Center for the History of Electrical Engineering

Newsletter No. 29 Spring 1992

Center's Trolley History Project

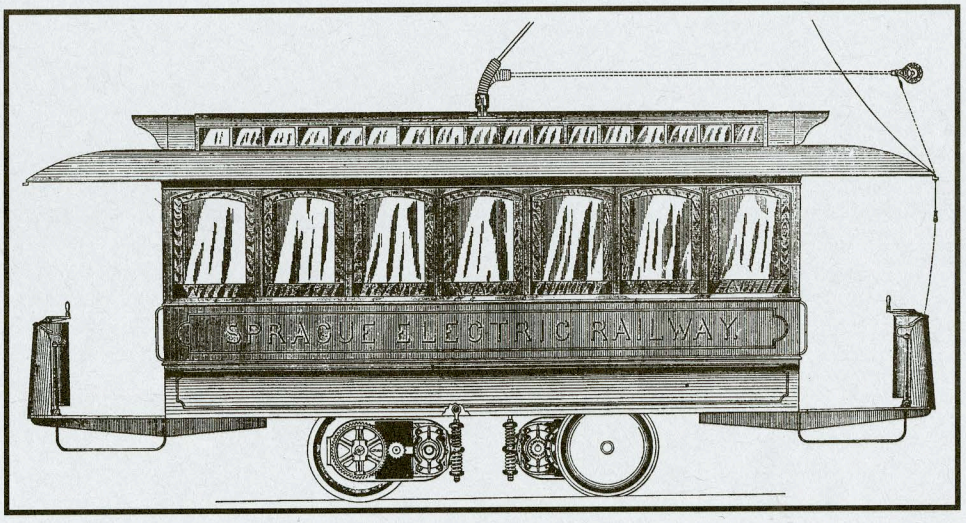
Most Americans have forgotten that electricity once powered most urban transit. Beginning in the late 1880s, the electric streetcar, or trolley, brought the advantages of mechanized transportation to travel within cities, just as the steam railroad had mechanized transportation between cities. Electric transportation made possible the rapid growth of American cities in the early twentieth century, with their booming downtowns and bedroom suburbs. The streetcar remained a central facet of urban life through World War II, but after the war the electric streetcar fell victim to the automobile and motor bus, disappearing from all but a few American cities. Recently, however, trolley systems have received renewed attention as an answer to the pollution and congestion resulting from our dependence on the automobile.

The Center's postdoctoral fellow, Dr. Eric Schatzberg, is engaged in a major scholarly study of the trolley, from its rise in the 1880s to its collapse after World War II. This study will help document a tremendously important electrical technology and will also illustrate important themes in the history of technology. The first theme concerns how choices are made among competing technologies. Electricity was not the only possible replacement for the horse in urban transportation. Steam engines, cable cars, and compressed air motors were all proposed as alternatives to electricity. Electricity triumphed in part because urban residents found it more acceptable than other forms of mechanical transportation.

The social impact of the trolley provides the second theme of the study. Street railroads were crucial to the creation of the modern metropolis, with its downtown skyscrapers and nearby bedroom suburbs. In addition to its impact on urban form, the trolley played a central role in urban politics, race relations, and popular culture. The notoriously corrupt trolley companies served as a key site for urban reform struggles during the Progressive Era. In the South, blacks organized effective boycotts to protest the imposition of Jim Crow laws on trolleys. The trolley also had a profound impact on urban culture, particularly on recreation patterns through the development of suburban amusement parks at the end of trolley lines.

The final theme of the project concerns the decline of the electric streetcar in the United States. The trolley was initially a tremendously successful technology, becoming a seemingly irreplaceable part of the urban infrastructure in little more than a decade. The trolley began to decline in the early 1920s, however, little more than a generation after its adoption. Historians generally credit (or blame) the automobile for the trolley's decline, but stringent regulations imposed to correct earlier abuses substantially weakened trolley companies before competition from the automobile became a major threat. In addition, New Deal legislation required electric utilities to divest themselves of trolley companies, thus sundering the trolley from its natural ally.

