Jackie Neff
June 16, 2007

Dip in Radio Sales from 1926-1927

Despite surrounding years of growth, the market experienced a sharp dip in radio sales between 1926 and 1927.[1] Though potential causes are many, the most likely motivator was a court's decision in 1926 determining that Hoover, Secretary of Commerce at the time, had exceeded his authority in restricting Zenith Corporation's ability to broadcast under a valid license.[2] The court held that, although Congress had empowered the Secretary to oversee license applications through the Radio Act of 1912, the Act did not grant Hoover discretionary authority to regulate license use.[3] Rather, the Act alone enumerated applicable regulations, and Hoover could not specify additional wave-length and broadcasting time restrictions as he had been doing.[4]

Under legal and political pressure, Hoover took a laissez-faire approach for the following year.[5] Congress was reviewing several regulatory proposals.[6] In the meantime, Hoover attempted to encourage self-regulation among licensees.[7] Rather than spontaneous order, the result was "chaos in the airwaves as the radio stations arbitrarily increased power, shifted frequency and started up without licenses."[8]

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[1] ??
[2] *U.S. v. Zenith Corp.*, 12 F.2d 614 (D.C.. Ill. 1926). This case was preceded by *Hoover v. Intercity Radio Company*, 286 Fed. 1003 (D.C. 1921), which held that the Secretary of Commerce had no discretionary authority to refuse a broadcasting license.
[3] *Zenith, supra,* note 1 at 618.
[4] *Id.* at 617.
[5] Hugh G.J. Aiken, *Allocating the Spectrum: The Origins of Radio Regulation*, 34 Tech. and Culture 686, 705 (Oct. 1994).
[6] *Id.*
[7] *Id.*
[8] Peter M. Lewis and Jerry Booth, *The Invisible Medium: Public Commercial and Community Radio* 40 (Howard Univ. Pres 1990); *See also supra*, note 5 at 706.

Due to the intolerable interference, consumers were wary of purchasing radios. There was no guarantee that any amount of tuning would result in consistent programming. During this period, more than two hundred new stations began broadcasting.[9] In 1927, the FRC (Federal Radio Commission) was created, regulations soon followed, and order resumed.[10] Consumers were reassured, and sales once again continued to rise.[11]

Were there important advances in radio receiver design that further helped tune out interference?

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[9] *Supra*, note 5 at 706.
[10] *Id.*; *See also* Frederic P. Lee, *Federal Radio Regulation*, 142 Annals of the American Academy of Political Science, Supp.: Radio 36, 39 (Mar. 1929).
[11] ?

Jackie Neff
July 5, 2007

Responses to Follow-Up Questions on Radio Memos

Q: In 1927 were there were any important advances in radio receiver design that further helped tune out interference?

A:

I was unable to discover any "significant" 1927 inventions deterring interference in radio communication. I did find two patents issued on devices with at least a partial purpose of blocking wireless interference.[1] However, neither the patents nor the devices were ever mentioned in any of the many articles I read on point.[2] The general consensus appears to be that the Radio Act of 1927 was responsible for the diffusion of interference rather than technological advance.[3] Additionally, there was scarcely any mention at all in any of this or any other literature surveyed that mentioned either of these or any 1920's inventions addressing interference. This leads me to believe that the inventions were not terribly significant and did not have a great impact on the functioning of the wireless system.

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[1] Signaling System, U.S. Patent No. 1637404 (filed March 12, 1921)(issued Aug. 2, 1927); Wireless Receiving System, U.S. Patent No. 1633932 (filed April 26, 1923)(issued June 28, 1927).

[2] *See* Hugh G.J. Aiken, *Allocating the Spectrum: The Origins of Radio Regulation*, 34 Tech. and Culture 686, 705-08 (Oct. 1994); W. Jefferson Davis, *The Radio Act of 1927*, 13 Va. L. Rev. 611, 612-13 (Jun. 1927); Frederic P. Lee, *Federal Radio Regulation*, 142 Annals Am. Acad. Pol. & Soc. Sci., Supp.: Radio 36, 39 (Mar. 1929); Peter M. Lewis and Jerry Booth, *The Invisible Medium: Public Commercial and Community Radio* 40 (Howard Univ. Pres 1990); Jora R. Minasian, *The Political Economy of Broadcasting in the 1920's*, 12 J. L. & Econ. 391, 400-03 (Oct. 1969); N.C.B., *Radio Broadcasting Under the Act of 1927: Status of Operators Licensed Under the Act of 1912*, 28 Mich. L. Rev 1032, 1035 (Jun. 1930); Hugh Richard Slotten, *Radio Engineers, the Federal Radio Commission, and the Social Shaping of Broadcast Technology, Creating "Radio Paradise,"* 36 Tech. & Cult.950, 953-57 (Oct. 1995); J. Willihnganz, *Debating Mass Communication During the Rise and Fall of the International Economy* 4-7, A White Paper, Univ. Cal. Berkely (1994).

[3] *See id.*

Q: What happened after Crosley "had become the world's largest radio seller?" How long did Crosley's business thrive? Please explain Crosley's "efforts in high-power radio broadcasting," "Cincinnati," and "WLW"?

A: Intending to propel his success further, Crosley built his own transmitter in his home and procured a license from the Secretary of Commerce, Herbert Hoover on July 1, 1921.[4] He commenced merely by playing the same record over and over in his "studio" with intermittent advertisements for Crosley's forthcoming radio set.[5] These amateur advertisements propelled Crosely Manufacturing into the limelight as the number one radio producer in the world by 1922.[6] Although faced with increased competition, the radio giant was still the fifth largest manufacturer of radio sets in 1954 and would remain a major industry player for the next thirty years.[7]

Verifying that his broadcasts were heard over the airwaves, Crosley began playing a variety of music and programs.[8] However, the chaotic airwave mess mentioned above was commencing as more and more amateurs tried their hands at broadcasting.[9] In 1922, Hoover ordered individual amateurs to cease all broadcasting and in response, Crosley applied for a commercial license.[10] Crosley Manufacturing began broadcasting under the name "WLW."[11]

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[4] Rusty McClure et al., *Crosley: Two Brothers and a Business Empire that Transformed the Nation* 129 (2006).
[5] *Id* at 129-30.
[6] Lawrence W. Lichty, *WLW*, 3 Museum of Broadcasting Communications Encyclopedia of Radio 1538, 1539 (2004).
[7] Lawrence W. Lichty, *Crosley, Powel: 1886-1961, U.S. Inventor, Manufacturer and Broadcaster*, 1 Museum of Broadcast Communications and Radio 420, 421-22 (2004).
[8] *Id.*
[9] *Supra*, note 4 at 135.
[10] *Id.* at 136.
[11] *Id.*

Crosely's success in the sale of radios continued to improve as he used WLW as an advertising outlet.[12] Although WLW enjoyed wide listenership, its success was essentially restricted to the Cincinnati area because Crosley's mass production was based upon an inexpensive less sensitive radio receiver.[13] To disseminate his programs further, Crosley increased WLW's power to 500 Watts in 1923 and to 1,000 Watts in 1924.[14] When the FRC began intensely regulating licensing in 1927, Crosley applied for a high power license.[15] The FRC assigned the 700 KHz band exclusively to Crosely, rendering WLW a "clear channel" station.[16] WLW continued to expand and the FRC authorized the station to broadcast at 50 Kilowatts in 1928.[17]

In 1932, Crosley Broadcasting Co. argued to the FRC (Federal Radio Commission), that a license grant for transmission at a higher power level would lead to more penetration of rural areas.[18] On the basis of this contention, the FRC conditionally approved a ten month experimental license for an additional 500 kilowatts of power to Crosley on April 17, 1934.[19] As of 1937, the company was the first and only station broadcasting at this high-power level.[20] Although other stations caught on and began high-power broadcasts, WLW maintained its market domination through its quality programming, consistently rated higher by listeners than other high power stations.[21]

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[12] *Supra*, note 6; *supra*, note 4 at 136.
[13] *Supra*, note 6.
[14] *Id.*
[15] *Id.*
[16] *Id.*
[17] *Id.*
[18] Jeffrey H. Smulyan, *Power to Some People: The FCC's Clear Channel Allocation Policy*, 44 S. Cal. L. Rev. 811, 822 (1970-71).
[19] *Id.*
[20] *Id.*; O.W. Riegel, *New Frontiers in Radio*, 1 Pub. Opinion Q. 136, 139 (Jan. 1937).
[21] *Supra*, note 6 at 1540.

However, the wide-ranging broadcasts interfered with Canadian broadcasts leading the now FCC to warn Crosley that its license would not be renewed upon expiration.[22] Persistent in its desire to continue broadcasting at high-power, the company created a "directionalized antenna" that reduced interference to a level deemed acceptable by the FCC and was allowed to continue superpower broadcasts.[23] In 1939 political concerns surfaced and the FCC revoked Crosley's high-power license.[24] The Commission however gave a relatively opaque reason for denying renewal noting that the use of high-power did not result in "any substantial contribution to the radio art" and the "public interest convenience and necessity will not be served by the granting of the application."[25] Crosely appealed the decision, but the case was dismissed on the grounds that the "experimental license" amounted to a contractual agreement revocable at will by the Commission.[26] It is generally seen as an anti-monopolistic tactic to quash Crosley's overreaching market influence.[27] Despite this setback, WLW went on to found Mutual Broadcasting System, and to engage in short wave radio.[28]

In 1934, Crosley purchased a controlling share of the Cincinnati Reds baseball team in order to keep them from fleeing the city.[29] The Reds' playing field still holds the name Crosley Field.[30] Crosley led the team from a financial slump following the Great

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[22] *Id.*
[23] *Id.*
[24] *Id.*
[25] *Report of Committee on WLW's Application for Renewal of Experimental Authority*, 3 Fed. Comm. B.J. 5 (1938-1939).
[26] Harry P. Warner, *Subjective Judicial Review of the Federal Communications Commission*, 38 Mich. L. Rev. 632, 662 (Mar. 1940); *Crosley Corp. v. FCC,* 106 F.2d 833 (App. D. C. 1939).
[27] *Supra*, note 6.
[28] *Supra*, note 7 at 422.
[29] *Supra*, note 4 at 279; Barry M. Horstman, *Powel Crosley, Jr.: Innovator, Sportsman Dreamed Big*, Cincinnati Post (Apr. 18, 1999), available at http://www.cincypost.com/living/1999/pcros040999.html
[30] Horstman, *supra* note 29.

Depression to economic success by implementing night games.[31] WLW aired Cincinnati games while continuing to expand its programming to include country music and new talk shows.[32] These and other programs initially earned WLW the title "The Nation's Station" and later "Cradle of the Stars."[33]

The government confiscated the station in 1942 to broadcast wartime propaganda.[34] Post-war, however, WLW reclaimed its glory and continued to adapt to market demands as FM radio was introduced.[35] Its adaptability has led it to remain in the top twenty "full service radio stations," in the United States.[36]

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[31] *Supra*, note 4 at 289-98.
[32] *Id.* at 301-04.
[33] *Id.*
[34] *Supra*, note 6 at 1540.
[35] *Id.*
[36] *Id.* at 1541.

To: Clay T. Whitehead; Susan Burgess
From: Wendell Bartnick
Date: May 20, 2007
Re: Radio Manufacturing Industry

Question

Did the creation of the Federal Radio Commission ("FRC") result in dramatic changes to the spectrum assignments that existed before its creation?

Answer

Not really, when the FRC was created, "it immediately grandfathered rights for major broadcasters, while eliminating marginal competitors and all new entry. . . . The FRC restored order out of chaos by ordering stations to 'return to their [original Commerce Department] assignments'"[1] The FRC decided not to widen the existing broadcasting band.[2] The FRC also adopted the same standards, (e.g. priority-in-use rights), for determining which entities got which frequencies and power levels as the DOC used before the FRC was created.[3] However, the FRC did thin out some spectrum use by failing to renew 83 broadcast licenses in July 1927 and gave reduced power and time assignments to nonprofit organizations.[4] Basically the 1927 Radio Act cemented what was occurring before the legislation by creating the mechanisms to assure commercial broadcasters dominance of broadcasting.[5]

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[1] Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast System*, 33 J.L. & ECON. 133, 154 (1990).
[2] *Id.* at 155.
[3] *Id.* at 166.
[4] *Id.* at 167.
[5] *Id.* at 173.

To: Clay T. Whitehead; Susan Burgess
From: Wendell Bartnick
Date: May 27, 2007
Re: Radio Manufacturing Industry

Question

After the Davis Amendment, did the Federal Radio Commission assign any licenses to entities for a future station?

Answer

Yes, General Order 40 appears to have given construction permits to two new stations, listed in Table 1. It also gave permits to some existing stations allowing them to broadcast with more power and those stations are listed in Table 2. Finally, Table 3 shows the much larger number of construction permits given to stations in the year prior to General Order 40, most of which had been built-out during that year.

After General Order 40

Table 1
The following stations have construction permits on September 10, 1928 pursuant to General Order 40. However, these stations did not exist before this time.

Location	Station	Permit Power	Frequency
PA, Philadelphia	WCAU	5000	1170
WV, Clarksburg	WOBU	65	1200

Table 2
The following stations were in existence when General Order 40 was announced on September 10, 1928 but were issued construction permits allowing them to broadcast with more power pursuant to General Order 40. [1]

Location	Station	Power	Permit Power	Frequency
AL, Auburn	WJAX	1000	5000	1140
AR, Hot Springs	WBAP	1000	5000	800
CA, LA	KFI	5,000	50,000	640
CT, Hartford	WBAL	500	50,000	1060
GA, Atlanta	WSB	1000	5000	740
KY, Louisville	WHAS	5,000	10,000	1020
LA, New Orleans	WWL	500	5000	850
NC, Charlotte	WBT	5,000	10,000	1080
NC, Raleigh	WPTF	5,000	10,000	1080

[1] 1928 Fed. Radio Comm'n 2d Ann. Rep. Appendix G (1) at 170-91, *available at* http://www.fcc.gov/mb/audio/decdoc/annual_reports.html.

TX, Dallas	KRLD	5,000	10,000	1040
TX, Dallas (part-time)	WFAA	5,000	50,000	1040
TX, Fort Worth	WBAP	5,000	50,000	800
UT, Salt Lake City	KSL	1130	5000	1130
VA, Richmond	WRVA	1000	5000	1110
WV, Wheeling	WWVA	250	5000	1020

Prior to General Order 40

Table 3

List of construction permits granted to broadcasting stations between July 1, 1927 and June 30, 1928. (before General Order 40)[2]

Zone	Location	Station	Permit Power	Frequency
1	NH, Manchester	WRBH	500	TBD
1	NY, Saranac Lake	WNBZ	10	1290
2	WV, Clarksburg	WQBJ	65	1250
2	VA, Roanoke	WRBX	1000	TBD
2	OH, Shelby (deleted soon after since this was portable)	WOBR	10	1470
3	FL, Tampa	WQBA	250	
3	AR, Little Rock	KGHI	15	1150
3	TX, Georgetown	KGKL	100	1290
3	TX, Goldthwaite	KGKB	50	1070
3	AR, Little Rock	KGJF	250	1080
3	TX, Richmond	KGHX	50	TBD
3	MS, Gulfport	WGCM	15	1350
3	TX, Wichita Falls	KGKO	250	TBD
3	MS, Utica	WQBC	100	1390
3	GA, Tifton	WRBI	20	1350
3	TX, Breckenridge	KFYO	15	1420
3	NC, Gastonia	WRBU	50	TBD
3	AR, McGehee	KGHG	50	TBD
3	GA, Columbus	WRBL	50	1170
3	SC, Columbia	WRBW	15	TBD
3	MS, Greenville	WRBQ	100	1090
3	TN, Union City	WOBT	15	1460
3	NC, Wilmington	WRBT	50	1320
3	MS, Hattiesburg	WRBJ	10	1200
3	TX, El Paso	KGHO	50	
4	SD, Pierre	KGFX	200	1180

[2] *Id.* at Appendix D (2) – D (3) 84-100.

5	MT, Billings	KGHL	250	1350
5	CO, Pueblo	KGHF	250	1430
5	MT, Missoula	KGHD	5	1290
5	CA, Inglewood	KGGM	100	
5	HI, Honolulu	KGHB	250	1320
5	CO, Pueblo	KGHA	500	1430

To: Clay T. Whitehead; Susan Burgess
From: Wendell Bartnick
Date: June 11, 2007
Re: Effects of Federal Radio Commission Creation

Question

Did the creation of the Federal Radio Commission ("FRC") result in dramatic changes to the spectrum assignments that existed before its creation?

Answer

Not really, when the FRC was created, "it immediately grandfathered rights for major broadcasters, while eliminating marginal competitors and all new entry. . . . The FRC restored order out of chaos by ordering stations to 'return to their [original Commerce Department] assignments.'"[1] The FRC decided not to widen the existing broadcasting band.[2] The FRC also adopted the same standards, (e.g. priority-in-use rights), for determining which entities got which frequencies and power levels as the DOC used before the FRC was created.[3] Initially, the FRC simply moved stations from congested to less congested areas rather than reduce the number of stations.[4] However, later the FRC thinned out spectrum use by failing to renew 83 broadcast licenses in July 1927 and gave reduced power and time assignments to nonprofit organizations.[5] Basically the 1927 Radio Act cemented what was occurring before the legislation by creating the mechanisms to assure commercial broadcasters dominance of broadcasting.[6]

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[1] Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast System*, 33 J.L. & ECON. 133, 154 (1990).
[2] *Id.* at 155.
[3] *Id.* at 166.
[4] Fritz Messere, The Davis Amendment and the Federal Radio Act of 1927: Evaluating External Pressures in Policymaking 5, http://www.oswego.edu/~messere/DavisAmend.pdf.
[5] Hazlett, *supra* note 1, at 167.
[6] *Id.* at 173.

To: Clay T. Whitehead; Susan Burgess
From: Wendell Bartnick
Date: June 11, 2007
Re: Effects on Stations after Davis Amendment and General Order 40 reallocation

Question

Did the Federal Radio Commission/Federal Communications Commission respond to the Davis Amendment by adding more stations in the South and West while removing stations outside the South and West?

Answer

Partially, yes, many stations in the North and Midwest were terminated, but most of these were smaller non-profit stations. The Davis Amendment, passed in 1928, ordered the FRC to allocate a roughly equal number of broadcast licenses to each of the nation's five zones on the claim that the South and West were being cheated out of their fair share of radio stations.[1] More specifically, the FRC was forced to equalize the number of assignments and broadcast stations' total power levels in each of the five zones covering the country.[2] Within the five zones, the Davis Amendment also required the FRC to consider an area's population to make their determinations, using the official census data.[3] Prior to the amendment, the FRC did not want to terminate any of the existing assignments,[4] but the FRC was forced to terminate some to implement the equalization requirements.[5]

When was the Davis Amend (first) implemented by the FRC?

[1] McCHESNEY, *supra* note 1, at 21; Hazlett, *supra* note 1, at 161, 168.
[2] ROBERT W. McCHESNEY, TELECOMMUNICATIONS, MASS MEDIA, AND DEMOCRACY: THE BATTLE FOR THE CONTROL OF U.S. BROADCASTING, 1928-1935, at 21 (1993); Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast System*, 33 J.L. & ECON. 133, 161, 168 (1990).
[3] 1928 Fed. Radio Comm'n 2d Ann. Rep. 11, [hereinafter "1928 REPORT"], *available at* http://www.fcc.gov/mb/audio/decdoc/annual_reports.html; 1930 Fed. Radio Comm'n 4th Ann. Rep. 57, [hereinafter "1930 REPORT"], *available at* http://www.fcc.gov/mb/audio/decdoc/annual_reports.html.
[4] 1928 Report, *supra* note 3, at 218.
[5] Fritz Messere, The Davis Amendment and the Federal Radio Act of 1927: Evaluating External Pressures in Policymaking 10, http://www.oswego.edu/~messere/DavisAmend.pdf.

cite paper

When the FRC was created in 1927, 732 licensed broadcast stations existed.[6] On July 1, 1928, after the Davis Amendment was passed, there were 677 and on November 1, 1929, there were 584 stations.[7] In 1929, twenty-eight had been added, but 121 had been terminated.[8] Most of the terminated stations were located in the highly populated East and Midwest.[9] No stations in the South were deleted.[10] However, the FRC did not terminate any stations pursuant to General Order 40, as that order simply reallocated stations to different frequencies and changed power levels to equalize the power levels in each region.[11] Most of the changes affected only educational and other non-commercial stations, so the commercial broadcasting industry was largely unaffected by the Davis Amendment and General Order 40.[12] In the years after General Order 40 in 1928, the FRC made only minor adjustments to the reallocation completed pursuant to General Order 40.[13] For example, in 1931, only 11 new stations were licensed and 20 were terminated.[14] In 1932, only 8 new stations were licensed and 12 were terminated.[15] The location of the stations was varied, with no clear trend of new stations in the South and terminated stations in the North.[16] The FRC did reassign some stations, but that was due

[6] 1929 Fed. Radio Comm'n 3d Ann. Rep. 15, [hereinafter "1929 REPORT"], *available at* http://www.fcc.gov/mb/audio/decdoc/annual_reports.html.
[7] *Id.* at 15-16.
[8] *Id.* at 16.
[9] Messere, *supra* note 5, at 10.
[10] *Id.* at 10.
[11] 1929 Report, *supra* note 6, at 16; *Id.* at 12.
[12] Messere, *supra* note 5, at 18.
[13] 1930 Report, *supra* note 3, at 56; 1931 Fed. Radio Comm'n 5th Ann. Rep. 19, [hereinafter "1931 REPORT"], *available at* http://www.fcc.gov/mb/audio/decdoc/annual_reports.html; 1932 Fed. Radio Comm'n 6th Ann. Rep. 25, [hereinafter "1932 REPORT"], *available at* http://www.fcc.gov/mb/audio/decdoc/annual_reports.html.
[14] 1931 Report, *supra* note 13, at 7.
[15] 1932 Report, supra note 13, at 7-8.
[16] *See* 1931 Report, supra note 13, at 13; *Id.*

to interference issues, not an effort to equalize power and station numbers in regions.[17] The FRC stopped applying the Davis Amendment's dictates in 1932.[18]

[17] 1930 Report, *supra* note 3, at 56.
[18] Messere, *supra* note 5, at 21.

FROM THE WIRELESS T

The evolution of tele

Dedication

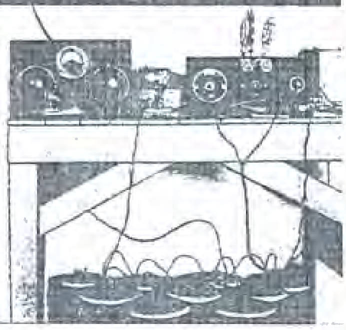
To all those writers who have set down their glimpses of the future of world communications and to those dedicated enthusiasts who have turned those visions into reality: Jules Verne, HG Wells, Isaac Asimov, Robert Heinlein, Alfred Bester, Arthur C Clarke, Guglielmo Marconi, Reginald Fessenden, Edwin Armstrong, John Logie Baird, Philo Farnsworth, William Shockley, Von Neumann and those still too young to be mentioned.

To my family who have remained supportive in the face of an author's obsession.

By the same author

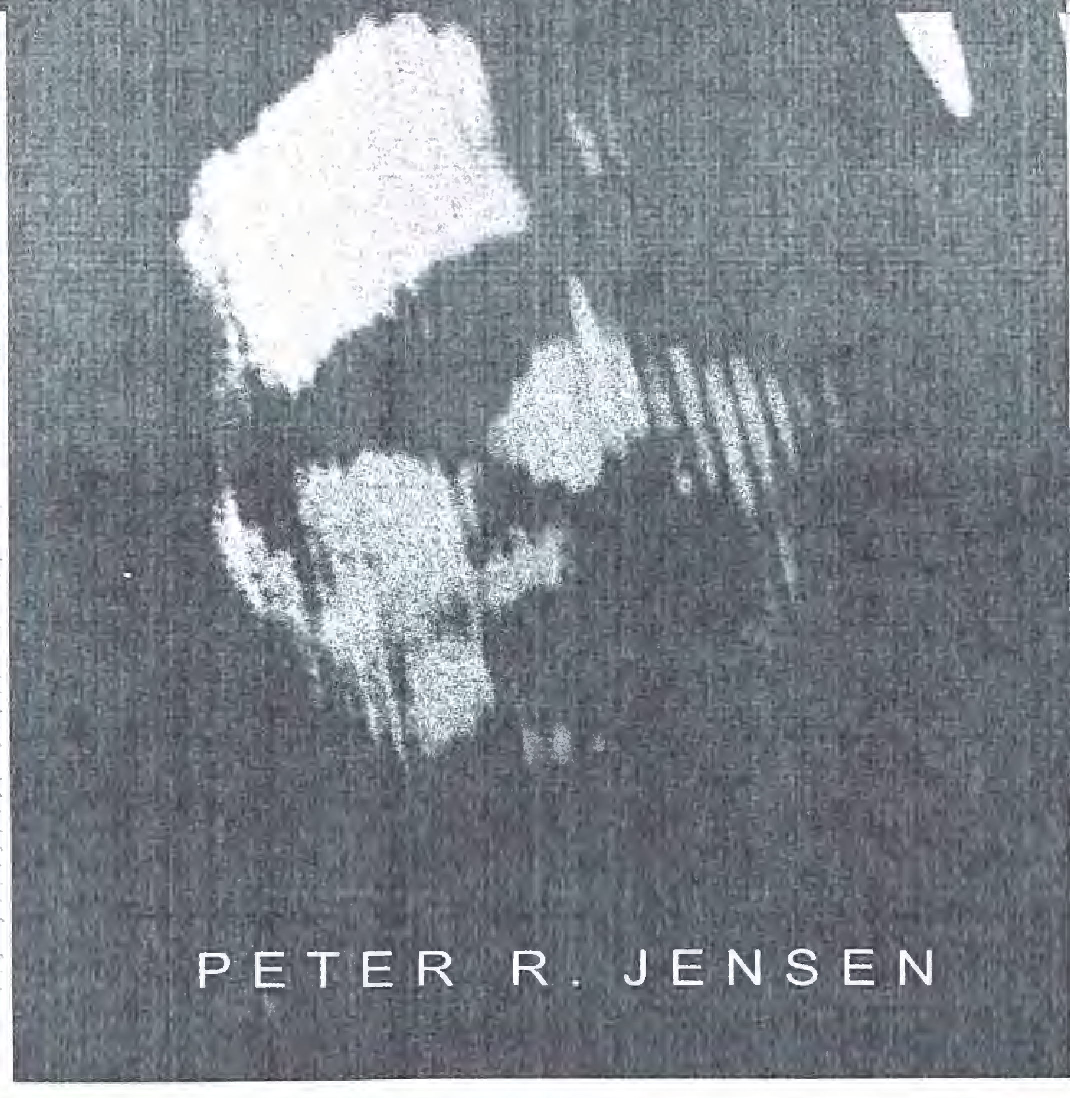
In Marconi's Footsteps 1894 to 1920: Early Radio

UNSW PRESS



SS TO THE WEB

on of telecommunications 1901–2001



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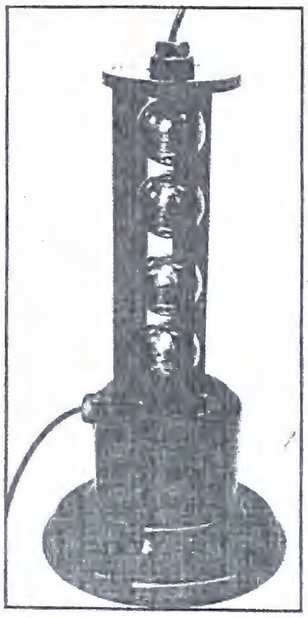
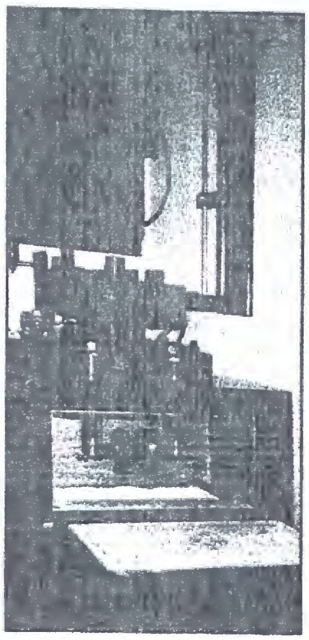
SPARK TRANSMISSION METHODS



Spark gap as used by Captain Henry Jackson in 1896 *(FAR)*



A plain spark gap as used in the Marconi marine wireless system up to about 1910 *(PRJ)*

The development of radio communication using electric sparks as a means of generating a radio frequency signal is likely to appear a quaint if not obscure topic for the modern reader. However, as an element in the early history of the world communication system, its part is quite fundamental and, in a technological sense, intriguing. The burst of radio frequency energy that accompanies the discharge of high-potential electric energy across a gap must, at first sight, seem to be a rather unlikely basis for a system of signalling. However, it was this principle that allowed the first generation of radio communicators to operate and it is only the perspective of more than 100 years of radio development that makes the spark seem so peculiar as a source of radio energy.

The initiation of the radio age can be seen as springing from the work of the renowned experimenter Michael Faraday and later from the mind of a Scot, James Clerk Maxwell. In the middle of Queen Victoria's reign, Maxwell set out a theory of the propagation of electrical energy based on an analogy with the dynamics of fluid systems and vortices.

In the latter part of the Victorian era, while scientists were starting to accept that it might be possible for electrical energy to be able to move away from a source of electrical or magnetic disturbance, this theory was greeted with much scepticism. In 1886, Heinrich Hertz carried out the experimentation that not only demonstrated the existence of radio frequency propagation but also established its character. In a series of elegant and repeatable experiments, he showed that electromagnetic energy was identical to light energy and, perhaps equally important, travelled at the same speed, 300 000 000 metres per second approximately.

The basis of Hertz's experimental work was the use of a spark generated by an induction coil, at that time known as a Ruhmkorff coil. This work was developed by a number of experimenters including Oliver Lodge, Aleksandr Popov and Ferdinand Braun but it was the energy of a young Italian, Guglielmo Marconi, who translated the scientific experiments into a practical system of 'wireless' communication. All these experimenters used sparks to generate the radio frequency waves.

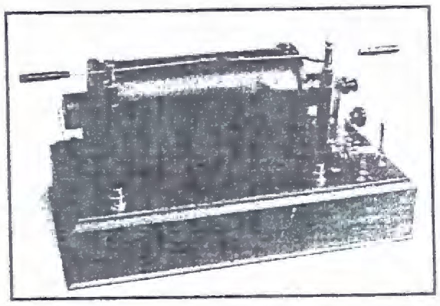
From 1895, the date of Marconi's earliest experiments, the spark transmitter was improved progressively until by 1918 it was an extremely sophisticated system that had reached the limit of its technical capability and was at that stage able to send a signal around the full circumference of the globe.

For the contemporary reader, it must immediately appear a conundrum that something as intrinsically random and impure (in a frequency sense) as a spark discharge could gradually be modified by any sort of technological means so as to be able to be used for signalling. Despite this, by 1918 Marconi, the principal user and promoter of spark-based signalling, was claiming that his system was able to produce radio frequency waves with equivalent characteristics to those produced by Alexanderson alternators or valves which had become available in recent years.

THE RADIO FREQUENCY (RF) SPARK AND QUENCHING

From the perspective of today and the sophistication to which radio communication has grown in over 100 years, the puzzle for a modern communicator is how this incoherent (in a frequency sense) discharge of electrical energy was harnessed to the production of radio frequency signals. Indeed, how did it work at all?

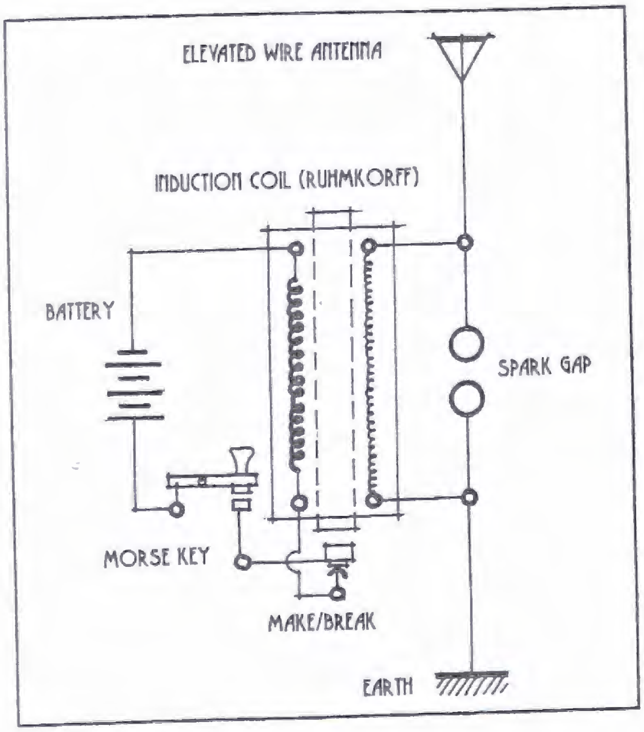
In the first instance, to generate the high-voltage energy required to strike a spark, a very simple device was used — a sort of primitive transformer, the induction coil. This consisted of a low-voltage primary circuit and a secondary circuit consisting of an enormous number of turns of wire which provided a series of very high voltage pulses when the primary circuit was activated with 'chopped' direct current, that is, rapidly switched on and off. Apart from the difficulties of constructing a device of this sort, which would not short over internally because of the high voltages in use, the transient nature of the pulses of high voltage produced meant that creating sustained energy in an antenna circuit was extremely difficult.



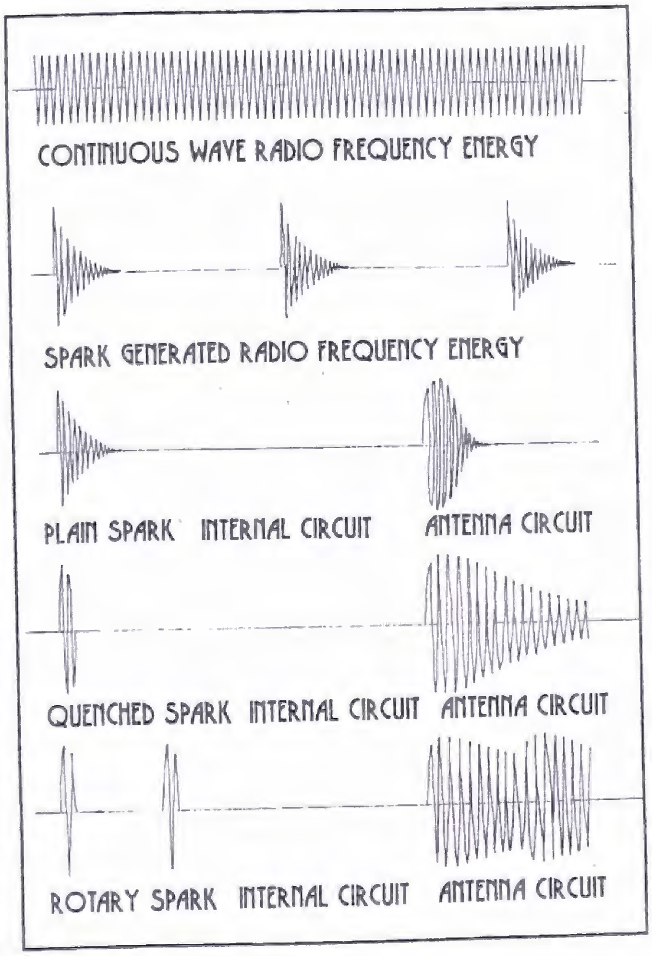
Replica of a Ruhmkorff coil (induction coil) *(PRJ)*

The diagrams (below right) showing spark and continuous wave energy illustrate the problem. The top diagram is the envelope of RF energy consisting of a sine wave oscillating at 1.8 megahertz, and this can be contrasted with the bursts or pulses of energy produced by the induction coil at roughly 60 hertz or 60 pulses per second. When one appreciates that in the very early days the 60-cycle pulsating noise was carried on the shoulders of the RF energy contained in those pulses of relatively short duration, again the question is: How did it work at all?

If one looks at the form of the pulse, where all the important RF energy was generated to carry the acoustic intelligence across free space, an appreciation of the problem of spark transmission is possible.

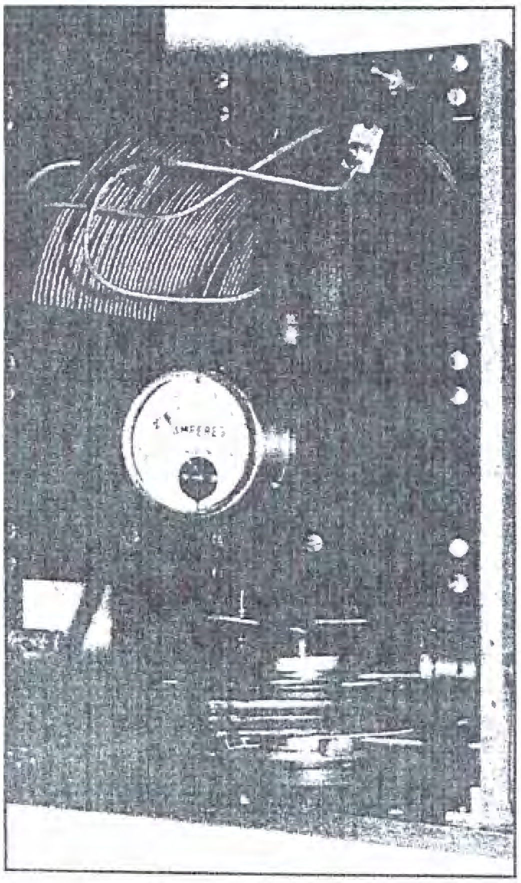


The first transmitter of Marconi in 1895 *(PRJ)*



Diagrammatic representation of energy from plain spark, quenched spark and timed rotary spark transmitters *(PRJ)*

What is created in that instant of a spark discharge is a pulse of raw and largely untuned RF energy. If this is coupled to a resonant circuit containing inductance and capacitance, it will ring or resonate at the natural frequency of the circuit established by the components. By inductive coupling it is then possible to transfer some of the energy into a secondary circuit containing the antenna. The net result is a relatively inefficient but workable system for generating RF energy.



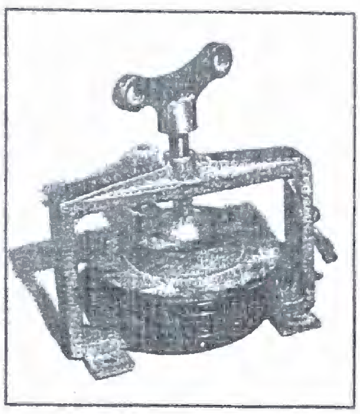
An emergency transmitter using a quenched-spark device *(PRJ)*

Over the first 15 years of development of the spark transmission technology, the reason for the inefficiency of the system came to be understood. During the striking of the spark, a virtual short circuit is created across the spark gap. This makes it possible for energy which has been transferred to the secondary circuit to leak back into the primary circuit and be dissipated there. The net result is a series of wave trains in both primary and secondary circuits which fall away in magnitude quite rapidly or, in the jargon of the time, had a steeply falling 'log decrement'.

In about 1902, the German scientist Max Wien discovered a partial solution to this problem in the 'quenched spark'. In this system, the burst of RF energy in the primary circuit is shut off by various technical means after only one or two swings of the RF signal. During this period, a substantial component of the RF energy can then be transferred to the secondary circuit including the antenna. Once the short circuit in the spark gap is removed, the energy in the secondary circuit continues to resonate without being able to leak away into the primary circuit.

Again the diagrams demonstrate this process. In particular, it can be seen that the quenched spark produces a wave envelope in the antenna or secondary circuit which fades away far more slowly than is the case for the plain spark gap. Indeed, as the frequency of operation of transmitters became progressively lower and lower during the first 25 years of radio, the interval between the striking of the spark and the RF signal became relatively much closer as well. Ultimately, it became possible to make the wave trains of RF energy generated by the spark join up into frequency-coherent packages. This then allowed the RF energy in the secondary circuit to be tuned up almost as in a conventional modern continuous wave (CW) transmitter.

A quenched-spark unit *(PRJ)*

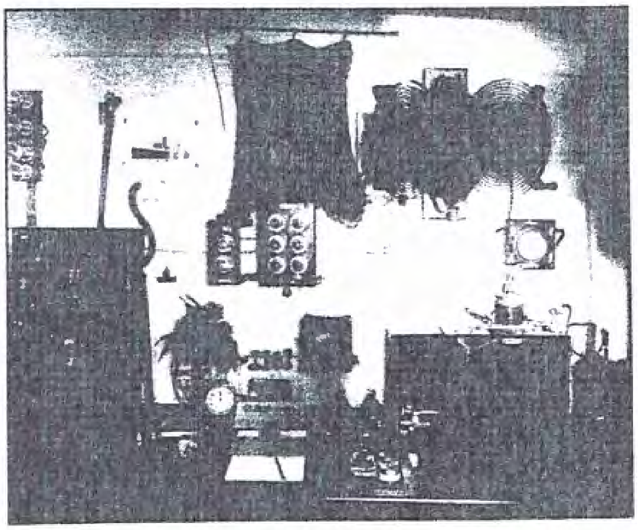


The 'quenched spark' device proved to be so robust and simple that it was used until well after the Second World War as a backup system for emergency communication. It appears that in some Australian coastal vessels the 'quenched spark' continued to be used as a primary means of communication during that period. Despite the extent to which this form of spark generation was used, it is unfortunately true of the 'quenched spark' that it was a potent source of interference to other operators. Because of its very nature — a sharp and transient burst of RF energy — it caused considerable problems with land-based stations including the early broadcast listeners and became very unpopular for that reason. In addition, it was well known to create sympathetic resonance in other antenna systems in the locality — they would resonate at their own natural frequency due to the introduction of this 'hand clap' of RF noise in the vicinity.

THE ROTARY SPARK

While in Germany and elsewhere the refinements associated with quenching the spark were being worked out so as to harness the spark and turn it into a more predictable and tunable source of RF energy, the Marconi Company tackled the problem in a somewhat different fashion. Fairly early on it was realised that there were considerable advantages in breaking the energy path between the spark faces at high speed. This appreciation was soon developed by Marconi into a rotating spark-gap system known as the 'rotary spark'.

By about 1910, both in land stations and at sea, the plain spark gap used in the early days had been almost entirely replaced by rotating spark systems of one sort and another. At sea, the alternators which had superseded the induction coil system were fitted with an extension plate and studs which spun synchronously with the alternator between spark poles. This produced something of an improvement in the quality of the RF signal but, inevitably, the audio frequency modulation produced by the studs was relatively low. At about 120 hertz or pulses per second, this was obviously quite close to the natural frequency level of interference from thunderstorms and the like. This could make the signal extremely difficult to hear and understand under poor operating conditions.



An Australian ship's radio room of about 1922 showing the quenched-spark device on the right and an AWA valved receiver on the left *(AWA)*

It was then realised that increasing the number of spark poles, which, incidentally, made the signal asynchronous, would result in an increase in the frequency of the acoustic modulation. This was found to be extremely beneficial for receiving purposes. Within a relatively short period, the frequency of the audio modulation was increased to about 800 hertz by adding spark poles to the rotating plate.

At sea this became more or less the standard Marconi system as installed from around about 1911 on. Such a system as this was installed on the *Titanic*, and is known to have been generally reliable. It was able to provide a working range of approximately 650–800 kilometres (400–500 miles) in daylight hours and significantly more than that at night time. In the period between about 1911 and 1918, ships crossing the Atlantic from east to west and west to east were able to keep in contact with one side or the other almost continuously, either by direct contact or by relaying via other vessels.

THE LAND STATIONS

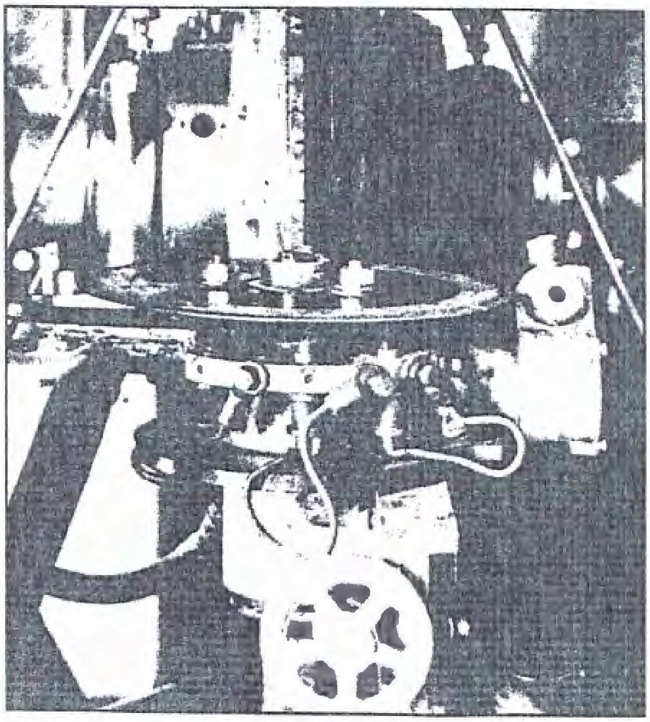
By comparison with the marine alternating-current systems of rotary spark, the land stations developed firstly in Cornwall at Poldhu and later at Clifden on the west coast of Ireland and later again at Caernarvon in north Wales used direct current at about 15 000 volts. The electrical energy was generally stored in enormous batteries of primary cells or, in the case of Caernarvon, was achieved by direct conversion from the alternating current mains supply available from the National Grid.

At Poldhu and later at Clifden, the spark took the form more of an arc produced by direct current between the spark poles. However, for cooling purposes, the path of the discharge was between the surfaces of rotating steel plates. A large steel plate mounted on the shaft of a motor was spun at relatively high speed between the faces of two smaller round steel plates turning at a significantly slower rate. What this first system of rotary spark or arc discharge produced was something much closer to a continuous wave RF signal than was the case with later systems of rotary spark transmission. However, because of the characteristics of the discharge path, the RF sine wave, the wavelength of which was determined by the inductance and capacitance in the primary circuit, had mixed with it an enormous number of RF components. This made the signal difficult to tune and, because of the absence of pulsating acoustic information as available in, say, an induction coil, the signal proved to be extremely difficult to hear, particularly in the presence of static. The solution developed for this problem was no doubt borrowed from the rapidly developing technology of marine rotary spark transmission. Studs were added to the rotating plate and the more or less continuous wave energy became interrupted spark/arc once again with a pulse repetition rate of about 800 hertz.

The advantage of having audio modulation of around 800 or 900 hertz imposed on the spark-generated signal had significant operator advantages. Despite the poor frequency purity of the signal, which inevitably led to difficulties in tuning and in much of the RF energy being wasted in merely heating up the primary circuit and the antenna elements, audibility of the signal was good and a workable system was achieved.

ULTIMATE SPARK

Over the first 20 years of spark development, for various reasons, not least of which was the general success that was achieved, there was an inexorable move to longer wavelengths and lower frequencies. By about 1914, the frequency of transmission across the Atlantic was down to about 25 kilohertz, or just above the range of hearing. This had some important implications in terms of the ability to create a coherent series of wave trains in the spark primary circuit. When the repetition rate of the spark discharges was increased to about 800 hertz and the radio frequency of operation was at, say, 15 000 or 20 000 hertz, it was just possible to make the bursts of RF energy overlap or join up. When coupled to the secondary circuit, it was ultimately possible to produce more or less continuous RF waves in an antenna system. As seen on a modern oscilloscope, the wave form would be continuous but pulsating at a rate of 800 hertz.



The rotary plates in a 'timed spark' unit as used at Caernarvon, Wales *(MAR)*

During the development period of 1895 to 1920, there is no doubt that there was an extraordinary expansion of the scientific basis of radio and the technology of radio communication in an incredibly short space of time. By the same token, in the early days, it is quite clear that the electrical technicians and scientists were guided at times more by experimental results than by good solid theory. However, by 'cut and try' methods in many instances, the apparatus was made to work effectively. By 1920, only major changes of technology could displace the spark transmission system and one of the new developments was 'waiting in the wings' — it was, of course, the thermionic valve.

By about 1916, during the dark period of the First World War, the Marconi

Company had developed a remarkably sophisticated system of RF-energy generation by spark. Though the details of this system are somewhat clouded by the mists of time and the inherent security associated with those war years, it is possible to obtain some idea of what was developed. This last and greatest expression of the art of spark radio occurred at Caernarvon and was known as the 'timed spark' system.

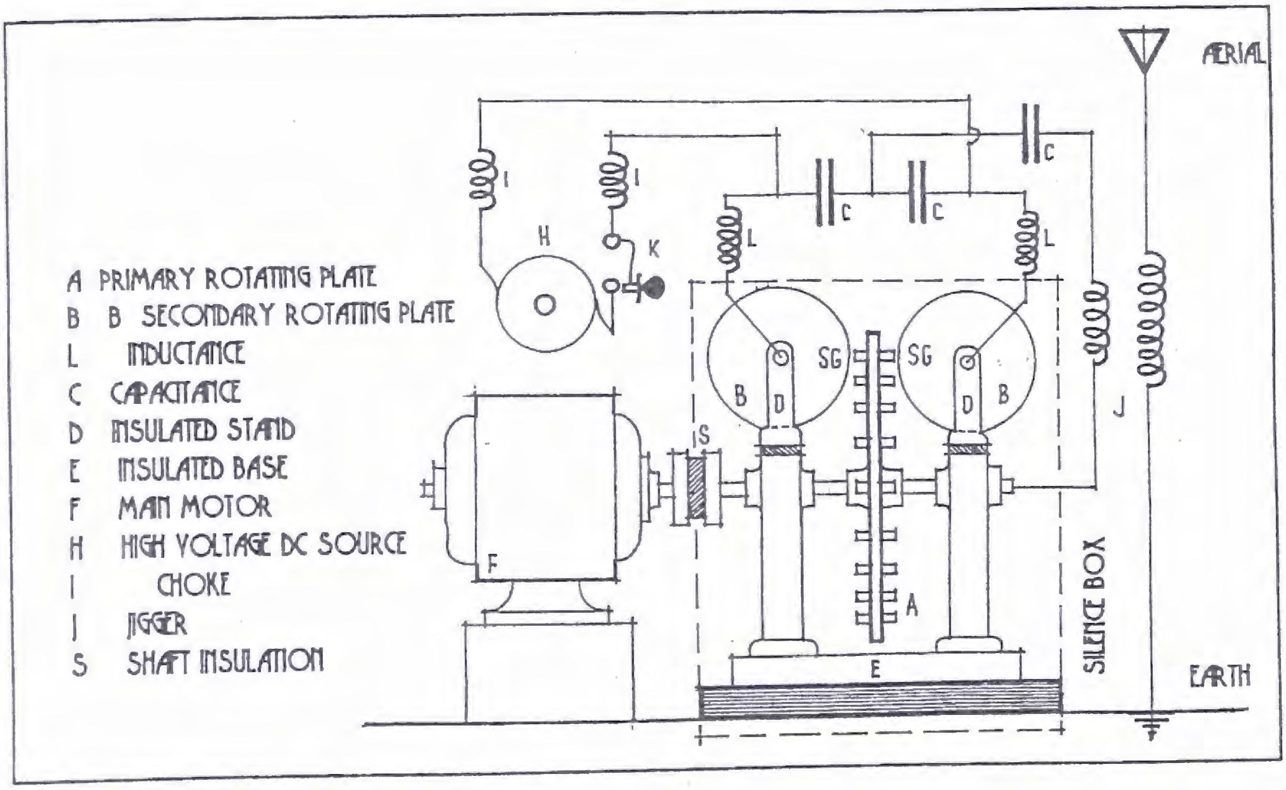
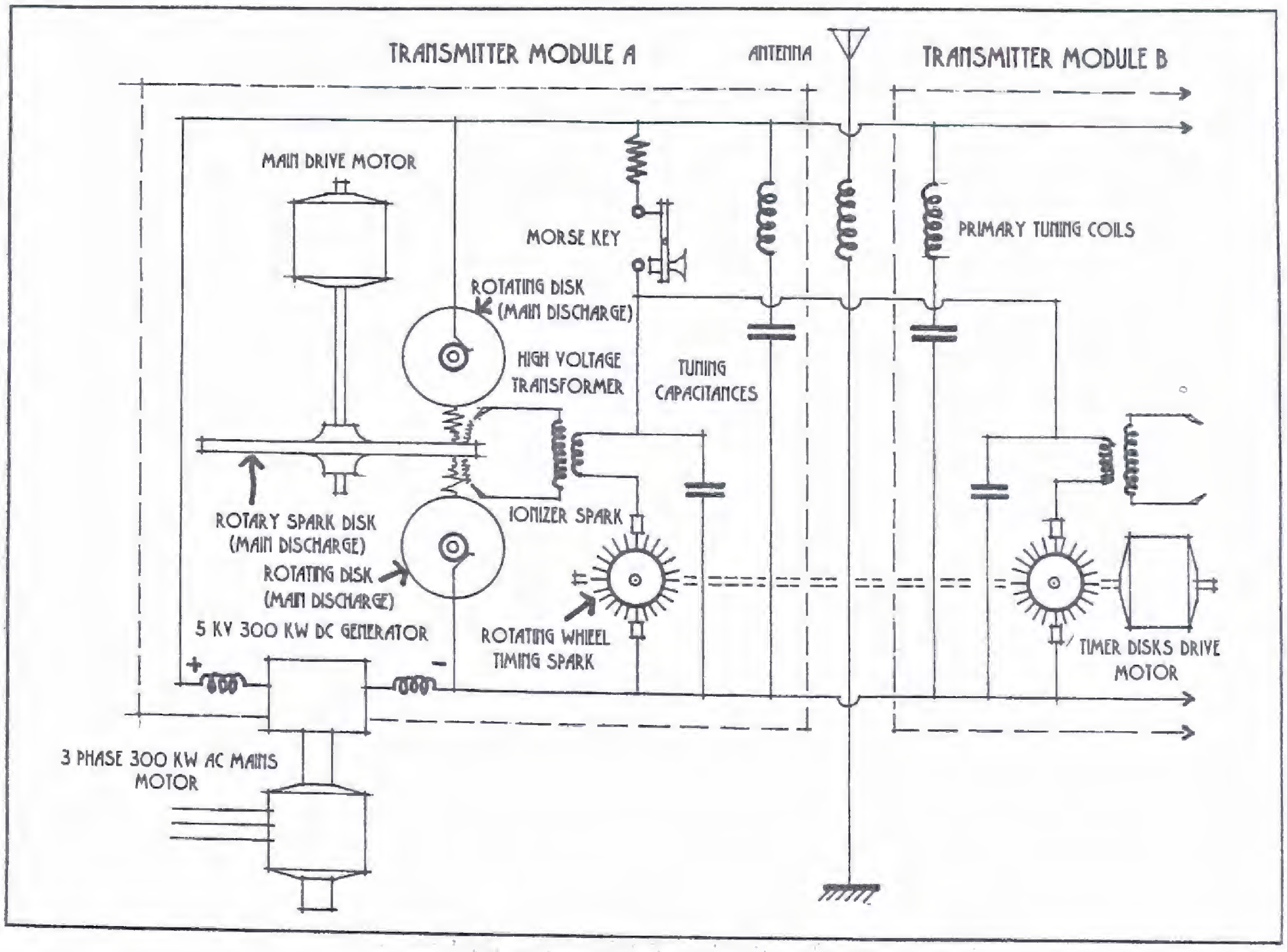


Diagram of the first rotary spark machine as installed at Clifden in Ireland in 1907 *(PRJ)*

The 'timed spark' system was developed in two stages, the first being described in considerable detail by Professor Fleming in 1916. The second more sophisticated stage is still the subject of a degree of speculation.

Grasping the potential advantages of producing an overlap of the RF signals developed in the individual pulses of spark-generated energy, the first 'timed rotary spark' system used a number of plates with rotating poles set in staggered array. The plates were mounted on a common shaft from the motor used to rotate them, but were electrically insulated from each other. As the plates spun at high speed, the discharges at each of the poles of the four plates occurred sequentially and added together in the primary circuit. When inductively coupled to the antenna secondary circuit, a pulsating but continuous wave was produced with all the advantages of tunability and audibility at the receiving end.

However, this first 'timed spark' system proved to have problems. In particular, the spark gap dimension was critical and the striking of the spark was very sensitive to atmospheric pressure differentials coupled with humidity variations. The net result was that the task of getting the spark pulses to join up to create a coherent continuous wave was subject to natural variables which were very hard to control. For this reason, a second-stage 'timed spark' system was developed and this was so successful that it was possible to send a signal halfway round the world. In 1918, a signal was sent from Caernarvon to Sydney, Australia.



The ultimate timed rotary spark machine as installed at Caernarvon, Wales, in 1918 *(PRJ)*

In order to understand this last system of rotary spark, it is necessary to appreciate that the distance that a spark will jump is related most particularly to the characteristics of the path between the poles and the voltage imposed across the gap. At a high gas pressure, the voltage required to strike a spark is less than at low pressure but, more importantly, if the path through air is filled with ions then the spark will strike at a voltage far below the normal value for an air gap.

It appears that what Marconi developed in the last 'timed spark' system was based on the use of dual rotors. The main rotary gap, which did all the work and produced the high power required — 300 kilowatts — consisted of a simple plate rotating at high speed between rotating spark poles. However, these were set away from the rotating plate, which had no studs, to a distance where the operating voltage would not initiate a spark or arc. What initiated the spark was a second set of poles set close to the main spark poles and driven by the spark discharge produced by another rotating plate with multiple studs. This separate plate was, in effect, a timing wheel, rather like the timing mechanism in a conventional ignition system in a motor car. What it did was to create an ionised path close to the main spark discharge path. As soon as this pathway was established with a cloud of ions, the main spark would strike but would extinguish as soon as the ionisation was removed. The result was a series a of pulses at the main spark discharge faces, controlled in terms of repetition rate by spark discharges generated separately at very high voltage but low power by the rotating timing plate.

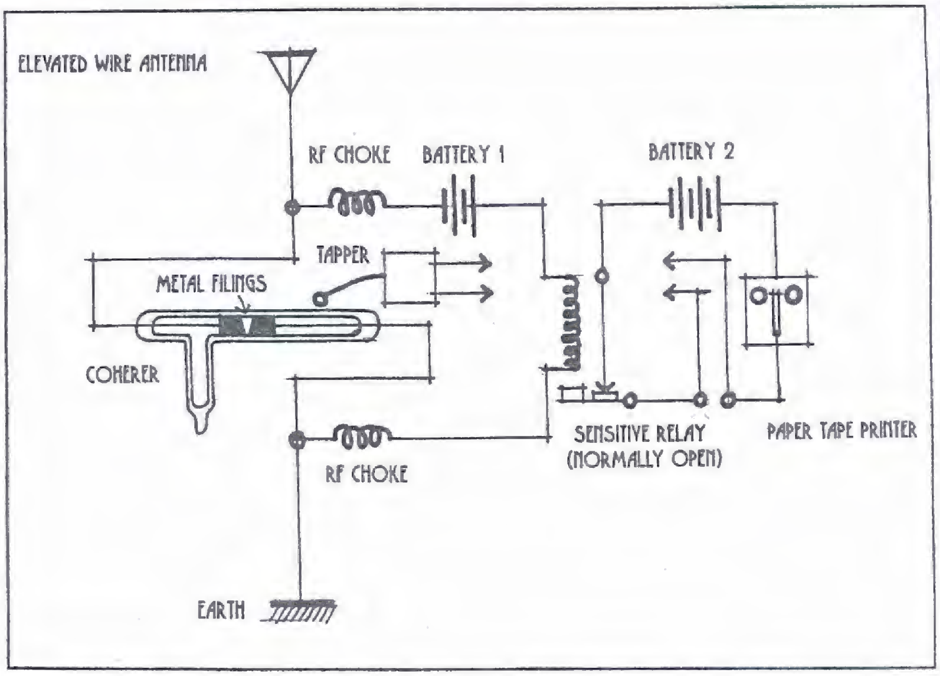
By using a very high voltage at low power and an initiation or ignition spark to ionise the air, the problems of natural conditions affecting the repetition rate of the high-power spark were overcome. More importantly, by achieving a very stable and accurate rate of repetition of the spark pulses, the wave trains of RF energy could be made to join together in a completely consistent fashion and the sought-for pulsating continuous waves at the antenna were able to be produced on a reliable basis.

THE VALVE

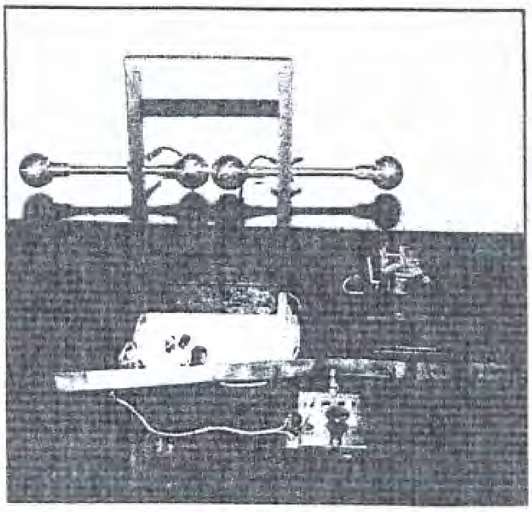
It is somewhat ironic that, while this great burst of ingenuity, directed at improving the characteristics of the spark, was occurring during the First World War, it was this same conflict that generated the successor to the timed spark, the valve (also known as the tube). Within only 4 years of the end of the war in 1918, the valve had been developed to a stage of reliability that made it possible to completely replace spark and electromechanical systems in the long-wave trans-oceanic stations such as Caernarvon.

At last the roar of the rotary spark was silent and the new age of 'quiet' RF-energy generation had arrived. Radio men from that earlier time described the rotary spark sound as 'awesome' — it is perhaps regrettable that, with the lack of awe associated with modern radio, some of the romance of radio communication has also vanished.

RECEPTION BEFORE THE VALVE



Schematic diagram of the first coherer receiver of Marconi, 1895 *(PRJ)*



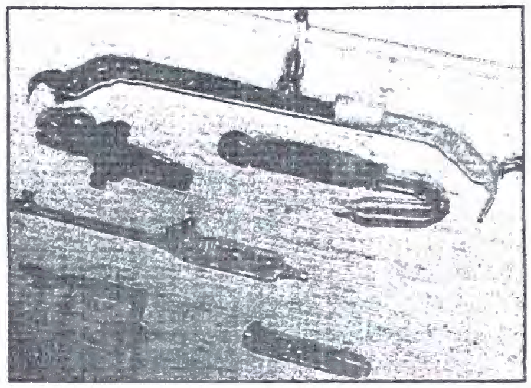
Replica of the first Marconi transmitter and receiver of 1896 *(PRJ)*

To the present generation of electrical experimenters and communicators, it may be hard to imagine a time before the use of solid-state devices, but for the best part of 60 years the vacuum in a bottle — the thermionic valve or tube — provided the basis of telegraphic and telephonic communication both by radio and through wires.

It may therefore be a surprise to learn that, in that remote time at the beginning of the radio era and before the invention of the valve, there was another significant period when radio waves were detected by a variety of, to modern eyes, quite peculiar devices. Of these, the coherer, magnetic detector and crystal detector are perhaps the most important, although a surprisingly large array of different methods was assembled following the experiments of Heinrich Hertz in 1886 and before the exclusive use of the valve for detection commenced in about 1916.

THE COHERER

In his vital experiments of 1886, Hertz made use of simple loops of wire with spark gaps to detect the radio frequency (RF) energy from his induction coil transmitter. A minute spark gap in the ring, which was adjustable with a screw-threaded contact and viewed with a magnifying lens, allowed him to see the tiny spark when resonance was achieved. This evidently was not a very easy or attractive device to use for experimental purposes, let alone for signalling, and other experimenters looked for better means to detect the RF energy.



