that stirred and thrilled every man in wireless work.

Just before dawn of that cold, foggy morning the Steamship Republic, of the White Star Line, bound from New York to the Mediterranean, and the steamship Florida, of Italy, crashed into each other twenty-five miles south of

Nantucket Light. The steel bow of the Florida crumpled like paper, and water began to rush into the Republic through a great gash in her side.

Panic-stricken passengers of the two vessels, nearly 2000 in all, rushed on deck. The Republic was sinking. Women and children sobbed and prayed. Men stood by the rail, cursing their helplessness. So unaccustomed was the public to the wireless that few on the Republic remembered that the vessel carried equipment and an operator.

There was a call for the lifeboats. Yet if the passengers took to the lifeboats they must perish of cold and exposure, unless help came. Their word was passed that the operator in his little wireless room on the upper deck was trying to reach the outside world with tidings of the disaster.

Like condemned prisoners granted a reprieve, the passengers cheered wildly and crowded in that direction. The roof and three sides of the wireless cabin had been splintered to matchwood by the collision, and two bodies lay crushed, half buried beneath debris; but the operator, Jack Binns, went steadily on sending the CQD distress call over and over. For five minutes he sent in vain, for the current was cut off by the flooding of the dynamo room. He connected with a weaker current from the storage batteries and tried again. At last from Siasconset came an answering signal, "All right. Who are you?"

Back went Binns' reply, "This is the Republic. We are shipwrecked."

The Siasconset operator began to call revenue cutters and liners such as the City of Everett, the New York, the Lusitania and the Baltic. All the same, it looked as if the Republic would sink before help could come, and the passengers were taken aboard the Florida. Binns, however, stayed at his post to direct the course of the rescuers. Not until cables were made fast to the wreck did he leave the ship. His last message was: "Current going. Wireless now closed."

In the general relief over the happy ending to what might have been a terrible tragedy, the world awoke to the need for radio on shipboard, and today all seagoing vessels carrying fifty persons or more are required by international law to include radio equipment and competent operators.

Jack Binns' feat excited all my hero worship and my ambition too. I became manager of the Sea Gate station, but the desire for travel smote me with a violence that could no longer be resisted. I reached the limit of my endurance on the day that a notice was posted asking for wireless operators in the Arctic ice fields. When I answered the call and sped northward I had the feeling that at last I was off to seek adventure.

The steamship Beothic, to which I was assigned, had never carried wireless equipment before, and so my apparatus and I were the objects of a rather skeptical curiosity. In the days when we were getting ready to set off I heard many tales of the perils of seal fishing, of starvation, of freezing, and the like. It was a disappointment and yet a thrill to discover that wireless was able to a great extent to strip the frozen wastes of their dangers. For the fishing it was valuable too. Seals travel together in great numbers, and it is not unusual for a vessel to miss the main group and return home empty-handed or with but a light load. Vessels of the same line equipped with wireless can communicate news of a good location and save the catch for the company.

The fishermen on the Beothic called me the Coni Man and were always anxious to know the latest news from their neighbors, chiefly whether anybody had made a better catch than they had. I think they never really believed at first that I was in communication with those other ships out over the ice, but the idea amused them and they were willing to humor my imagination. So they accosted me daily with the question: "Any bit of fresh news this mornin', Coni Man?"

One day I gave them a real surprise. Word came from the sealing company that a boy had been born to the wife of one of the men who was standing by my side at

the very moment. A wild yell went up from the new father when I told him, and another from the other men when he passed the glad tidings on. That night a celebration was held on board in honor of the wireless and the new baby.

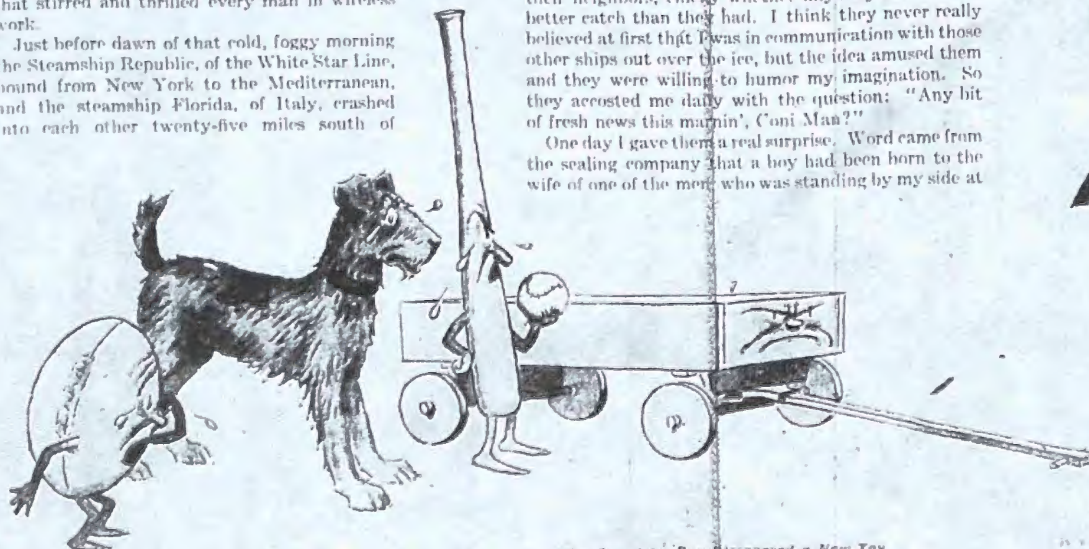
Another dramatic message was brought by the air the day. A few hours later the operator of a vessel 100 miles away called frantically for help for a member of the crew suffering from a serious internal injury. The symptoms were described in detail and I wrote them out for a physician. He prescribed a course of treatment, which relayed. Another ship picked up the message, and from a parts of the ocean we were bombarded with requests for medical aid for every complaint from bunions to bald spot.

#### A Call on the Ship's Doctor

ON ANOTHER day, out of the icy ether came a worrisome plaint from my friend Jack Daw, operator at Belle Isle Newfoundland. "I am up against it," he wirelessed. "My assistant is terribly ill and seems to be getting worse instead of better. His cheeks are swollen, his temperature high, and he can eat nothing. He has a bad toothache, too, and hasn't been able to get out of bed for nearly a week."

"Our only neighbors are the head lighthouse keeper, his assistant and the assistant's wife. There are two lighthouse keepers on the other side of the island, but we a

(Continued on Page 141)



The American Boy Discovered a New Toy



141

## RADIO

(Continued from Page 9)

separated from them by ten miles of wind-swept ice. The Canadian Government vessel comes here twice a year to bring fuel and provisions, but in the ice season we see nobody. It will be three months before time for the government ship. Only a sealing vessel could get in."

Our doctor made a few more inquiries, and then, with as much assurance as he could feel at such a distance, diagnosed the case as an abscess. The diagnosis was simpler than the remedy, for in the medicine chest 200 frigid miles away there were only calomel and liniment.

We were headed in the general direction of Belle Isle, but when the doctor and I went to the captain and begged him to turn the ship directly that way we got little encouragement. He was one of the silent, unemotional men of the north, and the most expansive observation usually to be got out of him was a grunt, or on bad days a snort.

Meantime the news about Barrett was more serious every day. Finally, in desperation, I advised Daw to send a message to the captain direct. I worded it myself. It said: "My assistant is dying. Unless you come at once with a doctor, it will be too late."

I thought the captain showed a flash of feeling when I delivered this, but he said nothing. Several days dragged by. The doctor sent hourly advice to Daw. Then came a message that made us wince in our helplessness. Symptoms indicated that blood poisoning was setting in. The doctor himself carried this word to the captain and was starting to make a last despairing appeal when that rocky-faced old fellow told him the vessel was headed for Belle Isle and would be there in six or seven hours. I broke the wireless speed record with that news. I didn't wait to get back Daw's aerial whoop of joy, though, but ran back to gather up blankets, pillows and what comforts we had on board for the sick man. The fishermen, all sympathy, contributed every jelly and cake their wives had given them at parting, and even such liquid refreshment as was carried for medicinal purposes.

We came to a stop two miles from Belle Isle and ten of us started to cross the ice to the wireless station. The Belle Isle light-house is nearly 500 feet above sea level, on a mountain of ice and snow. Seven members of our party dropped out before we got to the top. The doctor, the captain's son and I, who went on, were gulping for breath at the end of the climb.

## Saving Barrett's Life

Daw, literally speechless with joy, led us into the coldest, dreariest room I have ever seen. On a rickety old cot in the warmest corner lay the sick boy. His hair was matted and his hollow cheeks were covered with a stubble beard. Emaciated from twenty days in bed, during every minute of which he was racked with intense pain and was insufficiently nourished, he looked like a grotesque ghost of a wild man.

When he saw us and realized that perhaps help had come before it was too late, he broke down completely. Later the doctor examined him and found that three teeth must be taken out at once. The doctor was not a dentist, but was willing to try the operation: only, he was reluctant to leave the patient afterward for fear blood poisoning might set in. Yet he must go on with his ship.

I had to put it up to Barrett. He might undergo the operation then and there and take his chances, or we could carry him back to the ship and drop him at St. John's. I pointed out that the second would be the safer course. I was kneeling by the boy's cot and he was holding to my hand. He was in frightful pain, but when I had finished he smiled as well as he could with his swollen cheeks, and said, "I'll stay here. I wouldn't leave Daw after the way he's stood by me."

He held to this decision, even though Daw pleaded with him to go with the ship. The operation was finally performed in the dark little room, with me as the wobbly surgeon's assistant, and in spite of the difficulties it was successful. Before we sailed away we had the satisfaction of knowing that the patient would get well.

It was tremendously exciting to me to realize that wireless had literally saved Barrett's life. Since then I have seen and heard of many incidents of the kind, but the thrill is still there. I have seen surgeons operate by wireless, dictating every move to some less skilled person standing beside a patient whose only chance for life was bound up in the message coming out of the air. The time will never be when such a thing can seem commonplace to me.

From 1907 to 1912 wireless advanced slowly. One development of 1912 was a radio conference in London, in which the United States, together with many of the other nations of the earth, took part. At this meeting wireless communication was first called radio. The term was based upon the fact that signals are radiated outward in all directions in most forms of transmitters.

In 1912 also came another and greater tragedy than that of the Republic to force commercial and scientific development onward with unprecedented speed. This was the sinking of the Titanic.

## News of the Titanic Disaster

I came back to New York from the ice fields in 1910, and when John Wanamaker decided to equip his New York and Philadelphia stores with radio stations more powerful than any then installed in the commercial field, I applied for the place of operator, because it would leave my evenings free to take a course in engineering at Pratt Institute. So it happened that I was on duty at the Wanamaker station in New York and got the first message from the Olympic, 1400 miles out at sea, that the Titanic had gone down.

I have often been asked what were my emotions at that moment. I doubt if I felt at all during the seventy-two hours after the news came. I gave the information to the press associations and newspapers at once and it was as if bedlam had been let loose. Telephones were whirring, extras were being cried, crowds were gathering around newspaper bulletin boards. The air was as disturbed as the earth. Everybody was trying to get and send messages. Some who owned sets had relatives or friends aboard the Titanic and they made frantic efforts to learn something definite. Finally, President Taft ordered all stations in the vicinity except ours closed down so that we might have no interference in the reception of official news.

Word spread swiftly that a list of survivors was being received at Wanamaker's and the station was quickly stormed by the grief-stricken and curious. Eventually a police guard was called out and the curious held back, but some of those most interested in the fate of the doomed ship were allowed in the wireless room. Vincent Astor, whose father, John Jacob Astor, was drowned, and the sons of Isidor Straus were among those who looked over my shoulder as I copied the list of survivors. Straus and his wife went down too.

I remember praying fervently that the names these men were hoping to see would soon come over the keys, but they never did.

Much of the time I sat with the ear phones on my head and nothing coming in. It seemed as if the whole anxious world was attached to those phones during the seventy-two hours I crouched tense in that station.

I felt my responsibility keenly, and weary though I was, could not have slept. At the end of my first long tryst with the



## The test of "How-They-Fee"

MACGREGOR leadership has been achieved because the fundamental principles of correct club construction have been followed for almost thirty years. Proper balance and harmony are a important. Almost a third of a century ago we inaugurated the practice of shaping, weighing and balancing each head to match and harmonize with selected shaft to produce perfect rhythm. Whether you have resolution or not, this has been the secret of success with your MACGREGOR. For balance is something of which a is scarcely conscious when it is correct—and it is this that makes for rhythm.

How common it is to hear some golfer claim: "Gee, I wish I'd used my midiron—might have known I'd dub it with the spoon!"

Almost all golfers have some "favorite" club. They play this one club with more confidence than any of the others—hence it is but natural for such club to deliver the best results. The element of doubt arises whenever they use another club—as doubt usually brings disaster.

This condition develops from carrying clubs of mixed makes, or mixed models of the same make. It has been almost overcome, however, for the golfers who have availed themselves of the opportunity to buy matched sets in both Woods and Irons.

If certain of your clubs do not "just feel right"—if there is a lack of uniform balance between one club and another—if you have a "favorite" and your others are out of harmony with it—then investigate a complete matched set of MACGREGOR. Your Pro or Dealer should have them.

## Which of These Shall We Send You?

1—General Catalog. 2—Rule and Score Book. 3—Golf, the Game of Games, an introduction to golf. 4—Stepping Stone to a Golf Course, helpful suggestions for laying out a new course. 5—Matchless Golf Course, a booklet mailed free to anyone interested in public golf.

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## LESS ROAD SHOCK

sea, I was whisked in a taxicab to the old Astor House on lower Broadway and given a Turkish rub. Then I was rushed in another taxicab to Sea Gate, where communication was being kept up with the Carpathia, the vessel which brought in the survivors of the ill-fated Titanic.

Here again I sat for hours—listening. Now we began to get the names of some of those who were known to have gone down. This was worse than the other list had been heartbreaking in its finality—a death knell to hope.

I passed the information on to a sorrowing world, and when messages ceased to come in, fell down like a log at my place and slept the clock around.

The Titanic disaster placed the Marconi Company in undisputed leadership of the wireless field. Investors, realizing the need for radio, put up plenty of capital to give the company new facilities and thus turned this small organization into a large one. The United Wireless Company, one of the small groups which had also struggled along under great handicaps, was consolidated with Marconi, and by degrees more and more ships were equipped, together with coastal stations designed for ship and shore communication. In 1913, 500 American vessels were fitted with radio.

The fly in the ointment was that, even though it was located in America, the Marconi Company was organized by British interests and operated under foreign control. Wireless was not yet a native product.

Then a strange thing happened. The American boy discovered a new toy. He found that he could send messages out into space to be picked up by his friend on the other side of town, or even in a neighboring town. He grew so enthusiastic about his vivid plaything that he drew first his big brother and then his father into the charmed circle of interest. In several hundred homes throughout the country, amateurs united with scientists already working in laboratories to bring nearer the day of broadcasting as we know it now.

Occasionally a story crept into the newspapers about some home-town boy in Missouri or Maine or Montana who had got signals of distress from vessels at sea. Imaginative persons, looking up at infrequent aeriels, shivered with pleasurable awe at the thought of modern magic. By 1915 the engineers of the American Telephone and Telegraph Company had succeeded in talking by radio from the huge naval station at Arlington, Virginia, to Paris, and in the opposite direction to Honolulu. This feat was accomplished by using vacuum tubes as oscillators and voice magnifiers. The power of the transmitter was utterly inadequate to signal over so huge a distance except under the most favorable conditions. But radio was becoming part of the national consciousness.

## Who Was the First Broadcaster?

Meantime the foundation for a great American controversy was being laid. "Who was the first broadcaster?" everybody asks me. The answer to this question depends, it seems to me, upon the meaning of the phrase. In a sense, the first radio-telephone message sent—and dozens claim to have sent it—was the first broadcasting. Because of the very nature of radio, the message went out in all directions and could be picked up by anyone whose receiving facilities were adequate.

