

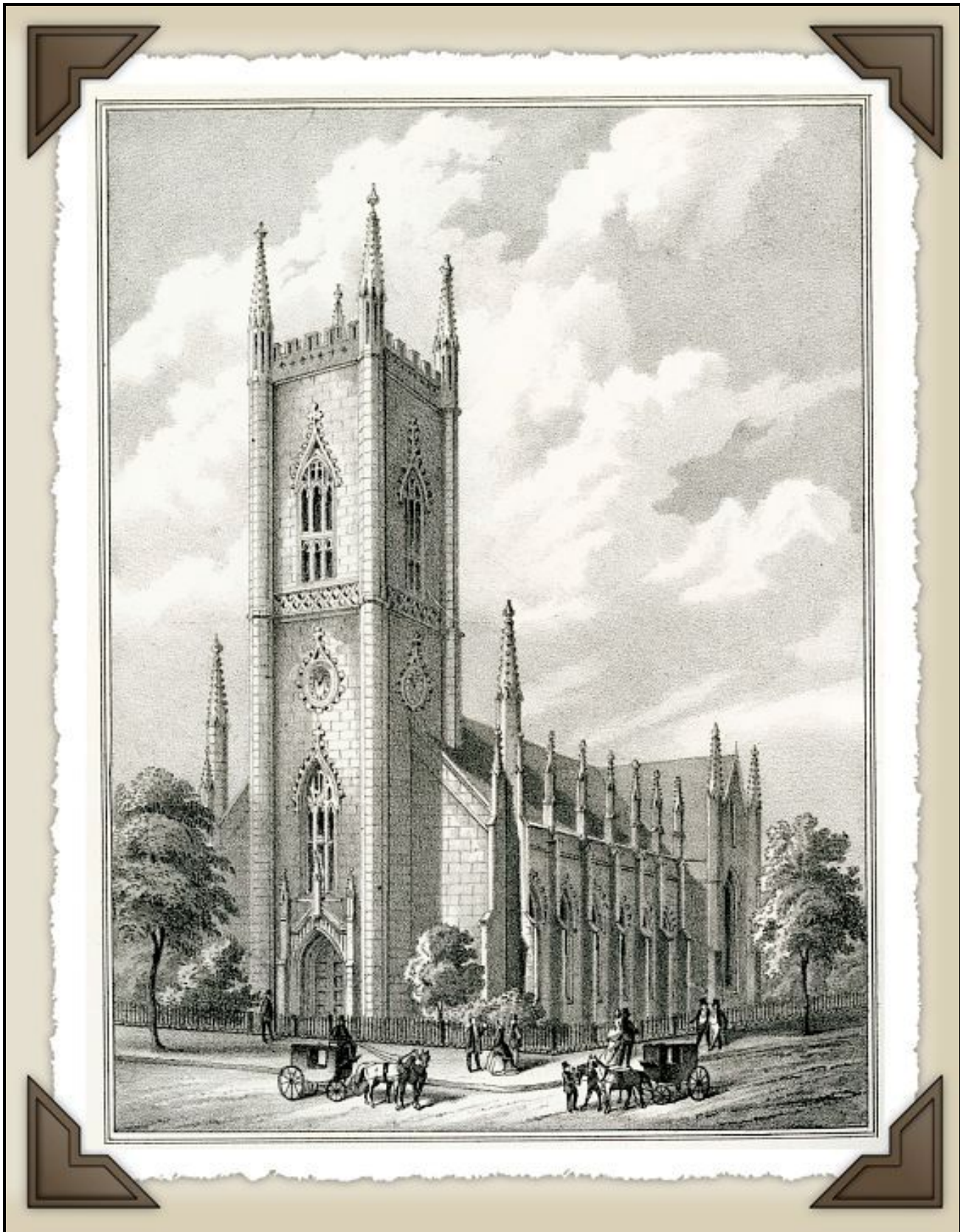
JOSEPH HENRY DEVELOPED ELECTROMAGNETIC INDUCTION

by Brian Roberts, CIBSE Heritage Group

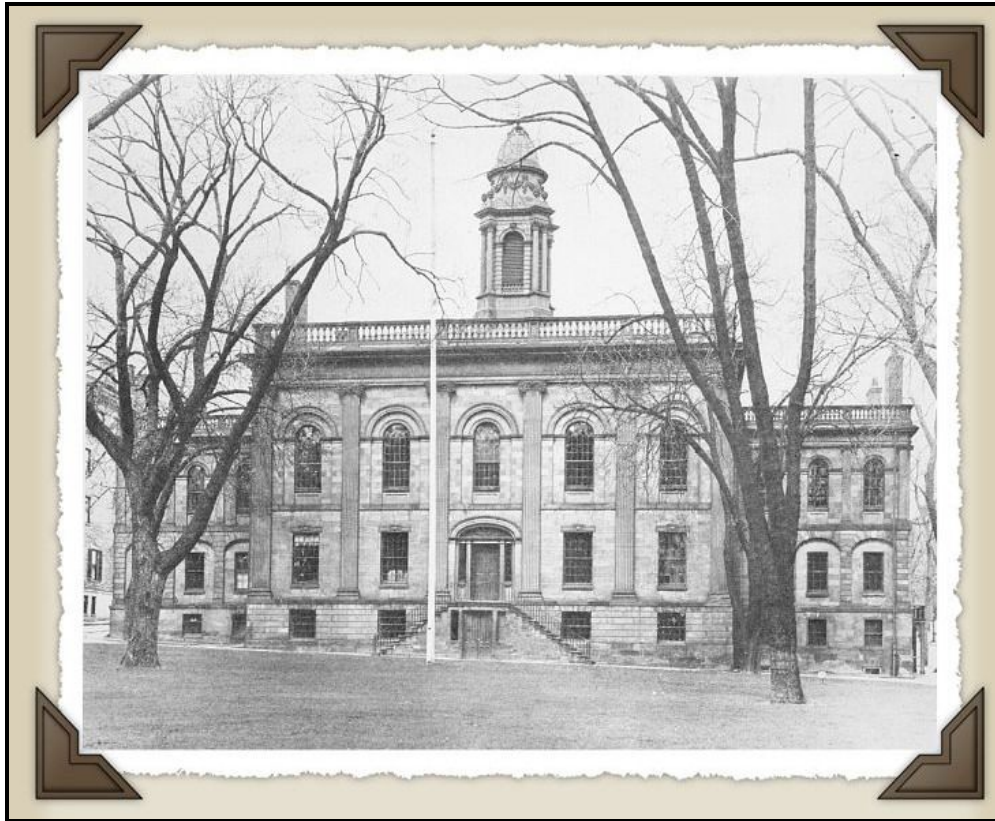


Joseph Henry, 1797-1878

Henry was born in Albany, New York State on 17th December, 1797, to Scottish immigrants William Henry and Ann Alexander Henry. His parents were poor and his father died while he was still young. Henry lived for the rest of his childhood with his grandmother in Galway, New York and went to a school which would later be named in his honour as the “Joseph Henry Elementary School.” After school he worked in a general store. At the age of thirteen he was apprenticed to a watchmaker and silver smith, but his first love was the theatre and he considered becoming a professional actor.



