IEEE Milestones Program

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Preserving, Researching and Promoting the Legacy of Electrical Engineering and Computing

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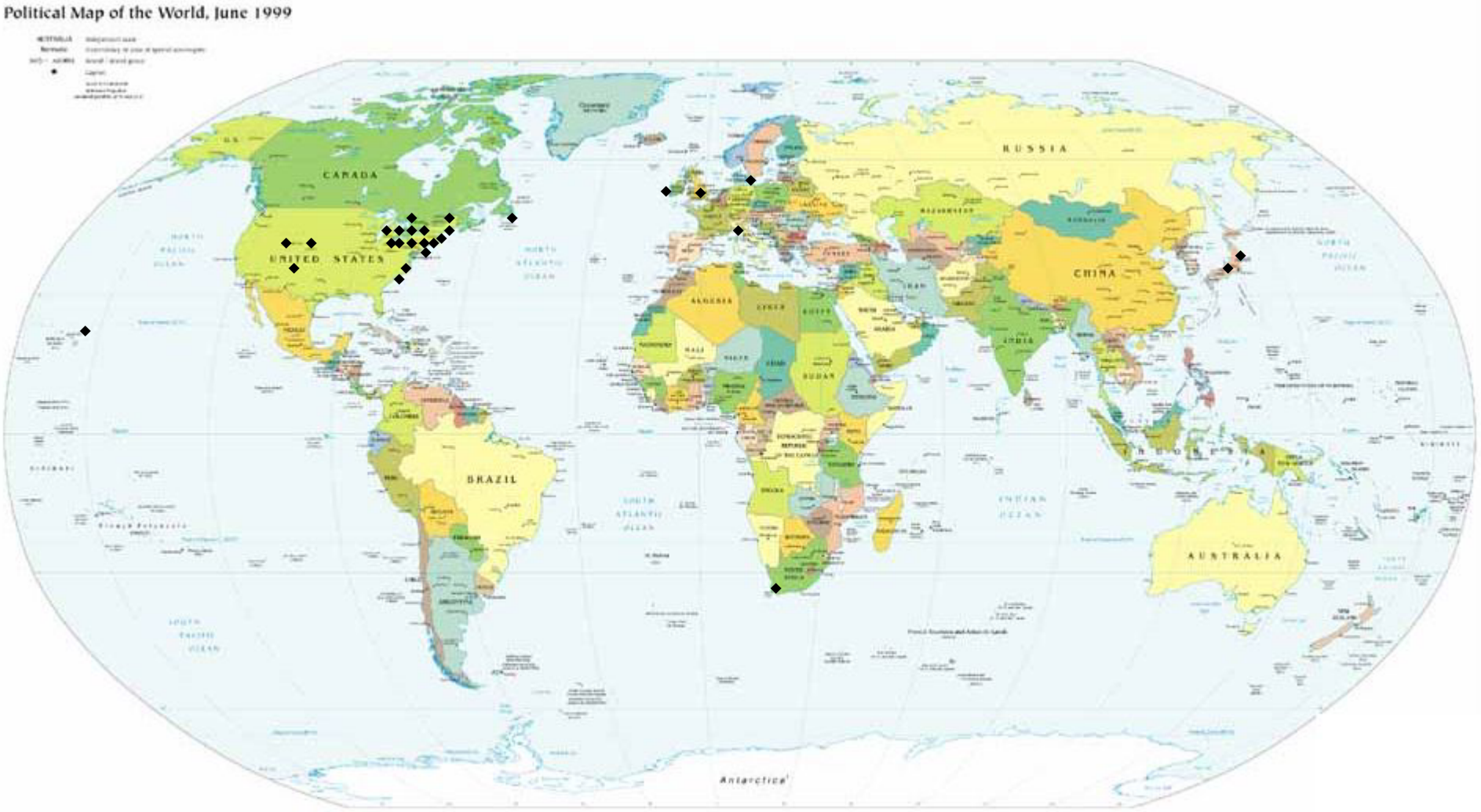
IEEE Milestones Locations



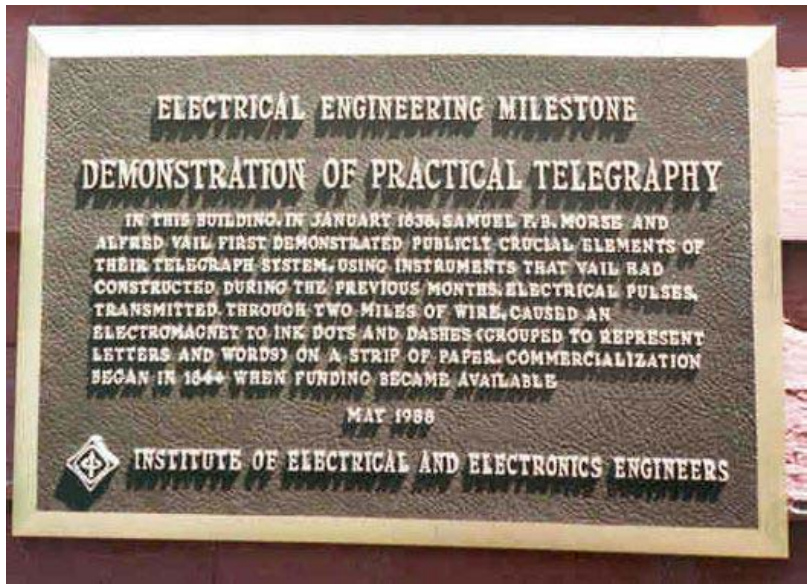
- Some of these symbols represent multiple Milestones

IEEE History Center - Milestone Program

IEEE Networking the World™

IEEE Milestones Program

- Over 30 Milestones
- Located in 9 of the 10 Regions
- Sponsored by the Section
- Forms and information available on-line

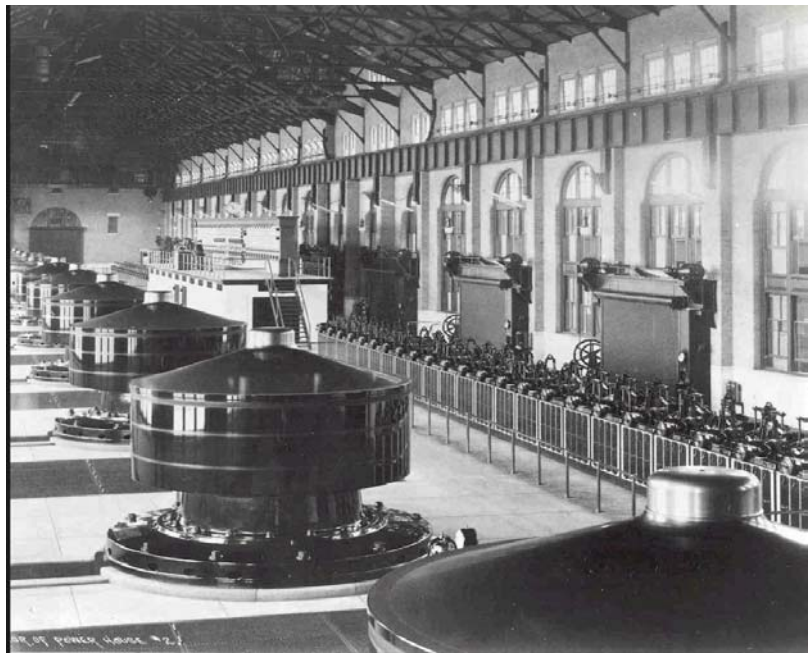


IEEE Milestones Program Guidelines

- Milestone proposal is submitted by a Section, a Society, or a Chapter to the Milestones Administrator at the IEEE History Center
- Milestone Subcommittee reviews proposal for appropriateness. Invites full nomination and forms Ad Hoc Subcommittee
- Submits completed nomination form, which must be endorsed by the IEEE Section
- Approval by Ad Hoc Subcommittee, including wording
- Approval by IEEE History Committee
- Approval by IEEE Executive Committee
- Milestone Dedication Ceremony