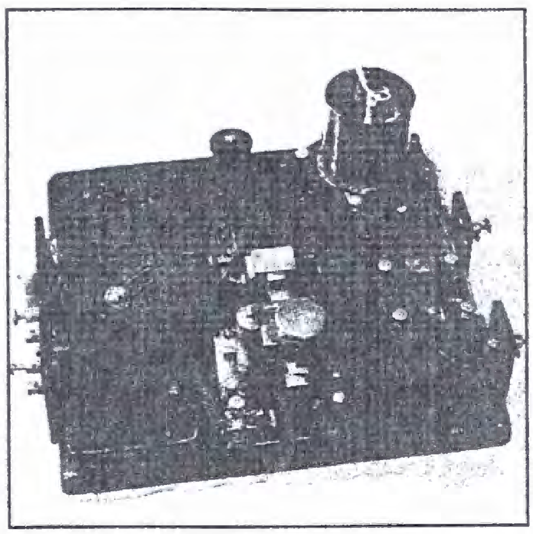
A collection of coherers as used by Oliver Lodge in 1894 *(PRJ)*

In even earlier times and as a means of protecting telegraph lines from lightning strikes, the scientist SA Varley had invented a device that was based on a peculiar property of granular conducting material in the presence of RF energy. When placed between the poles of a circuit including a battery, under normal circumstances granular metallic filings exhibit a very high resistance which appears to a low-impedance relay much like an open circuit switch. However, if a high-voltage pulse is created in the vicinity of the filings, with great suddenness they will stick together or cohere and the resistance through them drops to a very low value of ohms so as to appear almost a short circuit.

This effect was investigated in the late 1880s by a number of experimenters, such as the French scientist Professor Branly, the British scientist Oliver Lodge and the Russian scientist Aleksandr Popov. From this work came a primitive RF-activated switch which was known as a 'coherer', the name given to it by Oliver Lodge.

Although a pulse of RF energy would turn this switch on, once the particles of metal had 'cohered', the switch was locked on. The way to unlock it and open the circuit was to physically 'de-cohere' the metallic particles and this was done by lightly tapping the glass tube in which the particles were contained. Soon this was done by the trembler of a bell mechanism activated by the relay in circuit with the battery and coherer — an early form of 'feedback' control.

The coherer receiver as made by Captain Henry Jackson in 1896 *(PRJ)*



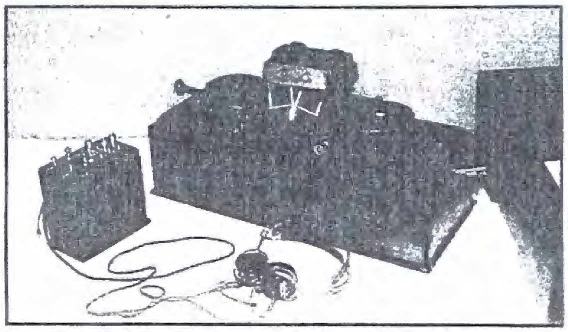
The action of the early receiver was therefore to turn on a relay in the presence of a radio signal which in turn activated a bell mechanism which immediately turned the coherer switch off again. A burst of RF energy, whether short or long, would create a series of very short pulses as the coherer was switched on and off by the relay and bell mechanism in the circuit. These short pulses would join together to synthesise the longer burst of RF energy as audible noise in headphones or as a continuous streak on a papertape morse code recorder as used in terrestrial telegraphy. However, this arrangement was intrinsically limited in terms of the speed at which morse code could be received. It was rarely possible to exceed about ten words a minute using a coherer and, even compared with terrestrial telegraphy of 1895, this was very slow.

The coherer was an incredibly crude and insensitive device by modern standards and one has to wonder how such a system worked at all. For the first 10 years of radio, the coherer was the basis of most commercial systems until displaced by other more sensitive devices after about 1905.

THE MAGNETIC DETECTOR

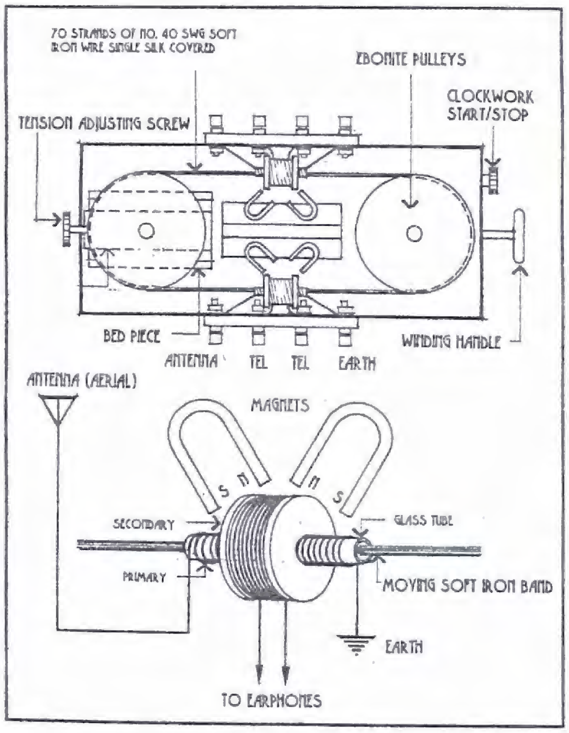
The RF switch provided by the coherer proved quite incapable of detecting the minute energy of the signal sent from Poldhu in 1901 and, in fact, the signal was received on a primitive 'solid-state' device, the Italian naval coherer. This used a globule of mercury and a plug of iron as the poles of what at that time was called a self-restoring coherer. In other words, one did not have to tap it to make it detect after the receipt of each telegraphic symbol. It is now known that this detector was actually operating as a solid-state diode.

Replica of the magnetic detector designed by Marconi in 1902 *(PRJ)*



It is clear that Marconi came back from Newfoundland dissatisfied with the ordinary metal-filings coherer that he had also used and immediately set to work to find something a lot more sensitive and robust. Basing his experiments on the work of the scientist Ernest Rutherford in the field of moving magnetic fields, Marconi produced a device that he called the magnetic detector. To radio operators over the next 15 years, it was to be known more familiarly as the 'maggie'.

The magnetic detector looked rather like an old fashioned reel-to-reel tape recorder, a device that would also appear quite unfamiliar to many people brought up on the technology of digital CDs. A continuous wire rope travels around two reels passing through a double coil of fine wire and the poles of two horseshoe-shaped magnets. The reels are driven by a handwound clockwork mechanism and if the operator forgets to wind up the device it stops detecting.



Schematic diagram of the magnetic detector of 1902 *(PRJ)*

One coil goes to a set of earphones and the other connects the antenna system to earth. When an RF signal passes through one coil of wire, a separate burst of energy at audio frequency is induced in the coil attached to the headphones and the signal becomes audible.

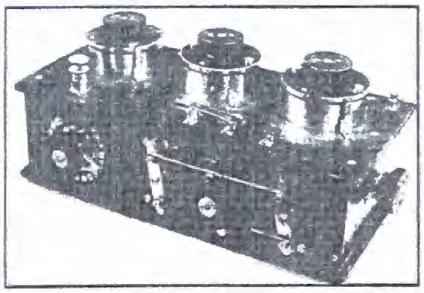
Interestingly, despite modern investigations of the mechanism of this device, the exact physical process remains the basis of argument among experts. In this regard, a number of useful discussions are referred to in the list of references. Of these, the most recent by O'Dell is probably the most useful, although it appears that his explanation is not accepted by everyone.

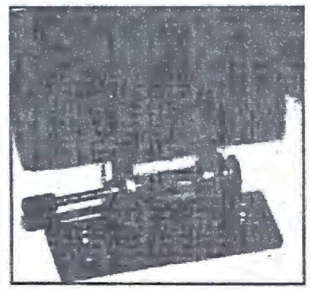
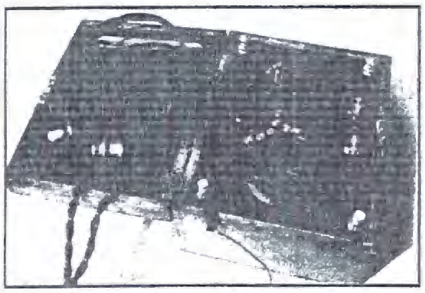
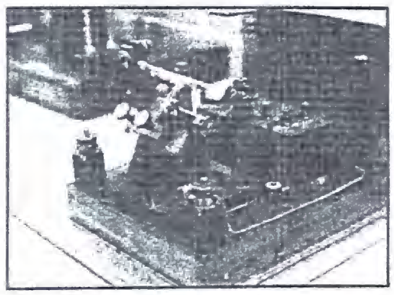
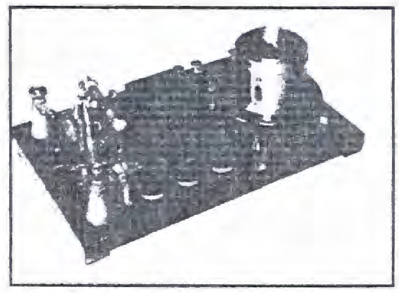
Although the magnetic detector worked best with the signal produced by the discharge of a spark, it was not entirely insensitive to other forms of RF energy which were more like the continuous wave energy that is now used for radio transmission. For this reason its use persisted until spark was finally abandoned in the period around 1920 and full continuous wave transmitters using valves became the norm. In passing, it was the primary method of reception on the *Titanic* although, by 1912, there was available a receiver that used a Fleming diode valve. It appears that even at this stage the 'maggie' remained the preferred device for normal operations.

CRYSTAL DETECTORS

In many respects the solid-state detectors that appeared after 1905 represent the most interesting of the pre-valve detecting devices. Although largely replaced by valves after about 1924, the crystal detector was to have a long and meritorious life, not only as the detector in much commercial radio telegraphy but also in the first generation of radio receivers as used after about 1920. From then until 1940, the crystal detector was generally set to one side as an unused relic of a former age.

With the development of radar, it was found that the solid-state diodes were extremely suitable for detecting the very high frequency energy reflected from distant aircraft and other targets. Many thousands of solid-state diodes



were made for this purpose and a great many were used by young experimenters after the Second World War for crystal sets to receive radio programs. For this experimenter, 'Dick Barton, Special Agent' via a radar diode and headphones was the gateway to a lifetime of communications activity.

The first successful crystal detector was based on a synthetic material, carborundum, and was discovered by the American experimenter General Dunwoody. Although stable and reasonably sensitive, the carborundum crystal detector required a battery to set the operating point of the device. For this reason, although it was used in a number of commercial radio systems, including those of Marconi and Telefunken, other methods were pursued and led to the realisation that a large number of naturally occurring minerals would operate to detect RF energy. Of these, undoubtedly the best known is the so-called cat's whisker which used a coiled silver wire in contact with a crystal of galena or silver lead sulphide.

Apart from the galena crystal, other combinations included the use of iron pyrites (iron sulphide), bornite (copper iron sulphide), molybdenite (molybdenum sulphide) and silicon. In addition, a dual crystal arrangement with a crystal of zincite (zinc oxide) in contact with a crystal of chalcopyrite and known as the perikon detector was very stable and easy to use as well as being quite sensitive. Stability was an attractive feature of this combination because, in other point-contact detectors, the slightest 'nudge' would lose the sensitive spot on the crystal and reception would cease.

Top row (left to right):

Replica of the multiple tuner designed by CS Franklin in 1904 *(PRJ)*

A multiple tuner manufactured by AWA in Australia *(PRJ)*

A cat's whisker detector unit from the 1920s *(PRJ)*

Bottom row (left to right):

A cat's whisker crystal set replica *(PRJ)*

A coherer receiver made by the Marconi Company for use in the trans-Tasman Sea experiments in Australia in 1905 *(PRJ)*

A Siemens coherer receiver, captured from the Boers in 1901 by British forces in South Africa *(PRJ)*

THE ALTERNATOR TRANSMITTER

As discussed earlier, one of the experts who saw that the way ahead lay with other methods of RF energy production was a Canadian, Professor Reginald Fessenden. As early as 1899, he had stated with great clarity that the ultimate method of generating RF energy would involve waves of continuous alternating current. This perception built on the foundation established by Sir Oliver Lodge who had very early realised the importance of tuning and resonance in the context of radio frequency energy.

While the Marconi Company clung tenaciously to spark technology, Fessenden sought for ways to produce continuous wave energy and finally concluded that the best method would involve the development of a radio frequency alternator. During 1905, Fessendon approached General Electric with a proposal to have an experimental alternator transmitter developed. This work was put into the hands of a young Swedish engineer, Ernst Alexanderson, and towards the latter part of 1906 he had successfully created such a machine. With a power of about half a kilowatt at a frequency of up to 75 kilohertz, it generally fitted Fessendon's requirements.

Despite its low power output, this first alternator transmitter proved to be a potent device compared with the rotary spark transmitter that Fessenden had been working with until then. When in was installed in the US naval radio station at Brant Rock, Massachusetts, experiments were conducted using continuous wave radio frequency energy and communications with a station in Scotland at Machrihanish took place. Earlier in 1906, Fessenden had established two-way communications with this same station using a synchronous rotary spark transmitter so that a direct comparison with the alternator could be made.

Later, a carbon microphone was inserted into the antenna lead of the alternator transmitter and, with it, the transmission of sound as amplitude-modulated radio frequency energy was possible. On 24 December 1906, this arrangement was the basis of what appears to have been the first radio sound broadcast. Material that was transmitted during this remarkable event included a selection of various musical pieces and a talk by Fessenden himself.

Much to the surprise of a large number of radio operators who had never heard anything on the ether before but morse code, the signal reached up and down the Atlantic coast and was heard as far away as the West Indies.

The reason it was possible for these operators to receive the amplitude-modulated signal was that, by 1906, the advantages of crystals as RF detectors had become known. Many were incorporated into receivers at radio stations with capabilities that few appreciated. Apart from demodulating the rough energy of a spark station, a galena or carborundum detector was also capable of converting the modulated RF signal to audio that could then be heard in the headphones.

With this dramatic event, it was quite clear that Fessenden had created a source of pure sine wave RF energy and radio communications would never be the same again. More than that, the observations of Lodge made in 1894 were now confirmed.

Following the Brant Rock demonstration, development of the alternator continued at General Electric under the supervision of Alexanderson. By 1918, this high-frequency alternator, which is now coupled indissolubly with the name Alexanderson, was progressively developed into a machine with an input power of 400 kilowatts and an operating frequency at around 16 kilohertz. A number of these machines were ultimately sold with perhaps the most appropriate sale being to Sweden, the homeland of its developer. As finally installed at Grimeton, its Swedish home, there were two machines in use with one on 'standby'. These machines were able to create a power level in the antenna system of around 200 kilowatts at a frequency of 17.2 kilohertz.

Via e-mail in February 1996, it was possible to obtain the following technical specifications of the Grimeton alternator from Bengt Willander, SM7BKH, of Swedish Telecom:

- Station call sign — SAQ
- Power input — 400 kilowatts
- Power output — 200 kilowatts
- Rotor diameter — 1600 millimetres
- Number of teeth — 976
- Rotation speed — 2115 rpm
- Frequency of CW — 17.2 kilohertz
- Antenna system (TX), 6 towers — 127 metres (416 feet) high
- Antenna system (RX), 'Beverage' — 12 kilometres (8 miles) long
- Operation commenced — 1925

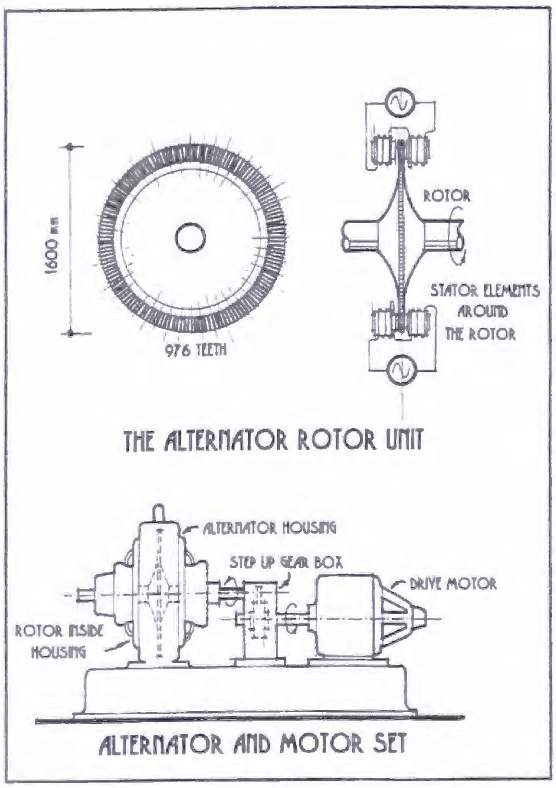


Diagram showing the main elements of the Alexanderson alternator (*PRJ*)

THE VOICE OF GRIMETON

In September 1995, the British Institution of Electrical Engineers held a centenary conference in London to mark the first wireless transmission of Marconi in Bologna in 1895. The conference covered a substantial array of topics relating to the history of radio.

During the course of the proceedings, it was announced that there would be a segment involving a presentation of slides about an alternator transmitter at Grimeton. This segment turned out to be a video film made in 1985 and was a good deal livelier than a slide show could have hoped to have been. Towards the end of the presentation, it was announced that shortly the delegates would be able to hear the voice of Grimeton. By courtesy of a BBC monitoring station in the United Kingdom, a message in impeccable morse code was soon heard in the auditorium, extending greetings to the participants in the conference from the oldest and only remaining Alexanderson alternator transmitter in the world.

To hear such a beautiful continuous wave signal

STRANDS IN THE WORLD WIDE WEB

1822	Babbage's paper on the difference engine no. 1 published
1844	Morse telegraphic link between Washington and Baltimore in the United States established
1851	International adoption of the continental code based on the morse code
1865	James Clerk Maxwell demonstrates the theoretical existence of electromagnetic waves
1866	The *Great Eastern* lays the first trans-Atlantic cable between Valentia in Ireland and Heart's Content in Newfoundland
1871	Death of Babbage
1872	Telegraph cable between Darwin and Adelaide in Australia established
1874	Guglielmo Marconi is born in Bologna, Italy
1876	The telephone is patented by Alexander Graham Bell
1879	The principle of the coherer is discovered by DE Hughes
1884	Paul Nipkow invents the scanning disk, the basis of early television
1887	Heinrich Hertz demonstrates the existence of electromagnetic waves
1888	Thomas Edison discovers the 'Edison effect' in light bulbs
1890	JA Fleming investigates the 'Edison effect'
	First US census using Hollerith equipment
1892	Edouard Branly and Oliver Lodge independently invent the coherer
1894	Marconi begins his experiments with wireless at the family villa near Bologna
1896	Marconi moves to England and receives the first patent for wireless telegraphy
1897	The Marconi Wireless Telegraph and Signal Company is created
1898	Oliver Lodge patents the tuned circuit for radio signals
	Commercial installation of wireless in ships
1899	Installation of wireless in the vessels of the Royal Navy
	First military use of radio in the Boer War
1901	Marconi receives signal from Poldhu at St John's, Newfoundland (12 December)
	Reginald Fessenden describes the detection of continuous wave signals by heterodyne mixing
1902	Introduction of the magnetic detector (Marconi)
1904	JA Fleming patents the diode, two-element valve (tube)
	Continuous wave transmission demonstrated by Fessenden using an alternator
	Introduction of the multiple tuner (Marconi)
1905	Trans-Tasman Sea wireless demonstration, Australia, by the Marconi Company
1906	Lee de Forest patents the triode, three-element tube (valve)
	Fessenden's Brant Rock telephony experiments
1907	Clifden (Ireland) to Glace Bay (Nova Scotia) trans-Atlantic message service commenced
1909	The SS *Republic* sinks following collision
	Cyril F Elwell introduces the arc transmitter to the United States
1910	Wireless Institute of Australia formed in New South Wales, Australia
	Dr Crippen apprehended on the SS *Montrose*
	C Maclurcan transmits music from his station 2CM at Sydney, Australia
1911	AA Campbell Swinton describes an all-electric television system
	Douglas Mawson's expedition to the Antarctic commences
	Thomas J Watson joins NCR
	Ernest Fisk arrives in Australia as resident engineer for the Marconi Company

1912	Sinking of the RMS *Titanic*
	De Forest invents the audion tube amplifier
	Radio station POS (later VIS) opened in Sydney, Australia
1913	Edwin H Armstrong invents the regenerative detector circuit using positive feedback
	Amalgamated Wireless (Australasia) Ltd formed with Ernest Fisk as technical manager
1914	First World War starts
1915	The Gallipoli campaign
1916	Marconi commences experiments with the 'short waves'
1917	Zimmermann telegram deciphered and passed to the US government; United States enters the war
1918	Transmission from Caernarvon received in Sydney, Australia, on the long waves
	Armstrong patents the 'superhet'
	End of the First World War (November)
1919	Radio Corporation of America, RCA, created
	Alexanderson alternator installed at Caernarvon
1920	Radio broadcasting experiments initiated by Marconi Company employees
	Dame Nellie Melba broadcasts from Chelmsford, England
	Regular broadcasting from Pittsburg radio station, KDKA, commenced
1921	First direct contact from the United States to Britain by radio amateurs (Paul Godley on 210 metres)
1922	British Broadcasting Company created (12 November)
	First BBC broadcast station opened, London-based 2LO
	First radio telegraph on the short waves from the United Kingdom to Switzerland
1923	Vladimir Zworykin proposes and patents an all-electronic television system
	Broadcast station 2SB commences service in Sydney, Australia (23 November)
	First two-way contact between the United States and the United Kingdom by radio amateurs
1924	Direct signal to Sydney, Australia, via the short waves from Poldhu (30 May)
	Broadcast station 3LO commences service in Melbourne, Australia (13 October)
	First two-way contact between the United Kingdom and Canada
	IBM created in the United States
1925	Grimeton radio station commences operation
	Reverend John Flynn tests the first inland radio in Outback Australia
1926	Short-wave beam radio-telephone service to Canada opened from the United Kingdom
	John Logie Baird opens experimental television service using the Nipkow disk with call sign 2TV
	Rugby long-wave station opened by the British Post Office operating on 16 kilohertz
1927	Short-wave beam service from the United Kingdom to Australia, South Africa and India commenced
	Alfred Ewing presents paper on his 'War Work'
1928	Philo Farnsworth demonstrates an all-electronic televison system using a camera called the 'image dissector' and an image display based on the cathode ray tube
	Rugby radio station commences operation on the short-wave band
	Flight of the *Southern Cross* from the United States to Australia by Charles Kingsford Smith and Charles Ulm
	The differential analyser of Vannevar Bush installed at Massachusetts Institute of Technology
	Australian national broadcasting service commenced
1929	Creation of Cable and Wireless Ltd, from merger of Marconi Company with other cable communications companies
	Introduction of pedal wireless system in the Australian outback

1929	BBC experimental television service commenced using the Baird system
	Zworykin develops the kinescope, an image display device based on the cathode ray tube
1930	Lilienfeld patents a form of primitive field-effect transistor
1931	Zworykin develops the iconoscope as an answer to the Farnsworth 'image dissector'
1934	Baird adopts the Farnsworth 'image dissector' camera as part of the system offered to the BBC, using a scan rate of 240 lines
	Watson Watt and Rowe visit the acoustic station at Hythe
	CEM Joad resolution at Oxford University — 'Under no circumstances will this house fight for King and Country'
1935	Patent dispute over primacy of electronic television in the United States is ruled in favour of Farnsworth
	First tests of radio location using short-wave reflections in the United Kingdom (the birth of British radar)
	Conrad Zuse sets down the concept of a binary computer, the Z1
1936	Dual-system national television service commenced by BBC from Alexandra Palace with the Baird and EMI systems used on an alternating basis
	Paper 'On Computable Numbers' by Alan Turing
	German troops retake the Rhineland
1937	BBC adopts the EMI system of televison with a 405-line scanning system using the 'Emitron' camera
	Death of Marquese Marconi
	Japan invades mainland China
1938	RCA produces the image iconoscope, incorporating the best elements of the 'image dissector' and the iconoscope (almost identical to the British 'emitron')
	Paper on the use of Boolean algebra in designing counting and switching networks by Claude Shannon
	German troops move into Austria and the 'Anschluss' is proclaimed
1939	NBC commences regular television broadcasting
	Farnsworth Television and Radio incorporated, broadcasting from Fort Wayne, Indiana
	Second World War begins
	RCA loses royalty battle with Farnsworth and is forced to pay licensing fees on his patents
	William Shockley joins the Bell Laboratories to study solid-state phenomena
1940	Commercial televison broadcasting in the United States commences from WBNT
1941	Colour television demonstrated by NBC in the United States
	FCC adopts the NTSC standard of 525-line, 30 frames per second, black-and-white TV
1943	The Harvard Mark 1 by IBM put into operation
1944	D-day landings announced, 6 June
	The 'Colossus' begins work at Bletchley Park
	The 'Market Garden' operation and the Arnhem debacle, September
1945	End of the Second World War
	Arthur C Clarke predicts the introduction of the communications satellite
1947	The point-contact transistor is invented by Shockley, Brattain and Bardeen
1949	Farnsworth Television and Radio Company sold to International Telegraph and Telephone
1951	RCA demonstrates a new electronic colour television system compatible with existing black-and-white television
	UNIVAC passes its acceptance test
1952	GW Dummer of Royal Radar Establishment, United Kingdom, proposes a monolithic block of components without connecting wires

1953 NTSC (based on RCA system) colour television adopted in the United States
The trans-Atlantic telephone cable TAT-1 laid by a US–UK–Canadian consortium
1954 Texas Instruments manufacture the Regency TR 1 pocket transistor radio
1955 BBC opens an FM broadcasting station at Northam in Kent
Shockley Semiconductor Corporation founded by William Shockley
1956 Black-and-white television service on 625 lines commenced in Australia; coverage of the Olympic Games in Melbourne
Bardeen, Brattain and Shockley awarded the Nobel prize for creation of the transistor
1957 Russia launches Sputnik
ARPA established in the United States and Joseph Licklider becomes first director of IPTO
Eight engineers leave Shockley Semiconductors to form Fairchild Semiconductors
Programming language FORTRAN made available
1958 Jack Kilby invents part of the solid-state integrated circuit
1959 Robert Noyce invents the other part of the solid-state integrated circuit
Integrated circuit announced by Texas Instruments
Fairchild files a patent for the planar process for making transistors
FORTRAN II made available
1960 COBOL programming language released
1961 Fairchild Semiconductors releases the first commercial integrated circuit
1962 United States launches Telstar Mark I
Television signals sent from America to Europe via satellite
1963 D Engelbart patents the first 'mouse' as a pointing device
1964 G Moore propounds the notion that integrated circuits will double in complexity every year from then on which is later known as 'Moore's Law'
BASIC programming language developed by Professor J Kemeny and TE Kurtz at Dartmouth College, United States
1965 The first INTELSAT flown from the United States
Digital Equipment Corporation (DEC) market the PDP 8 minicomputer
1966 Robert Taylor initiates the ARPANET project
1968 Intel formed by Robert Noyce and Gordon Moore
1969 First four IMPs installed at universities in the United States — ARPANET initiated
The design of the first microprocessor, the 4004, created at Intel by Marcian Hoff (Ted)
1970 Xerox opens the Palo Alto Research Centre, PARC
G Hyatt files a patent for a microprocessor he describes as involving 'single integrated circuit computer architecture'
1971 Texas Instruments produce the 'Pocketronic' electronic calculator
Fairchild produces the first central processing unit, the 4004
1972 File transfer protocol introduced (FTP)
Intel produces the 8008 microprocessor, accessing 16 kilobytes of memory and using an 8-bit configuration
1973 Gary Kildall writes CP/M, Control Program for Microcomputers
1974 Winterbotham reveals the 'Ultra Secret'
TCP/IP protocol established by Vinton Cerf
Intel produces the 8080 microprocessor running at 2 megahertz and accessing 64 kilobytes of memory (6000 transistors)
UNIX programming language is released by Bell Labs
1975 The Altair 8800 advertised in the United States via *Popular Electronics* at US$439
Fibre-optic cable developed

1975	CP/M applied to the 8080 microprocessor
	Bill Gates and Paul Allen found Micro-Soft (later Microsoft) and license their BASIC to MITS for use on the Altair
1976	Steven Jobs and Stephen Wozniak found Apple Computer Company on 1 April
	CP/M patented by Digital Research and created by company founder, Gary Kildall
	The 6502 microprocessor produced by MOS Technology and designed by C Peddle
1977	The Apple I microcomputer developed and sold
	The Commodore Pet 2001 produced using a 6502 chip
	The Tandy TRS-80 microcomputer produced
1978	Intel produces the 8086 microprocessor running at 4.7 megahertz (29 000 transistors)
1979	Visicalc introduced for use on the Apple microcomputer, designed by D Bricklin and R Frankson
	Micropro releases Wordstar wordprocessing program written by S Rubenstein
1981	The IBM personal computer launched using an 8088 running at 4.7 megahertz with 64 kilobytes of RAM
	The Osborne 01 computer introduced using a Z 80 microprocessor loaded with CP/M, BASIC, Wordstar and SuperCalc
1982	Intel produces the 80286 running at 6 megahertz (134 000 transistors and speed of 0.9 MIPS)
	Microsoft provide MS-DOS for the IBM PC
	Compaq Computer introduces the Compaq Portable PC using an 8088 running at 4.77 megahertz
1983	Apple LISA with GUI (graphical user interface) introduced
	Lotus 123 produced for MS-DOS, designed by J Sachs and M Kapor
	Osborne Computer Corporation files for bankruptcy
	Microsoft announces Windows development
1984	NFS Net established
	Apple produces the Macintosh using a Motorola 68000 CPU with 32 bits and running at 8 megahertz with the GUI
	Microsoft releases MS DOS 3.1 for the PC
	2400-baud modems start to appear
1985	Windows Version 1 introduced 2 years after first announcement
	Intel produces the 80386DX with 275 000 transistors running at 13 megahertz
1986	Compaq produces the Deskpro 386 using the 80386 running at 16 megahertz
	IBM produces the PC XT using a 80286 with a capacity to address 640 kilobytes of RAM with

1986	1.2-megabyte floppy drive and 20-megabyte hard drive
1987	Commodore produces the AMIGA 500 using the Motorola 68000 CPU with 512 kilobytes of RAM
	IBM produces the PS/2 series including the Model 30 (8086 at 8 megahertz), the Model 50 and 60 (80286 at 10 megahertz) and the 80 (80386 at 20 megahertz), all using the Micro Channel Architecture (MCA)
	IBM introduces the Video Graphic Adapter (VGA) with 16 colours at 640 by 480 or 256 colours at 320 by 200
1988	Microsoft produces DOS 4, able to address disk partitions above 32 megabytes
	Ashton-Tate produce DBase 4 for MS DOS
1989	Intel produce the 80486 running at 25 megahertz and integrating the 80386 CPU with the 80387 maths co-processor (1.2 million transistors running at 20 MIPS)
	Intel produces the 80486 running at 33 megahertz (27 MIPS)
	WordPerfect 5.1 released
1990	Microsoft produces Windows Version 3
	G Hyatt awarded patent for 'single chip integrated circuit computer architecture' after a 20-year wait
	ARPANET shut down
1991	Microsoft produces MS-DOS 5 with Q Basic to replace GW Basic
1992	NEC produces a double-speed CD-ROM drive
	Microsoft produces Windows 3.1 and sells 1 million upgrade copies in 7 weeks
	Microsoft produces Windows for Workgroups 3.1 allowing network operation
	Intel introduces the Pentium with 32-bit registers, a 64-bit data bus and able to address 4 gigabytes of address space (3.1 million transistors running at 112 MIPS for the 66-megahertz version)
1994	Intel produces the 100-megahertz Pentium running at 166 MIPS
	Mosaic Communications produces the Netscape Navigator Version 1 browser for the Internet
1995	Windows 95 introduced
	The Internet becomes publicly accessible as the World Wide Web
1997	Digital portable telephones begin to make analog phones obsolete
1998	Integration of portable telephone and personal digital assistants make mobile Internet access possible
1999	The Iridium satellite network commences
2001	Anniversary of the first trans-Atlantic radio signal

pink - dig into more

graph paper = Tom's book mark
manilla folder = relevant
~~stuff~~ stuff

1 article that cuts off that
Tom wants copy of
* article is only one on
Westinghouse's gearing up
for mass production

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production was necessary
part of broadcasting which
is what Davis realized
when he saw the ad

crystal set, but then vactubes b/c more sensitive phonographs didn't need them until later so it was beg of consumer electronics.

Yes KDKA was important, but the real imp thing was HP was using radios to talk to people.

To: Clay T. Whitehead; Susan Burgess
From: Wendell Bartnick
Date: ~~April 3, 2007~~
Re: General Order 40 reallocation rationale

Question

What factors did the Federal Radio Commission consider when reallocating almost every existing assignment when it issued General Order 40?

Short Answer

In General Order 40, the Federal Radio Commission ("FRC") changed almost every existing assignment by adjusting their power level, location, or frequency. The FRC attempted to balance a number of factors while creating its reallocation plan. First, the Davis Amendment to the Radio Act of 1927, which required the Federal Radio Commission to reallocate, required the FRC to equalize the number of assignments and broadcast station's total power levels in each of the five zones covering the country.[1] Along with the five zones, the Davis Amendment also required the FRC to consider an area's population.[2] Second, the FRC continued to follow its goal of decreasing interference and attacked interference as a technical problem to be solved.[3] Third, related to decreasing interference, the FRC weighed the quality of the technology used by the license holder.[4] Fifth, the FRC did not want to terminate any of the existing assignments.[5] Fourth, the FRC seemed to look at a station's popularity when determining

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[1] ROBERT W. MCCHESNEY, TELECOMMUNICATIONS, MASS MEDIA, AND DEMOCRACY: THE BATTLE FOR THE CONTROL OF U.S. BROADCASTING, 1928-1935, at 21 (1993); Thomas W. Hazlett, *The Rationality of U.S. Regulation of the Broadcast System*, 33 J.L. & ECON. 133, 161, 168 (1990).
[2] 1928 Fed. Radio Comm'n 2d Ann. Rep. 11, [hereinafter "1928 REPORT"], *available at* http://www.fcc.gov/mb/audio/decdoc/annual_reports.html.
[3] *Id.* at 12-13, 17; MCCHESNEY, *supra* note 1, at 22, 25.
[4] 1928 REPORT, *supra* note 2, at 11.
[5] *Id.* at 218.

its new assignment.[6] Sixth, the FRC did not want to disrupt the clear channels previously assigned to the high-powered national stations.[7] Finally, the FRC did not want to make drastic changes to the assignments affecting many people, so these people could still easily find their old station.[8] Importantly, a discussion limited to General Order 40 leaves out much of the background that explains why the FRC acted as it did and the actual effects of General Order 40; and that background is discussed in much more detail below in the Long Answer.

Long Answer

Prior To Radio Act of 1927

Before the Radio Act of 1927, anyone could request and receive a radio license from the Department of Commerce ("DOC").[9] The government could not deny a citizen's right to access spectrum or give exclusive rights to a part of the spectrum to one entity because spectrum was considered a public good.[10] Without spectrum access denials by the government, broadcasters increased their spectrum use. The increased use led to increased interference problems. Additionally, the government could not limit the power levels used by broadcasters.[11] The limits on technology were the only limits on a station's power level which was another key contributor to interference.[12] For example, the size of the antenna was one major determinate of power.[13] As an antenna increased in size and other technology improved, the power levels of stations rose, causing

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[6] McCHESNEY, *supra* note 1, at 24.
[7] 1928 REPORT, *supra* note 2, at 17.
[8] *Id.* at 216.
[9] Hugh G.J. Aitken, *Allocating the Spectrum: The Origins of Radio Regulation*, 35 TECH. & CULTURE 686, 688 (1994).
[10] *Id.*; Hazlett, *supra* note 1, at 133, 135 (1990).
[11] *See* Aitken, *supra* note 9, at 692.
[12] *Id.*
[13] *Id.*

interference.[14] Very wide broadcast signals were a third cause of interference because signals spilled over onto other frequencies.[15]

To combat this interference, Congress passed the Radio Act of 1912 ("1912 Act"). The 1912 Act resulted in moving amateurs to a different spectrum area so that they would not interfere with government and commercial use.[16] Also, new technology improvements, like the use of vacuum tubes, helped solve other interference problems.[17] These improvements caused most people to think the minimal regulations under the 1912 Act were enough.[18]

But the 1920's broadcast explosion changed this view.[19] The 1920s saw many more people who wanted to broadcast to a wide range of people, not just point-to-point communication as before.[20] The DOC attempted to fix the problem by dedicating a single frequency and then an entire frequency band to these broadcasters.[21] These frequencies were chosen away from the amateur, commercial, and government frequencies to avoid interference, but the broadcast stations multiplied faster than the available channels creating more interference problems as the number of stations increased.[22] In September 1921, three stations broadcasted, in December of 1922 there were 576 broadcast stations, and in February 1927, there were 716 broadcast stations.[23] The power levels of the broadcasts also increased due to technological improvements; the

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[14] *Id.*
[15] *Id.*
[16] *Id.* at 691.
[17] *Id.* at 693.
[18] *Id.* at 693-4.
[19] *Id.* at 693.
[20] *Id.*
[21] *Id.* at 694-5.
[22] *Id.* at 694-5.
[23] MARVIN R. BENSMAN, THE BEGINNING OF BROADCAST REGULATION IN THE TWENTIETH CENTURY 154 (2000); Hazlett, *supra* note 1, at 140.

power levels increased from a normal broadcast level of 250 watts to where many stations broadcasted at 500-1000 watts.[24] Two stations planned to broadcast at 5,000 watts and RCA stated they could broadcast at 50,000 watts.[25]

In the early and mid 1920s, a significant portion of the stations, around one third, were operated by nonprofit organizations like religious groups, civic organizations, labor unions, and colleges and universities.[26] Between 1921 and 1925, colleges and universities received 176 licenses, with 128 stations surviving until at least 1925.[27] The other nonprofit groups combined had approximately the same number of licenses.[28] During this same time, even the for-profit stations weren't "professional" broadcasters; they were newspapers, department stores, power companies, car dealerships, etc.[29] These unprofessional, for-profit stations had about half of the total licenses, and the stations were used to improve the publicity and reputation of owners' primary businesses.[30] In 1926, only 4.3% of US stations were labeled as "commercial broadcasters", but soon, huge corporations, including RCA, GE, AT&T, and Westinghouse, dominated radio communication, as many nonprofit broadcasters quit broadcasting due to lack of funds.[31] RCA established the first network, NBC, in late 1926.[32] CBS was created in 1927.[33] These two networks and their affiliates quickly dominated broadcasting.[34]

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[24] Aitken, *supra* note 9, at 695.
[25] *Id.*
[26] MCCHESNEY, *supra* note 1, at 14-15.
[27] *Id.*
[28] *Id.*
[29] *Id.* at 14-15
[30] *Id.*
[31] *Id.* at 12, 15.
[32] *Id.* at 14.
[33] *Id.*
[34] *Id.*

During this time, the DOC seemed to be able to at least regulate the location and frequencies where licensees broadcasted which allowed the DOC to prevent some broadcast interference.[35] For example, the DOC tried to keep the area near the Canadian border free from powerful U.S. stations to avoid interference and possible diplomatic problems.[36] However, the court in *U.S. v. Zenith Radio Corp.*[37] took away even this limited power.[38] The court case plus a subsequent attorney general's opinion on the subject resulted in the DOC taking a nearly complete hands-off approach to spectrum allocation, creating what some view as "chaos" where interference problems increased with no solution in sight.[39] For example, within six months, 200 new broadcasters began operation and many did not respect the others' frequencies.[40]

Radio Act of 1927

To fix these interference problems, Secretary of Commerce Herbert Hoover thought the only solution was strong regulation and Congress passed the Radio Act of 1927 ("1927 Act") which granted the federal government the right to deny access to the spectrum for the first time.[41] However, no one believed government ownership or complete control of broadcasting was the answer.[42] The National Association of Broadcasters ("NAB") and the commercial broadcasters were highly involved in drafting the 1927 Act.[43] Contrastingly, educators and other nonprofit broadcasters played almost

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[35] Aitken, *supra* note 9, at 702.
[36] *Id.* at 704.
[37] *U.S. v. Zenith Radio Corp.*, 12 F.2d 614 (N.D. Ill. 1926).
[38] Aitken, *supra* note 9, at 702.
[39] BENSMAN, *supra* note 23, at 154; Aitken, *supra* note 9, at 706.
[40] MCCHESNEY, *supra* note 1, at 14.
[41] BENSMAN, *supra* note 23, at 183; Aitken, *supra* note 9, at 689.
[42] MCCHESNEY, *supra* note 1, at 14.
[43] *Id.* at 17.

no role, though they did support the 1927 Act to fix the abundant interference problems.[44] Virtually everyone saw the 1927 Act as an emergency solution to the recent interference problems.[45]

The 1927 Act created the Federal Radio Commission ("FRC"), giving it the ability to assign frequency rights based on what the FRC thought would further "the public interest, convenience, or necessity," a highly general guideline.[46] Early versions of the 1927 Act attempted to favor nonprofit broadcasters, but specific language was rejected because legislators felt that mandate was implicit in the term "public interest, convenience, or necessity."[47] The FRC quickly identified a number of problems they would act to fix: 1) stations frequency jumped, 2) no separation between channels existed, 3) U.S. signals invaded Canada, 4) many new stations continually entered an already crowded situation, and 5) incumbent stations continued to increase their power output.[48] The FRC also identified two ways it could serve the public interest: 1) distribute stations evenly along the dial, and 2) license only stations that demonstrated a capacity to serve the public.[49] With these problems and goals in mind, the FRC, in the end, reassigned nearly every station.[50]

The FRC held a number of hearings on how best to regulate broadcasting to prevent the interference problems.[51] The FRC got most of their suggestions from

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[44] *Id.*
[45] *Id.*
[46] Radio Act of 1927 § 9; MCCHESNEY, *supra* note 1, at 18; Hazlett, *supra* note 1, at 136.
[47] MCCHESNEY, *supra* note 1, at 33.
[48] 1927 Fed. Radio Comm'n Ann. Rep. 10-11, [hereinafter "1927 REPORT"], *available at* http://www.fcc.gov/fcc-bin/assemble?docno=270701.
[49] *Id.* at 11.
[50] *Id.* at 9.
[51] MCCHESNEY, *supra* note 1, at 19.

commercial broadcasters, radio manufacturers, and other commercial enterprises.[52] The broadly held sentiment in these hearings was that the success of broadcasting meant removing small and unimportant stations.[53] When assigning spectrum, the FRC chose to employ a market success standard of public interest.[54] The market success standard favored applicants with better technical equipment, adequate financial resources, skilled personnel, and the ability to provide continuous service; in essence, the advantages that commercial broadcasters had over nonprofit broadcasters.[55] One scholar feels the process was highly political where the FRC grandfathered rights for major broadcasters, and eliminated many of the smaller stations and all new entry into the broadcast market.[56] Another scholar said, "[t]he beneficiaries of the ad hoc allocation process were the largest stations, generally affiliated with the networks, while the smaller and nonprofit broadcasters continued to struggle to survive."[57]

The FRC implemented the initial government-determined allocation by terminating all licenses on June 1, 1927.[58] On that date, the new allocations went into effect where the FRC granted temporary sixty-day licenses starting on June 15, 1927.[59] During the sixty days, stations could request a hearing to complain about their assignment and they had to show how their requested assignments were in the public interest.[60]

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[52] *Id.* at 19.
[53] McCHESNEY, *supra* note 1, at 19.
[54] Hazlett, *supra* note 1, at 157.
[55] *Id.* at 157-58.
[56] *Id.* at 154, 168.
[57] McCHESNEY, *supra* note 1, at 20.
[58] 1927 REPORT, *supra* note 40, at 15.
[59] *Id.*
[60] *Id.*

Between July 1, 1927 and March 18, 1928, the FRC held 51 hearings from broadcasters who wanted better assignments.[61]

According to the FRC, this allocation test proved to do well in the large cities, but poorly in rural areas.[62] The rural area listeners reported much more heterodyne interference on their stations.[63] Heterodyne interference occurs when two stations operate on the same frequency and one is running a little off frequency, causing the broadcast of an audible tone on those stations.[64] The FRC responded by reallocating assignments a number of times and only granted 60-day licenses to give the FRC the continued flexibility to do adjust the assignments.[65] The FRC reallocated assignments in Zone 5 in November 1927 and again in March 1928 due to interference problems.[66] The FRC reallocated in other zones in December 1927.[67]

One scholar noted the FRC's solution accomplished the following:[68]

- Gave de facto property rights to the incumbent licensees using a "priority in use rule",
- Did not renew 83 licensees in July 1927,
- Reduced power and time assignments to nonprofit organizations, and
- Awarded enhanced power assignments (up to 50k watts) to some large broadcasters, generally network affiliated

While the FRC seemed pleased with its success, not everyone shared its view. First, some members of Congress charged the FRC with discriminating against the

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[61] 1928 REPORT, *supra* note 2, at 9.
[62] *Id.* at 8.
[63] *Id.*
[64] KNLS English Service, http://www.knls.org/English/trascripts/dxdef02.htm#Heterodyne.
[65] 1928 REPORT, *supra* note 2, at 8.
[66] *Id.* at 9-10.
[67] *Id.* at 8.
[68] Hazlett, *supra* note 1, at 167-68.

southern states when it assigned stations.[69] As a result, the FRC tried to give more assignments to southern stations (32 new stations were added) and 47 northern stations voluntarily gave up their licenses between March 1927 and June 1928.[70]

Second, the number of nonprofit broadcasters was decreasing rapidly. In 1924, 151 stations were licensed to colleges and universities, and in September 1928 there were only around seventy.[71] Rather than help nonprofits, when possible the FRC attempted to create clear channels for high-powered stations broadcasting nationwide.[72] Of the first twenty-five channels set aside for clear channels, twenty-three were given to NBC affiliates.[73] Congress had mixed feelings on these FRC actions as some felt the public interest was served best by the content diversity of the network affiliates, while others were unsatisfied with the sharp decline in the role of nonprofit broadcasting.[74] Those unhappy with the increasing dominance of the networks called for legislation to require the FRC to break-up the network dominance, reduce the maximum power allowances so less capitalized stations could compete, and to turn over more of the prime clear channels to nonprofit broadcasters.[75] Much of this effort failed, but Congress did succeed in passing the Davis Amendment. [76]

Davis Amendment in 1928 – General Order 40

Congress enacted the Davis Amendment in March 1928.[77] The Davis Amendment ordered the FRC to allocate an "equitable" number of broadcast licenses to

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[69] 1928 REPORT, *supra* note 2, at 10.
[70] *Id.* at 11.
[71] Hazlett, *supra* note 1, at 164-65.
[72] MCCHESNEY, *supra* note 1, at 20-21.
[73] *Id.*
[74] *Id.*
[75] *Id.* at 21.
[76] *Id.*
[77] *Id.*

each of the nation's five zones on the claim that the South and West was being cheated out of its fair share of radio stations.[78] This new requirement implicitly attacked the network domination which was highly concentrated on the eastern seaboard.[79] The FRC changed its sole focus from achieving better radio reception and working to achieve "fair, efficient, and equitable radio service" required in the 1927 Act to achieving an equal allocation of licenses based on geographic location (the 5 zones) and population.[80] Congress directed that the FRC could accomplish this task by: 1) granting or refusing license applications or renewals, 2) changing periods of operation time, and 3) increasing or decreasing station power.[81]

The FRC acknowledged that Congress did not define the meaning of public interest, convenience, or necessity in the Act of 1927 or the Davis Amendment.[82] So the FRC interpreted it to mean that the FRC should strive 'to bring about the best possible broadcasting reception with the best technical equipment."[83] First, the FRC held a number of hearings which included mostly engineers, and allowed them to present plans to the FRC for implementing the Davis Amendment.[84] These engineers were mostly employed by the government, radio manufacturers, or commercial broadcasters, which coincided with the FRC's "harmonious and extensive relationship" with NBC, CBS, and the NAB.[85] Their primary recommendation was to create a large number of high-powered clear channels "upon which only one station operates" nationally and also to create a number of regional channels that several broadcasters could use

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[78] MCCHESNEY, *supra* note 1, at 21; Hazlett, *supra* note 1, at 161, 168.
[79] MCCHESNEY, *supra* note 1, at 21.
[80] 1928 REPORT, *supra* note 2, at 11.
[81] *Id.*
[82] MCCHESNEY, *supra* note 1, at 25.
[83] 1928 REPORT, *supra* note 2, at 11.
[84] *Id.* at 12-13; MCCHESNEY, *supra* note 1, at 22.
[85] MCCHESNEY, *supra* note 1, at 22-23.

simultaneously.[86] As a corollary, the engineers suggested that if the FRC could not reduce the number of small broadcasters to create the clear channels, those broadcasters should be forced to share the same channels.[87] This coincided with networks' and large commercials broadcasters' priorities, since they could best take advantage of this reallocation.[88] The FRC also asked major radio editors which stations were the most popular in their communities.[89] Contrastingly, the FRC had little contact with nonprofit broadcasters, public interest groups with an interest in broadcast policy, or even members of Congress.[90]

The FRC decided to discontinue licensing portable broadcasting stations and terminated the licenses of the 13 existing portable broadcast stations since they created many interference problems.[91] Then the FRC identified 164 stations which were doubtful to retain their license without a showing of how their continued operation would serve the public interest, convenience, or necessity.[92] In late August 1928, only 81 of those stations remained unscathed, as 62 of the station licenses were terminated, mostly in the Midwest, and 12 were reduced in power.[93]

Finally, the reallocation plan based on the mandate of the Davis Amendment occurred with the issuance of General Order 40 on August, 30, 1928.[94] One key conclusion the FRC made was to not abolish any of the existing stations beyond what had

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[86] *Id.* at 22, 24.
[87] *Id.* at 24.
[88] *Id.*
[89] *Id.*
[90] *Id.* at 23.
[91] 1928 Report, *supra* note 2, at 14.
[92] *Id.*
[93] *Id.* at 16. Nine more were also affected in other ways. *Id.*
[94] *Id.* at 17. General Order 40 is located in the 1928 Report's Appendix A.

already been terminated.[95] The important component of the implementation plan instead was to create limits on national, regional, and local channels in each of the 5 regions of the country.[96] Each zone would have a maximum of 8 national clear channels, 7 regional channels (between 500 and 1000 watts), and 30 local channels (50-100 watts).[97] Beyond these, 6 channels were set aside for stations greater than 100 watts for use in all zones and 5 channels for stations less than 1000 watts for use in all zones, and 4 channels were set aside for use by stations with greater than 5000 watts for use in two or more zones.[98] The FRC felt this created excellent radio reception on 80% of the channels.[99] The reallocation altered 94% of the broadcasters' prior frequency assignments.[100] The unaffected 6% were network affiliates already situated on existing clear channels.[101]

The new assignments from this reallocation were announced on September 10, 1928, to go into effect on November 11, 1928 and regulated frequency, power, and hours of operation.[102] There were some revisions to the plan during October, but everything went into effect in November as planned.[103] The statement by the commission pursuant to General Order 40 stated that the commission believed the plan provided an improved standard of radio reception generally, and also distributed the broadcast channels, powers, and periods of time on the air equally among the five zones.[104] A chief engineer looked at the allocation and found that: 1) allocation of frequencies and of stations assignments to the individual states were closely proportional to population, 2) aggregate power levels

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[95] *Id.* at 218.
[96] *Id.* at 17.
[97] *Id.*
[98] *Id.*
[99] *Id.*
[100] MCCHESNEY, *supra* note 1, at 25.
[101] 1928 REPORT, *supra* note 2, at 17.
[102] *Id.* at 18.
[103] *Id.*
[104] *Id.* at 214.

were nearly equal among the five zones, and 3) the assignments were only approximately equalized since the zone with the most had 155 assignments and the zone with the least had 106 assignments.[105] In addition, the choice of new frequencies was largely influenced by the previous frequencies.[106] For example, the high-powered stations were placed at certain frequencies because listeners were accustomed to hearing regional-service stations at those frequencies.[107]

Post General Order 40

Pursuant to General Order 40, the FRC assigned licenses for three month periods, giving the FRC the ability to adjust the assignments.[108] Any broadcaster could challenge the assignment during the 3 months and the FRC would allocate the majority of the hours to stations it deemed most worthy.[109] Most of the challengers were commercial broadcasters who challenged nonprofit broadcasters for their air-time.[110] The commercial broadcasters usually won these challenges because the FRC favored general public service broadcasters rather than the nonprofit stations it described as "propaganda stations."[111] This resulted in the hours going to commercial stations, often affiliated with one of the two networks.[112]

Most nonprofit broadcasters found themselves in a vicious cycle where the FRC lowered their hours and power by assigning them to well-capitalized commercial broadcasters, which made it that much more difficult for the nonprofit broadcasters to get

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[105] *Id.* at 217-18.
[106] *Id.* at 216.
[107] *Id.*
[108] *See* MCCHESNEY, *supra* note 1, at 25.
[109] *Id.*
[110] *Id.* at 26.
[111] *Id.* at 28.
[112] *Id.*

the money necessary to be successful. [113] Without money, the nonprofit broadcasters could not expand or spend the money to defend against the commercial broadcasters challenges to their air-time every three months. [114] This was the scenario for most of the educational and nonprofit stations that went off the air in the late 1920's and early 1930s. [115]

While the FRC didn't explicitly terminate the nonprofit assignments, the net effect of their actions resulted in a significant decline in the number of nonprofit stations.[116] In the year following the implementation of General Order 40, one hundred fewer stations were on the air.[117] Educational stations declined from ninety-five in 1927 to less than half that in 1930.[118] The overall number of nonprofit broadcasters declined from 200 in 1927 to 65 in 1934 and nearly all had low power.[119] By 1934, nonprofit broadcasters made up only 2% of US broadcast time.[120]

Unsurprisingly, after the General Order 40 reallocation and ensuing challenges, the nationwide networks took off. NBC and CBS combined to have forty-four stations in 1927 (6.4%).[121] Within 4 years, they combined for 30% of the stations.[122] All but three of the forty clear channels were soon owned or affiliated with the two networks and approximately one half of the remaining 70% of the stations were low-power independent broadcasters operating with limited hours and shared frequencies.[123] Within 2 years of

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[113] *Id.* at 25, 31.
[114] *Id.*
[115] *Id.*
[116] *Id.* at 30-31.
[117] *Id.* at 26.
[118] *Id.* at 30.
[119] *Id.* at 30-31.
[120] *Id.* at 31.
[121] *Id.* at 29.
[122] *Id.*
[123] *Id.*

the General Order 40 implementation, the average independent station had a power of 566 watts, while NBC's stations averaged over 10k watts.[124]

[124] *Id.*

Powel Crosley, Jr.: How his Blind Ambition Promoted Competition in the Wake of RCA's Radio Monopoly

By Jackie Neff

Despite failing out of engineering school, Powel Crosley, Jr. went on to become one of the most successful "engineers" in the broadcasting business.[1] Undeterred by his educational failure, Crosley blindly followed his ambition wherever it drew him. He spent his college summers selling securities to businessmen and developed marketing skills.[2] Confident in his salesmanship, Crosley charmed investors into backing several failed automobile sales ventures.[3] Lucky for Crosley, the wireless industry surfaced and radio began to blossom presenting endless opportunities for a driven young entrepreneur like Crosley.[4]

In 1921, Crosley's son, Powel Crosley III, told him about this great wireless set that he had seen at a friend's house, and Crosley took his son to purchase a similar model at a department store.[5] The store clerk informed him that the least expensive model was $130, 1/3 the price of a Model T at the time![6] Crosley was puzzled by the staggering price and refused to believe that radio production could possibly be so expensive.[7] Instead of a radio, Crosley purchased a pamphlet entitled "The A.B.C. of Radio."[8] He

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[1] Rusty McClure et al., *Crosley: Two Brothers and a Business Empire that Transformed the Nation* 50 (2006).
[2] *Id.* at 53.
[3] *Id.* at 52-56, 75-80.
[4] *Id.* at 63.
[5] *Id.* at 121.
[6] *Id.* at 124.
[7] *Id.*
[8] *Id.* at 125.

successfully built a functioning radio with materials costing less than $35.[9] Crosley saw a business opportunity and quickly sought willing investors.[10] Thereafter, Crosley made some modifications to suggested radio parts, lowering the manufacturing cost.[11] Before attempting to manufacture his own radios for distribution, Crosley gauged interest in his products by selling the less expensive, more promising parts to existing manufacturers such as Grebe.[12] Of particular interest were his porcelain socket set, cheaper than the alternative molded composite and yet more durable, and his improved dialing knob.[13]

It is unclear whether Crosley ignored the potential legal consequences of his decision or whether he was ignorant of them. However, the high price of radios at the time was a reflection of RCA's monopoly of the industry arising out of its exclusive patent rights on necessary parts.[14] In 1919, the U.S. government strongly feared a British monopoly of the airwaves.[15] To secure American participation in, and eventual domination of, the radio industry, the government accepted General Electric's proposal to allow the three controlling companies to consolidate and purchase the foreign threat.[16] As such, the companies were consolidated to form RCA.[17] The behemoth held all valid radio patents in the U.S., including the exclusive rights to manufacture vacuum tubes and filaments.[18]

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[9] *Id.*; *Crosley Radio: A Brief History*, available at http://www.maisonconnoisseur.com/crosley_radio_history.html
[10] *Supra*, note 1 at 127.
[11] *Id.* at 125.
[12] *Id.*
[13] *Id.*
[14] *Id.*
[15] Robert Sears McMahon, *Federal Regulation of the Radio and Television Broadcasting Industry in the United States, 1927-1959* 15 (1979).
[16] *Id.*
[17] *Id.*
[18] Leonard S. Reich, *Research, Patents and the Struggle to Control Radio: A Study of Big Business and the Uses of Industrial Research*, 51 Bus. Hist. Rev. 208, 215-16 (Summer, 1977).

Whether he was unaware or turned a blind eye, the possibility of a patent infringement suit did not deter Crosley. After accumulating enough capital to set his vision in motion, Crosley recruited two young engineers from the nearby Cincinnati University to bring his ideas to life.[19] The result was the historic "Harko" crystal radio set which went on the market in 1921 for seven dollars per set (minus accessory equipment).[20]

Crosley's decision was not unwise. He became known as the "Henry Ford" of radio because he delivered radios to the masses at an affordable price.[21] Crosley's secret was his swiftness. RCA was a corporate giant, three distinct companies attempting to mesh talent, ideas, material and personnel.[22] Essentially, RCA was an umbrella organization formed as an outlet for the individual companies' sales.[23] The companies agreed to a common licensing pact, each allowing the others rights to any individual radio patents.[24] However, each separate company was responsible for its own production.[25] The separation of sales and production was disastrous creating substantial lag time between each step of the manufacturing process from design to final sale.[26] The corporate giant reacted far too slowly to the market and to patent infringement.[27] By the time RCA was prepared to tackle a patent infringement suit, Crosley was still a new competitor and not the only manufacturer infringing on RCA's patents.[28] Therefore,

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[19] *Supra*, note 1 at 127.
[20] *Id.*
[21] *Crosley Radio: A Brief History*, available at http://www.maisonconnoisseur.com/crosley_radio_history.html.
[22] *Supra,* note 18 at 217.
[23] *Supra,* note 15 at 25.
[24] *Id.* at 25-26.
[25] *Id.*
[26] *Id.* at 26.
[27] *Id.*
[28] *Id; Supra*, note 1 at 125.

Crosley escaped RCA's ire in its 1923 suit, and RCA targeted the more established Grebe Radio Corporation.[29]

However, by that time, Crosley had sold thousands of radios and had finally achieved the success he had been searching for. By 1922, he had become the world's largest radio seller.[30] He also made an imprint in history that survived even his grandchildren's time.

Then what happened? How long did his business thrive? What about his efforts in high-power radio broadcasting? Cincinnati? WLW?

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[29] *Id.* The adversary in this 1923 case received community support which ultimately culminated in a counter-suit by the FTC against RCA for monopolization of the radio industry. Therefore, even if Crosley had suffered the unlucky fate of legal prosecution, the business would likely have survived.

[30] *Crosley Radio History*, available at http://www.crosley.com/history.html.

early radio

A universal speaking service: the role of Westinghouse Electric and Manufacturing Company in the development of National Network Broadcasting, 1922-1926.

by Crawford, Amy Graban
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Radio transmission evolved into something new on November 2, 1920. On Election Day a recently established radio station in East Pittsburgh, KDKA, reported the election results to a public that was becoming increasingly interested in radio. How to define "the first broadcast station" is still debated, but on that day Westinghouse Electric and Manufacturing Company, the company that owned KDKA, transmitted a general purpose program designed to reach a mass, general-interest audience of casual listeners.

As the decade progressed, corporate powers in radio manufacturing battled for prominence as the industry headed in a potentially lucrative new direction. The patent pool that had been in effect during the war was lifted, leaving corporations vying to become the bellwether of the industry. The battle for leadership and dominance in the largely experimental and unregulated world of radio broadcasting led to legal arbitration, corporate negotiations, personal animosities and, eventually, cooperation and cross-licensing (Bilby, 1986; Hilmes, 1997; Spalding, 1964; Sterling & Kittross, 1978). In his biography of David Sarnoff, Kenneth Bilby writes, "The years between 1922 and 1926 were the most crucial in the development of American broadcasting. The service matrix that exists today, for television as well as radio, was configured then" (Bilby, 1986, pp. 68). As the dominant broadcasting and communications companies of the day struggled to establish a regular, national broadcast presence, Bilby notes that "in security-sealed corporate board rooms and Manhattan legal offices, and at secret arbitration hearings, the penumbral drama unfolded" (Bilby, 1986, pp. 68).

The story of how Radio Corporation of America, General Electric, and Westinghouse Electric and Manufacturing Company worked together, if occasionally at cross-purposes, to build the structure of national network broadcasting has been told, but not from each company's perspective. The personal and business correspondence of Westinghouse Vice President and broadcast pioneer Harry Phillips Davis illustrates how Westinghouse planned to enhance and, later, preserve their leadership position as the industry evolved. If the drama unfolded behind closed doors, then these documents provide a window into the negotiation from Davis's and Westinghouse's perspective.

H. P. Davis's Broadcast Proposals

Broadcast history texts tell the familiar tale of how Frank Conrad, an engineer at Westinghouse, set up an experimental radio station at the Westinghouse factory in East Pittsburgh, Pennsylvania. At Westinghouse, Conrad had been in charge of the governmental wireless experiments during World War I. After the end of wireless restrictions imposed during the war, Conrad began airing programs of music, lectures, and sports scores that were picked up by wireless enthusiasts with receiving sets. As the broadcasts grew in popularity, a local department store, the Joseph Horne Company, ran an advertisement promoting Conrad's station and the store's radio department. The advertisement read that "Mr. Conrad will send out phonograph records this evening for amateurs with radio receivers" ("First Radiophone Station," 1922, p. 7; "Great Men of Radio," 1922, p. 6; "Story Told of Birth of Broadcast," 1922, p. 7).

Conrad's supervisor, H. P. Davis, an engineer and vice president at Westinghouse, saw the advertisement and inferred that if the broadcasts found an audience with little promotion, an organized, high-quality program designed to reach a wide, mass audience could be very effective (Barnouw, 1966; S. J. Douglas, 1987; Head, 1956; Sterling & Kitross, 1978). Davis later recalled thinking that if there was entertainment on the air, people would demand "ears," or Westinghouse could establish a wide market for radio receiver sets. ("Great Men of Radio," 1922). Davis sent for Conrad and informed him that Westinghouse was shutting down Conrad's experimental station. A two-part installment in The Chicago Evening Standard on June 17, 1922, describes Davis's recollection of the conversation.

Frank, my idea is that you stop sending from your station and we

will start a regular service from our experimental station here at

East Pittsburgh. We can arrange for a suitable wave length, and I

believe if we do this it will be the beginning of radio

broadcasting public service which seems to me to have wonderful

possibilities. ("Story Told of Birth of Broadcast," 1922, p. 7).

Whether Davis did foresee the full impact of radio as an industry and public service on that day in 1920 cannot be said for certain. As an advocate for a permanent radio station with a daily program schedule, Davis did articulate in internal correspondence his view that radio should not be limited as a point-to-point medium. Rather, Davis envisioned radio as a mass medium designed for the information, entertainment, and public service of the masses (Davis, 1928; "First Radiophone Station," 1922; "Story Told of Birth of Broadcast," 1922).

