



Statue of Isambard Kingdom Brunel at Brunel University.

**MEMORIALS**  
**TO ENGINEERS, ARCHITECTS AND**  
**SCIENTISTS WHO CONTRIBUTED**  
**TO BUILDING ENGINEERING SERVICES**

**BRIAN ROBERTS**

# **LOCATION OF PICTURED GRAVE OR MEMORIAL TO ENGINEER, ARCHITECT OR SCIENTIST IN ORDER OF THEIR SURNAME**

**ARNOTT, Dr. Neil:** Dean Cemetery, Edinburgh

**BOULTON, Matthew:** St. Mary's Parish Church, Handsworth, Birmingham.

**BRUNEL, Isambard Kingdom:** Victoria Embankment, London.

**CARNOT, Nicolas Leonard Sadi:** Vimoutiers, France

**CARRIER, Dr. Willis Haviland:** Forest Lawn, Buffalo, USA.

**DAVIDSON, Samuel Cleland:** Belfast City Cemetery.

**DAVY, Sir Humphry:** Market House, Penzance.

**EDISON, Thomas Alva:** Greenfield Village, Dearborn, USA.

**FARADAY, Michael:** Institute Engineers & Technicians, Savoy Place, London.

**FRANKLIN, Benjamin:** University of Pennsylvania, USA.

**GIBBS, Josiah Willard:** Yale University, USA.

**GORRIE, Dr. John:** Statutory Hall, Capitol, Washington DC, USA.

**HADEN, George:** Trowbridge Tabernacle Church.

**JOULE, James Prescott:** Worthington Park, Sale, Cheshire.

**KELL, John Robert:** Roof of St. Alban's Cathedral.

**MACKINTOSH, Charles Rennie:** Elliot Street, Glasgow.

**MEIGS, General Montgomery:** Arlington National Cemetery, Washington DC.

**NEWCOMEN, Thomas:** Dartmouth, Devon.

**PAPIN, Denis:** Blois, France.

**PAXTON, Sir Joseph:** St. Peter's Churchyard, Edensor, Derbyshire.

**PHIPSON, Wilson Weatherley:** Wandsworth Cemetery, Putney, London.

**RANKINE, William John Macqourne:** Scottish Engineering Hall of Fame.

**RUMFORD, Count { Sir Benjamin Thompson }:** Munich, Germany.

**SOANE, Sir John:** North Curtain Wall, Bank of England, London.

**SWAN, Sir Joseph Wilson:** Sunderland Museum & Winter Garden.

**TESLA, Nikola:** Queen's Park, Niagara Falls, USA.

**TREVITHICK, Richard:** Camborne, Cornwall.

**WATERHOUSE, Alfred:** Yattendon, Berkshire.

**WATT, James:** Greenock Town Hall, Scotland.

**WRIGHT, Frank Lloyd:** Florida Southern College, Campus.



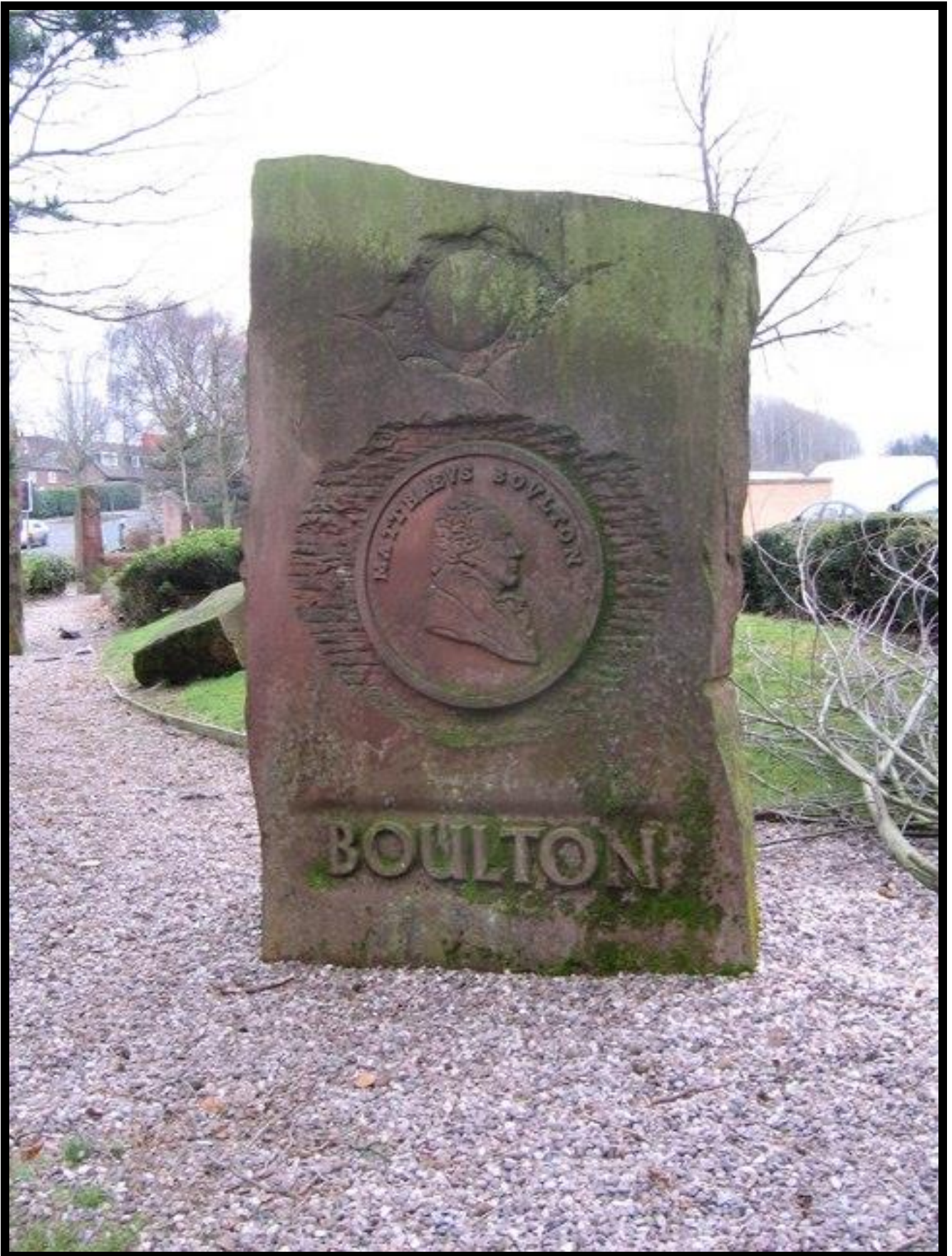
## Dr. ARNOTT, Neil 1788-1874



Doctor and Physician Extraordinary to Queen Victoria. In 1838, wrote book on "The Thermometer Stove, or Self-Regulating Fire." Described the use of fires, chimneys and stoves, believing his stove and regulator would halve England's consumption of coal. He invented other devices, one of which relied on the expansion of mercury within a tube, but all these inventions controlled the temperature within the stove casing, not that of the room.



## **BOULTON, Matthew 1728-1809**



English engineer. Partner of James Watt in the manufacture of steam engines. Carried out the warming of Soho House with a "cockle and warm air stove" the first in the UK for a large house since the Roman hypocaust.



## BRUNEL, Isambard Kingdom 1806-1859



English engineer, generally considered to be the most renowned of all Victorian engineers. He designed the Clifton Suspension Bridge (started 1831), the Great Western Railway (1833-1846), the largest transatlantic steam ships of their time: *Great Western* (1837), *Great Britain* (1853), and the *Great Eastern* (1858). He also designed a 1000 bed prefabricated hospital with all its services, which was erected at Scutari in Turkey during the Crimean War.