Adams Hydroelectric Generating Plant, 1895

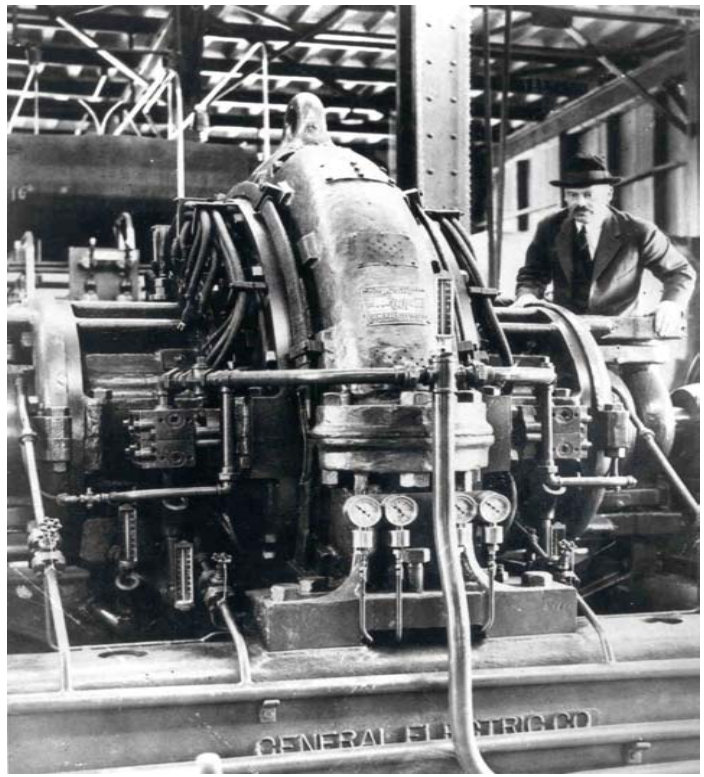
When the Adams Plant went into operation on August 26, 1895, it represented a key victory for alternating-current systems over direct-current. The clear advantage of high voltage AC for long distance power transmission and the unprecedented size of the plant (it reached its full capacity of ten 5,000-HP generators in May 1900) influenced the future of the electrical industry worldwide.



Niagara Falls, NY. Dedicated June 1990

Alexanderson Radio Alternator, 1904

The Alexanderson radio alternator was a high-power, radio-frequency source which provided reliable transoceanic radiotelegraph communication during and after World War I. Ernst F.W. Alexanderson (1878-1975), a General Electric engineer, designed radio alternators with a frequency range to 100 kHz and a power capability from 2 kW to 200 kW. These machines, developed during the period 1904 to 1918, were used in research on high-frequency properties of materials as well as for international communications.

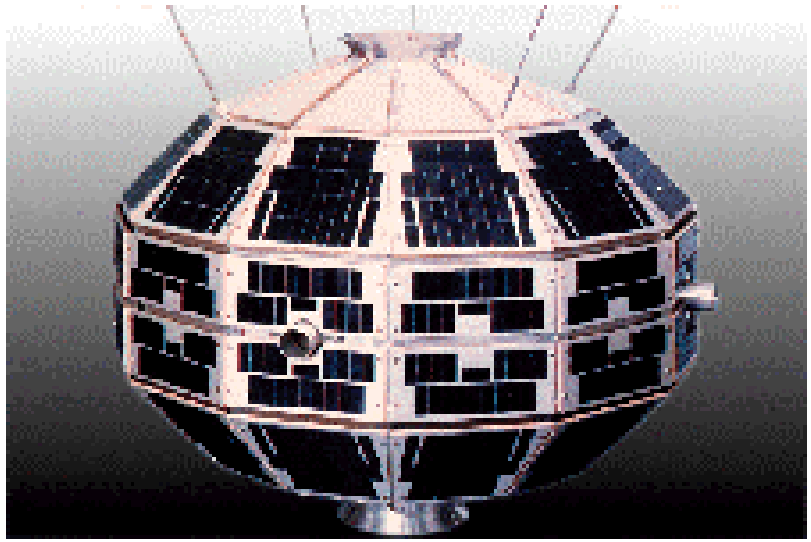


Schenectady, NY. Dedicated February 1992

Alouette-ISIS Satellite Program, 1962

Driven by the need to understand the characteristics of radio communication in Canada's North, Canadian researchers focused on the exploration of the earth's upper atmosphere, the ionosphere. Canada's satellite program commenced with the launch of Alouette-I on September 29, 1962. Alouette-II followed in 1965, ISIS-I in 1969, ISIS-II in 1971. The Alouette/ISIS tracking antenna serves as a reminder of Canada's contribution to this international effort in space science. IEEE Canada maintains a web site on this Milestone.

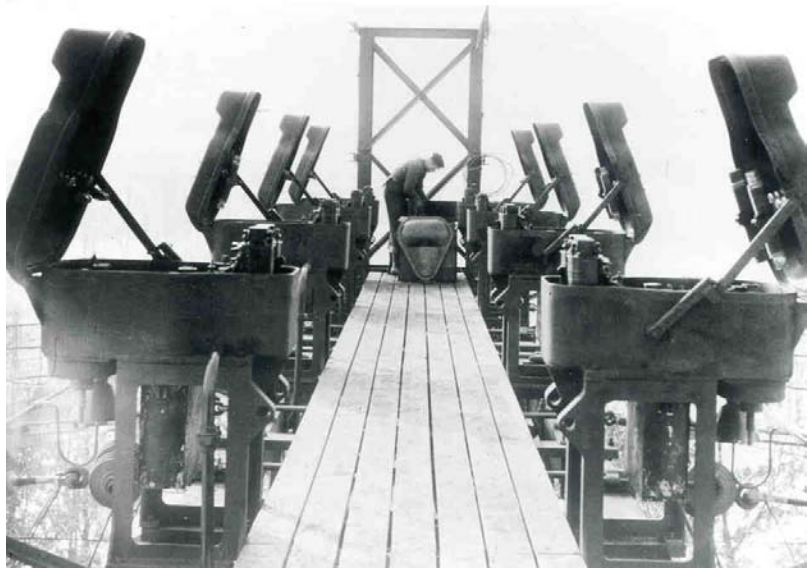
http://www.lark.ieee.ca/library/milestone/home.htm