Harry Phillips Davis was born July 31, 1868, in Somersworth, New Hampshire. Davis studied electrical and mechanical engineering and joined Westinghouse's engineering department in 1891. A biographical essay in The Story of Electricity quotes Davis on his interest, beginning in the late 1880s, with "the various applications of electricity then being undertaken" (Martin & Coles, 1922, p. 1). Davis's work early in his career focused on the electrification of mass transportation systems, a field in which Davis holds more than 100 patents. Davis then turned his attention to radio, an endeavor that would make him one of the most influential Americans of the time.

In the 1920s H. P. Davis was celebrated in the popular press as "the Father of Radio Broadcasting" ("Father of Radio Broadcasting," 1922; Foster, 1923; "Great Men of Radio," 1922; Krumm, 1922; Maclaurin, 1949/1971; Martin & Coles, 1922; The National Broadcasting Company, 1931 ; "Radio's Version," 1970; "Story Told of Birth of Broadcast," 1922). In a press release issued by the National Broadcasting Company announcing Davis's death, radio pioneer and inventor Ernst Alexanderson of General Electric addressed Davis's influence.

The growth of the technical arts follows lines that can be foreseen to some extent. Science shadows invention. But how will these inventions be adapted to human society and how will they change it. It takes a leader who is more than a scientist or an inventor to blaze those trails. It is in that broader sense that we have come to know H. P. Davis and when we call him the "Father of American Broadcasting" it is the greatest tribute we can give. (The National Broadcasting Company, 1931, p. 1)

In 1922, Davis wrote about the new promise of the broadcasting public service company. The radio, he wrote, offers great promise. Davis was among the first to foresee radio's practical possibilities. It was Davis's view that radio offers entertainment through its programming, but it is also a serious service for the good of the public. Davis likened the role of the radio to that of the newspaper but noted one difference. "The newspaper has been developed to a wonderful state of perfection and wields a tremendous influence in our lives today--yet that influence is more or less local." Radio had the potential to unite a nation (1922, January, p. 3).

Davis noted that when KDKA went on the air, the public response was dramatic and immediate. After 9 months of continuous operation, KDKA relayed its signal to stations WJZ in Newark, and WBZ in Springfield, Massachusetts, with a fourth station, KYW, in the works in Chicago. Still there was public demand for wider reach and more programming. Davis asked,

And where will it end? What are the limitations? Who dares to predict? Scientists and inventors are working on relays that will permit one station to pass its message on to another and we may easily expect to hear from an outlying farm in Maine some great artist singing into a radiophone many thousand miles away.... It is not a question of possibility--it is rather a question of "how soon." (1922, January, p. 5)

Davis also saw problems in the fast growth of early radio. The number of broadcasters on the air grew dramatically, numbering almost 600 stations in 1922 on only two wavelengths. There were no proposed plans to deal with this congestion and no clear call for action to restrict start-ups. Those who were established in the industry, like Westinghouse, looked at this chaos and feared that interference from newcomers would threaten their established stations. One idea being examined by Davis and others was a way of creating an efficient distribution system. This would be a way to reap the benefits of economies-of-scale and produce high quality programming. It would be a way to receive programming, perhaps live, from across the nation or globe. Davis called this a "universal speaking service" (Davis, 1922, April, p. 1). Others were developing this same concept and calling it chain broadcasting or network broadcasting (Barnouw, 1966; G. H. Douglas, 2002; Sterling & Kittross, 1978).

Westinghouse's Early Proposals for Networks

By 1925, the considerable interference brought about by the quick boon of the radio industry was becoming a critical issue for established broadcasters and receiver manufacturers, such as Westinghouse. The radio conferences initiated by the Department of Commerce through the early 1920s did little to solve the problem and established broadcasters were becoming anxious that their radio audiences would be discouraged by the noise on the radio band (G. H. Douglas, 2002). Broadcasters began looking for ways to rein in the competition. One method, especially for established stations and organizations, was to work together.

One way in which to do this was to create a chain of stations which could be used to distribute programming. A web of networked entities was a familiar concept in the telephonic communication sector. In 1923, the American Telephone and Telegraph Company used its existing long-distance lines to begin distributing programming to stations, an arrangement, they argued, to which they held the exclusive rights (G. H. Douglas, 2002; Sterling & Kittross, 1978). AT&T was not alone in its development of the network concept. Westinghouse experimented with relaying programs by other stations or putting "remote" programs on the air shortly after the establishment of KDKA in 1920 (G. H. Douglas, 2002).

Westinghouse also started to see how the presence of programming across wider geographic markets could lead to increased receiver sales. In a letter dated July 8, 1925, Frank E. Mulley, an editor at a farm journal, The National Stockman and Farmer, examined the correlation between desirable programming for a key audience and the adoption of radio sets. His letter documented what he saw as the influence that programming, in this case the farm report The Stockman on KDKA, had on encouraging farmers to purchase receivers. As evidence, Mulley pointed to the correlation that counties with the highest subscription rates to The National Stockman and Farmer newspaper also had the most radio sets.

There are more sets on farms in the western third of Pennsylvania

where The Stockman dominates, than in the eastern two-thirds of the

state. This in spite of the fact that there are 50,000 more farmers

in the eastern two-thirds of the state. (Mulley, 1925, p. 2)

This correlation, while not scientific, did anecdotally suggest a mutually beneficial alliance which could be formed between newspapers and radio stations. One such venture was debated at Westinghouse Electric and Manufacturing Company in 1925. The proposed chain would be a coalition of Midwestern Newspapers and Westinghouse, to be called the Mid-Continent Chain. Such a chain would place Westinghouse and affiliated newspapers in direct competition with AT&T (Conrad & Horn, n.d.).

From July through November 1925 Westinghouse Electric and Manufacturing Company considered the costs and benefits of being a part of a chain of broadcasting stations. As Davis looked for a way to promote radio receiver sales and to efficiently provide programming for an audience wary of interference, he looked at the organization of a press association or wire service. Such a group allows each individual paper to maintain its ownership and local identity, while providing content from one centralized source. He proposed that radio stations could work under the same organizational structure (Davis, 1925; Rosen, 1980).

Davis viewed the structure of the developing AT&T national chain as wasteful. Davis stated in a 1925 proposal that "a large majority of the receiving sets in use today can pick up at will a half dozen or more of the American Telephone and Telegraph Company's chain but they can listen to only one at a time" (Davis, 1925, p. 1). He added that if the AT&T stations broadcast at different times, this duplication would be reduced. The Mid-Continent Radio Chain would cull programming from its affiliate members and then share this programming among members through the week.

The Mid-Continent Radio Chain would consist of six powerful, well-established stations in the Midwest, each affiliated with a newspaper. These included WMAQ (Chicago Daily News), WWJ (Detroit News), WBAP (Fort Worth Star-Telegram), WDAF (Kansas City Star), WHAS (Louisville Courier-Journal), and KSD (St. Louis Post-Dispatch). Davis estimated that each station had a 500-mile radius. With this calculation the network would have reached 85% of the nation, and 42% of the nation's population (Davis, 1925).

Davis, working with J. C. McQuiston, Westinghouse's manager in the Publicity Department, was considering a number of possible ways to interconnect these stations. The first possibility was to emulate AT&T by employing a wire relay. Another option was to substitute short wave wireless transmission for the traditional wired approach. A final option was to create a wire/wireless hybrid model (Davis, 1925, July 8). As a plan for the network developed, executives and engineers at Westinghouse opted for a wireless short wave approach.

Westinghouse perceived several advantages in an alliance with newspapers. The first was that the newspapers were familiar with working with advertisers. The newspapers also brought to the table with them their government connections and contacts. Additionally, McQuiston noted, the press could be a beneficial ally in promoting the name of Westinghouse and the network itself.

In Davis's and McQuiston's assessment the newspaper/station owners were optimistic about the potential to work together and work with Westinghouse, yet both sides indicated they had reservations about the arrangement. McQuiston feared the newspapermen were overemphasizing advertising returns over content. McQuiston stated that he would reposition Westinghouse's proposal to emphasize how a network could "build up a high standard of excellence of broadcasting" (1925, p. 1). He questioned whether the newspaper owners would have the same commercial outlook if it were the radio broadcasters suggesting a "disregard for a high standard of editorial?" (p. 1). The representatives of the newspaper also balked at the idea of forming a new company. Davis saw this as an important part of the deal. His argument was that by committing to be part of a distinct corporation there would be a greater chance to achieve uniformity and market the group to national advertisers (McQuiston, 1925).

It was Davis's estimation that stations could receive a variety of original programming to air every night of the week and for producing a single evening's worth of programming in exchange. This promise of quality content was seen by executives at Westinghouse to be a good value in a competitive radio market where many stations were competing for the same audience and were also vying for the same artists, and, of course, the same advertisers. The Mid-Continent Radio Chain would represent a relationship among three parties; the newspapers whose stations were affiliates, Westinghouse who would serve as the central organizing network, and advertisers who would sponsor programming (McQuiston, 1925).

Another stumbling block for this potential chain was a lack of agreement on the best way to transmit signals from the hub station to the affiliates. Westinghouse had been actively involved in short wave system experimentation and had been using short waves to transmit

KDKA around the globe. The tests sending out programming to affiliates via short wave were less than promising. Although experimental broadcasts from KDKA using the short wave system reached distant locales, they did not do so with predictable reliability. Short wave radio as a form of distribution, at this time, would remain a highly questionable concept (Barnouw, 1966).

Another potential problem Westinghouse could foresee was that of a fee structure for the affiliates. McQuiston found that the stations spent about $50,000 a year on operating expenses. If the plan for the chain were to succeed broadcasters could offset or reduce their annual outlay. The network, in addition to facilitating the placement of advertising and the procurement of programming, would charge the affiliates fixed fees from gross revenue. These costs would include a 15% agency commission and charge to recoup the cost of producing programming and the cost of operating the network short wave system. This charge was projected to be approximately 35% of gross revenue (Davis, 1925). During the late summer of 1925 both sides were left to mull these considerations while Westinghouse worked on a definite proposition. However, another discussion was beginning to draw Westinghouse's attention from the Mid-Continent Radio Chain. This was the possibility of a national network being discussed among members of the Radio Group--Westinghouse Electric and Manufacturing Company, General Electric, and Radio Corporation of America. The possibility of creating a large-scale network of wire-linked stations was finally something that seemed feasible. Talks with the newspaper stations never did resume, and Westinghouse pursued a different route to chain broadcasting.

Westinghouse and the Organization of the National Broadcasting Company

While negotiations were underway for the Mid-Continent Radio Chain, negotiations were also taking place among members of the Radio Group. In 1925 the Radio Group continued their conflict with AT&T regarding each organization's rights and role in the broadcasting industry. AT&T and the Radio Corporation of America were in arbitration based on a previous cross-licensing agreement. As early as 1922, David Sarnoff, then a vice-president at RCA, prophesied a change to the model of broadcasting. In a letter to General Electric president E. M. Rice, Sarnoff outlined the problems faced by the radio industry. The novelty of the medium was wearing off and the airwaves were becoming chaotic as new stations took to the air. The public would increasingly grow to expect high-quality content, Sarnoff argued. The cost-effective way to present this programming to the nation was through a linked chain of stations. The job of putting together such a network called for broadcasting specialists who understood the audience's taste and had a plan for how to satisfy it (Bilby, 1986; Sarnoff, 1925; Spalding, 1964). To Sarnoff, the Radio Group was the logical choice for the job.

The inception of the National Broadcasting Company has been reviewed by broadcast historians. In particular, RCA, which controlled 50% of the corporation, and their role in the development of the National Broadcasting Company has been well documented (Archer, 1971; Barnouw, 1966; Bilby, 1986; G. H. Douglas, 2002; S. J. Douglas, 1987; Head, 1956; Hilmes, 1997; Maclaurin, 1971; Rosen, 1980). A less familiar examination of the network's history involves Westinghouse Electric and Manufacturing Company and their motivations for joining the association, and their reaction to the end result of the negotiations.

On June 27, 1925, H. P. Davis distributed a memorandum on the proposed organization of a broadcasting company articulating one view of this proposed network. In his opening paragraph, Davis articulates the group's objectives.

The purpose of this Company will be to form a group of the best established and suitably located stations throughout the United States and Canada, for the purpose of organizing and improving general broadcasting conditions; to improve quality and to maintain it on the highest possible plane; to obtain the best in the way of programs; and to make available all national events and important performances of high class and acceptable character; and to make available the best talent obtainable, both musical and dramatic, occurring or appearing in the principal centers of this country.

It is the purpose also, while improving quality and programs, to reduce the operating expense to all members of the Company.

It is proposed to develop this organization into a national, and possibly an international, advertising medium which will be extended as much as possible with the hope of making the entire project self-supporting. (p. 1)

The proposition further organizes the technical structure of the network. One station in the group would serve as a primary station. From this station, programming would be distributed to affiliate stations via long distance wire connections. The affiliate station would retain its identity, ownership, and call letters. The member station would produce and air local programming as appropriate. The affiliate would pay a fee to the network, which would be used for the general direction of the organization, the procurement of programming, and advertising for the network. The network would be in charge of planning the direction the network was to take and evaluating its performance. The network would also conduct suitable research activities to develop the network and stations at the technical level.

Members would receive dividend from profits, as these were to accrue (Davis, 1925, June).

On July 3, 1925, the board of the Radio Corporation of America passed a resolution inviting General Electric and Westinghouse Companies into their network negotiations. A few weeks later, on July 9, 1925, Davis sent a letter to E. M. Herr, the President of Westinghouse, expressing his impatience with the pace of the network negotiations. The bitter arbitration between AT&T and the Radio Group was continuing although the referee of the process, Roland Boyden, had issued an informal resolution that the Radio Group had the right to establish and maintain transmitting stations and to derive revenue from such transmissions (Davis, 1925, July 9). The resolution was not, however, final. Radio Group executives, particularly Owen Young, Chairman of the Board at General Electric, were wary of pushing too hard on AT&T before matters were finalized.

The relationship of the Telephone Company at the present moment, as

you can see, is a very sensitive one, and I think it important

beyond measure that all of us sit steady in the boat now for a

month or two until we see if we can not (sic) get it straightened

out. (Young, 1925, p. 1)

In July 1926, AT&T's broadcasting holdings were purchased by RCA. On September 9, the Radio Group formed a new corporation, the National Broadcasting Company. Ownership was held by Radio Corporation of America, owning 50%; General Electric, with 30%; and Westinghouse Electric and Manufacturing Company owning the remaining 20% of the new company (Sterling & Kittross, 1978). The network of the Telephone Company consisted of 18 stations which reached about 61.6% of the nation's radio receiving sets. These stations, based on a draft National Broadcasting Company prospectus, were to become Network Number 1. Some adjustments were made, filling holes in coverage in New York City and Washington, DC. A second network, called Network Number 2 in the prospectus, would consist largely of stations owned by RCA and Westinghouse.

Network Number 2 was seen as vital for a number of reasons. First, it was anticipated that Network Number 1 would face problems as the network quickly grew in scope and size. Due to the cost of the investment in wire for this far-reaching network, it would only be profitable if it were to remain in almost constant use. The cost of advertising would also be higher for this same reason; advertisers would sign a 1-year contract and pay for 1 hour of programming per week at a cost of $180,000. The authors of the draft concluded that an alternative way for prospective advertisers to enter into network broadcasting without as great a financial commitment would be advisable. Network Number 2 would serve as an alternative for advertisers who wanted to "test the medium" or only reach a concentrated audience in the eastern part of the country. The cost to advertise on Network Number 2 would be in the range of $50,000 to $75,000. The only difference for the advertiser, according to the prospectus, would be the size of the audience the advertiser would reach. Content would be of comparable quality (The National Broadcasting Company, 1926).

Westinghouse, KDKA, and the Blue Network

H. P. Davis reviewed the final draft of this prospectus on September 15, 1926, and sent his reaction to J. G. Harbord, President of RCA, in a letter. Davis indicated that he was a man of two minds; in his capacity as an official in the Radio Group and as the Appointed Chairman of the Board of the new National Broadcasting Company, he felt that the organization was well-conceived. However, as a Vice President at Westinghouse and one of the individuals who conceived of and developed KDKA, he was concerned. This plan would place KDKA in a secondary chain. Additionally another Pittsburgh station, WCAE, a former AT&T station, would be placed at a higher advertising rate than KDKA, despite KDKA's historic dominance over WCAE in the market. Davis suggests a compromise was needed, stating that "KDKA is the most powerful broadcasting station in the world today; it is the pioneer, and probably has at least as much reputation as any other broadcasting station, and is a very valuable asset of the Westinghouse Company" (p. 2).

An undated letter to Davis from Frank Conrad, Assistant Chief Engineer at Westinghouse and the individual who started the experimental station that would become KDKA, expressed Conrad's dismay at this situation as well. He argued that the Radio Group was investing in this venture to increase revenue, yet they were placing many of their owned-and-operated stations in the lower-tier network. Instead, they were investing in the old AT&T stations, which, in Conrad's opinion were "largely of an obsolete type, not effectively manned and mostly present glaring defects in transmission characteristics" (Conrad & Horn, n.d., p. 1). Conrad also raises questions about the promised quality of programming and transmission for Network Number 2. If the network asks less money to advertise on Network Number 2, which would later become known as the Blue Network, will that not equate to less revenue? Will the stations of Network Number 1, which would later become known as the Red Network, earn greater revenue? If so, will they be willing to redistribute those funds to stations in the Blue Network for the sake of quality?

The Inaugural Broadcast of the National Broadcasting Company on KDKA

From the Grand Ballroom of the Waldorf-Astoria Hotel on Monday, November 15, 1926, the National Broadcasting Company officially premiered. The initial ceremonial event of the evening was a brief address by Merlin Aylesworth, President of the National Broadcasting Company. Aylesworth addressed a crowd of nearly a thousand, consisting of politicians and business leaders. Also in the audience were members of National Broadcasting Company's Advisory Council, including Major General James G. Harbord, Owen Young, General Guy E. Tripp, Elihu Root, and Julius Rosenwald. The major tenor of Aylesworth's address was that this network was created for the use and benefit of individuals and families listening across America and that broadcasting's purpose is to serve its audience. "The best it can create," Aylesworth noted, "leaves no record other than on the minds and in the hearts of those who hear it. Therefore, you in the great cities, you in the towns and villages, you on the farms, have it in your power to make the National Broadcasting Company an institution of service from the beginning" (The National Broadcasting Company, 1926, p. 1).

The program for the evening included a diverse mix of classical pieces, folk and dance music, and comedic routines. The audience listening at home also learned that not only were they receiving the performance from New York, but that those in the Grand Ballroom, were also hearing a number of live performances, which were being relayed to New York City, before being transmitted to the nation. Soprano Mary Garden of the Chicago Opera Company sang before a microphone in Chicago. Will Rogers addressed the crowd from a microphone installed in the dressing room of the theater in which he was appearing in Independence, Kansas. The performances were relayed via telephone cable to 25 stations and reached an estimated 12 million people as far west as Kansas City (Barnouw, 1966; Bilby, 1986).

Thousands of these listeners sent letters and telegrams to KDKA to share their reaction to the Monday evening show. On November 18, 1926, a selection of these letters was collected by H. P. Davis and forwarded to Aylesworth to share with him the audience's response, but also to illustrate the reach of KDKA's powerful signal, and as such, highlight the unique vantage that Westinghouse brought to the National Broadcasting Company. One letter, from a dentist in Portland, Oregon, congratulates KDKA on their "wonderful program" from New York City and adds that his reception of KDKA was "perfect" and as clear as the local broadcast stations (Dulin, 1926, p. 1). A listener in Haina, Hawaii, wrote to express his thanks for the inaugural program from National Broadcasting Company.

Thank you very much for the fine programs. We considered the New

York City dance music a big treat even tho (sic) we had to get it

via Pittsburgh. Sunday night while the RCA chain of stations was on

I tried to get some of them but KDKA was the only one my set could

pick up. (Giddings, 1926, p. 2)

In the letter to Aylesworth, Davis noted that many letters were sent on stationery "of a better class," often from a business or doctor's office. From this Davis surmised that "our radio service is reaching into a better class of homes" (Davis, 1926, November 18, p. 1). Davis also intimated that letters from listeners in places like Tampa and other parts of the Southeast could suggest a solution for their ongoing negotiations with AT&T, whose lines had been slow to reach such areas. Even after the establishment of the National Broadcasting Company's hybrid network connection, Westinghouse is emphasizing the relative benefits of their high wattage station and what it could add to the existing network structure. Westinghouse was once again positioning itself as a superpower that should be employed, and empowered, as such within the network (Davis, 1926, November 23).

KDKA received listeners who commented on the new network affiliation. Some listeners from across the nation liked the programming the new chain of stations could offer, many of which H. P. Davis saved in his personal papers. One letter dated January 3, 1927, commends the chain for their coverage of the Stanford-Alabama game from Pasadena, which was broadcast on January 1. The writer states that the announcer helped him to visualize the plays on the field, "in fact we found it easier to picture the contest than if we had been actually seated in the bowl" (Castle, 1927, p. 1).

Other long-time listeners were not pleased with the changes they heard. A letter to KDKA from Pittsburgh decried the loss of the unique voice of KDKA. The writer stated that he didn't like the new chain.

There isn't a station to compare with KDKA so why spoil it by

"chaining" to a New York Station? What is the idea with all these

chain stations anyway? Let each station broadcast their own program

(sic). Is someone trying to capture the air so we all have to

listen to a certain program or not listen at all? (McElvany, 1927,

p. 1)

Tripp collected and forwarded these letters to Aylesworth along with questions about the development of the Blue Network and the placement of KDKA. Aylesworth responded that he understood the concerns of Tripp and Westinghouse Electric and Manufacturing Company, but begged patience. Aylesworth said he planned to make the WJZ programs so good that Westinghouse would be reluctant to even want to change to the Red Network. In any case, Aylesworth noted, if a major station in the Blue Network, like KDKA or WJZ, were to leave the Blue Network would be badly wounded in both public opinion and advertising, and consequently revenue (Aylesworth, 1926, November 24).

Westinghouse Electric and Manufacturing Company did agree to remain on the Blue Network. The advertising rates and audience levels for the Blue Network never did match those of the Red Network. An aftermath of later FCC chain broadcasting rules would break NBC into two separate entities--the still powerful and popular Red Network and the less important affiliates on the Blue Network. In 1943 NBC divested itself of the Blue Network. In 1945 the Blue Network became the American Broadcasting Company (Sterling & Kittross, 1978).

Conclusion

Primary sources from the archive of H. P. Davis's personal and professional papers provide perspective on the chaotic state of radio in the 1920s. The industry was facing an unprecedented growth in revenue, audience, and demand for programming. The industry also was inventing the idea of mass communication of a message from a single point of origination to a mass audience. At first this audience was regional. As the power of stations grew and as new technologies, such as short wave, were introduced the regional audience became national and international. As these technologies became more readily available to entrepreneurs who wanted to enter the broadcasting field, the radio manufacturers, Radio Corporation of America, General Electric, and Westinghouse, who held the bulk of the financial resources, found themselves also facing interference and chaos.

The radio marketplace in the 1920s was uncharted territory for those in the radio industry. Radio manufacturers were always aware of the growing frustration of a listening public who found little program variety and increasing interference on the airwaves. In an attempt to make the creation of programming and the operation of multiple radio stations more efficient as well as more profitable, they structured a system matrix of program distribution. This matrix became the radio network, and the National Broadcasting Company became an enduring part of broadcasting. The archival papers of H. P. Davis illustrate the concerns of Westinghouse as radio's pioneers addressed the challenges of the decade. The papers and documents also show how, despite the changes of 80 years, the core concept of the network is a foundation of broadcasting.

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NOTE: All illustrations and photos have been removed from this article.

NBC: A Finding Aid to the National Broadcasting Company History Files at the Library of Congress, Motion Picture, Broadcasting and Recorded Sound Division

Index to the collection completed by Seth Morris, Sam Brylawski, Jan McKee, Bryan Cornell, and Gene DeAnna, 1995.
Finding aid expanded by Gail Sonnemann
with the assistance of Kathleen B. Miller.

Motion Picture, Broadcasting and Recorded Sound Division
Library of Congress

Washington, D.C.

1999

Finding aid encoded by Gail Sonnemann, 1999.

Finding aid URL: http://hdl.loc.gov/loc.mbrsrs/eadmbrsrs.rs000001

Collection Summary

Title: The National Broadcasting Company History Files.
Dates: 1922-1986
Call No.: NBC history files, Folders 1-1966
Creator: National Broadcasting Company
Extent: 1966 folders of manuscript and published papers
Language: Collection material in English
Repository: Motion Picture, Broadcasting and Recorded Sound Division, Library of Congress, Washington, D.C.
Abstract: The National Broadcasting Company History files document the activities of the first national broadcasting network in the United States. The collection includes memoranda, correspondence, speeches, reports, policy statements, and pamphlets covering the creation of the network, its growth in the field of radio, and its subsequent expansion into television broadcasting.

Search Terms:

Names
Dunham, Corydon B., 1927-
Frank, Rueven
Goodman, Julian, 1922-
Kaltenborn, H. v. – (Hans), 1878-1965
Lohr, Lenox R.
Sarnoff, David, 1891-1971
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National Broadcasting Company, inc.
RCA Corporation
NBC Symphony Orchestra
WEAF (Radio station : New York, N.Y.)
WJZ (Radio station : New York, N.Y.)
National Broadcasting Company Radio Collection (Library of Congress)

Subjects
Radio broadcasting – United States – History
Radio broadcasting – United States – Archival resources
Radio broadcasting – United States – Employees
Radio advertising – United States – History
Television broadcasting – United States – History
Television broadcasting – United States – Archival resources

Administrative Information

Provenance

The National Broadcasting Company donated the NBC History Files to the Library of Congress in 1992.

Access

The NBC History Files are housed within the Recorded Sound Section of the Motion Picture, Broadcasting and Recorded Sound Division of the Library of Congress. For further information and for access to the collection, contact the Reference Desk in the Recorded Sound Reference Center at (202) 707-7833.

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NBC Chronology

Date	*Event*
1921	Westinghouse owned and operated WJZ radio in Newark from 1921 - 1923.
1922	WEAF radio, owned and operated by AT&T, was founded in New York.
1923	RCA, a subsidiary of Westinghouse, operated WJZ radio from 1923-46 in New York.
1926	RCA announced the formation of the National Broadcasting Company on September 13, 1926 upon the RCA purchase of WEAF radio from AT&T.
November 1, 1926	NBC established with both a Blue and a Red network.
1926	NBC began radio broadcasting on November15, 1926.
1926	NBC formed the Red and Blue radio networks, with WEAF as the flagship station of the Red network and WJZ as the flagship station of the Blue.
1928	The first permanent coast-to-coast network in the United States was established by NBC on December 23, 1928.
1928	NBC received its first television station construction permit.
1936 - 1939	NBC investigated the possibility of separating Red and Blue Networks (See NBC folder numbers 301-304)
1939	NBC televised the opening ceremonies of the New York World's Fair.
May 2 1941	*Chain Broadcasting Report* stated "no license shall be issued to a standard broadcast [AM] station affiliated with a network organization which maintains more than one network." (Quoted in Sterling and Kitross, *Stay Tuned*, p.191.)
October 30, 1941	Both NBC and CBS filed suit against the U.S. Federal Communications Commission (FCC) for its new regulations.
January 1942	The U.S. Justice Department filed an antitrust suit against NBC and CBS (Sterling and Kitross, *Stay Tuned*, p. 236)
January 9, 1942	RCA president David Sarnoff announced that the Blue Network had been separated from the Red Network and subsequently was wholly owned by RCA.

Container	*Contents*
	Printed items: April 8, 1954, 6-page program of the 30th anniversary reunion of the members of the NBC Symphony Orchestra. 1950 RCA 23-page booklet, *On Tour with Toscanini and RCA Victor*.
FOLDER 1243	Arturo Toscanini Programs and Repertoire. 1937 - 1961. 72 items. Onionskin and mimeographed press release, letters, reports, and articles on Arturo Toscanini. Highlights: February 8, 1937, copy of a letter from Toscanini to David Sarnoff stating his desire for a commitment to quality from NBC for NBC symphony. Twenty three reports from 1937 to 1954, "Listing of Programs and Repertoire" of the NBC concert orchestra. Materials relating to Toscanini's funeral and memorial services. Printed items: Black and white photograph of members of the NBC opera company. January February, 1957 excerpts from *NBC Chimes*. Two black and white photographs of Toscanini with his symphony. 1953 39-page concert program, *Missa Solemnis*. Undated seating chart of Carnegie Hall. Article from December 1954 *High Fidelity Magazine* "Toscanini on Records, part 1: 1920 1948. Article from March 1957 *High Fidelity Magazine* "Ninety years of Arturo Toscanini" by Vincent Sheean.
FOLDER 1244	Toscanini Tour (1950). 1950. 27 items. Mimeographed press releases and the schedule for Toscanini's 1950 tour. Printed items: Large, undated mock up of a *Daily Star* special supplement honoring Toscanini. Spring, 1950 press book, *Arturo Toscanini and the NBC Symphony Orchestra First Transcontinental Tour*, contains photographs, press releases, and biographies. (2 copies) .
	Speeches, 1923-1990 63 folders. Texts of speeches delivered by NBC Presidents and other officials, and related press releases. Speeches are organized by the last name of the speaker.
FOLDER 1245	Speeches: A & B. 1927 - 1984. 21 items. Speeches by David C. Adams, Dr. James Rowland Angell, Frank A. Arnold, Harry Bannister, Edward P. Bertero, Hugh M. Beville, Jr., Thornton F. Bradshaw, and David Brinkley. Printed items: November 18, 1954, pamphlet of a Hugh M. Beville, Jr. speech on television ratings. April, 1956 technical manual on color video effects by Edward P. Bertero. March 18, 1959, pamphlet of a Hugh M. Beville, Jr. speech on cost and sales trends in network television. October 18, 1957, booklet of a Hugh M. Beville, Jr. speech on the methodology of television ratings. December 8, 1948, booklet of a Hugh M. Beville, Jr. speech on television advertising.
FOLDER 1246	Speeches: C & D. 1923 - 1978. 34 items. Press releases and speeches by Lester M. Crystal, Thomas E. Coffin, Joe Culligan, Mathew J. Culligan, Reid R. Davis, Charles R. Denny, Don Durgin, and John J. Carty. July 2-3, 1968 memoranda on television violence. Printed items: May 13, 1969, pamphlet of a Don Durgin speech on television program development. October 23, 1956, pamphlet of a Mathew J. Culligan speech on network radio advertising. December 15, 1965, pamphlet of a Thomas E. Coffin speech on the impact of color television on audiences. October 17, 1972, Don Durgin speech on the Fairness Doctrine. September 23, 1952, booklet of a Charles R. Denny speech on television's responsibility and opportunity for serving the public.

Container	*Contents*
FOLDER P337	RCA Laboratories: a New Center for Radio Research-Address by David Sarnoff and Otto S. Schairer. 1941. 23-page booklet.
FOLDER P338	Radio Pioneers 1945. 1945. 64 pages. Program commemorating the Radio Pioneers Dinner.
FOLDER P339	The Story of the First Trans-Atlantic Short Wave Message. Radio Club of America Inc., October, 1950. 78-page booklet.
FOLDER P340	Revolt Against Radio. Fortune Magazine, March, 1945. 9-page excerpt.
FOLDER P341	Davis, H.P. The History of Broadcasting in the United States. April 21, 1928. 23 pages. Address by a Westinghouse vice-president at Harvard University.
FOLDER P342	Gaudet, Hazel & Cuthbert Daniel. Radio Listener Panels. Federal Radio Education Committee, 1941. 47-page booklet.
FOLDER P343	Beville, H., Jr. The ABCD's of Radio Audiences. Cooperative Analysis of Broadcasting, Inc., Undated. 12-page booklet.
FOLDER P344	St. John, Robert. Facts and Faces. 1946. 63-page booklet. Contains exceptional personality sketches by the WEAF reporter.
FOLDER P345	Around the World with Kaltenborn. 1947. 15-page pamphlet. Excerpts from Kaltenborn's September, 1947 broadcasts.
FOLDER P346	Return to Manilla. February 4, 1945. Broadcast excerpt by Royal Arch Gunnison of Mutual covering the liberation of Manilla.
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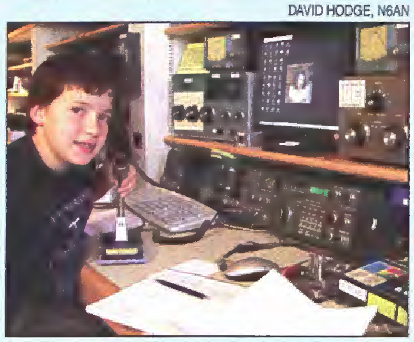
Get a Youngster on the Air During Kids Day 2008

2008 will bring two opportunities to introduce a kid to the magic of Amateur Radio: January 6 and June 21.

Dave Patton, N1NN
Manager, Membership and Volunteer Programs Department
dpatton@arrl.org

On January 6, 2008, kids everywhere can use the magic of radio to make new friends over the air. After over 10 years of activity, the Kids Day events, created by the Boring Amateur Radio Club, have gained in popularity year after year. Nearly 500 kids were reported to have shouted their favorite color into a microphone during 2007's running of Kids Day!

DAVID HODGE, N6AN



Ten-year-old Alan Hodge, son of David Hodge, N6AN, sitting at the main operating position at W6UE, the Caltech ARC in Pasadena, California, and no doubt getting hooked on the magic of radio. The Hodges used special event call sign W6CIT during Kids Day 2007.

After the successes of the 2007 events once again this year we suggest the use of the same frequencies used by the scouts during Jamboree on the Air (JOTA) — they're shown in the sidebar. With propagation conditions that accompany the bottom of the sunspot cycle, we need to spread out to find bands where everyone can participate.

Also carried over from the June 2007 announcement are some ideas from Ward Silver, NØAX (with a few new ones included), to help you make this event even more enjoyable.

For the parent ham or host:

- Use a CW reader program such as *CWGet* (**www.dxsoft.com/micwget.htm**)
- Have the kids make and exchange their own QSL cards
- Make a special logbook for each kid
- Be sure to request the participation certificate from BARC
- Amateur Radio is all about geography; have a map of North America available and point-out locations (or have the kids find them using an atlas) of the kids on the other sides of the QSO
- If this isn't the first Kids Day for your kids, pull up the old logs and see if previous friendships are renewed during the 2008 events.

For the radio club host:

- Have an open house at the club station
- Promote Kids Day in your newsletter
- Give out your own certificates and blank logbooks
- Sponsor a pizza party after the event
- Make custom stickers about ham radio or QSOs/QSLs for the kids to apply to their scrapbooks commemorating each event in which they participate.

For the kids:

- Mike fright? Make up cue cards and point to each thing to say
- Bored? Share the station with a friend, operate in short stretches
- "What's That Do?" Construct a "pretend radio" with knobs and switches
- Break the ice by arranging a schedule with another local family.
- The Kids Day operating events are the first Sunday in January and the third Saturday in June — January 6 and June 21 this coming year. Make that personal connection that may result in a new ham radio licensee. You just might find yourself re-infected with that enthusiasm you once had with ham radio. Don't forget to further the fun and invite the kids to Field Day the next weekend!

Find out more about Kids Day by visiting **www.arrl.org/FandES/ead/kd-rules.html**. Also, check out the certificate on the Web at **www.arrl.org/FandES/ead/kids-day-survey.html**. Send pictures of the kids operating your station so we can share them with others — **kidsday@arrl.org**.

Kids Day Rules

Sunday, January 6, 2008

Purpose: Kids Day is intended to encourage young people (licensed or not) to enjoy Amateur Radio. It can give young people on-the-air experience so they might develop an interest in pursuing a license in the future. It is intended to give hams a chance to share their station with children.

Date: Sunday, January 6, 2008.

Time: 1800-2400 UTC. No limit on operating time.

Suggested exchange: Name, age, location and favorite color. You are encouraged to work the same station again if an operator has changed. Call CQ KIDS DAY.

Suggested frequencies: 3.740 & 3.940 MHz, 7.270 MHz, 14.290 MHz, 18.140 MHz, 21.360 MHz, 24.960 MHz, 28.390 MHz and 2 meter repeater frequencies (with permission from your area repeater sponsor). Observe third party traffic restrictions when making DX contacts.

Awards: All participants are eligible to receive a colorful certificate (it becomes the child's personalized sales brochure on ham radio). Please visit **www.arrl.org/FandES/ead/kids-day-survey.html** to complete a short survey and post your comments. You will then have access to download the certificate page. You can also send a 9×12 self-addressed, stamped envelope to the Boring Amateur Radio Club, PO Box 1357, Boring, OR 97009.

GB3SSS — Marconi's Transatlantic Leap Revisited

Did he do what he said he did in 1901? A group attempts to reach a conclusion.

Steve Nichols, GØKYA

Club Chairman Dave Wall, 2EØGSD (left), and Club Secretary Keith Matthew, GØWYS, at the base of the GB3SSS antenna at GB2GM at The Marconi Centre, Poldhu, Cornwall, UK.

As far as the history books and the general public are concerned, Marconi is the father of radio. But Marconi's main claim to fame all rests on a simple premise — did he actually receive signals from Poldhu, Cornwall, UK at Signal Hill, Newfoundland on December 12, 1901?

Unfortunately, some say the evidence is stacked against him and people have argued about the success or otherwise of his achievement for years.

In 2001, Dr John S. (Jack) Belrose, VE2CV, of the federal Communications Research Centre in Ottawa and a respected authority on radio, is reported to have said that: "As far as I am concerned Marconi heard absolutely nothing. He deceived himself and the world into thinking he heard something."

That is why the Poldhu Amateur Radio Club at the Marconi Centre in Cornwall and the Marconi Radio Club of Newfoundland wanted to set the record straight.

In late 2006 a group of radio amateurs from both sides of the Atlantic decided to re-enact the legendary transmission. The idea came from Bart Lee, KV6LEE, an associate member of Poldhu ARC, who realized that the solar conditions in the winter of 2006/2007 would be similar to when Marconi received the signals in Newfoundland — sunspot minimum in midwinter with its attendant low ionospheric D layer absorption and minimum absorption frequency.

As Bart said: "I determined, in 1998 or so, that the sunspot number in December 1901 was exactly zero, a remarkable coincidence if nothing else.

"The D-layer daylight absorption was then much less than nowadays because the amount of atmospheric nitric oxide was less, too. Carl Luetzelschwab, K9LA, first pointed out to me the role of nitric oxide in the D-layer. What this could mean in 1901 is that a whole lot more of Marconi's 15 kW hit the F-layer to come down in St John's than would happen today. How much more is hard to say. So 1901 perhaps got a bonus in dBm relative to today."

From the start of November, the Poldhu Amateur Radio Club, based at Marconi's original transmitter site on the Lizard peninsula, Cornwall, used a 160 meter beacon — GB3SSS — to make regular one-minute transmissions on 1960 kHz while radio amateurs in Canada and the USA tried to copy and analyze the transmissions.

But why all the fuss? Why should there have been any doubt in the first place?

Keith Matthew, GØWYS, Poldhu ARC's club secretary explained:

> No one really knows for sure what frequency Marconi's transmissions were on. Marconi himself was evasive concerning the actual frequency. But in a lecture in 1903 Ambrose Fleming said that the wavelength was 1000 feet or more — 810-870 kHz is generally the quoted frequency.
>
> But in 1908, Marconi said in a lecture to the Royal Institution that the wavelength was 1,200 feet, and in a recorded lecture in the early 1930s he changed his story to approximately 1,800 meters (166 kHz). At the same lecture he quoted the transmitter power as being 15 kW.
>
> Whatever the frequency was, the tests took place at the worst time of day.

Marconi said he received the signals at 12:30 PM, 1:10 PM and 2:20 PM local time using a 500 foot long antenna suspended by a kite. At the time this corresponded to 1600Z, 1640Z and 1750Z.

Map these times using a modern program like *Geoclock* and you see that the complete path was in daylight at 4 PM and only the UK end of the path was in darkness at 5:50 PM.

Even though we know there were no magnetic storms at the time, or for 10 days before, the daytime skywave would have been heavily attenuated.

In Marconi's favor, it was midwinter with low sun elevation angles, but a 3500 km path in daylight on 880 kHz? Surely not.

Factor in that the receiving equipment consisted of a long-wire antenna and an untuned receiver and the odds get worse. As

Marconi - unclear whether he transmitted "S" in morse code over Atlantic?

Marconi used a spark transmitter he would have heard faint clicks, not the audio tone of a CW signal that we know and love today.

But as Marconi said later: "At 12:30 PM, while I was listening on the telephone receiver there came to my ear, very weakly, but with such clarity that there could be no possible doubt, a rhythmic succession of the three dots corresponding to the letter S of the Morse code..." Some signals were also received on December 13 during the brief time that a kite could be kept flying and there was a possibility that they were also heard on the 11th.

"Davey" Davey-Thomas, G3AGA, of Poldhu ARC is looking at the possibility that Marconi actually heard the signals on three-times the quoted frequency at around 2.5 MHz. The Poldhu spark transmitter emitted a wide range of frequencies and it was only the characteristic length of the transmitting and receiving antennas that favored one frequency over another. This is not to be confused with true "harmonics" of the fundamental. In truth, there was no fundamental.

If the Poldhu antenna was resonant at 860 kHz it would also have exhibited a low impedance at three times this — 2.5 MHz.

Perhaps the secret lies in the story that Marconi was allegedly using an untuned receiver. One theory is that the spectrum of the Poldhu transmitter contained significant power in the higher HF (short wave) bands — 14 MHz would be no problem for making the contact as Poldhu ARC shows every year on the anniversary of Marconi's claims when it contacts Newfoundland in a symbolic exchange of greetings.

But as Bart Lee pointed out: "Under these low sunspot conditions, the maximum usable frequency is at its lowest as well. I doubt that a harmonic or spurious signal got across in 1901. I also doubt that Marconi was listening for signals on anything other than his primary frequency where his transmitter's power was concentrated."

I visited Poldhu on the 105th anniversary of Marconi's achievement on December 12, 1901 to research this story. At 1600Z history was remade when GB2GM made CW contact with VO1MRC in Newfoundland on 20 meters as the club does every year. With Ron, GØMRH, on the key and a shack full of Poldhu ARC members it was a fitting tribute to Marconi's work.

But GB3SSS hoped to show once and for all that it could have been possible for Marconi to hear the signal transmitted on or around 880 kHz, slap bang in the middle of what is now the Medium Wave broadcast band. The closest frequency, with similar characteristics, available to radio amateurs was Top Band (160 meters); hence the selection of 1960 kHz.

Keith added: "The beacon, built by Andy Talbot, G4JNT, used a sequence of transmissions similar to that of the UK 5 MHz beacons. It used a one-minute transmission on the hour and at each subsequent 15 minutes consisting of the call sign in CW followed by a series of bursts of carrier each decreasing by 6 dB — from 100 W to 25 W, 6 W, 1.5 W, 0.4 W, and 0.1 W. There was then a burst of PSK31 at 100 W with the message: GB3SSS IO7ØIA POLDHU, CORNWALL GB3SSS IO7ØIA POLDHU, CORNWALL QSL GB3SSS@YAHOO.CO.UK.

Davey, G3AGA said: "The antenna used was a Marconi 'T' at 50 feet with eight 65-foot radials, which the National Trust would not allow us to bury. The original was a flimsy affair, but was later replaced by 16 SWG hard-drawn copper. The matching unit was a simple LC circuit feeding the 200 foot length of coax, and giving an SWR of 1:1.3, which varied between 1:1.1 to 1:1.4 depending on how much rain there was."

Thanks to John Gould, G3WKL's help, the beacon idea was steered through the RSGB beacon committee, was licensed by Ofcom and transmissions commenced. The results beat all expectations. By mid-December reception reports had been received from across the UK, Italy, Belgium, Germany, Sweden and New Zealand. There was even one possibly dubious report from Beijing, China. The transmissions continued until the end of January 2007.

But it was the transatlantic reception reports that Poldhu were interested in and it didn't take long for them to flow in.

Many US and Canadian stations heard the beacon, but mostly during the hours of darkness.

Jeff Briggs, K1ZM, author of *DXing on the Edge — the Thrill of 160 Meters*, has a holiday home on Prince Edward Island, Canada. Working as VY2ZM and using a 2×2 vertical element Top Band array with about 8 dBd of gain toward 55°, he reported hearing the beacon at 1031, 1615, 1659 and 1745Z on November 3. It was the same story the next day. Signal levels varied from ESP levels to 599+.

The Atlantic had been bridged on Top Band during daylight hours. Jeff said:

> I went back to VY2ZM from 22/11/06 through to 04/12/06 and did some actual

Ron, GØMRH (rear) and Keith Matthew, GØWYS, make the anniversary contact with VO1MRC on December 12, 2006 at GB2GM.

Part of the impressive display of wireless history at The Marconi Centre.

measuring of the GB3SSS signal at 1750Z using an HP signal generator (verified against an HP spectrum analyzer). On several days, I listened and measured the GB3SSS signal at 1750Z repeatedly at about –91 dBm strength. By way of information, I recall the signal at 0330Z was about –60 to –63 dBm in strength.

It was suggested to me by K1ZZ of the ARRL that I try to copy the EU broadcast stations at 9 kHz spacing and note how early and at what signal levels I could hear them.

I did this and copied signals from Norway, Sweden, UK, Spain, Canary Islands and Switzerland — with their carriers heard as early as 1630Z and *copiable* audio from programming content as low as 855 kHz (Radio Nacional de Espana) by 1750Z.

Joe Craig, VO1NA, of the Marconi Radio Club of Newfoundland also received the signal in daylight. He said the MRCN receiving station comprised a one-wave Beverage aerial feeding a stable DDS (direct digital synthesized) receiver with the automatic gain control disabled and whose line output was connected to the sound card of a computer running the GB3RAL software.

Joe said: "We mitigated noise by selecting a quiet location for the aerial, decoupling both ends of the line to the Beverage and running the computer and radio from a linear power supply. The system operated from the start of the experiment with only four days of downtime."

Joe also reenacted history by receiving the beacon at 2130Z and 2330Z on a short active antenna from the top of Signal Hill in Newfoundland. "I think this was the first time that MF signals have been received from Poldhu at this point since 1901," he said.

But the tests have now thrown up a new dilemma. If the signals could have been propagated across the Atlantic at the time and frequency logged by Marconi, was his receiving equipment sensitive enough to have heard them?

Marconi was using a Bose/Solari Mercury Detector (coherer) — sometimes called an Italian Navy coherer.

Coherers use a direct current (dc) voltage across them to work, the so-called bias voltage. Radio frequency (RF) energy from the antenna changes the dc resistance of the coherer from high to low. Once "triggered" the dc current causes a click to be heard in the headphones.

The coherer is believed to have used a carbon and iron electrode with mercury in between, but as Keith Matthew points out there was mention in Marconi's notes about the use of "dirty mercury."

"Could this have given a layer of mercury oxide in the coherer?" said Keith. "Did the voltage 'punch through' the mercury oxide which would then reseal? If it did then a lot more research needs to be done," said Keith.

The GB3SSS Top Band beacon at the Marconi Centre.

Ron, GØMRH, makes the anniversary contact with VO1MRC on December 12, 2006.

Bart Lee added:

The Solari/Bose detector has been shown, recently by Lane Upton, IEEE, to be about as sensitive as a germanium diode in rectifying mode. My suggestion is that it, like a Branly filings coherer, acts as a pulse amplifier when shocked with RF energy — a very small amount of RF energy and power triggers a much larger amount of power as a dc pulse of the bias voltage and current.

The filings coherer was regarded at the time as very insensitive compared to the mercury oxide detector, which is why Marconi used the mercury oxide variant.

It is hard for us to imagine how quiet the ether was in those days. No QRM, only atmospheric QRN (then far away in the southern hemisphere), very few electrical devices to make noise (especially in Newfoundland!) and for this test, QSB if any was irrelevant.

All Marconi and Kemp had to hear was some timed clicks, and they heard about 38 triple-clicks over two days. Fleming designed the transmitter as double-spark to send only sharp pulses, and Marconi designed his receiver to hear only clicks, taking advantage of the sensitivity (and filtering ability) of the human ear.

Jeff Briggs added:

My own conclusions suggest that Marconi may well have heard what he said he did — if his receiver was about 25 dBm more sensitive than most modern experts think it was, say about –25 dBm.

The eastern coast of VO1 is radically closer to the west coast of G than I am here on Prince Edward Island — so I would have to assume that with similar Rx capabilities, GB3SSS would be even more reliably received there.

If it were actually able to detect a –50 dBm signal — and if we factor in the additional daylight path losses to VY2ZM versus Signal Hill, Newfoundland — it begins to enter the realm of true feasibility, especially when we note I could copy reliably EU BC carriers as early as 1630Z.

Marconi was able to copy Poldhu on 272 kHz at night about several months later in 1902 as he entered North Sydney, Nova Scotia, on a ship. If his receiver was good enough to do that (and this is without question) — then how was it incapable of hearing a signal on or about 850 kHz (or higher) during the day on Signal Hill?

So is this the end of the story? I doubt it. We will never really know whether Marconi heard the signals that day in 1901, although the evidence supporting the claim is beginning to mount up. In any event, we cannot change history or destroy Marconi's memory and legacy. In our heart of hearts do we really want to?

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Photos by the author.

Steve Nichols, GØKYA, has been a licensed ham since 1982. He is a member of the Radio Society of Great Britain's (RSGB) Propagation Studies Committee, where he is interested in HF propagation, particularly gray line. He is also a member of CDXC, GQRP and QRPARCI. His daily work is as a business journalist and photographer specializing in technology and avionics. He can be reached at **steve@infotechcomms.co.uk**.

To: Dr. Whitehead, Susan Burgess
From: Ben Haskins
Re: Radio Music Box Memo

I. Question Presented

David Sarnoff wrote a memo on the "radio music box," in which he proposes the creation of this thing where Marconi would transmit music by radio and sell receivers to the public. Sarnoff claims that he wrote this memo in 1916, and that it marks the creation of radio. Later historians cast doubt on the authenticity of the memo's date – they think it was written after 1920 – and there's some evidence it was written after H.P. Davis created KDKA and, thus, that Sarnoff was just grandstanding. Were there any memos responding to Sarnoff's 1916 memo? Summarize the evidence for and against the memo's alleged 1916 creation date.

II. Short Answer

First, a 1916 David Sarnoff memo exists, but it is unlikely to be what has become known as the Radio Music Box Memo ("RMBM") because it is very short and undetailed. Rather, the "real" RMBM memo was likely written in 1920.

The only evidence supporting the belief that Sarnoff wrote a very detailed RMBM in 1915 are Sarnoff's own self-serving assertions, including a memo he wrote to an RCA researcher and a *Saturday Evening Post* article he authored. Most evidence weighs against the existence of such a memo.

First, Sarnoff seems to have had a penchant for exaggeration. Second, research reveals no pre-1920 references to a detailed 1915 RMBM. Third, and most significantly, no research has unearthed a version of the RMBM that is dated 1915 or even before1920. Finally, evidence indicates that the oft-cited Sarnoff historian that claims to have relied on a pre-1920 RMBM for his work was likely working from a 1920 memo, as discussed below.

III. Discussion

A. Introduction

The Radio Music Box Memo has contributed much to Sarnoff's persona. For years, historians assumed that Sarnoff wrote a 1915 RMBM explaining a detailed game plan for household radio based solely on Sarnoff's own assertions, not on any documentation. No such detailed memo dated 1915 currently exists. The quandary this provides is that there is no way to say for sure whether the memo ever truly existed, in detailed form, in 1915. Recent research points to a reasonable conclusion that Sarnoff had some idea about household radio around 1915/16, but did not articulate it fully until 1920. As you will see, this contradicts statements made by Sarnoff himself, but given his penchant for exaggeration, this is hardly a surprise.

B. Sarnoff's *Saturday Evening Post* article is unreliable evidence of a 1915 memo.

The primary source for the belief that Sarnoff wrote a 1915 RMBM are Sarnoff's own statements. In 1926, Sarnoff wrote two articles in the *SEP*, entitled "Radio," in which he shared much of his experience in the radio business.[1] In the first article he stated:

> So impressed was I with the work of the amateurs and the interest it was arousing everywhere that in 1915, as assistant traffic 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.[2]

1 Sarnoff, David. "Radio." *Saturday Evening Post* August 7, 14, 1926.
2 Sarnoff, August 7, at 142,145.

He stated that he had a copy of the 1915 memo in front of him (he was dictating the article) and went on to give the details for which his 1915 RMBM became known, including its household utility and the possibilities of broadcasting lectures and baseball games.3

Sarnoff's self-serving statements in this article are unreliable, however, because there is no evidence Sarnoff had any such 1915 memo in front of him when he wrote the 1926 article. A 1925 letter from an RCA researcher indicates that, as of 1925, he could not locate a copy of his alleged 1915 RMBM and no evidence suggests that Sarnoff ever did locate the memo he sought.

Additionally, Sarnoff had a proven tendency to manipulate or exaggerate reality to improve his self-image. For instance, soon after the Titanic disaster, he made false claims about his role in relaying messages about the sinking ship. Despite evidence to the contrary, Sarnoff claimed to have remained on duty at the Wanamaker department store as a telegraph operator for 72 hours while all other area stations shut down, causing news sources to rely on him for information. His role, however, was much less heroic. Sarnoff could not have been on duty when the first messages from the Titanic disaster arrived because the store was closed on Sunday night when they came in. Further, Sarnoff's equipment could only have received the strongest ship signals, making it unlikely that he was in much direct contact with the rescue ships. And when Marconi closed all but four stations due to the radio traffic, Sarnoff's was one of those closed. While Sarnoff was one source of information about the disaster, his role was not as dramatic as he claimed.4

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3 *Id.* at 145.

4 Lewis, Thomas, *Empire of the Air: The Men Who Made Radio*, HarperCollins P.: NY, 1991. p. 107.

C. Gleason Archer's reliance on an alleged 1915 RMBM is doubtful.

One other oft-cited source for the existence of a RMBM dated before 1920 is Gleason Archer's 1938 book *History of Radio to 1926*. Therein, Archer reprints what he claims to be a 1916 memo from Sarnoff to Edward Nally, which begins with "I have 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."5 It then goes on to discuss the possible design of the "Radio Music Box" and its possible range, and the possibility of using radio to broadcast lectures and baseball games into homes, just as was mentioned in Sarnoff's *SEP* article.6 The memo Archer reprinted is similar to the one Sarnoff quoted from in *SEP*.

Several pieces of evidence, however, indicate that Archer probably did not rely on a 1916 RMBM for his writing. Louise Benjamin, who has done much research on the RMBM, believes that the likely source for the memo reprinted in Archer is not a 1915/16 memo, but a 1920 memo Sarnoff wrote to Owen Young on January 31, 1920, shortly after the creation of RCA.7 Sarnoff's 1920 28-page report to Young contains two pages that are almost identical to the RMBM found in Archer. Two versions of the 1920 memo exist, the original and a copy found in Owen Young's papers. The later one matches Archer's reprint exactly.

Sarnoff begins the 1920 memo by stating that he presented the idea for a Radio Music Box to Nally in 1915. Archer probably saw a copy of this 1920 memo and, because Sarnoff referred back to 1915 in the memo's introduction, assumed that the 1920 memo was the same

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5 Gleason, Archer L., *History of Radio to 1926,* The New York Historical Society, 1938. p. 112.

6 *Id.* at 112-113.

7 Louise Benjamin. *In Search of the Sarnoff "Radio Music Box" Memo*. 37 J. Broadcasting & Electronic Media 325, 327 (1993).

and just assumed that he was reviewing a copy of the alleged 1915 memo. There are two reasons for this to be likely.

First, as Benjamin explores in her paper, the differences between the memo Archer reprints in his book as the alleged 1915 memo and the original version of the 1920 memo are mostly minor details like grammatical changes and word choice edits. Benjamin postulates that it is unlikely that Sarnoff would have drafted near identical versions of the same memo five years apart. Rather, she theorizes, these edits are consistent with the idea that someone at RCA changed the memo some time between 1920 to 1938, the date Archer's book was published, to make it conform with company style, something that most likely happened when the memo was copied. For example, certain punctuation used by Sarnoff to provide emphasis on one sentence was changed to ordinary type. Also, the word "propaganda" was removed from Archer's version as if it had been conscientiously edited out to avoid the negative connotation that word had derived between 1920 and 1938. The striking similarities between the 1920 memo and Archer's reprint suggest that the 1920 memo, with modifications, was Archer's source, and not a detailed 1915 RMBM.8

The second reason to suspect that Archer did not have an actual 1915 RMBM for his source is that, in 1925, 13 years before Archer's book was published, an RCA researcher could not find such a memo. In her second article on the topic, Benjamin cites a letter written by an RCA researcher retained by Sarnoff to locate a copy of the original Music Box memo in preparation for his *Saturday Evening Post* articles. The letter, dated in May 1925, is from a researcher identified only as "T.N.B." says:

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8 *Id.* at 332.

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 that 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 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.9

The letter suggests that no detailed 1915 RMBM existed in the RCA archives in 1925. First, the researcher couldn't locate any such memo. Second, the sentence "I have in mind a plan…" is identical to the phrasing in Sarnoff's 1920 memo to Owen. Third, this 1925 letter sheds doubt on Sarnoff's claim in his 1926 *SEP* article that he was quoting from a 1915 memo. T.N.B. indicates that Sarnoff didn't have a copy of the alleged 1915 memo by May 1925, and no evidence suggests that he obtained one between then and little over a year later outside of his own self-serving statements.

D. Edward Nally's correspondence suggests that Sarnoff had not yet fully developed his Radio Music Box idea by 1916.

In Benjamin's second article on the subject, she discusses the finding of two memos, one sent from Sarnoff to Edward Nally on November 8, 1916, and one from Nally to Sarnoff on the next day (which are also mentioned in the RCA researcher's letter above). As Benjamin notes, these memos conform with Archer's description of events:

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9 Louise Benjamin. *In Search of the Sarnoff "Radio Music Box" Memo: Nally's Reply.* 9 Journal of Radio Studies 97, 101 (2002).

> 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.10

In the preceding excerpt, Archer is clearly thinking that Sarnoff's "written recommendation to Edward J. Nally" was the detailed version of the RMBM, of which only the 1920's version exists. The memo that Benjamin uncovered from 1916, however, was not the detailed one described by Archer, but the following:

> 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.'

Nally's reply, which is mentioned in Archer, was titled "Re: MUSIC BOX SCHEME"11 and 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 Gramaphone [sic] Company's agreement, which I and sending you separately.12

While Sarnoff's memo to Nally shows that he had in mind a scheme for household broadcast radio – a "music box scheme" – it isn't the detailed RMBM found in Archer (and many later books on Sarnoff).

In fact, the discussion in Nally and Sarnoff's 1916 memos suggests that a more detailed 1915 RMBM probably did not exist. The dialogue within these memos would likely have been

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10 Archer at 112.
11 *Id.*

12 *Id.* at 100-01.

different had Sarnoff already proposed to Nally his detailed plan for the implementation of wireless entertainment radio before these 1916 memos. Why would he feel the need to discuss it again, or to re-present his ideas? Instead, these memos show that in 1916, a few men at American Marconi brainstormed about a revolutionary idea that had not taken full shape.

Some histories that accept the existence of Sarnoff's 1915 RMBM claim it was poorly received or outright ignored by Sarnoff's superiors. Nally's 1916 memo as General Manager of the Marconi Company, however, shows that interest was kindling. The idea was not entirely ignored, but was not yet strong enough to force a shift in company strategy either. The fact that the idea garnered little attention supports the idea that no detailed 1915 RMBM existed.

IV. Conclusion

In light of the above, it seems two possible conclusions could be drawn. The first, and more plausible, is that Sarnoff had an idea of household radio in 1915/16, and, after fully articulating the details in the 1920 memo to Young, later claimed that the 1920 memo was essentially the same as a memo he wrote in 1915. Sarnoff did not have a copy of a detailed 1915 memo in 1925, and no evidence indicates that he had one in 1926. This would be consistent with the idea that he was "grandstanding." This conclusion is also supported by the fact that an oft-cited historian who claims he saw a detailed 1915 memo probably did not. This would explain much of the post 1938 assumption that Sarnoff wrote the RMBM in 1915. The non-existence of any 1915, detailed RMBM obviously supports this conclusion as well.

The second possibility, opposite from the one above, is that the 1920 version of the memo actually had a 1915 brother that did not survive. This possibility is not likely, however, since the only support for this are Sarnoff's self-serving statements, which are especially doubtful in light of his tendency to exaggerate, and the absence of any unbiased pre-1920 references to a detailed RMBM.13

13 Alexander B. Magoun, "Pushing Technology: David Sarnoff and Wireless Communications, 1911-1921" Presented at IEEE 2001 Conference on the History of Telecommunications, St. John's, Newfoundland, July 26, 2001.

http://www.ieee.org/portal/cms_docs_iportals/iportals/aboutus/history_center/magoun.pdf

From Owen D. Young: A New Type of Industrial Leader — Ida M. Tarbell, N.Y. MacMillan Company 1932

quarters of a million horse power in units of twenty-five hundred horse power each.

There was the Navy's call for a submarine detector —a depot for this work was established at Nahant the day after we entered the war and within ten weeks they had a detector that gave results. Within five months it was declared practicable, and in December 1917 three General Electric engineers and several American naval men set out for England; went out on a British trawler, located a German submarine beneath the surface and destroyed it. Twenty-five hundred vessels were equipped with these detectors before the war ended.

The variety of demands bewilders the layman. J. W. Hammond in his unpublished history of the activities of the General Electric, from whose manuscript I am taking the figures used here, numerates articles for which the government called upon the General Electric:

submarine motors, a special type produced amid great secrecy; compasses for aëroplanes, shipped from Lynn at a rate of five hundred a week, a thousand delivered even before the contract was signed; radio tubes at the rate of twenty thousand a week until a total of a quarter million was attained; winch-drives for captive balloons; bomb-releasing mechanisms for land and sea; and switchboards in such quantity that if placed end to end they would have made a sidewalk a hundred miles long—all this array of war-time material and war-time equipment was in process of swift, skilled and accurate production until every General Electric plant in the land was a humming beehive every hour of the twenty-four.

The General Electric's contribution to the war destined to have the most far-reaching after effects—the contribution which later was to introduce Owen Young to the public as a negotiator unusually daring, as well as unusually persuasive and conciliatory—was in the radio field.

The possibility of the radio as a medium for not only national but international communication had been proved before the war—thirteen years before, in 1901, the ocean had been spanned. Marine radio was in daily use between the sea and shore, and already had been the instrument of a large saving of life and property.

The greatest commercial development of the radio at the time the war came had been made by the British Marconi Company which was already planning a world-wide English control—a wireless system parallel to its control of the international cable system. In this country where much experimenting was going on the most important concern was an offshoot of this British company, the American Marconi, controlled abroad but having many American stockholders.

Although messages had been sent across the ocean no inventor had been able as yet to perfect a transmitter which could be depended upon. The messages came by fits and starts, mutilated, unreliable. What was needed, said those who knew the science, was something which would give a high frequency current capable of steady reporting.

In 1915 Dr. Ernst Alexanderson of the General Electric laboratory sought from the American Marconi

Company at its New Brunswick, New Jersey, station a practical trial of a high frequency alternator which he had developed. The alternator was installed and so satisfactory was its work that Marconi himself came over that year to negotiate for its control.

Owen Young will tell you whimsically that his first wireless message came by mail and was signed "Marconi." This message received in 1915 asked him to drop into the old Holland House on his way up town.

Mr. Young has declared that up to the moment of this summons there probably was not a man in the General Electric who knew less than he of the discoveries and developments in radio going on in the research laboratory, and that when he made his call on Marconi and was told by him that the British Marconi Company of England wanted to buy the exclusive rights to an invention which Mr. Marconi spoke of as the Alexanderson alternator, he had to confess, at least to himself, that he had never heard of the Alexanderson alternator.

If he did not know he was not long in finding out, particularly when it turned out that if the British Marconi Company could make the arrangement it wished it meant millions of dollars of trade for the General Electric. The contracts for this trade would probably have been signed if the war had not laid its imperious hand on one after another of those interested: on Marconi who was suddenly called to the Italian service; on the British company, preventing further immediate development; and a little later on the Alexanderson alternator itself—the Navy of the

United States commandeering it as it did the devices and inventions of all the American laboratories interested in radio development.