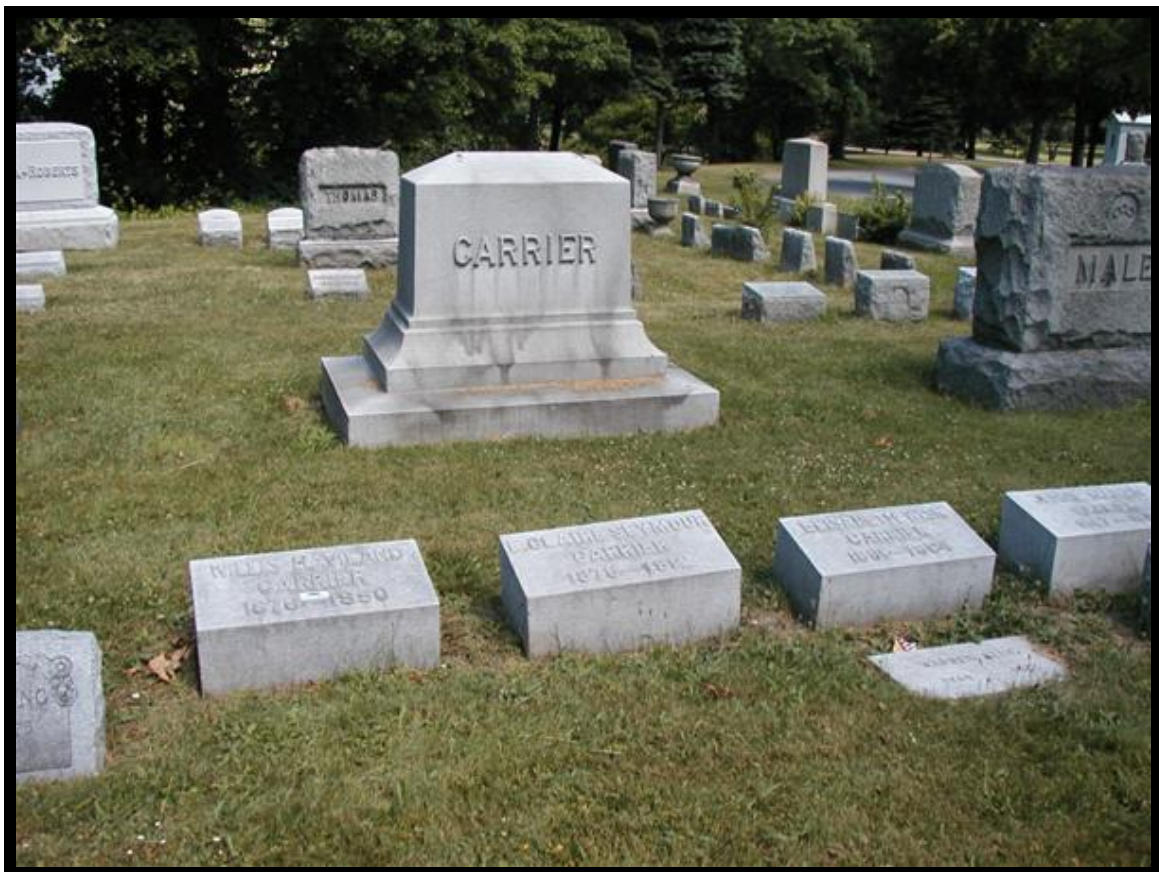
# CARNOT, Nicolas Leonard Sadi 1796-1832



French military engineer and physicist. Formulated the ideal, reversible engine cycle "Carnot Cycle" which was important in the study of mechanical refrigeration, and leading to the later formulation of the Second Law of Thermodynamics.



**Dr. CARRIER, Willis Haviland 1876-1950**



American engineer and inventor. Founder of Carrier Corporation. "Father of air conditioning."  
Developed centrifugal refrigeration. Served as President ASRE 1927, ASHVE 1931.



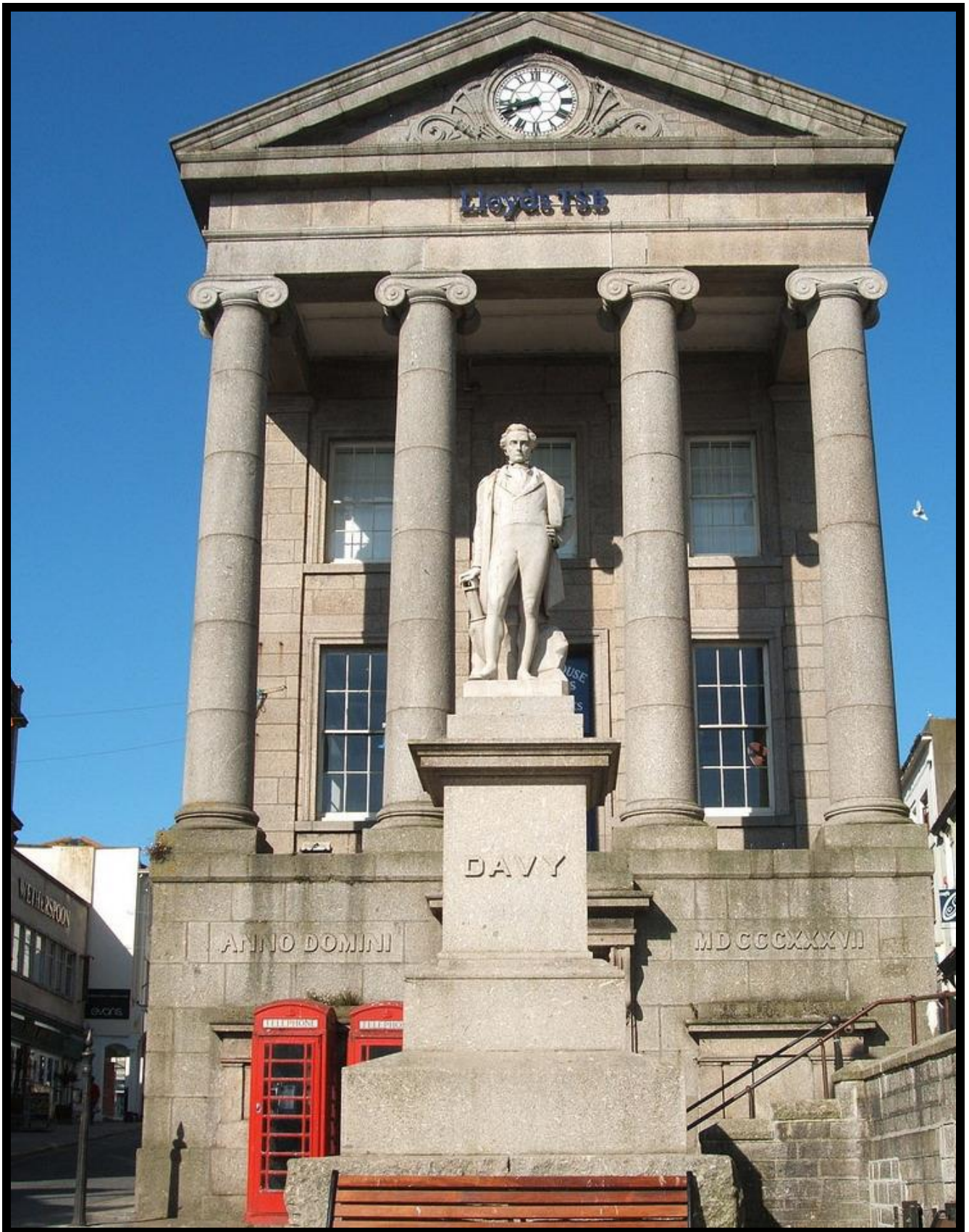
## DAVIDSON, Samuel Cleland 1846-1921



Belfast fan manufacturer. Developed his *Sirocco* multiblade centrifugal (BP 4609: 1898), but its "large open eye" resulted in an unresolved patent dispute with James Keith. However, the Davidson fan was extremely successful and "enjoyed a success unrivalled by any other design..... being constructed in greater numbers than any other form of flow machine." Apart from its compactness, it was extremely quiet in operation. Davidson was also involved in the design, installation and maintenance of the "air conditioning" (with humidification but no refrigeration) for the Royal Victoria Hospital, Belfast in 1903.