Dr. Schatzberg is working on a major monograph to present the results of his research. Some preliminary results of his work will be published in the proceedings of the technological competitiveness conference conducted last fall by the Center, to be published by IEEE Press. ■



Sprague Electric Street Car 1888 - Courtesy of The Smithsonian Institution

STAFF NOTES

Nebeker Publishes Monograph

The American Philosophical Society has just published a monograph by the Center's research historian, Frederik Nebeker. Entitled Astronomy and the Geophysical Tradition in the United States in the Nineteenth Century, it consists mainly of a guide to the sources on this topic in the manuscript collections of the American Philosophical Society Library.

A taxonomy of scientific activity in 19th-century America might recognize three divisions: (1) natural history, (2) experimental science, and (3) astronomy and the geophysical tradition. The last division includes cartography, geodesy, hydrography, study of terrestrial magnetism, study of atmospheric electricity, and meteorology as well as astronomy. These studies were characterized by quantitative description and the use of instruments of precise measurement. The scientists working in this area usually had mathematical training.

Nebeker's monograph consists of an introductory essay, a comprehensive list of scientists working in astronomy and the geophysical tradition, and for each of the 181 scientists represented in the APS Library's collections a biographical sketch and concise descriptions of relevant documents. ■

Associate Director Departs

The Center's Associate Director and Curator, Joseph N. Tatarewicz, who has been on leave of absence for the past six months, has decided to leave the Center to pursue an independent research career. He has recently begun work as an independent contractor to write a history of planetary geoscience for the NASA History office. He is also teaching history at the University of Maryland-Baltimore County. Dr. Tatarewicz was instrumental in settling the Center in its new quarters at Rutgers and in giving professional guidance to our archival and exhibits programs. We wish him well in his new endeavors. ■

Radar Commemorated

On December 3 1991, in a ceremony commemorating the historic role of radar in detecting the attack on Pearl Harbor, representatives of the IEEE gathered at the Historical Electronics Museum in Baltimore with individuals who designed, developed, and operated the first radar used in combat by the United States. A restored version of that 50-year-old technology was put on display as part of the event.

As part of the commemoration ceremony, the IEEE presented an award of appreciation to three individuals involved with the early radar effort. On behalf of the U.S. Army Signal Corps Laboratory at Fort Monmouth, N.J., Jack Slattery accepted recognition for helping to design the SCR-270. Fred Suffield represented Westinghouse, which was cited for manufacturing the radar. Joseph Lockard, who on the morning of December 7, 1941 at Opana, Hawaii, observed the huge radar signature that turned out to be approaching Japanese aircraft, accepted the award for the Signal Company Aircraft Warning Hawaii Group. Curator Andrew Goldstein represented the Center at the event. ■

Fellowship Awarded

The 1992-93 IEEE Fellowship in Electrical History has been awarded to Sungook Hong, a student of history of science at Seoul National University in Korea. Hong will investigate the interaction between science in technology in early electrical engineering by examining the career of John Ambrose Fleming. Further, his research will elucidate the historical process of the institutionalization of electrical engineering research and education in the universities of Great Britain. Hong is currently researching Fleming's papers while working at the University of Toronto's Victoria College as a visiting student of Dr. Jed Buchwald, an authority on late-nineteenth century electricity. ■

Summer Intern Named

The Center has selected David Morton to be its 1992 summer intern. Mr. Morton is a Ph.D. student in the history of technology at the Georgia Institute of Technology in Atlanta, Georgia. He will arrive at the center during May and remain for twelve weeks. While in New Brunswick, Morton will be assisting the center's staff with a variety of research projects, including preparation of a guide to oral history collections in United State repositories. ■

The Newsletter reports on the activities of the Center and on new resources and projects in electrical history. It is published three times each year by the Center for the History of Electrical Engineering.

