
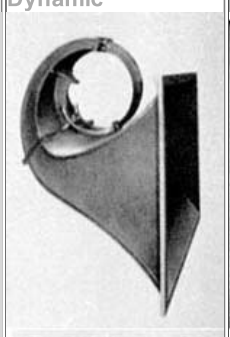







# Loudspeaker History

## Loudspeaker History

<p><b>Armature</b></p>  <p>1882 by Thomas Watson used in Bell <a href="#">cw929</a></p>	<p><b>Dynamic</b></p>  <p>1874 by Ernst Siemens used in Vitaphone</p>	<p><b>Direct Radiator</b></p>  <p>1925 by <a href="#">Rice-Kellogg</a> used in <a href="#">Altec A-7</a></p>	<p><b>Acoustic Suspension</b></p>  <p>1954 by <a href="#">Edgar Villchur</a> used in AR-3</p>	<p><b>Flat Panel</b></p>  <p>1929 by E. W. Kellogg used in <a href="#">Benwin bw2000</a></p>
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1874 - Ernst W. Siemens was the first to describe the "dynamic" or moving-coil transducer, with a circular coil of wire in a magnetic field and supported so that it could move axially. He filed his U. S. patent application for a "magneto-electric apparatus" for "obtaining the mechanical movement of an electrical coil from electrical currents transmitted through it" on Jan. 20, 1874, and was granted patent No. 149,797 Apr. 14, 1874. However, he did not use his device for audible transmission, as did Alexander G. Bell who patented the telephone in 1876. After Bell's patent was granted, Siemens applied for German patent No. 2355, filed Dec. 14, 1877, for a nonmagnetic parchment diaphragm as the sound radiator of a moving-coil transducer. The diaphragm could take the form of a cone, with an exponentially flaring "morning glory" trumpet form. This is the first patent for the loudspeaker horn that would be used on most phonographs players in the acoustic era. His German patent was granted July 30, 1878 and his British patent No. 4685 was granted Feb. 1, 1878.

1898 - Oliver Lodge filed for British patent No. 9712 on Apr. 27, 1898, for an improved loudspeaker with nonmagnetic spacers to keep the air gap between the inner and outer poles of a moving coil transducer. This was the same year he applied for a patent on his famous radio tuner. A model of his loudspeaker is in the British Science Museum in South Kensington, and a photo was published in *Wireless World* Dec. 21, 1927. This improvement was later claimed by Pridham and Jensen in the Magnavox application for patent No. 1,448,279 filed Apr. 28, 1920, and granted Mar. 13, 1923.



Oliver Lodge from [Das Fotoarchiv](#)

1901 - John Stroh first described the conical paper diaphragm that terminated at the rim of the speaker in a section that was flat except for corrugations, filed for the British patent No. 3393 on Feb. 16, 1901, granted Dec. 14, 1901.

1908 - Anton Pollak improved the moving-coil loudspeaker with a voice-coil centering spider, filed for U.S. patent No. 939,625 on Aug. 7, 1908, granted Nov. 9, 1909.

1911 - Edwin S. Pridham and [Peter L. Jensen](#) in Napa, California, invented a moving-coil loudspeaker they called the "Magnavox" that was used by [Woodrow Wilson](#) in San Diego in 1919.

1915 - Harold Arnold began program at Bell Labs to improve phonographic sound recording. The first priority was the electronic amplifier using the new vacuum tube, second was the microphone, and third was the loudspeaker that would improve the "balanced armature" units developed for public address. After WWI, J. P. Maxfield led this project that produced E. C. Wente's moving coil speaker by 1925, the Orthophonic phonographic player by 1925, and Vitaphone talking motion pictures by 1926.



early Bell loudspeakers

1918 - Henry Egerton on 1918/01/08 filed patent for balanced-armature loudspeaker, used in the Bell Labs No. 540AW speakers developed by N. H. Ricker Oct. 6, 1922, that became the 540 commercial speaker by 1924; was based on the balanced armature telephone patent of Thomas Watson granted Oct. 24, 1882, similar to devices also developed by Siemens and Frank Capps.

1921 - The [Phonotron](#) based on patent No. 1,847,935 filed Apr. 23, 1921, by C. L. Farrand, was the first coil-driven direct-radiator loudspeaker to be sold in the U.S. and was well-received, competing with the horns used by table radios



1925 Grebe radio receiver

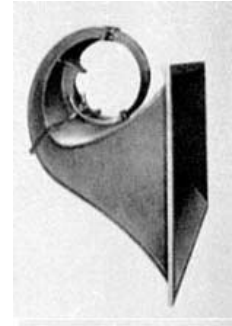
1923 - The [Thorophone](#) was a gooseneck loudspeaker with a voice-coil driver

1925 - The [research paper](#) of Chester W. Rice and Edward W. Kellogg at General Electric was important in establishing the basic principle of the direct-radiator loudspeaker with a small coil-driven mass-controlled diaphragm in a baffle with a broad midfrequency range of uniform response. Edward Wente at Bell Labs had independently discovered this same principle, filed patent No. 1,812,389 Apr. 1, 1925, granted June 30, 1931. The Rice-Kellogg paper also published an amplifier design that was important in boosting the power transmitted to loudspeakers. In 1926, RCA used this design in the [Radiola](#) line of a.c. powered radios.