*First Presbyterian Church of Albany, New York State, where Joseph Henry was baptised in 1798
(Smithsonian Archives)*



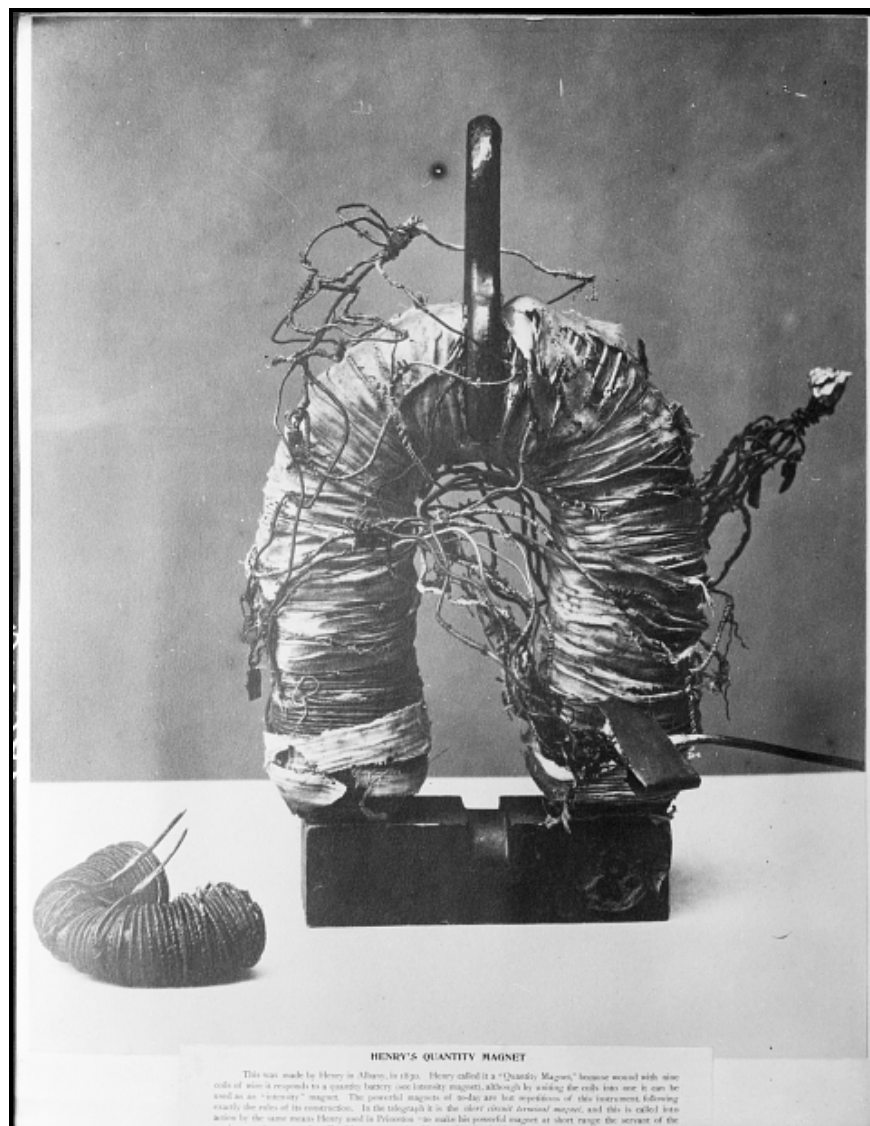
The Albany Academy (Smithsonian Archives)



The Albany Academy photographed in 1907

However, in about 1810, after reading a book *Popular Lectures on Experimental Philosophy* he became interested in science. In 1819 he entered The Albany Academy where, in spite of receiving free tuition, he was so poor that he had to support himself by various teaching positions. He planned to enter the medical profession, but in 1824 he was appointed Assistant Engineer for the survey of the State road, then being constructed between the Hudson River and Lake Erie.

In 1826, Henry was appointed Professor of Mathematics & Natural Philosophy at The Albany Academy, because not only did he excel at his studies, but he often helped his teachers teach science. It was here that Henry carried out research in terrestrial magnetism which led him to experiment with magnetism in general. He was possibly the first to coil insulated wire tightly around an iron core, making a powerful electromagnet. By winding several coils in parallel and multiple batteries he made possible a practical electric telegraph.