But Dr. Alexanderson was not satisfied with the performance of his first alternator. He set about developing one much more powerful, indeed developed a complete radio transmitting system. This the General Electric offered to install at New Brunswick for the government's use. The offer was accepted—it was used throughout the war. But at the moment all of this meant little to Owen Young.

In a mass effort like this of the General Electric in the war it is neither practical nor fair to attempt to segregate the contribution of any one man. One man is important in proportion to his ability and his willingness to fit his contributions to those of others. In Owen Young's case it is particularly difficult because of the nature of his service. To begin with when we went into the war he was little known outside of the electrical world, and there he was known only as a lawyer who had had experience and success in dealing with the legal side of public utilities. What the General Electric knew and thought of Owen Young had not passed on as yet to the outside business world—nor had it touched the public at any point.

Most of the officers of the company had specific war jobs. They were serving on national committees, boards, commissions. Mr. Coffin was occupied with the Red Cross and the Liberty Loan drives. Mr. Young sat on no committees; yet he did touch many. He seems to have functioned as a general liaison officer between just as it was sometimes necessary for us as a corporation to employ economic force, so these men of ours had but one economic weapon—the strike. We had not denied their right to strike. We had tacitly admitted it. What right had we to take away a right we had granted, because these men exercised a right we had not denied?"

Here then in the winter of 1918–1919, so disturbed for American industry, Owen Young began to ponder the relations of men and management; to work out with his associates a program which from that time to this has been a living growth.

The readjustment of labor relations on a more rational and human basis was not the only perplexing problem that the armistice put up to industrial leaders. For two years they had been operating on the government's plan, practically a five-year plan, since the end of the war was not to be prophesied and they must be ready for the worst, which might be years more of the frightful thing.

Then suddenly the war ends and industry is demobilized over night. It must go back to the old self-directing methods, put itself on a peace basis. It meant a grist of new problems. One of far-reaching importance came to Owen Young early in 1919. It concerned that Alexanderson alternator, which nearly four years before Marconi had wanted to buy from the General Electric.

The Alexanderson alternator had proved all and more than it had promised. Thanks largely to it the ocean had been spanned by the Navy's magnificent

handling of the multitude of American inventions and devices which poured constantly from the big and little laboratories of the country. Secretary Daniels was not exaggerating the accomplishment when he wrote in *Our Navy at War:*

> If the Germans had cut every cable, and their U-boats did cut some of them, we would still have been able to keep in touch with Pershing and the Army in France, with Sims in London, Rodman and Strauss in the North Sea, Wilson at Brest, Niblack at Gibraltar, Dunn in the Azores, with all our forces and Allies.
>
> President Wilson and Secretary Baker in Washington were, so far as time was concerned, in closer touch with Pershing and his forces than President Lincoln and Secretary of War Stanton were with the battle-fields a few miles away in Virginia, during the Civil War. It was infinitely easier for me to send a message or hear from our vessels three thousand or four thousand miles distant than it was for Gideon Welles, when he was Secretary of the Navy, to communicate with the Federal ships at Charleston or with Farragut at Mobile.

As we have seen, nobody realized so well as Marconi himself the value in international air communication of the Alexanderson alternator. He had wanted to buy it outright before we went into the war, but negotiations had been halted by the conflict. The war over, his representatives came back with the same proposal.

It was impossible, they were told. The General Electric would never sell control of an invention which might be of service to its own government in times of need. But as the war was over and its business was making and selling machines to any customer who could pay for them it would sell them any number of Alexanderson alternators needed. The contract amounting to some millions of dollars was under way, when suddenly on April 5, 1919—the date in the history of the radio which takes about the same place as the Fourth of July in the history of the country—two American naval officers appeared on the scene, Admiral Bullard who had just come back from Paris to take the direction of the communications of the Navy and Commander Hooper who all through the war had been at the head of the Navy's radio division.

They came, Admiral Bullard said, at the suggestion of the President, still in Paris at the Peace Conference, to ask that no contract be made with the British Marconi Company. Did the officers of the General Electric realize that putting their great invention into the hands of a British agency meant giving to the British Empire the control of the radio communications of the world, as it already had of the cable communications, that it meant leaving the United States without control of any international means of communication?

So eloquent and so convincing were the two visitors that the General Electric board threw up their hands.

"Of course," they said, "we are unwilling to do anything that would at any time in the future embarrass the activities of our own government. But what can we do? We are a manufacturing concern. The fact that we have developed in our normal research work inventions which are essential to the efficient operation of international communication through the air, does

not change our position. We invent, make and sell machines. What would you have us do?"

Various solutions of the problem were suggested. Government ownership of the radio was one. Secretary Daniels would naturally have liked to keep intact the system as it had been developed, buying outright patents and plants and continuing government operations, but there was not a shadow of a chance that the government would go into the business.

If that was out of the question would the government join a commercial company, taking over for its purposes all patents while the concern used them for commerce only? A contract of which Franklin Roosevelt, then Assistant Secretary of the Navy, approved, in the absence of Secretary Daniels in Paris, was worked out. It provided that all patents, patent rights and stocks should be held and used only for the benefit of Americans. But there were apparently too many pitfalls and delays in attempting such a partnership.

It soon became apparent that an all-American company organized and operated as a private business was the only way to meet the insistent demand of the Navy officials interested in preserving the system of communications they had set up in the war. But how could a private company be formed which would insure the complete control of all American radio property and inventions present and future? Ownership of property and inventions was widely scattered. To be sure the Navy had gathered them into one whole to meet the needs of war—but, the war over, sending and receiving stations and their operating crews, patents and licenses

Susan

This is an important meeting. Please try to get more documentation.

Oct 1, 1920
col 2
last ¶

GREAT MEN OF RADIO

IX.—HARRY P. DAVIS

The father of the present day development of wireless, of the concerts on regular schedules, advance programmes, the broadcasting of information of a thousand varieties, the marshalling of world-famed singers and artists behind the radio transmitters of great stations, and the consequent entertainment of millions of persons throughout the nation — undoubtedly was Harry Phillip Davis, vice-president of the Westinghouse company.

In September, 1920, radio was mainly the subject of scientific research and experiment. The devices and instruments necessary for transmitting and receiving wireless messages were not obtainable in the general market. There was practically no popular demand for them, and they were hard to obtain. Prior to the war interest in radio had been growing slowly, but the exigencies of the great struggle stifled it. But in September, 1920, Mr. Davis saw in a newspaper advertisement that Frank Conrad "would send out phonograph records this evening" for amateurs. Mr. Davis envisioned then the future of radio.

Mr. Davis pondered over the matter for several days. He saw that the true field of wireless for a long time to come would not be private communication, but broadcast communication, and the entertainment of hundreds, indeed, millions of persons all over the country. He saw that a station sending out entertainments, concerts, records of current events on regular schedules, was the key to the future. He believed that once such entertainment was broadcast, persons would demand "ears" with which to hear it. He sent for Frank Conrad, who had been in charge of wireless experiments for the government in Pittsburg during the war. He succeeded in closing the Conrad station, and in November, 1920, put into operation, under direction of Mr. Conrad, the KDKA station at East Pittsburg, as a broadcaster of programmes of popular entertainment.

Mr. Davis was born at Somersworth, N. H. He was graudated from the Worcester Polytechnic Institute with the degree of B. S. in electrical engineering in 1890, and after a trip to Europe and a few months spent with the Thompson-Houston Company entered the detail engineering department of the Westinghouse Company in 1891. In 1896 he was placed in charge of this department; in 1908 he was made manager of the engineering department.

HARRY P. DAVIS

The Literary Digest for September 2, 1922

PITTSBURGH'S BROADCASTING PIONEERS

AN ARTICLE in the *Radio Review* of the New York *Evening Mail* credits Mr. Harry Phillips Davis, vice-president of the Westinghouse Company, with being "the father of the present-day development of wireless, of the concerts on regular schedules, advance programs, the broadcasting of information of a thousand varieties, the marshalling of world-famed singers and artists behind the radio transmitters of great stations, and the consequent entertainment of millions of persons throughout the nation."

Mr. Davis has been associated with the engineering department of the Westinghouse Company since 1891, becoming manager of the department in 1908. Here is the account of the way in which he became interested in the broadcasting problem; and of the decisive action that led to the establishment of KDKA, at Pittsburgh, as the pioneer of present-day broadcasting stations:

"In September, 1920, radio was mainly the subject of scientific research and experiment. The devices and instruments necessary for transmitting and receiving wireless messages were not obtainable in the general market. There was practically no popular demand for them, and they were hard to obtain. Prior to the war interest in radio had been growing slowly, but the exigencies of the great struggle stifled it. But in September, 1920, Mr. Davis saw in a newspaper advertisement that Frank Conrad 'would send out phonograph records this evening' for amateurs. Mr. Davis envisioned then the future of radio.

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col 3 above pic
"several days"
Sept 29 → Oct 1
vs. "next day"

A BROADCASTING PIONEER.

Harry Phillips Davis, who saw in 1920 that the true field of wireless "would be broadcast communication and the entertainment of hundreds, indeed millions of persons all

col 3 *
pic

Pennsylvania Farmer
Philadelphia, Pa.
May 20, 1922

How Radio Broadcasting Started

Music, Speeches, Crop and Weather Reports Can Now Be Heard By All Who "Listen In"

WHO started the radio telephone broadcasting?

This question has been asked and answered a number of times during the past year, but so far the correct answer has never been given. And for a very good reason—nobody knew it. The Westinghouse Station KDKA, at Pittsburgh, first to broadcast on a daily schedule, was largely responsible for the present general interest in radio. But it has been so far impossible to discover who conceived the idea of operating KDKA in this manner. We have succeeded in securing full information concerning a meeting at which the decision to place the station in operation was reached. This meeting, which was held on October 1, 1920, is historic.

Four Westinghouse officials were present. They were Harry P. Davis, vice president; Frank Conrad, assistant chief engineer; M. C. Rypinski, manager of radio sales department, and C. McQuiston, manager of the

col 2, last ¶
Where's the rest of this
Looks new. ←

Where's rest

Pgh Sun
9/29/1920

Air Concert "Picked Up" By Radio Here

Victrola music, played into the air over a wireless telephone, was "picked up" by listeners on the wireless receiving station which was recently installed here for patrons interested in wireless experiments. The concert was heard Thursday night about 10 o'clock, and continued 20 minutes. Two orchestra numbers, a soprano solo—which rang particularly high and clear through the air—and a juvenile "talking piece" constituted the program.

The music was from a Victrola pulled up close to the transmitter of a wireless telephone in the home of Frank Conrad, Penn and Peebles avenues, Wilkinsburg. Mr. Conrad is a wireless enthusiast and "puts on" the wireless concerts periodically for the entertainment of the many people in this district who have wireless sets.

Amateur Wireless Sets, made by the maker of the Set which is in operation in our store, are on sale here $10.00 up.

—*West Basement.*

This is the only ad we have. Other quotes must be from memory.

The date corresponds to the date of Oct 1 for the mtg HP called.

Was the paper an evening paper or morning paper?

This is past tense

THE ELECTRIC JOURNAL

VOL. XVIII — APRIL, 1921 — NO. 4

Radio—Its Future

Looking into the future of radio development one sees possibilities of great expansion in an almost limitless field. The uses to which radio can be put are greatly diversified, and it is certain to create as epochal changes in our accepted everyday affairs as did the introduction of the telegraph and telephone, and the application of electricity to the street railway and to lighting.

Already the commercial transmission of messages by radio telegraphy is well-established. The speed of this transmission and the reliability of the radio systems as compared with wire and cable systems are favorable to the former. For long distance work the radio systems have greater capacity, can handle more traffic and the operation is performed at lesser tolls.

Following the developments of radio telegraphy, great advances are now being made in radiophone development. It is not to be assumed that the radiophone will displace the present wire telephone; rather that it will broaden the field of communication by the development of its own special advantages, which are more or less distinct from those of the wire telephone, as it possesses the feature of widest publicity, as compared with the secret or practically private character of the wire telephone. The two together will make many new applications possible, and it has now become practicable to converse on the sea, in the air or on moving trains, to one's own office or home, exactly as with land telephonic communication.

There is no doubt that in the very near future the radiophone will be largely employed over long distances in sparsely settled districts where other communication facilities are not now available. When it is considered that wherever wire systems reach there must be pole lines which are subject to damage by storms and other agencies, it can be seen how tremendously radio overcomes conditions of cost of installation, maintenance and reliability of service, which cannot be met advantageously by the wire systems.

The adaptability of the radiophone to broadcasting reports, news, entertainments, concerts, lectures, etc., creates a field particularly its own, and it is reasonably certain that the future will see many changes in the present accepted methods of conducting such functions and entertainments. It is quite possible that especially constructed transmitting rooms will be provided for such purposes, so that voices and music will be broadcasted through unbounded areas and listened to by invisible and widely-distributed audiences of vast numbers. The same opportunities would thus exist for the country dweller as for the city resident, and inmates of hospitals and sanitariums, and sick people and invalids in the home would have opportunities for pleasures and diversions now denied them. A transmitting system of this character would have the further great advantage of doing away with the necessity of appearing in person in public halls and auditoriums, the capacities of which at best are quite limited.

The importance of reaching such tremendous numbers of people, with practically no effort, offers great possibilities for advertising and the distribution of news and important facts, and in reality introduces a "universal speaking service." It is not unreasonable to predict that the time will come when almost every home will include in its furnishing some sort of loud-speaking radio receiving instrument which can be put into operation at will, permitting the householder to be in more or less constant touch with the outside world through these broadcasting agencies.

The application of radio to industry presents a vast undeveloped field of enormous possibilities. There are great possibilities in all methods of signaling, particularly in railroad operation for the dispatching of trains and for use as a means of communication over areas served by power transmission companies. During the World War it was conclusively demonstrated that radio is an indispensable agency in the directing of air planes and vessels, and in directing and controlling the movement of armies on the battlefields.

To what extent power can be transmitted by radio is as yet problematical, but it is possible even now to perform this important function in a minor way, so that electric relays can be operated at a distance, thus permitting the putting into operation of independent sources of power to direct and control various mechanical devices. As time progresses and knowledge increases, this field will undoubtedly be greatly advanced and developed.

The field of radio application is practically unlimited in the important affairs of the world, and its development will mark one of the great steps in the progress and evolution of mankind. H. P. DAVIS

May '22

p 1

The Permanency of Broadcasting

How A Scientific Novelty Developed In Eighteen Months to a Necessary and Popular Service—Present Limitations and the Line of Future Extension

By H. P. Davis

IT is always unsafe to assume the role of a prophet, but the writer presumed to take such a chance more than a year ago when in a published article he made the following statements:

"The adaptability of the radiophone to broadcasting reports, news, entertainments, concerts, lectures, etc., creates a field particularly its own, and it is reasonably certain that the future will see many changes in the present accepted methods of conducting such functions and entertainments. It is quite possible that especially constructed transmitting rooms will be provided for such purposes, so that voices and music will be broadcasted through unbounded areas and listened to by invisible and widely distributed audiences of vast numbers. The same opportunities would thus exist for the country dweller as for the city resident, and inmates of hospitals and sanitariums, and sick people and invalids in the home would have opportunities for pleasures and diversions now denied them. A transmitting system of this character would have the further great advantage of doing away with the necessity of appearing in person in public halls and auditoriums, the capacities of which at best are quite limited.

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"The field of radio application is practically unlimited in the important affairs of the world, and this development will mark one of the great steps in the progress and evolution of mankind."

What is the situation today? In a period of wide-spread business depression, and thus a most inauspicious one for a new venture, radio is a topic of as universal interest as the weather; and the spell of radio broadcasting especially is becoming world-wide.

5/22

It is probably a fact that no facility or service has ever received such instant response from the public or has grown so fast in popularity, and at a time when the public buying power was generally believed to be nil, a market has been developed which is limited only by the ability of manufacturers to supply apparatus.

Civilization progresses in direct ratio to the advance in communication and transportation facilities, and the public is quick to recognize and seize upon, and make use of, any new developments in either of these services. In a sense, radio broadcasting as a service has opened a new field for public communication, and what has been more or less of a scientific novelty, or possibly a visionary dream, has become almost overnight an accomplished fact and a wide-spread and necessary popular service.

H. P. Davis, Vice-President of the Westinghouse Electric and Manufacturing Company

It is fascinating in its mystery, and this is undoubtedly one of the greatest attractions in its first appeal to the imagination. But it is destined to be something more than a fascinating novelty, for as the possibilities of radio unfold we see before us a wonderful and permanent public service comparable with other modern facilities and conveniences in its ability to make life easier and better. Radio annihilates distance, reducing it to nothing, since the element of time scarcely enters into the speed of the transmission and can be entirely disregarded when it is possible to encircle the globe in a small fraction of a second with a radio wave.

We all realize that the interest of the public is fickle and that the mystery of this wonderful agency will wear off as it ceases to be a novelty, but even admitting that, the element of permanency is present in radio broadcasting. This is evidenced by the thousands of letters that have been received from the radio audiences, of which the following are samples:

"I'm an old lady, almost blind, 75 years old. My youngest grandson, an 18-year-old senior in high school, installed one of your radio sets for me last Monday, March 20, and I have enjoyed three fine concerts and two noon-hour services at Trinity Church. You are doing much good and giving great pleasure to the many, many 'shut-ins' like myself."

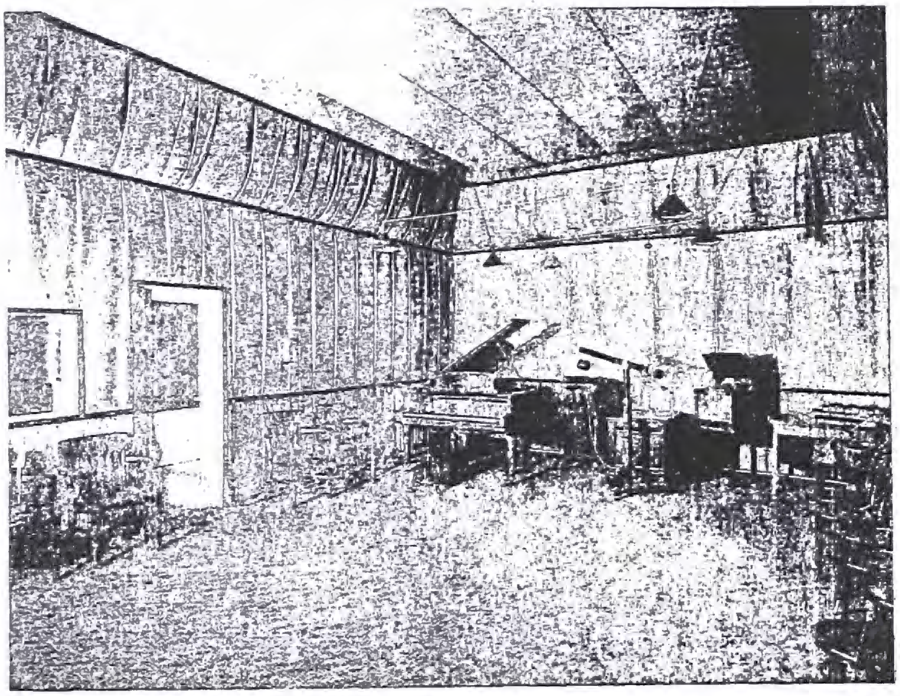
"We are located up on the lonesome mountains of Southeastern Kentucky. We listened in on your program last evening, and we certainly appreciate this very excellent music. We are about 200 miles from any large city, so you will understand why this is such a great treat to us and our miners."

"We enjoyed every bit of Tuesday night's program, but especially the talk given by the 'Bird Man.' We are country people and you know we live very near to nature, so his talk of the birds was very interesting to us. We are thankful to have lived to see this possible and we are surely indebted to you people who make it so. Being elderly people and during the winter's bad weather not often able to get out, it is a very great thing for us to be able to enjoy such things by radio."

Half our population resides in the country, and conditions similar to those recited in these letters will prevail. But consider also what it means to the sick, the infirm and the aged, even though they may be residents of the cities.

The broadcasting of church services alone, which was initiated by KDKA, the Westinghouse Electric and Manufacturing Company's broadcasting station at East Pittsburgh, Pennsylvania, would in itself be sufficient to make radio broadcasting permanent and invaluable. This service met with instant response, for it was at once unique and compelling it its appeal to people of all ages, classes and denominations, and is proving to be one of the greatest publicity and beneficent features ever presented; it is doing more to enlarge the church's sphere of influence than any medium heretofore utilized.

As radio broadcasting is developed today it has one feature not possessed by any other service in existence, and except for the comparatively small cost of the initial installation, it is without favor and without price. Everyone can occupy a "free reserved seat" at any and every radio broadcasting performance. This is an important fact not generally recognized, for while one large electrical manufacturing company initiated the service and several companies are now maintaining broadcasting stations, the only financial support they receive for this costly service is the possible profit from the sale of receiving apparatus of their manufacture; but there are hundreds of other manufacturers and dealers who are manufacturing and selling receiving apparatus also, who do not support this service in any way whatever and who, because of this service, reap large benefits without exertion or expense on their part.



The specially constructed studio at KDKA station which realizes the prophecy of a year ago that such rooms would be provided for broadcasting stations

It is doubtful if there is any way in which this service can be made a direct revenue producer for such companies or institutions as foster it. Recognizing this fact, there must then be developed sufficient indirect value to those maintaining radio broadcasting stations to make it profitable for them to operate and develop this service.

To the uninitiated it probably seems a simple matter to install a radio transmitting outfit and to broadcast music and speech and thus call the installation a broadcasting station. KDKA has now been in operation since the early part of November, 1920, and as the pioneer in radio broadcasting service, has made history in the development of the radio broadcasting art. It will be difficult for anyone now sitting at a receiving instrument to realize the amount of development work and expense that has been attached to bringing that station to its present effectiveness, but I am quite sure that if it were possible to compare what was considered good broadcasting a year and a half ago, and what is being transmitted today, it would at once be evident that a wonderful improvement has been brought about.

When W. J. Bryan speaks nowadays over the radio a quarter-million people hear the great Commoner

The transmitting microphone at WJZ into which great artists sing represents months of laboratory research and operating development

There are still considerable limitations in the ability of the available broadcasting apparatus to transmit talk and music tones true to life, and ultimate perfection of trueness is only attained when the listener receives what is broadcasted in the natural reflection and without distortion. Much thought is being given and work done to reach this perfection, and it is the writer's belief that very material steps of advance in this will be forthcoming shortly.

Our apparatus and means for radio broadcasting are today undeveloped, and if greater perfection is to be attained, confusion, with resultant public disgust, must be prevented; so protection of some kind is due those who foster and develop this service.

Recognizing that inefficient and interfering service will not be tolerated, the Government has already taken preliminary steps to formulate regulations with a view to materially improving this situation, in the recent conference held in Washington under the auspices of the Department of Commerce. As the conditions of service and the requirements of the public become better appreciated, means will be found to attain this end.

There are comparatively few available wave lengths in the ether, and to encourage this very necessary development these ether wave bands must be allocated and administered with much discrimination and care. Only companies or institutions with competent research and operating staffs, and financial means to back them, can possibly support this service in a proper manner and accomplish this most desirable perfecting of radio broadcasting. In other words, radio broadcasting is an infant industry and it must have protection, and if this is properly and conservatively done we shall hold the public support and shall look back in a very short time in amazement at what has been accomplished.

It is unfortunate, however, that this imperfection of the sending apparatus is not as fully realized as it should be, with the result that many new broadcasting stations are being planned which must necessarily give only mediocre results. Not only is the ether going to be crowded, but crowded with discordant and disagreeable performances.

I feel that this period is going to be the test of the public's approbation. The growth of the public approval has been too rapid to be healthy, as it outstrips the growth of the development of the art, and while the fascination of broadcasting is the impelling force now, the period of development of not only the apparatus, but of the service itself is going to require patience and forbearance on the part of the public.

The same situation confronts this service as has been encountered in all other innovations or great steps of progress, and that is the attitude of those in allied established activities to look upon the newcomer as a rival which is to be regarded with suspicion and gauged in a competitive sense.

It is easy to see from what has been said herein that there is little or no revenue-producing opportunity in this service, and that the value attached to it is almost wholly one of advertising. Until this is realized and appreciated by those who must furnish the talent for the program, however, more or less difficulty will be experienced in perfecting and broadening the program service, and the attitude now being met on the part of a few lecturers, artists, theatrical and concert managers who refuse their assistance for fear of adversely affecting their box-office receipts and of reducing their earning capacity, must be converted to an appreciation of its advertising value — not as a destructive, but as a constructive agent; for if advertising in any way has been a benefit in helping the growth of such undertakings, the far greater advertising possibilities in radio broadcasting must undoubtedly bring greater returns for the amount of energy expended than any other agent yet available.

Undoubtedly, however, if this service is to fulfill its mission, ways will be devised to overcome this difficulty; for in this case as in other cases of unusual developments, it will eventually be found that, instead of being a competitor, radio broadcasting becomes a source of development and extension to the other arts. A service which offers such possibilities must in the future wield a tremendous influence, and overcome obstacles which now beset its path.

In broadcasting, radio has found its greatest usefulness and its most important field of application, and it is destined to become a basic public service. The road is a rough one, however, as many of us who have been intimately connected with its development are realizing.

p. 3 rnd

1922 phonograph & radio cabinets

Radio and the Phonograph Dealer

Abstracts of an Editorial From "The Talking Machine Journal," Showing How Radio Will Help the Phonograph Business

THE big new idea in the talking machine field is Radio-Telephony. Like all big new ideas it is fraught with blessings or — blow-ups. When we contemplate the fact that in a time when all other businesses were moving with extreme slowness, or were actually at a standstill, radio-telephony sprouted up to a towering height in just a few months, we must admit that it has great force in it. But on the other hand, has it real strength and staying power? Granted that it has stability and a future, what does it mean to the talking machine dealer, and how should he connect himself with it? How should he plan today?

In considering radio and its possibilities, merchants should bear one thing steadily in mind—that they are in the phonograph business. The phonograph business is firmly established as a part of the commercial structure of this country. The recent census department report gives figures showing that only the automobile business rivals the phonograph business in the volume of sales — with two and a quarter million machines made and marketed in 1919 — and over two-thirds that number produced last year, admittedly an off year. Hence it becomes a question of the old and established business brother holding out a helping hand to the newly arrived child of commerce.

The point of view should be that the dealer should interest himself in the possibilities of radio because it can help his phonograph business, and, viewed from the other side, because he is the one merchant who is today properly equipped in his store and his business experience to distribute this type of goods and more particularly the type of goods that is being rapidly developed, namely the cabinet installed sets, particularly those combining phonograph and radio equipment.

At present there seems no chance for competition between broadcasted radio music, and the fine reproductions of artists to be had on the records. A fraction of the family's "listening time" may be absorbed by the radio outfit, but in general what they hear will stimulate a desire to own a smooth and artistic reproduction of the selection that they can put on their phonograph and hear through without interruption at any time they wish. This is without prejudice to the fact that radio contributes many individual and interesting features of its own to the home entertainment. Phonograph dealers should take hold of radio both for its present and for its future, going ahead conservatively and making sure that they have allied themselves with only standard and reliable lines. Plunging in the ordering of goods is not justified. The point is not so much to get goods as to get the proper kind. A few bad outfits will damage the entire proposition in your neighborhood. Radio is here to stay, and the dealer who proceeds cautiously with it, from the point of view of developing his phonograph business, will make more and better sales than the one who rushes in without proper consideration of the pitfalls as well as the profits.

Scene: Movie house in Kokomo.
Time: Nineteen twenty something.
Idea: Movie houses have installed radio. Three thousand get their music from Chicago orchestra.

We see the villain approaching the country lassie. Evil is written all over his face. The girl is frightened. He grabs her. They struggle furiously. Just as the fight is at its height, something slips in the music synchronizer and there bursts inappropriately forth from the radio receiver:

"Dapper Dan, der Pullman Porter man,
On a train that ...

64:21
Box 2
FF 19

Boston Ev. Trans
June 192?

date?

col 2
93

Who Saw the Radiophone Broadcasting Vision?

Harry Phillips Davis, Vice-President of the Westinghouse Electric & Manufacturing Company, Was the First Man to Foresee the Popular Appeal of Radio

HIS IDEA SUGGESTED BY A NEWSPAPER AD.

HARRY PHILLIPS DAVIS

"Frank I'm going to close your station."

Paradoxial as the statement may seem, this was the actual start of radio broadcasting as we now know it. The concerts on regular schedules, advance programs, entertainment in the air, all came from closing "Frank's station," and opening KDKA, the first radiophone station in the world.

For "Frank" was Frank Conrad, assistant chief engineer of the Westinghouse Company, and the man who made the statement was Harry Phillips Davis, vice-president of the Westinghouse Company.

Mr. Davis had come into his office that morning in September 1920, with an idea. The idea had come to him while reading the advertisements in his evening paper. In a corner of a full page ad, he came across the words "Mr. Conrad will send out phonograph records this evening." This advertisement was in the interest of the store's amateur radio department and was explaining to local radio amateurs that Mr. Frank Conrad, who had operated his station intermittently since the war, would send out by radio, phonograph records on a certain evening. The Conrad station was very well known to amateurs all over the country, for it was one of the few amateurs stations licensed to operate during the war. This special operating was in the interests of government research work which the Westinghouse Company was doing and also to test some apparatus.

Mr. Davis could not forget his idea. He was struck with the fact that the radiophone fundamentally did not lend itself only to private communication but that it had a universal field of usefulness and that through it, one could communicate with hundreds, thousands or millions; all could listen who had the suitable "ear," for if a certain class of people were interested enough to listen to music from a few records there was a possibility of increasing this small audience of radio listeners to an enormous number by sending out entertainments, current events, etc., in a regular and interesting manner. Why confine one's audience to a small portion of the country? Why not build a big station and let everyone, who want to, hear? Why not make radio broadcasting a public service?

Mr. Davis was so struck with his idea of a public broadcasting service that the first thing he said to his secretary on entering his office the next morning was "Ask Frank to come in."

"Frank," as has been previously explained, was Mr. Conrad, who, having been taken so abruptly with his chief's statement, could only listen to what followed.

"Frank, my idea is that you stop sending from your station and we will start a regular service from our experimental station here at East Pittsburgh. We can arrange for a suitable wave length, and I believe that if we do this it will be the beginning of a radio broadcasting public service which seems to me to have wonderful possibilities."

The conference with Mr. Conrad lasted a short time and Mr. Davis called other conferences before actual work on the broadcasting started. It was not until November 1?, 1920, that KDKA was formally opened with the broadcasting of election returns.

The remainder of the history of KDKA is now common property. Everyone, almost, now knows that there are over 200 broadcasting stations in the United States and that the radio audience numbers into the millions each night.

Not everyone knows, however, that it was a single line in a newspaper which suggested to the vice president of one of the largest electrical manufacturing companies in the world, the big thing of turning a scientific novelty into a new kind of public service by unfolding a new field of communication.

Mr. Davis was one of the best equipped men in the electrical industry to take up the difficult problems of broadcasting. He has been a leader in the electrical industry since his college days and has been issued nearly 100 patents covering electrical apparatus. He is an engineering genius and is known, not only as a designing engineer of high rank, but also as a man who gets things done. His ability to accomplish results has already been proved in the history of his company's broadcasting achievements. His ability was also admirably illustrated during the war. He was at that time in charge of production at the East Pittsburgh works and the duty of fulfilling the government contracts for munitions was his. Probably no more colossal manufacturing task was ever given anyone. The quantities involved were enormous; the time limits short; the specifications most rigid, new and undreamed of problems arose at every step; the government's plans changed with bewildering frequency; material, competent help and transportation facilities became almost unobtainable; and innumerable other difficulties were encountered. Yet, in spite of everything, the work was done and it was done properly and on time. Not a single promise made to the government was broken.

This is all by way of illustrating the character of the man who first saw that radio broadcasting was something that held greater possibilities than just being the plaything of the amateur.

Mr. Davis was born at Somersworth, New Hampshire. He graduated from the Worcester Polytechnic Institute with the degree of B. S. in Electrical Engineering in 1890, and after a trip to Europe and a few months spent with the Thompson-Houston Company, entered the Detail Engineering Department of the Westinghouse Company in 1891. In 1896 was placed in charge of this department; in 1908 he was made manager. This position he held until 1911 when he was elected vice president.

Sept 29
1920
"will send out"

Were there
2 ads?
Months apart?

64:21
Box 3
FF 36

As far as I know,
this is the only article
or memo we have on
the rapid gearing up
for mass production
of consumer radios.
GE caught up later.
Crosley & others?

MANAGEMENT ENGINEERING

THE JOURNAL OF PRODUCTION

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Radiphone ins'ruments *621.3846*

Putting Radio Instruments Into Production

By HARRY PHILLIPS DAVIS*

Vice-President Westinghouse Electric and Manufacturing Co.

TO develop an engineering and commercial enterprise out of the radiophone, it was necessary to attack and solve the problem of changing a scientific electric novelty into an instrument of public service, and of making it useful and usable in a new field of communication. Fundamentally, the radiophone does not lend itself to private communication, but has the possibility of universal usefulness. Through it one can communicate at the same time with hundreds, thousands, or even millions of people, the only prerequisite being that the one who listens shall have a suitable "ear" tuned to receive whatever is sent. The development of this possibility in the past two years has brought into being a new industry.

During the war, Frank Conrad, assistant chief engineer of the Westinghouse Electric and Manufacturing Company, was licensed to operate one of the few amateur stations permitted during the period of hostilities. This station was utilized in the interest of government work which the Westinghouse Company was doing and to test out apparatus. This station was very well known to amateur radio enthusiasts throughout the country. Mr. Conrad had been in the habit of operating it intermittently since the war to send out phonograph records by radio on certain evenings. A department store selling amateur radio equipment made use of this fact by including in its advertisement in one of the Pittsburgh newspapers this sentence: "Mr. Conrad will send out phonograph records this evening."

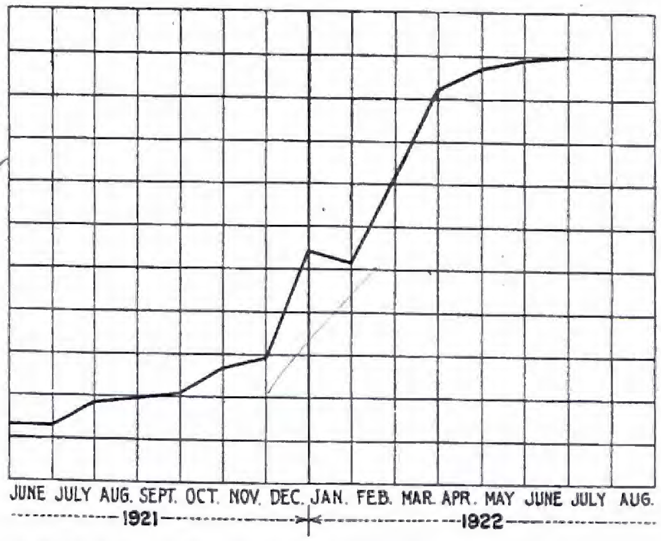


FIG. 1 PUBLIC INTEREST IN RADIO AS REFLECTED THROUGH THE AMERICAN NEWSPAPERS

From this came the idea of a public broadcasting service which would make available to all within range, music, news, information, and entertainments.

The possibilities of such a broadcasting service were sensed in September, 1920, and on November 11 of that year the Westinghouse Electric and Manufacturing Company's broadcasting station in East Pittsburgh—KDKA—was opened. Within less than a year three other such stations were set up: Newark, New Jersey, in April, 1921, WJZ; Chicago, Illinois, in August, 1921, KYW; and Springfield, Massachusetts, in September, 1921, WBZ.

These four stations were all pioneer stations in a way, for during the first year progress in developing public interest was slow. However, when transmission conditions became good, in the fall and early winter of 1921, public interest developed so rapidly that it practically became a craze. As a result, there was a rush to establish broadcasting stations, and there are now over 300 such stations in the United States, and the

* Mr. Davis was graduated from the Worcester Polytechnic Institute in 1890, and after a trip to Europe and a few months spent with the Thompson-Houston Company, entered the Detail Engineering Department of the Westinghouse Electric and Manufacturing Company in 1891. In 1896 he was placed in charge of this department; in 1908 he became manager of the Engineering Department. This position he held until 1911, when he was elected Vice-President of his company.

Mr. Davis is not only a designing engineer of high rank with 77 patents on electrical apparatus to his credit, but he is also a man who gets things done. During the war he was in charge of production at the East Pittsburgh works, and upon him devolved the duty of satisfying the government contracts for munitions. Not a single promise made to the government was broken in carrying through that colossal manufacturing task.

radiophone audience numbers into the millions each night. Fig. 1 shows the increase in public interest in radio during the past year.

The establishing of these stations, which broadcast to the public, provided a definite service which could only be taken advantage of by the possession and use

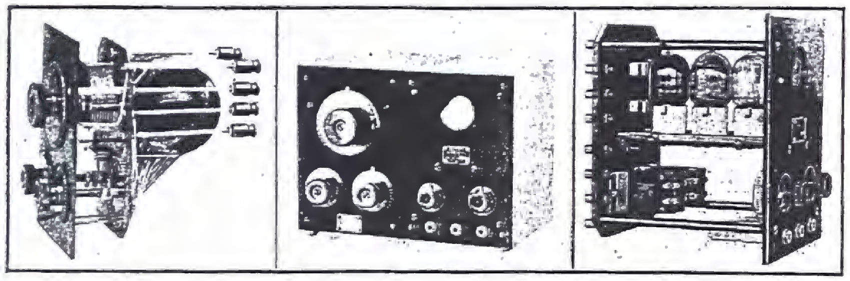


FIG. 2 EARLY TYPE OF RADIOPHONE SET

These exterior and interior views are of one of the first sets made by the Westinghouse Electric and Manufacturing Company.

of radio instruments. As soon as the service became available the public demanded such instruments. These have been supplied through two channels, the manufacturing and marketing of carefully designed, constructed, and tested instruments, and the supply of parts from which amateurs can build their own. It is estimated that up to the present more than 300,000 instruments have been manufactured, of which the Westinghouse Electric and Manufacturing Company has produced a few more than one-third. It is esti-

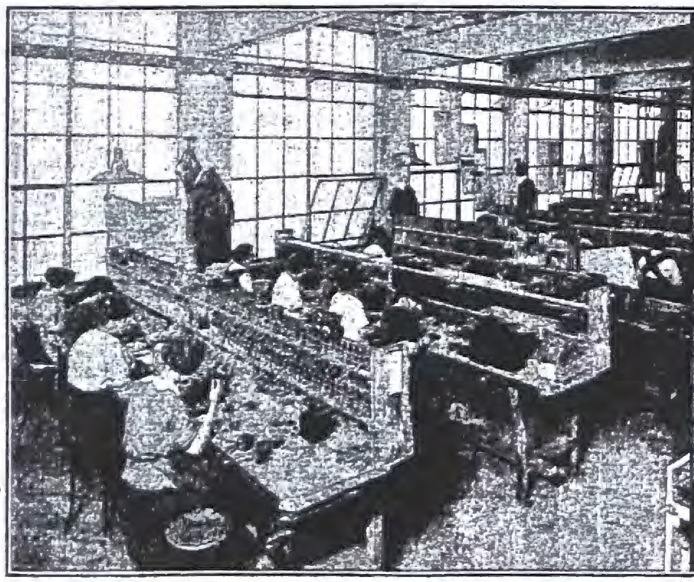


FIG. 3 ASSEMBLING AERIOLA JUNIOR INSTRUMENTS

There are 20 operations in this assembly and 15 separate parts. The assembling of the tube block is difficult and exacting. The girls average to produce 240 instruments per day; about two weeks is required to train a girl.

FIG. 4 WINDING COILS FOR AERIOLA JUNIOR INSTRUMENTS

In each coil there are 74 turns of wire. The girls average 100 stationary coils or 400 rotary coils per day. The average time required to train a girl for this work is from a week to 10 days.

mated further that fully as many instruments constructed by amateurs are in use. This tremendous development has taken place in about 14 months. In June, 1921, the East Springfield plant of the Westinghouse Company produced 404 radiophone instruments. During the present month, August, 1922, the output will be upward of 25,000.

This development is unquestionably one of the high-water marks of rapidly increasing demand and production in an article for general use. It is believed that the money value of radio equipment already sold far exceeds the value of the automobiles produced during the like period of the development of that new means of transportation.

The problems of production may be understood when it is realized that up to the time that the Westinghouse Electric and Manufacturing Company developed its first model and put it into the manufacturing departments no instrument of this design had ever been produced on a manufacturing basis. Involved, therefore, in the problem were all of the difficulties concerned with bringing out the initial design of a new piece of apparatus, adapting it to its uses, acquiring knowledge and skill for its production, securing the necessary manufacturing equipment, training workers to new tasks which were not even known by the executives in charge—in short, blazing through all of the problems of producing something which had never before been made in quantities and by manufacturing methods. That these problems were successfully solved is proved by the record of production already cited. Other proof is found in the facts that in the East Springfield plant alone 100,000 square feet of floor space are devoted to the production of radio equipment, that over 900 persons are employed on this work, and that their efforts are supplemented by an equal number at other works of this company. Between March 17 and June 6, a new radio building was constructed at East Springfield, 500 ft. long and 80 ft. wide, to give increased manufacturing space.

One factor which has contributed greatly to this

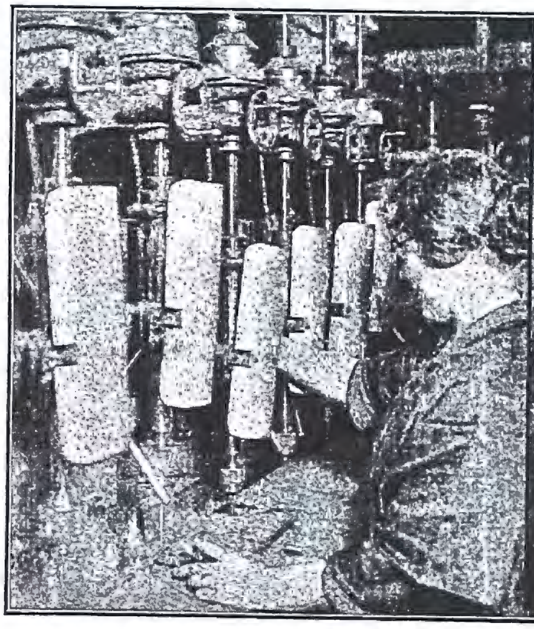


FIG. 5 DRILLING SUB-PANELS FOR RA TUNERS
Fifty-nine holes are drilled in each panel with an average output of 130 pieces per day.

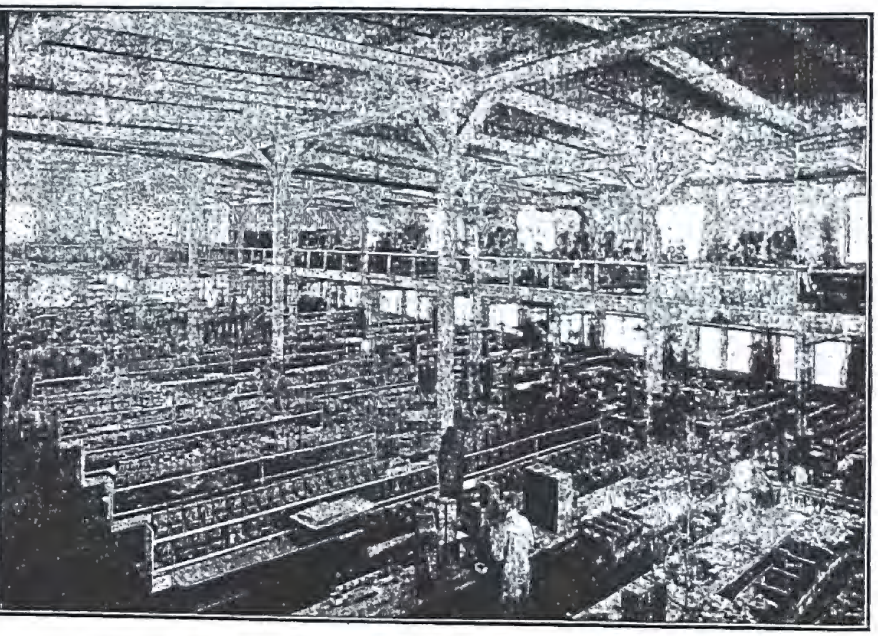


FIG. 6 GENERAL VIEW OF THE MANUFACTURE AND ASSEMBLY OF RC, DA, AND RA SETS
Three hundred and fifty persons are employed on this work, producing in all of the three 420 units per day.

record is the fact that the first design of a tuner put into production was a good one. Usually a new device or piece of apparatus must pass through an experimental stage before it functions successfully. This was not true of the tuner as first made. It is being turned out today according to the original design, the only modifications being in details to permit of easier manufacture. This instrument was followed by later designs, theAeriola Junior with a radius of 25 miles in May, 1921, the Aeriola Senior with a radius of 200 miles in January, 1922, and the Aeriola Grand with a radius of 750 miles in January, 1922.

To emphasize that the design has not changed, Fig. 2 shows one of the first tuners manufactured in East Pittsburgh in January, 1920. It will be noted that the characteristic front of the first instrument has been preserved in those which have followed. This external similarity holds throughout the design of the working parts of the instruments.

Turning now to actual production, it was decided to produce these instruments at the East Springfield plant to increase the diversity of work at that place. No one in the manufacturing organization had any previous experience in making radio equipment, so the experimental work in connection with production was more troublesome than that connected with the design and functioning of the instruments themselves. Inasmuch as the demand was unknown at the time production commenced, for at that time the design situation was not demonstrated, the first few instruments were

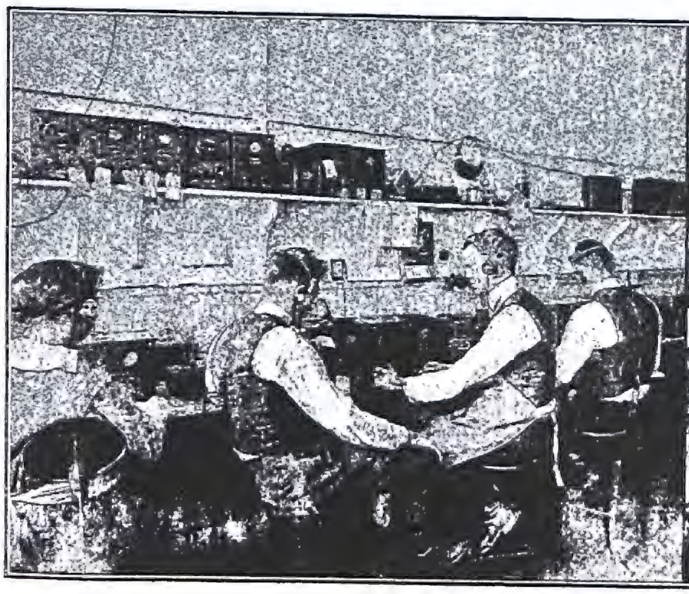


FIG. 7 TESTING-ROOM FOR RC SETS, DETECTORS, AMPLIFIERS, TUNERS, AND TRANSFORMERS

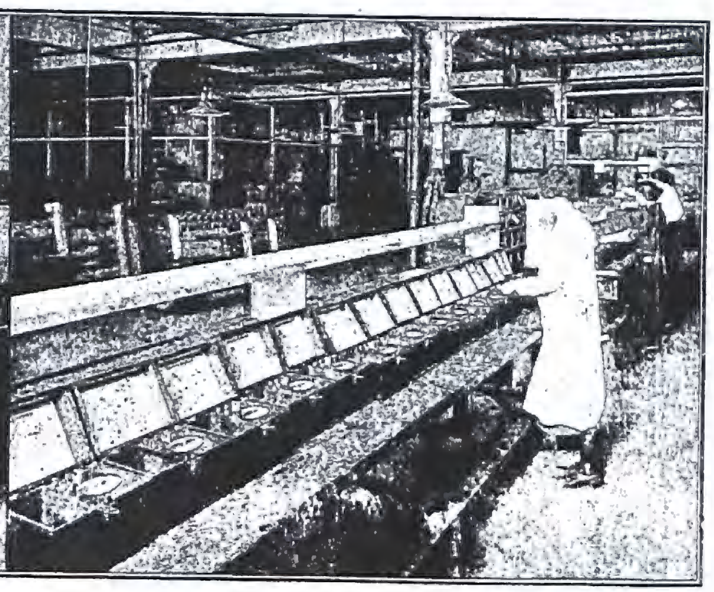


FIG. 8 FINAL OPERATIONS ON ASSEMBLING AERIOLA JUNIOR INSTRUMENTS

produced using the simplest kinds of tools, hardened templets without bushings for drilling, and vise jaws for milling. As it became apparent that the designs were settled and that some quantities would be necessary, these simple tools were replaced by well-designed tools for accurate production of interchangeable parts. Within the last few months the tool design has gone into a third stage to adapt it to large quantity production. Multiple jigs and milling fixtures have been built, multiple drilling machines selected, and some parts punched in quantity instead of being drilled. Still other parts are being produced from molded material instead of by machining methods. These changes, of course, have affected the machining operations, which, however, only involve about 20 per cent of the labor hours in producing radiophone instruments. By far the greater part of the producing time is taken up with assembling and testing. As an item of interest, 95 per cent of the instruments pass final inspection without any correction.

A few of the manfacturing, assembling, and testing operations are shown in the illustrations, Figs. 3 to 10, inclusive.

To emphasize the value of experience in producing any fine product and to show some of the small points which may cause trouble but cannot be foreseen, the case of a micarta panel is of particular interest. In laying out these panels each one was marked at a certain place with a lead pencil. Later six holes for terminals were drilled in this region. For some time trouble developed in shore circuiting in these terminals and not until the pencil marks were noticed and erased was this difficulty overcome. Now wax pencils are used for all marking on radio parts.

Turning now to the record of output in detail, Fig. 11 shows graphically the estimated sales requirements beginning with February, 1921, and the corresponding factory production. A very sharp rise in the units requested by the sales department is recorded for December, 1921. This was occasioned by a limited amount of advertising of radiophones available for Christmas gifts. The unfortunate part of this section of the diagram is that production was unable even to approximately offset the demand. However, production has been increasing steadily, the quantities for the past few months being 13,315 instruments for April, 14,728 for May, in round numbers 19,000 for June and 21,000 for July.

FIG. 9 FINAL TEST ON AERIOLA JUNIORS
The test is for wave length, ocillation, and audibility.

FIG. 10 SHIPPING ROOM FOR RADIO EQUIPMENT. AMOUNT SHIPPED PER DAY AVERAGES 10 TONS WITH A RECORD OF 18 TONS

As previously mentioned, the production for the current month will be upward of 25,000 instruments. These records visualize the public demand for radio apparatus which came into being only after a broadcasting service was made generally available.

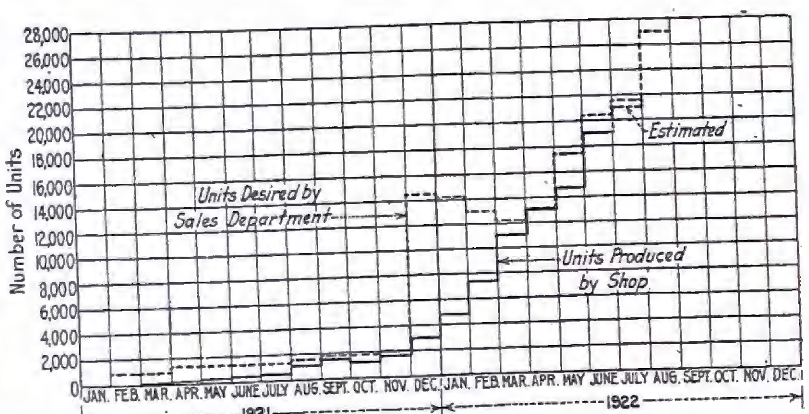


FIG. 11 SALES REQUIREMENTS AND FACTORY OUTPUT OF RADIO APPARATUS FOR 18 MONTHS
Included are tuners, amplifiers, RC sets, Aeriola Juniors, Aeriola Seniors, Aeriola Grands, and Tube Transmitters.

There are no signs of diminution of demand, but on the contrary, more and more apparatus is needed to satisfy the sales department requirements. As the economic uses for radiophones are enlarged we may expect to see this industry develop into one of the great branches of the diversified electrical business of the country.

Should Radiophone Broadcasting Be Continued?

By EDWARD LINWOOD.

N. Y. Globe Sept 30, '22

"IS it your opinion that radiophone broadcasting should be continued in its present form?"

This was the question put to H. P. Davis, vice-president of the Westinghouse Electric and Manufacturing Company, and the man who was responsible for the organizing of the first radiophone broadcasting station in the world, that of KDKA, at East Pittsburgh.

"Instead of answering the question," replied Mr. Davis, "I would like to ask you—

"Who wants radio broadcasting stopped?

"What causes any one to want broadcasting stopped?

"Is the present broadcasting service unsatisfactory?"

The interviewer assured Mr. Davis that there was no real objection to the radiophone, and so far as he knew there was no reason why it should not be continued. This was in answer to Mr. Davis's first question in reply.

"Broadcasting," he continued, "has become a public necessity and is rapidly lining itself up with other utilities such as the telephone, telegraph, electric light, moving pictures, etc., and just as these activities were crude in their beginnings but later refined to present-day conditions, so, in the same way, will radiophone broadcasting be developed and will cover and make available to all within hearing range all worth-while activities of general interest to the public."

When Mr. Davis was asked if present conditions under which radiophone broadcasting was done, wherein a free service was given, would be continued, he stated in reply that a service of this character offered such benefits to mankind in general that way would be found for its continuance.

"Why," he said, "consider the effect of discontinuing operations at our four stations! We believe that the combined audience of our four broadcasting stations is at least a million every night in the week. It may be more. This estimate is based on the number of radio receivers which have been sold in the territories covered by these stations. What would be the result if all broadcasting stations stopped suddenly, with or without warning, entertaining and informing this vast audience? The effect upon this radio audience would be about the same as would occur if we took away some one or more of the utilities already referred to, such as the electric light, or the telephone—and we might go even further and say that it might be the same as stopping the newspapers and magazines, and the cutting off of amusements and communications. The effect probably right now would not be so vital as it will be later, as the service improves and grows—as it is bound to do."

"What would happen if this occurred?" was asked of Mr. Davis.

"You know as well as I do," he said, "that there would be a public clamor that would quickly bring some solution of a state or federal nature. I do not believe however, that this can happen, as there is enough commercial possibility and good-will in the business to make it worth while for those companies that can benefit from it to continue the service."

"What is going to happen," Mr. Davis was asked, "if the federal government continues its present policy of indiscriminately licensing all applicants to broadcast?"

"Now," said Mr. Davis, "you have touched on the real, vital point. It is my opinion that the public is not going to stay interested in, nor will it support, an activity which does not at least approximate a real and satisfactory service. When it becomes possible, as it is now, for any one with a broadcasting set—good, bad or indifferent—to claim space in the ether and to force himself upon the listening public without furnishing quality or a programme of interest, the public is going

H. P. Davis

to become disgusted and, as a result, interest will flag—for under circumstances of this kind worth-while service cannot be given by those companies or stations which have the ability and facility to provide a real service, because of this interference. This is a real danger, as will probably be recognized this fall when receiving conditions become better and hundreds of stations which have been licensed grow more active."

"Naturally, then, you must have some opinion in regard to a way that radio broadcasting should be developed."

To this, Mr. Davis replied, "I have. I have always maintained that, like the telephone and the telegraph, the service is inherently monopolistic in character, and to get the best results, the best programmes, the greatest development, the activity should be confined to two or three companies of established reputation, having the necessary facilities and incentive to develop it; that they should be under federal control and be allowed this privilege as long as they have acceptable service."

"As you object to the large number of stations the government has licensed, how many do you think sufficient?"

Mr. Davis answered that he believed five or six large, powerful, well-located stations would be sufficient to cover this continent; that these stations should have separate wave bands, and that no other stations should be licensed that would in any way be capable of interfering with the transmission from these large, powerful stations. For local purposes there should be a network of low powered local stations on non-interfering wave bands. These stations should be capable of relaying the big stations' services for their immediate vicinity, and should be able to furnish for their locality matters of local interest.

"Do you think, even with this programme, that the few companies who would be given the broadcasting privileges by the government would guarantee permanency of service?"

"That is a hard question to answer," Mr. Davis replied, "but I think it quite probable they would. However, at this period in broadcasting history it is difficult to foresee the future evolution and development. I believe that if these central stations could be licensed, protected and organized, a great step forward would be made, and that it would become a matter of such public value that endowments or federal subsidies would be possible which would assist those responsible for the service to carry it on and to continue the development and research required to get the most value out of it."

Talking With 'Planes While in Flight

(Continued From First Page.)

the 'plane and connected together by wires strapped along the entering edge of the outer struts. The lead-in wires were taken from the upper portion of the loop and run into the radio compartment, as indicated in Fig. 1. The fore and aft coils can be wound in the fabric supports of the fuselage and consisted of three turns on either side of same. The dimensions of each loop were 30x4 feet.

The tail coil used in connection with the development on the twin-motored Martin 'plane is located at station No. 6, in the fuselage of the ship. (See Fig. 1.) This station has dimensions 56x36 inches, 56 inches deep. The coil is mounted so as to revolve on a shaft set in bearings fixed to longerons. The coil itself measures 40 inches on a side, and is composed of twelve turns of No. 22 double cotton-covered copper wire, spaced ⅛ inch apart. The centre of the coil is located 144 inches from the centre of the radio compartment, in which the transmitting set, amplifier, and batteries are mounted.

The radio compartment measures 45x36x24 inches deep. Attached to the shaft of the radio compass frame is a 10 inch scale, calibrated in degrees from zero to 360. This indicator is two inches above the turtle back and is readily visible from the compartment in which the operator sits. The coil frame is revolved mechanically by a system of pulleys over which a controlling wire is run, and anchored to both drums of the tail coil and controlling wheel in the radio compartment.

(To Be Continued.)

... Angeles, Cal.
... 1?, 1922.

...ICAL MEN ...PLIMENT L. A.

California is indeed ... be served by such ... power generation com... n electric railway sys... on a par with the best ... States," said H. D. ... president of the West... ctric & Manufacturing ... ho, in company with ... also an official, are ... es to inspect the new ... plant here.
...ere from the hazy city ... h to your delightful ... where electricity has ... the smokestack and ... cturing plants operat... ...eed, is indeed an in... a pleasure.
...ess outlook for 1923 is ... bright; especially is ... he Pacific Southwest ... building program has ... ernational attention."
...os Angeles, Mr. Davis ... ite will hold a con... K. E. VanKuran, dis... for Westinghouse.
... vice president of the ... charge of production ... ng, stated that he was ... ssed with the manu... sibilities of the Pa... Mr. Davis is inter... own as the "Father ... lcasting," and has the ... placing into operation ... ccessful broadcasting ... United States.

Tribune,
Oakland, Cal.
Nov. 12, 1922

WESTINGHOUSE HEAD HERE TO INSPECT SITE

Work on New Emeryville Plant to Begin Soon, Says Official

The Emeryville manufacturing site, which was purchased some months ago by the Westinghouse Electric and Manufacturing company, will soon accommodate a plant which will manufacture and assemble electrical machinery and radio apparatus.

H. P. Davis, known as the "father of radiophone broadcasting," is here to inspect the site and to make immediate recommendations for the erection of a plant, service department and assembling works. Davis is vice-president of the company and one of the foremost electrical engineers in the United States.

According to Davis, the plant which the company intends to erect will employ several thousand men. It will be the third largest plant of this company on the Pacific coast, the others being located at Los Angeles and Seattle.

Davis is credited as being the first to visualize the idea of broadcasting musical and professional programs on regular schedules by radiophone. He was chief promotor of the first large station of this kind. This station is now known as KDKA, a call letter familiar to every radio fan in the east.

The equipment to be used in the new building will be as up-to-date and modern as it is possible to make it. Electricity is to be employed wherever it can be used efficiently for the production of light, heat, and power. The electrical equipment is being designed specially by the Westinghouse engineers themselves. Because of the peculiar advantage the engineers have in this case in designing equipment for their own plant, the announcement of the detailed specifications is being awaited with some interest by local architects and engineers.

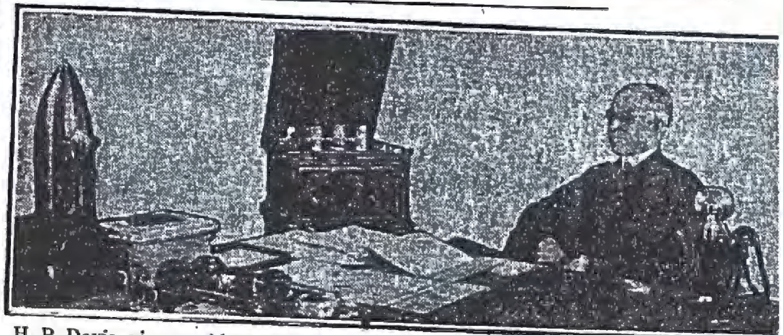
Davis is accompanied by Henry D. Shute, also a vice-president and salesmanager of the company.

The Pittsburg Dispatch Sunday, September 24, 1922.

Radio Diges...

Why Broadcasting Should Be Continued by Radiopho...

AN INTERVIEW WITH H. P. DAVIS, VICE PRESIDENT OF THE WE... INGHOUSE ELECTRIC AND MANUFACTURING COMPANY, WHO IS TH... ORIGINATOR OF THE MODERN RADIOPHONE BROADCASTING



H. P. Davis, vice president of the Westinghouse Electric and Manufacturing Compan...

"You have asked me, 'why should radiophone broadcasting be continued?' I cannot find any answer to that question, as it seems so perfectly obvious to me that radiophone broadcasting has come to stay. Instead of answering I would ask:

"Who wants radio broadcasting stopped?

"What causes anyone to want broadcasting stopped?

"Is the present broadcasting service unsatisfactory?

"If it is unsatisfactory, this should not be a cause for discontinuing it, but rather a reason for greater effort at improvement."

It was evident at once from his replies that H P Davis, vice president of the Westinghouse Electric and Manufacturing Company, had been surprised that anyone should ask such a question. And little wonder, for the man who was responsible for organizing the first radiophone broadcasting station in the world —this poineer station being KDKA at East Pittsburg—and the installing of three other stations (KYW at Chicago, Ill, WJZ at Newark, N J, and WBZ at Springfield, Mass, has been closely in touch with radio for the past two and a half years and had evidently detected no demand from the public for cessation of radiophone broadcasting activities.

Mr Davis called to the interviewer's attention the wonderful and phenomenal spread of popular interest in radiophone broadcasting, and stated that he believed that this interest was not waning, but was increasing.

Public Necessity

"You have asked me why radiophone broadcasting should be continued," said Mr Davis. "Perhaps I can answer your question best by saying that I can tell you many reasons why radiophone broadcasting should not be stopped."

The interviewer assured Mr Davis that there was no real objection to the radiophone, and so far as he knew there was no reason why it should not be continued. This was in answer to Mr Davis' first question in reply.

"Broadcasting," he continued, "has become a public necessity and is rapidly lining itself up with other utilities, such as the telephone, telegraph, electric light, moving pictures, etc, and just as these activities were crude in their beginnings but later refined to present-day conditions, so, in the same way, will radiophone broadcasting be developed and will cover and make available to all within hearing range, all worth-while activities of general interest to the public."

When Mr Davis was asked if present conditions under which radiophone broadcasting was done, wherein a free service was given, would be continued, he stated in reply that a service of this character offered such benefits to mankind in general, that way would be found for its continuance.

Audience of Million

"Why," he said, "consider the effect of discontinuing operations at our four stations! We believe that the combined audience of our four broadcasting stations is at least a million every night in the week. This estimate is based on the number of radio receivers which have been sold in the territories covered by these stations. What would be the result if all broadcasting stations stopped suddenly, with or without warning, entertaining and informing this vast audience? The effect upon this radio audience would be about the same as would occur if we took away some one or more of the utilities already referred to, such as the electric light, or the telephone—and we might go even further and say that it might be the same as stopping the newspapers and magazines, and the cutting off of amusements and communications. The effect probably right now would not be so vital as it will be later, as the service improves and grows—as it is bound to do."

"What would happen if this occurred?" was asked of Mr Davis.