I believe, however, that the effort of KDKA, at East Pittsburgh, in sending out the presidential-election returns November, 1920, would be accounted the earliest broadcasting on an organized basis of service to the public.

The event at KDKA was the result of amateur experimentation by Frank Conrad, now assistant chief engineer with the Westinghouse Electric and Manufacturing Company. This man's job was also his hobby. He was always tinkering with machinery at the office and he had rigged up a set at home. Every night he broadcast phonograph selections for the benefit of

other amateurs who listened in. Finally his audience got so large and enthusiastic that his friends began to say: "Look here, you aren't an amateur any longer. Why don't you take your instrument over to Westinghouse and start a regular broadcasting station?"

That was the foundation of KDKA.

H. P. Davis, vice president of the Westinghouse at Pittsburgh, saw in this humble experiment the vision of a great public service. He recognized the opportunity for the multiplication of the elementary scheme of 1920 into a national program by strengthening the power of KDKA, thus increasing its range.

The problem was: How was a company furnishing such service to receive adequate return for the great investment necessary? Mr. Davis submitted his plans to Gen. Guy Tripp, chairman of the board of directors of the company, and received not only encouragement but official authority to proceed with the development.

KDKA, since then, has expanded under General Tripp's guidance and has blazed the trail in many directions, including present-day experiments in short-wave radio-relay transmission and the use of higher power from transmitting stations.

## Wireless a Decade Ago

The broadcasting of election returns was an exciting success, as judged by the standards of those days. In preparation for the event the Westinghouse Company had sold a limited number of simplified receiving devices. These were little more than wet batteries attached to telephone head sets. A few hundred homes were equipped and neighbors crowded in to take turns listening to the device. Some refused to believe their own ears and were fairly struck of a heap when newspapers confirmed the tidings brought by the head phones.

I recall a number of instances of the more or less personal type of broadcasting; that is, of an individual making an effort to reach a certain other individual or group. I was part of one such attempt on May 13, 1914. I left New York that day on the steamship Antilles, on my way to New Orleans to attend a meeting of the association of railway telegraph superintendents which opened May nineteenth.

At that time I was contract manager for the Marconi Company. We had been testing various forms of the hydrogen-arc radio-telephone transmitter in the Marconi shops and at the Wanamaker station, and as the Antilles sailed along we tuned in on the Wanamaker station and got quite clearly from my colleagues a program of phonograph music. This afforded great amusement to our party and gave rise to speculation that occupied us during nearly all the rest of the trip. We disagreed violently. Several said that the radio had gone as far as was possible. Others, more sanguine, predicted part of what has come to pass today.

An amateur who was broadcasting in 1915 was Alfred N. Goldsmith, then of the faculty of the College of the City of New York, now chief broadcasting engineer with the Radio Corporation of America. He was using a telephone transmitter to reach a man in Grand Forks, North Dakota, and every evening when he began to broadcast he called the roll of the states, explaining that he hoped to be heard in all of them. He followed the roll call with phonograph selections and got responses by letter and telegraph from almost every state. Goldsmith often broadcast from his home in lower New York, controlling the transmitter up at City College by a wire line. That was very advanced for the time.

These instances of early personal broadcasting are not related because they were remarkable, but rather because they were typical of what was going on all over the country.

So impressed was I with the work of the amateurs and the interest it was arousing everywhere that in 1915, as assistant traffic

(Continued on Page 145)

S0001

## The Most Important

THE SPRING



Fig. 1—The Old Way  
Soft and weak arch preventing natural curve and play of muscles and bones. Touching the sole of the foot irregularly as the arch changes in form when making the step.

## Not One—Protect all

- 1 The New Sprung up A important feature, as exp
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- 3 A flexible, plant Gen that gives absolute fre and muscles of the fore
- 4 The Shaped to suit

**BU**  
for Boys

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**SS**  
**TEERING GEARS**

## LOAD SHOCK

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1 Car dealer ☐ Automobile jobber ☐



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families.

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PAPERS, INC.  
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attle Cleveland  
Detroit Los Angeles

(Continued from Page 142)

manager of the Marconi Company, I submitted a report urging the company to confine itself no longer to the ocean. Waxing prophetic, I visioned a radio music box arranged for several different wave lengths which should be changeable with the throwing of a single switch or the pressing of a single button.

I have that report before me now, for I was so sure its predictions would some day be fulfilled that I kept it in spite of unencouraging comment. I was writing, remember, not as an inventor, for I have never been that, but as an engineer and business man who could not help seeing the trend of the times.

I said: "The radio music box could be supplied with amplifying tubes and a loud-speaking telephone, all of which could be neatly mounted in one box. The box could be placed upon a table in the parlor or living room, the switch set accordingly and the transmitted music received."

I explained that there should be no difficulty in receiving music perfectly when transmitted within a radius of twenty-five to fifty miles.

"Within such a radius there reside hundreds of thousands of families," I wrote excitedly; "and as all could simultaneously receive from a single transmitter, there would be no question of obtaining sufficiently loud signals to make the performance enjoyable. The power of the transmitter could be made five kilowatts if necessary, to cover even a short radius of twenty-five to fifty miles, thereby giving extra-long signals in the home, if desired. The use of head telephones would be obviated by this method. The development of small loop antennae to go with each radio music box would likewise solve the antenna problem."

"The same principle could be extended to numerous other fields—as, for example, receiving lectures at home which can be made perfectly audible. Also events of national importance could be simultaneously announced and received."

"Baseball scores could be transmitted in the air by the use of one set installed at the Polo Grounds. The same would be true of other cities. This proposition would be especially interesting to farmers and others living in outlying districts removed from cities. By the purchase of a radio music box they could enjoy concerts, lectures, recitals which might be going on in the nearest city within their radius."

#### When Radio Went to War

The position of the Marconi Company at that time, as to research facilities, capital and patents, would not permit the carrying out of such a scheme. Furthermore, it seemed a radical departure from anything that had ever been done, and there were many objections from every source as to the technical and commercial nonfeasibility. I had to wait six years to see my dream developed.

As we have seen, radio, in its industrial beginnings, followed the call of the sea. In all ages the sea had been the mystery which man had tried in vain to solve. Beyond its dim edges lay land, peoples and continents strange to early humanity. Even the modern, when he took passage aboard an ocean liner, steamed away into silence until reported from shore days or weeks later.

By 1915, to supplement the shore-to-ship stations, a number of high-powered stations had been built in the United States for transoceanic telegraphy. Only here, unfortunately, the industry had grown in advance of the art. The key to constant reliable transoceanic service had not yet been found by those who controlled the basic radio patents.

That is, existing equipment did not generate sufficient power in suitable form to transmit radio messages continuously across the Atlantic. Industry recognized the situation, and in Schenectady, New York, for ten years the General Electric Company had been working upon the task

of designing and building a high-speed, continuous-wave, alternating-current machine which might be used instead of a spark apparatus to transmit signals across the breadth of the ocean.

At last the experiments succeeded. Representatives of the Marconi Company of England hurried to this country to negotiate for the sole and exclusive rights of the Alexanderson alternator.

In the midst of their parleying came the war. Then, that no foreign country might be permitted to control its communications with the air, the United States Government took over the high-powered stations of the Marconi Company of America. I was thrown in with the other liabilities and assets. And so I was privileged to witness the rebirth of radio and the actual preliminaries to broadcasting. Under the stress of a national need, commercial laboratories and individuals poured out their best to the Government. And the Government took what it would, as it must, in the stress of a national emergency.

#### Retaining American Leadership

The General Electric Company temporarily discontinued negotiations for the sale of the Alexanderson alternator and placed its entire development at the service of the nation. The alternator was installed at the government-operated wireless station at New Brunswick, New Jersey, and remodeled the entire system of wireless transmission. As a result, for the first time continuous and practically uninterrupted communication was made possible through the air with other nations. A later report of the Federal Trade Commission, issued by the Government, called the New Brunswick station the first on the Atlantic Coast which transmitted radio messages continuously and reliably.

Suddenly, thrilled by the knowledge that it could no longer happen, every thinking American awoke to the fact that up to this time the cutting of a cable might nearly have isolated an entire nation. Radio telegraphy took on new significance and became a subject of research and experiment in the great workshop of the Government. One brick was laid upon another so rapidly that an entirely new structure sprang up in a few months.

And then came peace and a problem: Should radio be demobilized? Should the United States relinquish the leadership of the air which American inventive genius, industrial vision and capital had made possible? Should our transoceanic communications by radio pass again under alien control? The patent fight was due to begin all over again. The vacuum tube, an outgrowth of the Fleming tube, was the heart of radio and the heart of litigation as well. The basic patent was owned and controlled by the Marconi Company of America, but many improvements had been added by others, notably Lee De Forest, to the original device. Patents for these were in different hands and the conflicting groups were each refusing to cross-license the other. It looked as if the industry would come to a standstill, because no one person or group of persons held enough patents to go ahead.

Finally, on April 5, 1919, a small group of men came together at the call of Rear Admiral W. H. G. Bullard, of the United States Navy, the Government's senior representative in control of United States radio during the war, and Lieutenant Commander S. C. Hooper, then, as now, head of the radio division in the Bureau of Steam Engineering of the United States Navy. Admiral Bullard and Commander Hooper knew that the General Electric Company was about to conclude negotiations with the Marconi Company of England for the use of the Alexanderson alternator. They thought the situation critical for American interests.

Admiral Bullard pointed out the "dangers that would ensue if the control of the Alexanderson machine should be sold to any foreign government or foreign private companies," and predicted that to turn a system



## RUSCO sta

My car stoppe  
going 25 m

A "HONK!" isn't always enough. You cannot always depend upon the agility of the pedestrian. Just imagine how you would feel if you struck, injured or killed him! It certainly pays in peace of mind to drive with superior quality, properly adjusted brake lining.

After a series of tests made on Jan. 21, 1925, Mr. Thos. J. Whalen, President, Knight Cab Co., of Toledo, Ohio, signed the following statement: "Our Cabs, with two wheel brakes, lined with Rusco Brake Lining, can be stopped going 25 miles an hour, in 45 feet."

That's 10 feet quicker than police requirements. Perhaps, thanks to Rusco Brake Lining, the difference between a miss and a crash.

#### Rusco Products

**BRAKE LINING**  
(Illustrated on Every Band)  
Emergency Brakes for Trucks  
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Hood Linings Stop the Battle  
Endless Fan Belts  
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for every purpose "Truck-  
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to prevent chatter  
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RUSSELL MFG CO., Dept. E6, Middletown  
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sample of Lining and name of nearest Rusco Serv  
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## Rad Locomotive versus ite Block Floors

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Wood Block Floors laid  
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obligation on your part.

NY, TOLEDO, OHIO  
Cities



such as was embodied in the New Brun-  
wick station over to the control of foreign  
interests would be to renounce American  
leadership in radio. He called it the pa-  
triotic duty of American industry to estab-  
lish a wholly American company to meet  
the competition of other radio interests in  
the world.

Reporting his remarks later to the  
United States Naval Institute, Admiral  
Bullard said: "I pointed out that our citi-  
zens had never played any prominent part  
in cable communication and that here was  
a chance to retain in American hands the  
complete domination of radio communica-  
tion in the United States, as well as Central  
and South America. I made reference to a  
policy of wireless doctrine, similar to the  
greater Monroe Doctrine, by which the  
control of radio on this continent would  
remain in American hands.

"The chairman finally announced that  
as the matter had been presented to them,  
it would be a most unpatriotic action to  
proceed with negotiations with the English  
company, and so far as the directors then  
present could do so, they would proceed no  
further in the contemplated sale of the  
Alexanderson machine."

In this manner was formed the Radio  
Corporation of America, with Owen D.  
Young, chairman of the board of directors,  
and Edward J. Nally, president. Mr.  
Young, then vice president of the General  
Electric Company, now chairman of that  
company, as well as of the Radio Corpora-  
tion, saw the value of a move which not  
only would prevent the control of an im-  
portant machine from falling into alien  
hands but would afford an opportunity for  
building around this nucleus a system of  
radio communication which would take  
over the patents and going business in this  
country of a company controlled from  
abroad, and at the same time give the Amer-  
ican public a competitive method of inter-  
national communication independent of  
the accidents of war or peace.

There followed then mobilization of the  
necessary patents, and the threatened paral-  
ysis was averted, but not before the situa-  
tion had finally impelled the United States  
Navy Department to write to the interests  
concerned, appealing for an agreement be-  
tween the holders of basic patents whereby  
the public could be freely supplied with  
vacuum tubes and other radio necessities.

### Talking to the Whole World

After its formation, the Radio Corpora-  
tion began to build a radio central on the  
north shore of Long Island—a superpower  
radio system that simultaneously could  
send messages to and receive them from the  
great nations of the world. This giant of  
radio, with its steel towers covering more  
than ten square miles of land, was opened  
on November 5, 1921, by President Hard-  
ing. The President's accompanying message  
was received simultaneously and directly  
in twenty-eight countries of the world.  
It read:

"To be able to transmit a message by  
radio in expectation that it may reach every  
radio station in the world is so marvelous a  
scientific and technical achievement as to  
justify special recognition. It affords pec-  
uliar gratification that such a message,  
from the chief executive of the United  
States of America, may be received in every  
land, from every sky, by peoples with  
whom our nation is at peace and amity.  
That this happy situation may ever con-  
tinue and that the peace which blesses our  
own land may presently become the fortune  
of all lands and peoples is the earnest hope  
of the American nation."

While these stirring events were taking  
place, I, with all the others who believed  
in the future of radio, was hard at work.  
During 1919-20, I was commercial man-  
ager of the Radio Corporation, the same  
position I had held in the Marconi Com-  
pany. Then on April 29, 1921, I became  
general manager.

The time was near when radio was to  
take a definite place in American life, and

the men were not wanting who could ac-  
complish this task. Mr. Young was a farm-  
er's boy, born at Vanhornsaville, in the  
state of New York; and Mr. Nally, the  
first president of the Radio Corporation,  
had started his career in the communica-  
tions world as a messenger boy of ten.

It was Mr. Nally, with his experience  
in communications, who carried out in  
practical detail Mr. Young's vision of a  
world-wide system of American radio com-  
munication.

"He gave me my first opportunity to as-  
sist in this program of development and to  
find my life work." In his kindly way he  
tempered the ambition of youth by his  
mature experience.

Gen. J. G. Harbord, who succeeded Mr.  
Nally, came to the Radio Corporation at a  
sacrifice to a brilliant career in the United  
States Army.

The radio art and industry faced virgin  
problems of production, organization and  
service, and General Harbord could offer  
the highest ideals of public duty and a  
genius for organization. The measure of  
his success is best gauged by the present  
position of radio, both as an art and as an  
industry.

### How Radio Works

At this point, by special request, as the  
broadcast announcers put it, I am going to  
try to tell in a nontechnical way how radio  
works. I find it difficult, however, to deal  
with this subject on a strictly nontechnical  
basis.

Broadly speaking, radio broadcasting, or  
radio-telegraph communication, is carried  
on by an electric-wave motion which, al-  
though invisible to the eye, has many analog-  
ies in our daily life. Thus, a stone dropped  
into a pool of water creates a wave motion  
which travels outward from the point  
where the stone is dropped. Your cook  
strikes or vibrates a bell to call you to din-  
ner and the transfer of this signal takes  
place by sound waves made up of varying  
degrees of air pressure. These are trans-  
lated by the human ear into what we call  
audible sound. Your janitor kindles a fire  
in the furnace and the energy released by  
the fuel generates heat waves which are  
responded to by the nerves of the human  
body.

The electric waves used in radio com-  
munication are projected into space by a  
group of wires suspended vertically or hori-  
zontally which are commonly called an  
aerial. These electric waves are set into  
motion by vibratory electric currents,  
which are made to surge back and forth in  
the aerial by the radio transmitter.

