

An Introduction to  
**BRITISH PIONEERS**  
*of*  
**BUILDING ENGINEERING SERVICES**

## Portraits & credits, front cover

### Row-1 (l-r)

#### **Bernard Melvyn Drake 1858-1931**

English lighting & electrical engineer  
Co-founder of Drake & Gorham in 1886, later Drake & Scull  
*Drake & Gorham, Some Account of the First 75 Years*

#### **David Boyle 1837-91**

Scottish refrigeration engineer.  
Father of Ammonia Compression Refrigeration in USA.  
*Ice & Refrigeration, July 1891.*

### Row-2 (l-r)

#### **Sir Henry Doulton 1820-97**

English sanitary engineer.  
Opened Lambeth factory in 1846.  
*Ceramic Water Closets, Munroe Blair, 2000.*

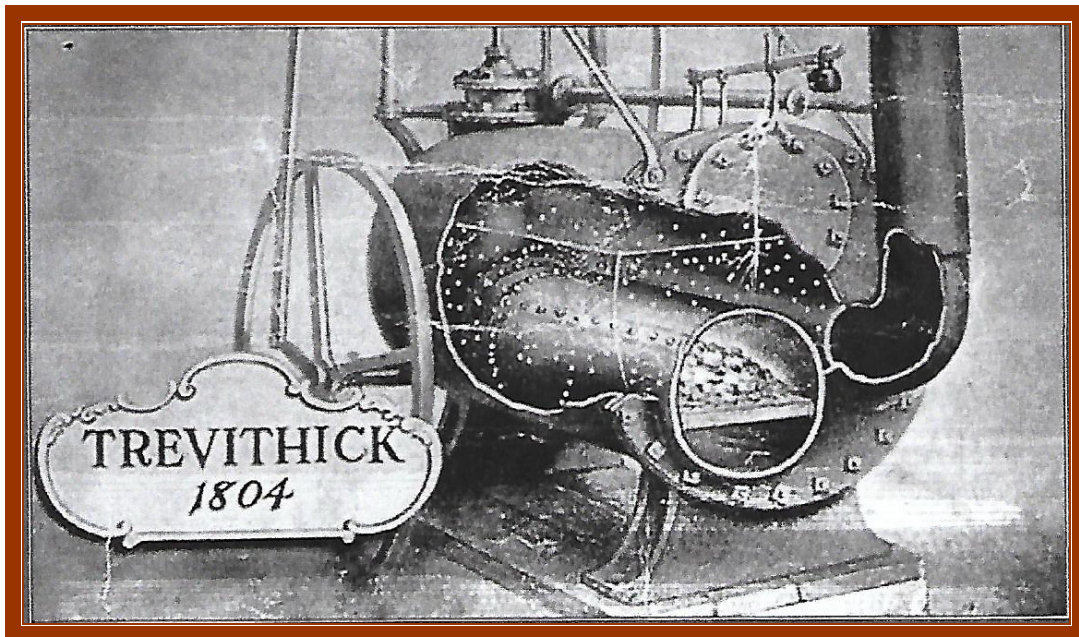
#### **Matthew Hall b.1814**

English skilled lead worker.  
Founded plumbing company in London.  
*Matthew Hall -Ahead of our time, since 1848.*

*When the weather was very inclement, the most robust of my parishioners  
complained to me of their inability to endure the cold of the Church.  
We got erected a ventilating stove by Mr George Haden;  
the consequence is that our Church is about as warm as any sitting room  
.....from about 52 to 57 degrees....*

**Reverend Peter Balfour** of Clackmannan, testimonial  
dated 4 February 1840.  
*Haden 150 Years, The Early Years, p. 13.*