## DAVY, Sir Humphry 1778-1829



English chemist who believed heat was a form of motion. Appointed as lecturer at Royal Institution by Rumford. Demonstrated arc lamp. Invented miner's safety lamp (the Davy Lamp). Carried out improvements and tests to try and improve ventilation of the House of Lords. As recounted, "For boring twenty thousand holes/The Lords gave nothing Damn their souls." Some consider Davy's most far-sighted decision was the appointment of the young Faraday as his assistant in 1813.



## **EDISON, Thomas Alva 1847-1931**



American inventor and business man. Without education or influence, worked as telegraph operator. Impressed by writings of Faraday, in 1876 set up laboratory in Menlo Park. He patented some 1300 inventions, developed a practical incandescent electric light bulb and a complete system of direct-current generation, transmission and consumer apparatus. This brought him into conflict with Tesla who favoured alternating current systems and he eventually lost "the battle of the currents."



## **FARADAY, Michael 1791-1867**



English physicist and chemist. Renowned for his electrical discoveries leading to generation of electricity and the electric motor. Commemorated by the name *farad*, given to the SI unit of electric capacitance.



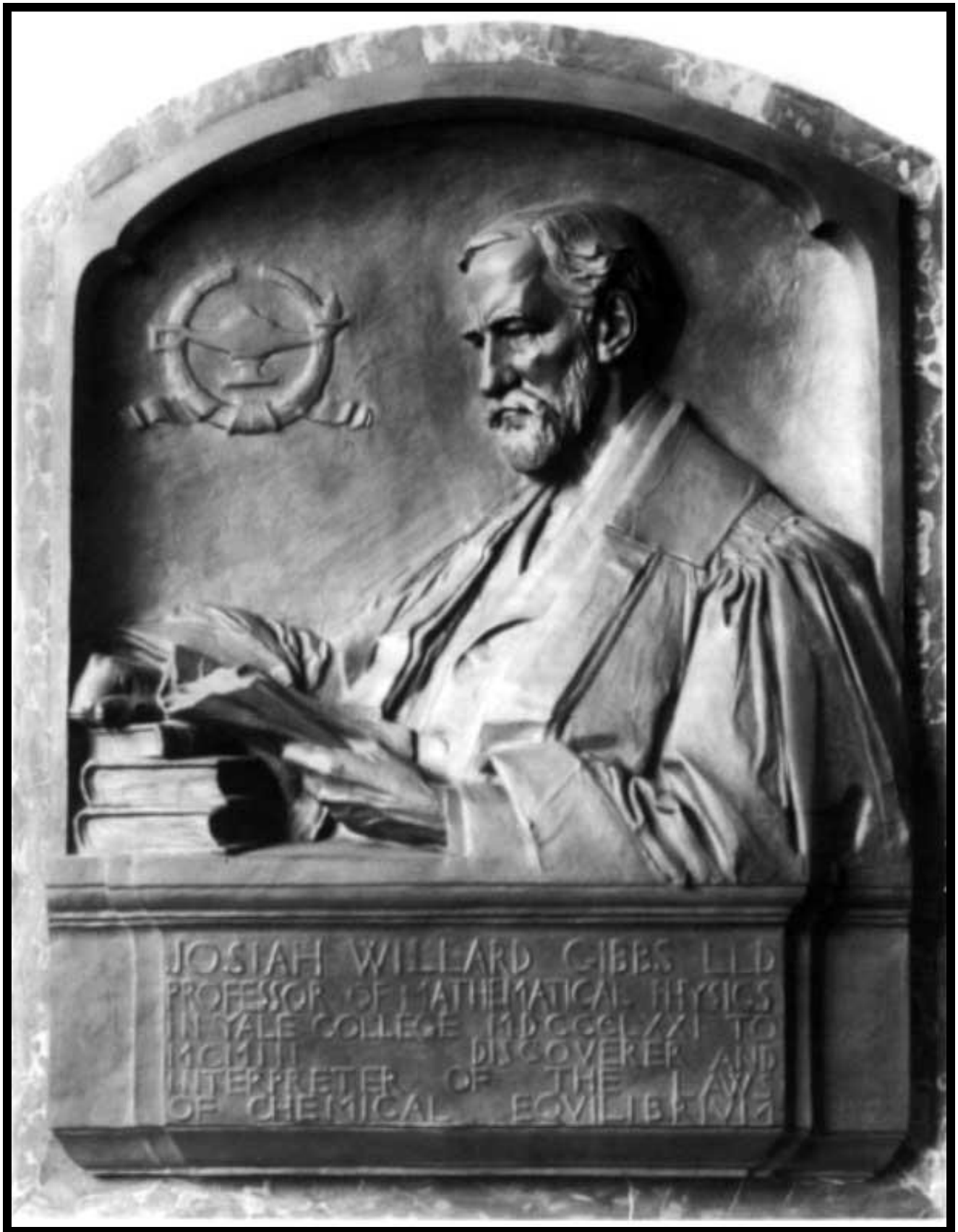
## FRANKLIN, Benjamin 1706-1790



American statesman, printer and scientist. In 1745, published a description of his *Pennsylvanian* fireplace, commenting "My common room is twice as warm as it used to be, with a quarter of the wood formerly consumed there." In 1748, heated a row of houses by means of an iron stove set in a chamber beneath the ground." After flying a kite in a thunderstorm, invented a lightning conductor." In 1785, he devised a back-to-back revolving grate that could be turned to face either of two rooms. Later wrote *Observations on the Causes and Cures of Smokey Chimneys*. For his work in connection with heating and ventilation, in 1929 he was adopted as the Patron Saint of the ASHVE.



## **GIBBS, Josiah Willard 1839-1903**



American physicist. Made significant contributions in thermodynamic analyses of heating and cooling, combustion processes, refrigerants and refrigerating machines. His contributions went largely unrecognised in Europe until the turn of the century.



**Dr. GORRIE, John 1802-1855**



American physician. Took interest in using mechanical refrigeration to control heat and humidity in Florida fever hospitals. Constructed a working air cycle refrigeration machine. His statue is in the U.S. Capitol Building.