By the proper form of control apparatus  
these waves may be radiated outward from  
the transmitting station in the form of the  
dots and dashes of the telegraph code, or  
they may be made to rise and fall in strength  
by the sound waves created by the human  
voice or by musical instruments. Thus, in  
radio broadcasting sound waves are gener-  
ated by the human voice or by music.  
These are picked up by a device termed the  
microphone, which, in turn, causes the  
strength of the electric wave radiated by  
the aerial to conform with the variations  
of the sound waves created in the studio  
by the artists and musicians. The electric  
waves now travel outward in all directions  
at the speed of light 186,000 miles a  
second—and continue in their passage until  
they strike the aerial attached to the re-  
ceiving set, in which they produce very  
feeble currents having the precise charac-  
teristics of the sound waves impressed upon  
the microphone.

So far, the currents in the receiving ap-  
paratus are still electrical. They are so  
weak, however, that they require amplifica-  
tion. This is accomplished by the use of  
one or more amplifying tubes, which in-  
crease their strength to the point where  
they will cause the detector to function.

The detector is the device which eventu-  
ally converts these electrical currents into  
audible sounds; that is, changes them into

(Continued on Page 149)

146



## Stromberg Windshield

Yours is a fine  
safely shield for  
your car. It is the  
most complete and  
practical shield for  
your car.



Continued from Page 146

a form where they have the characteristics of the sound waves impressed upon the microphone at the transmitting station. These sound currents are further amplified, and finally directed into the loud speaker, from which they emerge in the form of audible sound or music.

One hears much in radio conversation of the term "frequency," but it is simply another way of denoting the number of waves generated in a second of time. Radio has two kinds of frequencies: First, voice, or audio, frequencies, which lie in the range of 16 to 10,000 vibrations a second; and radio frequencies, which vibrate at the rate of 10,000 to 300,000,000 times a second.

The waves which are projected into space by the aerial at the transmitting station are radio frequencies; that is, they vibrate more than 10,000 times a second. The sound waves which are picked up in the broadcast studio and impressed upon the transmitting apparatus by the microphone are voice, or audio, waves, which really represent the notes of the musical scale or the inflections of the voice.

Now in order to receive messages by radio the station of the receiver must be tuned to the station of the sender; that is, the wave length of the receiving apparatus must be adjusted so as to be identical with that of the transmitting station. This involves the process of tuning, and to this end receiving apparatus is invariably fitted with control devices by which the receiving set is tuned to the frequency or the wave length of the transmitter.

We are often asked what we mean by "wave length." In the case of an ocean wave, the meaning of the term is easily understood; for obviously the length of the wave is the distance from the crest of one wave to the crest of the next, or from the hollow of one wave to the hollow of the next. Radio waves, although invisible, also have definite lengths, the length varying with the frequency of vibration. Thus, if we crowd 1,000,000 radio waves into a second of time, it is clear that the distance from the crest of one wave to the crest of another will be relatively short, and actually about 1000 feet. If, on the other hand, we project but 20,000 waves into space in a second of time, the distance from crest to crest will be correspondingly greater, or 50,000 feet. Described in another way, high frequencies in radio motion mean short waves and low frequencies refer to long waves. Broadcasting is carried on at wave lengths from 200 to 550 meters. The frequencies used, therefore, vary from 1,500,000 a second to approximately 550,000 a second.

#### Who Invented the Radio?

Every now and then somebody wants to know: "Who invented the radio anyway?" The popular idea about any invention is that it must have sprung full-fledged from the brain of some exceptionally clever person. That, of course, is not true; particularly of radio.

I am only a layman myself in the scientific laboratories and can realize how difficult it is for the inventor and the person for whom he invents—that is, you, me and everybody who owns a radio set—to become really well acquainted. Science has its own language—a language usually far too complicated for the rest of us. The result is that radio owners, as a whole, know very little about how the radios they have in their front parlors got that way. Yet the development of radio is as full of romance as the fact of its existence.

We must remember that most of the improvements in radio, or in any other device of the kind, go on, after a certain point, in the great commercial laboratories as part of a daily routine. Bit by bit, new discoveries are made, new refinements added and old principles discarded.

Often, no one person is responsible for these improvements and so it is not quite fair for any one person to get the credit at least all of it.

Another thing to be remembered is that there are long, expensive steps between the laboratory demonstration of a phenomenon and its appearance on a shop shelf ready to be sold to you.

The history of radio can be adoped indefinitely with tales of the battered hopes of eager inventors. H. G. Wells wrote of a fight in the air. The past ten years have been a continual battle over the air—a struggle for patents among inventors and for air supremacy among nations. The end is not yet in sight. Every now and again some judge makes a new decision and every month or so a fresh suit is filed.

#### Leaving it to His Subconscious

It is easy to see why this is the case. The process of invention is one of inspiration on the basis of the path which progress is taking. I have never been an inventor, but I have known a good many and I have always been interested in watching the processes of their minds.

Except on the stage or in a novel, it seldom happens that an invention pops full-grown into some genius mind, large as life and only waiting for the proper tools to put it into immediate operation. In other days, before there were so many in the field, it is true that it was possible to credit individuals with certain inventions; such as, say, Whitney with the cotton gin.

At the same time, even these inventions could hardly be said to have sprung full-grown from the brains of their inventors. They were pieced together patiently, almost painfully, throughout years of hard study and thought.

Sometimes, though not so often as romantic writers would have us believe, a man starts out with the definite idea of making one thing, only to end up by getting a result which, though it may be important, is still not at all what he intended it to be.

As a rule, invention comes about at least modern invention something like this: The field in which a scientist is interested calls for some specific improvement. He decides to try to work out the problem, or else is assigned to the task. Perhaps a number of persons in his laboratory are set to help him. He experiments along the line laid out, reads everything he can find on the subject, and finally, having gorged himself with his theme, goes about something else for a while, or perhaps even takes a rest cure so that his inventive powers may have a chance to work during a period of incubation.

This leaves everything up to his subconscious mind. Sometimes the subconscious mind is stubborn and refuses to function. Again, it may solve the problem promptly. Obviously, three or four persons working in this way might get the same results almost at the same time. Who is to say which of these has the best right to it? Naturally the law decides that the man who first makes the invention is the true inventor, even if he is only a few days ahead of the others. Then the second, third and fourth men come along, and of course it seems unbelievable to them that somebody has beat them to what they regarded as their very own brain child. Each wants a patent, too, and tries to show a priority claim. And so patent interferences, suits and countersuits begin.

Interestingly enough, since broadcasting officially started in 1920, there have been almost no radio inventions of a revolutionary character. When the war ended, practically all the important inventions for transmitting and receiving messages were in existence. They had only to be refined and adapted and placed in the proper combinations. This had to be done by trained engineers, as the needs of the public were gauged. Early crudities were due more to lack of knowledge of what was necessary in the way of adaptation than to any grave deficiencies in the fundamental principles of the existing inventions.

Editor's Note—This is the first of two articles by Mr. Sarnoff and Miss McBride. The next will appear in an early issue.

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#1

## In Search of the Sarnoff "Radio Music Box" Memo

Louise M. Benjamin

*An immigrant who became CEO of RCA and NBC at age 39, David Sarnoff claimed that he predicted broadcasting in 1915 in his "Radio Music Box Memo." The Memo stated that Sarnoff had "in mind a plan of development which would make radio a 'household utility' . . ." This Memo contributed to his renown as a prescient architect of broadcasting, but new evidence analyzed in this article suggests that the oft-cited Memo was written, not in 1915, but in 1920, when broadcasting was literally around the corner. Consequently, historians must revise their assessment of Sarnoff's early contributions.*

David Sarnoff, head of RCA and NBC from 1930 to 1969, is acclaimed as one of the legendary geniuses of American broadcasting. An immigrant boy who became chief executive officer of the industrial giants at the age of 39, Sarnoff was a pioneer in electronics and communication. His meteoric rise in radio was first mentioned in several articles written in the 1920s, including a two-part *Saturday Evening Post* series titled, "'Radio' by David Sarnoff as told to Mary Margaret McBride" (Sarnoff, 1926a, 1926b).

In these articles, Sarnoff wrote that he was the lone wireless telegrapher, receiving messages from the rescue ships carrying the survivors of the 1912 Titanic disaster. Sarnoff told McBride that the reports propelled him into the public limelight at the tender age of 21, and he added that three years later, in 1915, he predicted the advent of broadcasting in what he called his "Radio Music Box Memo." In this memo, Sarnoff said that he had "in mind a plan of development which would make radio a 'household utility' in the same sense as the piano or phonograph. The idea is to bring music into the house by wireless" (Sarnoff, 1926a, pp. 141, 145). Over the years, these two stories, more than any others, contributed to his renown as a prescient architect of the broadcasting industry.

Both stories enhance the Sarnoff legend as the propelling force behind radio and television (Bilby, 1986). They are included in lengthier, early biographies of

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Sarnoff (e.g., Dreher, 1977; Lyons, 1966) and in textbooks used in introductory classes in the field of broadcasting or telecommunications (e.g., Bittner, 1991; Gross, 1988; Kahn, 1984; Sterling & Kittross, 1990). Indeed, Sarnoff's eminence in the field is so pronounced that the Radio Music Box Memo forms a part of the Information Age exhibit at the Smithsonian's Museum of American History. Beside a picture of Sarnoff, one panel of the display reads:

In 1915, while working for the Marconi Wireless Telegraph Company of America, David Sarnoff argued that radio could become a fixture in every household — that everyone should own a "radio music box." "The idea," he wrote, "is to bring music into the house by wireless." In 1919, as general manager of the newly formed Radio Corporation of America, Sarnoff directed the development of such a radio.

Through the Memo, Sarnoff's legend and legacy lives on two decades after his death. This reputation has contributed to his stature as one of the great leaders of broadcasting.

But, new historical evidence questions the Memo's origin as dating back to 1915. This documentation suggests that the oft-cited Memo was written, not in 1915, but in 1920 when broadcasting was literally around the corner. Thus, the focus of this article is discerning fact from fiction in the Memo through the use of traditional historical methodology.

### Analysis of the "Radio Music Box" Memo

The papers of Owen D. Young, founder of RCA, NBC, and the chief executive officer of both RCA and General Electric in the 1920s, at St. Lawrence University in Canton, New York, offer an account of a Radio Music Box Memo written, not in 1915, but in 1920. With modifications, this 1920 Memo became the Memo cited in Archer's (1938) book, *History of Radio to 1926*. This book is the most frequently cited source for the Memo, as nearly all textbooks referring to the Memo cite the *History of Radio to 1926*. In his account, Archer (1938) highlights the story as told by Sarnoff:

In 1916 (sic) Mr. Sarnoff embodied in a written recommendation to Edward J. Nally, the General Manager of the Marconi Company, the details of his proposed "Radio Music Box" scheme. Mr. Nally's reply, dated November 9, 1916, is in existence and has been examined by the author. Elmer E. Bucher, at the time an engineer of the Marconi Company, has informed the author that he was with Mr. Sarnoff when the latter dictated the (memo). (pp. 112–113)

Archer then followed this introduction with his version of the Memo. Implied in Archer's analysis is the belief that Sarnoff's Memo was one or two pages long. Also assumed is the correctness of the date of the Memo — 1916. This accuracy can be questioned as the only other source cited for the Memo is an unpublished



manuscript housed in the David Sarnoff Research Center Library in Princeton, New Jersey: "Radio and David Sarnoff," written in 1943 by Elmer Bucher, an engineer at the American Marconi Company and long-time friend of Sarnoff. This source lists the Memo as written in 1915 (Bucher, 1943) and is the only source of the Memo found in Sarnoff's papers. When the original document could not be located, the research librarians at the Sarnoff Library confirmed that neither the original Memo nor Nally's reply to Sarnoff's Memo, the one that Archer claimed to have seen, existed. The only account of the Memo in the Library was in Bucher's biography (M. Waligore, personal communication, November 22, 1988).

Then, during the review of papers on RCA's formation, the original Memo was discovered as a part of a 28-page document on the "Prospective Radio Business," written to Young by RCA's Commercial Manager, David Sarnoff, on January 31, 1920. Pages 13 and 14 contain Sarnoff's notes on "Sales of 'Radio Music Box' for Entertainment Purposes." With modifications, these pages comprise the Radio Music Box Memo presented in Archer. Sarnoff wrote Young in the 1920 Memo that

In 1915 I presented this plan in detail to Mr. Nally, but the circumstances attending our business at that time and since then have not been such as to make practicable serious consideration of this project. However, I feel that the time is now ripe to give renewed consideration to this proposition which is described below (Sarnoff, 1920a).

In comparing these pages of Sarnoff's 1920 report with Archer's 1938 version, it was noticed that alterations had been made. Other similarities and differences were identified as the versions of the Memo were examined closely, using traditional methods for perusing documentary evidence outlined by historians James Davidson and Mark Lytle (1992). Their approach also allows analysis of the myths behind the Memo. They state that a document should be appraised in four ways: (1) A document should be read, first, to understand its surface content; (2) The context may be established, in part, by asking what the document might have said but did not; (3) The document may be understood by seeking to reconstruct the intellectual worlds behind its words; and (4) The document may be interpreted according to the way it functions within a specific social situation (Davidson & Lytle, 1992). Using this structure as a guide, distinctions can be made between the reality and the myths of the Sarnoff Radio Music Box Memo.

While the first step of the analysis may seem too apparent, it cannot be overlooked. Davidson and Lytle (1992) state that neglecting this step can result in a limited point of view on the document's meaning. At this stage, only the most basic questions are asked (Davidson & Lytle, 1992): How is the document organized? What are its major points, briefly summarized?

In looking at the major points of both the 1920 Memo and the reproduction in



Archer, variations in organization and major points are found. The most obvious difference is the overall length of both documents. The 1920 Memo was found on pages 13 and 14 of a 28-page document, a manuscript containing a summary of all of RCA's radio activities and Sarnoff's projections for the future (Sarnoff, 1920a, 1920b). This document is organized in an outline Sarnoff presents on the first page to Young. That outline divides the subject matter into nine areas with the Radio Music Box Memo appearing as item six (Sarnoff, 1920a). Through its position, some scholars might argue that the Radio Music Box Memo was buried. However, Sarnoff was presenting the report on radio in a fashion most comprehensible and interesting to those individuals then in his audience, his immediate superiors at RCA.

From the 28-page report's arrangement it is easy to see why Sarnoff's superiors could have overlooked the Music Box Memo part of his report, as he and others have claimed (Bilby, 1986; Dreher, 1977; Lyons, 1966; Sarnoff, 1926a, 1926b). But, Sarnoff's superiors did not neglect his idea, as other documents in the Owen Young collection indicate. Executives such as E. P. Edwards, later the manager of General Electric's broadcast operations, recognized broadcasting's potential immediately and singled out this portion of Sarnoff's 28-page memo in a reply to Sarnoff (Editor, 1920; Edwards, 1920; Whitestone, 1920). Edwards' (1920) letter noted that this radio development was worth watching.

But, Sarnoff's superiors focused on broadcasting with a wait and see attitude. By the end of 1920 and the inauguration of KDKA, the first continuously operating broadcast station, they could not postpone decisions on broadcasting. RCA began to analyze radio broadcasting in earnest in early 1921, and Sarnoff was made head of the investigatory team. This appointment, too, later helped his legend, as Sarnoff decided what avenues RCA would explore and develop in broadcasting (Minutes of the Board, 1922). Therefore, the view that Sarnoff's superiors initially ignored the Music Box Memo is a distortion of broadcast history.

After careful study of the major points of a document, historians are less likely to take a particular passage out of context, "magnifying its importance at the expense of the rest of the document" (Davidson & Lytle, 1992, p. 59). Knowing that the 1920 Memo was a part of a much lengthier document, for instance, helps scholars understand why Sarnoff later said that the Radio Music Box Memo did not receive more immediate emphasis or recognition from his superiors.

Taken by itself, though, such a reading of "surface content" may distort a document's import. Significance depends upon the circumstances under which a statement is made as much as upon the statement itself. Thus, the historian must approach a document from several perspectives to establish its historical context. This context may be established, in part, by asking what the document might have said but did not (Davidson & Lytle, 1992).