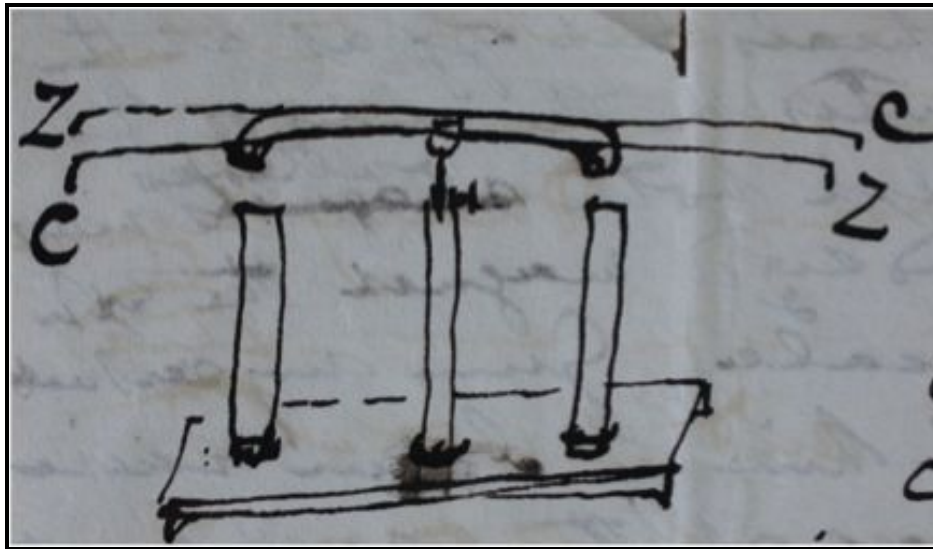


HENRY'S QUANTITY MAGNET

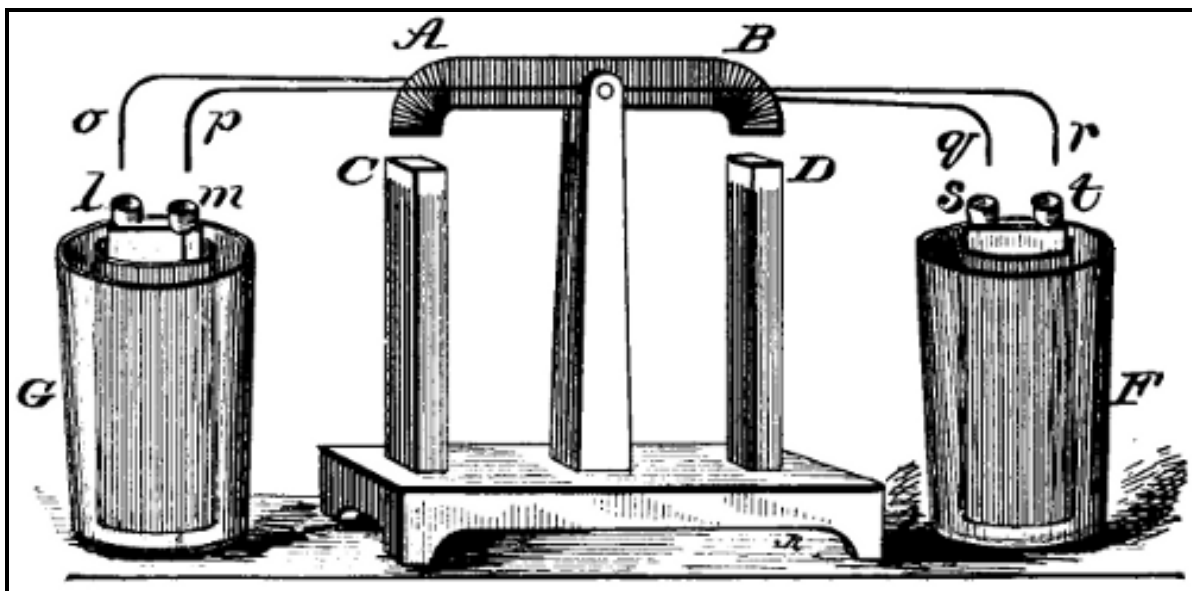
This was made by Henry in Albany, in 1826. Henry called it a "Quantity Magnet," because wound with wire coils of wire it responds to a quantity battery (see battery magnet), although by winding the coils into one it can be used as an "intensity" magnet. The powerful magnets of today are but variations of this instrument following exactly the rules of its construction. In the telegraph it is the short circuit dynamo magnet, and this is called into action by the same means Henry used in Philadelphia to make his powerful magnet of short range the secret of the

Henry's "Quantity Magnet"

In 1831, Henry created one of the first machines to use electromagnetism for motion. His experiment did not create rotating motion, but was set to produce a rocking action. This apparatus is considered to be a prototype of the modern DC motor. It allowed Henry to recognise the property of *self-inductance*, also discovered about the same time by the British scientist Michael Faraday. (Since Faraday was the first to publish, he is generally recognised as the discoverer of this phenomenon). However many years later, the SI unit of inductance, the *henry* (H), was named in honour of Joseph Henry.*



Henry's drawing of his experiment



Henry's "rocking motion" experiment

**Inductance* is the property of an electrical conductor by which a change in current through it induces an electromotive force in both the conductor itself and in any nearby conductors by mutual inductance.

In 1831, Henry developed his electromagnet into a practical device: a bell that could be rung at a distance via an electric wire, and in 1835 by an electric relay. Also in 1831, he built a telegraph of his own design and operated it successfully over 1.5 miles. It has been said that his electromagnetic relay was the basis of a practical electric telegraph, invented separately by Samuel Morse and Sir Charles Wheatstone.

In 1832, Henry was appointed Professor of Natural Philosophy at the College of New Jersey (later Princeton University) where he continued his researches. He discovered laws relating to the transformer and apparently experimented in the use of radio waves.

In 1846, Joseph Henry became the first Secretary of the Smithsonian Institution in Washington, D.C., and in 1848, carried out experiments looking at the temperature of sunspots compared with surrounding regions on the sun. The success of Smithsonian meteorological work led to the creation of the U.S. Weather Bureau.