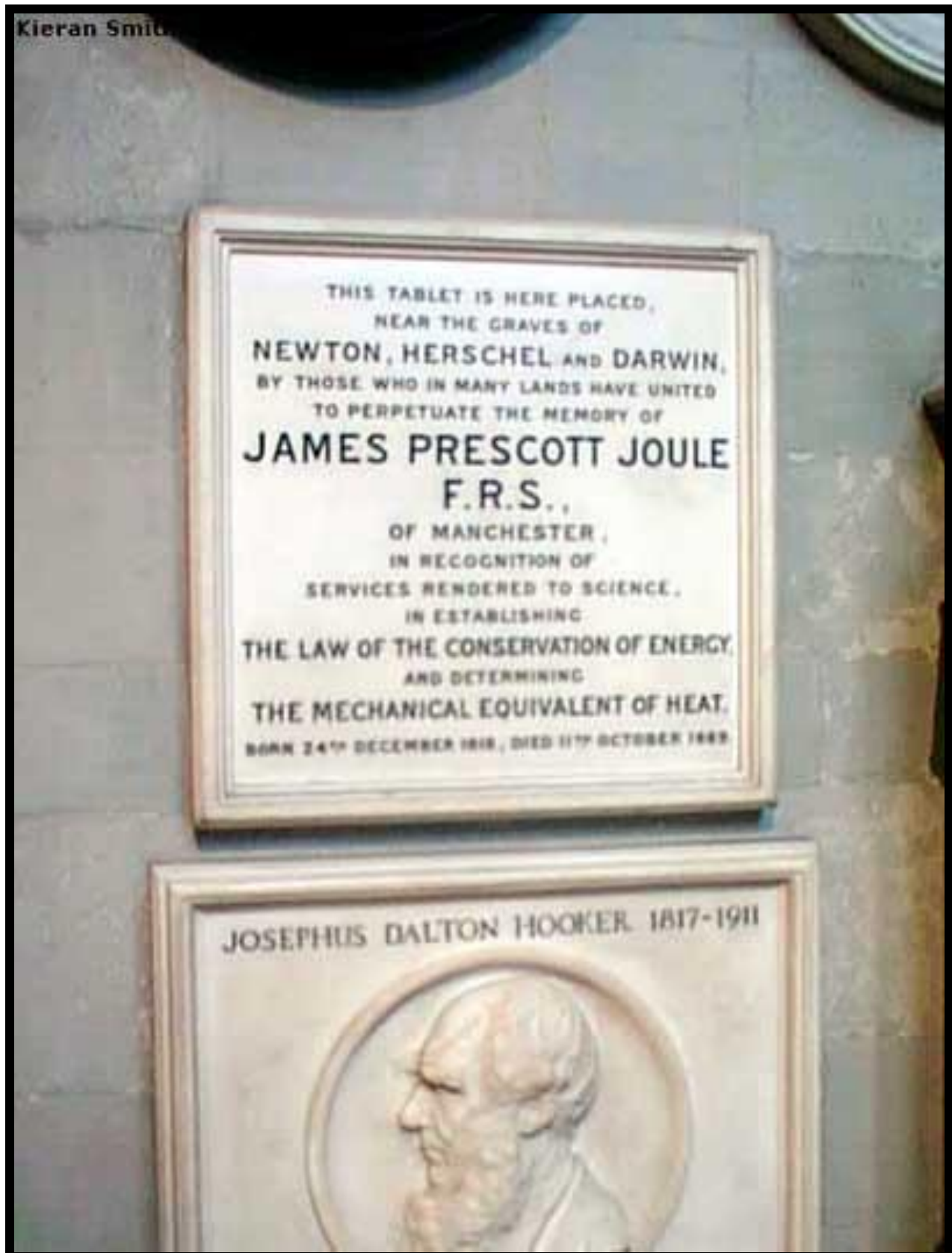
## HADEN, George 1788-1856



Son of George Haden Sr., who worked for James Watt. He was apprenticed to Boulton & Watt and trained on the steam engineering side of the business. With brother James, set up G & J Haden in Trowbridge in 1836, as an agent of Boulton & Watt to erect steam engines for West Country cloth mills. They went on to install associated steam heating systems, while George developed and patented a warm air ventilating stove (BP 9259: 1842). Their success was largely due to the installation of their patent stove in many hundreds of churches. Haden also worked with Jebb on the heating and ventilating of Pentonville Prison (1840-42). The Company he and his brother started was continued by the family, becoming the largest M&E contractor in the UK, even taking over Carrier UK. But sadly, they were taken over and the Company name changed just before what would have been their 200th Anniversary.



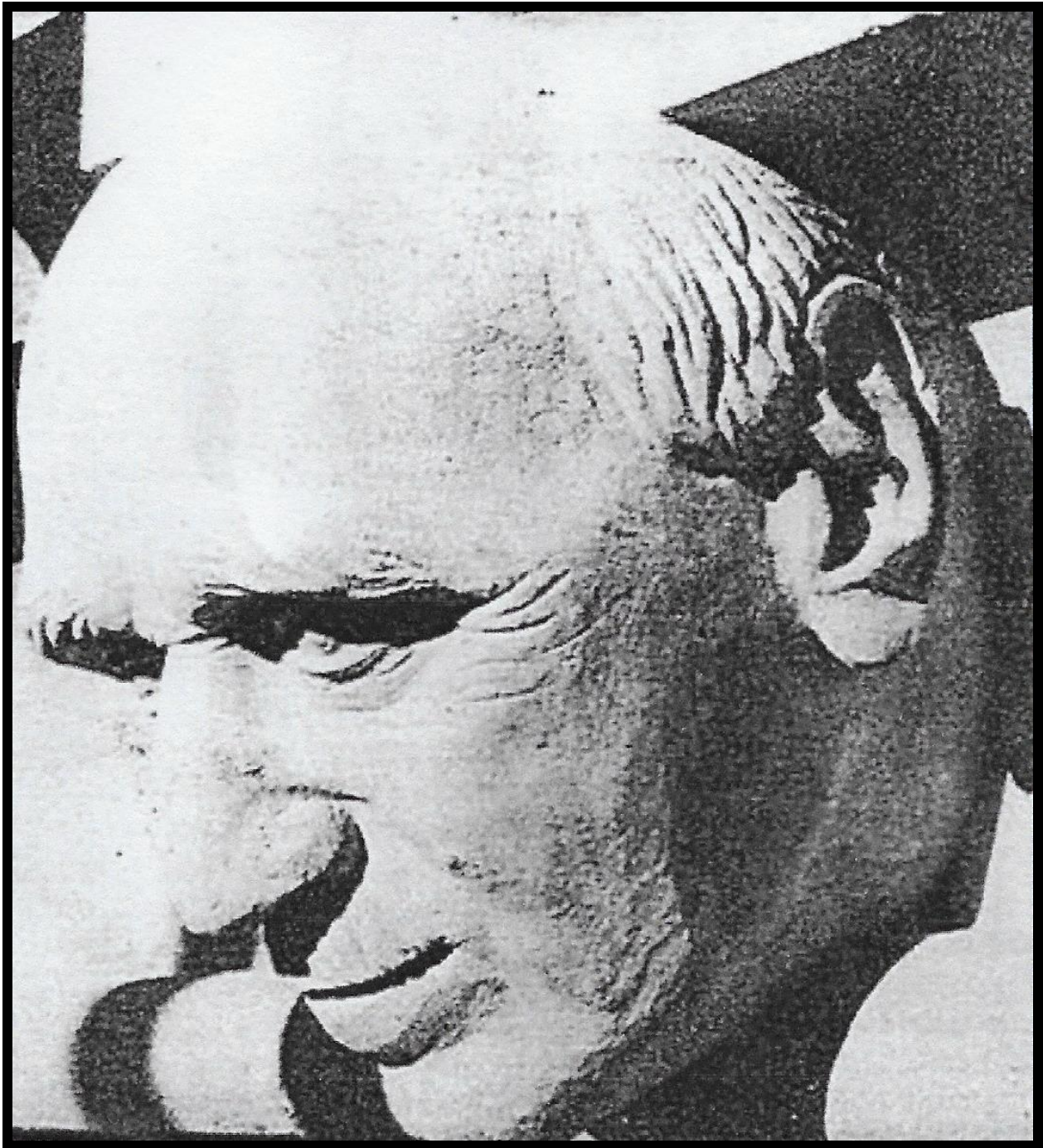
## JOULE, James Prescott 1818-1889



English physicist. Tutored by Dalton. Derived a value of 772.5-foot pounds of work per British thermal unit as the mechanical equivalent of heat. He is commemorated by the name *joule*, given to the SI unit of energy, work, quantity of heat.



## KELL, John Robert 1902-1983



English engineer. In 1926, joined the office of Oscar Faber (who was later President IHVE 1944-45). Involved in design of the M&E services for the Bank of England in London, which involved on-site electricity generation and waste heat recovery (by Drake & Gorham). In 1936, wrote (with Faber) the First Edition of *Heating and Air Conditioning of Buildings*, which became a standard textbook for many years. In 1938, his work on the 12-acre Earle's Court Exhibition Building involved full-scale tests on special ventilating jet nozzles. In 1948, taken into partnership by Faber. From 1943-1950,) responsible for the air conditioning of the rebuilt House of Commons, becoming President IHVE in 1952.