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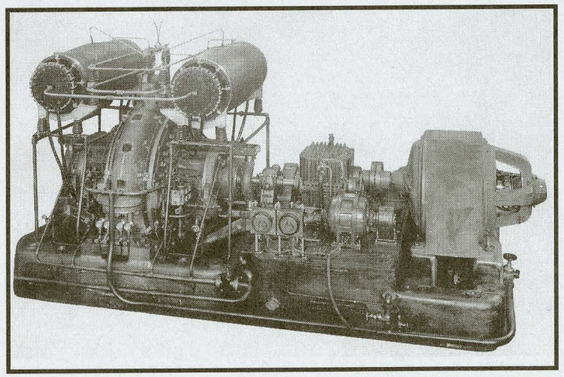
The Alexanderson Radio Alternator -*An Electrical Engineering Milestone.*

by James E. Brittain

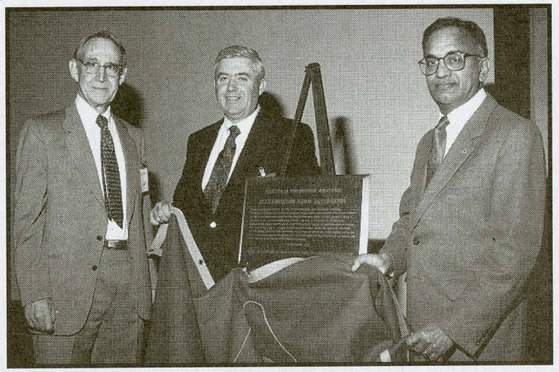
In February 1917, 75 years ago this year, a 50 kW radio alternator designed by General Electric engineer-inventor Ernst F.W. Alexanderson was transported from Schenectady, New York to a Marconi transmitting station in New Brunswick, New Jersey. When the United States entered the first World War in April 1917, the U.S. Navy took over the New Brunswick facility and used the alternator for direct radio communication to Europe. In June 1918, the first 200 kW Alexanderson radio alternator was installed at the New Brunswick station and used in October 1918 to transmit a message from President Wilson directly to Germany. The big alternator produced the strongest signals yet received in Europe from the United States, and it was said that the high quality sound did not "slur words" and "never needed repeating."

After the war, the Alexanderson alternator became a key element in an American strategy to establish a global radio communication system while excluding foreign stations from American soil. This strategy resulted in the creation of the Radio Corporation of America in 1919. Alexanderson, the chief architect of the radio alternator system, became the first chief engineer of the new company. Twenty of the 200 kW alternators were constructed for the global system and were installed at transmitting stations in Great Britain, Poland, and Sweden as well as in the United States. The alternators were rendered obsolete with the advent of less expensive short-wave transmitters using vacuum tubes, although a few of the alternators remained in service for specialized communication needs until the 1950s. One of the alternators, located in Sweden, has been preserved in an operable condition.

The Alexanderson radio alternator was recently recognized as an electrical engineering Milestone by the IEEE. The dedication ceremony took place 20 February 1992 at the General Electric Research and Development Center in Schenectady. Harold Chestnut and James Brittain represented the IEEE History Committee at the ceremony. A movie about the Swedish alternator transmitting station was shown. Following the ceremony, Dr. Brittain, author of a biography of Alexanderson to be published later this year, presented a colloquium talk on Alexanderson and his career as an engineer-inventor. ■



200 KW. Hgh Frequency Alternator - Courtesy of The Smithsonian Institution



Dedication ceremony for Alexander-Alternator (l. to r.) Harold Chestnut, Edward Owen, N.K. Nair

Richmond Milestone

On February 2, 1888, Frank Julian Sprague opened what was then the largest electric streetcar system in the world, the Richmond (Virginia) Union Passenger Railway. Sprague's system provided the standard pattern for most subsequent installations, integrating a variety of separate innovations to make the streetcar work effectively as a system. The Richmond Railway proved to be the turning point in the adoption of the electric streetcar, convincing many cities to replace their horse-drawn streetcars with electric trolleys. By the end of the century, electric traction had replaced animal power on almost every streetcar line in the United States.