Ottawa, Ontario. Dedicated May 1993

Alternating-Current Electrification of the New York, New Haven & Hartford Railroad, 1907

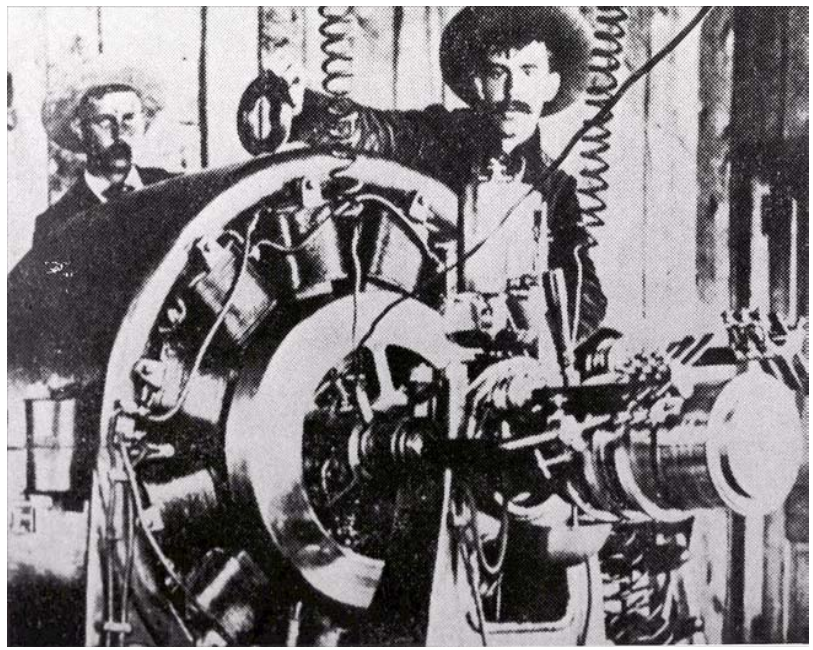
This was a pioneering venture in mainline railroad electrification. It established single-phase alternating current as a technical and economical alternative to direct current. This concept exerted considerable influence over subsequent systems both in the United States and abroad. The major components of the system were developed by the engineering staffs of the New York, New Haven & Hartford Railroad and the Westinghouse Electric and Manufacturing Company of East Pittsburgh, Pennsylvania.



Cos Cob, CT. Dedicated May 1982

Ames Hydroelectric Generating Plant, 1891

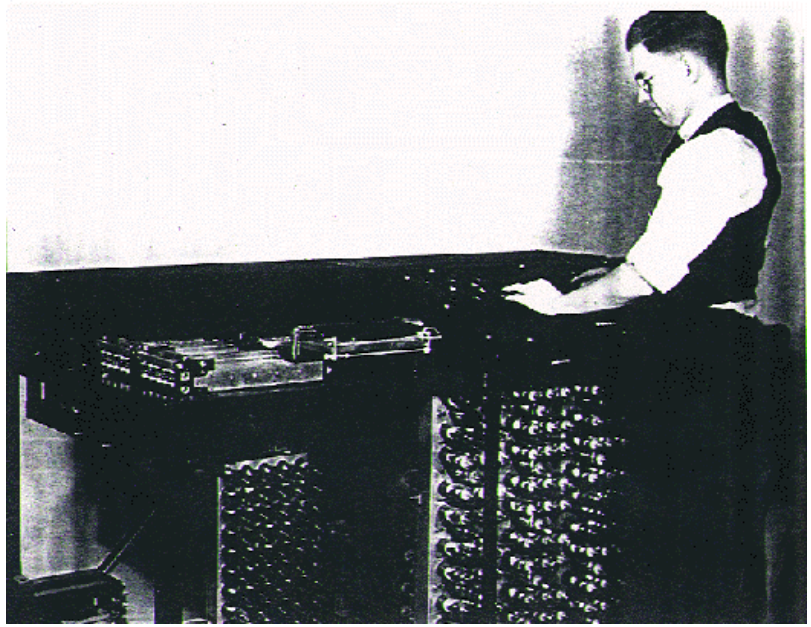
Electricity produced here in the spring of 1891 was transmitted 2.6 miles over rugged and at times inaccessible terrain to provide power for operating the motor-driven mill at the Gold King Mine. This pioneering demonstration of the practical value of transmitting electrical power was a significant precedent in the United States for much larger plants at Niagara Falls (in 1895) and elsewhere. Electricity at Ames was generated at 3000 volts, 133 Hertz, single-phase AC, by a 100-hp Westinghouse alternator.



Ames, CO. Dedicated July 1988

Atanasoff-Berry Computer, 1939

John Vincent Atanasoff conceived basic design principles for the first electronic-digital computer in the winter of 1937 and, assisted by his graduate student, Clifford E. Berry, constructed a prototype here in October 1939. It used binary numbers, direct logic for calculation, and a regenerative memory. It embodied concepts that would be central to the future development of computers.



Ames, IA. Dedicated April 1990

Benjamin Franklin's Work in London, 1757-1775

Benjamin Franklin, American electrician, printer, and diplomat, spent many years on Craven Street. He lived at No. 36 between 1772 and 1775 and at No. 7 from 1757-1762 and again from 1764-1772. During these years, Franklin popularized the study of electricity, performed experiments, and served as an advisor on lighting conductors.

London, England. Approved 1990

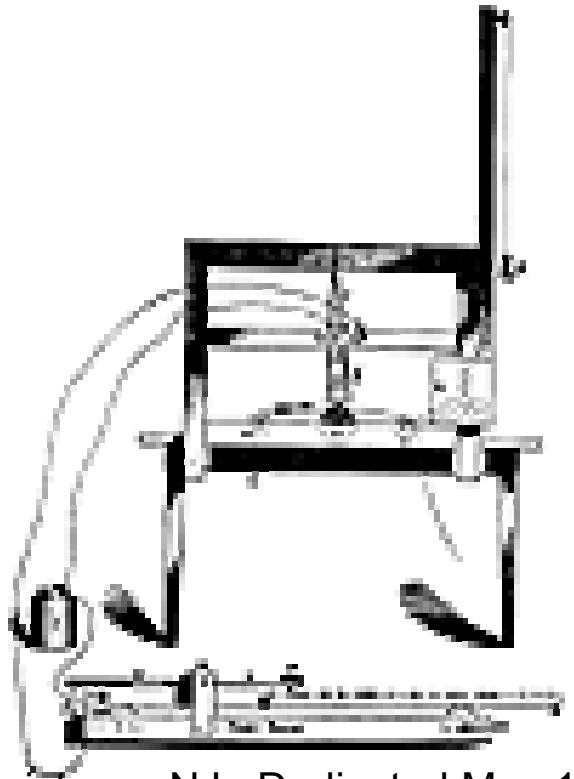
County Kerry Transatlantic Cable Station, 1866

On July 13, 1866 the Great Eastern steamed westward from Valentia, laying telegraph cable behind her. The successful landing at Heart's Content, Newfoundland on July 27 established a permanent electrical communications link that altered for all time personal, commercial and political relations between people across the Atlantic Ocean. Later, additional cables were laid from Valentia and new stations opened at Ballinskelligs (1874) and Waterville (1884), making County Kerry a major focal point for global communications.