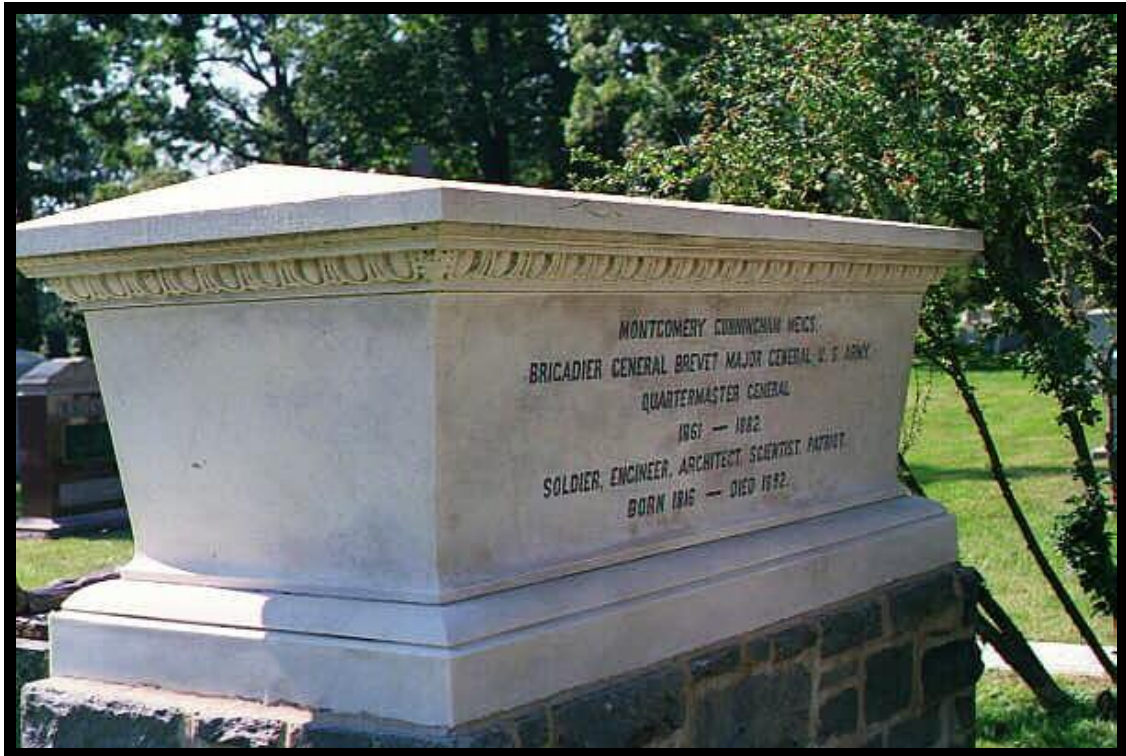
## **MACKINTOSH, Charles Rennie 1868-1928**



Scottish architect. Leader of the Art Nouveau movement in Great Britain. Designed the Glasgow School of Art (built in two phases 1898-1909), which included central heating and mechanical ventilation (possibly a very early air conditioning system).



## **MEIGS, Montgomery Brigadier General 1816-1892**



American soldier, architect and engineer. Responsible for the heating and ventilation of the rebuilt U.S. Capitol and for the natural ventilation and lighting of the huge atrium of the Old Pensions Office, both in Washington.

## **NEWCOMEN, Thomas 1663-1729**



English blacksmith and gifted amateur engineer. Constructed the first "atmospheric" steam engine.



## PAPIN, Denis 1647-1712



French physicist. In 1675 went to England and worked as assistant to Boyle. Then in 1679 developed the steam *digester*, a form of pressure cooker. Later, working first in Italy, then in Germany, in 1698 pioneered the steam engine, eventually returning to England to die in poverty.



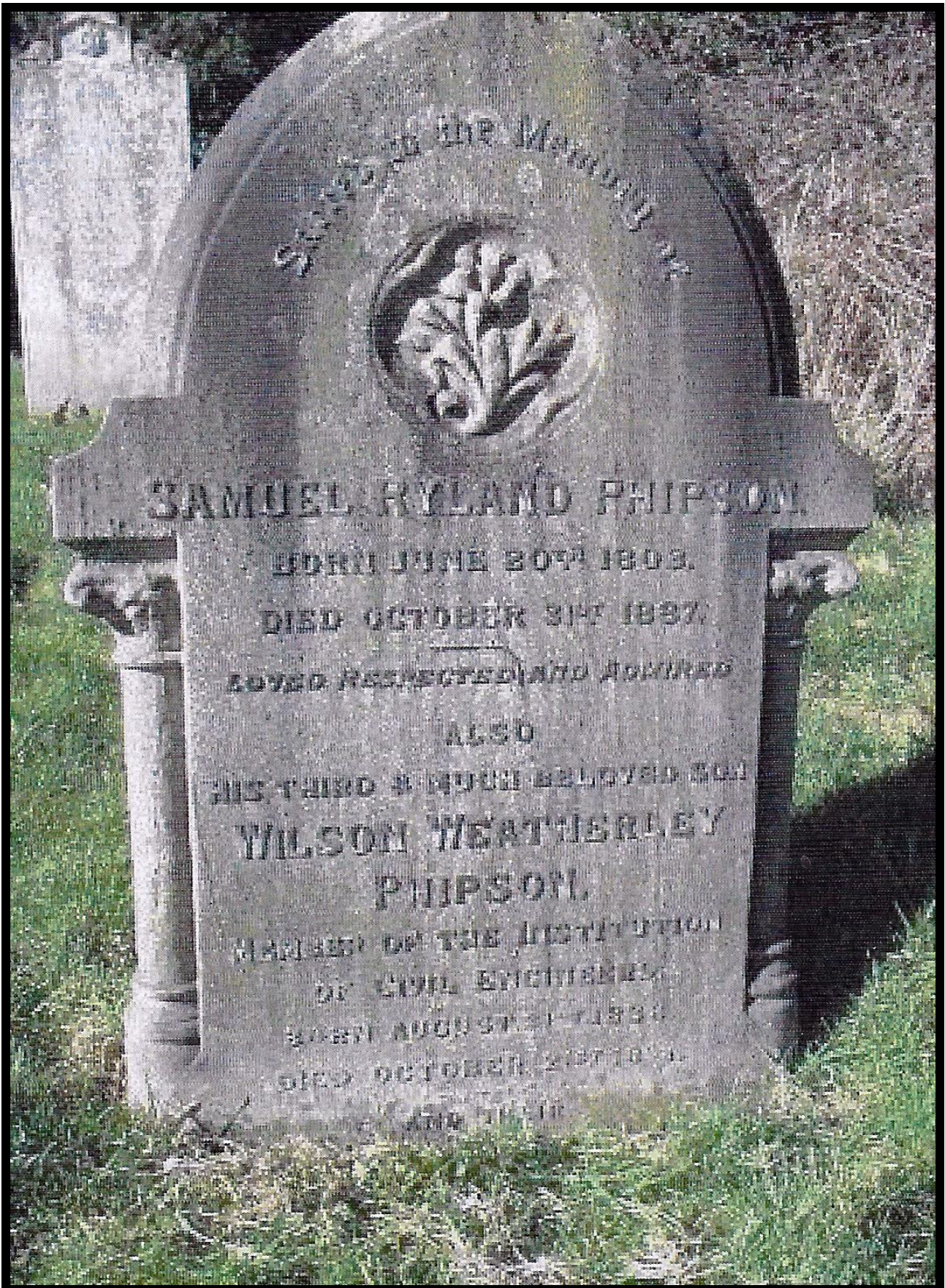
## **PAXTON, Sir Joseph 1803-1865**



English gardener and architect. Built the Great Conservatory at Chatsworth (1836), heated by eight boilers and seven miles of four-inch pipe. Best known for designing the London's Hyde Park Crystal Palace (1851) an unheated temporary Exhibition building, dismantled, re-erected and extended onto a permanent site at Sydenham in South London. Now with 22 boilers and some fifty miles of heating pipe.