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**Cornish Boiler**

**Eur Ing Brian M Roberts CEng Hon.FCIBSE  
Life Member ASHRAE**

**CIBSE Heritage Group 2020**

## **PART ONE: BIOGRAPHIES**

*In alphabetical order*

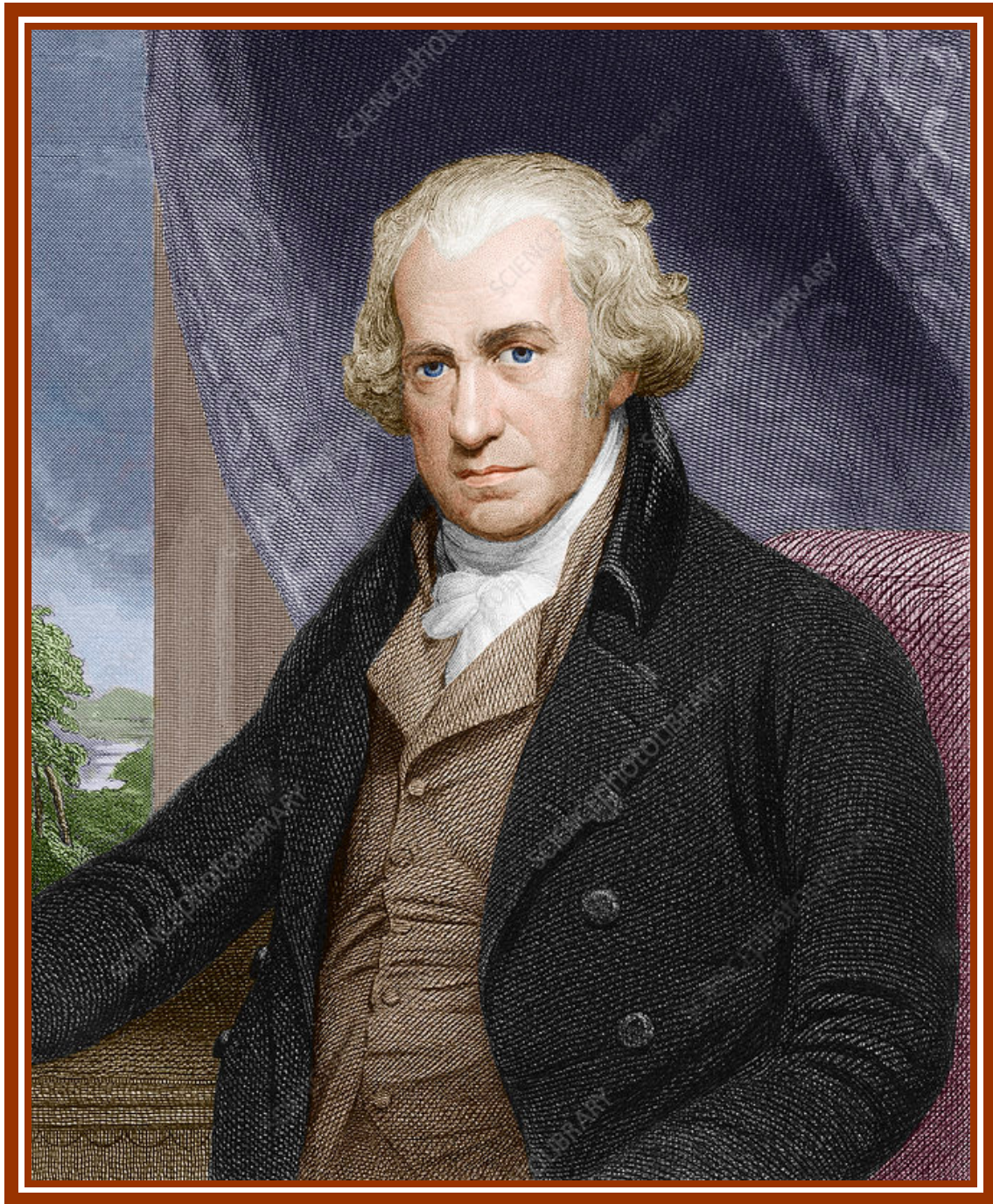
- [1] **ASHWELL Frank**
- [2] **BARKER Arthur H**
- [3] **BOULTON Matthew**
- [4] **HADEN George**
- [5] **HADEN James**
- [6] **HALES Rev. Stephen**
- [7] **LEA Henry**
- [8] **NESBIT David Mein**
- [9] **POTTERTON Thomas**
- [10] **PRESTON David Roger**
- [11] **REID Dr. David Boswell**
- [12] **THOMPSON John**
- [13] **TREDGOLD Thomas**
- [14] **TREVITHICK Richard**