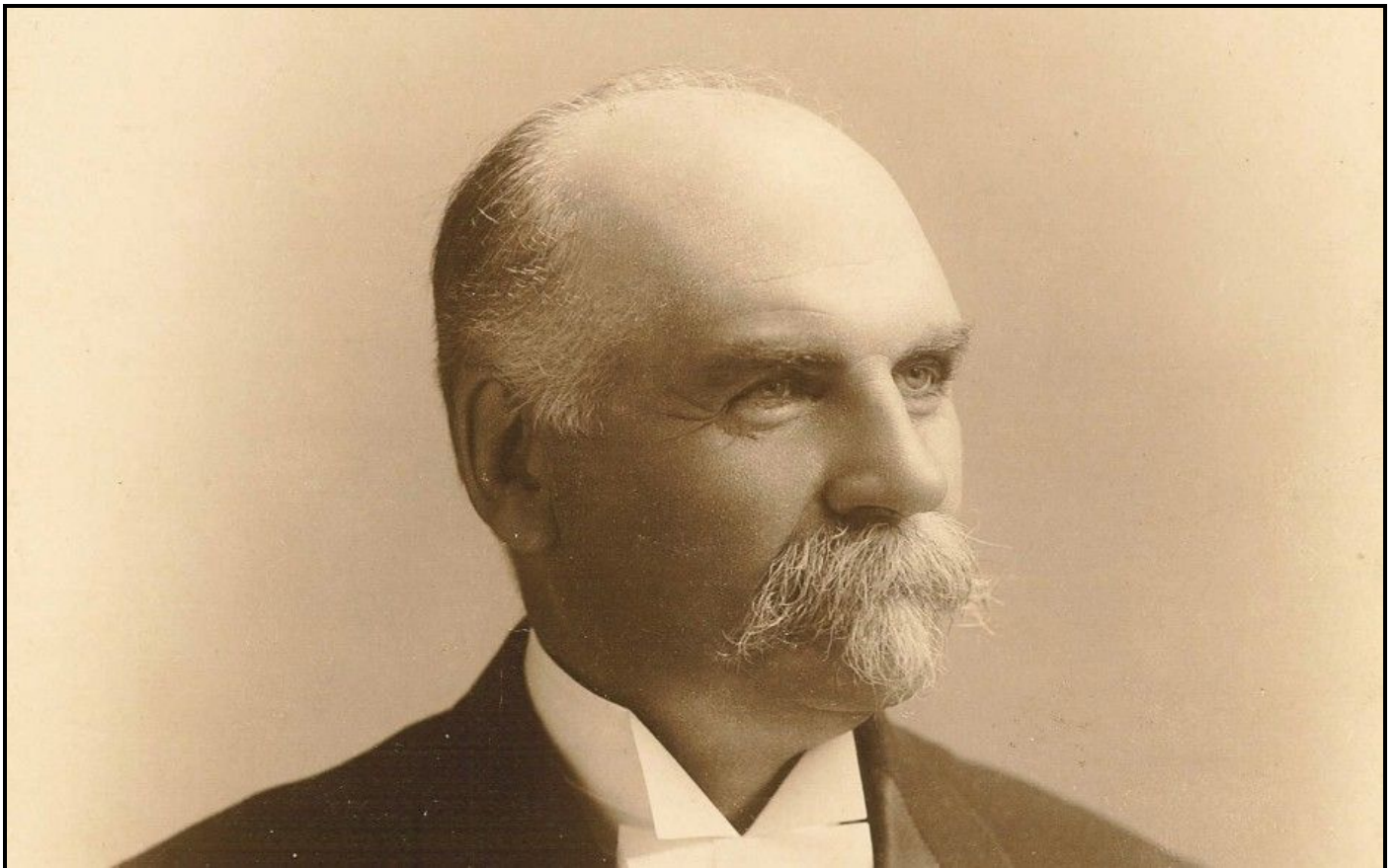


1860 Portrait of Joseph Henry (Smithsonian Archives)

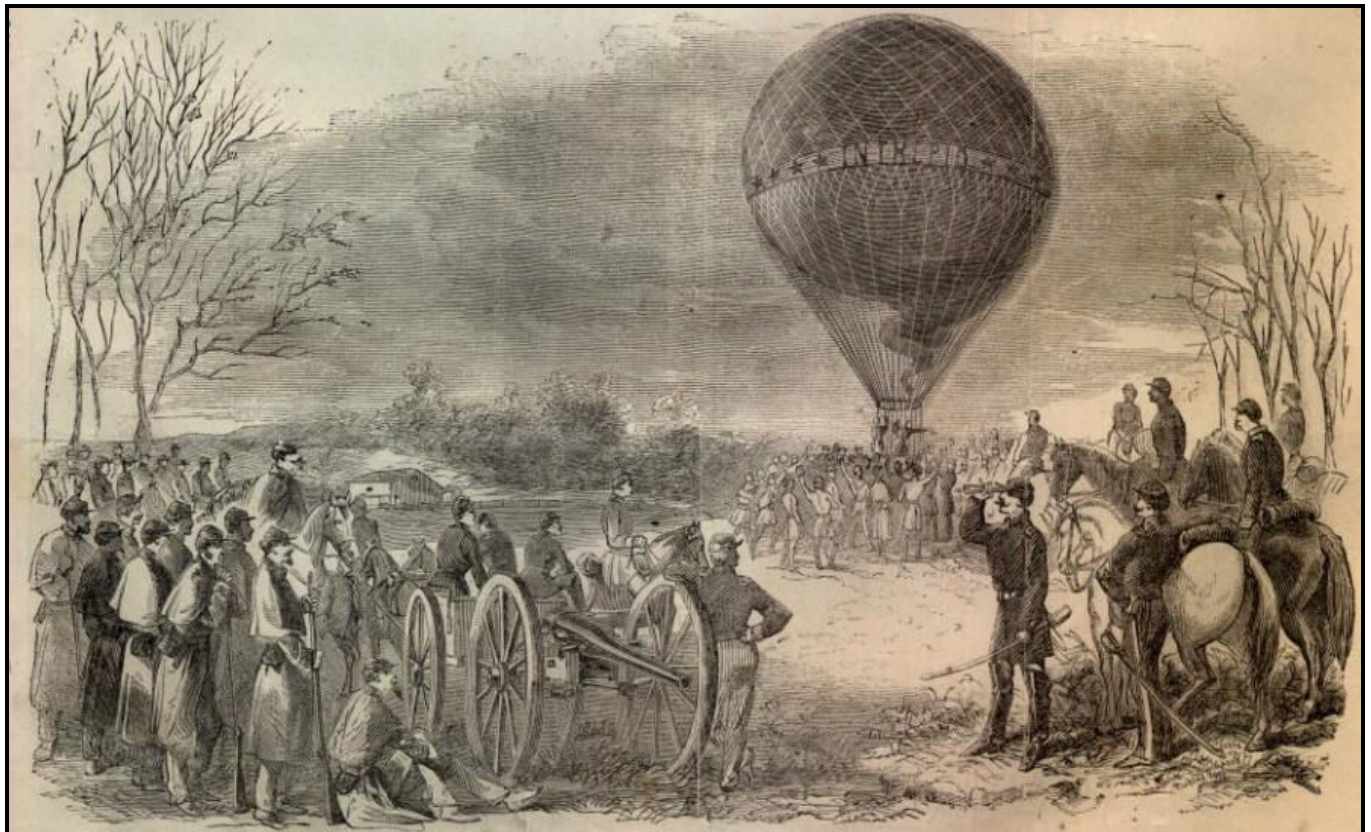
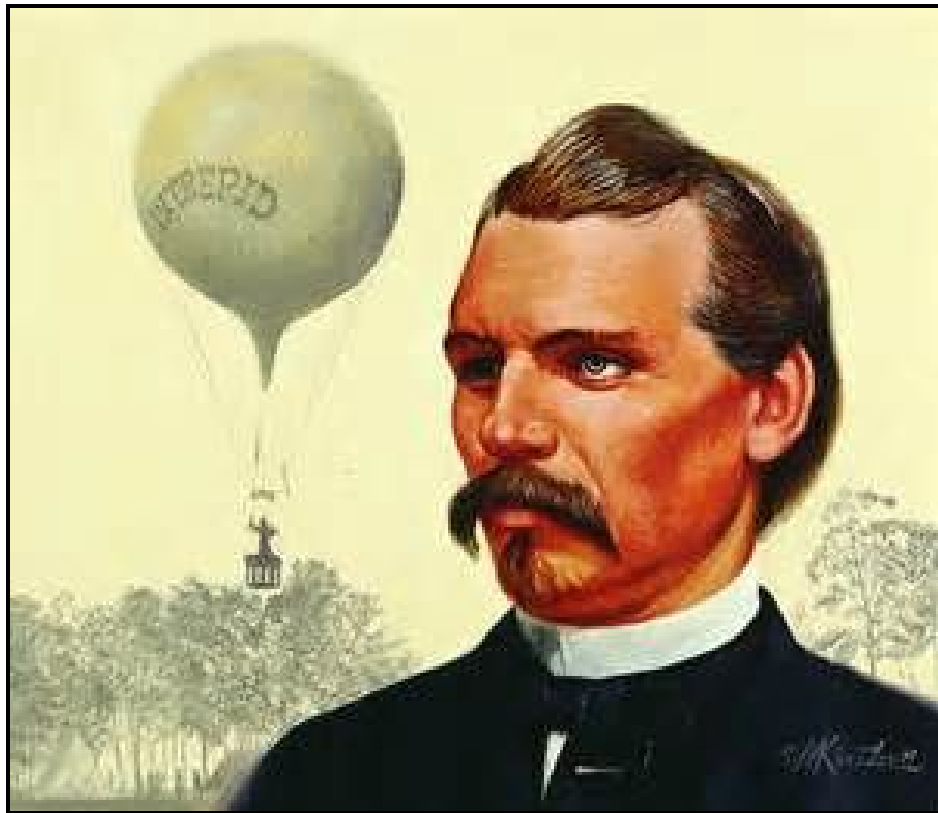
BALLOONS AND REFRIGERATION