County Kerry, Ireland. Approved 1999

Demonstration of Practical Telegraphy, 1838

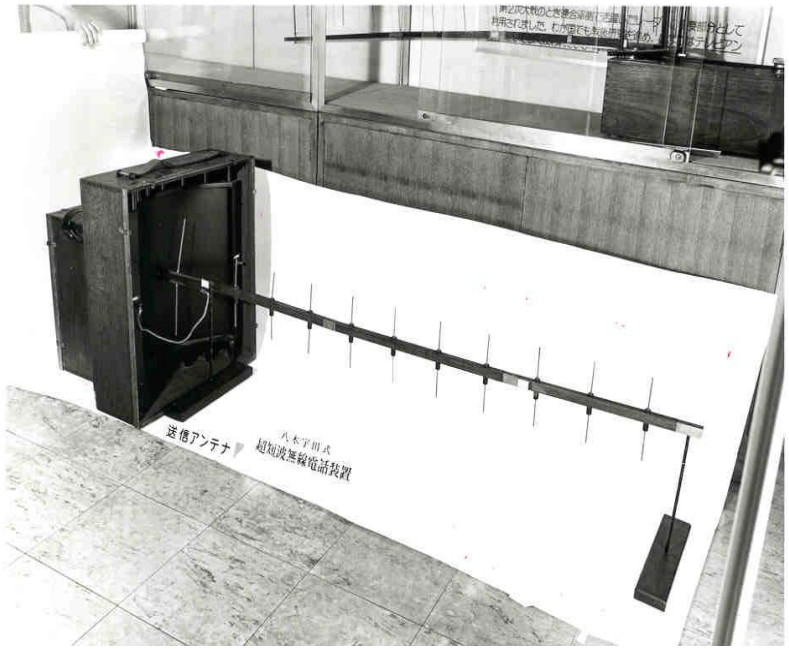
In this building in January 1838, Samuel F. B. Morse and Alfred Vail first demonstrated publicly crucial elements of their telegraph system, using instruments that Vail had constructed during the previous months. Electrical pulses, transmitted through two miles of wire, caused an electromagnet to ink dots and dashes (grouped to represent letters and words) on a strip of paper. Commercialization began in 1844 when funding became available.



Morristown, NJ. Dedicated May 1988

Directive Short Wave Antenna, 1924

In these laboratories, beginning in 1924, Professor Hidetsugu Yagi and his assistant, Shintaro Uda, designed and constructed a sensitive and highly directional antenna using closely-coupled parasitic elements. The antenna, which is effective in the higher-frequency ranges, has been important for radar, television, and amateur radio.



Miyagi, Japan. Dedicated June 1995

Electronic Numerical Integrator and Computer, 1946

A major advance in the history of computing occurred at the University of Pennsylvania in 1946 when engineers put the Electronic Numerical Integrator and Computer (ENIAC) into operation. Designed and constructed at the Moore School of Electrical Engineering under a U. S. Army contract during World War II, the ENIAC established the practicality of large scale, electronic digital computers and strongly influenced the development of the modern, stored-program, general-purpose computer.

Philadelphia, PA. Dedicated September 1987

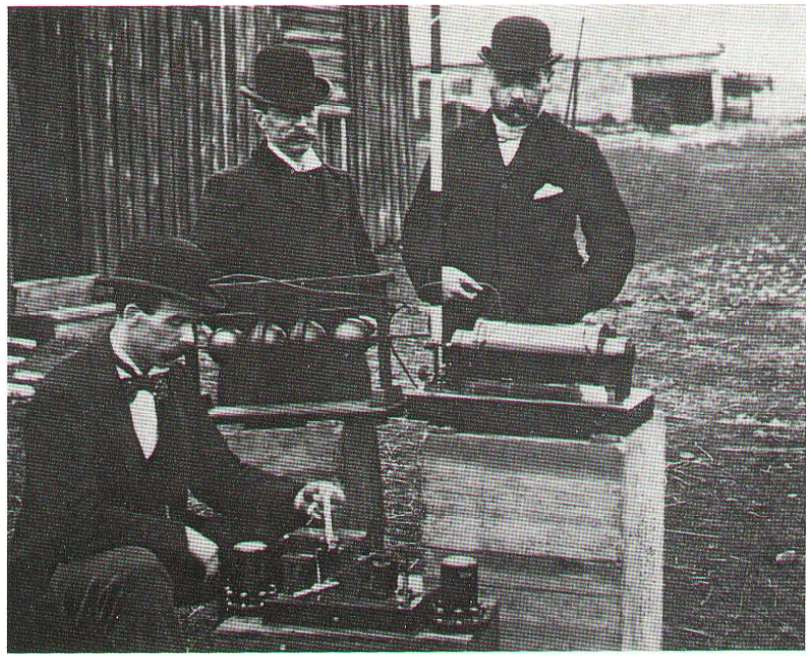
First Central Station in South Carolina, 1882

The United States Electric Illuminating Company started up South Carolina's first central station for incandescent electric lighting in this building in October 1882. This was just one month after Thomas Edison opened his central station on New York City's Pearl Street. In the following years, the pioneering firm of United States Electric was one of Edison's main competitors.

Charleston, SC. Dedicated July 1986

First Operational Use Of Wireless Telegraphy, 1899-1902

The first use of wireless telegraphy in the field occurred during the Anglo-Boer War (1899-1902). The British Army experimented with Marconi's system and the British Navy successfully used it for communication among naval vessels in Delagoa Bay, prompting further development of Marconi's wireless telegraph system for practical uses.



Capetown, South Africa.
Dedicated September 1999

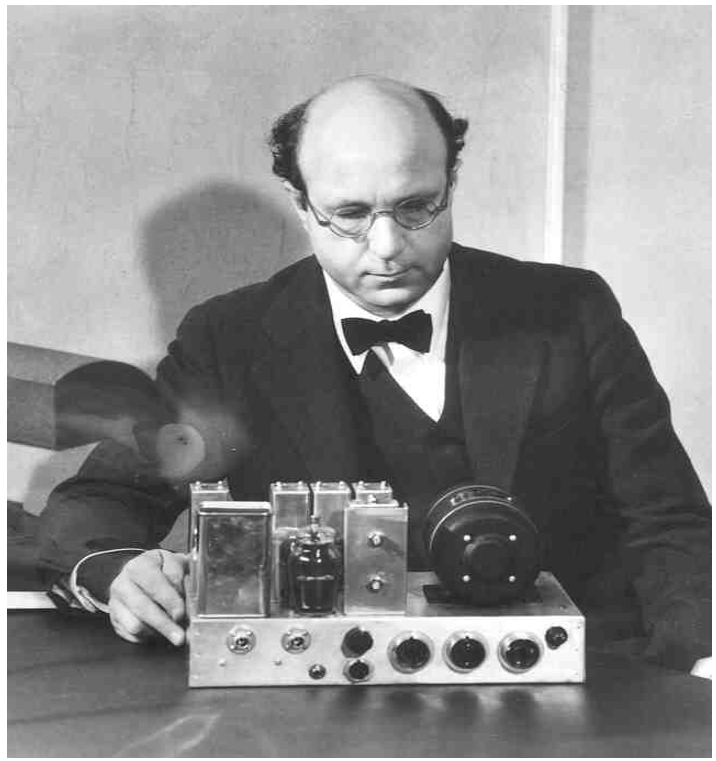
First Wearable Cardiac Pacemaker, 1957-58

During the winter of 1957-58, Earl E. Bakken developed the first wearable transistorized pacemaker, at the request of heart surgeon, Dr. C. Walton Lillehei. As earlier pacemakers were AC-powered, this battery-powered device liberated patients from their power-cord tethers. The wearable pacemaker was a significant step in the evolution to fully-implantable units.