*followed by* **PART TWO: PORTRAIT GALLERY**

*For hot, cold, moist and dry,  
four champions fierce strive here for mastery*

**John Milton**, *Paradise Lost*, 1666

## **OUTLINE BIOGRAPHIES of BRITISH PIONEERS**

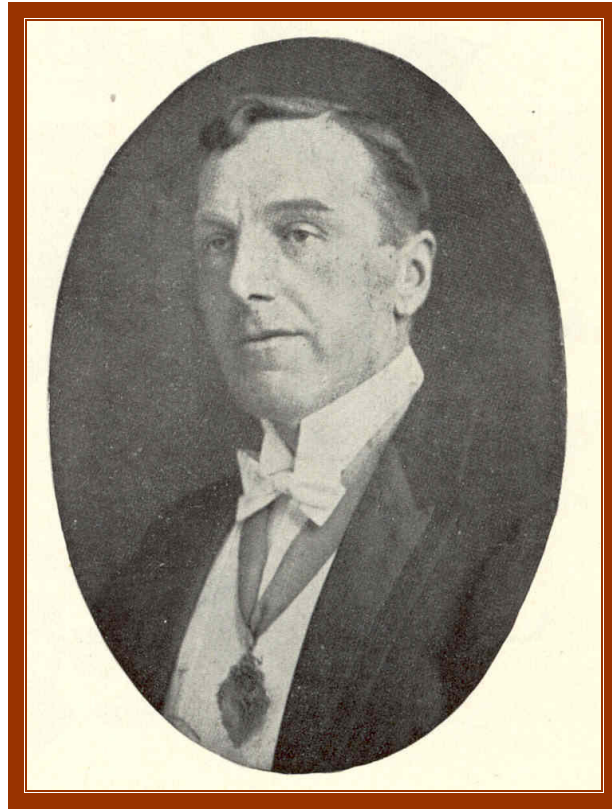


**James WATT FRS FRSE 1736-1819**  
**Scottish inventor and steam engineer**



**[1] Frank ASHWELL 1855-1896**

Upon completing an engineering apprenticeship, opened a small mill-wrighting workshop in Leicester (1879). Set up a heating department (1884) run by David Mein Nesbit. Took up agencies for various heating and ventilating products, including the "Lancaster" steam trap and the "Korting" stove. Specialized in the heating and ventilating of schools. Purchased the local "Victoria Foundry" (1887), turning out wrought and cast-iron goods, including gas and coal fire ranges. Continued to develop the school heating business with the introduction of his "Propulsion, Impulsion or Plenum System," which typically used a 5 ft diameter Blackman fan, driven by a 5 hp gas engine, and using heater batteries supplied with steam from Cornish boilers. His "Patent Ventilating Solar Radiator" often supplemented the plenum system. The success of the business led Ashwell to take Nesbit into partnership (1892) to form Ashwell & Nesbit. The same year he took over the consultancy practice of Wilson Weatherley Phipson. The business continued to expand and carried out considerable institutional work including "no fewer than 15 lunatic asylums"(1893-1896), but in the middle of this success, Ashwell died unexpectedly from a brain tumour.



**[2] Arthur H BARKER 1870-1954, PIHVE 1922**

English contractor, consultant, author, and lecturer. Gained BA and BSc, London. Senior Whitworth Scholar (1895). Worked as a fitter for Henry Berry of Leeds (hydraulic engineers), draughtsman for Gwynne Pumps, engineer at Haden, Trowbridge, and then Technical Managing Director at J.F. Phillips, London. Later set up as consulting engineer. Invented (1903) a steam accelerator, called the “Cable System,” for increasing flow in hot water heating systems. Patented a method of radiant heating (1908) and now regarded as the “Father of Radiant Heating.” Published his classic textbook “Barker on Heating” (1912). Appointed the first lecturer on heating and ventilation at London University. Deduced (with Kinoshita) the 1.3 power law for radiator output (1918). President IHVE (1922). Twice awarded IHVE Silver Medal (1906 and 1909). The CIBSE Barker Silver Medal award is named for him.