The search for context raises the questions of "What alterations did Sarnoff



make in the memo from 1915/16 to 1920? From 1920 to 1938? What alternatives could he have presented? What omissions could have been made?" Historians recognize the importance of unstated premises by continually remembering that actors in any drama possess more alternatives than the ones they finally choose (Davidson & Lytle, 1992).

Alternatives present to Sarnoff and his superiors can first be deduced from the entire 28-page 1920 memo on the prospective radio business. All of the items mentioned present alternatives and developments in radio. None is mentioned in subsequent discourses on the evolution of the Radio Music Box. The Radio Music Box is singled out later without mention of these other business aspects because of the importance of radio broadcasting in the 1930s. In the popular mind, broadcasting eclipsed the other radio endeavors presented or radio advancements forecast in the 1920 report.

As for the actual Radio Music Box Memo itself, one can only guess at the alternatives presented to Sarnoff as radio developed from 1915/16 to 1920 and what he might have included or changed between those years. Sarnoff's introductory passage in page 13 of the 1920 Memo (Sarnoff, 1920a) tells historians that something was presented to Nally in 1915, but what it is is unknown. The 1915 Memo does not exist, even Nally's response which Archer states was written in 1916 does not exist (M. Waligore, personal communication, November 22, 1988).

In looking at the two Radio Music Box Memos, deductions can be made about the changes made in the Memo from 1920 to 1938. The version RCA sent to Archer reproduced the 1920 Memo faithfully, with some minor grammatical and punctuation corrections and several wording changes, which will be addressed momentarily (Clark, 1953; David Sarnoff's Radio Music Box of 1915, 1952; McGhee, 1952).

In the 1920 Memo Sarnoff underlined and centered the sentence, as well as capitalized each noun of "The idea is to bring music into the home by wireless." Obviously, Sarnoff wanted this part of the Memo to be distinct, to attract the attention of his superiors. The statement is not similarly presented in Archer or in the others that cite him. In addition, in Archer and others the word "home" has been changed to "house." Why is still unclear, but the answer may simply be that the change is a typographical or transcription error.

As for other items the Memo could have addressed, but did not, one must remember that the 1920 report had been requested by Sarnoff's superiors at RCA and that it was part of a larger manuscript. A review of wireless publications in the Teens shows that other predictions for radio voice transmission existed. For example, RCA's own publication, *Wireless Age*, contained numerous references to the Navy's experiments with radio telephony, or voice and music transmission via wireless, and to the experiments conducted by others on wireless transmissions (see "An English Home," 1920; Brown, 1920; "Clean English," 1920; "First Prize," 1919; Goldsmith, 1917, 1918, 1920; "Marconi's



Wireless Telephone," 1915; "Music by Radiophone," 1920; Parnell, 1915; "Radiophone," 1920; "Second Prize," 1919; "Submarine Jazzes," 1919; "Television," 1920; "The Wireless Telephone," 1915; "Wireless Carries Voice," 1919; "Wireless Stages," 1919; "Wireless Telephone," 1920). Other publications contain similar articles about experiments with such transmissions (see, for example, "A Concert by Wireless," 1917; "DeForest Wireless Telephone," 1917; "Marconi Wireless Telephone," 1916; "NAA Message," 1916; "Phonograph Music via Wireless," 1920).

Sarnoff is mentioned specifically in one article in 1916 as participating in these experiments ("Marconi Wireless Telephone," 1916). He was also undoubtedly aware of voice transmissions by others in the pre-war years, such as those done by Lee DeForest, Edwin Armstrong, and Nikola Tesla (Kittross & Sterling, 1991; Marvin, 1988). But, the mention of these transmissions as reasons for RCA getting into the "radio music box" business was not included in his 1920 Memo.

One likely reason for the omission is that Sarnoff's superiors were already aware of these transmissions. Another reason may be that RCA wanted to establish some sort of paper trail of its own about wireless voice communication, a paper trail that might help the company at a future date when claims to rights regarding wireless voice/music transmission might arise. Given the litigation then existing over patents for equipment used in communication, this latter scenario is logical. Even more credibility can be given this interpretation by later suits involving inventors such as Lee DeForest and Philo T. Farnsworth ("High Court," 1931).

This analysis now comes to the third strategy outlined by Davidson and Lytle for reviewing a document: A document may be understood by seeking to reconstruct the intellectual worlds behind its words (Davidson & Lytle, 1992). The need to perform this reconstruction is often hidden because meanings of words change. As a result, readers may encounter a sixteenth-century sentence, for instance, whose meaning is perfectly clear to a twentieth-century reader, when in fact the sentence had an entirely different sense for its sixteenth-century author (Davidson & Lytle, 1992). Consequently, by understanding the intellectual world from which a document arises, by tracing in effect its genealogy, the document itself can be better understood.

Changes in the wording of the 1920 and 1938 Memos can be found in the last paragraph of the texts. The 1920 Memo reads: "Aside from the profit to be derived from this proposition the possibilities for *propaganda and free advertising of the Radio Corporation* are tremendous; for, its name would ultimately be brought into the household and wireless would receive national and universal attention" (emphasis added) (Sarnoff, 1920a, p. 14). Meanwhile, the 1938 Memo in Archer reads: "Aside from the profit to be derived from this proposition the possibilities for advertising for the Company are tremendous; for its name would ultimately be brought into the household and wireless would receive national and universal attention" (Archer, 1938, p. 113). As can be seen,



in the 1938 version the words "free" and "propaganda" have been deleted and "Radio Corporation" has been changed to "the Company." The wording exclusion raises the questions: Why did RCA drop the adjective "free" as a modifier of advertising in the material supplied Archer? Why is the reference to "propaganda" excluded?

"Free" might have been deleted because it seemed redundant in the 1938 rendition. Self-advertising was "free." This rationale seems plausible, especially if one takes into account the phrase "paid advertising" in the seventh paragraph of the 1920 Memo and the phrase "free advertising" mentioned in the last. In a 1938 world, advertising was "paid" while so-called "free advertising" was considered "promotion" or "publicity."

More fascinating is RCA's exclusion of the word "propaganda" from the Archer materials. The most plausible reason for its expulsion is a change in the popular meaning of the word "propaganda" from 1920 to 1938. In 1920, the word "propaganda" was not a pejorative term. Its meaning then was akin to today's concept of "publicity." The noun was defined in a 1923 dictionary entry both as "any institution or scheme for propagating a doctrine or system" and "effort directed systematically toward the gaining of public support for an opinion or a course of action" (*The College Standard Dictionary*, 1923).

During the 1920s, heated discussion about "propaganda" conducted in the United States during the First World War to swing sentiment in America to either a pro-British or pro-German stand began changing the meaning of the word (Murphy, 1972). Prior to the First World War, the term was used chiefly to describe the missionary activities of the Catholic Church. But, during the war, the once non-controversial term was stigmatized when it was used to describe efforts to influence the American public through slanted material (Lasswell, 1927; Rogerson, 1938).

By the late 1930s and the rise of fascism and the Nazis in Europe, the term began to take on its now more contemporary meaning connoting deception or distortion — "dissemination of ideas, information, gossip, or the like for the purpose of helping or injuring a person, an institution, a cause, etc." (*Webster's New International Dictionary*, 1948). More than likely, the reference to "propaganda" was dropped to avoid misinterpretation or misunderstanding over the 1938 popular meaning of the word.

In addition, tying Sarnoff's name to a derogatory term would have been detrimental to Sarnoff's stature as a "Great Leader." By 1938 Sarnoff was prominent in broadcasting. His penchant for self promotion to enhance his career, as seen in the 1926 *Saturday Evening Post* articles (Sarnoff, 1926a, 1926b), had spilled over to a desire in later life to be seen broadly as a courageous, perceptive industrial giant (Bilby, 1986). The giant would have been diminished had his name been linked to promoting "propaganda."

Last of all, the Memo must be analyzed so that "the document may be interpreted according to the way it functions within a specific social situation"



(Davidson & Lytle, 1992, p. 65). This approach relates a piece of evidence to its contemporary context rather than its genealogical past. Historians recognize that every document functions as a tool, fashioned to accomplish certain purposes within its own social situation. By studying the shape of the tool, historians can appreciate what goals the document hoped to achieve and what audiences it expected to reach (Davidson & Lytle, 1992). As a document, the Radio Music Box Memo is addressed to a particular audience or audiences. Who were they in 1915, 1920, and 1938? What messages were being sent to those audiences, and how was the document designed to send them? What goals did the author seek in each rendition? In the 1920 Memo, Sarnoff notes that the 1915 Memo was addressed to Nally; so its audience was his immediate superior. The same is true of the 1920 Memo. It was addressed to his superiors at RCA, especially Owen D. Young, and circulated to all of RCA's executives. Sarnoff needed Young's attention to advance him professionally. In both 1915 and 1920, his actions promoted him further into the career advancement limelight.

By 1938, however, Sarnoff was recognized as *the* genius of American broadcasting (Bilby, 1986). Consequently, the audience for the 1938 Memo had expanded tremendously. It now included historians such as Archer, other prominent industrial and governmental figures, and the public, people who could recognize and laud Sarnoff's genius. Sarnoff was as widely known in both radio fields and throughout the nation in 1938 as industrialist Ross Perot is recognized in today's society.

Sarnoff loved his celebrity and did everything possible to enhance his image. He realized that the audience of the 1938 Memo recognized his genius through his supposed conceptualization of broadcasting in the pre-World War One years. Such acclaim enhanced Sarnoff's "Great Leader" image, an image built on the Horatio Alger myth — the rise of a poor Russian-born Jewish immigrant from abject poverty to his post as leader of the nation's premiere communications industry. Sarnoff's rise fit nicely into these American myths, and Sarnoff did nothing to refute this image (Bilby, 1986).

## Discussion and Conclusion

This article has examined new evidence that calls into question the claim that Sarnoff predicted the advent of broadcasting nearly one decade before radio networks linked the nation. This new material suggests that the Memo reproduced in Archer was actually written in 1920 and that later modifications were made from it to the one found in Archer. Additional information refutes the claim that Sarnoff's superiors ignored his suggestions concerning broadcasting. This documentation notes that Sarnoff's supervisors at RCA were far more open to his suggestion to form a broadcasting company than history has acknowledged.

By examining the discrepancies between this new evidence and past reports of the "Sarnoff Radio Music Box Memo," this article corrects inconsistencies in the



history of early radio. Credit must be given to Sarnoff for a Radio Music Box Memo written in 1920, but this praise must be tempered with the understanding that in 1920 other options existed for radio and that other individuals had been experimenting with "radio music box" ventures.

So, then, what is known for certain about the Radio Music Box Memo and its perpetuation as a part of the Sarnoff legend?

First of all, *something* may have been presented in 1915 as Sarnoff's introductory sentences on page 13 of the 1920 Memo indicate. But, whether it was the same Memo or contained the detail of the 1920 Memo will remain a matter for historical speculation until misplaced or lost evidence is found. Sarnoff could have made major modifications in a memo from 1915 to 1920 that he did not recall in later years. But until such evidence is uncovered — either the 1915 Memo itself or other references to it, such as Nally's reply — communication historians must conclude that the oft-cited Memo was written in 1920, not 1915.

Second, reasons exist for assuming that the 1920 Memo reiterated an earlier version of a memo or presentation, but no evidence exists that the details in the 1920 Memo reflect precisely what that earlier memo stated. Such evidence has been misplaced, lost, destroyed, or it may have never existed. The fact exists that Sarnoff *did* predict and promote the concept of a "Radio Music Box" in 1920, at a time when experiments were being done on radio broadcasting and when magazines were reporting on these possibilities for wireless. Thus, the Radio Music Box Memo and Sarnoff's subsequent claims as a prescient visionary lose their luster because of the five-year discrepancy in the Memo's evolution.

In 1938, the belief that the Radio Music Box Memo was written first in 1915 served to magnify Sarnoff's aptitude and intellect, to identify him both in the context of a "Great Leader" in radio communication — someone who foresaw broadcasting before America's entry into World War I and long before others were forecasting its possibilities — and as a mythic hero — someone who, from humble birth, showed early evidence of ability and skill and later rose rapidly to prominence. No doubt exists that Sarnoff's later achievements were so abundant and so exceptional that any anecdote or tale about him seemed credible. As his achievements grew, those who wrote about him cast his life in mythic terms. His supposed foresight in predicting the development of a Radio Music Box in 1915, not in 1920 when others were conducting experiments in radio broadcasting, added distinction to his legend.

Last of all, recognizing that the 1920 Radio Music Box Memo came from a larger document can correct fallacies about the reception of broadcasting by Sarnoff's superiors. Understanding the modifications in wording and structural editing of the 1920 Memo as it was published in 1938 helps place it in its proper perspective. In all, reviewing this new evidence on the Radio Music Box Memo gives added detail on radio's early development and clarifies Sarnoff's contributions to that evolution.



With this new historical evidence, future biographers and historians can no longer use the Radio Music Box Memo to add as much luster to the Sarnoff legend as they have in the past. The Memo was written in 1920. While stating its origin as 1915 contributed to the Sarnoff legend in the past, such claims today are inaccurate. Future historians will have to remedy the past perpetuation of the Radio Music Box Memo as a part of Sarnoff's legend.

## References

- A concert by wireless. (1917, January). *QST*, p. 26.
- An English home wireless telephone. (1920, March). *Wireless Age*, p. 7.
- Archer, G. L. (1938). *History of radio to 1926*. New York: The American Historical Society.
- Bilby, K. (1986). *The general*. New York: Harper and Row.
- Bittner, J. R. (1991). *Broadcasting and telecommunication* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.
- Brown, S. J. (1919, August). Radio telegraphy v. telephony for amateurs. *Wireless Age*, p. 41.
- Bucher, E. E. (1943). *Radio and David Sarnoff*. Princeton, NJ: Sarnoff Library, Sarnoff Research Center.
- Clark, C. (1953, December 22). Letter to Owen D. Young. Canton, NY: Owen Young Library, St. Lawrence University (File 1-102).
- Clean English in wireless. (1920, April). *Wireless Age*, pp. 41-42.
- David Sarnoff's Radio Music Box of 1915. (1952). Canton, NY: Owen Young Library, St. Lawrence University (File 1-102).
- Davidson, J. W., & Lytle, M. H. (1992). *After the fact: The art of historical detection* (3rd ed.). New York: Knopf.
- DeForest wireless telephone. (1917, April). *QST*, pp. 72-74.
- Dreher, C. (1977). *Sarnoff: An American success*. New York: Quadrangle.
- Editor, Reuters Ltd. (1920, June 14). Letter to Lawson. Canton, NY: Owen Young Library, St. Lawrence University (File 11-14-6).
- Edwards, E. (1920, February 20). Letter to Sarnoff. Canton, NY: Owen Young Library, St. Lawrence University (File 11-14-6).
- First prize — Will it be 'hello' or telegraphic buzzes. (1919, July). *Wireless Age*, p. 37.
- Goldsmith, A. (1917, January). Radio telephony. *Wireless Age*, pp. 248-255.
- Goldsmith, A. (1918, March). Radio telephony. *Wireless Age*, pp. 491-504.
- Goldsmith, A. (1920, July). Radio telephony across oceans and continents. *Wireless Age*, pp. 10-13.
- Gross, L. S. (1988). *Telecommunications* (3rd ed.). Dubuque, IA: W. C. Brown.
- High Court to hear radio patent suit. (1931, February 20). *The New York Times*, p. 30.
- Kahn, F. J. (Ed.). (1984). *Documents of American broadcasting* (4th ed.). Englewood Cliffs, NJ: Prentice-Hall.
- Lasswell, H. (1927). *Propaganda in the world war*. New York: Knopf.
- Lyons, E. (1966). *David Sarnoff*. New York: Harper and Row.
- Marconi's wireless telephone. (1915, April). *Wireless Age*, p. 489.
- Marconi's wireless telephone. (1916, August). *QST*, p. 234.
- Marvin, C. (1988). *When old technologies were new*. New York: Oxford University Press.