1925 - Victor Orthophonic acoustic phonograph player had a folded exponential horn that was later used as model for the Klipsch speaker of the hi-fi era. Within a year, the Orthophonic faced competition from all-electric phonographs with an electromechanical pickup, vacuum-tube amplifier, and moving-coil loudspeaker, such as the Brunswick Panatrope sold by the Brunswick-Balke-Collender Company.

and 1924 Western Electric 540 speaker (NMAH)

1926 - Vitaphone sound system for motion pictures used a new speaker developed at Bell Labs. Wenthe and Thuras designed the Western Electric 555-W speaker driver that was coupled with a horn having a 1-in. throat and a 40-sq. ft. mouth; it was capable of 100-5000 hz freq. range with an efficiency of 25% (compared to 1% today) needed due to low amp power of 10 watts. The power amps were 205-D. Older loudspeakers were balanced armature type, but the newer 555-W speakers of the Vitaphone were moving coil type.



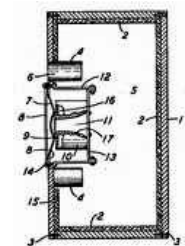
Vitaphone 555-W, from AT&T Archives

1928 - Herman J. Fanger filed patent No. 1,895,071 on Sep. 25, 1928, granted Jan. 24, 1933, that described what came to be known as the coaxial speaker, composed of a small high frequency horn with its own diaphragm nested inside or in front of a large cone loudspeaker, based on the variable-area principle that made the center cone light and stiff for high frequencies and the outer cone flexible and highly damped for lower frequencies.

1929 - E. W. Kellogg filed patent No. 1,983,377 on September 17, 1929, granted December 4, 1934, that described an electrostatic speaker composed of many small sections able to radiate sound without magnets or cones or baffles. This patent, as well as the 1932 British patents of Hans Vogt, influenced Peter Walker to build the Quad ESL flat panel speaker in 1957.

1929 - J. D. Seabert of Westinghouse developed a horn-type loudspeaker that directed the sounds of human speech toward the audience better than cone speakers that were intended for the over-all sound including music to fill the entire theater. These "directional baffle" horns had an opening 3 ft. by 4 ft. and were different from small-throat horns.

1930 - Albert L. Thuras filed patent No. 1,869,178 on Aug. 15, 1930, granted July 26, 1932, for the bass-reflex principle while working at Bell Labs. Early cabinets used a passive baffle to direct sound to the front, allowing the back of the cabinet to be open for the low sounds. The bass-reflex enclosure kept the low-frequency sounds from being lost from the rear of the diaphragm.



Thuras bass-reflex patent

1931 - Bell Labs developed the two-way loudspeaker, called "divided range" for the demonstration by H. A. Frederick in December of vertically cut records. The high frequencies were reproduced by a small horn with a frequency response of 3000-13,000 hz, and the low frequencies by a 12-inch dynamic cone direct-radiator unit with a frequency response within 5db from 50-10,000 hz. By 1933, a triple-range speaker had been developed for the Constitution Hall demo in April, adding Western Electric No. 555 driver units as the mid-range speaker. For the low frequency range 40-300 hz, a large moving coil-driven cone diaphragm in a large baffle expanding from a 12-in throat to a 60-inch mouth over a total length of 10 ft. This 3-way system was introduced in motion picture theaters as "Wide Range" reproduction.

1932 - RCA demonstrated a dual-range speaker of its own design for theaters, using three 6-inch cone diaphragms with aluminum voice coils in divergent directions, with a response of 125-8000 hz, and 10-ft. horns 40-125 hz.

1933 - "Progress was such that a demonstration of the new system - called "stereophonic" because of its ability to give a spatial sense corresponding to stereoscopic vision - was given before the National Academy of Sciences and many invited guests at Constitution Hall, Washington in the spring of 1933. Transmission was

over wire lines from the Academy of Music in Philadelphia and three channels were used with microphones respectively at left, center and right of the orchestra stage and loud speakers in similar positions in Constitution Hall." This transmission of music "was carried out with special loud speakers developed for the purpose by Dr. Wenthe and the late A. L. Thuras. The objectives in the design of these loudspeakers were uniform response over the whole tonal range of the orchestra, an enhanced sound power output capacity without noticeable non-linear distortion and uniform distribution of the emitted sound at all frequencies throughout a wide solid angle. For the receiving unit and the multicellular horn which were developed for this demonstration, Dr. Wenthe, jointly with the Bell Telephone Laboratories, was awarded a gold plaque by the Academy of Motion Picture Arts and Sciences in 1936." (Bell Labs, 1953)