At some point, Henry was introduced to Professor Thaddeus Lowe, a balloonist from New Hampshire who developed an interest in lighter-than-air gases and meteorology, constructing inflated balloons with the possibility of exploring the upper atmosphere and even transporting a person. The only suitable gases at this time were manufactured “street” gas or hydrogen. On Henry’s recommendation, Lowe went on to form the United States Union Army Balloon Corps and served two years with the Army of the Potomac as a Civil War *Aeronaut*. During the war the Army used observation balloons (with a man on board) to view the disposition of the enemy.

Street gas was not readily available and hydrogen expensive but could be produced using a portable generator. Probably with balloons in mind, Lowe made an early CO₂ compressor (U.S. Patent 63,413: 1867), but after the Civil War used it to manufacture ice, first in Texas, later in Mississippi.



Thaddeus Sobieski Colincourt Lowe, 1832-1913



Thaddeus Lowe and his observation balloon



Joseph Henry, first Secretary of the Smithsonian Institution (Smithsonian Archives)



The Smithsonian, c. 1861 (Smithsonian Archives)



Inside the Henry apartment, 1862 (Smithsonian Archives)



Damaged print from an 1862 photograph of Joseph Henry (Smithsonian Archives)



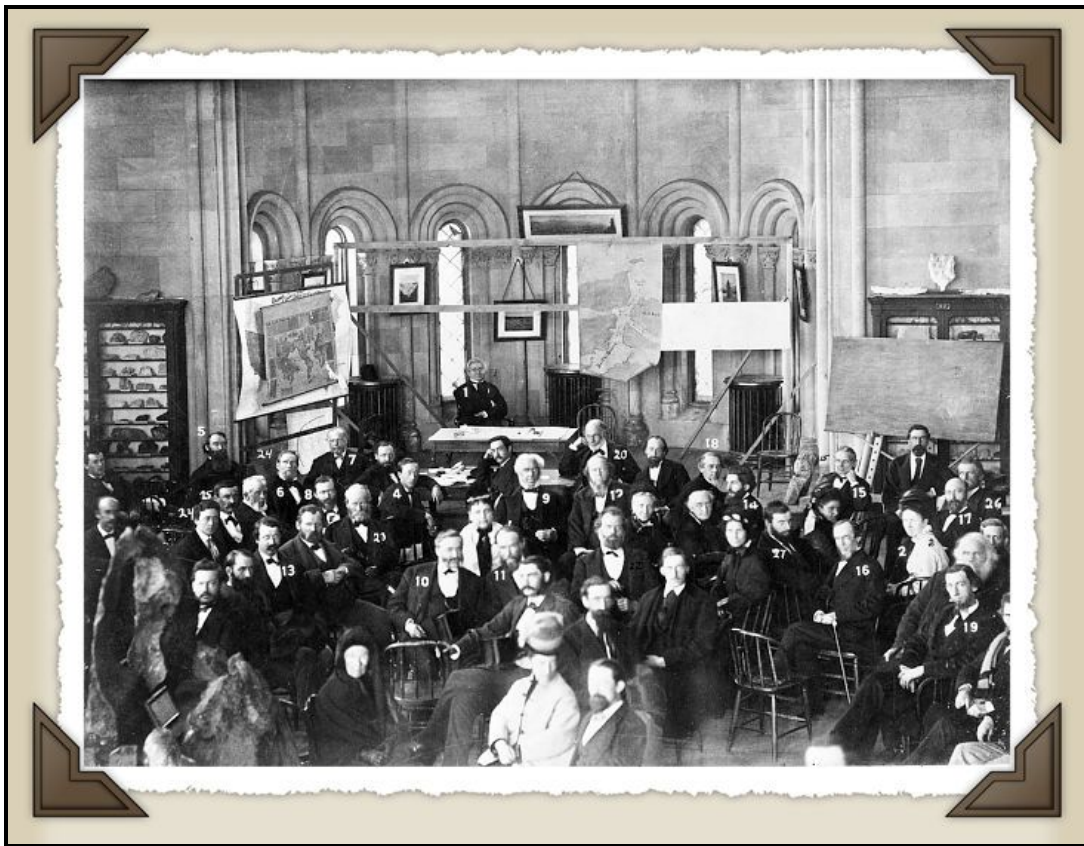
Joseph Henry, 1860's (Smithsonian Archives)



*Joseph Henry and his wife Alexander, with their daughters Caroline, Helen Louise and Mary Anna, who are holding croquet mallets, seated on the grounds of the Smithsonian Institution Building, 1865
(Smithsonian Archives)*



1865 portrait (Smithsonian Archives)