Sprague's Richmond system was an impressive engineering achievement, fully deserving designation as an Electrical Engineering Milestone. On February 2, 1992, IEEE president Merrill W. Buckley, Jr. presented the Richmond chapter of the IEEE with a plaque commemorating the Richmond system. The mayor of Richmond spoke at the ceremony. Dr. Eric Schatzberg, the Center's postdoctoral fellow, presented one of three historical papers on Frank Sprague and the Richmond trolley system. ■

PUBLICATIONS

Bernard S. Finn, History of Electrical Technology: An Annotated Bibliography. (New York: Garland), 1991, 360 pp., $48 cloth.

Dr. Finn's bibliography is a very welcome addition to the scholarly tools for the history of electrotechnology. A section on broad historical works includes general histories, bibliographies, collected and individual biographies, companies, and regional histories. The section on communications is broadly conceived and includes telegraphy, telephony, radio and television, and radar and microwaves. The section on power includes power generation and transmission, heating and lighting, electrical appliances, and transportation. A miscellaneous section covers computing, control systems, applications to medicine and music, and many other topics. Dr. Finn has done a thorough job culling the literature from the major western scholarly languages and selecting judiciously from this large, undifferentiated mass. The quality of the brief annotations displays Dr. Finn's command of the subject.

Dr. Finn is Curator of Electricity at the Smithsonian Institution's National Museum of American History. ■

John W. Morrisey, ed., The Legacies of Edwin Howard Armstrong, (The Radio Club of America, Inc.), 1990, xi + 321 pp. (The book costs $15.95, which includes postage within the U.S., and may be ordered from the Radio Club of America, 45 South Fifth St., Park Ridge NJ 07656.)

This book begins with the assertion that Edwin Howard Armstrong "did more to advance the art of radio and telecommunications than any other human being" and then presents some fifty articles that, collectively, make a strong case for the assertion.

Four of Armstrong's contributions are highlighted: the regenerative circuit, the superheterodyne circuit, the superregenerative circuit, and frequency modulation. Besides the classic papers by Armstrong presenting these inventions, the book contains articles by associates and historians. Biographical articles by Thomas J. Styles, long-time confidant of Armstrong, by John Ragazzini, associate at Columbia university, and by historians James Brittain and Thomas S.W. Lewis are especially interesting. Ed Lyon gives a detailed account of the invention and reception of the superheterodyne, while the question of priority in its invention is considered in a thorough article by Alan Douglas. David Morton describes Armstrong's role in the development of FM radio, and Thomas Buzalski tells the fascinating story of the first full-scale FM field tests, conducted by Armstrong from the Empire State Building.

The book contains many other articles, almost all of which appeared earlier in other publications. Morrisey's collection of them into a single volume will be appreciated by everyone interested in the history of radio.

John W. Morrisey is the editor of the Proceedings of the Radio Club of America. ■

Catalogue Available

A catalog of books dealing with electricity, radio and related topics has been issued by New Wireless Pioneers, Bampton Books, a book trading house in Elma, New York. The catalog, the 9th from Bampton, lists over 475 books. Subject headings range from medical electricity, to biographies to vacuum tube catalogs. In each entry, the contents and condition of the book are briefly described, and the book's scarcity is appraised. Also, Bampton extends an offer in the catalog to buy early radio and television books. For further information, contact New Wireless Pioneers, Bampton Books, Box 398, Elma NY 14059, tel. (716) 681-3186. ■

Edwin H. Armstrong 1954

We are pleased to report that Albert Gerard Gluckman has deposited in the Center's library a copy of his The Invention and Evolution of the Electrotechnology to Transmit Signals Without Wires (unpublished, c. 200 pp.). It is an annotated bibliography of the 17th, 18th, and 19th century experimental studies of electrostatic induction, spark-gap and lightning discharges, magnetic induction, oscillating circuits, resonance, and electromagnetic wave propagation. Researchers may consult the bibliography at our offices or obtain a copy from us. There will be a charge of $25 (check payable to "IEEE - History Center" to cover duplication and mailing costs). Copyright resides with the author, who can be contacted at Institute for Physical Science and Technology, University of Maryland, College Park, MD 20742. ■