Thuras theater speaker 1933, from AT&T Archives

1935 - Douglas Shearer and John Hilliard at MGM developed a standard theater speaker system, starting with the Loews 5000-seat Capitol Theater on Broadway. James Lansing and Dr. John F. Blackburn of Cal Tech designed a 2-way speaker system; the high frequency driver had a 3-inch aluminum diaphragm and throat size of 1.4 inches; the low frequency baffled cone unit was 15 inches. ERPI provided speakers from Fletcher's hi-fi experimental equipment to help design the speakers. The low frequency horn used four 15-in. Lansing cone drivers and Lansing 284 drivers for multicell horns of different sizes. The system was installed in 12 theaters for the opening of "Romeo and Juliet" with Norma Shearer, sister of Douglas,

then installed in all Loews Theaters, then became the standard established by the Academy.

1940 - Paul W. Klipsch filed patent No. 2,310,243 on Feb. 5, 1940, granted Feb. 9, 1943, for the corner horn speaker.

1941 - Altec Lansing Corp. was formed when Altec bought Lansing; Altec Service Corp. (from "all technical") had been formed in 1938 by M. Conroe and George Carrington to manage ERPI installations after ERPI was dissolved. John Hilliard worked at Altec Lansing in 1943 on magnetic airborne sub detection and in 1945 put on the market the 2-way "Voice of the Theater" speaker system with improved horns and magnet drivers. See [Lansing Heritage](#) for images and a detailed history.



Altec A-7 Voice of the Theatre, from Audio, Dec. 1961

1949 - W. E. Kock and F. K. Harvey at Bell Labs developed the acoustical lens, and reported findings in 1949 JAES. These lenses are used in James B. Lansing theater speakers and home hi-fi speakers

1953 - Arthur Janszen was granted patent No. 2,631,196 on March 10, 1953, for an electrostatic high-frequency speaker

1954 - Acoustic Research introduced the small AR-1 bookshelf loudspeaker that used the acoustic

suspension principle developed by company co-founder [Edgar Villchur](#). This was soon followed by the \$89 AR-2 and by the AR-3 with improved domed tweeters in 1958.

1957 - Quad ESL marketed as the first full-range electrostatic loudspeaker, designed by Peter Walker and David Williamson, based on Edward W. Kellogg's patent No. 1,983,377 filed September 17, 1929 and granted December 4, 1934.

1974 - *Earthquake* premiered Nov. 15 in the Chinese Theater in Hollywood with Universal Picture's Sensurround process developed by W. O. Watson and Richard Stumpf at Universal. Four large low-frequency horns were located behind the screen, two in each corner. The Model W horn in each corner was 8 ft. long, 4 ft. wide, 4 ft. high. The Model C horn in each corner was a modular unit 1 ft. wide and 5 ft. high.

Two additional horns were located on a platform in the rear of the theater. Each horn was driven by a 1000-watt amplifier controlled by inaudible tones on a special optical control track along with the normal 4-track magnetic soundtrack of the 35mm Panavision filmstrip.



Walker's ESL, from [Quad](#)



Avery Fisher with 9-tube amp and coaxial speaker, from *Fortune*, Oct. 1946

1982 - *Return of the Jedi* was the first movie exhibited on the THX sound system designed by George Lucas and Tomlinson Holman; THX "is comprised of customized acoustical design work for each auditorium, a

special screen speaker installation method, a proprietary electronic crossover network, and rigorous audio equipment specifications and performance standards."

1996 - The Verity Group in Britain formed New Transducers Ltd, now known as the [NXT](#) company, to develop the Distributed-Mode Loudspeaker (DML) based on the 1991 patent by Dr Ken Heron of Britain's Defence Evaluation & Research Agency (DERA)



[Benwin](#) 1998 flat panels

1998 - Benwin marketed the first DML flat panel loudspeakers

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### Sources:

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### Links:

[Actual Electrostatic Speakers from Quad](#)

[Altec Lansing Unofficial Webpage](#)

[JBL history since 1927](#)

[Lansing Heritage](#) has profiles on [JBL History](#) and the [Shearer Horn of 1935](#) and the [Iconic of 1937](#) and the [Altec 604](#) and the [Altec Voice of the Theatre](#) and [John Hilliard](#) and [Dr. John F. Blackburn](#) and [Altec catalogs](#) from 1941 to the present.

[Smithsonian National Museum of American History \(NMAH\) electrical exhibits](#)

[Wharfedale history since 1932](#)

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Return to [Recording Technology History](#) | this page revised 8/2/01