### **[3] Matthew BOULTON 1728-1809**

English engineer. Partner of James Watt in the construction of steam engines. Employed William Murdock, “Father of Gas Lighting,” at his Soho Works, near Birmingham (1777). George Haden, Sr. was foreman of his copying machine shop. His sons, George and James Haden, also worked for Boulton & Watt before setting up G & J Haden in 1816. Boulton used steam to heat his bath at Soho House (1789) and was involved with steam heating systems for the libraries of the Marquis of Lansdowne and a Dr. Witherington. Both systems failed due to problems with pipe joints, as did his son’s later installation at Dulwich Picture Gallery for the architect Sir John Soane. When Boulton extended Soho House (late 1790s) he therefore opted for a cockle and warm-air system, as pioneered by William Strutt of Derby, the first warm air installation in the UK for a large house since the Roman hypocaust systems. (Soho House has recently been restored and is open to the public.)





#### **[4] George HADEN 1788-1856**

Son of George Haden Sr, who worked for, and was held in high regard by, James Watt. Apprenticed to the firm of Boulton & Watt. Trained on the steam engine side of the business. With his brother James, established G & J. Haden in Trowbridge (1816) as an agent of Boulton & Watt to erect steam engines for West Country cloth mills. George was regarded as somewhat pious but the more dynamic of the two brothers and probably the better business manager. A natural extension of their work was the installation of the associated steam piping systems and this may have awakened the brothers' interest in heating. The real impetus came from the warm air ventilating stove, which was developed and patented by George (BP 9259: 1842). He also became involved in providing boiler plant and heating for the huge growth in institutional buildings, particularly lunatic asylums and prisons. Haden worked with Jebb on the heating and ventilating of Pentonville Prison. The success of the firm was also due to the installation of their patent stove in many hundreds of churches built in the mid-19<sup>th</sup> century. James Haden retired in 1855, the company becoming G N Haden & Son and continuing under the direction of George's son, George Nelson Haden (died 1892).