Other Books

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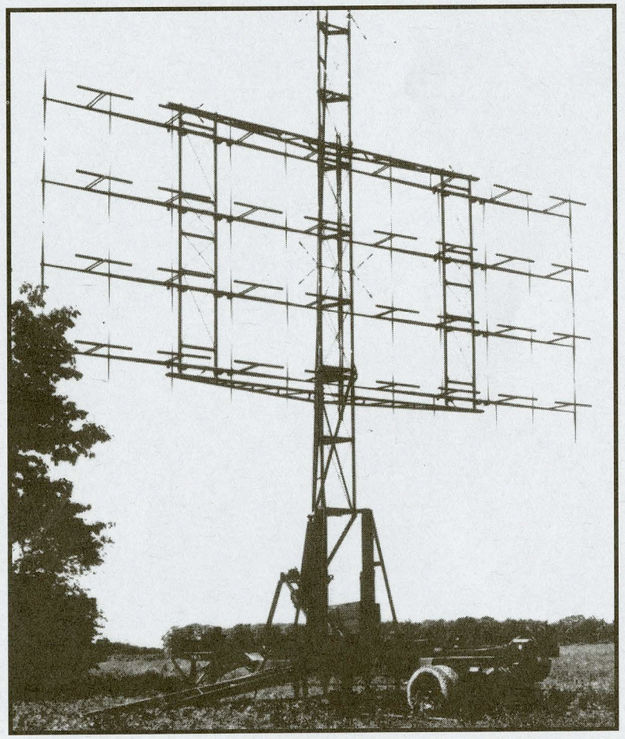
Information, Please!

Aaron Gusen of Toronto, Canada is doing research on Edith Clarke, whom he believes to be the first female member of the AIEE. He thinks that Clarke became an AIEE member in 1923. Do any of our readers have any information about women who were members of the AIEE prior to 1924?

Please send any information to the Center. Rutgers University, 39 Union Street, New Brunswick, New Jersey 08903.



SCR-270 Radar
Courtesy of Westinghouse

Artifacts For Sale

Over 400 pieces of civilian and military communications equipment dating from between the Greco-Roman period and the present day, are being sold by the Italian government. The pieces, known collectively as the Cremona collection, are divided into twenty sections. These include the origins of telecommunications from fire signals, messengers and carrier pigeons, communications from the middle ages to the French Revolution, early electrical devices such as telegraphs, typewrites, and Marconi wireless telegraphy; and more modern systems. The Cremona collection, over twenty tons of artifacts and displays in total, has appeared in numerous exhibits of communication technology. For more information about acquiring pieces of the collection, contact Patrizio Fondi at the Mission of Italy to the United Nations, tel. (212) 486-9191. ■

Museum Opens

As the days get longer and the North East weather more agreeable, the New England Wireless and Steam Museum prepares to open its doors for another season. The museum, located in East Greenwich, Rhode Island, is open between 1 and 5 PM on Sundays between May and September.

The museum has an impressive collections of artifacts of radio and steam engine technologies from the late 19th and early 20th centuries in three exhibition buildings. These include early telegraphs, tuners, crystal sets, vacuum tubes, microphones, spark transmitters, a complete 1920 ship radio cabin, and many types of steam powered engines. One of the buildings, an operating radio station today, used to be part of the Massie Wireless Telegraph System, a chain of stations on the Atlantic, Pacific and Alaskan coasts. The museum's library is also a valuable stop for scholars of turn-of-the-century-engineering. It documents engineering history with books, logs, trade catalogs, manuals, photographs, taped interviews and original drawings of steam engine manufacturers

The museum has open admission on Sunday afternoons. Tours for school groups, radio and engine clubs, engineering societies, and others can be arranged at other times. For more information, contact the museum at (401) 884-1710. ■

A SURVEY OF CURRENT RESEARCH ON THE HISTORY OF ELECTRICAL, ELECTRONICS, AND COMPUTER ENGINEERING

The staff of the Center for the History of Electrical Engineering is compiling a database of people currently doing research on the history of electrotechnology. We plan to make known the results of the survey in this newsletter. If you are engaged in research on any aspect of the history of electrical, electronics, or computer engineering, we would appreciate receiving from you the information requested below. Please return this form to CHEE, 39 Union Street, Rutgers University, New Brunswick, NJ 08903