"You know as well as I do," he said, "that there would be a public clamor that would quickly bring some solution of a State or Federal nature. I do not believe, however, that this can happen, as there is enough commercial possibility and good-will in the business to make it worth while for those companies that can benefit from it, to continue the service."

Licensing Applicants

"What is going to happen," Mr Davis was asked, "if the Federal Government continues its present policy of indiscriminately licensing all applicants to broadcast?"

"Now," said Mr Davis, "you have touched on the real, vital point. It is my opinion that the public is not going to stay interested in, nor will it support an activity which does not at least approximate a real and satisfactory service. When it becomes possible, as it is now, for anyone with a broadcasting set, good, bad or indifferent, to claim space in the ether and to force themselves upon ... listening public, without furni... quality or a program of interest, ... public is going to become disgusted ... as a result interest will fag—for u... circumstances of this kind worth-w... service cannot be given by those ... panies or stations who have the ab... and facility to provide a real ser... because of this interference. This ... real danger, as will probably be re... nized this fall when receiving condit... become better and hundreds of stat... which have been licensed grow more ... tive."

"Naturally, then, you must have a... opinion in regard to a way that r... broadcasting should be developed."

To this, Mr Davis replied, "I have ... have always maintained that, like ... telephone and the telegraph, the serv... is inherently monopolistic in charact... and to get the best results, the best p... grams, the greatest development, the ... tivity should be confined to two or th... companies of established reputation, h... ing the necessary facilities and incent... to develop it; that they should be un... Federal control and be allowed this pr... ilege as long as they have acceptal... service."

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Covering Continent

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"Do you think, even with this pro... gram, that the few companies who woul... be given the broadcasting privileges b... the Government would guarantee perma... nancy of service?"

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"What about the Westinghouse Company?"

"I feel that, in answer to that, I can say for the Westinghouse Company that it will not stop a worthwhile service. We realize the great value of the accruing good-will to the whole electrical industry which has come from radio broadcasting, and we further realize the responsibility we have undertaken, and it is our determination to do our share in the perfecting and developing of this important public service. So you see that there is really no reason why we should stop, as long as there is a service to the public to be fulfilled."

Use this instead of NYC [illegible]

THE BULLETIN: SAN FRANCISCO, MONDAY, NOVEMBER 13, 1922.

PLAN RADIO PLANT FOR EMERYVILLE

Harry Phillips Davis, known as the "Father of Radiophone Broadcasting," in company with Henry D. Shute, vice-president in charge of sales for the Westinghouse Electric and Manufacturing Company, are in San Francisco to inspect the factory site in Emeryville on which the company soon will erect its new plant. They are at the Palace Hotel.

Davis has been credited with the first conception of the Eastern system of large radiophone broadcasting stations, such as those at Pittsburg, Chicago, Newark and Springfield. He also visualized the broadcasting of program on regular schedules, and was the chief promoter of the first large station operated under this system.

The Westinghouse Company is planning to erect one of the largest plants around the bay at its Emeryville site, and will maintain a large service department, much larger warehouse facilities than are now in use, and manufacturing and assembling machinery which will supply employment for several thousand persons.

Davis and Shute, because of their respective positions, are both particularly interested in the new plant. On their return to Pittsburg they will make a report to the general management of their company, after which the work on the plant will commence as soon as possible.

Father of Radio

H. P. Davis, credited with first conceiving large radio broadcasting stations in the East.

RADIO PIONEER OF EAST IN S. F.

Harry Phillips Davis, vice president of the Westinghouse Electric and Manufacturing Company, who is said to be the first one to start radiophone broadcasting on a nightly schedule, is paying San Francisco a visit. He is stopping at the Palace Hotel and is accompanied by Henry D. Shute, vice president in charge of the sales of the company.

H. P. DAVIS

Davis, known as "the father of radio broadcasting" is a pioneer in the electrical industry, having been engaged in it since his college days.

Davis and Shute are here for a few days on an inspection tour which includes the factory site at Emeryville, where their company is soon to erect a new plant.

Davis' idea of radio broadcasting is said to have come from an advertisement which he read in a Pittsburgh newspaper. A department store was advertising that it would broadcast the music from phonograph records, and immediately Da-

Call and Post
San Francisco, Cal.
Nov. 13, 1922.

CONTINUED PROSPERITY PREDICTED

Westinghouse Officials on Visit Here Astonished at Activity on Coast

Arriving in Los Angeles this morning, Vice-President H. D. Shute, and H. P. Davis of the executive staff, Westinghouse Electric and Manufacturing Company, Pittsburg, went immediately to the new Westinghouse Building for a conference with K. E. VanKuran, district manager, and an inspection of the new headquarters of the Westinghouse Company for the Pacific Southwest. Mr. Shute expressed astonishment of the industrial advancement of the Pacific Coast.

"The business outlook for 1923 is exceptionally bright, especially is this so for the Pacific Southwest, where your building program has been at such a rate as to attract international attention," he said.

"Southern California is indeed fortunate to be served by such progressive power generation companies and an electric railway system that is on par with the best in the United States. A great deal of credit is due to the far-seeing officials of these public utilities who have anticipated the mighty growth of the West and kept growth its ever-increasing demands for power, light, heat and transportation."

Mr. Davis, in charge of production and engineering for the Westinghouse interests, stated that he was deeply impressed with the manufacturing possibilities of the Pacific Coast. Mr. Davis, who is popularly known as "The Father of the Radio Broadcasting Station," will speak tonight on the "Future of Radio" from The Times' broadcasting station.

Radio Notables Make Inspection Tour of Westinghouse Studio

Special Concert Given By KDKA as Test For Visitors.

ARE GUESTS OF OFFICIAL

Station KDKA, the pioneer broadcasting station of the world, was visited and inspected yesterday by more radio notables than ever have visited Pittsburgh before. The group included: Major E. H. Armstrong, inventor of the Armstrong regenerative and super-regenerative circuits; E. E. Bucher, manager of sales for the Radio Corporation of America; David Sarnoff, vice president and general manager of the Radio Corporation; A. Van Dyke, Radio Corporation; E. E. Mallory, manager of A. Stine of the General Electric Company, and Dr. A. Goldsmith, director of research for the Radio Corporation.

These men were guests of H. P. Davis, vice president of the Westinghouse Electric Company, himself recognized as the "father of broadcasting." They came to Pittsburgh yesterday to inspect Station KDKA and left for New York last night without making any comment on the future of radio broadcasting.

Other Westinghouse officials who were in conference with the radio generals were S. M. Kintner, manager of the research laboratory; L. W. Chubb, manager of the radio engineering department; Frank Conrad, assistant chief engineer, and others.

The inspection trip of KDKA was held yesterday afternoon. Last night the men were guests of H. P. Davis at his home in 1917 Wallingford street, East End. A special radio concert was broadcast from KDKA in honor of the guests and partly to test the expert-

St. Louis, Mo.
Nov. 24, 1922

PIONEER BROADCASTER PRAISES K S D WORK

Vice-President Davis of Westinghouse Co. Has Little Faith in Commercial Future of Radio.

The radio is essentially a device for amusement and information of the people, and of no great commercial value, such as the transfer of private messages, said H. P. Davis, a vice president of the Westinghouse Electric and Manufacturing Co., and one of the pioneers in broadcasting development in America, when in St. Louis Thursday with H. D. Shute, another vice president of the company, en route to Pittsburg after an inspection trip to the Pacific Coast.

Davis was in charge of the establishment and management of the Westinghouse broadcasting station K D K A, in Pittsburg, the pioneer station in introducing nightly programs.

Enthusiastic comment was made by Davis on the Post-Dispatch station, K S D. He spoke of its power and clarity, saying he often had heard its programs on the loud speaker at the Pittsburg stations. He especially stressed the efficient announcing of station K S D.

Doubts Commercial Future.

"I do not believe there is any commercial future for the radio," Davis said, "except in the manufacture and sale of the necessary instruments. The radio is for the transmission of news, which you want to tell the world about, and not for private and confidential communication. Another difficulty to be met with in personal transmission is the conflict of the wave lengths.

"I realize that several inventors are experimenting with instruments which whith they hope to make radio messages secret. But if such were discovered, it probably would not be long before some other ingenious person found a means by which the secret message could be intercepted.

"No. I believe the radio's future lies in the dispersing of news and the broadcasting of amusement features. It should be a great medium of public enjoyment, especially to persons living in sparsely settled regions, the northwest and the southwest.

Advantage Not Taken by All.

"Many of them have not yet taken advantage of radio, chiefly because no great initiative has been displayed by the dealers of instruments in those places. Any many have purchased poor instruments which have caused people to lost confidence in broadcasting efficiency.

"Much is yet to be accomplished in both broadcasting and receiving. I hardly would dare to prophesy the final attainments which may be expected."

Davis does not believe that as many broadcasting stations as are now in operation will be maintained because of the great cost. However, he thinks such a decrease may be offset by an increasing demand. The colleges and technical institutions are showing much interest in radio development, Davis says, and while none of them has established courses in radio engineering, the subject is

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1923

Davis proposes federal comm'n re: broadcasting as early as 1923

RADIO WOES ENDED BY RADIO FATHER'S BROADCASTING PLAN

H. P. Davis, Vice President, Westinghouse Company Suggests National Commission To Control Broadcasting

With the idea in view of greatly expanding the usefulness of radio telephone broadcasting, H. P. Davis, Vice President of the Westinghouse Electric and Manufacturing Company, nationally known as the "Father of Broadcasting", has suggested a plan for the establishment of a national broadcasting service.

Mr. Davis thinks that a regulating body should be formed to control broadcasting. In an interview, he said: "On the assumption that broadcasting, if not already so, will soon develop into a stable public utility, where the public interest would become paramount, it would appear to us as though the regulating machinery should follow the pattern that has been worked out with other utilities—namely, the establishing of a Public Service Commission which, in the case of radio, would be an Interstate Radio Commission, and, therefore, a Federal Commission created by Presidential appointment.

H. P. DAVIS

"This Commission should be vested with full power and authority to make regulations and enforce same to the full extent of existing laws.

"All requests for licenses should come to and be approved by this body, and when an application for a license is approved and the license given, it should take on the nature of a franchise which should be enjoyed by the owner so long as he gives the service required. This is important, because a large investment is necessary and in order to encourage the making of the instrument and protecting it afterwards the owner so long as he follows the regulations of this Commission will have assurance of a definite tenure in his ownership."

64:21
Box 3
FF 37

Pittsburgh Post
February 15, 1923

The Post Blazes Way In Newspaper Radio Service, Says Davis

Westinghouse Official Sees Great Future For Studio.

LINKS ARTISTS TO AUDIENCES

The pioneering of The Pittsburgh Post in the field of radio broadcasting of news was described by one of the men who made radio, H. P. Davis, vice president of the Westinghouse Electric and Manufacturing company, speaking over the radio last night from the new Pittsburgh Post studio of the KDKA.

Mr. Davis' address was in connection with the elaborate opening program broadcast last night from the new Post studio. Mr. Davis said:

It gives me great pleasure to greet the vast radio audience of KDKA and speak at the opening of this splendid new Pittsburgh Post-Westinghouse studio, and again I am reminded of the great progress made in radio during the past three years since public broadcasting began.

Here I am standing in a beautifully furnished new studio, which contains every latest appointment that we know of to make more perfect broadcasting.

There are heavy carpets on the floor, and the walls are covered with monk cloth to absorb vibration and prevent echoes. An expensive piano stands at my left. In front of me is a microphone of the latest design, which, by the way, is different from any other pick-up or microphone used for broadcasting.

The reception room just outside the studio is a gem, and the walls are decorated with photographs of well-known people, all of whom have spoken to or entertained the radio audience from The Pittsburgh Post studio at one time or another during the past year.

This new studio has cost The Pittsburgh Post thousands of dollars. The officials of The Pittsburgh Post have consulted the best talent available and undertaken considerable research to determine the best kind of studio to install. After finding out what was needed, more difficulties were encountered—but successfully solved—in obtaining the necessary space for building such a large studio.

Yes, The Pittsburgh Post has done its best to please. But to please whom? Why, the radio listener—commonly termed the invisible audience—something that was unknown less than three years ago, when the Westinghouse Electric and Manufacturing Company started KDKA, the first broadcasting station in the world to transmit radio telephone programs on a daily schedule.

This audience has grown and grown from a mere handful of people from that time to thousands of people, scattered over a vast area, at the present time. Every night there are millions listening to radio programs, and of this number a goodly percentage are listening not only to radio programs in their immediate vicinity, but also to programs broadcast from points hundreds of miles away.

It can easily be seen that an audience which can hear a concert in Pittsburgh, New York, Chicago or Cuba, just as fancy wills, in a short time will be satisfied to listen to those stations only which present the best talent available, and broadcast their entertainments in the best way, that organizations like the Westinghouse Electric and Manufacturing Company and others are spending thousands of dollars monthly in research, broadcasting equipment, studios, and other things incidental to broadcasting.

It is for this same reason that the Pittsburgh Post has discarded its old studio and has constructed and equipped this magnificent room.

When speaking of the origin of broadcasting, it must be remembered that the Pittsburgh Post has been a pioneer. Its early work did much to enlist the public interest, and it holds a number of records. For instance, the Pittsburgh Post was the first newspaper in the world to print daily broadcasting schedules. When KDKA was first put into operation and an effort was made to get newspaper publicity for the broadcasting programs, the Pittsburgh Post was the first newspaper to respond and to print this service.

The managing editor tells me that he was only living up to his newspaper's slogan when he printed these schedules—but whatever the reason, the fact remains that it was The Pittsburgh Post which did it first. It is estimated that now two-thirds of the daily newspapers in the United States are printing daily radio programs, and this number—as large as it is—is still growing. Following the inserting of the programs and noting the growth of broadcasting popularity, the management of The Pittsburgh Post planned and studied ways to assist in the KDKA programs.

To that end, a studio was installed on the fourth floor of its building in downtown Pittsburgh, and connected directly by telephone line with KDKA at East Pittsburgh—about 12 miles away. This downtown studio was an ideal place for the broadcasting of prominent people in the theatrical or social world, and greatly enlarged the scope of KDKA's programs.

It enables the broadcasting officials of KDKA to book many artists or speakers who otherwise would not have been heard from the station because the time at their command would not permit a trip to East Pittsburgh and return before the evening's engagement.

The Pittsburgh Post studio proved to be very popular and successful. From this studio such well-known figures in public life as Governor Pinchot, Senator George Wharton Pepper, Congressman M. Clyde Kelly, Otis Skinner, Robert Mantell, David Wark Griffith, Lillian Gish and a host of others, were heard.

The Pittsburgh Post studio thus served as a link between professional artists and others prominent in public life and the radio audience.

Now, because of changes and improvements such as the march of time demands, the original studio was found to be too small, and with characteristic enterprise the Pittsburgh Post discarded it and has provided this wonderful new studio and equipment.

Thus the new studio came to be, and I can assure my hearers tonight that from it there will be broadcast an even larger number of events than has been done in the past. Radio broadcasting is a science in which only the swift can survive the race. In nothing else will the march of time be so ruthless to those who cannot keep up. Hardly a day goes by but what some new appliance is perfected, which immediately puts into the discard some existing apparatus.

However, have no fear that the Pittsburgh Post will find the pace too swift, for it has shown in the past that it

need for studio & understanding requirements

THE PITTSBURGH SUNDAY POST, JUNE 3, 1923.

Calvary Church To Unveil Tablet Tonight, Given By Unseen Radio Congregation

CALVARY EPISCOPAL CHURCH

Fund Contributed by Wireless Service Listeners-In.

Episcopal churches all over the country will make the announcement today that a bronze tablet, probably the most unusual in the world, contributed by and dedicated to the unseen radio congregation of Calvary Church, will be unveiled during the church services tonight.

Rev. Edwin J. Van Etten, pastor, who was the first minister in the world to have his services broadcasted; Bishop Alexander Mann of the Pittsburgh Episcopal diocese; H. P. Davis, "father of radio broadcasting," representing Station KDKA of the Westinghouse Company, which station first broadcast the church services, and other prominent Pittsburghers will take part in the ceremony.

More than 4,700 persons, representing 40 states of the Union, five provinces of Canada, Cuba and Bermuda, London, England, even sailors from ships sailing the Atlantic ocean, contributed to the purchase of the tablet. The contributions came in every form of legal tender—silver dimes, stamps, nickles, pennies and checks. There were a surprising number of Canadian dimes. A worker in the southern cotton mill sent Dr. Van Etten two cotton socks with a nickel in each toe. A sailor from a boat on the Atlantic sent the minister 120 pennies he had won playing penny ante.

Response Instantaneous.

These contributions came as a result of Rev. Van Etten's idea that his radio congregation, to which he had been preaching since January 2, 1921, might like to contribute to some sort of memorial. Accordingly, during the reading of his regular church announcements, Dr. Van Etten addressed, directly, his unseen hearers and told them of a plan to have smal contributions from such of them as might like to participate. The sum obtained from the contributions was to be used for a memorial dedicated to them.

Responses to this idea were almost instantaneous. An hour after the announcement was broadcast contributions were received from residents of Pittsburgh. People living in the district even walked to the minister's home a few minutes after they had heard his voice by radio and left their contributions, even as he was preaching by radio.

The first announcement was sent out into the ether one Sunday last February and contributions have been coming into Calvary Church ever since. The amount obtained, all of it in small contributions has been enough to purchase a beautiful bronze memorial tablet.

Was Pioneer S[illegible]

The tablet is 30x24 inches in[illegible] it is a relief map of the territory where Calvary Church has been heard and this includes all of the United States and a considerable surrounding territory in Canada, Mexico and the oceans. The map is criss-crossed by jagged lines, indicative of radio waves, emanating from the radio station at East Pittsburgh, where the church services go out into the air. On the tablet is the following inscription which undoubtedly will be read with great interest in the years to come: "January 2, 1921, from Calvary Church, a church service was broadcast by radio telephone by the Westinghouse Electric and Manufacturing Company. This tablet was placed in 1923 by the unseen congregation."

In those early days of radio, as indicated by the date on the tablet, it took a pioneer in every sense of the word to agree to have the church services broadcast by radio telephone. It took a pioneer churchman and a pioneer station to do it. Station KDKA was the broadcasting pioneer, Calvary Church was the religious pioneer and Rev. Van Etten the ministerial pioneer. All these factors in the first church broadcasting are now seeing the day when there are many, many churches broadcasting services and hundreds of radio telephone stations to broadcast them. In 1921 there were perhaps five or six stations and only one church.

Rev. Van Etten, who has preached nearly every Sunday to his radio congregation since his first sermon in 1921, is of the opinion that the possibilities for the clergy in doing good work are endless.

Boon to Church.

"Mission churches without [illegible] may have religious services," [illegible] Etten points out. "Hospita[illegible] been equipped. Our paris[illegible] [illegible]ganized [illegible] by wireles[illegible] several receiving sets. The [illegible] home hears our services throu[illegible] of them. Two invalids of the pa[illegible] enjoying the use of two other [illegible] side our own parish family gr[illegible] over the country gather around the library table for a new manner of Sunday evening worship. Thousands and thousands of people can have church services now who never have had the opportunity before. I feel that radio is a wonderful boon to the work of the church. Like the men who sent the first cable message across the ocean we should exclaim reverently of radio 'What Hath God Wrought.'"

The entire services, including the dedicatory address as well as the Calvary Church services, will be broadcast by Station KDKA.

News-Tribune,
Wilmerding, Pa.
April 5, 1923

RADIO WOES WOULD BE ENDED BY PLAN OF DAVIS

Father of Radio Broadcasting Suggests Formation of National Commission

With the idea in view of greatly expanding the usefulness of radio telephone broadcasting, H. P. Davis, vice president of the Westinghouse Electric & Manufacturing Company, nationally known as the "Father of Broadcasting", has suggested a plan for the establishment of a national broadcasting service.

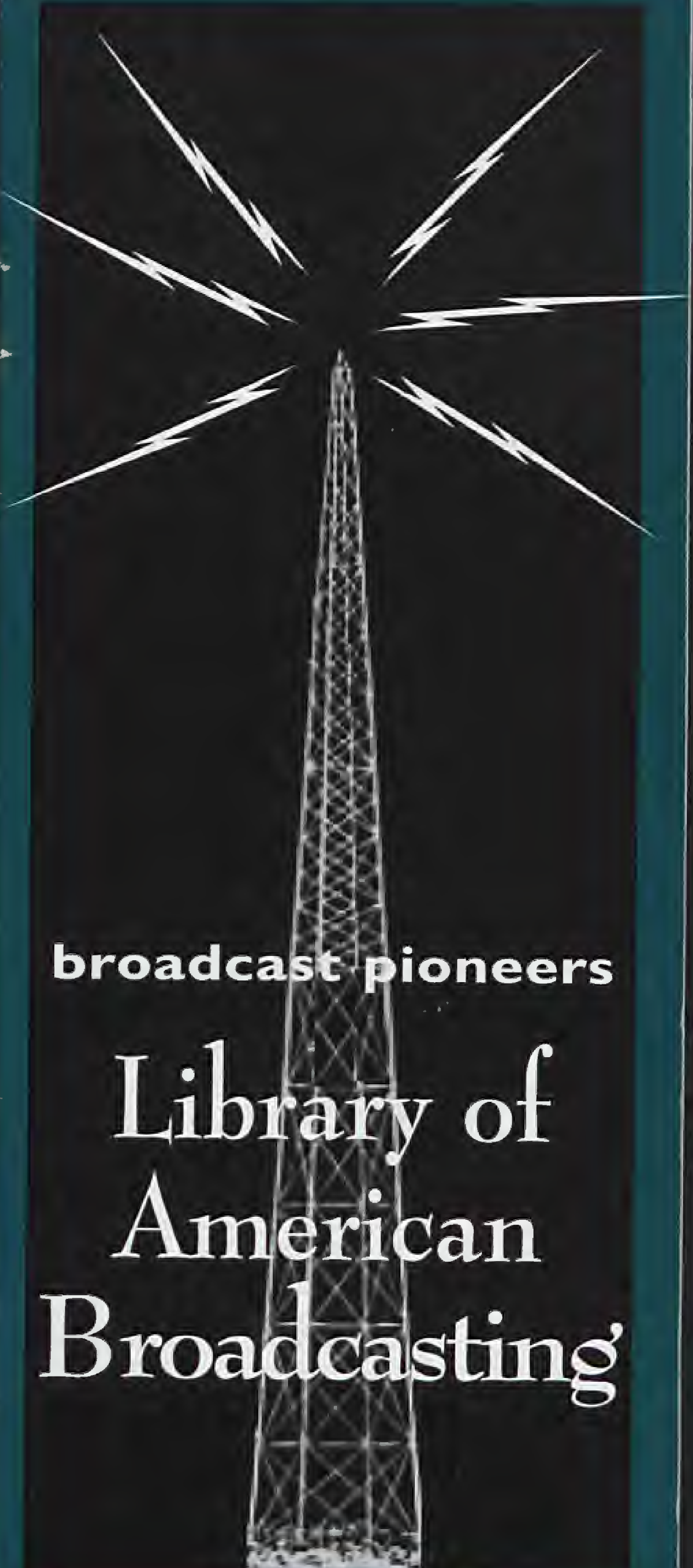
Mr. Davis thinks that a regulating body should be formed to control broadcasting. In an interview, he said: "On the assumption that broadcasting, if not already so, will soon develop into a stable public utility, where the public interest would become paramount, it would appear to

H. P. Davis

us as though the regulating machinery should follow the pattern that has been worked out with other utilities—namely, the establishing of a Public Service Commission which, in the case of radio, would be an Interstate Radio Commission, and, therefore, a Federal Commission created by Presidential appointment.

"This Commission should be vested with full power and authority to make regulations and enforce same to the full extent of existing laws.

"All requests for licenses should come to and be approved by this body, and when an application for a license is approved and the license given, it should take on the nature of a franchise which should be enjoyed by the owner so long as he gives the service required. This is important, because a large investment is necessary and in order to encourage the making of the instrument and protecting it afterwards the owner so long as he follows the regulations of this Commission will have assurance of a definite tenure in his ownership."



broadcast pioneers

Library of American Broadcasting

The Broadcast Pioneers Library is pleased to announce that we have changed our name to the Broadcast Pioneers Library of American Broadcasting.

The Library's goals remain the same: we are committed to preserving the work of past, present, and future broadcasters, while providing valuable research services for people working in the industry today.

The Broadcast Pioneers Library of American Broadcasting is a wide-ranging collection of audio/video recordings, books, pamphlets, periodicals, personal collections, photographs, scripts, and vertical files devoted exclusively to the history of broadcasting.

The mission of the Library is preservation and access. The pace of history seems to quicken with each passing year. Material a scant twenty years old represents a bygone age in the rapidly changing world of broadcast communication. New technology and new formats replace the old, and with the future constantly becoming the present, there seems little time available to dwell on what is past.

Our staff makes the time. This Library strives to serve as part of a "collective memory" for an industry whose very nature is ephemeral. Much of the history of the broadcasting industry has been preserved, but much work remains to be done. The safekeeping of the documentary evidence of the most influential cultural force of the twentieth century is a job worth doing, and at the Broadcast Pioneers Library of American Broadcasting there are trained and dedicated individuals who wish to help in that task.

books, periodicals, pamphlets

The Library's extensive book collection numbers over 3000 volumes that include histories of the industry and individual stations, biographies of broadcasting notables, engineering texts, and classic children's series like the *Radio Boys*. Of particular interest are books published in the 1920s and 1930s that trace the evolution of broadcasting from its earliest days.

MODERN TELEVISION & RADIO, JANUARY 1949

Over 260 periodical titles, including many that are difficult to find, are available at the Library. Among these are runs of *Broadcast Weekly* (1930-1936), the *Heinl Radio Business Letter* (1930-1950), *Radio and Television News* (1919-1958), *Radio Guide* (1931-1943), *Ross Reports/Television Index* (1949-present), *Sponsor* (1946-1964), and *Wireless Age* (1913-1925).

RED CHANNELS, 1950

The pamphlet holdings are quite extensive with over 3000 titles, ranging from 1920s vintage Bell Laboratories radio engineering bulletins to promotional materials and internal studies generated by the broadcast networks. The Library also has an impressive array of government documents, including the Navigation Bureau List of Radio Stations (1913-1927), FRC/FCC decisions, and Congressional reports and hearings.

photographs

BONANZA, NBC (1959-1971)

The Library of American Broadcasting's photograph collection contains over 25,000 photos, slides, and negatives dating from the 1920s to the present. This component is one of the most historically significant elements of the Library, for it offers the researcher a pictorial history of the evolution of broadcasting in the United States. The images illustrate a wide variety of subjects, including the people in broadcasting; radio and television programs; the studios, facilities and community activities of local stations; and other organizations related to broadcasting.

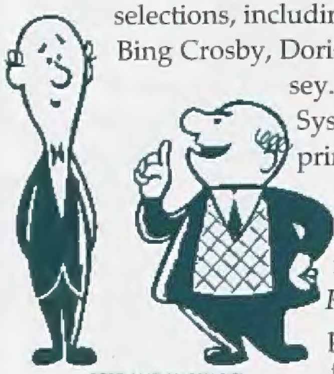
Photographs are a particularly important tool in the study of the history of radio broadcasting. Since radio is a medium of sounds, not images, photographs provide a necessary visual resource. However, these images illustrate more than just the history of broadcasting; they also document many of the historical events that have shaped twentieth century American culture.

GRAHAM MCNAMEE INTERVIEWS BABE RUTH

audio collections

The Library's audio holdings chronicle a wide array of broadcasting activity, including advertising, programming, newsgathering, and the personal recollections of hundreds of broadcasters. The largest element of this component is the Radio Advertising Bureau Collection, over 2000 discs containing radio commercials for products representing the entire scope of American industry in the 1950s and 1960s. Illustrating the work of dozens of advertising agencies, the discs are sorted into product categories ranging from Airlines to Wine. Items of special interest include commercials written by and featuring Stan Freberg and some Piel's Beer advertisements with comedians Bob and Ray.

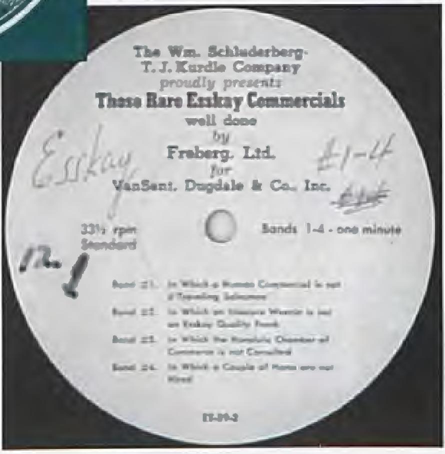
The "Standard Program Library" Subscription Service consists of 450 discs sent to subscribing radio stations regularly as supplemental programming in the 1940s and 1950s. The emphasis is on musical selections, including performances from Bing Crosby, Doris Day, and Tommy Dorsey. The World Broadcasting System collection consists primarily of 225 transcribed musical programs dating from the early 1930s, including a run of the *Rubinoff's Musical Moments* program featuring the famous violinist.


BERT AND HARRY PIEL

Other interesting recorded discs include 56 World War II era V-Discs, ten BBC glass discs featuring Glenn Miller and Dinah Shore from August 1944, a complete set of original pressings of early transatlantic broadcasts from 1925 and 1926, and "NBC Stands By," a D-Day coverage test/ preview recording from May 1944. The collection includes several examples of syndicated programming as well, including episodes of *The Cliff 'Ukulele Ike' Edwards Show*, *Joseph Cotton & Co.*, *Columbia Workshop*, and a special 3 disc set of the *Jack Frost Sugar* program, a musical review series from 1934.

LOWELL THOMAS

The Library maintains the Westinghouse News Collection (1958-1982), 2300 audiotape reels consisting mainly of raw feeds from its Washington bureau with particular emphasis on Vietnam War coverage and the Watergate imbroglio. The Library also has nearly 1000 oral histories, interviews, and speeches (most of which are transcribed) by such notables as Norman Corwin, Edgar Bergen, Niles Trammell, Frank E. Mullen, Rosel H. Hyde, and Leonard H. Goldenson.



scripts

The Library of American Broadcasting has over 1300 scripts from various radio and television programs, including *The Stebbins Boys* (1931-1932), *Sky King* (1947-1950), *Ford Television Theater* (1948-1949), and a complete, hand-annotated run of *Your Show of Shows* (1950-1954). The *Wisdom* collection (1952-1959) chronicles every aspect of this NBC public affairs program, including scripts, photographs, promotions, and background research material.

DUFFY'S TAVERN, CBS AND NBC (1941-1951)

vertical files

The Library has extensive clipping files on a vast array of broadcasting topics, including biographical, subject, and genre files. Of particular interest are materials from individual stations around the United States. There are over one million items in this component.

NBC RATE CARD, JULY, 1935

VOX POP COLLECTION

Vox Pop (1932-1948) was the first "man on the street" interview show. The program's host was also its creator, a salesman named Parks Johnson. After a three year run on a Houston radio

RADIO CITY BROADCAST, OCTOBER 1, 1938

station, the program went national from New York on NBC in July 1935.

Vox Pop hit the road in 1939, eventually broadcasting from practically every state in the Union. In 1940, at the request of the War Department, Johnson and his crew began 230 consecutive weeks of programs originating from military installations. From 1940 to 1946 the show never went on hiatus, traveling the country in an effort to boost troop and home front morale.


VOX POP IN SAN ANTONIO, APRIL 22, 1947

The *Vox Pop* collection includes contracts, letters, photographs, scrapbooks, artifacts, and thousands of questions used on the show as well as transcription discs of the program.

THE HELEN J. SIOUSSAT COLLECTION

Helen J. Sioussat was the director of the Talks Department at CBS from 1937 to 1958, and was responsible for arranging the network's public affairs programming. In this capacity she scheduled broadcasts by an incredible array of speakers on topics of current interest as well as formulating policy for all CBS public service programs. In 1941 she created, produced, and hosted one of the first roundtable discussion programs on television, *Table Talk with Helen Sioussat,* and in 1945 led the CBS delegation to the San Francisco Conference that heralded the formation of the United Nations. Ms. Sioussat was promoted to the Executive Offices of CBS in Washington in 1958, where she served primarily as a liaison between the network, Congress, and federal agencies until her retirement in 1962.

HELEN SIOUSSAT WITH VICE PRESIDENT RICHARD NIXON

The Sioussat collection contains a range of material from every aspect of her remarkable career. Included are scripts, memoranda, nearly 150 broadcast-related books, press releases, scrapbooks, a complete run of *Talks* magazine, hundreds of photographs (most of them autographed), and volumes of correspondence from a host of renowned individuals, particularly Richard Nixon, whose letters to her date from 1951 to 1992.

SIOUSSAT AND HERBERT HOOVER

THE EDWARD M. KIRBY COLLECTION

Colonel Edward M. Kirby began his career as a reporter for the *Baltimore Sun* before moving into public relations. He served as chief of the radio branch of the War Department during WWII, creating *Command Performance* and *The Army Hour*, and was later appointed Public Relations Director of the USO.

EDWARD M. KIRBY AND DAVID SARNOFF

RADIO EXECUTIVES IN EUROPE, 1945

His book, *Star Spangled Radio*, documents his experiences in wartime broadcasting.

The Kirby collection includes photographs from the war years, scripts, correspondence, awards, and two scrapbooks documenting *The Army Hour* on NBC.

THE ALOIS HAVRILLA COLLECTION

An announcer for Jack Benny, Fred Waring, and Paul Whiteman in addition to dozens of other programs, Mr. Havrilla's material includes photographs, scripts, correspondence, scrapbooks, and a 270-page unpublished biography, "Radio's Golden Age of Adventure," written by his wife.

ALOIS HAVRILLA, NBC ANNOUNCER, C. 1930

THE WILLIAM HEDGES COLLECTION

Mr. Hedges, former NBC executive and president of the National Association of Broadcasters, collected some 13,000 items in 540 subject categories for the Broadcast Pioneers History Project (1964-1971) that formed the core collection of the Library. Included are primary and secondary sources on nearly every aspect of broadcast history from 1915 to 1971.

WLS, CHICAGO, HEDGES COLLECTION

THE EDYTHE MESERAND COLLECTION

Ms. Meserand donated items from her tenure as first president of the American Women in Radio and Television, her career as a documentary producer, and other material relating to women in broadcasting.

ELECTION NIGHT, 1944

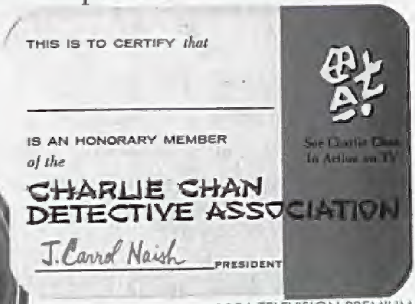
scrapbooks

The Library has more than one hundred scrapbooks in its holdings, documenting the careers and concerns of people as varied as RCA chief engineer Dr. Alfred N. Goldsmith, James M. Gaines, the press agent for the *Major Bowes Original Amateur Hour*, radio actress Mildred Funnel, and Herbert C. Ovendon's journal of his work at the Otter Cliff Naval Radio facility during World War I.

NBC TELEVISION PRODUCTION, 1936: ARTHUR HUNGERFORD SCRAPBOOKS

artifacts

A small but interesting portion of the Library's holdings consist of items that might best be described as "museum pieces," including commemorative plaques and awards, radio premiums, several vintage radio microphones and receivers, press badges and political buttons.



THIS IS TO CERTIFY *that*

IS AN HONORARY MEMBER *of the*

CHARLIE CHAN DETECTIVE ASSOCIATION

J. Carrol Naish PRESIDENT

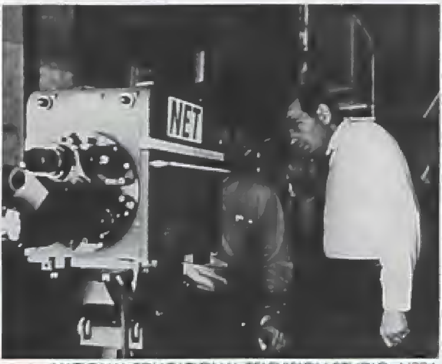
See Charlie Chan In Action on TV

1956 TELEVISION PREMIUM

RADIO CITY COMMEMORATIVE, C. 1933

Some of the more unique items include a life size bust of Jimmy Durante, an 1885 letter from Thomas Edison, a framed four-panel *Blondie* strip from the 1940s drawn and autographed by the comic's creator, Chic Young, and a baton used by maestro Arturo Toscanini while directing the NBC Symphony Orchestra.

The Broadcast Pioneers Library originated in 1964 with the creation of the Broadcast Pioneers History Project. As proposed by NBC executive William S. Hedges, the Broadcast Pioneers organization collected materials for the Library well in advance of its capitalization in 1971; that year, the Library opened its doors using space donated by the National Association of Broadcasters in downtown Washington, D.C. In October 1994, the collection moved to the University of Maryland at College Park, where it joined the National Public Broadcasting Archives as part of the University's growing media-related holdings.



NATIONAL EDUCATIONAL TELEVISION STUDIO, NPBA

The Library of American Broadcasting is located on the ground floor of Hornbake Library on the University of Maryland campus. The Library is open from 9am to 5pm, Monday-Friday. Telephone and e-mail research requests are also welcomed.

Library of American Broadcasting
Hornbake Library
University of Maryland
College Park, MD 20742-7011
(301) 405-9160
bp50@umail.umd.edu

http://www.itd.umd.edu/UMS/UMCP/BPL/bplintro.html

While the Broadcast Pioneers Library of American Broadcasting actively seeks donations in all eras and aspects of broadcast history, we are currently pursuing material focusing on radio and television from the Fifties and Sixties in order to better chronicle this crucial period of broadcast history.

All contributions to the Library are tax deductible.

The Library of American Broadcasting has provided source material for an impressive array of patrons, including:

- ABC News
- Arts and Entertainment Productions
- Cronkite/Ward & Company
- The Daytime Emmy Awards
- HBO
- National Geographic Television
- National Public Radio
- Walt Disney Television
- The motion picture *Quiz Show*
- The PBS documentary *Empire of the Air*
- Susan J. Douglas, *Inventing American Broadcasting, 1899-1922*
- Michele Hilmes, *Hollywood and Broadcasting: From Radio to Cable*
- B. Eric Rhoads, *Blast From the Past: A Pictorial History of Radio's First 75 Years*
- Michael Ritchie, *Please Stand By*

In addition, the Library has answered innumerable inquiries from people in the broadcasting industry.

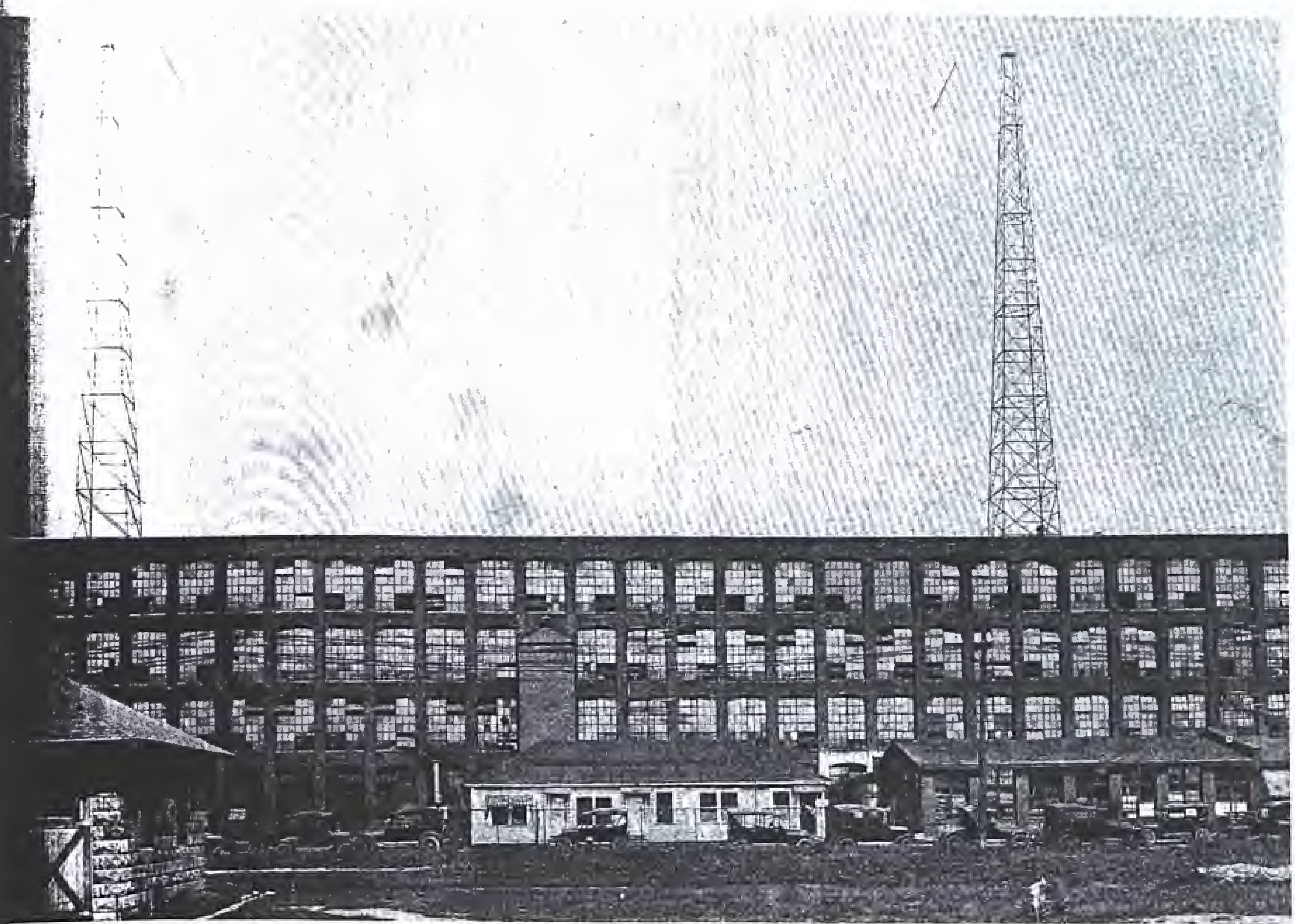
Library of American Broadcasting
Hornbake Library
University of Maryland
College Park, MD 20742-7011


RADIO SPECTRUM
DISTRIBUTION OF CHANNELS
BROADCASTING
Clear Channel
Regional
Local
Canadian Shared (Regional)
Canadian Shared (Local)
Fixed Point to Point
Maritime Mobile
Aviation
Government
Emergency
Agriculture
Shared with foreign coastal stations
Portable (including geophysical)
Special Mobile except portable
Temporary Mobile
Emergency Fire (Marine)
Emergency Police
OTHER REGIONS
U.S. stations must not interfere
Priority as follows:
C-Canada Cu-Cuba
NF-Newfoundland
ON-Other Nations
Channels shared between services, or between the U.S. and other regions are appropriately marked
10Kc. to 97.70Kc.
98.45Kc. to 315Kc.
316Kc. to 1500Kc.
1504Kc. to 2296Kc.
2302Kc. to 3500Kc.
3508Kc. to 4915Kc.
4925Kc. to 7295Kc.
7310Kc. to 10,000Kc.
11,020Kc. to 17,100Kc.
17140Kc. and above
General Experimental
Exp. Visual
Broadcasting
Exp. Relay Broadcasting
Amateur
Engineering Division
Federal Radio Commission

Radioana by George H.
Clark at
Archives Ctr Nat'l Museum
of Am History. Behring Ctr,
Smithsonian

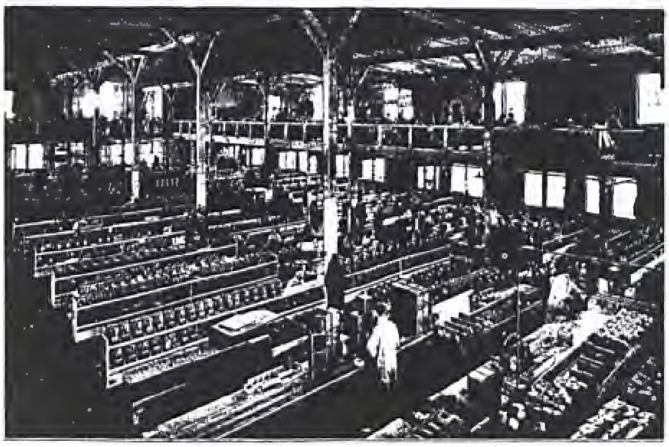
+ copies

Radio Manufacturers of the 1920s
Alan Douglas



When the Radio Corporation realized that it could operate without the Fessenden and Armstrong ents, Westinghouse was brought into the "radio up" fold in June, 1921. It contracted to produce % of the radio apparatus sold by the Radio rporation while General Electric would make 60 cent. If orders for one period didn't work out to s ratio, orders in subsequent periods would be ad-ted to compensate. Further, if either company ldn't meet its quota, it could ask Wireless Spe-lty to manufacture for it with WSA's share included the 40% or 60%, or not included, by mutual con-t.

Even after joining the radio group, however, West-house continued to advertise its own receivers and as its own sales agent until February 1, 1922. arly, the Radio Corporation was not prepared for, interested in, the broadcast-receiver market ore that date. In fact, the boom in late 1921 and ly 1922 caught these companies by surprise in other respect: it threatened to make their carefully gotiated contracts worthless. Westinghouse sold s of thousands of RC models during the boom, to say nothing of Aeriola Juniors and Seniors, while General Electric had nothing to offer but components and tubes. Obviously, something had to be done to balance the accounts; the Radio Corporation would have to sell mainly GE products the following year while Westinghouse marked time.



Completing Sets at the Westinghouse Electric and Manufacturing Company's Radio Works, Springfield, Massachusetts

Eric Wenaas

the phone plug into the appropriate phone jack. These jacks simplified the control panel by eliminating the need for separate filament switches for detector and amplifier tubes. With this system, inserting the phone plug not only connected the headset to the appropriate circuit, but also provided power to the appropriate filaments all in one operation, thus saving both battery and tube life.

KDKA Ushers in the Broadcast Era

While the Westinghouse broadcast was declared a complete success, it was not the first broadcast, nor did it receive the same amount of attention as previous broadcasts, most notably De Forest's November 1916 election night broadcast and subsequent concerts and news reports over 2XG,[24] the Bureau of Standards broadcasts and concerts throughout 1919 on station WWV,[25] and Madam Nellie Melba's June 15, 1920 "world" concert over the Marconi station at Chelmsford, England.[26] The Westinghouse inaugural broadcast by comparison received scant notice in the press, amounting to a four-line article appearing in the November 6, 1920 issue of the *Electrical Review*.[27] So, what was different about this broadcast, and why did it usher in the broadcast era where previous and more notable broadcasts did not?

What set Westinghouse and KDKA apart from the rest was 1) Westinghouse's commitment to regularly scheduled broadcasting that continued beyond the inaugural event, 2) the development of interesting program content that fascinated listeners, and 3) the development and marketing of low-cost, easy-to-operate receivers that enabled the general public to listen. Within several days after the inaugural broadcast, Westinghouse was operating every day–albeit on a very limited basis–with the call sign KDKA. Within a few weeks transmitter power was boosted to 500 watts, and by the end of 1921 Westinghouse had opened three additional stations including WJZ in Newark, N.J., WBZ in East Springfield, Mass., and KYW in Chicago, Ill.[28]

Westinghouse also dedicated resources to develop and improve programming. Harold W. Arlin was selected as the first radio announcer for KDKA in early 1921, and Thomas H. Cowan was selected as the first announcer for WJZ later that year.[29] Initially, they both relied on playing phonograph records, reading newspaper headlines and community bulletins, recapping sports scores, giving weather forecasts, explaining Arlington time signals, and so forth. Cowan is credited with developing a general program mix which added orchestral music, humorous speeches, special programs for women and also for children, religious programming including church services, performers and singers including stars from Broadway and vaudeville, and opera.

While a great boom in broadcast radio lay ahead, it did not come immediately after the inaugural broadcast, or even in the first year thereafter, for that matter. No new broadcast stations were licensed in the first six months following the KDKA broadcast, and a total of only eight broadcast stations were licensed in the following six month period ending in November, 1921, three of them owned by Westinghouse.[30] However, on December 1, 1921 the Department of Commerce assigned 360 and 485 meter wavelengths specifically for broadcasting under the category of "Limited Land Stations," and in that month alone, 20 stations were licensed with frequencies reserved for broadcast stations. By the end of March of 1922, there were 138 such stations licensed, and by March 1, of 1923 there were 556 such stations. The year 1922 would usher in the great broadcast radio craze.

Westinghouse Implements a Bold Strategy to Supply Broadcast Receivers

The third element setting Westinghouse apart from others was their plan to provide a line of affordable broadcast receivers to allow even the most technically unsophisticated to "listen in." Westinghouse was able to meet the demand for broadcast receivers immediately following the KDKA inaugural broadcast by commercializing and marketing the RA/DA receiver (later combined to form the RC receiver) originally designed for point-to-point communication—not withstanding an IEEE paper published in December 1922 where Conrad described it as being principally suited for broadcast radio:

> *"...[one] of those types of receiving apparatus which are adapted for reception over a limited range of wave length, and which depend for their operation on such manipulation as can be successfully carried out by persons unfamiliar with the technique of radio apparatus. Their principal field of application is the reception of broadcast radio telephone signals."* [31]

Serendipitously, Conrad's three major design goals for point-to-point communication between Westinghouse facilities were also optimum for broadcast radio reception by a technically unsophisticated public:

- simple adjustments that do not interact with each other,
- selectivity such that the signal strength from another equal or possibly more powerful station separated by 10-KHz should be below audibility, and
- sensitivity limited by static interference, fading, etc., rather than by actual lack of response.

However, Westinghouse must have realized that the RC was too expensive for the average broadcast radio listener in the long run, so in order to meet the demands of a broader range of listeners with varying requirements and means, Westinghouse cleverly set about to design a series of receivers ranging from a simple inexpensive crystal set to a one-tube regenerative receiver with a companion two-stage amplifier, which when put together, was similar in design, if not performance, to the higher-priced RC.

Westinghouse designed and produced four different models in an 18 month period from June 1921 to January 1923, each mounted in a rectangular box with a similar appearance and dimensions. A fifth model incorporating a phonograph to be used with the Aeriola radio line was under development, but it was dropped after the RCA/Westinghouse agreements were signed in June 1921.[32] The four models were the Aeriola Jr. crystal set, the one-tube Aeriola Sr. regenerative receiver, the two-tube AC audio amplifier, and the two-tube Radiola RS regenerative receiver with one stage of audio amplification. These models provided the public with an inexpensive crystal set and three more-sensitive regenerative receiver combinations with one, two and three tubes. Pertinent characteristics of these four models are compared with each other and with characteristics of the RA/DA/RC technology in Table 3-1.

The Aeriola Jr. crystal set at $25 ($32.50 with antenna) was certainly less expensive than the RA tuner using the DB detector at $85.50, and was priced competitively with other crystal sets on the market at the same time such as the De Forest Everyman, which also sold for $25 comparably equipped. The range of this and most other crystal sets for reliable reception was on the order of 10-25 miles, although stations from much greater ranges could be heard at certain times of the night and under favorable atmospheric circumstances. The Aeriola Sr. regenerative receiver was designed for those who wanted reception from greater distances (nominally 100-150 miles), but like the crystal set, this receiver was unable to actuate a loudspeaker. The AC amplifier was introduced for use with the Aeriola Sr. to permit the actuation of loudspeakers and/or to extend the range of reception. The combined price of $143 for the two units compared favorably to the three-tube RC with a price tag of $213. The RS receiver augmented the regenerative tuning circuits of the Aeriola Sr. with one stage of audio amplification, resulting in a set which was described in a Westinghouse brochure as being designed "*primarily for those who feel that the cost of a receiver embodying two stages of amplification is beyond their means, yet wish to hear their local stations on a loud speaker.*"

The receivers introduced in 1920 and 1921 are described in the following paragraphs of this chapter—including the RC and variants, the Aeriola Jr., the

Table 3-1. The line of affordable receivers originally envisioned by Westinghouse

	Model	Apparatus Type	Tubes	Nominal Range[a]	List Price	Date Introduced
RC Technology	RC Receiver (Radiola RC)[c]	Regenerative Receiver	3	500 miles	$125 without tubes	December 1920
RC Technology	*RA Receiver (with DB detector)*	*Crystal Receiver*	*None*	*See text*	*$70*	*August 1921*
RC Technology	RA Tuner	Tuner	None	N/A	$65	December 1920
RC Technology	DA Detector-Amplifier	Detector plus two-stage audio amplifier	3	N/A	$65 without tubes	December 1920
Westinghouse Broadcast Receiver Strategy[b]	Aeriola Jr. (RE) (Radiola Junior)[c]	Crystal Receiver	None	25 miles	$25[d]	July 1921
Westinghouse Broadcast Receiver Strategy[b]	Aeriola Sr. (RF); (Radiola Senior)[c]	Regenerative Receiver	1	100-150 miles	$75[e]	December 1921
Westinghouse Broadcast Receiver Strategy[b]	Phonograph for Aeriola radio line	Development discontinued after RCA/Westinghouse agreement signed in June 1921				
Westinghouse Broadcast Receiver Strategy[b]	Aeriola Sr. Amplifier (AC); (Radiola AC)[c]	Two-Stage Audio Amplifier	2	N/A	$68	August 1922
Westinghouse Broadcast Receiver Strategy[b]	Radiola RS	Regenerative Receiver	2	See text	$85	January 1923

[a] Nominal ranges as suggested in Andre Catalog R-2-A are listed here to indicate relative sensitivity
[b] The apparatus in shaded rows were introduced by RCA after the Westinghouse-RCA agreements
[c] Name changed by RCA in late 1922 to incorporate the new Radiola trade name; no change in design
[d] Price included earphones
[e] The price advertised by Westinghouse included headphones, antenna, and tubes, and batteries

Aeriola Sr. and the Radiola Senior. The AC amplifier and RS receiver listed in the shaded portion of Table 3-1 were introduced in 1922 and 1923 respectively, and therefore are addressed in subsequent chapters according to the year in which they were introduced.

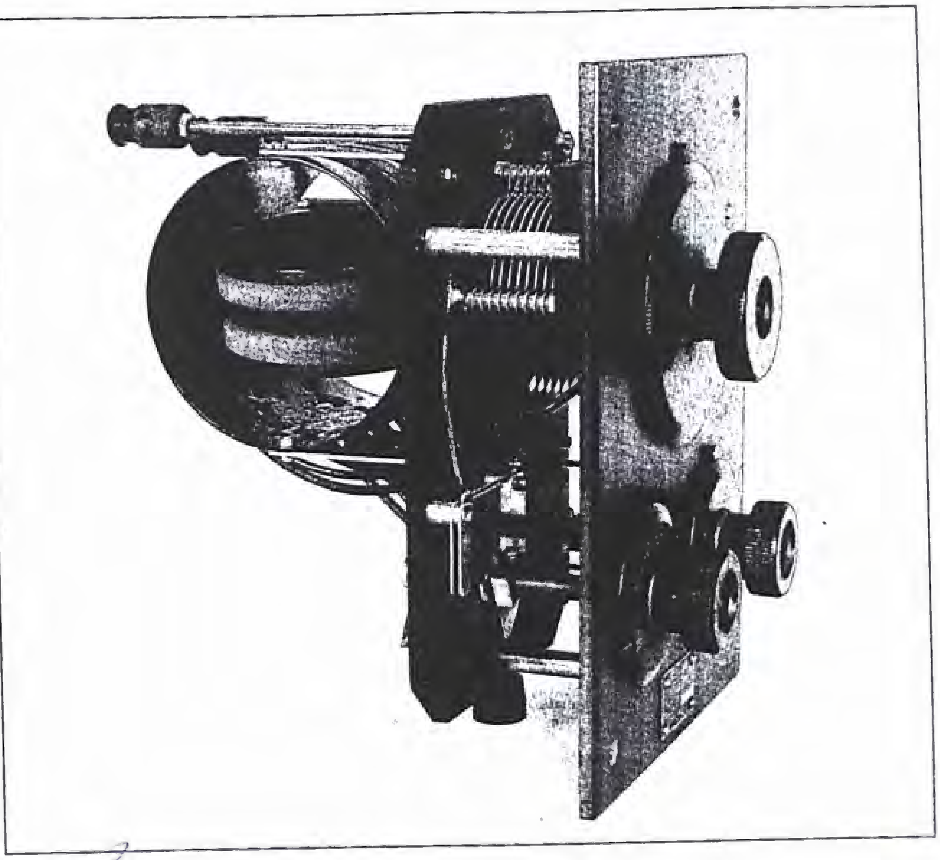
Westinghouse Markets the RA, DA and RC Receiver

The RA was a single-circuit tuner unit, the DA was a detector-amplifier unit with two stages of audio amplification, and the RC was a regenerative receiver with the RA and DA units combined in a single cabinet. It was common practice at the time to house the tuner and detector/amplifier in separate cabinets for several reasons. First, the tuner could be used separately as a less-expensive crystal set in conjunction with an external crystal detector, and second, the separate units by themselves did not constitute a regenerative receiver and therefore did not infringe on the regeneration patient awarded to Edwin H. Armstrong on October 6, 1914. Westinghouse acquired rights to this patent on November 4, 1920, and therefore was able to manufacture the RC as a complete regenerative receiver in a single package without fear of infringement litigation.

According to historian George Clark, the first RC receiver was sold to W. L. Chubb, a Westinghouse employee, for use at a gathering to hear the election returns transmitted on the first KDKA broadcast on November 2, 1920.[33] This receiver was undoubtedly one of a number of engineering models made for the first broadcast because the first production models made in Pittsburgh were dated 11-30-20, clearly after the first KDKA broadcast in early November.

Many of the early RA and DA units manufactured in Pittsburgh were housed in separate cabinets and sold separately as RA tuners and DA detector-amplifiers.

The interior of the RA was essentially unchanged throughout its life cycle except for some very minor rerouting of wires.



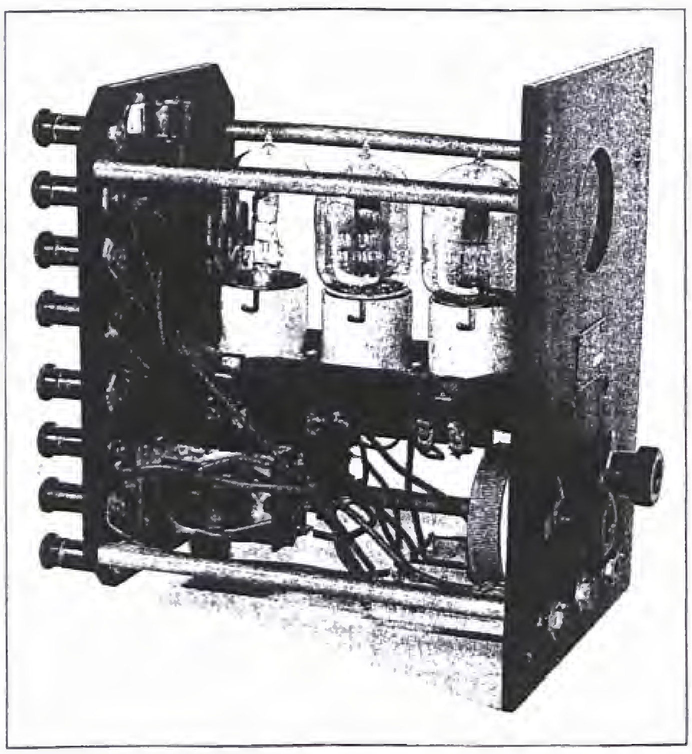
Other *Radioana Collection* documents indicate, the early production models were first advertised and sold in the Pittsburgh area—it was said that the Horne Department Store was one of the first to sell this receiver. It is not known exactly when the first production units were sold, but it could not have been earlier than the November date on the first production units, or later than April 1921, the month they first appeared in national advertisements.[34]

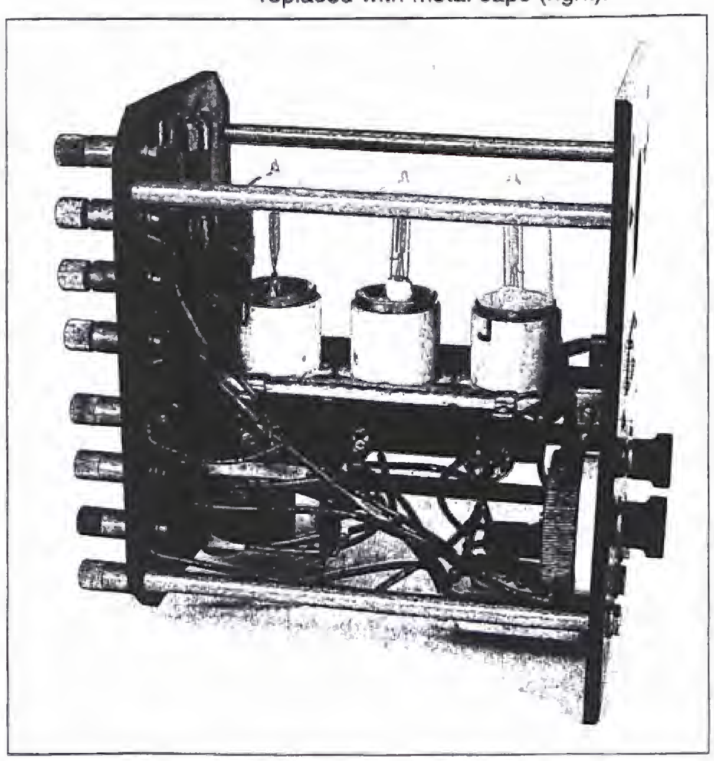
Most of the late RA and DA units manufactured in East Springfield were combined into one cabinet and sold as RC receivers.

According to an interview with Westinghouse engineer Donald G. Little on March 27, 1951, about 1500 RA and DA units were manufactured at the Shadyside plant in Pittsburgh and were put on the market about Christmas 1920.[35] From serial number evidence presented later, both individual RA and DA units and RC's were manufactured during the first production run.

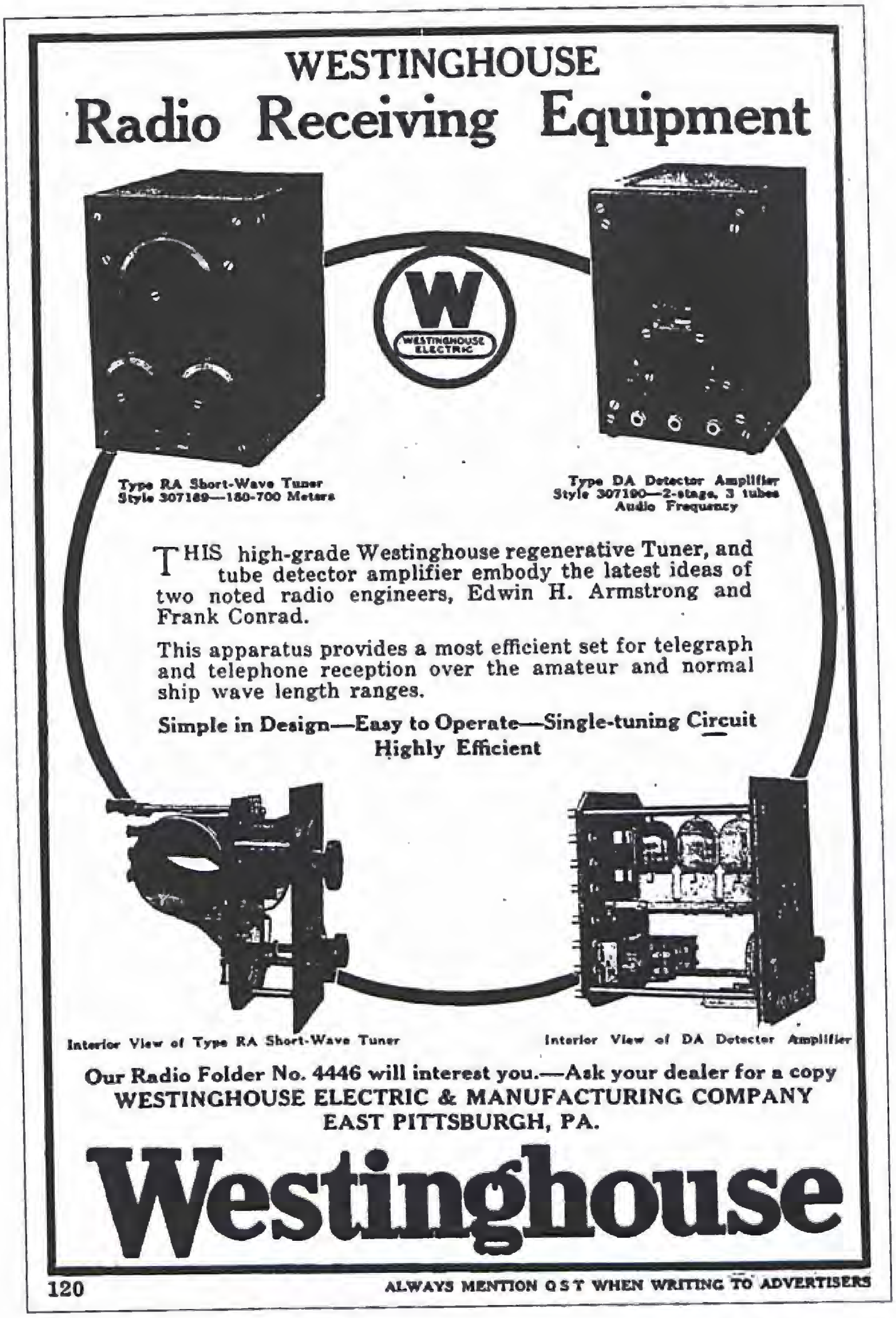
A companion DB detector designed to convert the RA tuner into the RA crystal receiver was introduced to the public in the August 1921 issue of *The Wireless Age* for $5. Retail prices for the RA/DA/RC units were first advertised

The tube sockets on the early DA chassis such as the one shown here with Moorhead tubes were positioned such that the key slots all faced the same direction, and the binding post caps on the rear were fiber (left). The center socket on later DA chassis such as the one shown here with WD-12 tubes was rotated—presumably to avoid some type of unwanted interaction, and the fiber binding-post caps were replaced with metal caps (right).