- McGhee, K. (1952, August 12). Letter to Charles Clark. Canton, NY: Owen Young Library, St. Lawrence University (File 1-102).
- Minutes of the board, RCA Board of Directors. (1922, February 17). Canton, NY: Owen Young Library, St. Lawrence University (File 11-14-7).
- Murphy, P. L. (1972). *The meaning of freedom of speech*. Westport, CT: Greenwood.
- Music by radiophone from San Francisco to Victoria, B.C. (1920, May). *Wireless Age*, p. 7.
- NAA message. (1916, September). *QST*, p. 261.
- Parnell, C. (1915, August). NAA: The naval station at Radio, Va. *Wireless Age*, pp. 801-805.
- Phonograph music via wireless. (1920, January). *The Phonograph and Talking Machine Weekly*, p. 7.
- Radiophone: An aid to legislation at Washington. (1920, May). *Wireless Age*, p. 7.
- Rogerson, S. (1938). *Propaganda in the next war*. London: Geoffrey Bles.
- Sarnoff, D. (1920a, January 31). Report to O. D. Young entitled *Subject: Report on prospective radio business*. Canton, NY: Owen Young Library, St. Lawrence University (File 11-14-6).
- Sarnoff, D. (1920b, February 11). Letter to A. H. Morton. Canton, NY: Owen Young Library, St. Lawrence University (File 11-14-6).
- Sarnoff, D. (1926a, August 7). Radio. *Saturday Evening Post*, pp. 8-9, 141-149.
- Sarnoff, D. (1926b, August 14). Radio. *Saturday Evening Post*, pp. 24-25, 91-103.
- Second prize — Radio telephony as regards the amateur. (1919, July). *Wireless Age*, p. 38.
- Sobel, R. (1986). *RCA*. New York: Stein and Day.
- Sterling, C. H., & Kittross, J. M. (1990). *Stay tuned* (2nd ed.). Belmont, CA: Wadsworth.
- Submarine jizzes for airship by radiophone. (1919, May). *Wireless Age*, p. 8.
- Television, a new radio development. (1920, August). *Wireless Age*, p. 7.
- The college standard dictionary of the English language*. (1923). New York: Funk & Wagnalls.
- The wireless telephone, as seen by artists. (1915, December). *Wireless Age*, p. 210.
- Webster's new international dictionary of the English language* (unabridged) (2nd ed.). (1948). Springfield, MA: G. & C. Merriam.
- Whitstone (1920, February 24). Letter to Sarnoff. Canton, NY: Owen Young Library, St. Lawrence University (File 11-14-6).
- Wireless carries voice across the Atlantic. (1919, May). *Wireless Age*, p. 7.
- Wireless stages the world drama. (1919, March). *Wireless Age*, p. 10.
- Wireless telephone commercial practicable. (1919, February). *Wireless Age*, p. 8.



## **In Search of the Sarnoff "Radio Music Box" Memo: Nally's Reply**

**Louise Benjamin**

*In 1993, I published an article in the Journal of Broadcasting and Electronic Media entitled "In Search of the Sarnoff 'Radio Music Box' Memo: Separating Myth from Reality." That article focused on my quest to find the original memo David Sarnoff, the legendary broadcast leader, claimed to have written in 1915 in which he predicted the advent of broadcasting. This article presents evidence I sought then that proves the existence of a "Radio Music Box Memo" written in 1916 and includes confirmation of a reply E.J. Nally wrote to that Memo in 1916. It also describes the context in which both of the documents—Sarnoff's 1916 memo to Nally and Nally's 1916 reply—were written. These materials indicate Sarnoff and Nally were actively involved in developing some type of music service for wireless consumption. They also show that Sarnoff had conceived the idea of a "music box" that would use wireless apparatus as early as November 1916. He should be recognized for that early concept.*

### **INTRODUCTION**

In 1993, I published an article in the *Journal of Broadcasting and Electronic Media* entitled "In Search of the Sarnoff 'Music Box' Memo: Separating Myth from Reality." That article focused on my quest to find the original memo David Sarnoff, the legendary broadcast leader, claimed to have written in 1915 in which he predicted the advent of broadcasting. In this often-cited memo, Sarnoff said that he had "in mind a plan of development which would make radio a 'household utility' in the same sense as the piano or phonograph. The idea is to bring music into the house by wireless" (Benjamin, 1993, p. 326). Beginning with a series of articles published in 1926 (Sarnoff & McBride, 1926a, 1926b), Sarnoff claimed that the "Radio Music Box" was among

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his most visionary ideas. The prophetic nature of the Memo later added luster to Sarnoff as his legend grew in the 1930s. In the summer of 1900, at age 9, Sarnoff emigrated to the United States and, by age 39, he had risen through the ranks of the American Marconi Company and its successor, the Radio Corporation of America, to become RCA's president. As an industry executive, Sarnoff was widely acclaimed as a propelling force behind the development of both radio and television (Bilby, 1986; Dreher, 1977; Lyons, 1966). As noted, Sarnoff's life story epitomized the American ideal of the rugged, self-made individual, a "Horatio Alger" of the broadcasting field (Benjamin, 1993).

In pursuing the Memo's origin and the supposed myths behind the legend of the Memo, I concluded that, although something was probably written earlier, "the Radio Music Box Memo reproduced in Archer was actually written in 1920 and that later modifications were made from this memo to the one found in Archer," a reference to the 1938 book by Gleason Archer, *A History of Radio to 1926* (pp. 112–113). This book provided the basis for numerous citations of the Memo found in histories and textbooks related to broadcasting (Bittner, 1991; Gross, 1988; Sterling & Kittross, 1990).

My earlier research found that David Sarnoff actually wrote the Memo mentioned in Archer in 1920 when he was commercial manager of the Radio Corporation of America (RCA). It had been part of a 28-page document entitled "Prospective Radio Business" dated January 31, 1920, that Sarnoff sent to his superiors at RCA, including Owen D. Young, RCA and General Electric chief executive officer, and E.J. Nally, then president of RCA and former commercial manager of American Marconi. As noted, pages 13 and 14 of this memorandum contained Sarnoff's discussion on "Sales of 'Radio Music Box' for Entertainment Purposes" (Benjamin, 1993). This part of the 28-page memorandum became the famous "Radio Music Box Memo" and are prefaced with the words:

*In 1915 I presented this plan in detail to Mr. Nally, but the circumstances attending our business at that time and since then have not been such as to make practicable serious consideration of this project. However, I feel that the time is now ripe to give renewed consideration to this proposition which is described below.*  
(Benjamin, 1993, p. 326, citing Sarnoff, 1920)

With modifications, these pages make up the "Radio Music Box Memo" presented in Archer and others (Archer, 1938; Bittner, 1991; Gross, 1988; Sterling & Kittross, 1990).



After analyzing the original and subsequent versions of the Memo, I ended the article by asking "What is known for certain about the 'Radio Music Box' memo?" I concluded that Sarnoff had presented *something* related to a "radio music box" plan to his superiors in 1915 or 1916, but added, "Whether it was written or contained the detail of the 1920 memo will remain a mystery until misplaced or lost evidence is found. Such evidence could include either the 1915 memo itself or other references to it, such as Nally's reply." During the past decade, questions about the Memo surfaced that kept me looking for the material that I suspected had been misplaced. This article describes that search, and more importantly, it provides evidence I sought then that proves the existence of a "Music Box Memo" written in the mid-teens and includes confirmation of the reply Nally wrote to the Memo in 1916 that was mentioned in Archer's 1938 book, *History of Radio to 1926*. It also describes the context in which the documents—Sarnoff's 1916 memo to Nally and Nally's 1916 reply—were written.

#### THE SEARCH FOR NALLY'S REPLY

In his first volume *History of Radio to 1926*, Archer (1938) highlighted Nally's involvement in the Memo's evolution and states Nally's reply existed:

*In 1916 Mr. Sarnoff embodied in a written recommendation to Edward J. Nally, the General Manager of the Marconi Company, the details of his proposed "Radio Music Box" scheme. Mr. Nally's reply, dated November 9, 1916, is in existence and has been examined by the author. Elmer E. Bucher, at the time an engineer of the Marconi Company, has informed the author that he was with Mr. Sarnoff when the latter dictated the (memo). (Archer, 1938, pp. 112-113)*

The Memo written in 1920, with modifications discussed in my 1993 article, then followed that introduction in Archer's book. As this passage indicates, Nally wrote something in response to Sarnoff in 1916, but as I noted in the article, if the original did exist, "it became lost in the shuffle" (Benjamin, 1993, p. 330).

After that article's publication in 1993, any further search for existing documentation on the subject was put on hold as avenues for investigation seemed closed. Still, I was nagged by my inability to find that missing material corroborating Sarnoff's memory. It should exist somewhere. Then, rather serendipitously in 1999, I began electronic mail correspondence with Dr. Alexander Magoun, the new curator and archivist at the Sarnoff Corporation Research Library. In our subsequent



communiqués (personal communications, 1999, 2000), we reviewed my initial conclusions in the 1993 article, and began an earnest search for materials related to the Sarnoff Music Box Memo. In August 2000, Dr. Magoun wrote that he had come across some items related to David Sarnoff's initial radio years that had definitely been misplaced and indicated materials possibly related to my investigation might be within these mislaid documents. With great expectation and hope, I visited the Library again in September 2000. There, to my delight, two large scrapbooks titled *Early Reports on Radio (collected by) David Sarnoff* yielded several letters and various newspaper articles related to wireless demonstrations in the teens. More importantly, these volumes also contained two significant primary resource documents: a short memo Sarnoff wrote to Nally dated November 8, 1916, and Nally's reply written the next day. Both refer to a "music box scheme" devised by Sarnoff.

I was elated as I read the missing memos that Sarnoff had obviously saved, pasted into a scrapbook, and later labeled as his first volume of *Early Reports on Radio (collected by) David Sarnoff*. These notes, which had been "lost in the shuffle," offered new insight into David Sarnoff's prescience regarding broadcasting. In total, the Sarnoff interoffice memo states:

*Mr. Nally,*

*This is a matter which I have given much thought during your absence. It involves my "music box scheme" about which I spoke to you sometime ago. I still believe in it and my faith is even stronger. It is one of the things I am saving up to talk over with you when your time will permit.*

The note is initialed "D.S." and contains the following handwritten addendum in David Sarnoff's script:

*Here's an opportunity, too, to make a big thing out of the Marconi Publishing Co. as we can work in the Wireless Age on this proposition.*

Again, this postscript is initialed "D.S."

Nally's reply of the next day was titled in caps "Re: MUSIC BOX SCHEME", and, in total, stated:

*With reference to the attached, I think we should at once take steps to protect our interests. I have some views along these lines and shall be glad to discuss them with you in connection with the*



*Gramophone [sic] Company's agreement, which I am sending to you separately.*

Together, these memos show that Sarnoff had conceived the idea of a wireless "music box" as early as 1916 and that both he and Nally wanted to develop a music service to offer the public.

Accompanying these memos was a letter written in 1925 from a researcher identified only by the initials "T.N.B." He or she was responding to an inquiry from Sarnoff, who, as a rising corporate star at RCA, had requested the original Music Box Memo be pulled from the archive. In 1924, Sarnoff had begun looking for the Memo in preparation for a series of articles he was coauthoring with Mary Margaret McBride for the *Saturday Evening Post*. These articles were on radio's evolution and were to highlight Sarnoff's contributions. In May 1925, "T.N.B." replied to Sarnoff:

*Some time ago you asked me about some early correspondence in connection with your "music box" scheme.*

*I have not, to date, been able to locate anything earlier than 1916, and enclose herewith the original of your memorandum of November 8 of that year to Mr. Nally and the carbon of Mr. Nally's reply of the 9th. Note that your memorandum carries the file reference number "A-22." This may give you a clue to the correspondence.*

*In your letter of August 2, 1922, to Dr. Goldsmith on the subject of "Individual Radio (Radiolette)" of which you sent a carbon to Mr. Nally with the penned notation "Another brainstorm" you quote from a letter of 1915 to Mr. Nally [exact date not given]—*

*"I have in mind a plan of development which would make radio a household utility in the same sense as the piano or phonograph  
\*\*\*\*\*[sic] The idea is to bring music into the house by wireless."*

*I have not, so far, been able to locate this letter of 1915 but shall continue my search.*

*Sincerely, [Initialed] T.N.B.*

As this letter indicates, Sarnoff wanted to locate the memo as a part of the story of early radio development and his involvement in that evolution. This letter also provides other clues as to the 1915 memo in its citation of the correspondence with Goldsmith in 1922. Of course, this letter to Goldsmith was written well after the 1920 28-page memorandum Sarnoff wrote to his superiors at RCA (Benjamin, 1993). Further analysis of the letter from "T.N.B." began a search for file A-22, but



either it does not exist at the Sarnoff Library or it has been "lost in the shuffle."

#### **THE CONTEXT FOR THE "MUSIC BOX SCHEME" AND NALLY'S REPLY**

With this letter from "T.N.B." and the important correspondence between Nally and Sarnoff were several letters and newspaper articles that provide the context for references made in these memoranda as well as the circumstances in which Sarnoff approached Nally with his "music box scheme." These items reveal more about experiments conducted by the Navy, communication companies, and inventors in the teens in wireless telephony, or transmission of voice and music via radio. The picture painted is one of a complex, dynamic investigation of radio's potential, its possible future commercial markets, and its usefulness to government agencies.

In May 1914, for instance, music was sent from Wanamaker's department store in New York to ships at sea. Sarnoff was among the passengers who heard these transmissions (Kaiser, 1924; Wells, 1924). This experiment and others conducted from 1915 to 1920 carried voice and music from transmitter to receiver and illustrated the fact that many organizations were engaged in early demonstrations of radio's potential (A Concert by Wireless, 1917; DeForest Wireless Telephone, 1917; "Marconi Wireless," 1916; "Marconi's Wireless," 1915; NAA Message, 1916; Parnell, 1915; "The Wireless," 1915; Phonograph Music via Wireless, 1920, January 7). Sarnoff was well aware of these tests, as I mentioned in my earlier article, and through Sarnoff's scrapbook collection of letters and newspaper articles, an even richer picture emerges of Sarnoff's understanding of the potential of wireless telephony.

Sarnoff knew of individuals experimenting with wireless telephony, such as Lee DeForest and Edwin Armstrong, and two newspaper articles published in November 1916 underscore the reasons why he may have written Nally at this time to remind Nally of their earlier conversations. One article reviews DeForest's use of recordings from the Columbia Graphophone Company for a wireless telephone musical concert from the Hotel Astor in New York ("Air will be," 1916); the other, published a few days later, touts DeForest's coverage of the 1916 election via wireless to amateurs within a 200-mile radius of New York City ("Returns," 1916). Both present perspective for understanding Sarnoff's short note to Nally reminding Nally of their earlier communication. DeForest's company was a business competitor to American Marconi, and both Sarnoff and Nally naturally wanted to protect their company's potential business as indicated in Nally's short reply (Nally,



1916). Correspondence such as these notes could also provide the beginning of a paper trail, which might be needed if any litigation arose later between DeForest and American Marconi. Written at the same time the newspaper articles appeared, the memos also indicate that Sarnoff and Nally were aware of the importance of the experiments for further wireless developments.

In Nally's response, his reference to the "Gramophone Company agreement" highlights American Marconi's own experiments with radio telephony and Nally's hope to use Gramophone's recordings in their own music service (Nally, 1916). In 1916, Gramophone was a competitor to the Columbia Graphophone Company used by DeForest for his transmissions. Their competition ended when the two merged in 1931 to form Electric and Musical Industries, Ltd., or EMI (Martland, 1997). Although this agreement between Gramophone and American Marconi is not in the Sarnoff Library collection, other sources refer to the Gramophone Company's development and cooperation in wireless experiments (Jolly, 1972; Martland, 1997).