Minneapolis, MN. Dedicated October 1999

FM Police Radio Communication, 1940

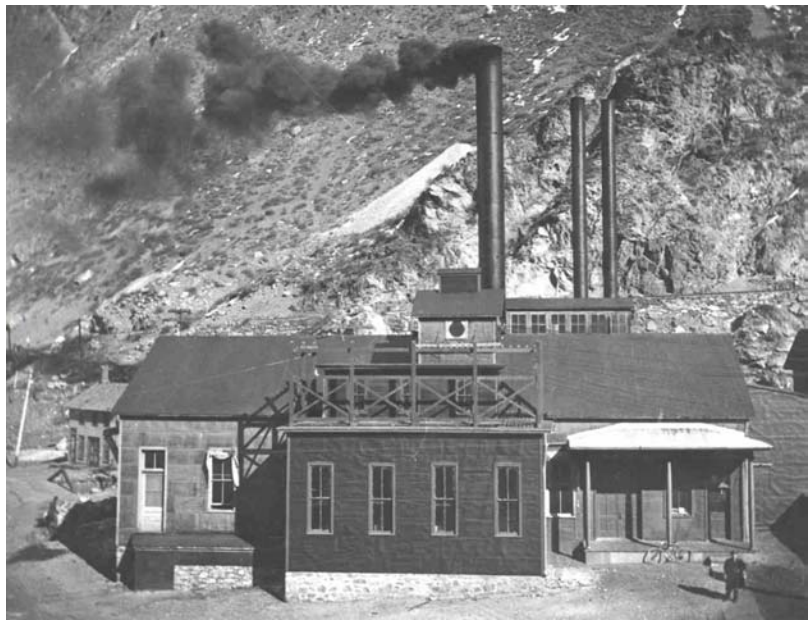
A major advance in police radio occurred in 1940 when the Connecticut state police began operating a two-way, frequency modulated (FM) system in Hartford. The statewide system developed by Daniel E. Noble of the University of Connecticut and engineers at the Fred M. Link Company greatly reduced static, the main problem of the amplitude modulated (AM) system. FM mobile radio became standard throughout the country following the success of the Connecticut system.



Hartford, CT. Dedicated June 1987

Georgetown Steam/Hydro Generating Plant, 1900

Electric generating plants, through their high-voltage lines, provided critical power to the isolated mines in this region. Georgetown, completed in 1900, was unusual in employing both steam and water power. Its owner, United Light and Power Company, was a pioneer in using three-phase, 60-Hertz alternating current and in being interconnected with other utilities.



Georgetown, CO. Dedicated July 1999

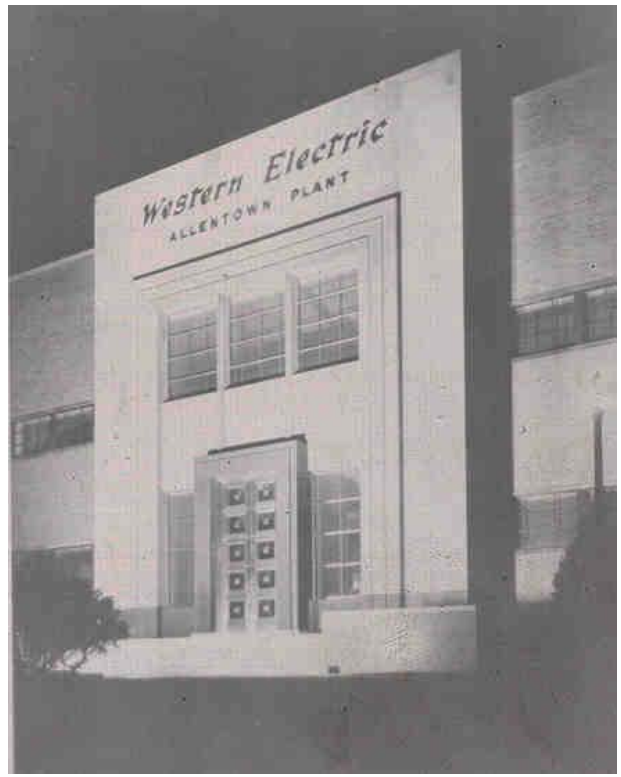
Landing of the Transatlantic Cable, 1866

A permanent electrical communications link between the old world and the new was initiated at this site with the landing of a transatlantic cable on July 27, 1866. This achievement altered for all time personal, commercial, and political relations between peoples on the two sides of the ocean. Five more cables between Heart's Content and Valentia, Ireland were completed between 1866 and 1894. This station continued in operation until 1965. IEEE Canada maintains a web site on this Milestone.

Heart's Content, Newfoundland. Dedicated: June 1985

Manufacture of Transistors, 1951

The commercial manufacture of transistors began here in October 1951. Smaller, more efficient, and more reliable than the vacuum tubes they replaced, transistors revolutionized the electronics industry.



Allentown, PA. Dedicated April 1989

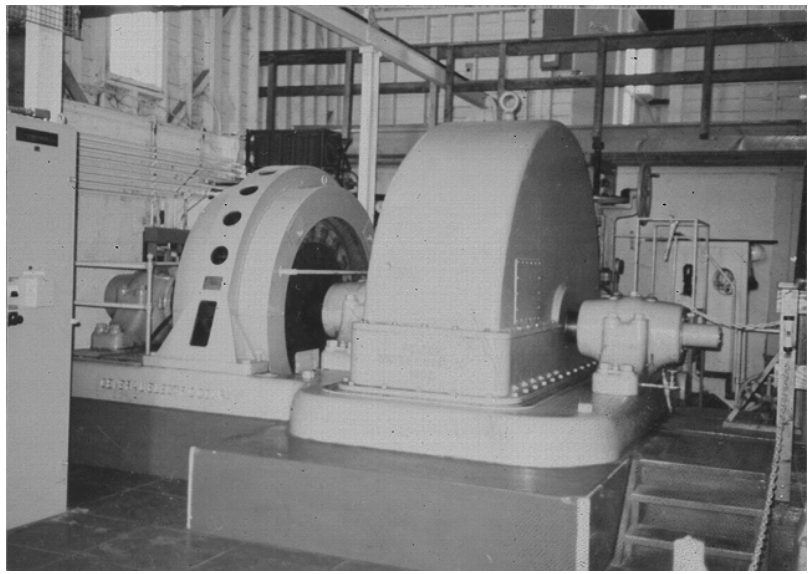
Merrill Wheel-Balancing System, 1945

In 1945, Marcellus Merrill first implemented an electronic dynamic wheel-balancing system. Previously, all mechanical methods were static in nature and required removing the wheels from the vehicle. Merrill's innovative balancing system came to be widely used internationally. Elements of the dynamic balancing systems are still used today, primarily for industrial and automotive production applications.