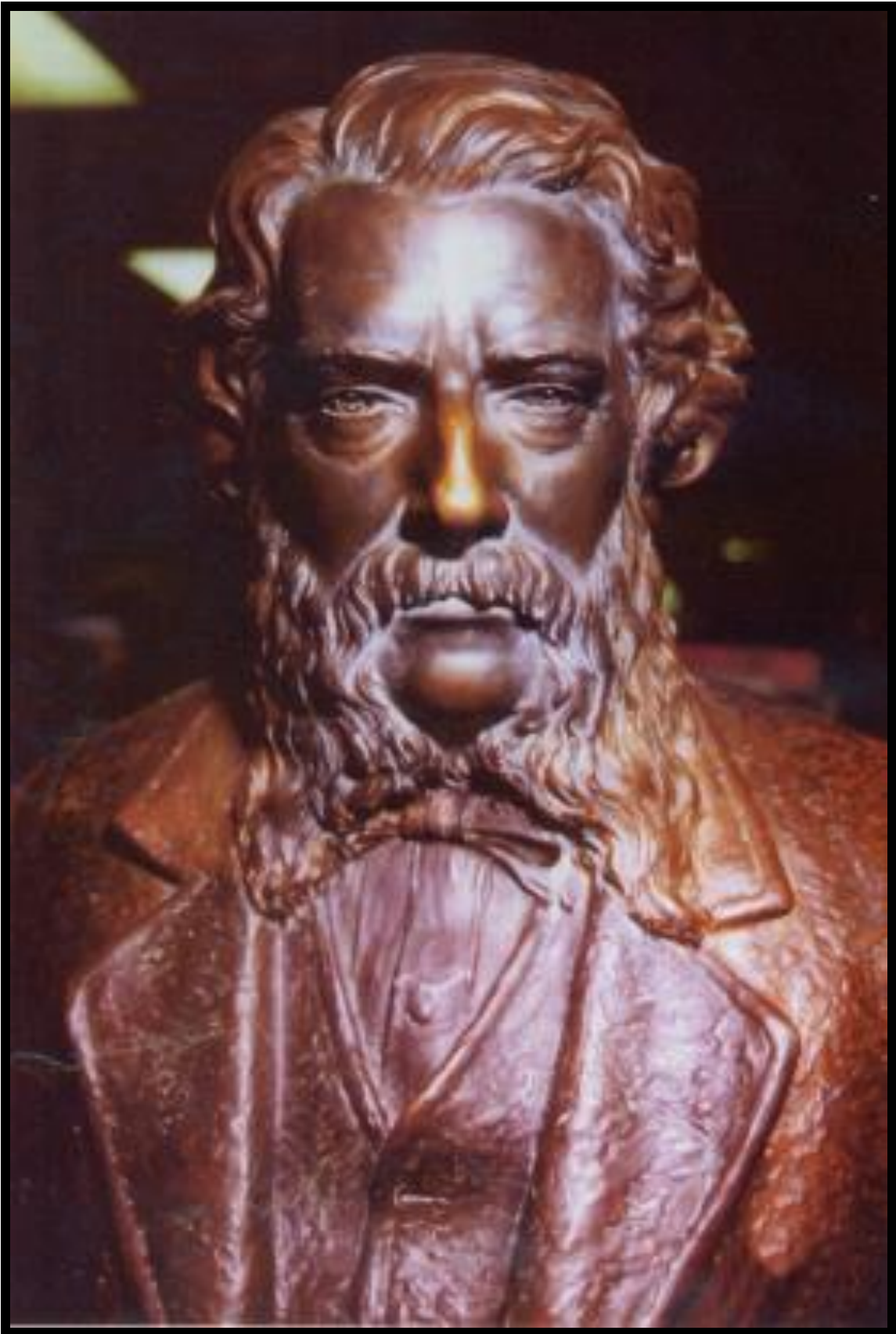
## PHIPSON, Wilson Weatherley 1838-1891



English Civil Engineer who specialised in heating and ventilation. Initially worked with Dr. Van Hecke of Brussels, heating and ventilating hospitals on the Continent. Then set as a consultant in London and provided heating and ventilation to a wide range of UK buildings, including Glasgow University, Royal Holloway College, the first Alexandra Palace and the Royal Albert Hall.



## **RANKINE, William John Macqourn 1820-1872**



Scottish engineer. Trained in physics. Took up civil engineering. In 1855, Professor of Engineering at the University of Glasgow. In 1857, designed a fan with a spiral or scroll-shaped housing. In 1859, wrote Manual of the Steam Engine and "introduced working engineers to the realm of thermodynamics.

## RUMFORD- Count: Sir Benjamin Thompson 1753-1814



Born Woburn, Massachusetts. Went to London and then entered service with the Elector of Bavaria. Said to have introduced Watt's steam engine to the Continent. Made Count of the Holy Roman Empire. After noting the heat which came from the boring of cannons concluded that heat was a form of motion (not the *caloric* fluid then thought). Returning to London, helped establish the Royal Institution. Developed a double boiler, a drip coffee pot, a pressure cooker and a kitchen range. Devised rules for *Chimney Fireplaces*. Settled and died in France. Today, the *Rumford Club* of London (launched 1947) is a meeting place for engineers.

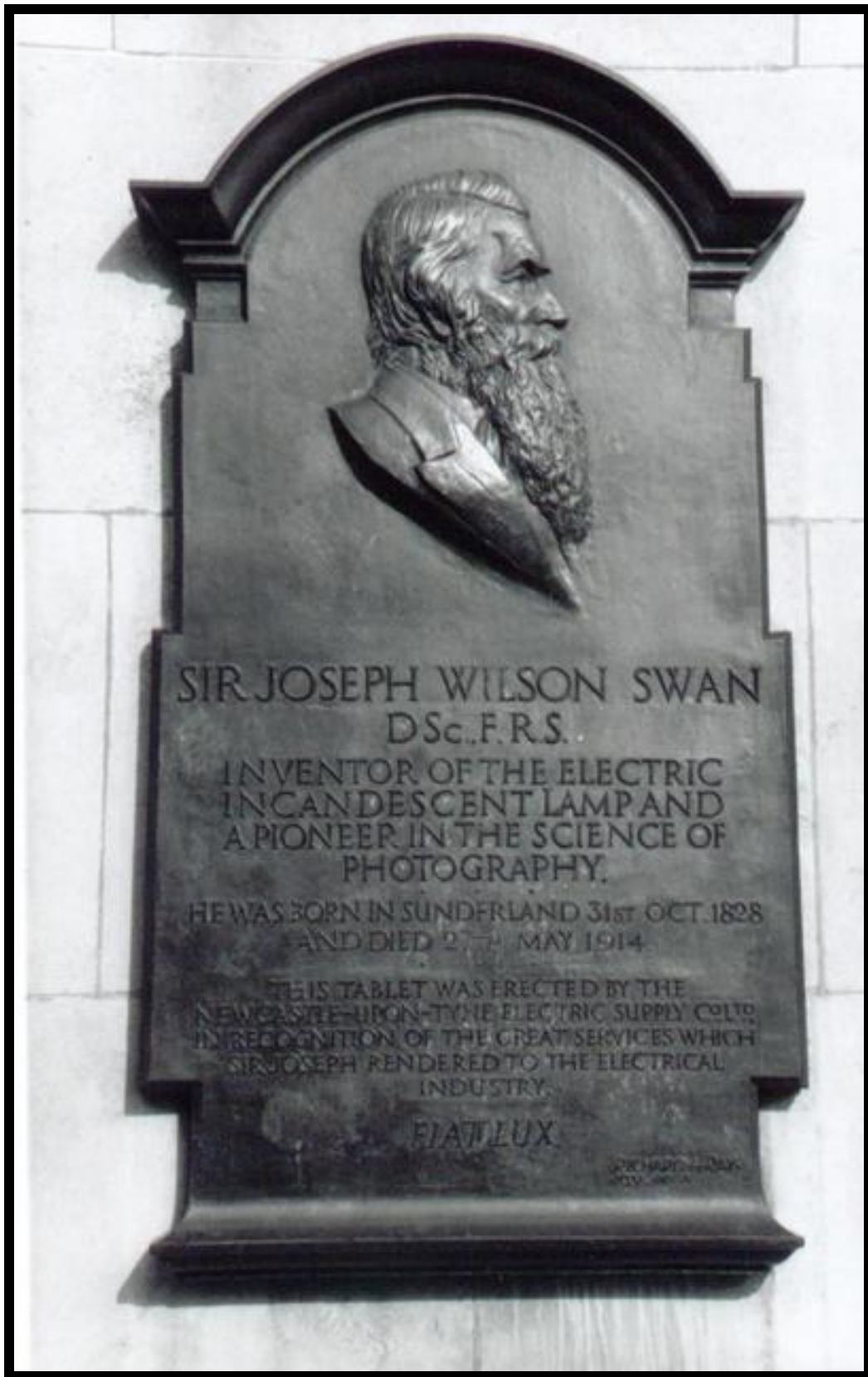


## SOANE, Sir John 1853-1837



English architect who embraced traditional heating by fireplaces and stoves, but took advantage of the developing systems using steam, hot water and hot air. Experimented with many heating systems in his own offices and museum. Responsible for the rebuilding of the Bank of England in London.