One can strongly suspect that both Nally and Sarnoff were interested in the potential business of carrying music via wireless to listeners. Not only did Sarnoff mention *Wireless Age* in his handwritten postscript on his interoffice memo (Sarnoff, 1916), but he also participated in wireless experiments in the summer of 1916 ("Marconi Wireless," 1916). American Marconi was seeking ways to make its magazine more profitable, and integrating advertising and notices to the public of wireless concerts and coverage of events with other articles were ways of developing readership (Benjamin, 1993). Through increasing circulation, more listeners and potential buyers for a radio music box could increase company revenues, as Sarnoff's 1920 memo indicates (Benjamin, 1993, citing Sarnoff, 1920).

This investigation also confirms, first and most foremost, that Sarnoff had presented *something* to his superiors in 1916. Sarnoff's short memo states he "spoke to you [Nally] some time ago" (Sarnoff, 1916). Whether he also *wrote* something at the same time he spoke to Nally is debatable but likely, as Sarnoff typically followed verbal discussion with written memoranda.

Second, the documents cited in this article reveal that this *something* Sarnoff presented was far more fleshed out than I had indicated in the earlier article. The phrase "music box scheme," which both Sarnoff and Nally mentioned in their 1916 correspondence, demonstrates that they were building on their own as well as others' ideas of carrying music to the public via wireless, a point Sarnoff reiterated in his 1920 memo to his superiors at RCA.



Third, Sarnoff called his plan a "scheme" in his memo, but this term should not be perceived as pejorative. In 1916, the word's connotation meant "strategy" and its use here indicates that Sarnoff had thought about his "music box" idea enough to conceive a design for its implementation. Nally's mention of an arrangement with the Gramophone Company indicates he had also thought of how a "music box scheme" could benefit American Marconi.

Fourth, the use of the phrase "music box" confirms Sarnoff's vision of some type of encasement for a reception device for wireless signals, another point Sarnoff restated in 1920 in allusions to making "radio a household utility in the same sense as the piano or phonograph." This "box" could be sold to consumers at a considerable return. How any profitability was to be realized and how much income might be achieved are not spelled out in these 1916 documents, but the later 1920 memo certainly restated and probably expanded on ideas Sarnoff had in mind earlier for radio set profitability.

Fifth, in his 1920 memo, Sarnoff also repeated references made in the 1916 postscript to making *Wireless Age* more profitable through the music box. In 1920 he stated that secondary sources of income for the company would come from increased advertising and circulation of *Wireless Age*. Archer (1938) also made these points.

Consequently, these short memos written in 1916 and accompanying newspaper articles about wireless illustrate that Sarnoff and Nally were aware that some type of music service for wireless consumption could be developed. They also show that Sarnoff and Nally were actively involved as early as 1916 in a "music box" scheme that would use wireless apparatus.

## CONCLUSION

In summary, this article clarifies, expands, and amends the work I published in 1993. As an historian, I find it exciting to play detective in pursuing work that revises and reassesses prior conclusions. These new conclusions then become an integral part of the ever-continuing evolution of communication history.

As I noted in the 1993 article, the memo, which may have been written in 1915 or 1916, is still missing, but the short memos presented in this article reference several of the main points of pages 13–14 in Sarnoff's 1920 memorandum to his superiors, the draft used by Archer (1938) as the famous memo. Thus this present research reveals that Sarnoff *did* present a radio music box plan of some kind to his superior, E.J. Nally, in 1916. Although Sarnoff's short memo was not as fleshed out as the famous "Radio Music Box Memo" printed later in Archer,



Sarnoff's 1916 memo had mentioned several of the major points or concepts presented in later renditions of the Radio Music Box memo.

Consequently, Sarnoff should be given credit for developing the idea of a "Radio Music Box" and delineating some of its most important points as early as November 1916. Although the predictions and experiments of others in wireless telephony in the mid-teens should temper accolades accorded Sarnoff, his foresight should be recognized. He envisaged receipt of wireless signals via a radio music box as early as 1916. Sarnoff was prescient in foreseeing radio's development in broadcasting, and broadcast history should afford him that recognition.

### References

- A concert by wireless. (1917, January). *QST*, p. 26.
- Air will be full of music tonight. (1916, November 6). *New York Sun*. From the collection of David Sarnoff, Vol. 1, 1914-1924.
- Archer, G. (1938). *History of Radio to 1926*. New York: The American Historical Society.
- Benjamin, L. (1993). "In Search of the Sarnoff 'Music Box' Memo: Separating Myth from Reality." *Journal of Broadcasting and Electronic Media*, 37(3), 325-335.
- Bilby, K. (1986). *The General*. New York: Harper and Row.
- Bittner, J. (1991). *Broadcasting and Telecommunication* (3rd ed.). Englewood Cliffs, NJ: Prentice Hall.
- DeForest Wireless Telephone. (1917, April). *QST*, p. 72-74.
- Dreher, C. (1977). *Sarnoff: An American Success*. New York: Quadrangle.
- Gross, L. (1988). *Telecommunications* (3rd ed.). Dubuque, IA: William C. Brown.
- Jolly, W.P. (1972). *Marconi*. New York: Stern and Day.
- Kahn, F. (Ed.). (1984). *Documents of American Broadcasting* (4th ed.). Englewood Cliffs: NJ: Prentice Hall.
- Kaiser, B.K. (1924). Letter to Sarnoff, May 1. Princeton, New Jersey: Sarnoff Library, Sarnoff Research Center.
- Lyons, E. (1966). *David Sarnoff*. New York: Harper and Row.
- Marconi wireless telephone. (1916, August). *QST*, p. 234.
- Marconi's wireless telephone. (1915, April). *Wireless Age*, p. 489.
- Martland, P. (1997). *Since Recording Began: EMI, The First 100 Years*. London: B.T. Batsford, Ltd.
- NAA message. (1916, September). *QST*, p. 261.
- Nally, E. (1916). Re: Music box scheme, November 9. Princeton, NJ: Sarnoff Library, Sarnoff Research Center.
- Parnell, C. NAA: The Naval Station at Radio, Va. (1915, August). *Wireless Age*. pp. 801-805.
- Phonograph music via wireless. (1920, January 7). *The Phonograph and Talking Machine Weekly*, p. 15.
- Returns by wireless. (1916, November 8). Early reports on radio from the collection of David Sarnoff, Vol. 1, 1914-1924.
- Sarnoff, D. (1916). Memo to Mr. Nally, File No. A-22, November 8. Princeton, NJ: Sarnoff Library, Sarnoff Research Center.
- Sarnoff, D. (1920, January 31). Report to O.D. Young entitled, "Subject: Report on Prospective Radio Business," ODY, RCA, 11-14-6, Box 87.
- Sarnoff, D., & McBride, M. (1926a, August 7). Radio. *Saturday Evening Post*, pp. 8-9, 141-149.



- Sarnoff, D., & McBride, M. (1926b, August 14). Radio. *Saturday Evening Post*, pp. 24–25, 91–103.
- Sterling, C., & Kittross, M. (1990). *Stay Tuned* (2nd ed.). Belmont, CA: Wadsworth Publishing Company.
- T.N.B. (1925). Letter to Mr. Sarnoff, May 22. Princeton, NJ: Sarnoff Library, Sarnoff Research Center.
- Wells, L.S. (1924). Letter to Sarnoff, May 1. Princeton, NJ: Sarnoff Library, Sarnoff Research Center.
- The wireless telephone, as seen by artists. (1915, December). *Wireless Age*, p. 210.





S B &lt;memosources@gmail.com&gt;

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**Fwd: Sources Memo 1 Part 1**

1 message

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**Jackie Neff** <jrneff@gmail.com>  
To: Memosources@gmail.com

Tue, Apr 17, 2007 at 1:27 PM

----- Forwarded message -----

From: **Jackie Neff** <jrneff@gmail.com>  
Date: Apr 17, 2007 1:08 PM  
Subject: Sources Memo 1 Part 1  
To: Susan Burgess <susan@cw.com>







Susan,

I have attached the sources from the 1st memo (in 2 parts). Any remaining documents are available online. I have also attached a copy of the memo because I made some minor changes to a few of the citations. I am still looking into the AT&T issue in the Rosen book, but have yet to find anything. I will let you know as soon as I do. Thanks!

Jackie

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**6 attachments**

-  **How Institutional Constraints Affected the Organization of Early U.S. Telephony.pdf**  
1833K
-  **AT & T's Strategic Response to Competition.pdf**  
1165K
-  **The Antimonopoly Ideal and the Liberal State.pdf**  
960K
-  **Debating Mass Communication During the Rise and Fall of Broadcasting.pdf**  
239K
-  **Integration and Exclusion in the Telephone Equipment Industry.pdf**  
2209K
-  **The Early Competitive Era in Telephone Communication.pdf**  
2068K

All sources  
saved to  
computer





S B &lt;memosources@gmail.com&gt;

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## Sources Memo 2 Part 1

1 message

---

Jackie Neff <jrneff@gmail.com>

Tue, Apr 17, 2007 at 2:03 PM

To: Memosources@gmail.com

Here are sources from part 2.

Thomas Streeter's *Selling the Air* is available at <http://books.google.com/books?id=94xPOrL1meEC&pg=PA169&lpg=PA169&dq=nbc+%26+divest+%26+blue+network&source=web&ots=E4LnkVtbWX&sig=VaB3ysVZCMAHxiZUuxBVB0TCnxw#PPA115,M1>.

Use the same login info (memosources; memosource) to access it.

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### 8 attachments



**NBC v. US.doc**  
221K



**Allocating the Spectrum, the Origins of Radio Regulation.pdf**  
920K



**47 USCA 303.doc**  
35K



**History of the Broadcast License Application Process.pdf**  
66K



**FCC Regulation of Competition Among Radio Networks.pdf**  
711K



**Antitrust and the Regulated Industry, Promoting Competition in Broadcasting.pdf**  
746K



**FCC Review of the Commission's Broadcast Ownership Rules....pdf**  
91K



**Impact of the FCC's Chain Broadcasting Rules.pdf**  
1184K

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S B &lt;memosources@gmail.com&gt;

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## Sources Memo 2 Part 2

1 message

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**Jackie Neff** <jrneff@gmail.com>

Tue, Apr 17, 2007 at 2:15 PM

To: Memosources@gmail.com

Also, the original rules and regulations of the FCC are no longer available online but are quoted in the NBC v. US case. The official citations are 6 FR 2282-2285. (The dual network rule was extended in 11 FR 33). The current version is found in 47 C.F.R. 73.658 which I have attached. Any additional documents that I did not attach should be available either online or are cited in the book you allowed me to borrow. If you have any other questions or concerns regarding the citations, please let me know.

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### 2 attachments

**FM Radio, Technical Support & Decision-Making.pdf**

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**47 CFR 73.658.doc**

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## INTRODUCTION

On March 15, 1935, the President approved a joint resolution of the Congress,<sup>1</sup> "authorizing the Federal Communications Commission to investigate and report on the American Telephone & Telegraph Co. and all other companies engaged directly or indirectly in telephone communication in interstate commerce, including all companies related to any of these companies through a holding company structure, or otherwise." The purpose of the resolution was to secure information on the telephone industry, particularly the American Telephone & Telegraph Co., "in aid of legislation by the Congress and for the use of governmental agencies, including State regulatory commissions, for the information of the general public, as an aid in providing more effective rate regulation, and for other purposes in the public interest." The resolution was drawn in broad terms, authorizing the Commission to investigate and report to the Congress on the following general matters, among others, relating to interstate telephone operations: Corporate and financial history; capital structure; inter-company relationships; service contracts; accounting methods; apportionment of investment, revenues, and expenses between State and interstate operations; policies and practices; methods of competition; the effect of monopolistic control upon the reasonableness of telephone rates and charges; and the reasons for the failure generally to reduce telephone rates and charges during the years of declining prices.

The resolution appropriated the sum of \$750,000 to carry out the mandate of Congress. Two additional appropriations were made, one for \$400,000, effective June 22, 1936, and one for \$350,000, effective February 9, 1937.<sup>2</sup>

The benefits to users of telephone service since the passage of the resolution may be summarized as follows: Long distance telephone rates have been reduced substantially. Subsequent to the issuance of an order of investigation of the interstate toll rate structure by the Telephone Division on September 9, 1936, and as the result of negotiations between representatives of this Commission and the American Telephone & Telegraph Co., long distance telephone rates were reduced on a basis equivalent to an estimated saving to the public of \$12,235,000 per annum. Other reductions of lesser amounts were made effective during the period from June 1, 1935 to January 15, 1937, the total effect of all reductions being estimated to amount to about \$24,000,000 per annum. Other benefits to customers of the telephone system may be attributable to some extent to the activities of the Commission such as (1) revision of wire service charges to radio stations; (2) reduction or discontinuance of extra charges for the so-called hand-set telephone; (3) reduction in the interest rate paid by

<sup>1</sup> Public Res. 8, 74th Cong., 49 Stat. 43. A copy of the resolution is set out in appendix 1.

<sup>2</sup> Of this sum, \$170,000 was set aside by the Federal Communications Commission to support a technical unit designated as a Rate and Research Department, to study general telephone rate problems. A brief discussion of the work of this Department is included in ch. I, pt. II, of this report.



the associated companies on advances from the American Telephone & Telegraph Co.; and (4) liberalization of the policy of the Western Electric Co. in selling certain telephone devices to connecting companies.

The work of the investigation was confined largely to a study of the American Telephone & Telegraph Co. and certain of its subsidiary and related companies. The resolution directed specific attention to the American Telephone & Telegraph Co., although the activities of all telephone companies operating interstate were included therein. Due to limitations of time, funds, and personnel, such a comprehensive study of all companies was not practicable. Telephone companies other than the Bell System Cos. have been studied only to the extent that their activities have had a direct bearing on the activities of the American Co. Inasmuch as the latter company controls more than 85 percent of the telephone business in this country,<sup>3</sup> the investigation made covers the larger part of the telephone industry.

Pursuant to General Order No. 1, dated July 17, 1934, organizing the Divisions of the Commission, the Telephone Division had and exercised the jurisdiction of the Commission over all matters relating to telephone communication, including the conduct of the investigation. The Telephone Division, accordingly, by its Order No. 13,<sup>4</sup> adopted on March 4, 1936, prescribed the procedure to govern the conduct of the investigation, and the investigation was conducted by the Telephone Division in accordance with the procedure so prescribed.

At the close of the hearings it was announced that the American Telephone & Telegraph Co. would be permitted to submit statements in writing pointing out any inaccuracies in factual data or statistics in the reports introduced in the hearings or in any testimony in connection therewith, provided that such statements were confined to the presentation of facts and that no attempt would be made therein to draw conclusions therefrom. It was further announced that the statements to be submitted should be properly verified and should refer specifically by page number to the matter in the report or transcript sought to be corrected. September 30, 1937, was fixed as the time limit within which such statements might be filed.

The company submitted a series of unsigned, unattested memoranda designated as "comments" upon the reports submitted in evidence by members of the investigation staff. The documentary material submitted by the company under the designation "Comments" did not conform to the requirements laid down by the Telephone Division as outlined above. The comments were not verified; they were not filed within the time limit fixed; and they contained much argumentative material and unsupported assertions in addition to corrections of factual or statistical data. Inasmuch as they did not comply with the Telephone Division requirements as to the matter to be contained therein they were not made a part of the record as requested by the company. These comments were, however, considered, insofar as they related to corrections of factual or statistical data, in the preparation of both the proposed report and this report to the Congress.

<sup>3</sup> See testimony of Walter S. Gifford, president of the American Telephone & Telegraph Co., in hearings before the Committee on Interstate and Foreign Commerce on H. R. 8301, 73d Cong., 2d sess.

<sup>4</sup> A copy of Telephone Division Order No. 13 is included as appendix 4.