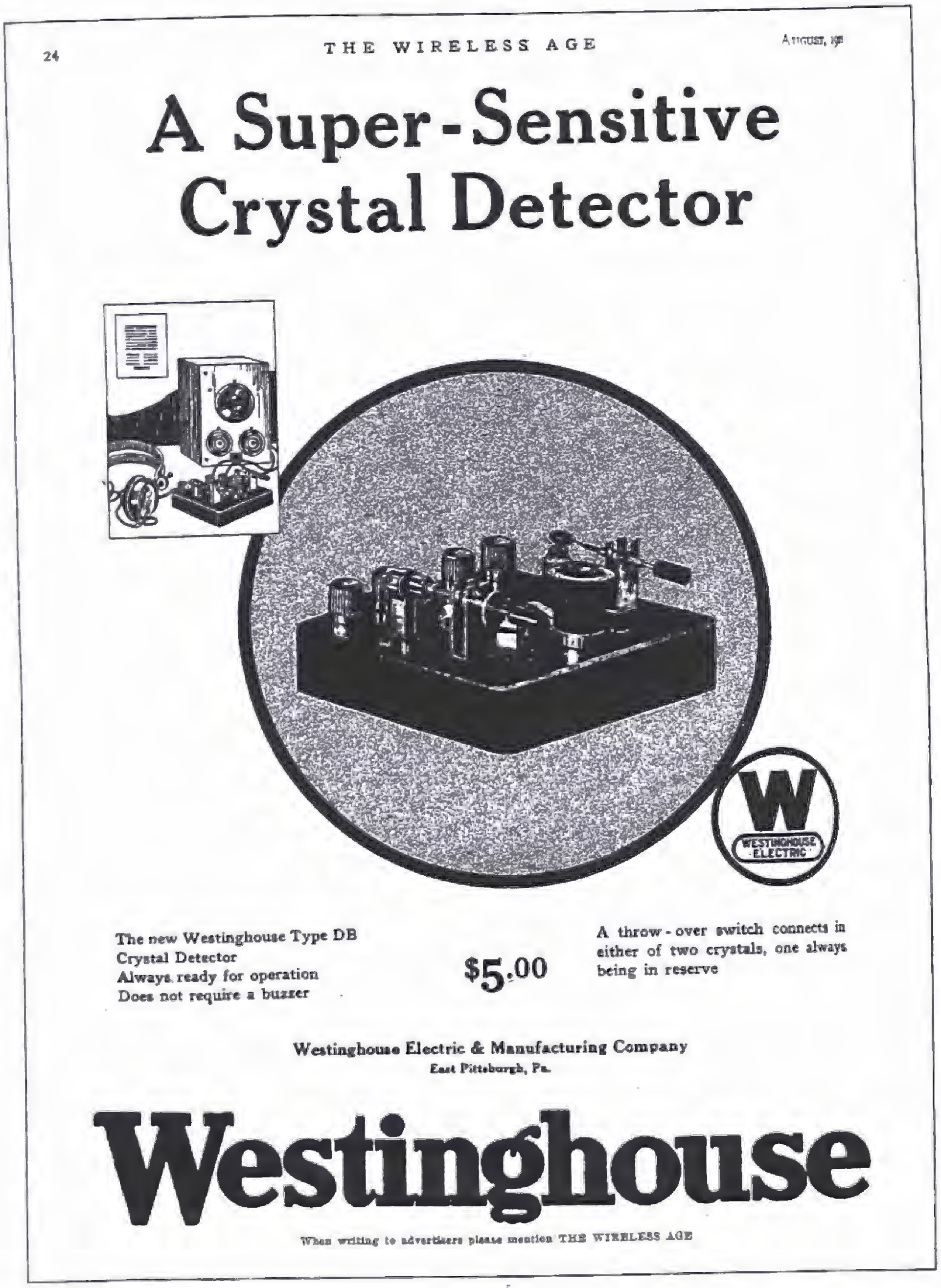


The first national advertisements for the RC technology appearing in April and May of 1921 pictured the RA tuner and DA detector-amplifier without referring to the RC. (*QST*, April, 1921, p. 120)



in the September and October issues of *The Wireless Age*.[36] The RA was advertised at $65, the DA without tubes at $65, the RC without tubes at $125, a complete RA crystal receiver with a DB detector, headphones and antenna at $85.50, and a complete RC receiver with four tubes, a Type CB loading coil, batteries, and headphones with adaptor at $216.

RCA began to advertise radio equipment manufactured by Westinghouse in December 1921,[37] although Westinghouse continued to advertise the RA, DA and RC until circa March 1922. When RCA became the exclusive distributor for Westinghouse products circa January 1922, they tweaked the prices by adding $3 to the price of RA and DA for a total of $68 apiece, by adding $5 to the price of the RC without accessories for a total of $130, and by adding $4.50 to the price of the RA crystal receiver for a total of $90. They maintained the $216 price of the complete RC but did not include a spare vacuum tube—



The first advertisements for the "Super-Sensitive" Type DB detector pictured it with the RA tuner, a combination which was later referred to as the RA crystal receiver. (*The Wireless Age*, August, 1921, p. 24)

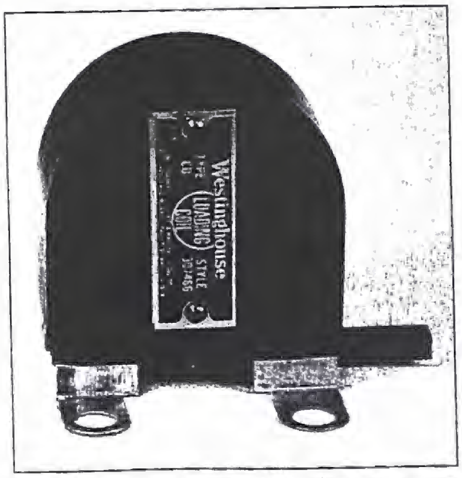
effectively increasing the price by $6.50. The Westinghouse name rarely appeared in RCA's national advertising, although it was still prominently used in brochures and distributor catalogs for some time thereafter.

The key technical features of the RC receiver were as follows:

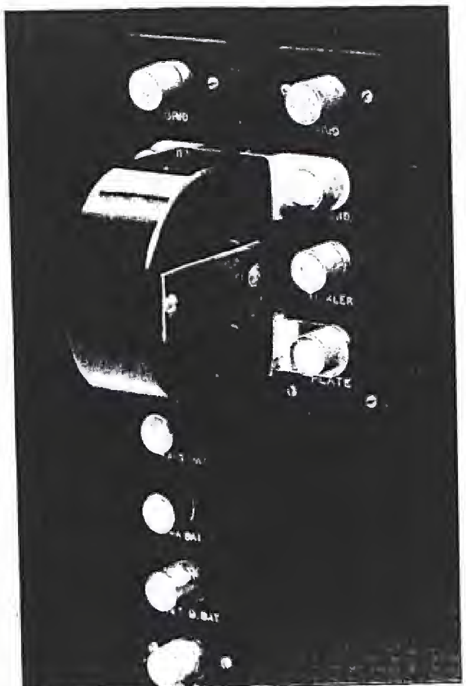
- A regenerative vacuum tube to increase sensitivity and selectivity,
- An inductive coupling method for regeneration to achieve constancy of regeneration with varying wavelength,
- A single-knob selection of wavelength by mounting tuning coil and variable capacitor on a single shaft, and
- A "vernier" wavelength adjustment consisting of small variable capacitor in parallel with the main tuning condenser to compensate for small errors in the desired ratio of inductance to capacitance as the receiver is tuned over its range.

The resulting receiver design was excellent and performed well. It could be operated with the detector alone or with one or two stages of amplification by

RCA began the exclusive distribution of Westinghouse receivers circa January 1922 with advertisements in national magazines that rarely mentioned the Westinghouse name. (*The Wireless Age*, January 1922, p. 4)



The CB loading coil was offered as an accessory for those who wanted to listen in on time signals, weather forecasts and other transmissions from stations operating with wavelengths between 1600 and 2700 meters.



The CB loading coil was positioned on the rear binding posts between the RA and DA units.

selecting the appropriate telephone jack for the headset. It was easy to use, and as sensitive and selective as the more complex designs of the day. It produced less interference than most other regenerative sets of the day because the regeneration circuit did not need to be readjusted after each tuning, a procedure which generally caused the set to radiate a strong signal, invariably producing an annoying howl in neighboring receivers.

While the RA tuner was designed to operate between wavelengths of 180 to 700 meters for the reception of radio telephone (e.g. broadcast radio), amateur and ship stations, a Type CB loading coil could also be purchased for the reception of time signals, weather forecasts, and other types of transmissions from stations operating on wavelengths of 1600 to 2700 meters.[38] The CB coil with Style No. 307466 and a production date of 7-11-21 was placed on the rear of the RA tuner as shown in the accompanying photograph.

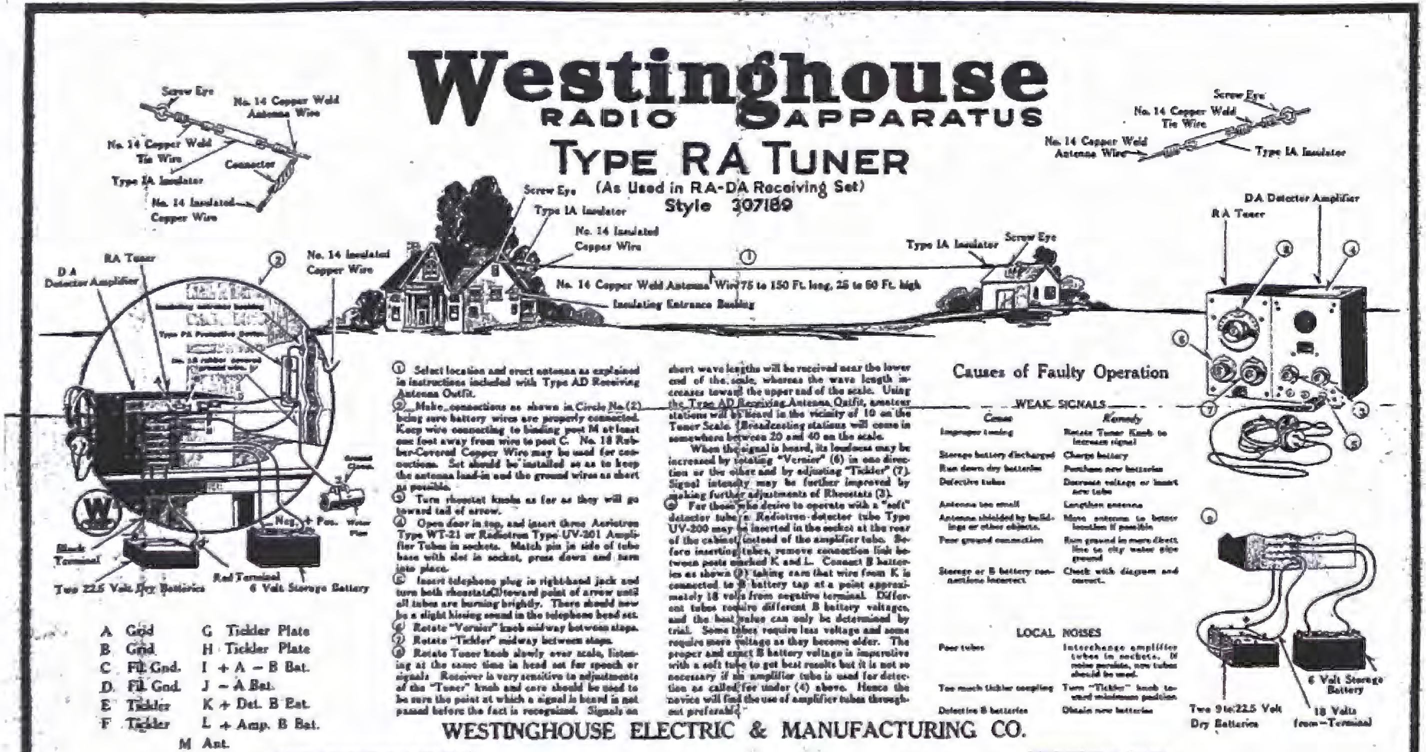
RCA changed the name of the RC to the Radiola RC in late 1922, and ads for the Radiola RC began to appear in March, 1923.[39] However, there were no RA, DA, or RC receivers with the Radiola name on the panel because none was manufactured after RCA made the name change. While the earliest instruction sheets had only the Westinghouse name, later revisions had both the Westinghouse and RCA name and RCA logo. The RA/DA/RC sets were on the market until July 1923, when RCA sold off their entire inventory of sets below cost to Gimbel Brothers, who in turn sold them at a deep discount in their New York City store.

RA/DA Production Runs

A large number of RA and DA units were made in the 2½-year period from December 1920 to mid-1923 in six separate production runs, and while the exact number made in each production run–or the total for that matter–is not known, the serial numbers provide a clue. Westinghouse numbered the individual RA and DA units with serial numbers presumably beginning with one, and stamped a "production run" date on each serial number plate. As a result, the total number of sets can be inferred from a sampling of serial numbers for each type of set, and the number in each production run can be inferred from a sampling of serial numbers having the same production run dates.

In a sampling of serial numbers and production dates from approximately 288 RA and DA units (both separate units and combined into RC's), the highest serial number observed to date is close to 143,000. However, this does not mean that there were 143,000 units manufactured because of two complicating factors: 1) there were approximately 28,000 receivers of other types (Aeriola Grand, Radiola Grand, Radiola Senior, and Radiolas DR, AC, RS, AR, and RT) manufactured during the same period with interleaved serial numbers, and 2) in the last production run there were approximately 31,400 RA units without serial numbers paired with DA units having serial numbers to make RC's. It turns out quite serendipitously that these two factors

The early RA instructions showed how the tuner was used in the RA-DA Receiving Set (below left). Instruction sheets for the RA (top right) were also prepared to describe how the RA tuner was used with the DB detector as a complete RA Receiving Set. The early DA instructions (below right) showed how the detector-amplifier was used in the RA-DA Receiving Set.



Westinghouse

RADIO APPARATUS

TYPE RA TUNER

(As Used in RA-DA Receiving Set)

Style 307189

A Grid G Tickler Plate
B Grid H Tickler Plate
C Fil. Gnd. I + A – B Bat.
D. Fil. Gnd. J – A Bat.
E Tickler K + Det. B Bat.
F Tickler L + Amp. B Bat.
M Ant.

① Select location and erect antenna as explained in instructions included with Type AD Receiving Antenna Outfit.

② Make connections as shown in Circle No. (2) being sure battery wires are properly connected. Keep wire connecting to binding post M at least one foot away from wire to post C. No. 18 Rubber-Covered Copper Wire may be used for connections. Set should be installed so as to keep the antenna lead-in and the ground wires as short as possible.

③ Turn rheostat knobs as far as they will go toward tail of arrow.

④ Open door in top, and insert three Aeriotron Type WT-21 or Radiotron Type UV-201 Amplifier Tubes in sockets. Match pin in side of tube base with slot in socket, press down and turn into place.

⑤ Insert telephone plug in right-hand jack and turn both rheostats (3) toward point of arrow until all tubes are burning brightly. There should now be a slight hissing sound in the telephone head set.

⑥ Rotate "Vernier" knob midway between stops.

⑦ Rotate "Tickler" midway between stops.

⑧ Rotate Tuner knob slowly over scale, listening at the same time in head set for speech or signals. Receiver is very sensitive to adjustments of the "Tuner" knob and care should be used to be sure the point at which a signal is heard is not passed before the fact is recognized. Signals on short wave lengths will be received near the lower end of the scale, whereas the wave length increases toward the upper end of the scale. Using the Type AD Receiving Antenna Outfit, amateur stations will be heard in the vicinity of 10 on the Tuner Scale. Broadcasting stations will come in somewhere between 20 and 40 on the scale.

When the signal is heard, its loudness may be increased by rotating "Vernier" (6) in one direction or the other and by adjusting "Tickler" (7). Signal intensity may be further improved by making further adjustments of Rheostats (3).

⑨ For those who desire to operate with a "soft" detector tube, a Radiotron detector tube Type UV-200 may be inserted in the socket at the rear of the cabinet instead of the amplifier tube. Before inserting tubes, remove connection link between posts marked K and L. Connect B batteries as shown (9) taking care that wire from K is connected to B battery tap at a point approximately 18 volts from negative terminal. Different tubes require different B battery voltages, and the best value can only be determined by trial. Some tubes require less voltage and some require more voltage as they become older. The proper and exact B battery voltage is imperative with a soft tube to get best results but it is not so necessary if an amplifier tube is used for detection as called for under (4) above. Hence the novice will find the use of amplifier tubes throughout preferable.

Causes of Faulty Operation

WEAK SIGNALS

Cause	*Remedy*
Improper tuning	Rotate Tuner Knob to increase signal
Storage battery discharged	Charge battery
Run down dry batteries	Purchase new batteries
Defective tubes	Decrease voltage or insert new tube
Antenna too small	Lengthen antenna
Antenna shielded by buildings or other objects.	Move antenna to better location if possible
Poor ground connection	Run ground in more direct line to city water pipe ground
Storage or B battery connections incorrect	Check with diagram and correct.

LOCAL NOISES

Poor tubes	Interchange amplifier tubes in sockets. If noise persists, new tubes should be used.
Too much tickler coupling	Turn "Tickler" knob toward minimum position
Defective B batteries	Obtain new batteries

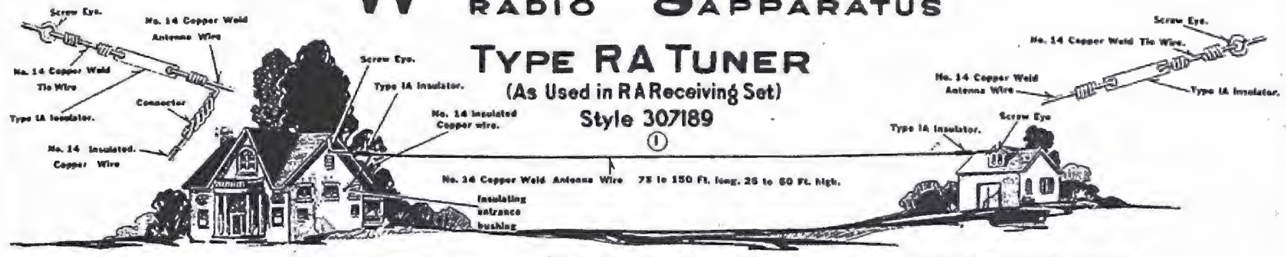
WESTINGHOUSE ELECTRIC & MANUFACTURING CO.

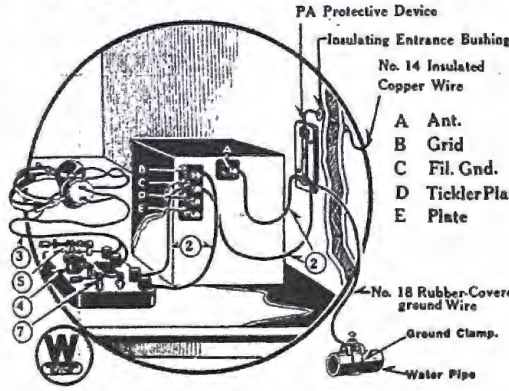
EAST SPRINGFIELD WORKS SPRINGFIELD, MASS.

I. L. 1127
(Over)

Westinghouse
RADIO APPARATUS

TYPE RA TUNER
(As Used in RA Receiving Set)
Style 307189





This carton contains one Type RA Tuner only. For a complete Type RA Receiving Set, the following are required:

1--Type DB Crystal Detector S. No. 307216
1—Brandes Head Set S. No. 307423
1—AD Receiving Antenna Outfit S. No. 319486

① Erect Antenna as explained in instructions accompanying the Type AD Antenna Outfit.

② Make connections as shown, using care that the two wires leading to the Protective Device do not lie closer together than 1 ft. These wires should be as short as possible. Wiring may consist of No. 18 Rubber covered copper wire. Carefully remove the covering from both ends of each wire used, scraping clean with a knife and place the end thus cleaned under the terminal caps shown, and tighten cap.

③ Connect head set as shown.

④ Place Dial Switch in the position shown.

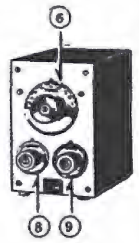
⑤ Adjust the Pressure Type Crystal by grasping black handle and pulling the Movable Crystal away from the Stationary one, and letting it come into contact with it at various points. Crystals should come together with firm pressure. While trying various spots, turn the Tuner Knob ⑥ slowly over the scale, listening at the same time in the Head Set for signals. As soon as a signal is heard, stop Crystal adjustment and rotate the Tuner Knob (6) until maximum signal is heard. Now readjust the Detector Crystal until spot giving loudest signal is found. Do not rub Crystals over each other.

⑦ By throwing the Dial Switch (4) to the other position, this crystal may be used. The flexible wire with special tip should be brought into contact with the various spots on the stationary crystal, at the same time manipulating the Tuner Handle (6) as explained under (5) until the sound is loudest. If the Tuner Handle has been set when adjusting the crystal (5) it will only be necessary to adjust the Detector. Once adjusted, detectors should remain in adjustment unless jarred or unless subjected to heavy atmospheric discharges such as are experienced in warm weather. When Dectector is once adjusted, different Radio Stations may be heard by merely turning Tuner Knob (6).

⑧ Vernier Knob may be used as a fine adjustment on Tuner Knob (6). It should be midway between its stops when adjustments of the Tuner Knob (6) are made. After Tuner Knob (6) is adjusted for the loudest signal, signal may be improved by rotating the Vernier Knob (8).

⑨ This knob is not used in this Set. It should be placed on minimum.

Note- If the Pressure Type Crystals are rubbed together, a black deposit will appear on the projecting points of the Movable Crystal, decreasing markedly the sensitivity. This deposit may be removed by lightly scraping with a knife.

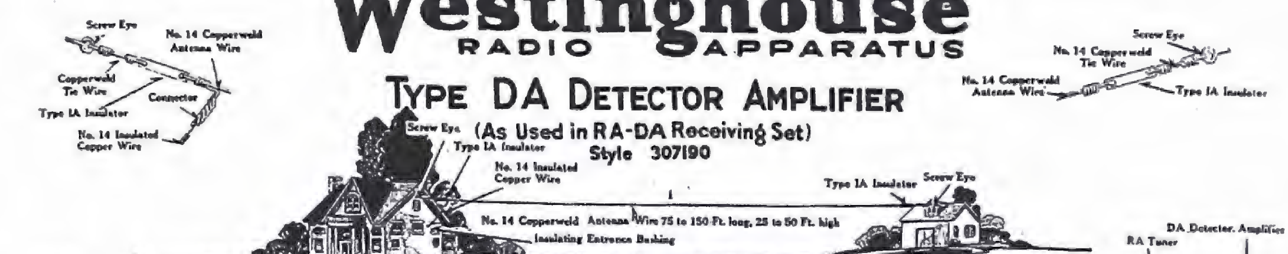


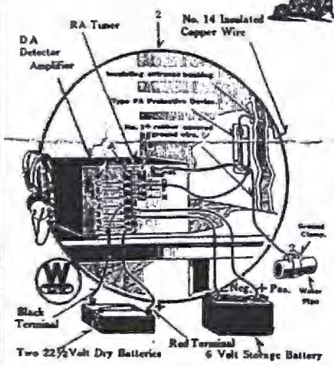
WESTINGHOUSE ELECTRIC & MANUFACTURING CO.
EAST SPRINGFIELD WORKS SPRINGFIELD, MASS.

I. L. 1127

Westinghouse
RADIO APPARATUS

TYPE DA DETECTOR AMPLIFIER
(As Used in RA-DA Receiving Set)
Style 307190





A Grid
B Grid
C Fil. Gnd.
D Fil. Gnd.
E Tickler
F Tickler
G Tickler Plate
H Tickler Plate
I + A – B Bat.
J – A Bat.
K + Det. B Bat.
L + Amp. B Bat.
M Ant.

1 Select location and erect antenna as explained in instructions included with Type AD Receiving Antenna Outfit.

2 Make connections as shown in Circle No. (2) being sure battery wires are properly connected. Keep wire connecting to binding post M at least one foot away from wire to post C. No. 14 Rubber-Covered Copper Wire may be used for connections. Set should be installed so as to keep the antenna lead-in and the ground wires as short as possible.

3 Turn rheostat knobs as far as they will go toward tail of arrow.

4 Open door in top, and insert three Aeriotron Type WT-21 or Radiotron Type UV-201 Amplifier Tubes in sockets. Match pin in side of tube base with slot in socket, press down and turn into place.

5 Insert telephone plug in right-hand jack and turn both rheostats(3) toward point of arrow until all tubes are burning brightly. There should now be a slight hissing sound in the telephone head set.

6 Rotate "Vernier" knob midway between stops.

7 Rotate "Tickler" midway between stops.

8 Rotate Tuner knob slowly over scale, listening at the same time in head set for speech or signals. Receiver is very sensitive to adjustments of the "Tuner" knob and care should be used to be sure the point at which a signal is heard is not passed before the fact is recognized. Signals on short wave lengths will be received near the lower end of the scale, whereas the wave length increases toward the upper end of the scale. Using the Type AD Receiving Antenna Outfit, amateur stations will be heard in the vicinity of 10 on the Tuner Scale. Broadcasting stations will come in somewhere between 20 and 40 on the scale.

When the signal is heard, its loudness may be increased by rotating "Vernier" (6) in one direction or the other and by adjusting "Tickler" (7). Signal intensity may be further improved by making further adjustments of Rheostats (3).

9 For those who desire to operate with a "soft" detector tube a Radiotron detector tube Type UV-200 may be inserted in the socket at the rear of the cabinet, instead of the amplifier tube. Before inserting tubes, remove connection link between posts marked K and L. Connect B batteries as shown (9) taking care that wire from K is connected to B battery tap at a point approximately 18 volts from negative terminal. Different tubes require different B battery voltages, and the best value can only be determined by trial. Some tubes require less voltage and some require more voltage as they become older. The proper and exact B battery voltage is imperative with a soft tube to get best results but it is not so necessary if an amplifier tube is used for detection as called for under (4) above. Hence the novice will find the use of amplifier tubes throughout preferable.

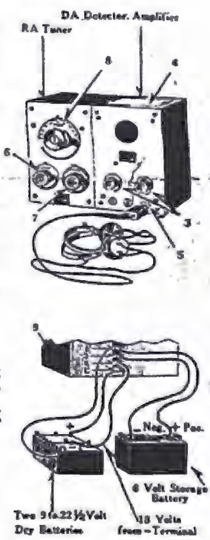
Causes of Faulty Operation

WEAK SIGNALS

Cause	Remedy
Improper tuning	Rotate Tuner Knob to increase signal
Storage battery discharged.	Charge battery
Run down dry batteries	Purchase new batteries
Defective tubes	Decrease voltage or insert new tube
Antenna too small	Lengthen antenna
Antenna shielded by buildings or other objects.	Move antenna to better location if possible
Poor ground connection	Run ground in more direct line to city water pipe ground
Storage or B battery connections incorrect	Check with diagram and correct.

LOCAL NOISES

Poor tubes	Interchange amplifier tubes in sockets. If noise persists, new tubes should be used.
Too much tickler coupling	Turn "Tickler" knob toward minimum position
Defective B batteries	Obtain new batteries



Manufactured for
Radio Corporation of America
WOOLWORTH BUILDING – NEW YORK CITY
By
Westinghouse Electric & Manufacturing Company

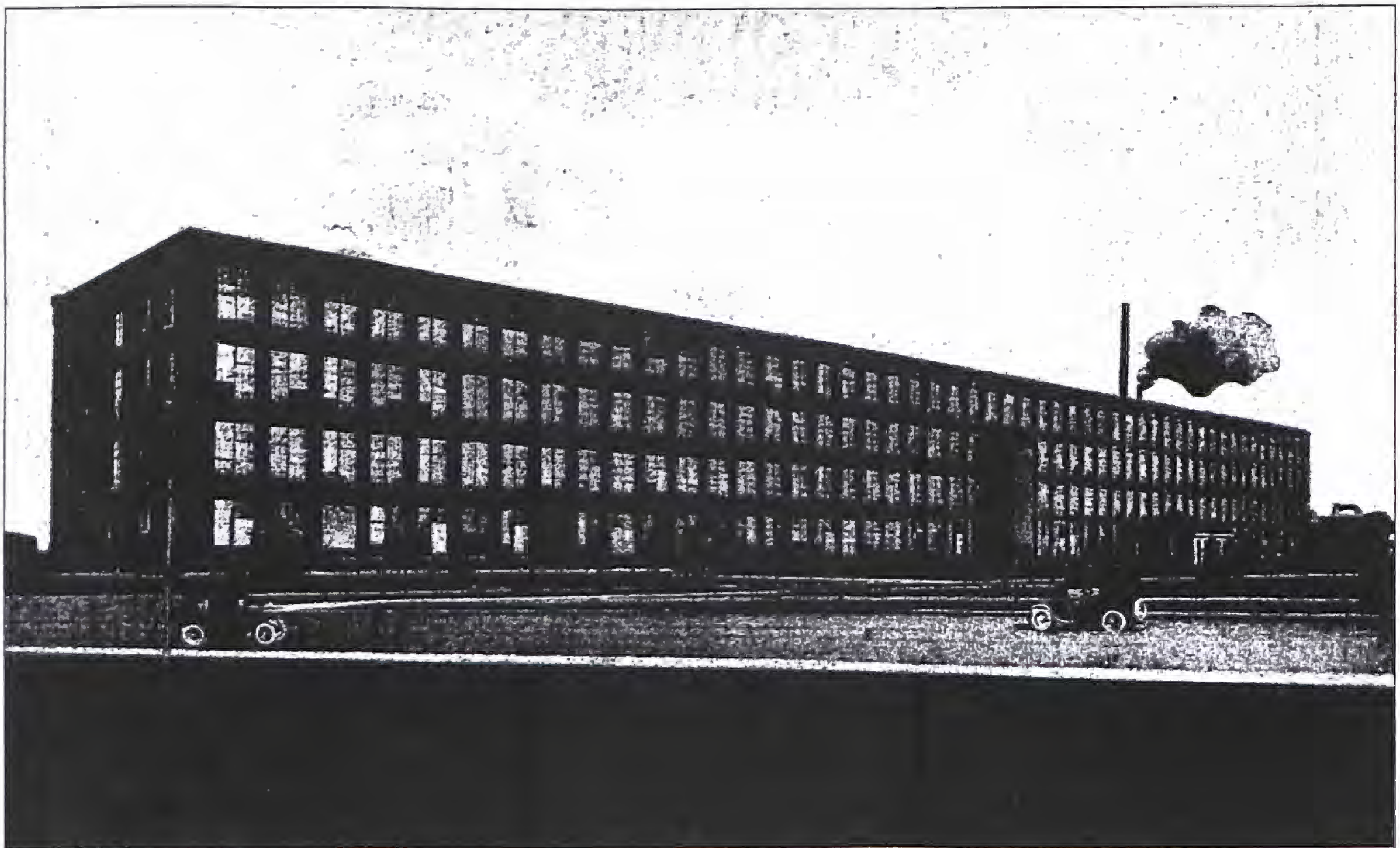
I. L. 1134-A

The early production line of Westinghouse receivers including the RA units shown here was very labor intensive with little automation. (George H. Clark Collection, Smithsonian Institution)

approximately cancel—for quite unrelated reasons—so the total number of RA and DA units turns out to be about 144,800 (see Appendix D).

The first production runs of RA, DA, and RC units were made in Pittsburgh with name plates dated 11-30-20, while all units thereafter were manufactured in East Springfield, Mass. with name plates bearing five

Westinghouse transferred responsibility for manufacturing broadcast radio apparatus to its East Springfield, Mass. facility.



NEW ENGLAND WESTINGHOUSE FACTORY, EAST SPRINGFIELD, MASS.

Table 3-2. RA and DA production quantities and locations grouped by production dates appearing on name plates

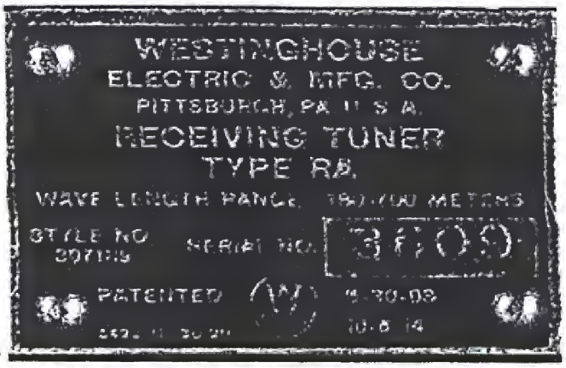
Production Date	Production Location	Unit Type	Estimated Number of Units Produced[a]
11-30-20	Pittsburgh, PA	RA and DA	1700
5-18-21	East Springfield, MA	DA only	1700
8-2-21	East Springfield, MA	RA and DA	4900
9-28-21	East Springfield, MA	RA only	1700
12-14-21	East Springfield, MA	RA and DA	72,000
5-29-22	East Springfield, MA	RA and DA	62,800[b]
		Total RA and DA	144,800

[a]Most of these units were paired and sold as RC receivers
[b]Half are RA units without serial numbers paired with DA's and sold as RC's

different production dates between 5-18-21 and 5-29-22. Approximately 1700 RA and DA units were initially made in Pittsburgh before manufacturing was transferred to East Springfield.

The numbers of RA and DA units manufactured within each of the six production dates are summarized in Table 3-2. The methodology used to

Each of the five different RA serial number plates has a unique design which can be used to readily identify the production run date at a glance. A. 11-30-20 B. 9-28-21 C. 8-2-21 D. 12-14-21 E. 5-29-22

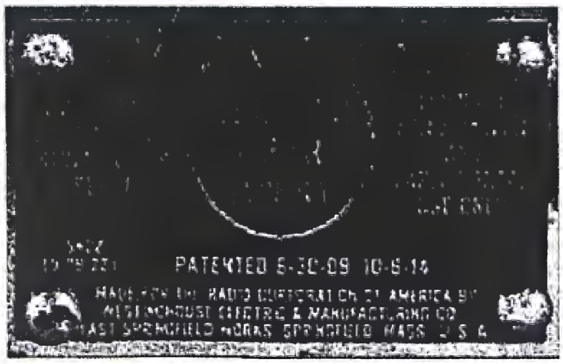


A

B

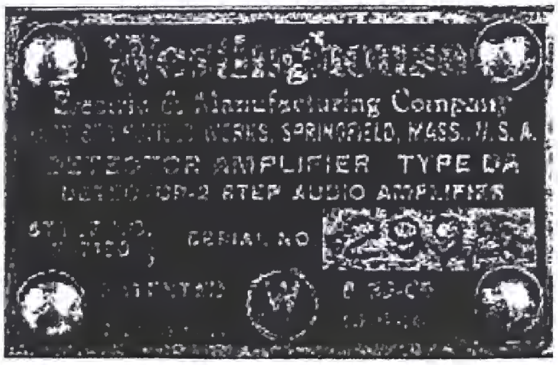
C

D

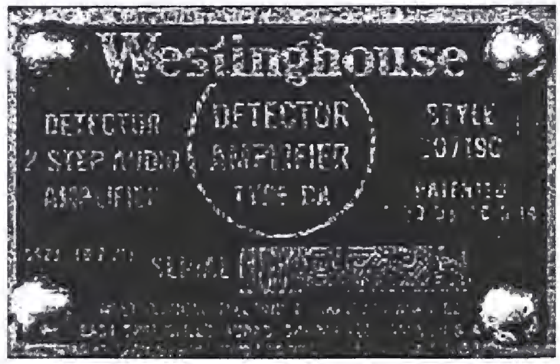


E

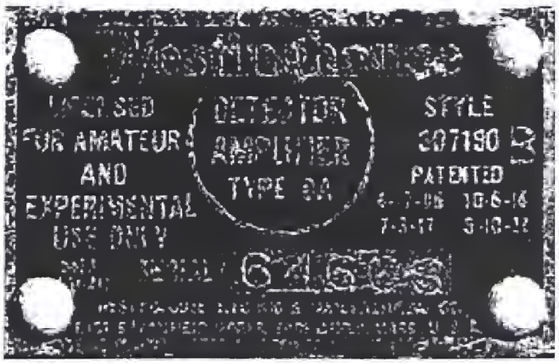
A



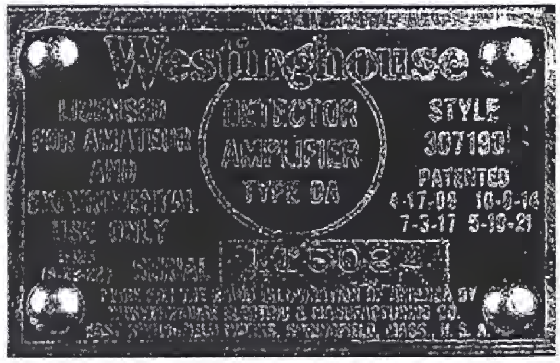
B



C



D



E

Each of the five different DA serial number plates has a unique design which can be used to readily identify the production run date at a glance. A. 11-30-20 B. 5-18-21 C. 8-2-21 D. 12-14-21 E. 5-29-22

arrive at these results is explained in Appendix D. The numbers of units manufactured in the first four production runs are substantially less than in the last two, and as a result these units are more desirable from the collector's viewpoint. The units manufactured in Pittsburgh are the first and among the rarest, and therefore are the most desirable of all. While there is some uncertainty in the numbers manufactured within each of the six groups, the total estimated number of 144,800 units manufactured is believed to be reasonably accurate.

While the total number of individual RA and DA units manufactured can be determined from the observed serial numbers with some accuracy, determining the number of RA and DA units paired together and sold as RC receivers is somewhat more complicated. The upper bound to that number is 72,400, which is arrived at by assuming that all of the 144,800 sets indicated in Table 3-2 are paired together. However, a number of these units were sold individually as RA's and DA's. This fraction can be estimated by taking the ratio of a) the number of all RA and DA units in the serial number data base sold individually to b) the number of all RA and DA units in the data base sold either individually or paired as RC's. Based on the available serial number data base, this fraction is 50% for the first group dated 11-30-20, 5% for the last group dated 5-29-22, and 22% for the remaining units considered as one group. Using this technique, the total number of RC sets manufactured is estimated to

Table 3-3. The total number of RA's and DA's combined into RC's

Group Date	Total Number of RA's and DA's Manufactured	Percentage Sold Individually	Total RA & DA Sold Individually	Total RA & DA Sold as RC's	Total Number of RC's
11-30-20	1700	50%	850	850	425
5-29-22	62,800	5%	3140	59,660	29,830
All others	80,300	22%	17,666	70,664	35,332
Totals	144,800	15%	21,656	123,144	65,587

be 65,587 as indicated in Table 3-3.

This number of RC's is substantially smaller than the 80,000-85,000 estimated by Douglas,[40] who also used serial numbers. Douglas began with an upper bound of 100,000 RC's instead of the 72,400 bound estimated here.[41] His upper bound included a large number of RC's that are now known to be other types of sets with interleaved serial numbers. He then made an educated guess that the upper bound should be reduced by 15,000-20,000 to account for *both* the existence of other models with interleaved serial numbers and the sales of individual RA's and DA's. Based on a more detailed analysis of a larger serial number data base, it appears that his upper bound should have been reduced by about 13,000 or so to account for other receiver types, and an additional 21,600 or so to account for sales of individual RA's and DA's.

DA Design Changes

The DA's in the first production run in Pittsburgh were assigned the Style Number 307190 and dated 11-30-20, while the Style Number for all DA's manufactured in East Springfield was altered slightly by adding a "B." There were numerous design changes made to the DA throughout the life of this unit. Many of the design changes were cosmetic in nature, intended primarily to decrease cost, but some were clearly caused by functional requirements. Other changes were made over time, some coinciding with a new production run, and

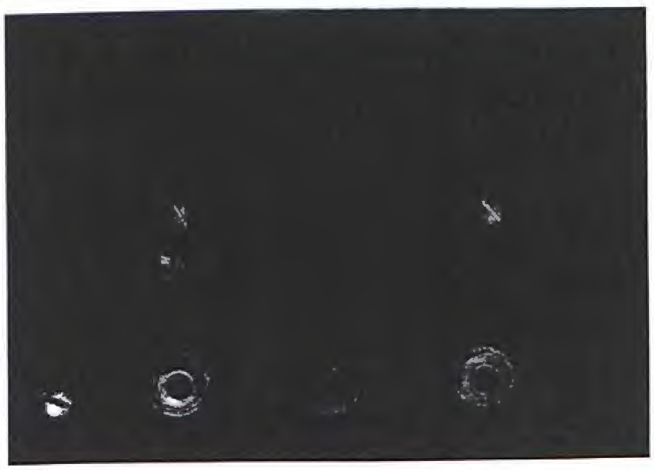
Table 3-4. Design features of the DA detector-amplifier evolved in each of the four DA production runs following the original production run dated 11-30-20

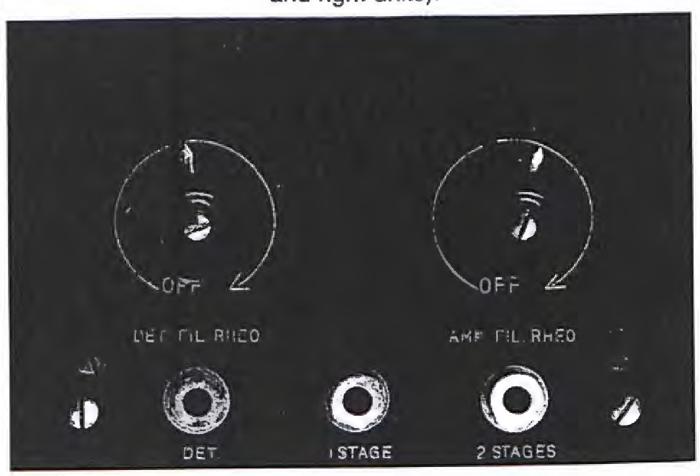
DA Design Feature Changes from 11-30-20	5-18-21	8-2-21	12-14-21	5-29-22
Copper shield on cabinet walls changed to ferromagnetic metal	✓	✓	✓	✓
Rear terminals changed from fiber to metal	✓	✓	✓	✓
Labels added to phone jacks	✓	✓	✓	✓
Tube socket design changed and all sockets rotated by 45°	✓	✓	✓	✓
Center tube socket rotated by 180°		✓	✓	✓
Panel mounting brackets changed from solid blocks to L-brackets		✓	✓	✓
Knob diameter decreased; arrowhead pointer design added			✓	✓
Mortised hinges on lid changed to surface mounted			✓	✓

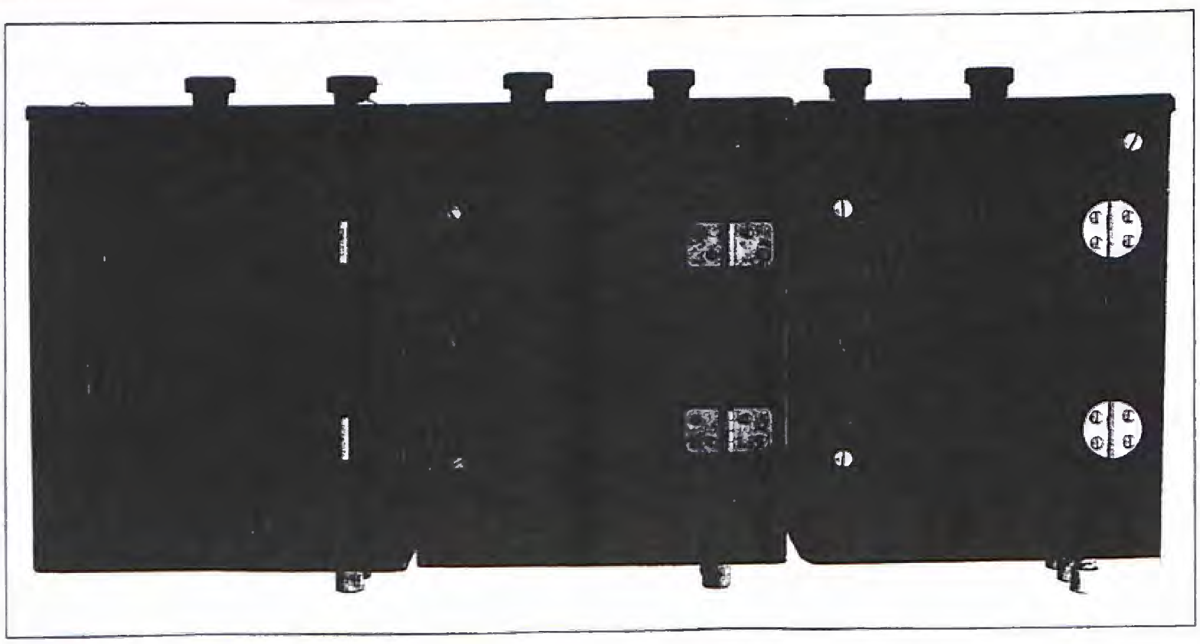
others implemented in the middle of a production run. These design changes for the DA units are summarized in Table 3-4, along with the production run or runs in which each change became prevalent.

In addition to these design changes, there were also changes in the supplier for individual parts such as the telephone jacks and transformers. While the changes in most of these parts are not readily apparent to the eye, a change in the physical appearance of the audio transformer was significant, and differs markedly from the transformer that appears in all of the early ads. These transformers were changed sometime during the second production run, and later changed back to the original. The novice collector might believe the alternate transformer was an after-market replacement for the notoriously fragile factory-installed transformer, but this is not necessarily the case. Other minor variations have been observed such as rounded corners on the lids of the tube access hole on a few sets. The reason for this type of variation on such a small number of sets is unknown.

There were also some minor wiring changes, perhaps the most well known being a change to reduce distortion by inserting a "C" battery in the grid circuit of the amplifier tubes. The RC was originally designed to have 45 volts applied to the plate of the amplifier tubes, but the desire for increased power to drive loudspeakers led to increases of plate voltage first to 68 volts and then to 90 volts. This increase in plate voltage changed the operating point of the amplifier tubes such that the output became distorted. The distortion could







The more obvious changes to the front panel of early DA detector-amplifiers (top left) were the addition of labels to the phone jacks and a change in pointer design on the filament rheostats of later panels (top right). The mortised hinges on earlier DA lids (below) were changed to surface-mounted hinges with both round and square shapes on later lids (center and right units).

be remedied by inserting a "C" battery in the grid circuit of the amplifier tubes to reposition the operating point to a more linear portion of the operating characteristic. The wiring diagram for this change is shown in the RCA Victor Service Notes under the section entitled Radiola RT.[42] Later, the WD-12 tubes were substituted for the UV-200 or UV-201-A tubes, and the distortion then occurred at voltages as low as 45 volts. RCA published articles on how the RC owner could retrofit his or her set with a "C" battery to reduce the distortion,[43] and many sets can be found with wiring changes made by owners to accommodate a "C" battery.

Variations in the thickness of the front panels have been reported,[44] but measurements on a number of panels from each production run do not show any marked variation. Since the front panels were hand sanded and polished, it is certainly possible that some sets have thicker panels than others, but it does not appear to be an intentional design change. Also, a decidedly brown hue has been observed on some of the front panels, but there does not seem to be any pattern with regard to different production runs, and so it is possible that a small number of the panel changed color over time as the result of exposure to some environmental factors such as sunlight.

RA Design Changes

There were a number of design changes made to the RA tuner over the life of this unit as indicated in table 3-5. The RA's in the original production run made in Pittsburgh were assigned Style No. 307189 and dated 11-30-20, while the Style Number for all subsequent RA's manufactured in East Springfield

Table 3-5. Design features of the RA tuner evolved in each of the four RA production runs following the original production run dated 11-30-20

RA Design Feature Changes from 11-30-20	9-28-21	8-2-21	12-14-21	5-29-22
Copper shield on cabinet walls changed to ferromagnetic metal	✓	✓	✓	✓
Rear terminals changed from fiber to metal	✓	✓	✓	✓
Wiring rerouted away from coil; minor change to spiral connectors	✓	✓	✓	✓
Panel mounting brackets changed from solid blocks to L-brackets		✓	✓	✓
Dial skirts changed from Micarta to metal; dial print size decreased			✓	✓
Westinghouse logo added to large center dial				✓

was altered slightly by adding an "A." The first changes to the RA indicated in the table were actually made on sets manufactured in Pittsburgh near the end of the 11-30-20 production run, most likely in preparation for the transfer of production to East Springfield, Mass. The few RA's made in Pittsburgh with these changes have serial numbers in the mid-3600s, and are virtually indistinguishable from those made in the first production run in East Springfield dated 9-28-21—with the notable exception of the details on the name plate.

TOC | **Previous Section:** Chapter XLI | **Next Section:** Appendix A

History of Communications-Electronics in the United States Navy, Captain Linwood S. Howeth, USN (Retired), 1963, pages 501-512:

CHAPTER XLII

Radio Conferences During the Period Between World Wars

1. PREFACE

At the First International Radio Conference, held in Berlin in 1903, delegates of the powers represented drafted a protocol governing the use of radio to be considered by a second conference to be assembled a year later. The Second International Conference, postponed by the Russo-Japanese War, met again in Berlin in 1906 and essentially agreed to these previously drafted agreements and regulations. The U.S. delegates took a leading part in drafting this covenant but unfortunately the Senate delayed ratifying it until 1912. Late in that year the Third International Conference convened in London and took actions to increase the utilization and regulation of radio to enhance safety of life at sea. At this time a decision was reached to hold the Fourth International Radio Conference during 1917. The U.S. Government extended an invitation to hold this in Washington. This invitation was accepted but as a result of World War I it was not convened until 1925.[1]

2. ALLIED RADIO CONFERENCE

In 1921 representatives of the United States, France, Great Britain, Italy, and Japan met in Washington to discuss the international use of radio and to draft a protocol for consideration at the Fourth International Radio Conference. These representatives formulated a series of technical questions which could not be answered at the time and directed the assembling of a Technical Committee on International Radio Communications in Paris at the earliest possible time to consider and advise upon these questions. This Committee met from 21 June to 22 August 1921 and gave recommendations in the premises. In closing, the Committee recommended that the United States, being charged with calling the next international conference, should accept the task of preparing a revised presentation of the Washington draft, which would include the proposals presented by the Technical Committee, and communicate this to the other nations with an invitation to attend the Conference. It further recommended that these nations should transmit, within a definite period, all their objections, observations, and proposals with the understanding that no new matters would be presented during the Conference. Following receipt of objectives, observations, and proposals the United States was to transmit them to all attending nations in sufficient time to permit at least 6 months for their consideration prior to the convening of the Conference.[2]

3. NATIONAL RADIO CONFERENCES

Suddenly and unheralded, in 1921 radio broadcasting created one of the most fantastic booms in the history of the American people. Without prospect of monetary gain, unless the applicant was a manufacturer or purveyor of radio equipment, increasing numbers of requests for station licenses for broadcasting purposes poured into the Department of Commerce. Under the Radio Act of 1912 no power existed permitting the denial of a license to any reputable American citizen. At the time there were only two authorized frequencies for broadcasting purposes, 830 and 620 kc. By 1922 the conditions became so chaotic that President Harding directed Secretary of Commerce Herbert Hoover to convene a conference of manufacturers, broadcasters, radio amateur spokesmen, and civilian and military government radio communication personnel to study the problem and to make recommendations to alleviate the intolerable situation.

In his opening speech to the members of this First National Radio Conference Secretary Hoover remarked:

> We have witnessed in the last four or five months one of the most astounding things that has come under my observation of American life. This Department estimates that today more than 600,000 persons possess wireless telephone receiving sets, whereas there were less than 50,000 such sets a year ago. We are indeed today upon the threshold of a new means of widespread communication of intelligence that has the most profound importance from the point of view of public education and public welfare.[3]

Although acrimony quickly developed between the several factions striving to gain control of the recently developed medium, all were in agreement that a definite U.S. radio policy was needed and that Federal control was essential.[4]

The conferees recommended that the public and the Government have priority rights in the use of radio and that the existing inadequate laws should be changed to give the Government control over all transmitting stations. They recommended no restrictions upon the use of receivers but reannunciated the inviolability of the contents of private and official messages.

Four classes of broadcasting were recommended:

> Government;
> Public, by States, universities, and others disseminating educational information;
> Private, by stores, newspapers and others distributing news, entertainment or other services; and,
> Toll, by public service radio telephone companies as a paid service.[5]

The increase in broadcasting stations necessitated that an increase in broadcasting frequencies be recommended. This required the invasion of that portion of the spectrum between 185 and 500 kc., formerly reserved for military and naval usage by national and international laws. Governmental broadcasting was allotted two frequency bands, 146 to 162 and 200 to 285 kc.; private and toll broadcasting was allotted the band 700 to 965 kc., public broadcasting was allocated the band between 1053 and 1090 kc.; and the amateurs were allowed the exclusive use of the band between 1500 and 2000 kc. and the frequency of 910 kc. plus the shared usage of the band 1090 to 1500 kc. with technical and training schools. No material changes in the frequencies utilized by ships, aircraft, fixed stations, radio beacons, and radio compass stations were recommended.[6]

In view of the amount of commercial advertising on radio and television channels today it is of interest to note that this Conference recommended against this obnoxious means of advertising by limiting it to the announcement of the name of the program sponsor.

It was recommended that the Secretary of Commerce be given the power to prohibit the use of radio-transmitting apparatus and methods which created unnecessary interference provided more satisfactory apparatus and methods should become reasonably and commercially available.[7]

Recognizing that radio interference was one of the major problems of broadcast reception, the members submitted the following program for the study by the U.S. Bureau of Standards:

> The reduction of the rate of building up of oscillations in radiating systems;
> The reduction of harmonics in continuous wave transmitters and of irregularities of oscillation;
> Comparison between the variable amplitude and the variable-frequency methods of continuous wave telegraphy;
> The preferable methods of telephone modulation to avoid changes in the frequency of oscillation;
> The proper circuit arrangements of regenerative receivers to avoid radiation of energy;
> The use of highly selective receiving apparatus, including a list of approved types;
> The use of receiving-coil aerials instead of antennas, with special reference to high selectivity;
> The reduction of interference with radio communication by other electrical processes, such as X-ray apparatus; and,
> The study and standardization of frequency meters.[8]

In September 1922 Congressman Wallace H. White, Jr., of Maine, who had been a voluntary member of the First National Radio Conference, introduced a bill which embodied the recommendations of that Conference. The November issue of Radio Broadcast reported that this was "lost in the mazes of congressional procedure." Congress, always reluctant to enact legislation controlling radio, simply could not get the bill reported out of committee.[9]

The Second National Radio Conference was held in 1923 but, without enabling legislation, the members could only reiterate the recommendations of the previous Conference. By the middle of 1923, 143 radio broadcasting stations had closed because of lack of income and the insistence of the writers of popular music that they be paid royalties for its use in radio broadcasting.[10]

The failure of Congress to pass the White Radio bill convinced Secretary Hoover that he would be granted no authority in excess of that which he already possessed. With the concurrence of the major broadcast executives he issued a reassignment of frequencies for broadcasting stations in July 1923. Radio Broadcast for the following month stated:

> . . . the Secretary of Commerce, acting in accord with the opinion of the radio experts and authorities of the country has reassigned frequencies to practically all the broadcasting stations in the country and has done it so well that we no longer have any cause for complaint. Instead of the bedlam of noise to which we had become almost accustomed, there is practically no interference at all.[11]

This new system, which worked for a few weeks, had no compelling basis of law and unscrupulous and selfish individuals soon ruined the Secretary's excellent plan and the situation returned to its former chaotic condition.[12]

The Third National Radio Conference convened in Washington on 6 October 1924. This was by far the most important of these Conferences. The present allocations of frequency bands stems from its recommendations. Military and naval communication systems voluntarily agreed to use the broadcast band 500-1600 kc. only on a noninterference basis. As a result of this shifting of frequency bands the Navy drew up its first complete radiofrequency plan which was approved by the President upon the recommendation of the Interdepartmental Radio Advisory Board. Later this plan became the basis for an international allocation of frequency bands.[13]

In this Conference the members unselfishly endeavored to solve the problems of radio usage. This is amazing when one considers that it was held at the time when the controversy over broadcasting rights was being waged between the radio and telephone groups. Amateurs cooperated by voluntarily agreeing to abolish the use of spark transmitters and to discourage the use of oscillating receivers within the broadcast band.[14]

One of the most significant and controversial events of the Conference was the advocation by Mr. David Sarnoff, Vice President of the Radio Corp. of America, of the establishment of a chain of 50-kw (superpowered) broadcast stations. This proposal was finally compromised by recommending the Secretary of Commerce issue licenses for such stations which could be revoked if it should be found by experience that they interfered with other stations.[15]

The recommendations of the Conference resulted in dividing broadcasting stations into the three following classes:

Class	*Kilocycles*	*Number of channels*
1	550-1,070	63
2	1,090-1,400	32
3	1,420-1,460	5

This provided for an increase of 10 channels for class 1 stations and the elimination of broadcasting below 550 kc.[16]

For the first time in the U.S. allocations of frequencies bands above 2000 kc. were considered and the following usage was suggested:

Kilocycles	*Service*
95-120	Government, CW and ICW, exclusive.
120-157	Marine, CW and ICW, exclusive.
157-165	Point-to-point, CW and ICW. Marine, CW and ICW.
165-190	Point-to-point, CW, ICW, spark. Marine, CW and ICW.
190-230	Government, CW and ICW, exclusive.
230-235	University, college, and experimental, CW and ICW, exclusive.
235-250	Marine, phone, nonexclusive.
250	Government, CW, ICW, nonexclusive.
250-275	Marine, phone, nonexclusive.
275	Government, CW, ICW, nonexclusive.
275-285	Marine, phone, nonexclusive.
285-500	Marine and coastal, including radio compass and radio beacons.
500-550	Aircraft, CW, ICW, phone and fixed safety-of-life stations, phone, exclusive.
550-1,500	Broadcasting services, phone, exclusive.
1,500-2,000	Amateur, CW, ICW, phone.
2,000-2,250	Point-to-point, nonexclusive.
2,250-2,500	Aircraft, exclusive.
2,500-2,750	Mobile.
2,750-2,850	Relay broadcasting, exclusive.
2,850-3,500	Public service.

2,500-4,000	Amateur and Army mobile.
4,000-4,500	Public service and mobile.
4,500-5,000	Relay broadcasting, exclusive.
5,000-5,500	Public service.
5,500-5,700	Relay broadcasting, exclusive.
5,700-7,000	Public service.
7,000-8,000	Amateur and Army mobile.
8,000-9,000	Public service and mobile.
9,000-10,000	Relay broadcasting, exclusive.
10,000-11,000	Public service.
11,000-11,400	Relay broadcasting, exclusive.
11,400-14,000	Public service.
14,000-16,000	Amateur.
16,000-18,000	Public service and mobile.
18,000-56,000	Beam transmission.
56,000-64,000	Amateur.
64,000-infinity	Beam transmission.[17]

The Committee on Marine Communications recommended allocation of the frequency bands recommended for this service as follows:

Kilocycles	*Service*
120-190	Unassigned, except as noted below, with the recommendations that allocations to various marine services be made by the Department of Commerce.
160-175, and 185	Government use. It was further recommended that the frequency of 185 kc. be used for ice-patrol broadcasting and for other navigational aid messages.
235-285	Marine radiotelephony. It was recommended that specific allocations within this band should be made by the Department of Commerce and, pending further developments, should be tentative.
343, 410 and 454	Ship-to-ship and ship-to-shore communications.
425	It was recommended that ships now assigned this frequency be assigned other frequencies within a reasonable time.
315	Government use.
345-410	Radio compass.
445	Government use for aircraft and submarines, CW and ICW.
500	Exclusive for calling and distress signals and messages relating thereto.
2,500-2,750	Mobile marine services.[18]

The Fourth National Radio Conference was convened in the autumn of 1925. The Secretary of Commerce had practically been forced to abandon his policy of issuing licenses to all applicants, for despite numerous failures of broadcasting stations, applications for new licenses increased by leaps and bounds. The Secretary keynoted his opening speech of this Conference by declaring the radio industry should solve its problems by private initiative and not be too ready to ask the Government to assume the responsibility. However, the members were almost unanimously in favor of the Department of Commerce in illegally assuming the responsibility, for reducing and limiting the number of stations. The Secretary yielded to this recommendation and assumed the authority.[19] He also entered into an agreement with the Canadian Government which allocated the use of six broadcasting channels for the exclusive use of their broadcasting stations. Meanwhile, the Zenith Radio Corp. had applied for license for a station in Chicago. This was granted and the station was assigned a frequency shared with a General Electric Co. station in Denver. Only a few hours a week were available to the Chicago station. This was unsatisfactory to Zenith officials who requested the assignment of one of the channels which had been allocated to Canada. Their request was denied. They then ignored the prescribed rules and the Zenith Co. was promptly sued by the Government. On 16 April 1926, a decision was rendered which did not uphold the right of the Department of Commerce to assign frequencies. The Attorney General of the United States was forced to issue the edict that the Secretary of Commerce had no power to withhold licenses from reputable U.S. citizens, nor authority to prescribe frequencies for or hours of operation of stations. With the last vestige of control removed one can readily picture the conditions which immediately ensued. This country, scheduled to be the host nation for the first International Radio Conference since 1912, unable to control an industry within its own boundaries and unable to enforce international agreements, set a horrible example for the remainder of the world.[20]

4. THE FEDERAL RADIO COMMISSION

Immediately following the edict issued by the Department of Justice a new bill establishing a Federal Radio Commission, with authority to allocate commercial frequencies and hours of usage as well as to prescribe and supervise radio discipline, was agreed upon. This action was taken too late for the bill to be enacted into law prior to the adjournment of Congress. It was considered and passed in early 1927 and was signed by President Coolidge on 25 February 1927. The new established commission consisted of five members. The President immediately nominated Rear Adm. W. H. G. Bullard, USN (retired), as chairman and Messrs. Orestes H. Caldwell, Eugene O. Sykes, Henry A. Bellows, and John F. Dillon as members. Three of the Commission's members were confirmed on 4 March. One of the other two, Mr. Bellows, resigned on 8 October prior to confirmation. Colonel Dillon, one of the three early confirmed, died on that day and the chairman, Rear Adm. Bullard, died of a heart attack on Thanksgiving Day of the same year. The organization meeting was held on 15 March 1927.[21]

The lack of understanding of the radio situation by most of our legislators is evidenced by the provision of this Radio Act of 1927 which envisioned that the licensing authority of the Commission would be returned to the Department of Commerce at the end of one year and thereafter the Commission would only act in an advisory and appellate capacity.[22] No engineering staff was provided to assist the members in their gigantic task. In order to provide such assistance, and to eliminate the chaotic conditions which were rendering naval radio communications on and near our coastlines practically impossible, the Navy Department volunteered the services of the Radio Division of the Bureau of Ships. This proffer was accepted.