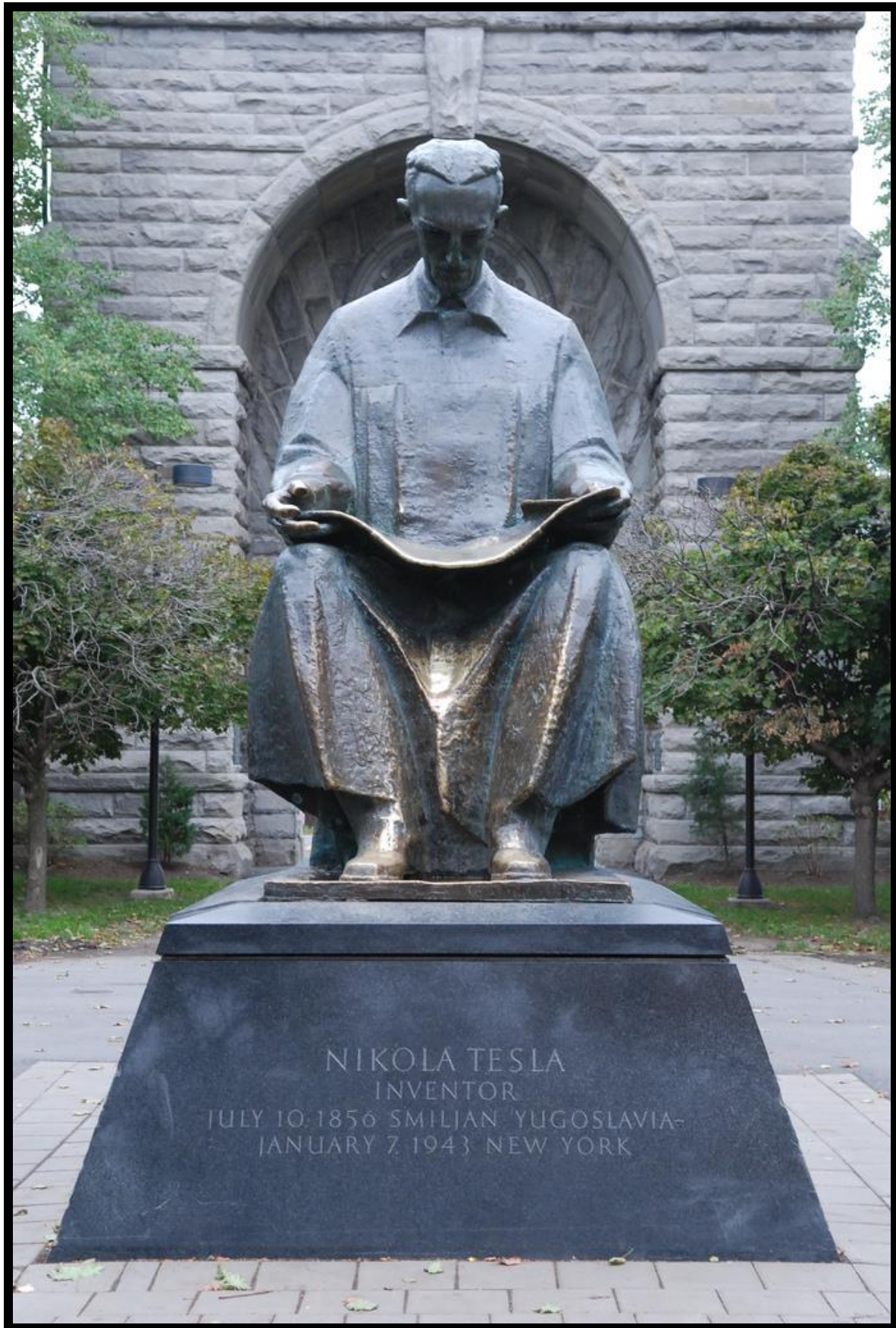
## SWAN, Sir Joseph Wilson



British physicist and chemist, most famous for the invention of an incandescent light bulb. He experimented with filament lamps from 1848 to 1860, obtaining his first patent in 1878 (a year before Edison). At this time, he was partially successful. His lamps lit up, but the filaments rapidly burnt out. London's Savoy Theatre, which opened in 1881, was lit by Siemens using Swan incandescent lamps, the power generated by steam engines. The theatre was claimed to be the first public building in the world to be lit in all areas by electric light. When Edison and Swan eventually met, to avoid a dispute over patents, in 1883 they formed the Edison & Swan United Electric Lamp Company.



## TESLA, Nikola 1856-1943



Croatian-American electrical engineer. Played an important part in the introduction of alternating current and the development of transformers and ac motors. Fell out with Edison over payment of monies due to him. Collaborated with Westinghouse to ensure adoption of alternating current (defeating all Edison's attempts to get dc universally adopted). The SI unit of magnetic flux density, the *tesla*, is named after him.