Name _____

Address _____

_____

Telephone _____

Fax _____

e-mail _____

Areas of research ***circle:*** aerospace electronics, circuits and systems, communications technology, computers, consumer electronics, control systems, EE education, electron devices, engineering in medicine and biology, engineering management, EE in industry, instrumentation, lasers and electro-optics, magnetics, microwaves, neural networks, nuclear and plasma sciences, power engineering, robotics and automation, signal processing, vehicular technology.

Brief description of your research topics: _____

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ESL Begins Restoration of the Wheeler Gift

In February the Engineering Societies Library (ESL) began a major project to reassemble the "Wheeler Gift" of books, pamphlets, and periodicals related to electrical engineering history. With more than 6,000 titles spanning 400 years, the Wheeler Gift represents one of the world's major collections of electrical literature. Its restoration is one of the major priorities of ESL's new management team.

Originally collected by Josiah Latimer Clark, an English telegrapher and bibliophile in the 19th century, the library was purchased and donated to the American Institute of Electrical Engineers (AIEE) in 1901 by Schuyler Skaats Wheeler. The collection became part of ESL with the official merging of the Founder Societies' separate libraries in the old Engineering Societies Building in 1916. Following this agreement, parts of the Wheeler Gift were interspersed within the general holdings. With the move to the new United Engineering Center in 1960, the Collection remained scattered with only approximately 800 of the Rare Books removed to a specialized area of the Library.

Like all of ESL's collections, the Wheeler Gift has experienced varying forms of deterioration. Books, pamphlets, and periodicals are composed of organic materials that decay over time. However, the natural processes have been accelerated by inadequate storage, poor handling, and minimal care.

Preservation of technical literature is one of ESL's primary missions. The recent restructuring of the Library, under new Director of ESL Information Services, Davida Scharf, has refocussed attention on this issue. The Wheeler project is part of a major program to identify the extent of damage to ESL's collections and secure remedies for the condition.

The new Associate Director for Collection Management, Richard Steele, is a professional archivist with experience in large-scale preservation projects. Formerly with Cornell university's New York Historical Resources Center and the NYNEX Corporation, his first assignment was a six-month preliminary survey of the condition and relocation of ESL's various special collections. One of the results of his work is the Wheeler Restoration Project. For further information concerning the restoration project or the status of the Wheeler Gift, contact Steele at 212-705-7627. ■

Friends Fund

We are grateful to the organizations and individuals listed below, who provide generous support to the Center in the form of operating, endowment, and project funding. If you or your organization are interested in joining our Partnership Program, please contact the Director, Dr. William Aspray.

Founding Partners:
IEEE
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Alfred P. Sloan Foundation

Senior Partners:
IEEE Foundation - Life Member Fund
National Science Foundation

Partners:
IEEE Foundation - General Fund

Associate:
Electro-Mechanics Company
Environmental Research Institute of Michigan
Sematech
MTT-S

Thanks to the Microwave Theory and Techniques Society for providing money for the Rab-Lab Oral History Project.
We are also grateful to the hundreds of individuals who have contributed to our Friends Fund.

CORRECTION—

We apologize for an error in the caption to the photograph on page 7 in the last newsletter. The computer in the photograph is the ANACOM I, not the ANACOM III. Also, Asea Brown Boveri Power Systems neither built the ANACOM nor employed Edwin Harder. The machine was built by Westinghouse, for whom Dr. Harder worked, and was only sold to Asea Brown Boveri Power Systems in the 1980s. ■

In the list of Friends of the Center for the History of Electrical Engineering printed in the last issue of our newsletter, we inadvertently misspelled the name of The Institution of Electrical Engineers. We also neglected to include Earl Bakken in our list of Sustaining Friends. We apologize for these errors and appreciate the continued support of all of our Friends. ■

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