## APPENDIX 1

[PUBLIC RESOLUTION—No. 8—74TH CONGRESS]

(S. J. Res. 46)

JOINT RESOLUTION Authorizing and directing the Federal Communications Commission to investigate and report on the American Telephone and Telegraph Company and on all other companies engaged directly or indirectly in telephone communication in interstate commerce, including all companies related to any of these companies through a holding company structure, or otherwise

*Resolved by the Senate and House of Representatives of the United States of America in Congress assembled,* That it is necessary, in aid of legislation by the Congress and for the use of governmental agencies, including State regulatory commissions, for the information of the general public, as an aid in providing more effective rate regulation, and for other purposes in the public interest, that accurate and comprehensive information be procured and compiled regarding the American Telephone and Telegraph Company and other telephone companies.

SEC. 2. The Federal Communications Commission is hereby authorized and directed to investigate and report to the Congress on the following matters with respect to the American Telephone and Telegraph Company and all other companies engaged directly or indirectly in telephone communication in interstate commerce, including all of their subsidiary, affiliated, associated, and holding companies, and any other companies in which any of them have any direct or indirect financial interest, or which have any such interest in them, or in which any of their officers or directors hold any office or exert any control or whose officers or directors hold any office or exert any control in them—

(a) The corporate and financial history, and the capital structure and the relationship of such company and of its subsidiary, affiliated, associated, and holding companies, including the determination of whether or not such structure may enable them to evade State or Federal regulation or taxation, or to conceal, pyramid, or absorb profits, or to do any other act contrary to the public interest.

(b) The extent and character of intercompany service contracts and all transactions between the telephone companies and their subsidiaries, affiliated, associated, or holding companies, and particularly between the American Telephone and Telegraph Company and the Western Electric Company and other manufacturers of electrical communication equipment; the methods of publishing telephone directories and placing and charging for advertising therein; the cost of and sale prices of telephone equipment, material, or devices to telephone operating companies or users; the profits upon such sales and the effect of such sales upon the rates or upon the rate base of



The Bell System systematically attempted to break up the formation of independent interconnected systems by purchasing any independent properties that could be obtained reasonably. The executives of the Bell System considered the existence of an independent interest in the telephone business, whether localized or interconnected, as inconsistent with the ideals of a universal and interdependent system of telephone communication. Many important independent properties were acquired by the Bell System after 1907. Most of the important acquisitions were subsequent to 1912.

Another method adopted by the Bell System after 1907 to eliminate competition was the use of its financial backers and their influence to prevent the financing of large independent units.<sup>25</sup> Such methods were used, for example, to prevent the financing of a long-distance line between Kansas City, Chicago, and New York and the development of an independent company in the State of Wisconsin. This method was made effective by bringing financial pressure to bear through the Baker-Morgan group, the financial backers of the Bell System, upon other financial organizations and institutions to which appeals were made by various independent organizations for adequate financing. The result was that large sources of investment capital in this country were made unavailable to independents. The larger the independents became the more impossible it was for them to obtain capital in the large amounts required. This slow financial strangulation of attempts to develop large competing independent systems was an important factor in regaining for the Bell System its former position of monopoly in the telephone field.

The effects of the change in policy of the Bell System in 1907, is demonstrated by the disproportionate increase in telephone stations owned by the independents as compared with stations owned by the Bell System. In 1907, the independents owned 2,986,515 stations, as compared to 3,642,565 owned in 1912, an increase of approximately 22 percent.<sup>26</sup> In 1907 the Bell System owned 3,132,063 stations, as compared to 5,087,027 in 1912, an increase of approximately 62 percent.<sup>27</sup>

#### Antitrust Law Enforcement (1913-21).<sup>28</sup>

The independent telephone interests resisted vigorously the acquisition policies of the Bell System, claiming violation of the antitrust laws. Complaint was made to the United States Department of Justice. After a series of conferences and communications, the Attorney General expressed an opinion on January 3, 1913, to the effect that certain proposed acquisitions by the American Co., if consummated, would be in violation of the Sherman antitrust law. Following the expression of the above opinion by the Attorney General, Mr. M. C. Kingsbury, vice president of the American Co., addressed a letter to the Attorney General under date of December 19, 1913, which outlined the proposed future policy of the Bell System with respect to the acquisition of independents. This letter has since been referred to as "The Kingsbury Commitment." Substantially, the Bell System agreed not to acquire, directly or indirectly, control over any competing company. It agreed to connect its system with other telephone systems for toll-service purposes provided the independent

<sup>25</sup> This policy had its inception in 1902, when the Baker-Morgan group first entered Bell System financial affairs. See exhibit 2000-F, pp. 100-109.

<sup>26</sup> See table 31, p. 128.

<sup>27</sup> *Ibid.*

<sup>28</sup> For complete development of this period see exhibit 2006-D, pp. 14-46.



company supplied standard trunk lines between its exchanges and the toll board of the nearest exchange of the Bell operating companies. It also agreed to, and did, dispose of its interest in the Western Union Telegraph Co., which it had acquired a short time previously.<sup>29</sup> The Kingsbury Commitment did not prevent acquisition of noncompeting telephone companies by the Bell System, but was generally understood to prevent acquisition of competing telephone companies until after January 1918, when it became generally understood that it was not a violation of The Kingsbury Commitment for the Bell System to acquire competing telephone stations, if at the same time the Bell System sold an equal or comparable number of Bell-owned stations to an independent. A typical transaction under this modification is the acquisition by Bell of the Federal Telephone & Telegraph Co. of Buffalo, N. Y., and the sale of the New York Telephone Co. stations in Jamestown and Rochester to the independent companies operating at these latter points. It appears, and it has been judicially determined, that the Bell Co., instead of selling its stations in Rochester to an independent, actually had and retained control of the company which purchased the New York Telephone Co. stations.<sup>30</sup> Table 35 below, which consists entirely of data supplied by the American Telephone & Telegraph Co., indicates the total number of stations purchased and sold by the Bell System during the period 1912-34, inclusive. It shows a total of 580,756 stations were purchased from, and 277,378 stations sold to, independents by the Bell System during the period when The Kingsbury Commitment was effective, 1914-21, inclusive, resulting in a net gain by purchase of 303,378 stations.

TABLE 35.—Stations purchased and sold by Bell System during the period 1912 to 1934, inclusive

Year	Number of stations purchased	Number of stations sold	Year	Number of stations purchased	Number of stations sold
(a)	(b)	(c)	(a)	(b)	(c)
1912.....	135,924	42,045	1925.....	137,482	45,540
1913.....	10,187	16,017	1926.....	15,009	11,419
1914.....	23,327	1,729	1927.....	207,640	4,976
1915.....	31,428	15,188	1928.....	45,022	1,053
1916.....	31,200	15,910	1929.....	64,234	12,120
1917.....	131,853	10,333	1930.....	163,959	9,847
1918.....	101,497	111,757	1931.....	15,784	348
1919.....	50,030	70,225	1932.....	67,062	35
1920.....	41,086	8,337	1933.....	1,741	57
1921.....	157,337	43,060	1934.....	2,005	116
1922.....	26,341	7,747			
1923.....	124,611	3,380	Total.....	1,090,077	443,357
1924.....	98,730	9,173			

Source: Statement prepared by American Telephone & Telegraph Co. and exhibit 2006-D, table V, p. 42.

NOTE.—The foregoing data include (1) for the years 1912 and 1913, purchases and sales of stations (presumably company stations) in connection with purchases of and sales of physical property; (2) for the years 1914 to 1927, inclusive, purchases and sales of company (for 1921, company and service) stations in connection with purchases and sales of "going or completed plant;" (3) for the year 1928, purchases and sales of company stations in connection with the purchase or sale of plant involving in any one transaction a consideration of \$10,000 or more and each purchase or sale involving an entire company or exchange regardless of amount involved; (4) for the years 1929 to 1934, inclusive, purchases and sales of company stations in connection with the purchase or sale of the entire property of a company, or where an entire exchange is involved, or where telephone plant is purchased or sold involving a consideration exceeding \$10,000 and the business handled over such plant is transferred by the selling company to the purchasing company. The foregoing data do not include (1) purchases and sales between Bell System companies; (2) purchases and sales by Bell-controlled companies from or to companies other than Bell associated companies; (3) corrections of reports of previous years and transactions reported in year following that in which consummated.

<sup>29</sup> The Western Union Incident is discussed in chapter 4.

<sup>30</sup> *Rochester Telephone Corporation*, 2 F. C. C. 476, and *Rochester Telephone Corporation v. U. S. et al.*, decided June 20, 1938 by the U. S. District Court for the Western District of New York.



## CHAPTER I

### CURRENT REGULATORY PROBLEMS

The concentration of the Nation's telephone business, and in particular of its interstate telephone business, in the hands of the Bell Telephone System is such that, whereas the problem of regulation is one of large magnitude, it is relatively simplified by reason of this very integration, as contrasted with the railroad, gas, electric-power, maritime, and motor-carrier fields of Federal regulatory effort. The fundamental problem underlying the provision of effective regulation in the interstate telephone field appears to consist largely of developing ways and means, as well as positive and effective machinery, for the continuous acquisition of the basic factual data, and of providing methods for the prompt and adequate digestion and analysis of such facts in such form and manner as to render Commission action thereon readily possible.

Analysis of the experience of numerous State commissions in connection with telephone regulation has disclosed that, whereas many States have given serious attention to such problems over a considerable period of years, they have at all times been seriously hampered in these efforts by the very organization of the Bell System, the parent corporation being beyond their jurisdiction, even from the fact-gathering viewpoint.

With the enactment of the Communications Act of 1934, however, the regulatory situation was radically altered. Concentration of authority over all phases of interstate telephone operations in this country in the Federal Communications Commission, under a broad statutory mandate, for the first time brought before a single regulatory body both the parent and the subsidiary entities of the Bell System's corporate pyramid, and for the first time made possible the adequate amassing of basic facts in relation to all phases of that system's Nation-wide operations. Ultimate facts not hitherto within the reach of the individual States are now obtainable through this Federal agency.

During the course of, and as an integral part of the telephone investigation, the Federal Communications Commission early in 1937 undertook to develop the fundamental data and background material relative to basic interstate telephone rate and regulatory problems, particularly as such issues are affected by Bell System methods and practices. Such action was motivated and necessitated by facts already developed by the investigation staff, and approximately 10 percent of the total appropriations of public moneys made available for this investigation by Congress was earmarked by the Commission and was used for the purposes of this specialized phase of the investigation. In this connection a "telephone rate and research department" of the investigation was established directly following the conclusion of the series of conferences between representatives of the Commission



mental studies being suggested.<sup>3</sup> The work of the Federal Communications Commission through this department was exploratory in character, the reports in question having been developed as preliminary studies in a complex field hitherto largely untouched by the operation of Federal administrative processes. While in no sense final, these reports and the other data accumulated by this department afford a background for future Commission action, and point the way toward the effective development of adequate and positive regulatory procedures in this highly specialized field.

Early in the investigation, it was noted that, whereas the Federal Government had as early as 1910 (by the Mann-Elkins Act, 36 Stat. 544) vested certain interstate telephone toll-rate authority in the Interstate Commerce Commission, such regulation had in practice proved largely nugatory partly by reason of the lack of an effective statutory mandate, but also because of a lack of "appropriations sufficient to carry on an investigation." Indeed, such was the conclusion of the Congressional Investigating Committee which reported on this situation in 1934. That committee had then reported that "at the present time there is little, if any, Federal regulation of the rates, practices, and charges of the several branches of the communications industry," but had added that:

The importance of the (telephone) industry calls for actual and not nominal regulation. Telephone business is a monopoly—it is supposed to be regulated. Thus far regulation, particularly by the Federal Government, has been nominal largely because Congress has not made appropriations sufficient to enable the Interstate Commerce Commission to give effect to existing statutes.<sup>4</sup>

From its establishment in 1934, the Federal Communications Commission has endeavored, to the extent that appropriations and personnel have been available, to develop methods and machinery in its regular staff departments for the continuous consideration of many of the legal, accounting, and engineering issues involved in interstate telephone regulation. For the first time in the country's history a complete set of interstate telephone toll tariffs has been brought together through company filings; many rate inconsistencies have been called to the attention of the operating companies and have been rectified; accounting procedures and systems have been promulgated; reports and data have been accumulated; jurisdictional issues have been heard and determined; applications for construction permits have been considered, and in general the work of actual interstate

<sup>3</sup> In this department's final report these matters were discussed under the following headings:

1. Fundamental legal problems involved in the regulation of interstate telephone rates.
2. The rate of return problem, with special reference to the return properly allowable to the long-lines department.
3. The problem of depreciation, both in connection with operating expenses, and as a factor in the rate base.
4. The structure of and the philosophy underlying existing Bell System toll rates and practices.
5. The problem of separation of property, revenue, and expense.
6. The problem of divisions of toll revenue, where 2 or more companies participate in furnishing toll service.
7. The problem of securing greater uniformity in Bell System interstate telephone rate schedules.
8. The license contract problem, with special reference to servicing charges made against the long lines department of the American Telephone & Telegraph Co.
9. The problem of Western Electric Co. costs and prices.
10. Detailed telephone rate studies, including stimulation factors in connection with rate adjustments, and types of potential rate adjustments.
11. Interstate telephone toll operating data and results, including the problem of long-lines rental payments.

<sup>4</sup> See Preliminary Report on Communications Companies (H. Rept. No. 1273, 73d Cong. 2d sess. 1934) submitted pursuant to H. Res. 59, 72d Cong., 1st sess. (1932), and H. J. Res. 572, 72d Cong., 2d sess. (1933), commonly referred to as the "Splawn Report."



## CHAPTER II

### SUMMARY AND FINDINGS

#### **Corporate History of the Bell System.**

The history of the corporate development of the Bell System commenced with the ownership of basic or essential telephone patents by the parent company, acting first as licensor under such patents, and later also as owner of companies furnishing telephone service. The first licensees were, in general, individuals, partnerships, or companies, independent of the licensor, financed by interests local to the community in which they were licensed to furnish telephone service. The licenses were granted originally for a limited period, usually 5 years, and the licensor obtained an option to take over the licensee's business under conditions specified in the license. In 1882 the parent company adopted the policy of exchanging the short-term licenses for permanent licenses, receiving a substantial stock interest in the licensees as a consideration, thereby obtaining a vested interest in the business of furnishing telephone service as distinguished from its previous position as merely a licensor under patents. The interest in the operating companies acquired by the parent company under the provisions of the permanent license was increased through various means, including outright purchase of stock, in addition to the exercise of its preemptive rights. The present associated companies of the Bell System, usually covering entire States or groups of States, are the result of many mergers and consolidations in which the parent company of the Bell System consistently followed the policy of increasing its interest in the business of furnishing telephone service. The parent company has always reserved to itself that part of the operating telephone business relating to the furnishing of long-distance telephone service connecting the territories of the various licensees. Throughout the history of the Bell System the changing corporate structures have involved a parent company, subsidiaries, and subsidiaries of subsidiaries, but in general the practice of pyramiding securities of the various companies, as practiced by certain other utilities, has not been indulged in.

In 1881 the American Bell Telephone Co. acquired control of the reorganized Western Electric Manufacturing Co. for the announced purpose of assuring itself of a dependable source of supply of telephones and telephonic appliances. The reorganized company, Western Electric Co., and its successor, have continued as the manufacturing and supply department of the Bell System since that time. There are a number of subsidiary companies within the Bell System organized for the purpose of carrying on various activities; such as Bell Telephone Laboratories for research and development work; Electrical Research Products, Inc., for the exploitation of byproducts of research and development; and other corporations organized to hold



was completed with the management reorganization in 1907 which has been self-perpetuating since that date.