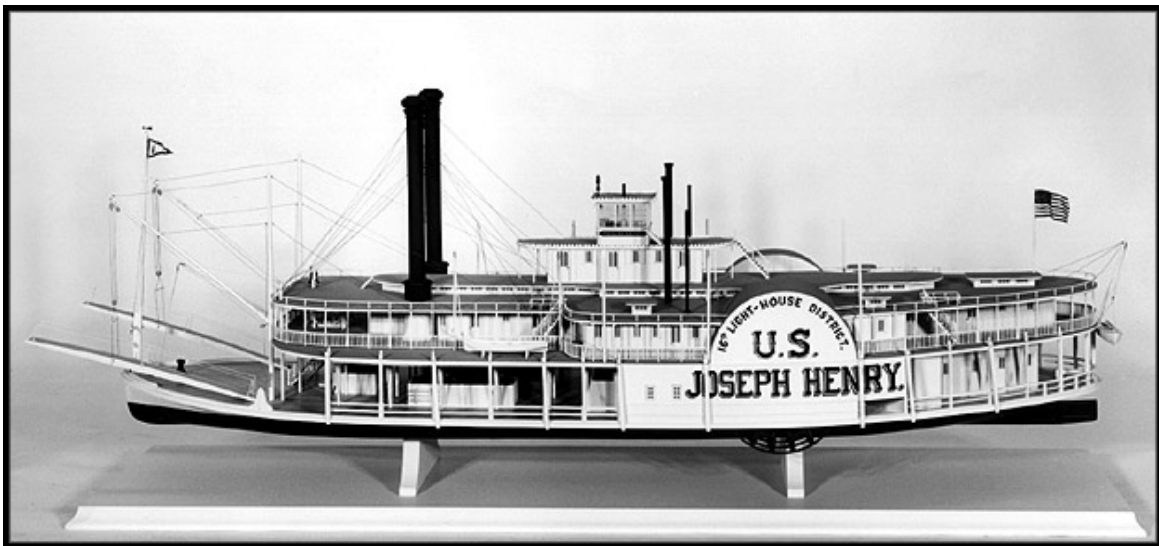


*A Meeting at the Smithsonian Institution in April 1874.
Henry (numbered 1 in photo is behind the table, right at the back)
(Smithsonian Archives)*



Dedication of the Henry Statue in 1883 (Smithsonian Archives)

Henry was appointed to the Lighthouse Board in 1852 and became Chairman in 1871.



*Model of the Light House Board paddle-wheel cutter named the U.S Joseph Henry
Launched 1880, active until 1904*



Professor J Henry listed on the Light House Board plaque of 1860



Working near the Henry statue at the Smithsonian in 1934 (Smithsonian Archives)



1934 postcard

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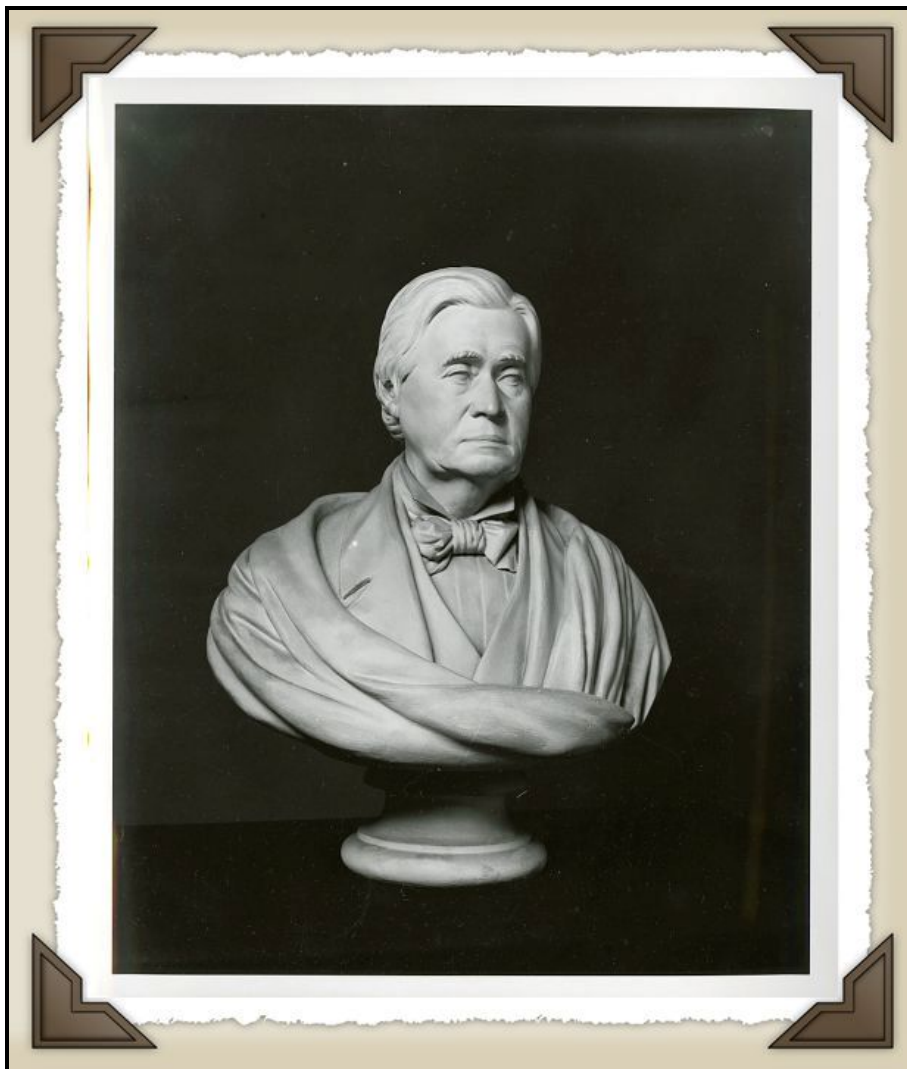
----- *Smithsonian Archives, History Division**

1979 *A History of Refrigeration*, Roger Thevenot, International Institute of Refrigeration, Paris

2016 *Joseph Henry*, Encyclopaedia Britannica Online

----- *Joseph Henry*, Edison Tech Center, Hall of Fame

*Joseph Henry was the first Secretary of the Smithsonian Institution from 1846 until 1878 and the Smithsonian Archive is an important source of information about him and his family as it holds detailed records, dates and contemporary photographs.