The initial action taken by the Commission occurred on 17 April 1927 when it ordered 129 stations, which had been operating on unassigned frequencies, to return to the frequencies previously assigned them by the Department of Commerce.[23]

Having established the Commission, Congress immediately proceeded to make it a political football. Broadcasters sought more favored frequencies and enlisted the support of their Congressmen as well as their listeners. The latter were encouraged to write directly to the Commission as well as to their Congressmen imploring that the station of their choice be given most favorable consideration. The Commission was quickly buried under an avalanche of letters and affidavits. One station, alone, is purported to have filed 170,000 affidavits collected from its listeners.[24] Constant congressional pressure was brought to bear upon each member of the Commission. Lawrence F. Schmekebier stated, "Probably no quasijudicial body was ever subject to so much congressional pressure as the Federal Radio

Commission. Much of this, moreover, came at a time when several members of the Commission had not been confirmed."[25]

Even under favorable conditions it is doubtful that the Commission could have executed its licensing responsibility within the alloted year. Faced with outside interference and loss of membership, it made slow progress and even that was subject to the most severe criticism. Congress, in March 1928, reluctantly extended the Radio Commission's authority for another year but curbed its authority by providing for five broadcasting zones and "a fair and equitable allocation among the different States thereof in proportion to population and area."[26] This amendment was subject to different interpretations by the several Commission members and hindered them in carrying out their responsibilities. This resulted in additional legislation being enacted in 1929 and thereafter such legislation became increasingly frequent.[27]

5. THE FOURTH INTERNATIONAL RADIO CONFERENCE

The Fourth International Radio Conference had been scheduled to convene during 1917 with the U.S. Government as host. World War I prevented this meeting. Following the conclusion of the war, the members of the Inter-Allied Radio Conference endeavored to convene this Conference at an early date. They established a Technical Committee to submit proposed redrafts of the London Convention of 1912 which would provide a new convention more in keeping with technological advances in radio. The U.S. Government agreed to circulate these proposals through diplomatic channels to the numerous nations which were to be invited to the Conference in order that they might have at least 6 months to study them prior to the convening of the Conference. The initial deliberations of this Technical Committee coincided with the beginning of enormous technological improvements in radio equipment and with the commencement of radio broadcasting. The improvements were so rapid that the Technical Committee could not make the required changes and have them circulated and studied before these changes required modifications. This condition continued for several years and was further complicated by the development of the use of short waves and the concurrent expansion of the spectrum and an increase in international radio interference.

Finally, on 4 October 1927, a decade later than its original scheduling, the Conference was convened in Washington. Almost 300 delegates, from 79 countries, including those of several colonies and possessions which were authorized independent action, were participants. The primary purpose of the Conference was to formulate international, regulations to minimize interference between radio stations engaged in international service or which were international in their capabilities of creating interference.[28]

The U.S. delegation of 15 members, appointed by President Coolidge, was headed by the Hon. Herbert Hoover, Secretary of the Department of Commerce. Capt. T. T. Craven, USN, Director of Naval Communications, was the Navy member. Capt. S. C. Hooper, Comdr. F. H. Roberts, Lt. Comdrs. W. S. Hogg, Jr., T. A. M. Craven, R. H. Blair, and L. Cooper and Lt. A. I. Price, all of the U.S. Navy, were designated technical advisors. Lt. Comdr. Tully Shelley, USN, was a member of the reception committee.[29]

The Conference was opened with a welcoming address by President Coolidge which was immediately followed by addresses by Secretary Hoover, Col. T. F. Purvis, chief of the British delegation, and Mr. G. J. Hotker, chief of the Netherlands delegation.[30] Conforming to international protocol Secretary Hoover was installed as the presiding officer of the Conference.

Secretary Hoover's address stressed the necessity of providing regulations which would not impede advances in the art or fetter the minds of persons who might be directed toward scientific discovery and technical improvement. He pointed out that the London Conference had to deal with but a few frequencies which concerned calling and communication channels for ships' use but that the present Conference must concern itself with the entire usable radio spectrum. He stated that the radiotelephone, broadcasting, direction finding, beacons, facsimile, aircraft, and the thousands of amateurs engaged in international communication, research, and experimentation had resulted in an enormous expansion of the original application of radio. He closed his address with a plea that the conferees endeavor to reach an international understanding to control these extended uses of radio.[31]

At the plenary session the following committees were established to facilitate and expedite the work of the conferees:

Committee for revision of the London Convention;
General Regulations Committee;
Mobile and Special Services Regulation Committee;
Point-to-point and Other Fixed Services Regulation Committee;
Tariff Committee;
Technical Committee;
Drafting Committee; and,
International Code of Signals Committee.

The United States proposed the use of both French and English and offered to provide the interpretors. This was agreed to by the Conference.[32]

In some countries radio was a government or quasi-government monopoly while in others it was purely a commercial operation. Difficulties arose as to the legality of regulating the latter. On a motion of the United States, this was solved by dividing the regulations into two parts, General Regulations and Supplementary Regulations. Those regulations and rules of a managerial nature and relating to the operation of radio service were put in the Supplementary Regulations. These were not to be signed by the delegates of the United States and other countries where radio was a commercial venture. A provision making the regulations of the International Telegraph Convention, to which the United States was not a party, applicable to radio was included in the Supplementary Regulations.[33]

The Convention as accepted, contained 24 articles, couched in broad terms covering the licensing of transmitting stations and operators, the inviolability of the contents of messages, intercommunication between ship and ship, and ship and coastal stations, the settlement of commercial accounts, the establishment of an international radio consulting committee, the allocation of blocks of call letters by nations, and the settlement of disputes concerning radio matters by arbitration.[34]

The radio arbitration plan caused a rift to develop during a plenary session held on 19 November. Japan and Great Britain opposed the inclusion of this article which was strongly advocated by the delegations of the United States, Argentina, Mexico, and Uruguay. The motion in favor of the article was brought to vote after extensive debate and effort at compromise, and was carried. This was the first treaty to which the United States was a party which contained an unconditional, compulsory arbitration clause.[35]

The General Regulations contained articles. The most important of these, article 5, dealt with the allocation of frequencies. Frequency was adopted as the standard of measurement, supplanting the less accurate means of specification by wavelength. Instead of making frequency allocations by countries, the Conference made allocation to specific services, all nations having equal rights to the uses of these specified bands. The allocations basically conformed to those established in the United States based upon the recommendations of its Third National Radio Conference. The band from 10 to 100 kc. was assigned to stations engaged in point-to-point service, chiefly transoceanic service. The band from 100 to 550 kc. was designated primarily for ship-to-ship, ship-to-shore, and aircraft services. This included radio beacons on a band at about 300 kc. and provided for a radio compass service on a band around 375 kc. The 500-kc. frequency remained the international calling and distress wave and could be used for message traffic only on condition that interference with call signals and distress signals would not result. The band between 194 and 285 kc. was one on which it was somewhat difficult to secure agreement. This difficulty arose because many of the European countries desired to utilize it for broadcasting. It was finally agreed that part of this band could be used for broadcasting in Europe only, and that the rest of the band would be assigned to mobile and aircraft services and to fixed stations not open to public correspondence. The band from 550 to 1500 kc. was universally recognized as the broadcasting band. One frequency in this band, 1365 kc. was assigned to small ships. The entire band could be used by mobile service in any part of the world on a noninterference basis. The band between 1500 to 60,000 kc. was divided into 40 smaller bands and apportioned between mobile services, communication between fixed stations, broadcasting, and amateur stations. This allocation of the short waves involved some changes from the Third National Radio Conference allocation, but had the advantage of giving some assurance that stations of a given type operating in this band would be able to continue their operation subject only to the adjustment of interference with other stations engaged in similar service.[36]

The Conference gave definite recognition to the amateur in international radio communication by allocating for amateur use four exclusive bands and two nonexclusive bands. This was accomplished by the efforts of the American delegation supported by the Canadian and New Zealand delegations. This provision gave amateurs greater assurance of making international contact one with another.[37]

Although the Conference recognized that the allocation of frequency bands to specific services was necessary to minimize interference, there was a corresponding desire to leave to each country, or to groups of countries in a certain region, as much freedom as possible in making assignments to stations which are not international in their effect. Freedom was left for the assignment of any frequency to any station which could not cause international interference.

It was recognized that it was inadvisable to write into the regulations definite provisions of a technical or engineering nature which might become obsolete during the next few years. Instead, general provisions calling for the maintenance of a high technical standard were adopted. For example, article 4 of the General Regulations required that a station must maintain its authorized frequency as closely as the state of the art would permit, and its radiation must be kept as free as practicable from all emissions not essential to the authorized type of communication. The various nations were allowed to fix the allowable tolerance between the assigned and transmitted frequencies, and they agreed, to take progressive advantage of technical improvements to reduce this tolerance. The width of the frequency band of a transmitter was required to be reasonably consistent with good current engineering practice for the type of emission.[38]

The conferees considered that definite dates must be set on which certain restrictions on the use of damped-wave transmitters would become effective. The regulations provided that no further installations of transmitters of this type would be installed at fixed or land stations and that, after 1 January 1930, such transmitters installed on ships should, at full power, use less than 300 watts measured at the input of the supply transformer. It was provided, however, that no restriction should be placed upon the means which an operator of a mobile station in distress could use in attracting or in indicating his position and obtaining assistance.[39] The use of existing damped-wave transmitters was to be discontinued by all land stations prior to 1 January 1935.

The Regulations annexed to the London Convention were applicable exclusively to ship-to-ship and ship-to-shore services. In the Washington Convention most of the Regulations were applicable to mobile service, including aircraft. Provisions were included covering the use of traffic frequencies, the necessary control of traffic by land stations, the routing of messages by mobile stations, and other related matters. The Regulations required absolute priority for distress calls and messages and traffic pertaining thereto. A radiotelephone distress call consisting of the spoken expression "May Day" was included in addition to the telegraphic signal. "SOS." Provision was also made for the use of a special signal for setting into operation an apparatus to give an automatic alarm and to warn someone on a ship fitted with such an installation that a distress signal would follow. A safety signal, "TTT," was also established to be used as a preamble for messages concerning the safety of navigation or containing meteorological warnings. Article 6 of the General Regulations covered the issuance of operator's certificates. These provisions differed but little from the existent requirement of the United States, except that a chief operator's license on a vessel of the first class could only be issued to persons who had a year's experience under a first-class license. Provisions were included designating the hours of service for ships with one or with two operators. Complete revised lists of abbreviations or operator's procedure signals were included. These were also made applicable to aircraft communications.[40]

Throughout their work, the delegates endeavored to keep before them the principle, enunciated by the presiding officer, that the conclusions of the Conference should be of such a nature as not to interfere with the development of the art. The regulations adopted were the absolute minimum necessary to maintain orderly communications. The Convention and annexed Regulations became effective on January 1, 1929 for all of the ratifying governments. The Governments of Spain, Egypt, and Holland volunteered to be host to the next Conference scheduled for 1932. The invitation of Spain was accepted.[41]

In this most important of all the international radio conferences, every effort was made by all of the delegates to secure the correct solution of the problems under discussion. The technical questions in particular were usually, discussed, and the conclusions arrived at, from a technical rather than a nationalistic standpoint. The general attitude was one of cooperation and of realization that the problems should be solved on their merits.

The preliminary work of the U.S. delegation and their technical assistants was thorough and of the highest order. With an allocation plan, based on services, ready to lay before the conferees, the U.S. delegation was in a position to dominate the Conference. Our delegation was ably supported by the French and Italian delegations as well as by most of those of the Western Hemisphere. In the many committee and subcommittee meetings our delegates never failed to show unanimity of opinion and effort to obtain decisions which would eliminate interference and further the art. The Navy was an important factor in the matter of radiofrequency allocation, in furthering the interests of the amateurs, and in protecting the interests of commercial communications against unnecessary governmental controls.[42]

In his closing address, made on 25 November 1927, Secretary Hoover stated:

> It is a great honor to be able to congratulate the delegations and in fact the peoples of their countries on the successful issue of this Conference. That the representatives of 80 different governments, the largest international conference of history, have been able to sit together for a period of 7 weeks and, without any important disagreement, to reach a unanimous conclusion upon so highly a technical and so difficult a problem, is in itself, not only a sign of progressive capacity of the world to solve international problems, but it is a fine tribute to the character and spirit of the delegations from all these nations.

The effects of this Conference and other national developments during 1927 were ably summed by the Director of Naval Communications, Capt. T. T. Craven, USN. He stated that the Fourth International Conference provided an agreement which made international administrative conditions more stable; the Federal Radio Commission was making the Radio Act of 1927 effective; and that national policies were becoming more firmly established. As a result of these developments, radiofrequency allocations would be more stable than heretofore and permit the improvement of radio communications equipment along definite lines. This would permit the more rapid advancement of the naval communications improvement program.[43]

The Navy willingly gave up the use of many frequencies in the successful endeavor to obtain allocations based on usage. The elimination of interference on their assigned frequencies far outweighed these losses. Basic exchanges were those of 75, 85 and 95 kc. for five frequencies between 400 and 485 kc. and 315 kc. for 355 kc. Other losses necessitated the rearrangement and sharing of frequencies by certain of the naval shore radio stations.[44]

The Washington Conference established the International Technical Consulting Committee on Radio Communications. The purpose of this body was to provide opinions and advice on technical questions of radio communications which might be submitted by adhering nations or private enterprises. This Committee, which met between International Radio Conferences, was limited to advising the International Berne Bureau of Telecommunications on questions studied. The Bureau transmitted these advices to participating nations and private enterprises concerned to provide a basis for determination of technical standards to be adopted in drafting succeeding conventions.

6. THE FIFTH INTERNATIONAL RADIO CONFERENCE

The Fifth International Radio Conference was held, as scheduled, in Madrid in 1932. For the first time it was held concurrently with the International Telegraph Conference. This Radio Conference was the least important of all those held. The work of the previous one had been so complete and the worldwide economic depression had resulted in the reduction in research capabilities and the resultant lack of progress in the art. The Conference was concerned primarily with further interference reduction, providing additional communication facilities for the rapidly expanding use of aircraft, making available additional broadcast channels in the European area where chaotic broadcast conditions existed, and in expanding the spectrum upward from 23,000 to 30,000 kc. This Conference also recognized the effectiveness of high-frequency communications for mobile marine stations and the resultant convention assigned specific high-frequency channels for this purpose in order to further reduce interference and to provide useful long-distance communication facilities.[45]

7. THE SIXTH INTERNATIONAL RADIO CONFERENCE

The Sixth International Radio Conference was held in Cairo, Egypt, with the opening session being held on 1 February, 1938. Prior to this Conference the need for regional considerations of common interests was recognized. In 1937 a conference of North American countries concerning the broadcast bands was held in Ottawa. Another conference of Western Hemisphere nations was held in Lima, Peru, to discuss aeronautical radio and, finally, one of all American countries was held in Havana to consider the Western Hemisphere position at the forthcoming conference. Similar regional conferences were held by the European nations.[46]

The United States delegation to the Cairo Conference was headed by Senator Wallace H. White of Maine. He was assisted by three other delegates, one each from the War and Navy Departments, and one from the Federal Communications Commission.[47] Capt. S. C. Hooper, USN, was a delegate.

The Cairo Conference was important because of the rapid increase in hemispheric and transoceanic aviation, the increased uses of high frequencies, and the uses of the newly developed portion of the radio spectrum between 30 and 300 mc.

The more important changes incorporated in the convention were:

Designation of radio channels for the world's seven main intercontinental air routes, including calling, safety, and service channels;

Requirement that aircraft flying maritime routes carry radio equipment capable of operating on the distress frequency of 500 kc.;

Widening high-frequency broadcast bands to 300 kc. and assignment of special bands for tropical regions:

Limiting the use of spark transmitters to three channels and making it unlawful to use such transmitters with an output in excess of 300 watts;

Limiting the frequency tolerance and decreasing bandwidth tables;

Allocation for service uses of bands between 30 and 300 mc.;

Narrowing of bandwidth assigned amateurs;

Provision of meteorological services for use of balloon-carried miniature transmitters;

Establishment of 5000 kc. as the dividing line between regional and international frequencies;

Slight improvements in operating regulations based upon experience; and,

Provision for holding regional radio conference.[48]

Prior to completing their work the conferees accepted the invitation of the government of Italy to hold the next Conference in Rome in 1942. This did not materialize because of World War II. Instead, the next International Radio Conference was held in Atlantic City following that war.

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[1] Supra, Ch. XII.

[2] "Report of the Technical Committee on International Radio Communications," p. 2.

[3] Gleason L. Archer, "History of Radio to 1926," the American Historical Society, Inc., New York, 1938, pp. 248-249.

[4] Ibid.

[5] Popular Radio, 1922, p. 61.

[6] Ibid., p. 62.

[7] Ibid.

[8] Ibid., p. 63.

[9] Gleason L. Archer, "History of Radio to 1926," the American Historical Society, Inc., New York, p. 281.

[10] Ibid., p. 317-318.

[11] Ibid.

[12] Ibid.

[13] Ibid., pp. 350-351.

[14] Ibid., p. 351.

[15] Ibid.

[16] "Recommendations For The Regulations Of Radio," adopted by Third National Radio Conference, Washington, Government Printing Office, 1924, p. 17.

[17] Ibid., p. 15.

[18] Ibid., pp. 20-21.

[19] Gleason L. Archer, "History of Radio to 1926," the American Historical Society, Inc., New York,

1938, p. 567.

20 Gleason L. Archer, "Radio and Big Business," the American Historical Society, Inc., New York, 1939, pp. 271-272.

21 Ibid., p. 306.

22 Ibid., p. 425.

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28 Proceedings of the Institute of Radio Engineers 1928, W. D. Terrell, "The International Radio Telegraph Conference of Washington, 1927," p. 409.

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30 Ibid., p. 1.

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34 Ibid. App. N contains extracts of this Convention.

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37 Ibid.

38 "International Radiotelegraph Conference, and General and Supplementary Regulations Thereto," Washington, Government Printing Office, 1937.

39 Ibid.

40 Ibid.

41 Ibid.

42 U. S. Naval Communications Bulletin No. Sixty, 15 December 1927.

43 Ibid., p. 2.

44 Ibid.

45 Journal of American Society of Naval Engineers, vol. 51, no. 2, May 1939. "International Telecommunication Conferences," S. C. Hooper, pp. 159-160.

46 Ibid., p. 159.

47 Federal Communications Commission, successor to the Federal Radio Commission was established as a permanent commission by act of Congress in 1934.

48 Journal of American Society of Naval Engineers, vol. 51, no. 2, May 1959. "International Telecommunication Conferences," S. C. Hooper, pp. 169-175.

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Communications

US Military History Companion

Related Topics

- Combat Support
- Command and Control
- Reconnaissance Satellites

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Communications

From the Revolutionary War to the present, the American military has used communications in order to command and control its forces and other assets, but the technology has changed dramatically. Methods employed during the nation's war for independence (messengers, signal lights, and voice commands) differed little from those used by ancient armies.

During the Civil War, visual signaling remained the primary communications method. The utility of the electric telegraph (invented 1837) had been amply demonstrated by European armies since the 1850s; but Albert J. Myer gave it little attention when designing the nation's first military communications organization, the U.S. Army Signal Corps. Established by an act of Congress on 21 June 1860, the Signal Corps employed Myer's "wigwag" system. Using an adaptation of the Bain telegraph code, movements of flags (and at night, torches) transmitted tactical communications within visual range. Although army signalers operated "telegraph trains" (communications wagons with telegraphs and field wire), fixed wire communications were beyond Myer's purview. With regular trips to the War Department, President Lincoln read the latest telegraphic reports on the progress of the war. The conduit for that information, more than likely, was the rival U.S. Military Telegraph, a contract firm that used commercial lines and civilian employees to meet the administrative and strategic needs of the army.

After the war, the Signal Corps assumed responsibility for the electric telegraph and used it to create a national weather service as well as a military communications network. Although visual signaling—wigwag, sun-powered heliograph, and observation balloons—remained important to the U.S. military, the Spanish-American War found commercial and military telegraph enjoying extensive use. Commanders in widely dispersed theaters of war—Cuba, Puerto Rico, and the Philippines—made use of both military and commercial telegraph. Telegraph and ocean cable connected the front lines of Cuba with defense planners in Washington. Wire communications facilities across the Philippine Islands linked the archipelago by submarine cable. At the same time, Adolphus W. Greely (chief signal officer 1887-1906) adapted and equipped the army with emerging late nineteenth-century technology, such as the telephone (invented 1876), to command and control its forces. Its use was demonstrated by the telephone system in Cuba that enabled Gen. William Shafter's Fifth Army to communicate within yards of the front line, as well as with the admiral of the U.S. Fleet.

While providing a communications network and trying to quell the Philippine War (1899-1902), the Signal Corps simultaneously supported the army on another frontier. Signal Corps celebrities such as then Lt. Billy Mitchell helped to construct the Washington-Alaska Military Cable and Telegraph System (WAMCATS). The network, which connected the region's isolated military posts, helped the army coordinate its peacekeeping efforts in the territory during the Alaska gold rush. Renamed the Alaska Communication System in 1936, it remained under military control for over sixty years. Radio replaced Alaska's telegraph system in 1928, owing much to the efforts of George Owen Squier (chief signal officer 1917-24), who tested Marconi's invention, the wireless (1895), for military use.

The U.S. Army and the U.S. Navy both employed the wireless. In 1904, a radio station in the Boston Navy Yard transmitted the first official Naval Observatory time. Although experimentation continued and the navy employed wireless to transmit time and weather reports, the navy's admirals had little faith in its tactical uses.

The Army Signal Corps introduced the first portable wireless sets into the field in 1906, and began experimenting with radio telephony (voice radio) the following year. In 1914, it tested a radio set mounted in an automobile. Parallel efforts by the navy during this period included in-house experimentation and support of the commercial development of radio. Regarded as a novelty, however, radio remained largely unused. Army land forces in World War I relied on the telephone, telegraph, and even homing pigeons for communications in the era of trench warfare.

Supporting the American Expeditionary Forces, the army was also responsible for combat photography and aviation. Nevertheless, the Signal Corps' grandest achievement was the establishment of a massive wire communications system that ran from the seacoast to the American battle zone in France. The system consisted of literally thousands of miles of administrative and combat lines: 134 permanent telegraph offices and 273 telephone exchanges, facilitated by 200 bilingual American telephone operators. Multiplex printing telegraph equipment linked Tours, Chaumont, Paris, and London.

The army's communications arm also oversaw the adaptation of the airplane to military use. With its genesis in Civil War and Spanish-American War observation balloons, the Signal Corps purchased a Wright brothers' flying machine in 1908. James Allen (chief signal officer 1906–13) and his immediate successors perceived the airplane as an observation platform and vehicle for courier service. When aviation's role as a fighting and bombing force expanded during World War I, the army created the Army Air Service (1918), separating aviation from the Signal Corps.

Experimentation before and during World War I contributed to the Signal Corps' development of radio for military purposes. Stepping stones included the achievements of Signal Corps captain (later major) Edwin H. Armstrong. Armstrong invented a major component of amplitude modulated (AM) radio—the superhetrodyne circuit—during World War I. His next invention, frequency modulated (FM) radio, came during the interwar years. Chief Signal Officer Squier facilitated the standardization and mass production of vacuum tubes. He established the first Signal Corps Laboratory at Camp Alfred Vail, New Jersey. Introduction of the SCR-68, an airborne radio telephone, and its companion ground set, the SCR-67, were significant steps in the development of radio communications.

During the interwar years, developments in both wire and radio technology set the stage for communications support for World War II. Naval research included experimentation with the radio compass, airborne radio, and radio remote control. The teletype, remarkable for its accuracy, speed, and simplicity of operation, came into the arsenal in the 1930s. The battery-powered field telephone was developed as the Germans improved both the switchboard and communications cable. The War Department Radio Net (established 1922) became the genesis for an elaborate command and control communications system that enveloped both army forces and navy ships during World War II. About the same time, the International Radio Convention (1927) adopted the navy's plan for worldwide frequency allocation.

A 25-pound army walkie-talkie, developed in 1934, made its debut in the army maneuvers of 1939. A truck-mounted long-range radio, with a 100-mile voice range and several times greater range for Morse Code, was introduced in the 1940 Louisiana maneuvers. Captain Armstrong helped Col. Roger Colton develop his invention into the army's first FM pushbutton, crystal-controlled, tactical radio in the Signal Corps Laboratory at Fort Monmouth, New Jersey. Although the army's armor and artillery branches communicated via FM radio (proven feasible by 1936), the infantry (as well as the navy) failed to integrate the new technology until after World War II.

Numerous countries claimed ownership of radar, developed during the 1930s. Its significance in World War II communications cannot be overstated. By 1943, the Germans were effectively using radar as an early warning and weapons-directional device. In the United States, navy research and development paralleled that of the Army Signal Corps. Prewar, the navy installed it on ships (1940), while the army used it as a short-range radio locator for directing searchlights. A new, long-range aircraft detector radar, on Oahu, Hawaii, issued a warning (unfortunately ignored) when Japanese aircraft approached the island on 7 December 1941. By early 1942, the Signal Corps SCR-517 microwave radar was used in aircraft to search for ships in the Atlantic. In 1944, a microwave SCR-584 helped aim U.S. weapons in combat at Anzio, Italy. By the end of the war, such communications advances as the bi-service advancement of radar, navy perfection of sonar, army development of FM radio, and overall miniaturization of electronic components laid the groundwork for the electronics and space ages to follow.

The Signal Corps used a modified SCR-271 long-range radar set (1946) to bounce radar signals off the Moon to test the properties of radio communications in space. Postwar navy technological achievements included over-horizon VHF radio communications, the use of radar waves to reflect signals off the Moon (1951), and Moon-relayed messages between Honolulu, Hawaii, and Washington (1956). Both services contributed to the development of artificial space satellites and communications. By the 1960s, rockets of the U.S. Air Force were sending manned and unmanned vehicles into space.

Improved radar supported land and air forces and naval batteries in the conduct of the Korean War. The Signal Corps played a major supporting role in that conflict. Although doctrine dictated wire as the primary means of communication, the exigencies of Korea—distance, terrain, primitive roads—led to a dependence on very high frequency (VHF) radio. VHF, effective far beyond its 25-mile range, carried teletype as well as voice traffic. It proved adaptable to the frequent infantry moves characteristic of the fighting in the first two years of the conflict. But line-of-sight properties restricted its usage; VHF station components, weighing hundreds of pounds, often required transportation to—and operation and maintenance from—high, remote communication sites. In spite of the difficulties, army communicators proclaimed VHF the backbone of communications during the Korean War.

Between Korea and Vietnam, military efforts again focused on the peaceful uses of communications. The army, in 1958, used its technology to explore outer space. The Signal Corps' Space Sentry bounced signals from the Moon, developing the ability to ensure the close tracking of satellites. The same year, Vanguard II's infrared scanning devices mapped the cloud cover over the Earth.

Technological advances in communications during the Vietnam War were the end product of twenty years of research and experimentation by the army, navy, and air force. Miniaturized electronic components increased the payloads of U.S. communications satellites propelled into space by air force boosters. One notable benefit was initiation of the first operational satellite communications system in history when the Army Satellite Communications Command established two clear channels from Tan Son Nhut, South Vietnam, to Hawaii (1964).

Radio transmission had improved as well. Line-of-sight wave transmission was surpassed by tropospheric scatter or troposcatter propagation radio with a maximum 400-mile range. The new technology enabled radio waves to travel long distances by using special antennas to bounce them off clouds of ionized particles in the higher ionosphere before they returned to Earth hundreds of miles away.

Military communications support in Southeast Asia proved that advanced electronics could master the geography. Although Vietnam's Integrated Wideband Communications System (established and funded by the air force and operated jointly with the army) never fulfilled the promise of a regional civil-military network, it demonstrated the need and effectiveness of a high-capacity area telecommunications system in an undeveloped region. More important, the wideband system reflected a permanent move to an area-oriented communications doctrine. Improved technology was directly responsible for the shift in focus.

As a joint-services endeavor, Vietnam communications included numerous examples of inter-service cooperation. For example, army field commanders enjoyed rapid aircraft response because of connectivity with air force support centers. Joint army-navy mobile riverine forces, using command and communications boats, had well established internal as well as external communications with the South Vietnamese army. A continuing problem in Vietnam, security was addressed first by the navy's "Talk Quick" system which preceded the army's automatic secure voice system (1967).

Major communications systems in Vietnam included the 1st Signal Brigade's Southeast Asia Defense Communications System and the Southeast Asia Automatic Telephone Service (1968). The latter comprised 9 switches connected to 54 automatic army, navy, and air force dial exchanges. Overall, communications support for the Vietnam war could be characterized as the beginning of an ongoing trend toward the use of commercial-type facilities for both strategic and tactical communications. While mobile multichannel radios, switchboards, and teletype centers linked headquarters throughout the chain of command, strategic and administrative networks comprised a variety of commercial sets.

Changes in military strategy and tactics such as the long-range and heavy logistical requirements of modern weapons, and reliance on coordinated air-ground operations, both prevalent in Vietnam, dictated more flexible and extensive communications support than that offered by traditional chains of command. Technical advances in communications made it possible—indeed, imperative—to create interconnecting area networks. The merger of tactical and strategic communications became official in 1966 with the formation of the 1st Signal Brigade. As part of the Strategic Communications Command, area networks linked fighters with intelligence, personnel, and logistical centers in the United States. At the same time, combat commanders kept organic tactical communications to respond to military requirements.

Higher-echelon advances did little to change Vietnam's combat communications from those of previous conflicts. Field telephones connected by single-strand wire linked artillery battery, guns, fire direction centers, and commanders. Infantry platoon command posts used small field switchboards and wire lines to connect squads, sentries, and listening posts. The 173rd Airborne Brigade, in 1965, deemed the PRC-25 (transistorized FM voice radio) its greatest communications device. Hand-held, vehicle-, and aircraft-mounted PRC-25s were the primary means of combat communication for army units from squads through division level.

The Vietnam conflict demonstrated the interdependence of the army, navy, and air forces in the conduct of mid-twentieth-century warfare. The secretary of defense acknowledged this fact in such cooperative efforts as the Joint Tactical Satellite Research and Development Program (1965). At the same time, the communications arms of the various military branches continued to invest in their own unique information systems.

Post-Vietnam technology further changed the face of military communications. The 1970s development of the semiconductor dramatically decreased size and power requirements of communications systems. The microprocessor revolution, in turn, led to the development of modules rather than discrete systems. Miniaturization, greater standardization, and modules all made commercial equipment cheaper, more adaptable, mobile, and secure.

The U.S. military's post-Cold War operations revealed major weaknesses in the Department of Defense's (DoD) efforts to weld its various communications assets into a cohesive whole. Communicators in Operation Urgent Fury (Grenada, 1983) encountered major obstacles in the coordination and provision of support for the Joint Task Force. Both the DoD and Congress took positive steps to strengthen cooperation among the various service components—DoD through the establishment of the Joint Tactical Command Control and Communications Agency (1984) and Congress with the Goldwater-Nichols Act (1986). The positive results of these and other actions became clear in Operation Just Cause (Panama, 1989-90).

Operation Desert Storm (1990-91), a major joint operation directed by the U.S. Central Command, provided a true test of service cooperation. The Persian Gulf War demonstrated that military communications had expanded and transformed into information technology. In the few years between Panama and the gulf, joint training had become the rule.

As information systems achieved equal footing with military hardware in the conduct of the Gulf War, all of the services incorporated numerous commercially produced systems. The Army Signal Corps' network, connected with those of the other services and Allied Coalition forces, spanned the geographic area with commercially developed cellular telephone and a single-channel ground and airborne radio system.

Operation Desert Storm left little doubt that late twentieth-century military communications embraced all aspects of information management. Using multimedia sources, communicators need to get the right information to the right people almost instantaneously. At the end of the twentieth century, information activities in war have equaled and in some cases supplanted industrial activities.

Military communication—or more accurately, information management—presents a seamless network on the late twentieth-century battlefield. As a result of technological advancements, the centerpiece of the battlefield is no longer simply the weapons platforms but also an information grid into which weapons are plugged.

Information technology will continue to transform military communications. Because the value of information increases exponentially through dissemination, its potential is virtually limitless.

[See also Combat Support; Command and Control; Satellites, Reconnaissance.]

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THE INTERNATIONAL RADIOTELEGRAPH CONFERENCE OF WASHINGTON

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The International Radiotelegraph Conference of Washington was opened on October 4, 1927, with an address by President Coolidge [1] and was closed on November 25, 1927, with the signing of an International Radiotelegraph Convention and Annexed General Regulations by delegates representing 78 governments [2] and a set of Annexed Supplementary Regulations by representatives of 75 governments.[3] In his closing address, Secretary Hoover, president of the conference, referred to it as "the largest international conference of history." [4]

The Washington Convention, embodying the general principles agreed

* Technical Adviser to the American delegation to the International Radiotelegraph Conference.

[1] Published in New York Times, October 5, 1927.

[2] Union of South Africa, French Equatorial Africa and other colonies, French West Africa, Portuguese West Africa, Portuguese East Africa and the Portuguese Asiatic possessions, Germany, Argentine Republic, Commonwealth of Australia, Austria, Belgium, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Republic of Colombia, Spanish Colony of the Gulf of Guinea, Belgian Congo, Costa Rica, Cuba, Curacao, Cyrenaica, Denmark, Dominican Republic, Egypt, Republic of El Salvador, Eritrea, Spain, Estonia, United States of America, Finland, France, Great Britain, Greece, Guatemala, Republic of Haiti, Republic of Honduras, Hungary, British India, Dutch East Indies, French Indo-China, Irish Free State, Italy, Japan, Chosen, Taiwan, Japanese Sakhalin, the Leased Territory of Kwantung and the South Sea Islands under Japanese Mandate, Republic of Liberia, Madagascar, Morocco (with the exception of the Spanish Zone), Mexico, Nicaragua, Norway, New Zealand, Republic of Panama, Paraguay, the Netherlands, Persia, Peru, Poland, Portugal, Rumania, Kingdom of the Serbs, Croats, and Slovenes, Siam, Italian Somaliland, Sweden, Switzerland, Surinam, Territories of Syria and The Lebanon, Republic of San Marino, Czechoslovakia, Tripolitania, Tunis, Turkey, Uruguay, and Venezuela. Of these Liberia, Persia and Rumania signed *ad referendum*. In signing the general regulations, Poland made a reservation concerning paragraph 4 of Article 5 in the terms found in the *procès verbal* of the eighth plenary session, Nov. 22.

A statement was inserted in the *procès verbal* of the eighth plenary session, Nov. 22, to the effect that the list of names appearing in the preamble as those of the contracting governments should not affect the question of votes in the next Conference.

The convention and regulations were sent to the Senate by the President on December 12, 1927, and the injunction of secrecy removed from the document on December 17. An English translation of the convention and regulations has been published as Senate Document, Executive B, 70th Congress, 1st Session. That document, hereinafter referred to as Executive B, also contains English translations of the *procès verbaux* of the plenary sessions.

[3] All of the countries listed in note two except the United States, Canada and Honduras.

[4] *Procès verbal* of ninth plenary session, Nov. 25, 1927; Executive B, p. 288.

upon by the conference, is the third of the series of conventions treating generally of the subject of radio.[5] The Berlin Convention of 1906 [6] was the first international convention which purported to cover the field of radio as it currently existed; it is of little or no importance now, as it is binding only as between countries adhering to it, when one of the interested governments has not become a party to the London Convention of 1912.[7] This latter convention, which is at present in force and will continue to be binding until it is superseded by the Washington Convention, had at the time of the opening of the 1927 conference been adhered to by 97 separate contracting parties.[8] By the time of the second plenary session, held on October 25,[9] four additional countries had adhered to the London Convention, and the adherence of still another was announced at the third plenary session, November 3.[10] Of the original 97, several adhered only a short time before the convening of the Washington Conference. The reason for adherence at that time was that the 1912 convention, under the terms of which the 1927 conference was held, permitted only governments which were parties to that convention to participate in subsequent conferences with the right to vote.

The fifteen years between the signing of the London and the Washington Conventions were exceedingly important in the field of radio communication, and the need of revising the London Convention was felt long before the 1927 conference. At the time the London Convention was signed, it was thought that the next radiotelegraph conference would be held in Washington in 1917. The World War, however, made impossible the convening of a conference at or near the tentative date. As the London Convention was not sufficient adequately to provide for the regulation of the enlarged field of radio communication, the Allied and Associated Govern-

[5] Of course, conventions not in this series have contained provisions bearing upon radio, or even, as in the case of the draft prepared by the Commission of Jurists in 1922, have been devoted to a particular phase of radio. The various earlier provisions of multilateral treaties bearing upon radio are to be found conveniently listed in *The Law of Radio Communication* by Stephen Davis, pp. 175–185. In addition to those treaties which have radio as their special subject matter, Judge Davis mentions the Convention Respecting the Rights and Duties of Neutral Powers and Persons in War on Land (1907), the Convention for the Adaptation to Naval War of the Principles of the Geneva Convention (1907), the Convention Concerning the Rights and Duties of Neutral Powers in Naval War (1907), the unratified Declaration of London (1909), the Convention for the Safety of Life at Sea (1914), the resolution on Radio Stations in China passed by the Limitation of Armament Conference of Washington (1922), and the draft prepared by the Commission of Jurists (1922). To this list should be added the Convention for the Regulation of Aerial Navigation (1919).

[6] U. S. Treaty Series No. 568; Malloy, Treaties, Conventions, International Acts, Protocols, etc., Vol. III, p. 2889.

[7] U. S. Treaty Series No. 581; Malloy, Vol. III, p. 3048.

[8] *Procès verbal* of the opening session; Executive B, p. 100.

[9] *Procès verbal* of the second plenary session; Executive B, p. 134.

[10] *Procès verbal* of the third plenary session; Executive B, p. 153.

ments prepared and put into effect a draft of revised radio regulations responsive to current developments.[11]

A resolution was adopted at Paris by the five Principal Allied and Associated Powers, looking toward the convoking of an international congress to consider all international aspects of communication by land telegraphs, cables, or radio. A conference, preliminary to such an international conference and composed of representatives of the Principal Allied and Associated Powers, convened at Washington on October 8, 1920.[12] The product of the labors of this preliminary conference was a draft of convention and regulations for a universal electrical communications union, to serve as the basis for an electrical communications conference. A technical conference held in Paris in July and August of the following year revised the technical parts of the Washington draft. Differences of opinion as to the advisability of forming an electrical communications union led to a decision to hold separate telegraph and radiotelegraph conferences. The Telegraph Conference was held in Paris in 1925, the Telegraph Regulations there adopted including as well a number of radio regulations.[13]

One of the results of these various conferences and conventions and regulations was that by the time of the opening of the Washington Conference, the problem of adjusting radio regulation to the present state of the radio art had been given thorough consideration. The governments invited to participate in the Washington meeting were well aware of the questions which would arise; and the delegates, familiar with the viewpoints of the various countries, were prepared to take all the steps which should prove necessary to reach an agreement on the proper solution of these questions.

As the basis for its labors, the Washington Conference had a Book of Proposals compiled by the International Bureau of the Telegraph Union at Berne from replies received to requests for proposals of modifications to be made in the London Convention and in the revised Washington draft of 1920. The book was printed in two columns: on the left appeared the

[11] The EU-F-GB-I (United States, France, Great Britain, Italy) Radio Protocol of Aug. 25, 1919. This document was published by the United States Navy Department in 1920.

[12] Provided for by an act dated Dec. 17, 1919, 41 Stat., Vol. I, p. 367.

[13] Particularly Articles 1 and 64; see page 34 *infra*. It is of interest to note that at its second plenary session, the Paris Conference passed the following resolution: "The conference expresses the opinion that, after the Radiotelegraph Conference of Washington, the contracting governments should consider the best way of modifying the St. Petersburg Convention, and of introducing into it the provisions of the Radiotelegraph Convention by a congress possessing the necessary powers. It expresses the hope that the Washington Conference may be able to make a similar recommendation."

At the eighth plenary session, Nov. 22, the following resolution passed by the Convention Committee on Nov. 19 was adopted: "The International Radiotelegraph Conference of Washington expresses the desire that the contracting governments shall examine the possibility of combining the International Radiotelegraph Convention with the International Telegraph Convention, and that, eventually, they shall take the necessary steps for this purpose." Executive B, p. 271.

articles of the London Convention and of the Washington draft, while on the right appeared proposals for the amendment of the particular articles or for the insertion of relevant new matter. The book proper contained 601 pages with 1768 separate proposals. It was circulated for study several months before the date set for the convening of the conference. After the publication of the book, various additional proposals were sent to the Bureau and were circulated in the form of Supplements to the Book of Proposals. Still other proposals were made during the course of the conference, so that by the time the conference adjourned a total of 1951 proposals had been circulated and had been considered by the conference.

ORGANIZATION OF THE CONFERENCE

The conference was opened by President Coolidge at 3.00 p. m., October 4, 1927, with a brief address emphasizing the importance of the work before it.[14] Mr. G. J. Hofker, head of the delegation from the Netherlands, acting as dean of the conference in the absence of Count Hamilton of Sweden, responded and nominated Mr. Herbert Hoover, head of the delegation of the United States, as president of the conference. Mr. Hoover was elected by acclamation. In his address the new president alluded to a number of the problems confronting the conference and touched in particular upon one which loomed large at the beginning of the conference—that of providing regulations which would be acceptable to those countries in which the control and management of radio communication were in the hands of private enterprises as well as those in which such communications were operated by government administrations.

The first plenary session of the conference, held on October 5, was devoted largely to the adoption of rules of procedure and the organization of committees.[15] Printed copies of a "Draft of Rules of the Conference, Submitted by the President" had been distributed in advance. In the main, the draft followed the rules which had governed the procedure of the London Conference. The more important alterations were those in Article 2 giving the president the power to select a vice-president to preside in his absence and to appoint such acting vice-presidents as might be necessary, and in Article 5 recognizing in a qualified manner the use of English. The first of these changes was made necessary because the demands upon Mr. Hoover's time were such that it would be impossible for him to be present at all of the plenary sessions. Under this provision, the president immediately designated Judge Stephen Davis, vice-chairman of the United States delegation, as vice-president. On the occasions when Judge Davis also was unable to be present, the Honorable Wallace White, Member of Congress from Maine, was designated to preside. In all three cases the conference was very fortunate in the choice of its presiding officers.

[14] *Procès verbal* of the opening session; Executive B, pp. 77–118.

[15] *Procès verbal* of the first plenary session; Executive B, pp. 119–128.

Article 5 of the draft rules provided that French should be the official language of the conference. It continued: "Nevertheless, since the presiding administration has so requested, and as an exceptional measure, English may be used. Delegations are recommended to use this privilege with discretion. Translations from French into English and *vice versa* will be made only at the request of a delegation. French alone will be used for the *procès verbaux* and the text of the convention and regulations." On the floor of the conference the Italian delegation moved to replace the third quoted sentence by the following: "Declarations, remarks and speeches pronounced in English shall immediately be translated into French." The Chinese delegation in supporting this motion suggested the following addition to it: "Those pronounced in French shall be translated into English only upon request of a delegation." The article was adopted with the amendments suggested by these two delegations.

In the course of the discussion on the adoption of Article 5 of the Rules of Procedure the Japanese delegation indicated that it desired translations from French into English. This was followed at the first meeting of the Convention Committee by a request on behalf of that delegation that all statements made in French be translated into English without further request for translations of particular remarks.[16] This procedure was adopted and was followed at all committee meetings where translation was desired as well as in plenary sessions. All documents necessary to the work of the conference were published in French by the Bureau of the conference, but unofficial English translations were usually furnished by the American delegation shortly after the distribution of the French originals.

A plan for the organization of the committees of the conference, together with an assignment of the committee chairmanships and vice-chairmanships by countries, had been prepared in advance of the opening of the conference and distributed prior to the first plenary session. Before submitting the suggested plan to the conference, the president announced some changes in the list of committee chairmanships and vice-chairmanships. The list as amended by the Chairman and adopted by the conference without change,[17] is as follows:

Committee	*Chairman*	*Vice-Chairman*
1. Convention	United States	Canada
2. General regulations	Great Britain	Spain
3. Mobile and special service regulations	Germany	Brazil
4. Point-to-point regulations and regulations for other services	Uruguay	
5. Special section to consider the report of the Committee on the Study of Code Language	Italy	Czechoslovakia
6. Tariffs, word count, and accounting	Italy	Australia

[16] *Procès verbal* of first meeting of Convention Committee, Oct. 7.

[17] *Procès verbal* of first plenary session, Oct. 5.

Committee	*Chairman*	*Vice-Chairman*
7. Technical	France	Denmark
8. Drafting	Belgium	Sweden
9. International Code of Signals	Japan	Netherlands
10. Work of the International Bureau	China	Mexico

At the second plenary session, October 25, a committee on full powers was appointed, consisting of the heads of the delegations from Finland, as chairman, Siam and Venezuela.[18]

Though the chairmanship of the Convention Committee was assigned to the United States, all of the sessions of that committee were presided over by the head of the Canadian delegation. Italy was given the chairmanship of one of the regular committees of the conference (tariffs, word count, and accounting). In addition, because of the highly specialized character of the work to be performed by the Committee to Consider the Report of the Committee on the Study of Code Language, which latter committee had met at Cortina d'Ampezzo, Italy, in 1926, under the chairmanship of the chief of the Italian delegation to the Washington Conference, the chairmanship of this special committee was likewise given to Italy. This special committee of the conference had an interesting, though brief, history, which will be touched upon later.[19]

As the Book of Proposals had been the subject of study prior to the conference with a view to the assignment of proposals to the various committees, the president submitted a preliminary list of assignments of proposals at the first plenary session. Tentatively, each committee was composed of representatives of those governments which had made proposals included within the list referred to that committee. As a delegation, however, might obtain assignment to any committee by notifying the Director of the International Bureau of its desire to serve on such committee, each delegation was represented on such committees as it cared to be.

At its first session the Convention Committee adopted as a rule of procedure, that before an article would be discussed by the committee it must be considered by a sub-committee consisting of delegates representing those governments which had made proposals for the amendment of the particular article.[20] In practice, the subcommittee was enlarged to include any delegates who desired to attend. Prior to each session of the subcommittee, its chairman prepared a transactional text of each article to be considered at that session, based upon a consideration of the various proposals for the amendment of the particular article. After a number of transactional texts had been debated, amended and finally adopted by the subcommittee, the full committee would adopt them, with or without amendment. Similar procedure was established for most of the other committees, some of which had three or more subcommittees.

[18] *Procès verbal* of second plenary session; Executive B, p. 136.

[19] See page 38 *infra.*

[20] *Procès verbal* of first meeting of Convention Committee, Oct. 5.

After an article had been adopted by the appropriate committee, the language in which it was couched was revised by the chairman and the rapporteurs of the Drafting Committee for consideration by the Drafting Committee.[21] Only after that committee had placed them in proper form did the articles come before the plenary session. In plenary session, they received two readings; the first as groups of articles came from the Drafting Committee, the second at the closing session of the conference when the entire treaty was read for the second time, the reading being of articles by number only.

THE TWO SETS OF REGULATIONS

The relationship between the Telegraph Convention and Regulations and the Radiotelegraph Convention and Regulations promised to be one of the most difficult problems of the conference.[22] The Telegraph Convention remains as it was drawn up in St. Petersburg in 1875, while the most recent regulations annexed to that convention are those drawn up in Paris in 1925. Although the United States and Canada, among other countries, have never adhered to the Telegraph Convention and Regulations, those documents are in effect among most of the countries participating in the Washington Conference.

The complications arose largely from the fact that the Regulations Annexed to the London Radiotelegraph Convention, to which the United States is a party, provide in Article 50 that:

> The provisions of the International Telegraph Regulations shall be applicable analogously to radio correspondence in so far as they are not contrary to the provisions of the present regulations.

The article then specifically enumerates a number of articles of the Telegraph Regulations applicable to radio communications. The first article of the Paris Telegraph Regulations provides:

> So far as these Regulations do not provide otherwise, provisions applicable to wire communications are also applicable to wireless communications.

In addition to this blanket clause and to several brief provisions applying specifically to radiotelegrams, the Paris Regulations contain an entire article (64), several pages in length, governing radiotelegrams. Paragraph 19 of this article states:

> Modifications of the provisions of these Regulations relating to radiotelegrams and to telegrams for multiple destinations (Art. 69), which may be rendered necessary in consequence of decisions of subsequent Radiotelegraph Conferences, will be put into force on the date fixed for the application of the provisions made by each of these latter Conferences.

[21] To Mr. Pierart, of Belgium, chairman of the Drafting Committee, more than to any other single individual, belongs the credit for the final form of the convention and regulations.

[22] See the notes exchanged between the United States and France prior to the Paris Conference; Dept. of State press release Sept. 28, 1927, U. S. Daily, Sept. 29, 1927.

The situation which confronted the conference was this: On the one hand, the governments not parties to the Paris Regulations did not desire to adopt without consideration rules in the formation of which they did not participate or of which the operation might involve constitutional difficulties. Moreover, they did not desire to incorporate by reference, rules which in the future might be altered without their consent. On the other hand, the parties to the Telegraph Regulations were opposed to reopening questions which had been settled only two years previously after long discussion and serious consideration. They felt that in services as analogous as cable and point-to-point radio, different rules should not be permitted to obtain. And they objected even to writing into the Radio Regulations the exact wording of the Paris Regulations, because future amendments of the Telegraph Regulations would not affect the corresponding changes in the Radio Regulations.

To this complication, a further one was added. While most of the important Powers represented at the conference conducted their own communication services, those services in the United States were largely in the hands of private enterprises. This meant that most of the delegates could act as representatives of governments and as heads of telegraph administrations, while the delegates of the United States were present solely as representatives of their government. Consequently, the United States delegation was compelled to refrain from taking part in those matters which were a matter of internal administration as distinguished from those of governmental concern.

This dual problem was given serious consideration by the American delegation prior to the conference. The American proposals for the amendment of the London Convention were divided into two groups: the first, the Convention and the annexed Government Regulations; the second, so-called Management Regulations.[23] At the first meeting of the Convention Committee on October 7, Judge Davis, on behalf of the delegation of the United States, formally called attention to the proposed division of the regulations into two parts.[24]

After much informal discussion of the situation with delegates from other countries, the American delegation, on October 25, presented a plan for the solution of the difficulty.[25] In brief, its four points were: (1) that the convention and annexed regulations adopted by the conference be divided into three classes, of equal binding force among the countries which signed

[23] The Management Regulations were to be signed by the operating agencies, whether government administrations or private companies. A clear and concise statement of the United States position was printed in French and Spanish, as well as English, and distributed prior to the conference. See *Projet de Convention Radioélectrique Internationale et de Règlements Gouvernementaux Annexés*, and *Proyecto de Convención Internacional de Radio y Reglamentaciones de Gobierno Anexas* (Government Printing Office, 1927).

[24] *Procès verbal* of the first meeting of the Convention Committee.

[25] At the sixth meeting of the Subcommittee of the Convention Committee.

them, namely, the convention, general regulations, and supplementary regulations; (2) that the convention consist of general provisions covering the subjects included in the London Convention and any further proposals of an amendatory character which might be adopted at the conference; (3) that the general regulations include the provisions which all governments agree must, in the public interest, be followed by their operating agencies, whether publicly or privately owned; (4) that the supplementary regulations include all rules which the countries adhering to the International Telegraph Convention and Regulations consider desirable among themselves, either in addition to those regulations or as modifications of them, and any further provisions which might be deemed advisable by the conference. It was stated that the United States expected to become a party to the convention and general regulations but not to the supplementary regulations. The heads of a number of important delegations immediately declared themselves in favor of the adoption of the plan, and it was followed by the conference without a formal vote being taken on it.

No attempt was made to separate the articles in the committees which acted upon them in the first instance, though a number of changes were made from time to time in order to avoid the necessity of certain articles being placed in the supplementary regulations. The division of the regulations into two groups was not definitely made until the Drafting Committee met to prepare the text of the entire convention and regulations for second reading, although the United States delegation made a preliminary designation on November 17.[26] The desires of the United States in the matter of placing certain articles in the supplementary regulations, arrived at in conjunction with Canada, were observed by the conference; and the document as it appears in its final form carries in the supplementary regulations only those articles which were placed there at the request of the United States.[27]

VOTES

Aside from technical problems, the question which offered the most difficulty was that of voting. The provisions of Article 12 of the London Convention on this point were unusual. According to that article, each country was entitled to one vote. If, however, a government adhered to the convention for its colonies, possessions or protectorates, subsequent conferences might decide that such colonies, possessions or protectorates, or a part thereof, should be considered as forming a country as regards the right to vote. The only qualification upon this was that the votes at the disposal

[26] At a joint meeting of the General Regulations, Mobile Services, Point-to-Point Services, and Technical Committees called for that purpose; see *procès verbal* of that session.

[27] In the *procès verbal* of the seventh plenary session, Nov. 19, there was inserted a statement by the American delegation that references in the convention or general regulations to provisions of the supplementary regulations should not be binding upon the United States. Executive B, p. 240.

of one government, including its colonies, possessions or protectorates, might never exceed six. The article concluded with a list of dominions, colonies, possessions and administrative units each of which was to be given a vote under the terms of the article.

The net effect of the article was to give Germany, the United States, France, the British Empire and Russia six votes each; Italy, the Netherlands and Portugal three votes each; Belgium, Spain and Japan two votes each; and the remainder of the contracting parties one vote each.

Whatever might have been the justification of such a provision in 1912, clearly it did not represent any adequate measure of the relative importance of the contracting countries in radio communication in 1927. Moreover, certain complicating factors had arisen. Germany had lost the colonies which had nominally been given the five extra votes accorded to the German Empire.[28] The Irish Free State had been created, and it was clearly apparent that strenuous efforts would be made to obtain for it the right to vote. Japan had been given six votes in the Washington Draft Convention of a Universal Electrical Communications Union[29] and gave notice that a similar number would be requested at the Washington Conference.[30] In addition a number of other countries had indicated their dissatisfaction with the existing arrangement.

The most comprehensive proposal for the modification of Article 12 was submitted by the British Government.[31] Briefly, it was to the effect that every independent state, dominion, colony, possession, protectorate, or territory under mandate which conducted public communication services or authorized private enterprises to conduct such services might become a contracting country and as such be entitled to one vote. Under such a plan the internal organization of the communications system would be the controlling, if not the sole, factor in the determination of the number of votes which would be accredited to a single political sovereignty. Amplifying the proposal, the British Government suggested that not more than one vote should be claimed in respect of the British non-self-governing colonies, protectorates, etc., it being understood that the British Government itself and the government of each of the self-governing dominions and British India should be given votes. The exact number of votes which it would be possible for a single government to obtain under this proposal was never definitely stated, though the number would certainly be very large.

No other general plan for the revision of Article 12 having been proposed, the British proposal formed the basis of the discussion in the subcommittee of the Convention Committee. The debate on the proper distribution of votes extended over several days, during which exceedingly divergent views were expressed. Among other suggestions was one by Dr. Wang, head of

[28] At the second plenary session, Oct. 25, Germany was granted the right to cast six votes. Executive B, p. 136.

[29] Article 22. [30] Proposal No. 105a. [31] Proposals Nos. 100, 101, 138–140.

the Chinese delegation, which would have given to each country a number of votes conditioned upon its importance in the field of radio communication, as determined by the number of radio messages in the international service originating in its territory within a specified time. Shortly after this, the United States delegation declared itself absolutely opposed to the British proposal, and indicated that it was prepared to accept as an alternative, either a system of plural votes worked out along the lines of the suggestion made by Dr. Wang or a plan under which each contracting government should receive only one vote, the term "contracting government" being narrowly defined. Finding agreement in full committee or subcommittee difficult, the delegations represented passed on to the consideration of subsequent articles.

A series of informal conferences followed, as a result of which it was decided to suppress Article 12 of the London Convention, to make no provision whatever for votes, and to leave the question of votes to be settled by the foreign offices prior to the next conference, or, failing that, by the next conference itself. The conference followed this decision.

This action called for a further decision. Various units which normally would not be considered as properly parties to an international agreement[32] were, in accordance with the terms of the London Convention, participating in the conference. The decision to abolish the unusual situation created by the London Convention gave rise to the question whether the delegates representing these units were entitled to sign the convention embodying the work of the conference. A special subcommittee of the Convention Committee, presided over by Mr. W. R. Castle, Assistant Secretary of State and member of the United States delegation, was appointed to consider the question. This subcommittee decided that as the London Convention determined the composition of the Washington Conference, the latter had no authority to refuse to any participating government the right to sign the documents adopted by the conference.[33] The course recommended by the subcommittee was adopted by the committee and followed by the conference. To forestall complications in future conferences, a statement was inserted in the *procès verbal* of the seventh plenary session, November 19, to the effect that the manner of signing the convention and regulations should have no effect whatever on the question of votes. A similar declaration was made in connection with Article 16, relating to adherences to the convention.[34]

THE CORTINA REPORT ON CODE LANGUAGE

The Paris Telegraph Conference of 1925 created a special committee for the study of the question of code language, which met at Cortina d'Ampezzo, Italy, from August 2 to August 26 of the next year. The committee's re-

[32] Compare the list of signatories given in footnote 2.
[33] *Procès verbal* of meeting of Subcommittee on Signatures, Nov. 15.
[34] *Procès verbal* of seventh plenary session, Nov. 19; Executive B, p. 235.

port, according to the resolution passed by the Paris Conference on October 17, 1925, was to be "submitted to the examination and decision of the first telegraph or radiotelegraph conference following the conclusion of the labors of the Committee."

The Cortina Conference issued a majority report signed by fourteen countries and a minority report signed by one.[35] The fundamental difference between the two reports was that the former favored a five letter code word with a rate coefficient to be determined, while the latter preferred the retention of the ten letter code word with certain modifications.

In accordance with a request transmitted by the French Government in its capacity as manager of the Telegraph Union, the Government of the United States issued invitations to the interested countries to send delegates to the Washington Conference empowered to consider and dispose of the Cortina Report. These delegates composed Committee No. 5 in the list of committees of the conference.

The first question considered by that committee at its opening session on October 11 was whether it was sitting as a part of the Washington Radiotelegraph Conference or, with the consent of the United States, as an entirely distinct Telegraph Conference. After some discussion the chairman, Mr. Gneme, head of the Italian delegation, concluded that the committee must proceed as a special Telegraph Conference, convened in Washington with the consent of the Government of the United States. This ruling was accepted by the committee, and rules modeled on those of the Paris Conference were adopted to govern the work of the newly created Telegraph Conference. After further debate on the constitution of the conference, the meeting adjourned in order that formal notification of the opening of the Telegraph Conference might be given to all the nations represented at Washington.

Two days later, October 13, the first plenary session of the Telegraph Conference was held. Immediately upon the opening of the session the British delegation made a declaration challenging the existence of the conference, on the ground that the conference had not been established in conformity with the provisions of the Telegraph Convention. The French delegation agreed with this view because the Paris Conference had decided that the next Telegraph Conference would be held in Brussels in 1930, and Article 88 of the regulations while permitting the date to be advanced, did not permit a change in the place of meeting. Other delegations expressed the fear that a difference of opinion as to the validity of the decisions reached by the conference might imperil the eventual solution of the entire question of code language.

As its final action, the committee decided to report to the Washington Conference that (a) the question of code language could not be treated as a matter pertaining to the International Radiotelegraph Conference of Wash-

[35] Great Britain.

ington; (b) that the telegraph delegations present at Washington could not organize themselves into an International Telegraph Conference in view of the provisions of Article 15 of the St. Petersburg Convention; and (c) that it was desirable that the date of the Brussels Conference be advanced from 1930 to 1928 for the sole purpose of the study of code language. The British delegation abstained from voting on paragraph (c).

The report of the committee was presented to the fourth plenary session, November 10, at which time the head of the Belgian delegation read a telegram from his government authorizing him to declare that the Belgian Government was willing to advance the date of the Brussels Conference to 1928. The British delegation objected to advancement of the date of the conference, stating that the matter deserved further consideration. At the suggestion of the President, the conference adopted the report of the committee and postponed the decision to be taken with regard to the Telegraph Conference. Later in the same session, the chairman of the Italian delegation stated that in his opinion the date for the Telegraph Conference was not within the province of the Radiotelegraph-Conference; that the normal procedure would be to inform the French administration as manager of the Telegraph Union of the recommendation of the Washington Conference and to request it to comnunicate with the Belgian Government. This course was followed by the conference.

THE CONVENTION AND REGULATIONS

Although the article setting out definitions is the first in the convention,[36] it was among the last adopted. Terms were used with an understanding of their general meaning, and near the end of the conference a special subcommittee was charged with the duty of defining terms in the sense in which they had been used. The definitions in the convention are supplemented by additional definitions in the general regulations, each group defining terms used in the document in which it appears. Of the convention definitions probably the most interesting is that of "radio communication," which is defined to apply "to the transmission by radio of writing, signs, signals, pictures, and sounds of all kinds by means of Hertzian waves." As this definition indicates, the title of the convention does not reveal its extent. Although the document is called a "Radiotelegraph Convention," its provisions were written to apply not only to radiotelegraphy but also to radiotelephony, facsimile transmissions, and all other radio transmissions by means

[36] As has been stated, the conference took the London Convention and Regulations as the basis for its labors. Consequently, the articles coming from the various committees bore numbers corresponding to those in the London documents. This numbering was retained by the plenary session, the Berne Bureau being charged with renumbering the articles and writing titles. (See *procès verbal* of ninth plenary session, Nov. 25; Executive B, p. 279.) In the succeeding pages the numbers assigned to the articles are those which will be given by the Berne Bureau; the numbers in parentheses are those designating the articles in the convention and regulations as signed.

of Hertzian waves. Another definition bearing upon the scope of the convention is that of "international service," which, after including services that are strictly international, continues: "An internal or national radio communication service which is likely to cause interference with other services outside the limits of the country in which it operates is considered as an international service from the viewpoint of interference."

Article 2 (Article 1) defines the scope of the convention. In the first paragraph the contracting governments undertake to apply the convention to all radio communication stations established or operated by them, open to the international service of public correspondence, as well as to special services covered by the regulations. These special services are defined in Article 1 of the general regulations as "services of radiobeacons, radiocompasses, transmissions of time signals, notices to navigators, standard waves, transmissions having a scientific object, etc." By paragraph 2 they further agree to take or to propose to their respective legislatures the necessary measures to impose the observance of the provisions of the convention and regulations upon individuals and private enterprises authorized to establish and operate radio communication stations in international service, whether or not open to public correspondence.[37] Paragraph 3 recognizes the right of two contracting governments to organize radio communications between themselves within certain limits.[38]

The difference between the scope of the 1912 and 1927 conventions is readily apparent. While the provisions of the earlier treaty applied only to

[37] Over the objection of the United States, this paragraph as reported out of the Convention Committee imposed upon the contracting parties a similar obligation with regard to "individual and private enterprises authorized to establish and operate radio communication stations whether or not open to the international service of public correspondence." Such a provision would have made the convention and regulations applicable to all radio communication stations, regardless of the service in which they were engaged. The conference at the second plenary session, Oct. 25, changed the paragraph into its present form; but in order to protect international communications from interference set up by stations engaged in national service, the term international service was extended to include such interference. Executive B, p. 137.