Management control of the associated companies by the officers of the American Telephone & Telegraph Co. has been made effective through written instructions, recommendations, and suggestions covering methods and practices, which are accepted as orders by the associated companies. The centralized management exercised by the general department of the American Co. controls the cost of property and operating costs of the Bell System operating companies to an extent which makes it extremely difficult for State Commissions to obtain a valid measure of the reasonable cost of telephone service. This American Telephone & Telegraph Co. management controls the prices of telephone apparatus and equipment purchased by the operating subsidiaries through its ownership of the Western Electric Co.; it controls changes in operating plant through joint ownership with Western of the system's technical unit, the Bell Telephone Laboratories; and it controls plant construction costs and operating expenses of the local companies through selection and standardization of plant construction and maintenance practices, traffic operating methods, commercial forecasts and long-range planning, and depreciation charges included in operating expenses. Because of this centralized management, effective State regulation cannot be accomplished by reliance entirely on records of the associated companies, but involves examination of the records of the American Co., Western Electric, and Bell Telephone Laboratories, with respect to which State jurisdiction is limited. Hence effective regulation can be accomplished only by cooperative effort of State commissions and the Federal Communications Commission.

#### **Elimination of Competition.**

The Bell System has consistently pursued the policy of obtaining control of a Nation-wide unified telephone system. Since its inception the watchword has been "One System, One Policy, Universal Service." In achieving its present dominant position, the Bell System has been successful in the elimination of effective competition. There is today no competition, worthy of the name from the Nation-wide standpoint, with the unified Bell System.

The Bell System dominance in the telephone field was first threatened by the Western Union Telegraph Co., which owned control of patents under which it developed commercial telephone service in a large number of communities, in many cases in competition with Bell licensees. This threat was eliminated through the execution of the 1879 agreement between the National Bell Telephone Co. and the Western Union group.

During the period subsequent to the execution of the agreement with the Western Union Co. in 1879, and prior to the expiration of the basic Bell patents in 1893 and 1894, the Bell System enjoyed a monopoly in the telephone communications field due to its patent position. During this period attempts to compete with the Bell System were met with infringement suits, in which the Bell System was the successful party. With the expiration of the basic Bell patents in 1894 competition became active and by 1907 the number of independently owned telephones had reached almost 2,987,000, substantially equal to 3,132,000 stations then owned by the Bell System.



## CHAPTER III

### CONCLUSIONS AND RECOMMENDATIONS

Although the telephone business of the United States is today, and at all times since the invention of the telephone has been, almost exclusively private in ownership, it has been recognized from its inception to be a business peculiarly affected with a public interest. The necessary attributes of so-called natural monopoly which ordinarily attend efficient and economical telephone service; the intimate relation of such service to social well-being, both local and national; the nature of telephone service as a fundamental necessity of modern living; and the public interest in the progressive development of increasingly effective and economical communication facilities are all factors which disclose the underlying character of this business as an essential public utility—entitled in the interest of its patrons to reasonable protection from wasteful competition, and entitled to make reasonable charges for its service, but subject to public scrutiny, regulation, and control, to the end that adequate service, equal treatment, and reasonable and nondiscriminatory rates may be assured to all who may apply. The importance of the telephone industry and the magnitude of telephone operations demand actual and not nominal regulation. A coherent and constructive program of regulation must be developed and placed in operation in order to protect the interests of the public. This imposes upon the public authorities a responsibility of prime importance.

The concentration of by far the greater proportion of telephone assets and facilities in this country in the hands of the Bell Telephone System, and the high degree of management unification and control attained by that corporate aggregate, has rendered it necessary for both the users of telephone service and the public agencies created to regulate such service to concern themselves largely (in the interstate field almost wholly) with that unified and dominating agency. The efforts of individual States to ascertain many of the basic facts necessary for effective telephone rate and service regulation within their borders have at all times been hampered and have frequently been rendered largely nugatory by reason of their necessarily limited jurisdiction, many essential elements of Bell System organization and practice being beyond their control. It is apparent that only a Federal administrative agency, equipped with broad regulatory and investigatory powers over both the parent and the subsidiary units of the Nation-wide Bell System, may hope effectively to develop and keep currently available the extensive factual background upon which any adequate and informed regulatory process must rest in respect to the American telephone industry.

Although the regulation of exchange and intrastate toll operations was commenced by State and local authorities soon after the inven-



tion of the telephone, and although such regulation has developed and expanded over the years until a relatively large body of law and administrative precedent today surrounds these operations, in the sphere of interstate telephone service no attempt to initiate public regulatory activity was made prior to the passage in 1910 of the Mann-Elkins Act (36 Stats. 544), under which certain limited jurisdiction was vested in the Interstate Commerce Commission. That body in 1913 prescribed a uniform system of accounts to be kept by telephone companies, but whether by reason of lack of sufficient funds, or of an effective statutory mandate, the Interstate Commerce Commission did not find it practicable to engage in positive rate and service regulation, with the result that in 1934 the special congressional committee which investigated communication problems reported that "at the present time there is little, if any, Federal regulation of the rates, practices, and charges of the several branches of the communications industry"; and later in the same report declared:

The American people are entitled to know if they are being overcharged for this service, though they may be satisfied with the quality of the service \* \* \*. The importance of the industry and the magnitude of its operations call for actual and not nominal regulation. Telephone business is a monopoly—it is supposed to be regulated. Thus far regulation, particularly by the Federal Government, has been nominal largely because Congress has not made appropriations sufficient to enable the Interstate Commerce Commission to give effect to existing statutes.<sup>1</sup>

The filing of the report just quoted was shortly followed by the enactment of the Communications Act of 1934, under which, among other things, the telephone regulatory powers of the Interstate Commerce Commission were transferred to the new Federal Communications Commission and were amplified to vest in this administrative agency much more comprehensive authority over interstate telephone rates and service. On March 15, 1935, by Public Resolution No. 8 of the Seventy-fourth Congress (49 Stat. 43), the Federal Communications Commission was authorized and directed to "investigate and report on the American Telephone & Telegraph Co. and all other companies engaged directly or indirectly in telephone communication in interstate commerce, including all companies related to any of these companies through a holding company structure or otherwise \* \* \* in aid of legislation by the Congress and for the use of governmental agencies, including State regulatory commissions, for the information of the general public, as an aid in providing more effective rate regulation, and for other purposes in the public interest."

The mandate contained in this congressional resolution has now been complied with. An extensive investigation and survey of the telephone business of the United States and particularly of the so-called Bell Telephone System, has been completed by this Commission, and the foregoing report outlines the more noteworthy facts gathered during that investigation, together with certain conclusions which have been drawn from those facts. It is believed that the data contained in this report, as summarized in these conclusions, presents for the first time for the use of Congress and American people a fully rounded and inclusive picture of this history, development, magnitude, present status, and operating practices of the telephone

<sup>1</sup> Preliminary Report on Communication Companies (H. Rept. 1273, 73d Cong., 2d sess. 1934), submitted on April 18, 1934, pursuant to H. Res. 59, 72d Cong., 1st sess. (1934), and H. J. Res. 572, 72d Cong. (1933), the so-called Splawn Report.



industry in this country, with particular reference to the unified group of corporate agencies which dominate that industry. Moreover, the cost to the public of the telephone investigation, totaling \$1,500,000, may fairly be compared to concrete monetary savings to the public in telephone rates now aggregating considerably in excess of \$30,000,000, directly resulting from the efforts of this Commission in this investigation—not to mention additional rate adjustments of equal volume which have been at least largely caused by the pendency of the investigation, and also not to mention the fund of experience and the background of basic factual data which has resulted from the carrying out by this Commission of the mandate of Congress under Public Resolution No. 8.

The telephone industry of the United States renders an essential public service which, by reason of its very nature, is not only subject to but definitely requires regulation by public authority. It is today a \$6,000,000,000 industry. The development of the Bell Telephone System has resulted in the concentration in the hands of a single corporate aggregate of by far the greater portion of the telephone service, equipment, and facilities of the Nation, a concentration which in the interstate telephone field is well-nigh absolute. While this high integration of the entities to be regulated simplifies to a marked degree the problem of regulation in the field, both local and national, it likewise imposes upon the regulatory authorities an unusual responsibility in one of the most difficult and complex fields of governmental effort.

Indeed, the report here offered to the Congress discloses that the public authorities, particularly those which have to do with interstate telephone operations, are faced with a problem of no small moment even in respect to the creation and development of underlying regulatory machinery. However, the investigation conducted under the mandate of Public Resolution No. 8 has resulted in the development and analysis of a large and important fund of data, and in the production of a background of fundamental experience upon which it is believed that adequate future regulation of interstate telephone operations may successfully be founded, and in connection with which positive cooperation may be afforded to the various State regulatory authorities. The possibility of developing sound regulatory processes in this general field may fairly be said to have been demonstrated.

It is fundamental that the administrative process must be so developed as to fill the need of the occasion for expertness. In the highly technical field of telephone rate and service regulation this fact is of peculiar import. Only if it be fortified with an adequate staff, continuously employed solely in the exploration of these problems, can any agency hope to develop the sound, positive, and effective regulatory methods which are requisite. Indeed, it has become obvious that the experience, expertness, and continuity of management attained by the American telephone industry must be matched to the highest practicable degree by equivalent experience, expertness, and continuity of supervision on the part of the representatives of the public, if the regulatory process is to become even measurably successful in this technical and highly specialized field of interstate public administration. This means that a staff of adequately trained experts must be developed with specific responsibility in connection with



wire-communication problems, consistent with the declared purposes of the Communications Act of 1934:

To make available, so far as possible, to all the people of the United States a rapid, efficient, Nation-wide, and world-wide wire \* \* \* communication service with adequate facilities at reasonable charges \* \* \*.

The earning power disclosed by the major elements of the American telephone industry, even in the teeth of the country's most severe economic depression, discloses that the saturation point is as yet far from reached in this sphere of communication activity. Maintenance and improvement of the quality of service which has already been attained in respect to most phases of this service is important, and the public is entitled to know whether repeated company claims that such service is being rendered at the lowest possible rates consistent with the maintenance of adequate service are in fact justified. The accomplishment of these ends will require a program of constant effort and a policy of persistent exploration in a rapidly changing field. The fundamental problem consists in the development of adequate machinery for the continuous provisions, effective analysis, and prompt publication of the underlying facts. Experience over the years demonstrates that under existing conditions in the telephone industry this result cannot be brought about in the most effective manner except through a Federal administrative agency armed with broad powers of investigation, equipped with a staff of high caliber, training, and capacity, and prepared not only to carry forward positive regulatory effort in the interstate sphere, but also to afford the States with access to those facts which they today frequently find themselves unable satisfactorily to obtain. So long as the Bell System continues to be organized upon its present basis the individual States must continue to look to the Federal regulatory agency to afford them with many elements of the essential factual background of telephone regulation. Not only, therefore, is an adequately staffed and properly organized Federal regulatory agency important in itself, but there is need for such a body to act in some measure as a cooperating agency with the States. Only through such a program may the public authorities of both the Nation and the States be enabled to cope with this complex situation, and only thus may assurance be had that the public moneys which have been expended on the telephone investigation may find full fruition.

Numerous specific issues which must be faced have been discussed at length in the foregoing report. Certain of these are common to all public utility regulation, others are peculiar to the telephone business, while still others stem from the particular organization and operating practices of the Bell Telephone System. Among the more important of the issues thus to be faced in connection with active and positive telephone regulation may be mentioned the problem of developing an effective method of determining the reasonableness of the costs and prices of telephone apparatus, equipment, and supplies whenever the manufacturer or supplier and the operating company are under common control or ownership; the question of the proper separation or allocation of property, expense, and revenue as between different types and classes of telephone service and of the simplification of existing allocation procedures; the problem of determining just and equitable divisions as between the various entities which render the component parts of certain phases of this service;



the problem of effectively meeting the issue of Bell System license-contract charges as well as other intercompany transactions and agreements; and the problem of developing processes and machinery of an accounting nature which will enable the public authorities to keep at all times fully abreast of progress in this business, and to determine continuously and with accuracy the reasonableness of particular rates and charges.

Examination of the Communications Act of 1934, in the light of the issues thus presented, as well as of the other problems discussed in the foregoing report, discloses that a general frame work of statutory authority has been provided for the regulatory efforts of this Commission in the telephone field. This does not mean that additional or amendatory legislation will not be required, in order, as the need arises, to expand and clarify the authority vested in this body.

It is at this time deemed necessary and desirable to recommend the following amendments to the act in question:

First, specifically to authorize this Commission to prescribe basic cost-accounting methods to be followed by manufacturing companies under contract with operating telephone companies for the general supplying of materials or equipment, and by manufacturing companies subsidiary to or affiliated with operating telephone companies through corporate structure.

Second, to require approval by this Commission for, and as a condition precedent to, the issuance or refunding of any securities of corporations which offer telephone service subject to this Commission's jurisdiction.

Third, amend section 201 (a) of the Communications Act to clarify this Commission's jurisdiction over the division of joint interstate rates per se. As the section stands it might be contended that the jurisdiction of the Commission is limited in this connection to those instances wherein a physical connection has been ordered by the Commission.

Fourth, amend section 202 (b) so as to make it clear by specific language rather than by implication that practices, classifications, regulations, and facilities, as well as services and charges, in connection with the use of wires in chain broadcasting shall be subject to regulation by this Commission and so that this section of the act will correspond to the preceding half of the section, 202 (a).

Fifth, amend section 214 (a) of the act to prohibit the abandonment of any interstate line operated by any carrier subject to the act without authorization from this Commission.

Sixth, amend section 221 (a) so as to make the application for consolidations of telephone companies subject to the act mandatory.

Seventh, amend section 221 (a) so as to require approval by the Commission of all acquisitions by one company of the stock or voting stock of another company for purposes of control.

Eighth, in the event of the refusal of any common-carrier utility engaged in interstate communications to license others upon reasonable terms under any patents obtained in connection with communication service to the general public as a common-carrier utility, the Commission should be empowered, upon the application of parties so refused, to order the issuance of such license; provided that the granting thereof will not be detrimental to the communication service rendered by the utility holding such patents and not detrimental to technical progress.

Ninth, it is suggested that the Congress give consideration to the question of assessing the cost of regulation against the industry to be regulated.

The instituting of an active program of telephone regulation need not await the enactment of further laws by the Congress. From time to time we shall be impelled to request of the Congress additional legislation either declaratory in character of the intent of Congress or expressly granting additional regulatory powers to this Commission. The telephone investigation, however, has provided the Commission with basic data to serve as the foundation for the inauguration and development of continuous and efficient administrative processes in the highly technical field of telephone regulation. It must be noted



that the development of effective regulatory process consistent with the magnitude of this general problem and with the statutory responsibilities already vested in this Commission will require the provision of funds sufficient to enable the Commission to meet the exigencies of the situation and the need for expertness of legal, accounting, engineering, statistical, and certain related branches of regulatory technique. The exploratory efforts put forth during the course of the telephone investigation afford a basis of experience upon which it is possible with assurance to predicate estimates of the amounts required to accomplish these purposes and certain concrete suggestions in this direction will be made the subject of a separate communication from this Commission to the Congress.

Finally, the telephone investigation conducted by the Federal Communications Commission in response to the mandate expressed in Public Resolution No. 8 has served effectively to disclose the nature and magnitude of the telephone industry and of basic telephone-regulatory problems in this country. Through the investigation this Commission has been enabled to bring together for the first time an impressive volume of data in respect to such problems—data both fundamental in import and of permanent value, and which, but for this investigation, would have had to be provided by some other means or agency before effective interstate telephone regulation could be inaugurated. During the course of the investigation, and as a result of the direct efforts of the investigatory staff, telephone-rate reductions now aggregating in excess of \$30,000,000 were effected in the interest and for the benefit of the American telephone-using public. In addition, the extent of the problem of future effective interstate telephone rate and service regulation has been thoroughly explored, and the possibilities of cooperation with State regulatory authorities have been canvassed. With the minor exceptions already noted, this Commission is deemed now to be possessed of inclusive statutory authority and, as a direct result of the telephone investigation, to be provided with basic data sufficient to serve as a firm foundation for the inauguration and development of continuous and efficient administrative processes in this highly technical field of governmental effort.

The actual development of such administration is conditioned upon the provision of funds sufficient to make possible the placing in effect by this Commission of such a program, in continuation of efforts begun during the progress of the telephone investigation and in aid of the interest and requirements of the Nation's telephone users.

Respectfully submitted.

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