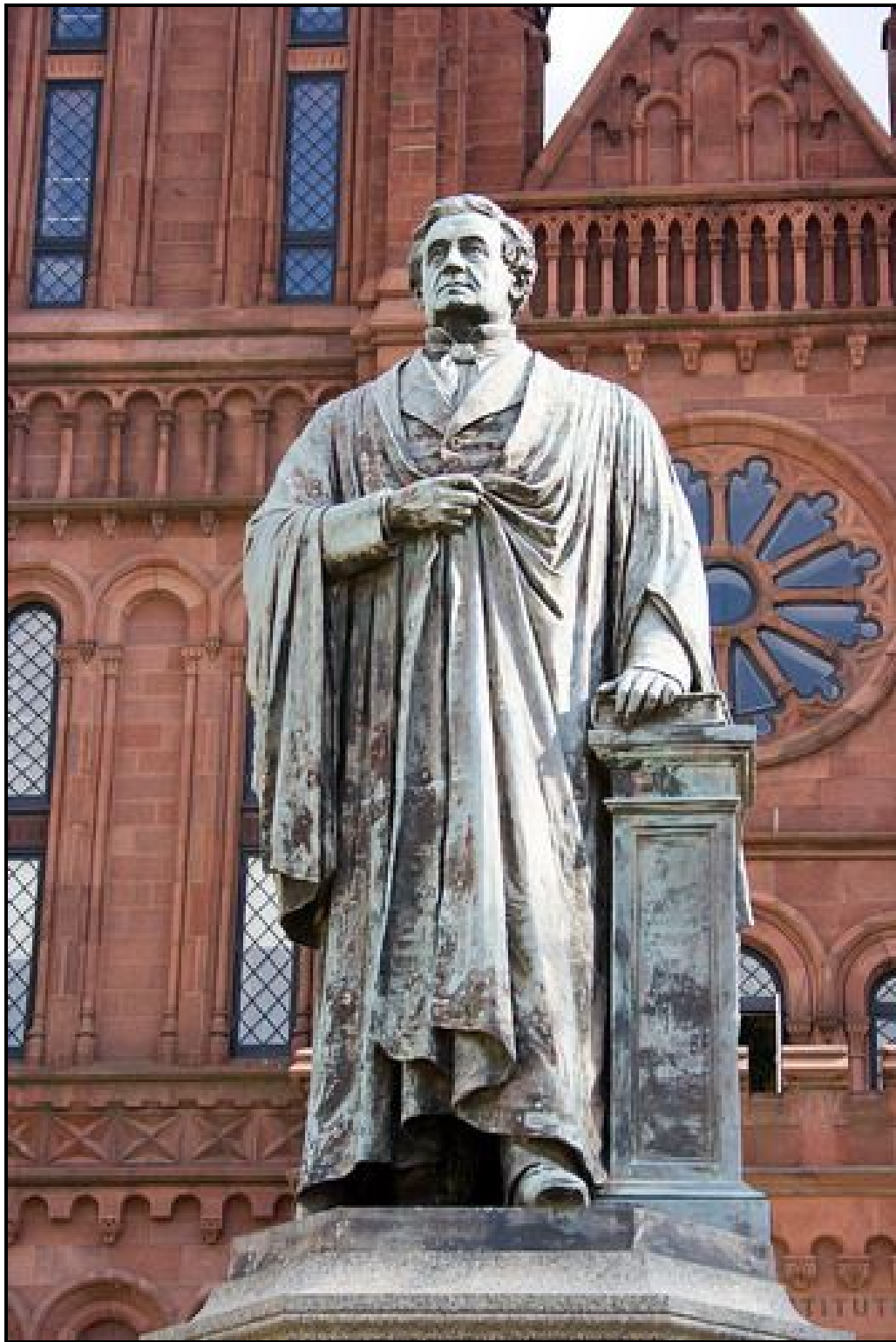
1870's bust of Joseph Henry (Smithsonian Archives)

EPILOGUE

Joseph Henry died on the 13th May, 1878 and was buried in Oak Hill Cemetery in the Georgetown section of northwest Washington, D.C.

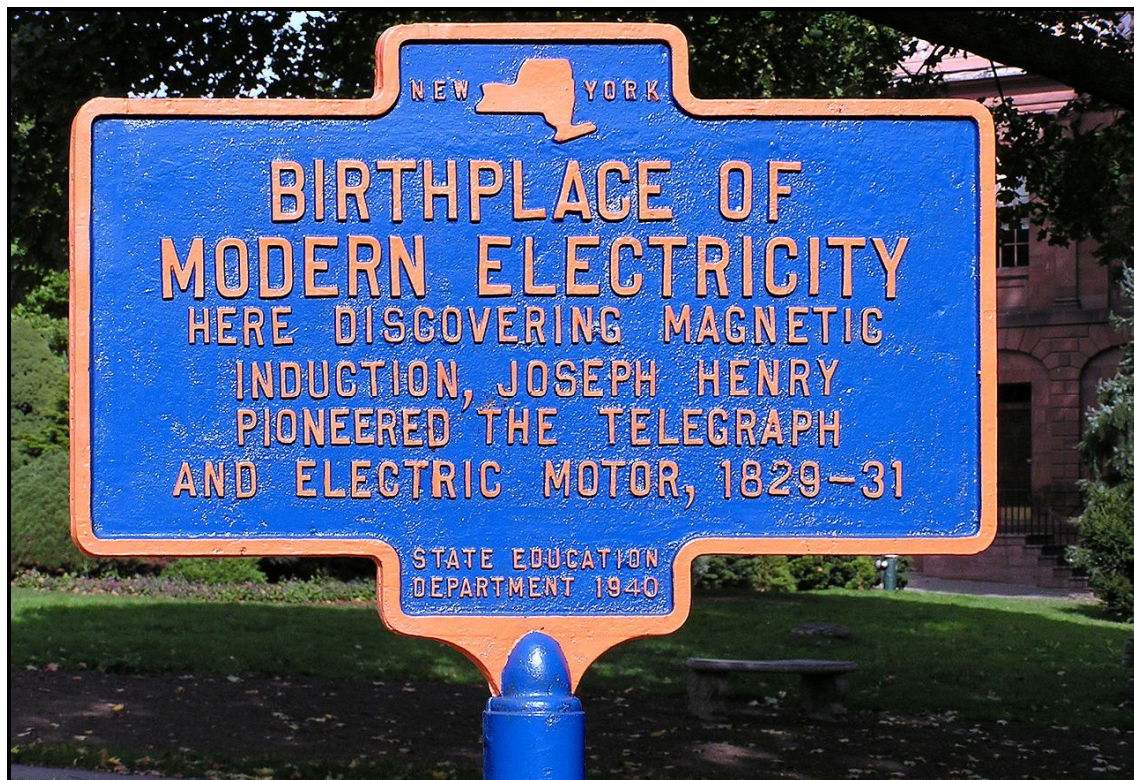
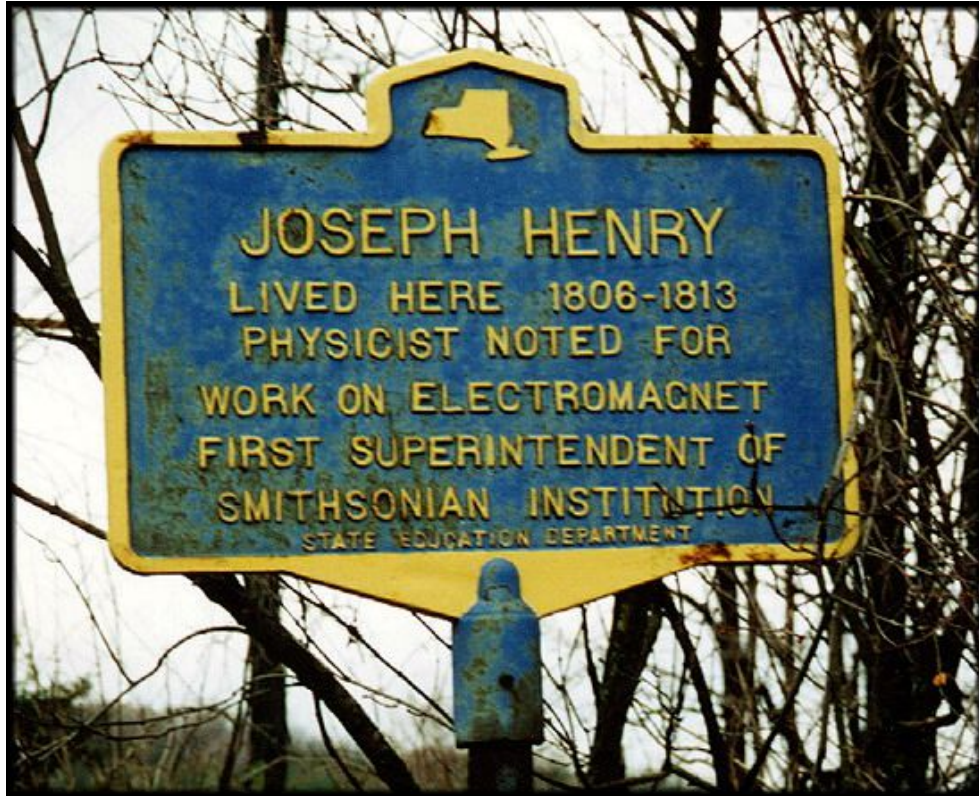