Denver, CO. Dedicated September 1999

Mill Creek No. 1 Hydroelectric Plant, 1893

Built by the Redlands Electric Light and Power Company, the Mill Creek hydroelectric generating plant began operating on 7 September 1893. This powerhouse was foremost in the use of three-phase alternating current power for commercial application and was influential in the widespread adoption of three-phase power throughout the United States.



Redlands, CA. Dedicated February 1997

MIT Radiation Laboratory, 1940-1945

The MIT Radiation Laboratory, operated on this site between 1940 and 1945, advanced the allied war effort by making fundamental contributions to the design and deployment of microwave radar systems. Used on land, sea, and in the air, in many adaptations, radar was a decisive factor in the outcome of the conflict. The laboratory's 3900 employees made lasting contributions to microwave theory and technology, operational radar, systems engineering, long-range navigation, and control equipment.

Cambridge, MA. Dedicated October 1990

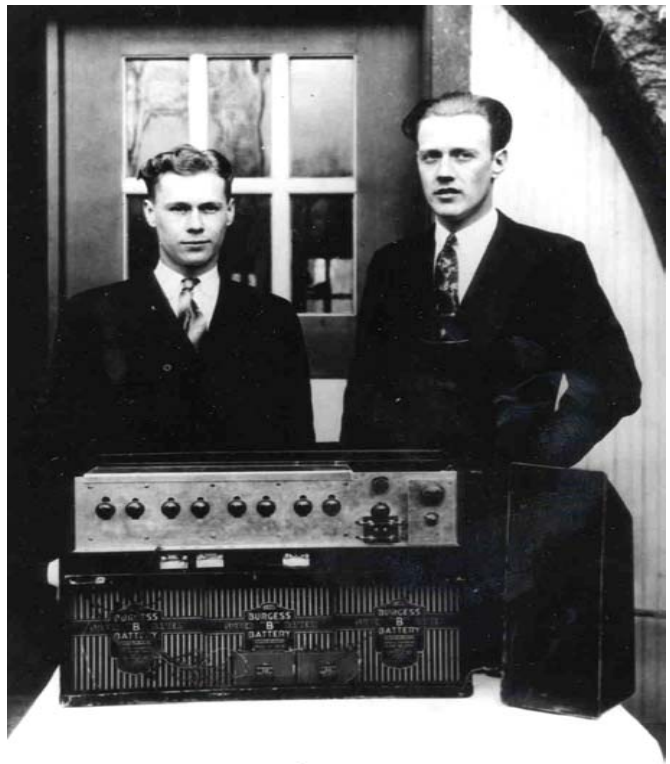
Mount Fuji Radar, 1964

Completed in 1964 as the highest weather radar in the world in the pre-satellite era, the Mount Fuji Radar System almost immediately warned of a major storm over 800 km away. In addition to advancing the technology of weather radar, it pioneered aspects of remote-control and low-maintenance of complex electronic systems. The radar was planned by the Japan Meteorological Agency and constructed by Mitsubishi Electric Corporation.

Mount Fuji, Japan. Approved 1999

One-Way Police Radio Communication, 1928

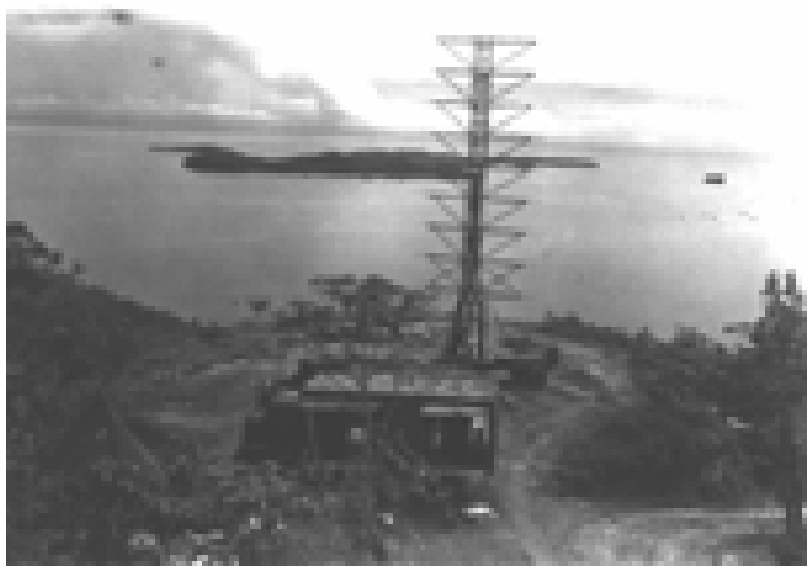
At this site on April 7, 1928 the Detroit Police Department commenced regular one-way radio communication with its patrol cars. Developed by personnel of the department's radio bureau, the system was the product of seven years of experimentation under the direction of police commissioner, William P. Rutledge. Their work proved the practicality of land-mobile radio for police work and led to its adoption throughout the country.



Detroit, MI. Dedicated May 1987

Opana Radar Site, 1941

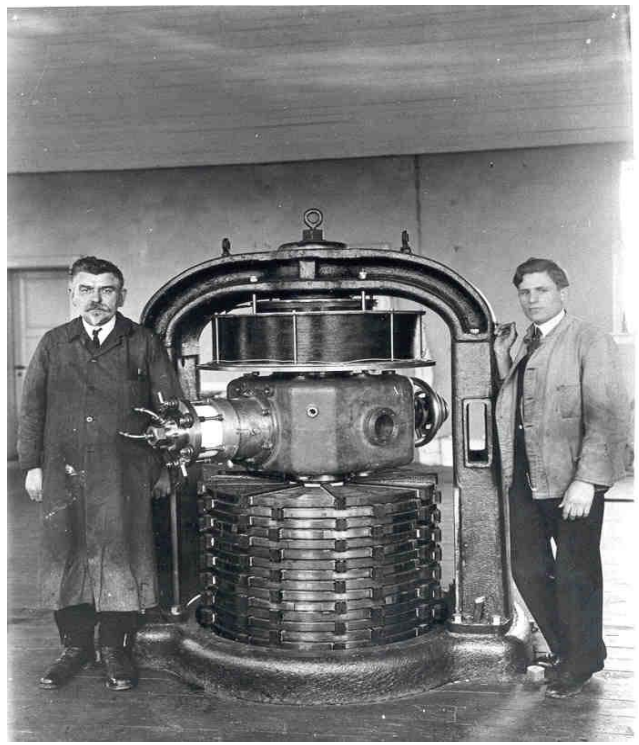
On December 7, 1941, an SCR-270B radar located at this site tracked incoming Japanese aircraft for over 30 minutes until they were obscured by the island ground clutter. This was the first wartime use of radar by the United States military, and led to its successful application throughout the theater.