[38] The Convention Committee at its second meeting, Oct. 11, adopted a fourth paragraph in which the contracting governments agreed to exchange traffic with properly authorized private enterprises. Upon further consideration in the Subcommittee of the Convention Committee, the government administrations represented were of the opinion that the paragraph lacked mutuality; and an amended paragraph was suggested to the effect that all of the contracting parties would refuse to exchange traffic with a private enterprise that declined to deal with a government administration for the sole reason that the latter was an administration. This new provision was believed by the United States and other countries in which radio communication is conducted by private enterprises to deal too severely with such an offending company. It was finally decided to eliminate the paragraph, a decision which was reached the more readily because it was believed that no administration or private enterprise respectively would give as the sole reason for refusing to deal with a private enterprise or administration the private or public character of the latter. (Sixth session of the Subcommittee of the Convention Committee, Oct. 25.)

stations in the maritime mobile service,[39] the later one has the enlarged scope just indicated. The necessity for enlarging the scope of the 1912 convention was in a large measure responsible for the convening of the Washington Conference; the changes made merely reflect the progress of the radio art.

Article 3 (Article 3) is largely a repetition of provisions in the 1912 convention. The first paragraph relating to the organization of the service of, and the determination of the correspondence to be exchanged by, fixed stations is carried over from Article 21 of the London Convention. That part of paragraph 2 subjecting fixed stations when engaged in international service from country to country to the appropriate provisions of the convention and regulations is new, though that referring to correspondence with stations in the mobile service is not. Paragraph 3 makes obligatory the reciprocal exchange of radiotelegrams by stations in the mobile service, without regard to the radio system employed by those stations. It was largely for the purpose of obtaining the insertion of a provision similar to this that the Berlin Conference was called in 1906. It appears in both the Berlin and London Conventions. A fourth paragraph, found also in the London Convention, states that in order not to impede scientific progress the preceding paragraphs shall not prevent the eventual use of a radio system incapable of communicating with other systems, provided that this incapacity be due to the specific nature of that system and not the result of devices adopted solely to prevent intercommunication. Article 4 (Article 4) further limits the application of Article 3 by providing that notwithstanding the provisions of the latter article, a station may be assigned to a limited international service of public correspondence determined by the purpose of the correspondence or by other circumstances independent of the system employed.

Article 5 (Article 4 *bis*) is designed to insure the secrecy of radio correspondence.[40] The commitment of the governments in this article is not very extensive, but it is the most stringent upon which agreement could be reached. The Convention Committee clearly recognized that the agreement by the contracting governments "to take or to propose to their respective legislatures the necessary measures to prevent," etc., was one which could easily be made of no effect by any government so desiring. It was felt, however, that the contracting parties could be relied upon to carry out the spirit of the article, within the limits of their powers.

The specific acts to be prevented are (a) the unauthorized transmission and

[39] Article 1. The provisions relating to interference and distress had a wider scope. See Article 15.

[40] The debate on this article revealed the difference between the position of the United States and that of a number of European countries in the matter of licensing of receiving sets. The United States Government has never attempted to require any such license, and the American delegation was continually on the alert to prevent the insertion of any provision in the convention or the regulations which would compel it to do so.

reception by means of radio installations of correspondence of a private nature; (b) the unauthorized divulging of the contents, or even of the existence, of correspondence intercepted by means of radio installations; (c) the unauthorized publication or use of correspondence received by means of radio installations; and (d) the transmission or the placing in circulation of false or deceptive distress signals or distress calls. The London Convention contains no similar provision.

By the terms of Article 6 (Article 4 *ter*) the contracting governments undertake to assist each other by supplying information concerning violations of the convention and regulations, as well as, if necessary, in the prosecution of persons violating the provisions of these documents. This article, likewise, has no parallel in the London Convention.

Article 7 (Article 5) of the Washington Convention has the same purport as Article 5 of the London Convention. The earlier convention bound the contracting governments to connect coast stations with the telegraph network of the country, or at least to take other measures to insure a rapid exchange between coast stations and the telegraph system. It was clearly impossible for a government situated as that of the United States to fulfill the obligation to connect the coast stations with the telegraph system. In the Washington Convention, therefore, the provision was altered to bind the contracting governments to take the necessary measures in order that such connections be made, or at least to take steps to assure rapid and direct exchanges between land stations and the general communication system. It will be noted that the Washington Convention differs from the London Convention in that it requires the connection to be with the general communication system, whereas the London Convention merely required connection with the telegraph system.

Article 8 (Article 6) makes the International Bureau of the Telegraph Union the intermediary between the contracting governments in the furnishing of the names of stations engaged in the international service of public correspondence, of the names of stations carrying on public correspondence, of the names of stations carrying on special services, and of all data for facilitating and expediting radio communication. This article is expanded by the provisions of Article 13 of the general regulations; it is an enlargement of Article 6 of the London Convention, responsive to the enlarged scope of the new convention.

Article 9 (Article 7) is a reservation of the right of each of the contracting governments to permit in the stations mentioned in the preceding article the establishment and operation of devices, other than those covered by the data to be published in accordance with that article, for special radio transmission. It is practically identical with Article 7 of the London Convention.

Article 10 (Article 8) contains a statement of the ideal sought in international radio service. "The stations covered by Article 2 (Article 1) must, so far as practicable, be established and operated under the best conditions known to the practice of the service and must be maintained abreast of scientific and technical progress." Delegates from a number of the smaller countries kept constantly before the conference the fact that radio apparatus is expensive, and that in view of the rapid development of the art, installations comparatively new in point of time may soon not be the most efficient developed. The phrase "so far as practicable" was inserted to cover this situation; it is to be hoped that it will not be extended to permit the continuance in operation of an antiquated and inefficient station whose activities constitute a disturbance to a large number of more modern and more efficient stations.

The article is completed by a second paragraph to the effect that all stations, whatever their purpose, must, so far as practicable, be established and operated so as not to interfere with radio communications or services authorized by one of the contracting governments. It is to be noted that this paragraph applies not only to the stations covered in Article 2 (Article 1), but also to those stations, including naval and military installations, with regard to which liberty is reserved by Article 22 (Article 21). The article corresponds to Article 8 of the London Convention, but it so far expands that article that the resemblance between the two is slight indeed.

Article 11 (Article 9) relative to priority for distress calls is identical with Article 9 of the London Convention. Article 12 (Article 10) contains the only reference which the convention makes to charges. It differs from Article 10 of the London Convention (upon which the United States reserved at the time of signing) in that all details concerning charges are left to the regulations. Detailed provisions concerning charges are contained in two articles of the regulations (numbered 24 and 33 in the draft adopted by the conference), both of which at the request of the United States were inserted in the supplementary regulations.[41]

In Article 13 (Article 11) official recognition is accorded to the division of the regulations into two parts—general regulations which have the same force and go into effect at the same time as the convention, and supplementary regulations which bind only the governments which have signed them. Only the United States, Canada and Honduras did not sign the supplementary regulations, so that if ratification follows signature in all cases, the supplementary regulations will be effective among by far the larger number of parties to the convention.

The second paragraph of this article, making provision for the alteration of the convention and regulations, corresponds to Article 11 of the London Convention with some important changes. Under the Washington Convention changes may be made only by conferences of plenipotentiaries of the

[41] In accordance with a statement made by the American delegation at the seventh plenary session, reference in the convention to articles in the supplementary regulations is not binding upon the United States. Executive B, p. 240.

contracting governments, each conference fixing the time and place of the next meeting.[42] The London Convention had also a provision for the modification of the convention and regulations between conferences by common consent. With the deletion of the article relating to votes, and the understanding that the entire question of votes would be settled before the next conference, the deletion of the provision for amendments between conferences necessarily followed. Article 13 also carries a third paragraph, without precedent in the London Convention, stating that before any deliberation, each conference shall establish rules of procedure to govern debate.

In Article 14 (Article 12 *bis*) the contracting governments reserve for themselves and for private enterprises duly authorized by them, the right to make special arrangements on matters of service which do not affect the governments generally, on the condition that such arrangements must be in conformity with the convention and regulations so far as concerns interference which their execution might produce with the services of other countries. No similar provision occurs in the London Convention.

In Article 15 (Article 12 *ter*) each government reserves the right to suspend international radio communication service for an indefinite period either generally or only for certain connections or certain kinds of radio communication, provided that it immediately so advise the other contracting governments through the intermediary of the International Bureau.

The first paragraph of Article 16 (Article 13) relating to the duties of the International Bureau is almost identical with the corresponding paragraph of Article 13 of the London Convention, the changes being responsive to the enlarged scope of the new convention. The second paragraph of the article provides for the expenses of the bureau and the manner in which they are to be borne. It is completed by Article 34 (Article A49) of the general regulations, which follows Article 84 of the Telegraph Regulations rather than Article 43 of the London Regulations. Unlike the Telegraph Regulations, the Washington Radio Regulations do not assign the contracting governments to particular classes for the payment of expenses, but leave each government to notify the International Bureau of the class in which it desires to be placed.

Article 17 (Article 13 *bis*) of the convention is entirely new, the subject matter of the article having caused one of the most prolonged debates in the conference. It provides that an International Technical Consulting Committee on Radio Communications shall be established for the purpose of studying technical and related questions pertaining to these communications. This provision is amplified by Article 33 (Article 34) of the regulations. There it is specifically stated that the functions of the committee are limited to giving advice on questions which shall have been submitted to it

[42] The conference at the eighth plenary session, Nov. 22, accepted the invitation of the Spanish Government to hold the next conference in Madrid, and set the date for 1932. Executive B, p. 274.

by the participating administrations or private enterprises, and which it shall have studied. This advice is to be transmitted to the International Bureau with a view to its being communicated to the administrations and private enterprises concerned. The opposition to the establishment of the committee was based on the fear that it might develop into a supercommittee which might tend to stifle radio development. Agreement upon the creation of the committee was obtained by the limitation of its functions to a strictly advisory character.

After the question of the creation of the committee and of its powers had been disposed of, the contest centered on its composition. Countries in which radio communication is a government function felt that the dignity and authority of the committee would be impaired if representatives of private enterprises were accorded the full rights and powers granted to representatives of the administrations. They recognized the importance of having representatives of the large radio communication companies at the meetings of the committee, but they wished this presence to be in an advisory character only without carrying with it a vote in the determination of the decisions of the committee. Such a system, however, would have deprived the United States and other countries not operating their radio communication systems of any effective participation in the work of the committee. This situation, reënforced by the desire of the contracting governments to obtain the advice of the technical experts to be found in the employment of American companies, led to a compromise embodied in Article 33 of the regulations. It is there provided that the committee shall be formed, for each meeting, of experts of the administrations and authorized private companies who wish to participate in the work of the committee. Experts of the private companies participate in the work in an advisory capacity. When, however, a country is not represented by an administration, the experts of the authorized private enterprises of that country have the right to cast a single vote. Expenses of any meeting are to be borne in equal parts by the administrations and private companies participating therein; personal expenses of the experts are to be borne by the administrations or private enterprises which appointed them.

The administration of the Netherlands is charged by Article 33 with organizing the first meeting of the committee, and of drawing up its program of work.[43] Thereafter, the administrations represented at any meeting are to designate the administration which shall call the following meeting. Questions to be studied by the committee are to be sent to the administration organizing the next meeting, and this administration shall fix the date and program of that meeting. While no regular schedule of meetings of the committee is designated in the regulations, it is provided that in principle these meetings shall take place every two years.

[43] At the sixth plenary session, Nov. 18, the Netherlands delegation announced that the first meeting of the committee would be at The Hague. Executive B, p. 229.

Article 18 (Article 14), which declares that each of the contracting governments shall determine the conditions under which it will accept telegrams or radiotelegrams originating in or destined to a station not subject to the provisions of the convention, is almost identical with the first part of Article 14 of the London Convention. The article further provides that if the message is accepted, it must be transmitted and the usual charges applied to it; in the corresponding part of the London Convention nothing was said of the obligation to transmit, though the provision relative to charges is contained therein.

Article 19 (Article 16), authorizing the adherence to the convention of non-contracting governments and stating the effect of adherence and denunciation upon colonies, etc., is identical with Article 16 of the London Convention, except that the later provision treats of "colonies, protectorates, or territories under sovereignty or mandate" while the earlier one listed "colonies, possessions, or protectorates."

Article 20 (Article 18) is devoted to the arbitration of disputes regarding the interpretation or execution of the provisions of the convention or regulations. In addition to rearranging and rewriting the provisions of Article 18 of the London Convention, the conference wrote into the new document one departure from the older one, namely the provision for compulsory arbitration. While the change was opposed, there can be no doubt that the new provision is responsive to the desires of a large majority of the contracting governments.[44]

Article 21 (Article 20) differs from Article 20 of the London Convention only in providing that regulations as well as laws relating to the object of the convention shall be exchanged and that the exchange shall be through the intermediary of the International Bureau.

In Article 22 (Article 21) each of the contracting governments reserves its liberty regarding radio installations not covered in Article 2 (Article 1), and especially with reference to naval and military installations. It is further provided that, so far as practicable, these installations must comply with the provisions of the regulations regarding assistance to be given in case of distress and measures to be taken to avoid interference. To this point the article closely resembles Article 21 of the London Convention. The 1927 convention, however, proceeds to state that they must also, so far as practicable, observe the provisions concerning the types of waves and the frequencies to be used, according to the type of service which these stations carry on. The subject matter of this latter provision is more recent than the 1912 convention. Article 22 carries a further concession in the interests of efficient international radio communication in a third para-

[44] Opposition to compulsory arbitration was led by Great Britain and Japan. A British motion to eliminate the compulsory feature was defeated 43 to 7, and the article with the provision for compulsory arbitration was adopted, 38 to 10. See *procès verbal* of seventh plenary session, Nov. 19; Executive B, pp. 237, 238.

graph which obligates these stations when used for public correspondence or for special services, to conform, in general, to the provisions of the regulations for the conduct of these services. That portion of Article 21 of the London Convention which deals with fixed stations has its counterpart in paragraph 1 of Article 3 of the Washington Convention, no corresponding provision being carried in Article 22.

Articles 23 and 24 (Articles 22 and 23) are formal articles dealing with the time the convention shall go into effect, its duration, and ratification. The effective date of the convention is fixed at January 1, 1929, and the place of deposit of ratifications at Washington; otherwise Articles 22 and 23 of the London Convention are almost unchanged.

The general regulations annexed to the convention are composed of 34 articles and 8 appendices taking up more than 67 pages, as against 24 articles of the convention filling 9 pages. The provisions are largely of a technical nature, of interest primarily to telegraph operators. Extensive changes have been made in the London Regulations.

Probably the most important of the new provisions of the regulations is that contained in Article 5 relating to the allocation of frequencies. The principle of allocation of frequencies to services, not countries, was followed, and an elaborate table showing this allocation was incorporated into the article. Beginning with frequencies in the band 10–100 kilocycles per second (30,000–3,000 meters), the table shows the allocation of frequencies up to 60,000 kc/s (5 m.), with only two bands unreserved. Above the latter figure, frequency bands are unreserved.

Another important decision incorporated into the regulations is that for the eventual abolition of damped waves. Generally, the use of damped waves of a frequency of less than 375 kc/s (wave length above 800 m.) is forbidden beginning January 1, 1930; no new installations of damped wave transmitters (spark sets), except low-power transmitters, may be made in ships or aircraft beginning at the same date; the use of damped waves of all frequencies is forbidden beginning January 1, 1940, except for the low-power transmitters mentioned above; no new installations of damped wave transmitters may be made in land or fixed stations henceforth; and waves of this type are forbidden in all land stations beginning January 1, 1935. (Article 5, paragraph 8 and Article 16 [18], paragraph 1.)

The supplementary regulations are few in number, consisting of but six articles and one appendix. For the most part these relate either to raidotelegraph charges or to the procedure to be followed in radiotelephony. The Government of the United States has consistently refused to attempt to regulate charges to be applied in the radio communication service. The reason for the insertion of the article and appendix regarding radiotelephony in the supplementary regulations was the belief that the service has not yet developed to the point where specific detailed regulation is desirable. Two other articles relate to priority of communications (a part of this article appears as Article 23 of the general regulations) and to ocean letters. The remaining article provides that the International Telegraph Convention and annexed regulations shall be applicable to radiotelegrams in so far as they are not inconsistent with the International Radiotelegraph Convention and regulations. In part it corresponds to Article 50 of the London Regulations.

One of the committees of the conference devoted its entire time to a study of the International Code of Signals. Though its labors constituted an important part of the work of the conference, the conclusions of the committee have been incorporated in another document and do not appear in the convention or regulations.[45] In other cases also, careful work on the part of committees of the conference is not immediately apparent; as, for instance, in the delicate problem of preserving the proper relationship between the Radio Convention and the Convention for the Safety of Life at Sea and the Convention for the Regulation of Aerial Navigation.

An appreciation of the difficulties confronting the conference can be obtained from a careful study of the convention and regulations. Some of those difficulties appeared insurmountable even as late as the opening of the conference. The fact that the conference was a success is a tribute to the ability and earnestness of the delegates, and to the decision of their governments that a working basis for the conduct of the radio communications of the future must be found. The conference made no attempt to devise permanent regulations. It is believed that the fruit of its labors, not unduly restrictive of the progress of the radio art, will be a satisfactory guide for the period of approximately five years it is due to remain unchanged.

[45] Report of the chairman of the Committee on the International Code of Signals to the President of the International Radiotelegraph Conference, November 17, 1927.

Vallance, William Roy

Title: WILLIAM ROY VALLANCE PAPERS
Date range: 1908-1967
Location: A.V17
Size: 212 boxes

The Vallance Papers were presented by William Roy Vallance (University of Rochester, Class of 1910) in 1964 and 1967. The papers, related to Vallance's career in the State Department, consist of correspondence, memoranda, reports, proposals, documents, pamphlets, publications, other printed material, and memorabilia. Where not otherwise specified, the material is classified in two categories: correspondence and printed material. Much of the correspondence, especially letters from prominent government officials, exists as carbon copies. "Printed material" is a term used loosely to refer not only to the products of the printing press, but also to typewritten reports, directives, speeches, articles, and anything else that cannot properly be classified as correspondence. Where no type of material is specified in the description, it is understood that both types are included.

The bulk of the collection covers the years 1920-1940 and falls into two large subject categories: state and personal papers. In the 163 boxes of state papers there is emphasis on prohibition violations and early conferences on radio and telegraph law. Also represented are aliens and immigration, international claims, maritime issues, miscellaneous State Department correspondence, and other subjects. Since Vallance served on the British Empire desk in the office of the Solicitor of the State Department, a good deal of his state papers concerns British Commonwealth countries, especially Canada.

Three quarters of the 49 boxes of personal papers deal with the formation and perpetuation of various law groups in which Vallance was active, in particular the American Bar Association, the Inter-American Bar Association, which he helped to found, and the Federal Bar Association, of which he was a six-time president. The remainder of the personal papers include affiliations and personal correspondence.

See also "The *I'm Alone* Case: A Tale from the Days of Prohibition" (*University of Rochester Library Bulletin* XXIII:3, Spring 1968) by Nancy Galey Skoglund, and article based on this collection.

The collection was a gift of William Roy Vallance, presented to Rush Rhees Library in 1964 and 1967.

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Boxes 14 - 25: Canadian Relations, 1919 - 1962. Seizure of U.S. fishing vessels, International Joint Commission projects such as Columbia River, Passamaquoddy Power, and St. Lawrence Seaway

Boxes 26 - 78: Communications, 1869 - 1945. International radiotelegraphy and cable laws, communications in foreign countries, international conferences at Washington (1920 and 1927), Mexico City (1924), Paris (1921 and 1925), Brussels (1928), the Hague (1929), Madrid (1932), and Interdepartment Radio Advisory Committee

Boxes 79 - 82: Diplomatic Immunity, 1885 - 1942. Immunity from various forms of taxation

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Box 96: Latin American Relations, 1921 - 1962. Organization of American States, Pan-American Union

Box 97: League of Nations, 1920 - 1941. Communications, codification of international law

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Boxes 104 - 139: Prohibition, 1906 - 1935. Liquor control conferences and rumrunners, especially the *I'm Alone* case

Boxes 140 - 149: State Department, 1889 - 1962. Miscellaneous correspondence and printed material

Box 150: Taxation, 1921 - 1941. Taxing Americans abroad and foreigners in the United States

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Box 161: U.S. Territorial and Insular Possessions, 1920 - 1941. Antarctica, Philippines, District of Columbia

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PERSONAL PAPERS

Bibliography of articles and addresses by William Roy Vallance

STATE PAPERS

ALIENS AND IMMIGRATION

Box 1. Aliens

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1. Rights of Aliens. Correspondence, 1922 - 1941
2. Rights of Aliens. Correspondence, 1922 - 1941
3. Rights of Aliens. Printed Material, 1923 - 1940, undated
4. Suit Testing Pennsylvania Alien Registration Law. Correspondence and Printed

Material, 1939 - 1940
5. Enemy Aliens in the United States. Correspondence, 1940 - 1942
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7. Federal Code on Aliens, 1918
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Box 2. Immigration Acts of 1921 and 1924

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3. Immigration Act of 1924. Correspondence, 1924
4. Immigration Act of 1924. Correspondence, 1924
5. Immigration Act of 1924. Correspondence, 1924
6. Immigration Act of 1924. House Committee on Immigration and Naturalization Hearings, March 3, 1924
7. Immigration Act of 1924. Copy of Act
8. Immigration Act of 1924. Printed Material, 1924
9. Extradition Treaty with Mexico. Correspondence and Drafts, 1925
10. Immigration. Printed Material, 1922 - 1945

Boxes 3-9. Interdepartmental Visa Review Committee Opinions, January, 1942-January, 1945

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Box 18. International Joint Commission

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The Columbia River Supplemental Reports on the Bitterroot Valley, vol. 2, March, 1950

Box 19. International Joint Commission

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Box 22. International Joint Commission: Columbia River and Tributaries Review Report, October 1, 1948

Boxes 23-24. International Joint Commission: Passamaquoddy Tidal Power Project Report to the IJC, October, 1959 and Appendices 1 - 18

Box 25. International Joint Commission: St. Lawrence Seaway. Correspondence and Printed Material, 1939 - 1962, undated

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Box 50. Inter-American Committee on Electrical Communications [Mexico City, 1924]

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Box 59. International Radiotelegraph Conference [Washington, 1927]

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5. Sub-committees on Meteorology and Frequency of Committee No. 7. Minutes
6. Sub-committees on Meteorology and Frequency of Committee No. 7. Documents
7. Sub-committees on Meteorology and Frequency of Committee No. 7. Documents
8. Committee No. 9 on International Code of Signals
9. Committee on Voting Rights
10. Committee on the International Bureau

Box 62. International Radiotelegraph Conference [Washington, 1927]

Folder:

1. Proposals
2. Proposals
3. Proposals
4. Proposals
5. Supplements 1 - 7 to Book of Proposals
6. Supplements 1 - 7 to Book of Proposals

Box 63. International Radiotelegraph Conference [Washington, 1927]

Folder:

1. Text Submitted, Documents Nos. 113 - 325 incomplete
2. Articles Submitted and Approved
3. Articles Submitted and Approved
4. Minutes, Documents 102 - 200
5. Minutes, Documents 102 - 200
6. Minutes, Documents 102 - 200
7. Minutes, Documents 102 - 200

Box 64. International Radiotelegraph Conference [Washington, 1927]: Minutes, Documents 201 - 334 (French text)

Box 65. International Radiotelegraph Conference [Washington, 1927]: Minutes, Documents 101 -

335. Bound

Box 66. International Radiotelegraph Conference [Washington, 1927]: Minutes, Documents 180 - 265 (French text). Bound

Box 67. International Radiotelegraph Conference [Washington, 1927]

- Minutes, Documents 266 - 335 (French text).
- Bound Committee Reports. Bound

Box 68. International Radiotelegraph Conference [Washington, 1927]: Minutes, Documents 102 - 329. Extra, incomplete

Box 69. International Radiotelegraph Conference [Washington 1927]

Folder:

1. Drafts of Convention
2. Drafts of Convention
3. Drafts of Convention
4. Remarks on Draft Convention
5. Convention and Signers
6. Convention and Signers
7. Convention and Signers
8. Bibliography of Conference Documents, 1928

Box 70. International Radiotelegraph Conference [Washington, 1927]

Folder:

1. Convention Rules
2. Lists of Delegates
3. Lists of Delegates, American Representative Companies
4. Printed Material
5. Printed Material
6. Printed Material
7. Press Releases and Clippings
8. Articles and Addresses on the Conference

Box 71. International Telegraph Conference [Brussels, 1928] : Correspondence and Printed Material, 1926 - 1933, undated

Box 72. International Technical Consultative Committee on Radio Communications [The Hague, 1929]: Correspondence, 1929 - 1931

Box 73. International Technical Consultative Committee [The Hague, 1929]

Folder:

1. Lists of Delegates and Representatives
2. Proposals
3. Proposals
4. U.S. Delegation Report
5. Documents, Statements, and other Printed Material
6. Press Releases

Box 74. Fourth International Radio Conference [Madrid, 1932]

Folder:

1. Correspondence, 1929 - 1935
2. U.S. Proposals
3. U.S. Proposals
4. Regulations Annexed to the Convention
5. Printed Material

Box 75. Miscellaneous International Communications Conferences, 1921 - 1928

Folder:

1. International Radio Telegraph Conference [London, 1912], 1912 - 1926
2. International Radiotelegraph Convention [London, 1920]: Appendix No. 1 to Convention and Service Regulations, Charts
3. International Radiotelegraph Convention [London, 1920]: Appendix No. 1 to Convention and Service Regulations, Charts
4. Third National Radio Conference [Washington, 1924], 1924
5. Fourth Annual Radio Conference [Washington, 1925], 1925. (Canada, Mexico, Cuba, United States participants)
6. Conference with Canada on Wave Lengths [Washington, 1925], 1927
7. Second International Juridical Congress on Wireless Telegraphy [Geneva, 1927], 1927
8. International Juridical Congress on Wireless Telegraphy [Rome, 1928], 1928.
9. International Juridical Congress on Wireless Telegraphy [Rome, 1928], 1928.

Box 76. Miscellaneous International Communications Conferences, 1929 - 1936

Folder:

1. North American Radio Conference [1929], 1927 - 1929. (Short wave conference among U.S., Canada, Newfoundland, Cuba)
2. North American Radio Conference [1929], 1927 - 1929. (Short wave conference among U.S., Canada, Newfoundland, Cuba)
3. European Radio Conference [Prague, 1929], 1928 - 1929
4. European Radio Conference [Prague, 1929], 1928 - 1929
5. International Congress on Radio Communication [Liege, 1930], 1929 - 1930. Correspondence, proposals, terminology, word changes, reviews of Congresses
6. International Congress on Radio Communication [Liege, 1930], 1929 - 1930. Correspondence, proposals, terminology, word changes, reviews of Congresses
7. International Congress on Radio Communication [Liege, 1930], 1929 - 1930. Correspondence, proposals, terminology, word changes, reviews of Congresses
8. Aviation Radio Conference [New York, 1930], 1930
9. Fifth International Juridical Congress on Radio [Warsaw, 1931] , 1931
10. Seventh International Congress on Radio [Tangier, 1936], 1936

Box 77. Miscellaneous U.S. Communications Conferences, 1921 - 1933

Folder:

1. Interdepartmental Committee on Electrical Communications, 1921 - 1925
2. American Institute of Electrical Engineers, 1924 - 1928
3. American Radio Relay League, 1924 - 1933. International Committee on Wireless Telegraphy. American Section

4. Correspondence, 1927 - March, 1930. (Chiefly with Louis Goldsborough Caldwell)
5. Correspondence, 1927 - March, 1930. (Chiefly with Louis Goldsborough Caldwell)
6. Correspondence, 1927 - March, 1930. (Chiefly with Louis Goldsborough Caldwell)
7. Correspondence, 1927 - March, 1930. (Chiefly with Louis Goldsborough Caldwell)
8. Correspondence, 1927 - March, 1930. (Chiefly with Louis Goldsborough Caldwell)
9. Correspondence, 1927 - March, 1930. (Chiefly with Louis Goldsborough Caldwell)

Box 78. International Committee on Wireless Telegraphy. American Section. Correspondence, April, 1930 - 1937; Printed Material, 1927 - 1930, undated

DIPLOMATIC IMMUNITY

Box 79. General Correspondence

Folder:

1. Correspondence, 1916 - 1942
2. Correspondence, 1916 - 1942
3. Automobile Accidents, 1929 - 1941
4. Court Testimony, 1932 - 1941
5. Free Entry, 1921 - 1938
6. Legal Suits, 1931 - 1941
7. Legal Suits, 1931 - 1941
8. Legal Suits, 1931 - 1941
9. Legal Suits, 1931 - 1941
10. Liquor Imports during World War I, 1919 - 1937

Box 80. Tax Exemptions

Folder:

1. Correspondence, 1885 - 1941, undated
2. Correspondence, 1885 - 1941, undated
3. Correspondence, 1885 - 1941, undated
4. Correspondence, 1885 - 1941, undated
5. Correspondence, 1885 - 1941, undated
6. Correspondence, 1885 - 1941, undated
7. Correspondence, 1885 - 1941, undated
8. Correspondence, 1885 - 1941, undated
9. Opinions, Treaty Provisions, 1920 - 1937

Box 81. Tax Exemptions

Folder:

1. Automobile Taxes, 1911 - 1940, undated
2. Automobile Taxes, 1911 - 1940, undated
3. Automobile Taxes, 1911 - 1940, undated
4. Automobile Taxes, 1911 - 1940, undated
5. Automobile Taxes, 1911 - 1940, undated
6. Automobile Taxes, 1911 - 1940, undated

7. Automobile Taxes, 1911 - 1940, undated
8. Automobile Taxes, 1911 - 1940, undated
9. Gasoline Taxes, 1932 - 1939
10. Gasoline Taxes, 1932 - 1939
11. Gasoline Taxes, 1932 - 1939

Box 82. Tax Exemptions

Folder:

1. Income Taxes, 1927 - 1941
2. Income Taxes, 1927 - 1941
3. Income Taxes, 1927 - 1941
4. Income Taxes, 1927 - 1941
5. Income Taxes, 1927 - 1941
6. Inheritance Taxes, 1925 - 1938
7. Sales Taxes, 1927 - 1941
8. Sales Taxes, 1927 - 1941
9. Social Security Taxes, 1936 - 1938
10. Telegram Taxes, 1924 - 1941

INTERNATIONAL CLAIMS

Box 83. Correspondence, 1918 - 1948

Box 84. American and British Claims Arbitration

- Correspondence and Printed Material, 1912 - 1963, undated. Includes Burt Fiji Land claims, Americans in British army, Herbert Priestly Brock's kidnapping of the Vinall brothers, U.S.-Great Britain Rio Grande dispute, Irish Land Annuities, cables, and Indians Claims Commission on claims by Pottawatomi and Cayuga tribes

Box 85. Business Claims

Folder:

1. Correspondence and Printed Material, 1920 - 1942. Patents, Copyrights, and Royalties
2. Correspondence and Printed Material, 1920 - 1942. Patents, Copyrights, and Royalties
3. Correspondence and Printed Material, 1920 - 1942. Patents, Copyrights, and Royalties
4. Correspondence and Printed Material, 1920 - 1942. Patents, Copyrights, and Royalties
5. Correspondence and Printed Material, 1920 - 1942. Patents, Copyrights, and Royalties
6. Correspondence and Printed Material, 1920 - 1941, undated
7. Correspondence and Printed Material, 1920 - 1941, undated
8. Correspondence and Printed Material, 1920 - 1941, undated

Box 86. Cable Claims

Folder:

1. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims
2. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims

3. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims
4. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims
5. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims
6. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims
7. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims
8. Commercial Cable Company & Ex-German Cables, 1899 - 1928. Canadian Claims
9. Jacob Braun Estate v. Canadian Government. Correspondence, 1939 - 1942
10. Luton Trust Fund. Correspondence, 1940

Box 87. Criminal Claims

Folder:

1. American Criminals Abroad. Correspondence, 1918 - 1941
2. American Criminals Abroad (Thurman E. Gantt). Correspondence, 1934 - 1937
3. American Criminals Abroad (Thurman E. Gantt). Correspondence, 1934 - 1937
4. American Criminals Abroad (John Mulgrew). Correspondence, 1931 - 1932
5. American Criminals Abroad (George E. Reeves). Correspondence, 1935
6. Foreign Embassies in the U.S. Correspondence, 1931 - 1932
7. Foreign Criminals in the U.S. Correspondence, 1935 - 1936
8. British Suits v. the U.S. Correspondence, 1921 - 1936
9. U.S. Suits v. Great Britain. Correspondence, 1920 - 1936

Box 88. Inheritance Claims

Folder:

1. Correspondence, 1920 - 1957
2. Correspondence, 1920 - 1957
3. Correspondence, 1920 - 1957
4. Correspondence, 1920 - 1957
5. Correspondence, 1920 - 1957
6. Canadian Inheritances. Correspondence, 1918 - 1941
7. Canadian Inheritances. Correspondence, 1918 - 1941
8. Canadian Inheritances. Correspondence, 1918 - 1941
9. Foreign Claims in the U.S. Correspondence, 1920 - 1940
10. Real and Personal Property. Correspondence, 1920 - 1941
11. Treaty Rights. Printed Material, 1931 - 1940

Box 89. Inheritance Claims

Folder:

1. U.S. Claims in Europe. Correspondence, 1920 - 1946
2. U.S. Claims in Europe. Correspondence, 1920 - 1946
3. U.S. Claims in Europe. Correspondence, 1920 - 1946
4. U.S. Claims in Europe. Correspondence, 1920 - 1946
5. U.S. Claims in Europe (Eugenic Sekkinghaus Zelinka). Passports, letters used as evidence

Laws Governing Enforcement of Claims in Foreign Countries

Box 90. Mexican Claims

Folder:

1. General Claims Commission, 1928 - 1929. (Decisions 92 - 142 incomplete.)
2. General Claims Commission, 1936
3. International Boundary Commission. Correspondence, 1924 - 1937
4. International Boundary Commission. Pamphlets, 1944 - 1959
5. Mexican Claims Commission, 1929 - 1938
6. Mexican Insurrection State Department memorandum regarding protection of American interests, 1922
7. Vera Cruz Claims, 1929 - 1930

Box 91. Mexican Expropriation

Folder:

1. Correspondence, 1938 - 1939
2. Mexican Expropriations in International Law, October 11, 1938
3. Decision in case of Compañia Mexicana de Petroleo "El Aguila" *et al.* v. Expropriation Law, December 2, 1939
4. Pamphlets, 1938 - 1940
5. Articles about Mexican Expropriation, 1938 - 1940, undated
6. Articles about Mexican Expropriation, 1938 - 1940, undated

Box 92. Shipping Claims

Folder:

1. Correspondence, 1918 - 1941
2. Collisions. Correspondence, 1921 - 1944
3. Collisions. Correspondence, 1921 - 1944
4. Collisions. Correspondence, 1921 - 1944
5. Court Decisions, Reports, 1899 - 1938
6. Manatawny. Correspondence, 1927 - 1928
7. Pre-World War I Claims. Correspondence, 1922 - 1938
8. Salvage. Correspondence, 1924 - 1946
9. U.S. Seizures of Foreign Ships. Correspondence, 1921 - 1941

Box 93. World War I Alien Property Claims

Folder:

1. Diplomatic Correspondence, 1916 - 1920
2. Correspondence, 1915 - 1940. Material covers British-owned property in the U.S. and U.S.-owned property in the United Kingdom
3. Correspondence, 1915 - 1940. Material covers British-owned property in the U.S. and U.S.-owned property in the United Kingdom
4. Correspondence, 1915 - 1940. Material covers British-owned property in the U.S. and U.S.-owned property in the United Kingdom
5. Correspondence, 1915 - 1940. Material covers British-owned property in the U.S. and U.S.-owned property in the United Kingdom
6. Correspondence, 1915 - 1940. Material covers British-owned property in the U.S. and U.S.-owned property in the United Kingdom
7. Correspondence, 1915 - 1940. Material covers British-owned property in the U.S. and U.S.-owned property in the United Kingdom

8. Correspondence, 1915 - 1940. Material covers British-owned property in the U.S. and U.S.-owned property in the United Kingdom
9. German Property in the U.S. Seized by Great Britain. Correspondence, 1930
10. Printed Material, 1919 - 1928, undated

Box 94. World War I Claims Commission

Folder:

1. Mixed U.S.-German Claims Commission, 1921 - 1939. Correspondence, decisions, orders, briefs, printed material
2. Mixed U.S.-German Claims Commission, 1921 - 1939. Correspondence, decisions, orders, briefs, printed material
3. Mixed U.S.-German Claims Commission, 1921 - 1939. Correspondence, decisions, orders, briefs, printed material
4. Mixed U.S.-German Claims Commission, 1921 - 1939. Correspondence, decisions, orders, briefs, printed material
5. Mixed U.S.-German Claims Commission, 1921 - 1939. Correspondence, decisions, orders, briefs, printed material
6. Mixed U.S.-German Claims Commission, 1921 - 1939. Correspondence, decisions, orders, briefs, printed material
7. Tripartite [U.S.-Austria-Hungary] Claims Commission. Documents, 1927 - 1930, undated

Box 95. World War I Prize Court Cases

Folder:

1. Belgian Prize Cases. Decisions, 1919
2. British Prize Cases. Correspondence, 1920 - 1923
3. French Prize Cases. Correspondence, 1919 - 1920
4. French Prize Cases. Decisions, 1915 - 1917
5. French Prize Cases. Decisions, 1915 - 1917
6. French Prize Cases. Decisions, 1915 - 1917
7. French Prize Cases. Decisions, 1915 - 1917
8. French Prize Cases. Decisions, 1915 - 1917
9. French Prize Cases. Decisions, 1915 - 1917
10. French Prize Cases. Decisions, 1915 - 1917

LATIN AMERICAN RELATIONS

Box 96. Latin American Relations

- Correspondence and Printed Material, 1920 - 1962, undated Material covers Tacna-Arica Award (Peru-Chile land dispute), 8th American Scientific Congress, 6th International Conference of American States, the Organization of American States, the Pan-American Union

LEAGUE OF NATIONS

Box 97. League of Nations

Folder:

1. Correspondence, 1920 - 1941
2. First General Conference on Communications and Transit, 1920. Preparatory Documents
3. Second General Conference on Communications and Transit, 1923 - 1925. Records, texts, preparatory documents I - II
4. Second General Conference on Communications and Transit, 1923 - 1925. Records, texts, preparatory documents I - II
5. Codification of International Law, 1927 - 1928. Report and printed material
6. Codification of International Law, 1927 - 1928. Report and printed material
7. Articles about the League of Nations
8. Printed Material

MARITIME ISSUES

Box 98. Fishing

Folder:

1. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
2. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
3. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
4. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
5. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
6. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
7. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
8. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
9. Correspondence and Printed Material, 1920 - 1942. Material covers International Fisheries Commission created by E1 Paso Conference on smuggling 1925, U.S. legislation regarding fishing, international incidents involving U.S., Canada, Japan, Iceland, and others.
10. Whaling. Correspondence, 1934 - 1946, undated
11. Whaling. Correspondence, 1934 - 1946, undated
12. Whaling. Correspondence, 1934 - 1946, undated

Box 99. Whaling

Folder:

1. International Convention for the Regulation of Whaling [Geneva, 1931], 1935 - 1936
2. Agreement for the Regulation of Whaling [London, 1937], 1937 - 1939
3. International Whaling Conference [Washington, 1946], 1946
4. Printed Material, 1932 - 1940, undated
5. Printed Material, 1932 - 1940, undated
6. Printed Material, 1932 - 1940, undated

Box 100. Seamen

- Correspondence and Printed Material, 1918 - 1940. Material covers foreign laws regarding relief of national seamen, relief of sick, injured, destitute, shipwrecked seamen, personal injury suits, wages, altercations (*Algic*), arrests, U.S. legislation regarding seamen.

Box 101. Shipping

- Correspondence, 1921 - 1943. Material covers legislation (especially in mid-1930's), National Recovery Administration Code of Fair Competition, U.S. government-owned commercial vessels, U.S. Maritime Commission, foreign shipping laws, and freight rates.

Box 102. Shipping

Folder:

1. Brussels Collision Convention [1910], 1931 - 1938
2. Brussels Collision Convention [1910], 1931 - 1938
3. International Convention for the Safety of Life at Sea [1929], 1927 - 1937, undated
4. International Convention for the Safety of Life at Sea [1929], 1927 - 1937, undated
5. International Convention for the Safety of Life at Sea [1929], 1927 - 1937, undated
6. International Convention for the Safety of Life at Sea [1929], 1927 - 1937, undated
7. International Labor Organization Conference [1936], 1937 - 1939
8. Inter-American Maritime Conference [1940], 1940

Box 103. Shipping. Printed Material, 1894 - 1940, undated

PROHIBITION

Boxes 104-107. Correspondence, 1906 - 1939

- Material includes chiefly correspondence and memoranda among the Departments of State, Treasury, and Justice with U.S. Foreign Service officers and foreign ambassadors to the U.S. regarding infractions of the prohibition laws

Box 108. Clippings and Press Releases, 1922 - 1935

Box 109. Legal Documents and Speeches

Folder:

1. U.S. Liquor Legislation, 1920 - 1938, undated. Material covers liquor laws in U.S. and Philippines, and lists smuggling cases
2. Canadian Court Proceedings, 1923 - 1930
3. Canadian Court Proceedings, 1923 - 1930
4. Canadian Government Customs Documents, 1917 - 1926
5. Citations from International Smuggling Laws
6. Speeches and Articles on Smuggling, 1923 - 1962, undated. Includes Vallance's lectures to Foreign Service School

Box 110. Liquor Control Conferences, 1919 - 1926

Folder:

1. Convention to Control African Liquor Traffic [1919], 1919 - 1922
2. Conventions on Liquor Traffic: Italy and Serbia, 1922; U.S. and Netherlands, 1923-1925; U.S. and Panama, 1924; Helsingfor Protocol (north and northeastern European countries), 1924; U.S. and Belgium, 1925; Norway (proposals only), 1926
3. Ottawa Conference on Smuggling [1923], 1922 - 1929
4. Ottawa Conference on Smuggling [1923], 1922 - 1929
5. Ottawa Conference on Smuggling [1923], 1922 - 1929
6. Ottawa Conference on Smuggling [1923], 1922 - 1929
7. Ottawa Conference on Smuggling [1923], 1922 - 1929
8. Washington Conference on Smuggling [1925], 1924 - 1925
9. Washington Conference on Smuggling [1925], 1924 - 1925

Box 111. Liquor Control Conferences, 1925 - 1926

Folder:

1. E1 Paso Conference on Border Smuggling [1925]: Correspondence, drafts, reports, proposals, proceedings, 1923 - 1927
2. E1 Paso Conference on Border Smuggling [1925]: Correspondence, drafts, reports, proposals, proceedings, 1923 - 1927
3. E1 Paso Conference on Border Smuggling [1925]: Correspondence, drafts, reports, proposals, proceedings, 1923 - 1927
4. E1 Paso Conference on Border Smuggling [1925]: Correspondence, drafts, reports, proposals, proceedings, 1923 - 1927
5. E1 Paso Conference on Border Smuggling [1925]: Correspondence, drafts, reports, proposals, proceedings, 1923 - 1927
6. E1 Paso Conference on Border Smuggling [1925]: Correspondence, drafts, reports, proposals, proceedings, 1923 - 1927
7. E1 Paso Conference on Border Smuggling [1925]: Correspondence, drafts, reports, proposals, proceedings, 1923 - 1927
8. Washington Conference [With Mexico, 1926], 1925 - 1927

Box 112. Liquor Control Conferences, 1926 - 1935

Folder:

1. Havana Conference [1926], 1924 - 1926
2. Havana Conference [1926], 1924 - 1926
3. Havana Conference [1926], 1924 - 1926
4. London Conference [1926]: Printed Material, 1926 - 1931
5. Washington Conference [1927], 1926 - 1928. Canadian Royal Commission hearings, minutes, printed material
6. Washington Conference [1927], 1926 - 1928. Canadian Royal Commission hearings, minutes, printed material
7. Washington Conference [1927], 1926 - 1928. Canadian Royal Commission

hearings, minutes, printed material

8. Miscellaneous Liquor Control Conventions: United Kingdom and Finland, 1933; Brazil and Argentina, 1933; Buenos Aires Convention, 1935

Box 113. Coast Guard Intelligence Reports

Folder:

1. Indices to Circular Nos. 1-600, 701-800
2. Law Enforcement Intelligence Circulars, 1924 - 1927
3. Law Enforcement Intelligence Circulars, 1924 - 1927
4. Law Enforcement Intelligence Circulars, 1924 - 1927
5. Law Enforcement Intelligence Circulars, 1924 - 1927
6. Law Enforcement Intelligence Circulars, 1924 - 1927
7. Law Enforcement Intelligence Circulars, 1924 - 1927
8. Law Enforcement Intelligence Circulars, 1924 - 1927
9. Law Enforcement Intelligence Circulars, 1924 - 1927
10. Law Enforcement Intelligence Circulars, 1924 - 1927

Boxes 114-119. Rumrunners. A - Z

Boxes 120-129. *I'm Alone* Case. Correspondence, 1925 - 1934

- Material covers sinking and arbitration of Canadian-registered smuggler

Box 130. *I'm Alone* Case. Correspondence

Folder:

1. Correspondence, 1935 - 1938, undated
2. Correspondence, 1935 - 1938, undated
3. Correspondence, 1935 - 1938, undated
4. Correspondence, 1935 - 1938, undated
5. Correspondence, 1935 - 1938, undated
6. Justice Department Reports, 1934
7. Indices 1-393 to Papers 1-4573, 1926 - 1935
8. Indices 1-393 to Papers 1-4573, 1926 - 1935
9. Indices 1-393 to Papers 1-4573, 1926 - 1935
10. Indices 1-393 to Papers 1-4573, 1926 - 1935
11. Indices 1-393 to Papers 1-4573, 1926 - 1935

Box 131. *I'm Alone* Case. Hearings

Folder:

1. Preliminary Hearings and Statements, 1928 - 1934
2. Preliminary Hearings and Statements, 1928 - 1934
3. Preliminary Hearings and Statements, 1928 - 1934
4. Preliminary Hearings and Statements, 1928 - 1934
5. Preliminary Hearings and Statements, 1928 - 1934
6. Testimony in U.S. v. John Magnus *et al.*, February, 1928
7. Affidavits, 1929 - 1934
8. Grand Jury Decisions in Louisiana Criminal Suits, 1929 - 1930

Box 132. *I'm Alone* Case. Court Proceedings

Folder:

1. Court Minutes in U.S. v. Dan Hogan, 1929 - 1930
2. Court Minutes in U.S. v. Dan Hogan, 1929 - 1930
3. Court Minutes in U.S. v. Dan Hogan, 1929 - 1930
4. Court Minutes in U.S. v. Dan Hogan, 1929 - 1930
5. Court Minutes in U.S. v. Frank Allen *et al.*, 1930
6. Court Minutes in U.S. v. Malcolm McMasters *et al.*, 1931

Box 133. *I'm Alone* Case. Trials, Evidence, Appeals

Folder:

1. John Campbell Papers, 1931
2. Marvin James Clark Family Letters and Naval Records, 1918 - 1928
3. Marvin James Clark Family Letters and Naval Records, 1918 - 1928
4. Marvin James Clark Family Letters and Naval Records, 1918 - 1928
5. Daniel E. Hogan Papers, 1927 - 1929
6. George J. Hearn Papers, 1928 - 1930
7. Cecil P. Molyneaux Family Letters, 1930
8. Frank H. Reitman Papers, 1925 - 1932
9. Edward Satinover Papers, undated
10. Telegrams, 1928 - 1929. Photostats of coded telegrams and decoded translations from *I'm Alone* operators from Belize, B. H. to New York
11. Expense Accounts, 1929 - 1931
12. Trial Brief Memorandum
13. Appeals. Dan Hogan *et al.* v. U.S., 1930 - 1931
14. Appeals. Hogan, Molyneaux, Baker, McMasters, *et al.* v. U.S.

Box 134. *I'm Alone* Case. Arbitration Documents

Folder:

1. Registry of *I'm Alone*, 1923 - 1929
2. Coast Guard Cutter Logs, 1927 - 1929: *I'm Alone*'s movements described
3. Canadian Immigration Statements, 1928: Documents regarding crew's nationality
4. Nautical Charts
5. Appropriations and Expenses, 1924 - 1935
6. Miscellaneous Documents, 1928 - 1934

Box 135. *I'm Alone* Case. Arbitration Hearings. Transcripts: December, 1934 - January, 1935, vols. 2-4

Box 136. *I'm Alone* Case. Arbitration. Government Publications

Folder:

1. U.S. Statements and Evidence Documentary evidence, diplomatic correspondence, and answers to the Canadian Claim
2. U.S. Statement regarding Claim, June 30, 1933
3. U.S. Statement regarding Claims for Compensation, June 30, 1933
4. U.S. State Department Publications: Arbitration Series No. 2, (1) - (5), (7)
5. Canadian Government Publications, 1929 - 1935
6. Canadian Government Publications, 1929 - 1935

Box 137. *I'm Alone* Case. Documents and Photographs

Box 138. *I'm Alone* Case. Photograph Albums

Box 139. *I'm Alone* Case. Clippings

Folder:

1. Press Releases, 1929 - 1935
2. "A Skipper of the Seven Seas," by John Thomas Randell, 1929
3. U.S. Newspaper Clippings, 1929 - 1935, undated
4. U.S. Newspaper Clippings, 1929 - 1935, undated
5. U.S. Newspaper Clippings, 1929 - 1935, undated
6. U.S. Newspaper Clippings, 1929 - 1935, undated
7. U.S. Newspaper Clippings, 1929 - 1935, undated
8. U.S. Newspaper Clippings, 1929 - 1935, undated
9. U.S. Newspaper Clippings, 1929 - 1935, undated
10. U.S. Newspaper Clippings, 1929 - 1935, undated
11. U.S. Newspaper Clippings, 1929 - 1935, undated
12. U.S. Newspaper Clippings, 1929 - 1935, undated
13. U.S. Newspaper Clippings, 1929 - 1935, undated
14. U.S. Newspaper Clippings, 1929 - 1935, undated
15. U.S. Newspaper Clippings, 1929 - 1935, undated
16. Canadian Newspaper Clippings, 1930 - 1935
17. Articles on the *I'm Alone* Case, 1929 - 1935

STATE DEPARTMENT

Boxes 140-144. Correspondence, 1889 - 1957

- Material covers, among other subjects, treaties, international marriages, fur seals, Nazis and other wartime issues, citizenship, extra-territorial rights, territorial waters, and narcotics

Box 145. Internal Organization

Folder:

1. Correspondence, 1918 - 1941
2. Department Orders, 1922 - 1937
3. Department Orders, 1938 - 1941
4. Edith Miller Case, 1934 - 1937
5. Personnel Classification. Correspondence, 1923 - 1930
6. Personnel Classification. Printed Material
7. Printed Material
8. Vallance's Cases, 1927 - 1934

Boxes 146-149. Printed Material, 1913 - 1965, undated

TAXATION

Box 150. Correspondence and Printed Material, 1921 - 1941

- Material covers taxation of U.S. nationals abroad, of foreigners, property, and securities in U.S., and maritime taxes (tariffs, tonnage duties, etc.)

UNITED NATIONS

Box 151. Documents

Folder:

1. Economic and Social Council Drafts and Resolutions
2. General Assembly Documents, 1947 - 1954
3. General Assembly Documents, 1947 - 1954
4. General Assembly Documents, 1947 - 1954
5. General Assembly Documents, 1947 - 1954
6. General Assembly Documents, 1947 - 1954
7. General Assembly Documents, 1947 - 1954
8. General Assembly International Law Commission. Minutes, Reports, 1950 - 1967
9. General Assembly International Law Commission. Minutes, Reports, 1950 - 1967
10. Printed Material, 1944 - 1959

U.S. FOREIGN SERVICE

Boxes 152-153. Correspondence and Printed Material, 1920 - 1946, undated

- Material covers duty of diplomatic agents, foreign notarial service, embassy financial procedures

Box 154. Consular Regulations

- Diplomatic Serials, 1927 - 1933 Articles XI - XXI

Box 155. Consular Regulations

- Diplomatic and Consular Laws and Regulations of Various Countries, Books I & II, 1932; Foreign Service Regulations of the U.S.A., 1941

U.S. GOVERNMENT

Box 156. Treasury Department

Folder:

1. Comptroller General's Decisions on Economy Act, 1932 - 1941
2. Comptroller General's Decisions on Economy Act, 1932 - 1941
3. Comptroller General's Decisions on Economy Act, 1932 - 1941
4. Comptroller General's Decisions on Economy Act, 1932 - 1941
5. Comptroller General's Decisions on Economy Act, 1932 - 1941
6. Comptroller General's Decisions on Economy Act, 1932 - 1941
7. Treasury Department Tax Regulations, 1919 - 1944
8. Treasury Department Tax Regulations, 1919 - 1944

Box 157. Domestic Affairs; Correspondence and Printed Material, 1913 - 1941. Material covers constitutional amendments and matters pertaining to the Presidency

Box 158. U.S. Courts of Appeal and Miscellaneous Courts. Opinions and Briefs, 1911 - 1957

Boxes 159-160. U.S. Supreme Court. Opinions and Briefs, 1918 - 1966

U.S. TERRITORIAL & INSULAR POSSESSIONS

Box 161. Correspondence and Printed Material, 1920 - 1941

- Material covers Antarctica, Philippines (including the Cincinnati Soap Company Case), the District of Columbia, and others

WORLD WARS

Box 162. World War I

Folder:

1. Neutral Rights and Commerce. Correspondence, 1914 - 1919
2. Neutral Rights and Commerce. Correspondence, 1914 - 1919
3. Neutral Rights and Commerce. Correspondence, 1914 - 1919
4. Treaty of Versailles. Correspondence and Printed Material, 1919 - 1923
5. Treaty of Versailles. Correspondence and Printed Material, 1919 - 1923
6. Treaty of Versailles. Correspondence and Printed Material, 1919 - 1923
7. Treaty of Versailles. Proceedings of Committee on New States, I & II
8. Treaty of Versailles. Proceedings of Committee on New States, I & II
9. Treaty of Versailles. Analytical Table of Contents
10. Treaty of Versailles. Analytical Table of Contents

Box 163. World War II

Folder:

1. Claims. Correspondence, 1939 - 1946
2. Claims. Correspondence, 1939 - 1946
3. Claims. Correspondence, 1939 - 1946
4. Claims. Correspondence, 1939 - 1946
5. Claims. Correspondence, 1939 - 1946
6. Claims. Correspondence, 1939 - 1946
7. Neutrality Laws. Correspondence and Press Releases, 1935 - 1941
8. Neutrality Laws. Correspondence and Press Releases, 1935 - 1941
9. Prisoners of War and Internees. Correspondence, 1940 - 1941
10. Printed Material, 1943 - 1946

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Susan Burgess <skburgess@gmail.com>

LexisNexis(R) Email Request (1842:78628440)

1 message

R LexisNexis Print Delivery <lexisnexis@prod.lexisnexis.com> Sat, Mar 1, 2008 at 12:56 PM
To: skburgess@gmail.com

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Print Request: Selected Document(s): 1
Time of Request: March 01, 2008 12:56 PM EST
Number of Lines: 40
Job Number: 1842:78628440
Client ID/Project Name:

Research Information:

Note:
Leg History for HR 11964

1 of 1 DOCUMENT

Congressional Indexes, 1789-1969

TITLE: To Amend the Radio Act of 1912

CIS-NO: H323-9
SOURCE: Committee on Merchant Marine and Fisheries. House
DOC-TYPE: Published Hearing
DATE: Jan. 2, 3, 1923
LENGTH: ii+66 p.
CONG-SESS: 67-4
SESSION-DATE: 1922, 1923
CIS-HEARINGS-MICROFICHE-GROUP: 1A
SUDOC: Y4.M53:R11/12
CONGRESS: 67

CONTENT-NOTATION: Radio communications regulation by Commerce Dept, authorization

BILL-NO: 67 H.R. 11964

NOTES: Considers legislation to authorize Commerce Dept. regulation of radio facilities.

DESCRIPTORS: DEPARTMENT OF COMMERCE; RADIO (Commerce Dept regulation of radio facilities, authorization); RADIO ACT; LICENSES; TELEGRAPH; NAVY; CIVIL-MILITARY RELATIONS (Navy radio facilities regulation by Commerce Dept, authorization)

WITNESSES: ZIEGEMEIER, HENRY J. (Rear Adm., Dir of Naval Communications, Navy Dept, p. 6.) BENDER, L. B. (Maj., Army Signal Corps, p. 9.) SIBLEY, EUGENE T. (PO Dept, p. 10, 48.) WHEELER, W. A. (Bur of Agric Economics, USDA, p. 10.) MAXIM, HIRAM P. (representing Amer Radio Relay League, p. 11.) GREGG, KENNETH P. (mgr, Natl Radio Chamber of Commerce, p. 23.) CHAMBERS, FRANK B. (representing Wireless Assn of Pa, p. 25.) Hoover, Herbert 1929-1933 (Sec, Commerce Dept, p. 29.) HOGAN, JOHN V. (consulting engr, NYC, p. 43.) BELMONT, ARTHUR R. (asst engr, Boston ; Albany RR and vice chm, committee No 12 on radio and wired carrier systems, Amer Railway Assn, p. 51.) THOM, ALFRED P. (representing committee No 12 on radio and wired carrier systems, Amer Railway Assn, p. 58.) MCNAUGHTON, ANDREW D. (representing Wireless Assn of Pa, p. 61.) STEWART, CHARLES H. (pres, Amer Radio Relay League, p. 65.))

AFFILIATIONS: Department of Navy; Army Signal Corps; Department of Post Office; Department of Agriculture; American Radio Relay League; National Radio Chamber of Commerce; Wireless Association of Pennsylvania; American Railway Association

Gmail

Susan Burgess <skburgess@gmail.com>

LexisNexis(R) Email Request (1842:78628578)

4 messages

R LexisNexis Print Delivery <lexisnexis@prod.lexisnexis.com> **Sat, Mar 1, 2008 at 1:00 PM**
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Print Request: Selected Document(s): 1
Time of Request: March 01, 2008 01:00 PM EST
Number of Lines: 46
Job Number: 1842:78628578
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Research Information:

Note:
leg history for HR 7357

1 of 1 DOCUMENT

Congressional Indexes, 1789-1969

TITLE: To Regulate Radio Communication

CIS-NO: H346-4
SOURCE: Committee on Merchant Marine and Fisheries. House
DOC-TYPE: Published Hearing
DATE: Mar. 11-14, 1924
LENGTH: iv+254 p.
CONG-SESS: 68-1
SESSION-DATE: 1923, 1924
CIS-HEARINGS-MICROFICHE-GROUP: 1A
SUDOC: Y4.M53:R11/13
CONGRESS: 68

CONTENT-NOTATION: Radio communications regulation by Commerce Dept, authorization

BILL-NO: 68 H.R. 7357

DESCRIPTORS: DEPARTMENT OF COMMERCE; FEDERAL TRADE COMMISSION; INTERSTATE COMMERCE COMMISSION; FEDERAL INTERAGENCY RELATIONS; RADIO (Commerce Dept regulation of radio facilities, authorization); LICENSES; MONOPOLIES; JURISDICTION; MERCHANT MARINE; PATENTS; UNITED FRUIT CO

WITNESSES: Hoover, Herbert 1929-1933 (Sec, Commerce Dept, p. 8.) BINGHAM, DONALD C. (Commdr., Asst Dir, Naval Communications, Navy Dept, p. 12.) MAUBORGNE, JOHN

O. (Maj., Signal Corps, Research Lab, Natl Bur of Standards; representing War Dept, p. 28, 136.) CALDWELL, CHARLES P. (representing Radio Broadcaster's Soc of Amer, p. 28.) COOPER, C. B. (representing Radio Trade Assn, p. 37.) THOM, ALFRED P. (gen solicitor, Assn of Railway Execs; representing Amer Railway Assn, p. 38.) BELMONT, ARTHUR R. (vice chm, committee No 12, radio and wire carrier system, Amer Railway Assn, p. 38.) ASSERSON, RAYMOND (broadcasting supvr, NYC; on behalf of:) WHALEN, GROVER A. (commr, NYC Dept of Plant Structures, p. 40, 95, 201.) DEVERY, JOSEPH A. (asst corp counsel, NYC, p. 50.) KLUGH, PAUL B. (exec chm, Natl Assn of Broadcasters, p. 52.) HEIN, SILVIO (representing Amer Soc of Composers, Authors, and Publishers, p. 61.) ARMSTRONG, EDWIN H. (radio inventor, NYC, p. 63.) WILSON, E. S. (vp, AT;T, p. 71, 101.) HARKNESS, WILLIAM E. (asst vp, AT;T, p. 82.) WARNER, K. B. (representing Amer Radio Relay League and Natl Assn of Radio Amateurs, p. 99.) NICHOLSON, JOHN (Counsel, Committee on Legislation, US Shipping Bd, p. 103.) LEE, L. L. (Head, Radio Div, Emergency Fleet Corp, p. 108, 225.) LOGUE, W. G. (sales mgr, Independent Wireless Telegraph Co, p. 122.) SCOFIELD, FREDERIC C. (atty, Interstate Radio Telegraph Co, p. 130.) SARNOFF, DAVID (vp and gen mgr, Radio Corp of Amer, p. 157.) COVINGTON, J. HARRY (atty, representing Tropical Radio Telegraph Co, p. 203.) DAVIS, STEPHEN B. (Solicitor, Commerce Dept, p. 208.) JENKINS, C. FRANCIS (DC, p. 213.))

AFFILIATIONS: Department of Navy; War Department; U.S. Shipping Board; U.S. Shipping Board Emergency Fleet Corp.; Radio Broadcaster's Society of America; Radio Trade Association; American Railway Association; National Association of Broadcasters; American Society of Composers, Authors, and Publishers; American Telephone and Telegraph Co.; American Radio Relay League; National Association of Radio Amateurs; Independent Wireless Telegraph Co.; Interstate Radio Telegraph Co.; Radio Corporation of America; Tropical Radio Telegraph Co

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Susan Burgess <skburgess@gmail.com> **Mon, Mar 3, 2008 at 9:18 AM**
To: Hannah Bergman <hannah.haley@gmail.com>

Can I borrow your Lexis password? I'd like to see if I can find more about these documents - I don't really understand these legislative histories. I wouldn't use it til tomorrow since I'm out of the office today. Thanks!

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To: skburgess@gmail.com

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Print Request: Selected Document(s): 1
Time of Request: March 01, 2008 01:00 PM EST
Number of Lines: 46
Job Number: 1842:78628578

Client ID/Project Name:

Research Information:

Note:
leg history for HR 7357

1 of 1 DOCUMENT

Congressional Indexes, 1789-1969

[Quoted text hidden]

Hannah Bergman <hannah.haley@gmail.com> **Mon, Mar 3, 2008 at 9:28 AM**
To: Susan Burgess <skburgess@gmail.com>

Lexis is so wierd - some things are linked and some are not, and it's often hard to find stuff you know must be there. I only scrounged a bit, so some more intense looking will probably yield other stuff.

I have two Lexis accounts for school

lawschool.lexis.com
user name hhb348
password 5478779

Lexis Nexis congressional
https://proxy.wcl.american.edu/login?url=http://web.lexis-nexis.com/congcomp/form/cong/s_pubnumber.html?doctype=searchBillLaw
hb9218a
fuckme11

If for some reason it doesn't let you on - like I mixed up my passwords (it happens) just let me know and I'll double check. Sometimes Lexis is just flakey too.

From my experience, once you get that CIS # from the legislative history it's the key to finding what you need on the mircofilm. If it does turn out you need the microfilm, I'm pretty sure AU will have it - I've had to pull stuff like this from their film before. I can help you get it from the library, save on your trip to the Archives and the joys of public restroom pumping.

hannah
[Quoted text hidden]

Susan Burgess <skburgess@gmail.com> **Mon, Mar 3, 2008 at 9:49 AM**
Reply-To: skburgess@gmail.com
To: Hannah Bergman <hannah.haley@gmail.com>

Thanks!
Sent via BlackBerry

-----Original Message-----

From: "Hannah Bergman" <hannah.haley@gmail.com>

Date: Mon, 3 Mar 2008 09:28:23
To:"Susan Burgess" <skburgess@gmail.com>
Subject: Re: LexisNexis(R) Email Request (1842:78628578)

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lawschool.lexis.com <http://lawschool.lexis.com>
user name hhb348
password 5478779

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fuckme11

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hannah

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