The grave of Joseph Henry and his wife Harriet (died March, 1882) in Washington D.C.'s Oak Hill Cemetery

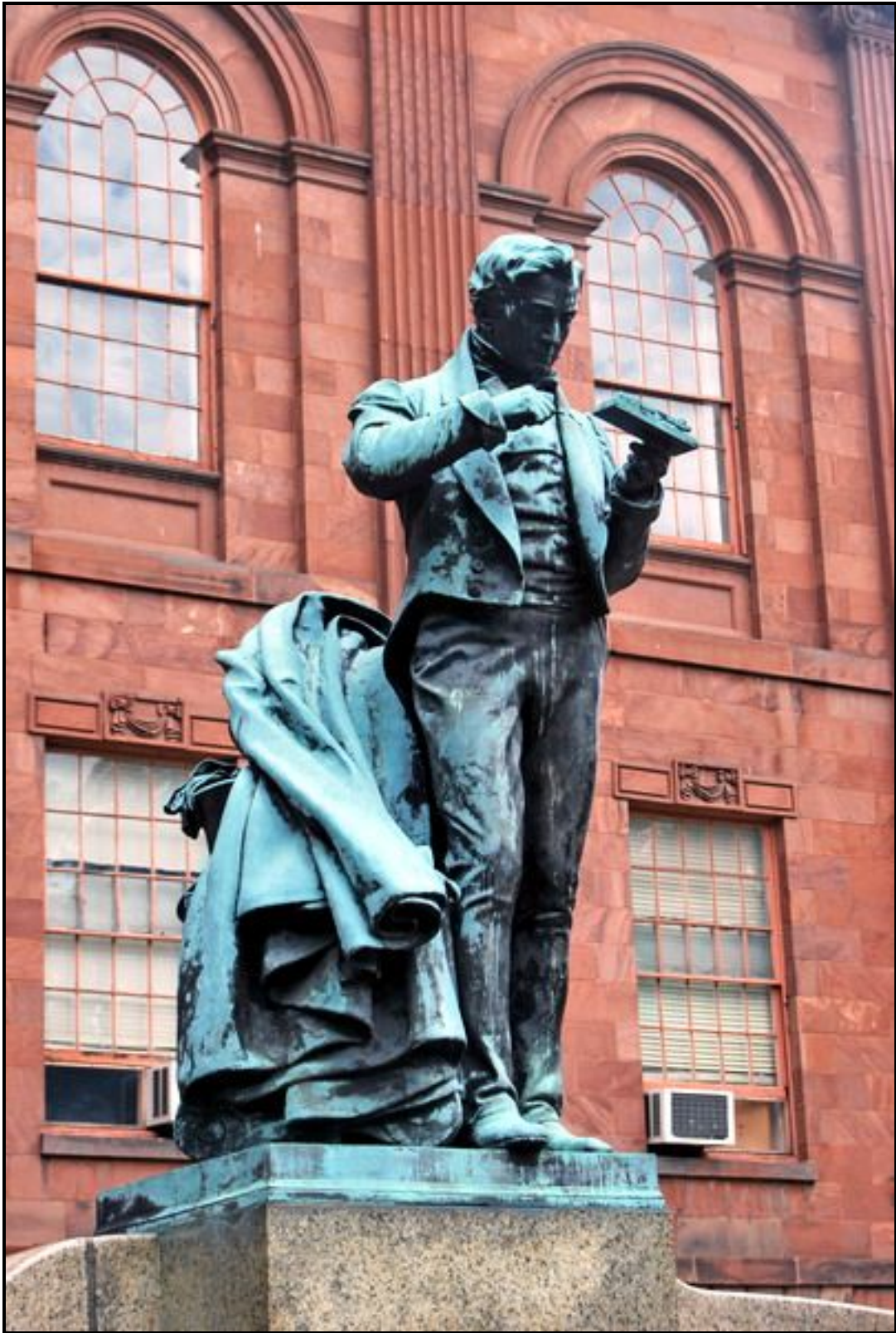


Joseph Henry statue in front of the Smithsonian Castle

John Phillips Sousa wrote the *Transit of Venus March* for the unveiling of the Joseph Henry Statue at the Smithsonian.



Joseph Henry commemorative markers



Joseph Henry statue in front of the old Albany College in New York State

Joseph Henry: His Career and His Honours

1826 Professor of Mathematics & Natural Philosophy at The Albany Academy, New York State

1832 Professor at Princeton

1835 Invented the electromechanical relay

1846 First Secretary of the Smithsonian Institution until 1878

1848 Edited *Ancient Monuments of the Mississippi Valley*, the Institution's first publication

1851 Elected Member of the American Antiquarian Society

1852 Appointed to the Lighthouse Board

1871 Appointed Chairman of the Lighthouse Board

1872 John Wesley Powell named a mountain range in Utah after Henry

1878 Received the Medal & Diploma of the Norwegian Order of St Olaf from the King of Sweden for scientific achievements

1880 The District of Columbia named a school as the Joseph Henry School

1915 Henry was inducted into the *Hall of Fame for Great Americans* in the Bronx, New York

In addition:

At Princeton the Joseph Henry Laboratories and the Joseph Henry House are named for him.

A bronze statue of Henry (with Isaac Newton) represents science on the balustrade of the galleries of the Main Reading Room in the Thomas Jefferson Building of the Library of Congress on Capitol Hill in Washington D.C.



Henry medal, 1874