Pearl Harbor, HI. Approved 1999

Poulsen-Arc Radio Transmitter, 1902

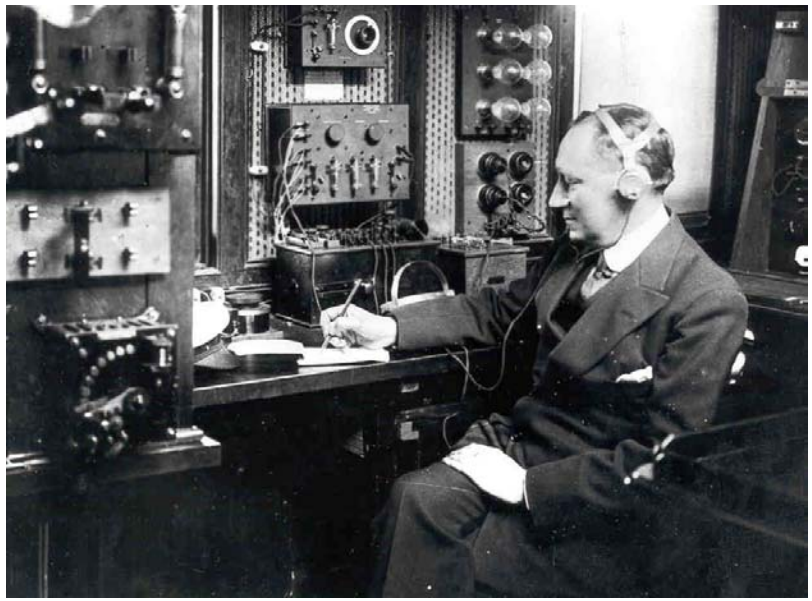
Valdemar Poulsen, a Danish engineer, invented an arc converter as a generator of continuous-wave radio signals in 1902. Beginning in 1904, Poulsen used the arc for experimental radio transmission from Lyngby to various receiving sites in Denmark and Great Britain. Poulsen-arc transmitters were used internationally until they were superseded by vacuum-tube transmitters.



Lyngby, Denmark. Dedicated May 1994

Reception of Transatlantic Radio Signals, 1901

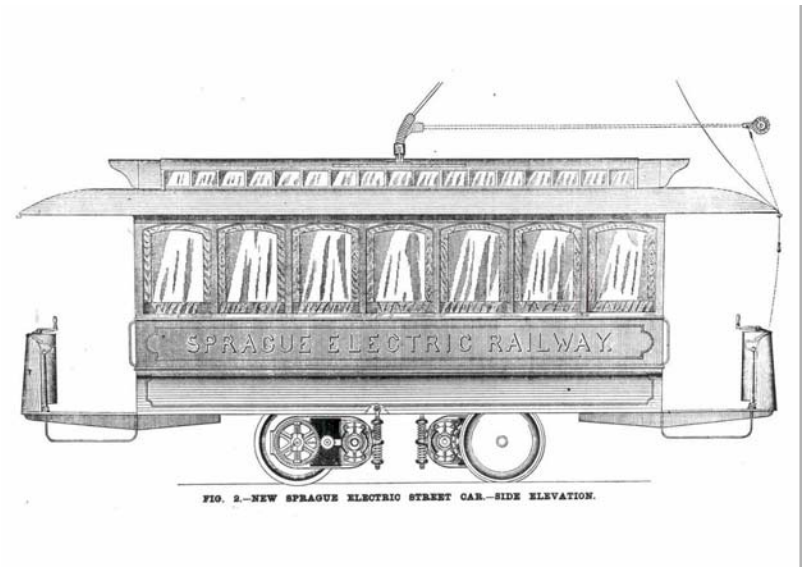
At Signal Hill on December 12, 1901, Guglielmo Marconi and his assistant, George Kemp, confirmed the reception of the first transatlantic radio signals. With a telephone receiver and a wire antenna kept aloft by a kite, they heard Morse code for the letter "S" transmitted from Poldhu, Cornwall. Their experiments showed that radio signals extended far beyond the horizon, giving radio a new global dimension for communication in the twentieth century.



Signal Hill, Newfoundland. Dedicated October 1985

Richmond Union Passenger Railway, 1888

In February 1888, the electric street railway system designed by Frank Julian Sprague for the Richmond Union Passenger Railway began operating in Richmond, Virginia. Sprague's Richmond system became the lasting prototype for electric street railways because of its large-scale practicality and operating superiority. This system, which combined Sprague's engineering innovations with other proven technical features, helped shape urban growth worldwide.



Richmond, VA. Dedicated February 1992

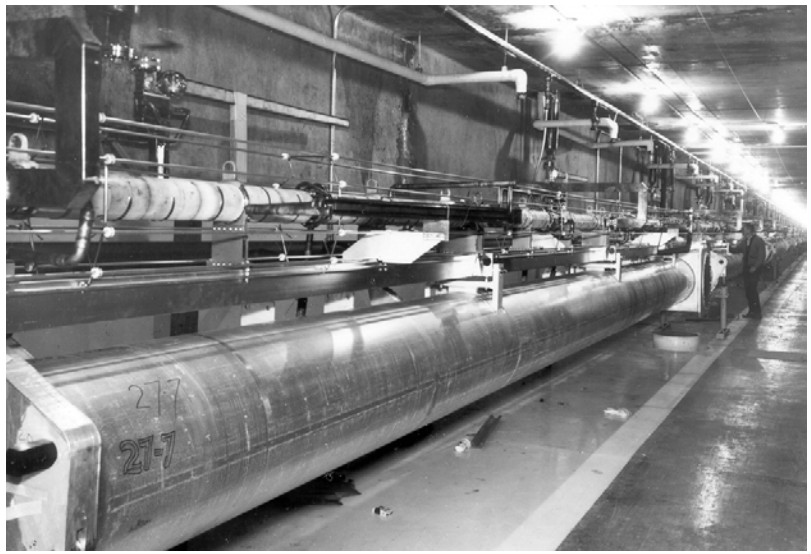
Shoshone Transmission Line, 1909

July 17, 1909, the Shoshone Transmission Line began service carrying power, generated by the Shoshone Hydroelectric Generating Station, to Denver. The Line operated at 90 kV, was 153.4 miles long, and crossed the Continental Divide three times reaching an altitude of 13,500 feet. Its design and construction represented an outstanding electrical engineering accomplishment due to its length, the mountainous country over which it was constructed, and the unusually severe weather conditions under which it operated.

Georgetown, CO. Dedicated June 1991

Stanford Linear Accelerator Center, 1962

The Stanford two-mile accelerator, the longest in the world, accelerates electrons to the very high energy needed in the study of subatomic particles and forces. Experiments performed here have shown that the proton, one of the building blocks of the atom, is in turn composed of smaller particles now called quarks. Other research here has uncovered new families of particles and demonstrated subtle effects of the weak nuclear force. This research requires the utmost precision in the large and unique electromechanical devices and systems that accelerate, define, deliver and store the beams of particles, and in the detectors that analyze the results of the particle interactions.