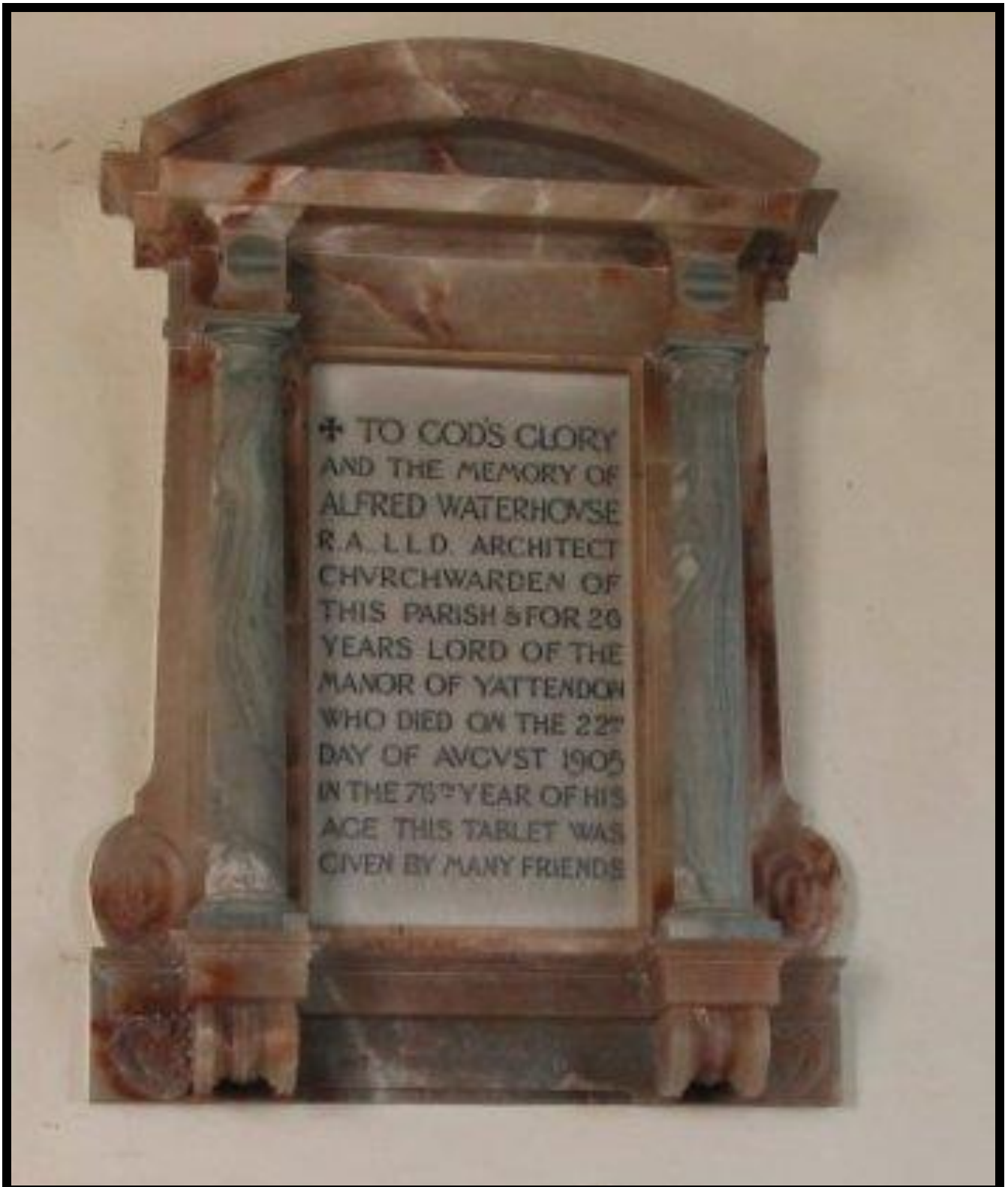
## TREVITHICK, Richard 1771-1833



English mining engineer. In 1798, invented a water-powered pumping engine, followed in 1802 by a high-pressure steam engine. With Oliver Evans developed the *Cornish* boiler. Worked as a refrigeration consultant for J&E Hall and gave advice to Jacob Perkins. Developed a portable stove (BP 6083: 1831). Died in poverty.



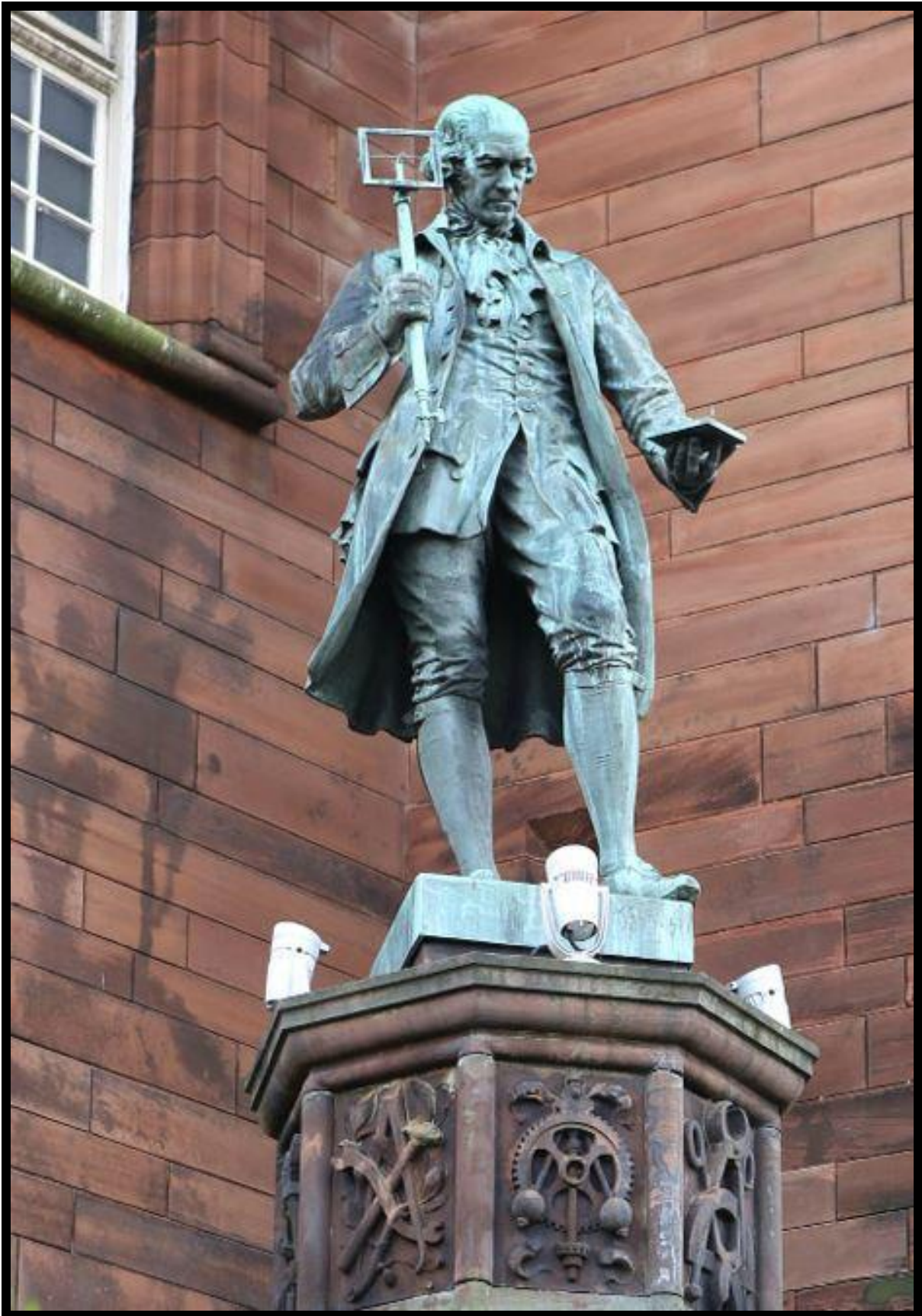
## WATERHOUSE, Alfred 1830-1905



Leading English architect. Works include Manchester Town Hall (1877) and Manchester Assize Courts (1863), with heating and air washing systems respectively by Haden. His most famous work is London's Natural History Museum, having heating and ventilation by Phipson. Waterhouse also designed the new Head Office for the Prudential Assurance Company in High Holborn. Here Phipson was involved in specifying steam-driven dynamos with the exhaust steam used for space heating- an early example of combined heated and power, the installation by Drake & Gorham.



## WATT, James 1736-1819



Scottish engineer. Working at Glasgow University, in 1765 he improved the steam engine by addition of a separate condenser and a steam jacket. Taken into partnership by Matthew Boulton, heated Soho House with a "cockle and warm air stove" the first in the UK for a large house since the Roman hypocaust. Carried out a number of steam heating installations including c.1800 Lee's Cotton Mill in Manchester. The firm may have been the first to use cast-iron pipes for heating. The unit of electric power, the *watt*, is named after him.



## **WRIGHT, Frank Lloyd 1869-1928**



Generally considered America's greatest architect. Renowned for his domestic architecture, but designed many commercial buildings including the Larkin Building, Buffalo (1904) and the Johnson Wax Building in Racine, Wisconsin (1939), both notable examples of comfort air conditioning. He is also known for the great Imperial Hotel in Tokyo (1922) and the unusual New York's Guggenheim Museum (1959).





Nikola Tesla Memorial at Niagara Falls.

## **REFERENCES**

Information on the 30 listed pioneers is taken from two sources:

- (1) The CIBSE Heritage Group website, [www.hevac-heritage.org](http://www.hevac-heritage.org) under "Pioneers who created the Built Environment" link on opening page. Data and portraits are given for 128 pioneers.
- (2) The Book "The Comfort Makers", Brian Roberts, ASHRAE, 2000. This lists 370 pioneers and 100 portraits of contributors to our knowledge of heating, ventilation, refrigeration and air conditioning. The Bibliography provides 125 References.