Stanford, CA. Dedicated February 1984

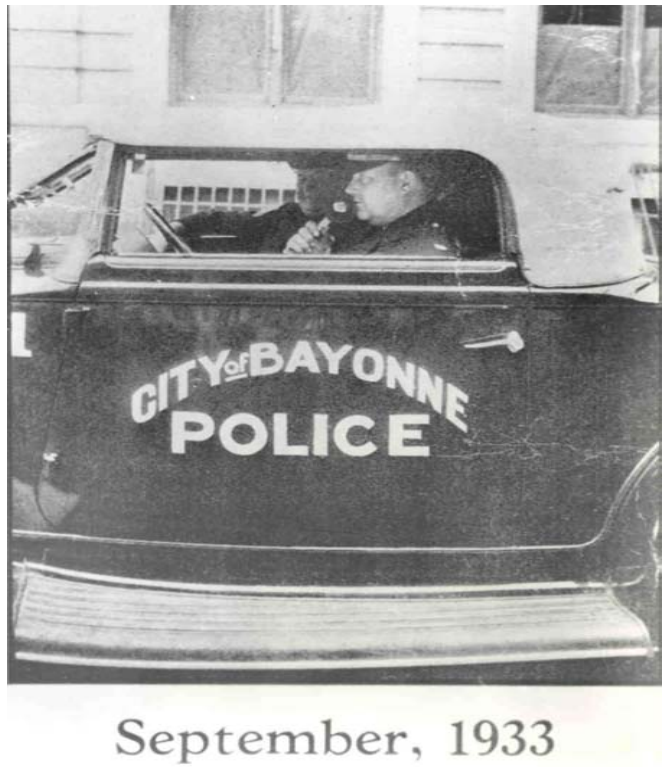
Transcontinental Telegraph, 1861

Between July 4 and October 24, 1861, a telegraph line was constructed by the Western Union Company between St. Joseph, Missouri, and Sacramento, California, thereby completing the first high-speed communications link between the Atlantic and Pacific coasts. This service met the critical demand for fast communications between these two areas. The telegraph line operated until May 1869, when it was replaced by a multi-wire system constructed with the Union Pacific and Central Pacific railway lines.

Fort Laramie, WY. Dedicated August 1990

Two-Way Police Radio Communication, 1933

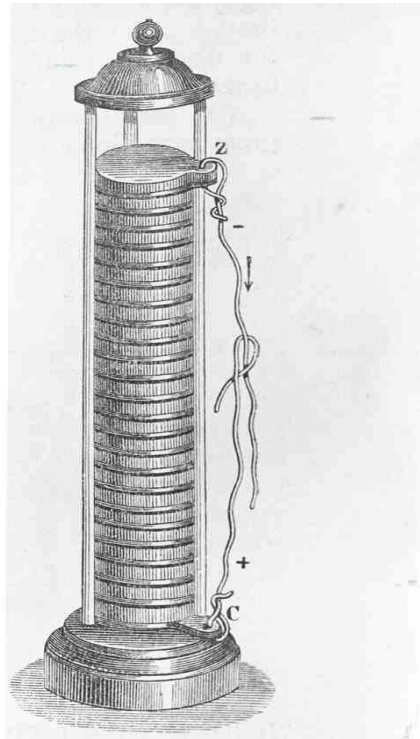
In 1933, the police department in Bayonne, New Jersey initiated regular two-way communications with its patrol cars, a major advance over previous one-way systems. The very high frequency system developed by radio engineer Frank A. Gunther and station operator Vincent J. Doyle placed transmitters in patrol cars to enable patrolmen to communicate with headquarters and other cars instead of just receiving calls. Two-way police radio became standard throughout the country following the success of the Bayonne system.



Bayonne, NJ. Dedicated May 1987

Volta's Electrical Battery Invention, 1799

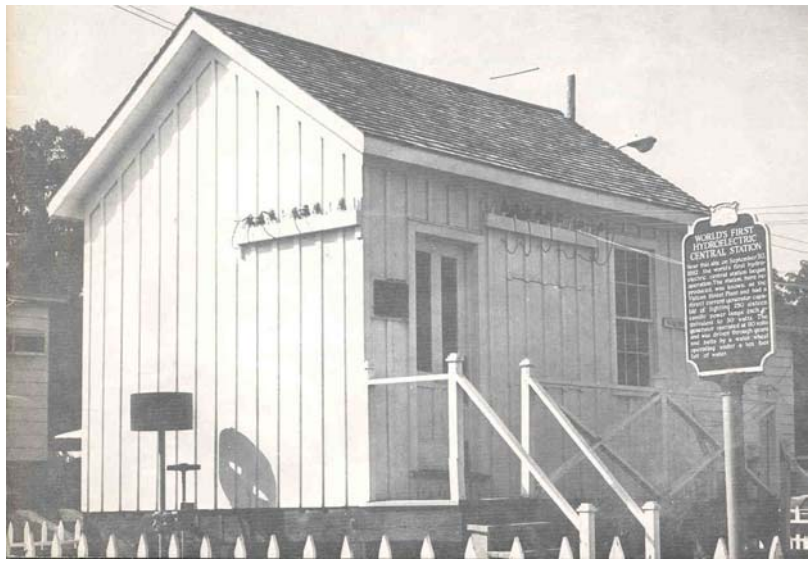
In 1799, Alessandro Volta developed the first electrical battery. This battery, known as the Voltaic Cell, consisted of two plates of different metals immersed in a chemical solution. Volta's development of the first continuous and reproducible source of electrical current was an important step in the study of electromagnetism and in the development of electrical equipment.



Como, Italy.
Dedicated September 1999

Vulcan Street Plant, 1882

Near this site on September 30, 1882, the world's first hydroelectric central station began operation. The station, here reproduced, was known as the Vulcan Street Plant and had a direct current generator capable of lighting 250 sixteen candle power lamps each equivalent to 50 watts. The generator operated at 110 volts and was driven through gears and belts by a water wheel operating under a ten foot fall of water.



Appleton, WI. Dedicated September 1977

Westinghouse "Atom Smasher", 1937

The five million volt van de Graaff generator represents the first large-scale program in nuclear physics established in industry. Constructed by the Westinghouse Electric Corporation in 1937, it made possible precise measurements of nuclear reactions and provided valuable research experience for the company's pioneering work in nuclear power.

Forest Hills, PA. Dedicated May 1985

Westinghouse Radio Station KDKA, 1920

Westinghouse Radio Station KDKA was a world pioneer of commercial radio broadcasting. Transmitting with a power of 100 watts on a wavelength of 360 meters, KDKA began scheduled programming with the Harding-Cox Presidential election returns on November 2, 1920. A shed, housing studio and transmitter, was atop the K Building of the Westinghouse East Pittsburgh works. Conceived by C.P. Davis, broadcasting as a public service evolved from Frank Conrad's weekly experimental broadcasts over his amateur radio station 8XK, attracting many regular listeners who had wireless receiving sets.

Pittsburgh, PA. Dedicated June 1994