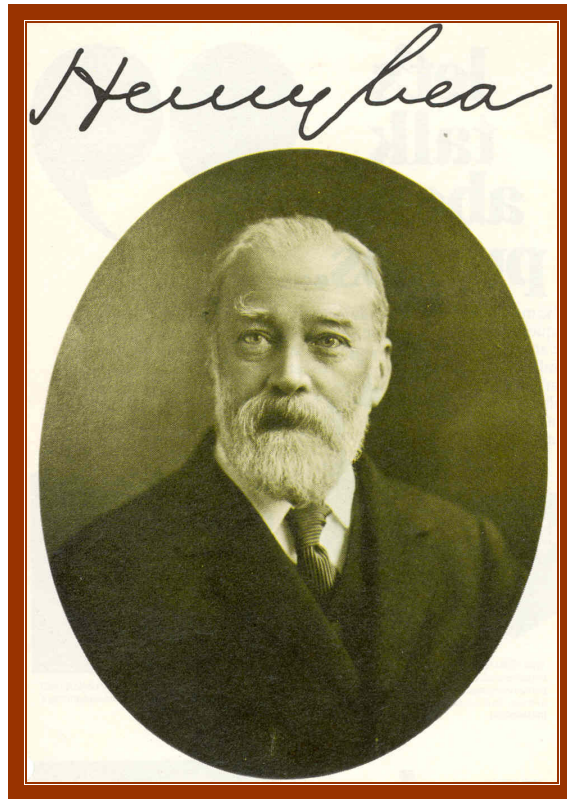
**[5] James HADEN 1790-1871**

Brother of George. Served a general apprenticeship with Boulton & Watt. Co-founder of G & J Haden at Trowbridge (1816). A bachelor and said to be an extremely hard worker, James travelled the country for some 20 years, meeting prospective clients, providing estimates for warm air stoves, and frequently supervising their installation. A five-day itinerary (1826), said to have been typical, covered Trowbridge, Birmingham, Manchester, Blackburn, Preston, Carlisle, and Edinburgh -often travelling by coach through the night. He began by working for the landed gentry and had an impressive list of titled customers. For George IV, he provided a warm air stove for the Royal apartments at Windsor (1826), and when apologizing to other customers for delays took delight in writing, "But I have been much occupied fixing stoves for His Majesty at Windsor." These efforts laid the foundation of the heating business, which upon his retirement (1855) became G N Haden & Son.



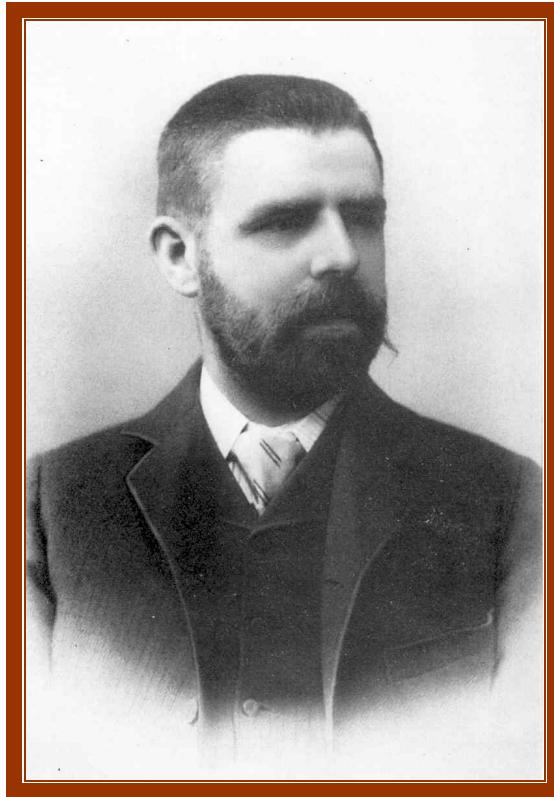
**[6] Rev. Stephen HALES c.1700-1761**

Perpetual curate of Teddington in Middlesex. Scientist, botanist, inventor, and ventilation engineer. Elected Fellow Royal Society (1717). His most famous work, “Vegetable Staticks” (1727), deals with his experiments on plants. He became interested in ventilation by fans and bellows. Wrote his “Treatise on Ventilators” (1758). Proposed to ventilate a ship “using 10-foot-long inject and exhaust pumps similar to a blacksmith’s bellows.” He estimated that his “machine would expel a ton of air at each stroke, or six tons a minute by two men working at the lever...” His methods were similar to those of Sir Martin Triewald. Hales also worked on the design of bellows ventilation of the county hospital and county jail in Winchester, the Savoy Prison, and Newgate Prison. In his ventilated prisons, “the diminution in the annual mortality...seems to have been very great.”



**[7] Henry LEA 1839-1912**

English consulting engineer whose expertise ranged widely over the civil, mechanical, and electrical disciplines. Opened an office in Birmingham (1862) and issued a circular letter, "Henry Lea begs leave respectfully to announce that by the advice of many gentlemen well acquainted with his qualifications and experience, he has commenced practice as a Consulting Mechanical Engineer." He may have been the first in the field to describe himself thus. Lea was a pioneer of electric lighting but also introduced new methods of artificial ventilation based on the plenum system of William Key. Used it with notable success at Birmingham General Hospital (1893). Then at the Royal Victoria Hospital, Belfast (1903), where, "A sprinkler system, used to moisten the filters through which the fresh air passed, was regulated on the basis of regular readings of wet- and dry- bulb temperatures. This conscious control of humidity gives the Royal Victoria Hospital a place among pioneering air conditioning systems."



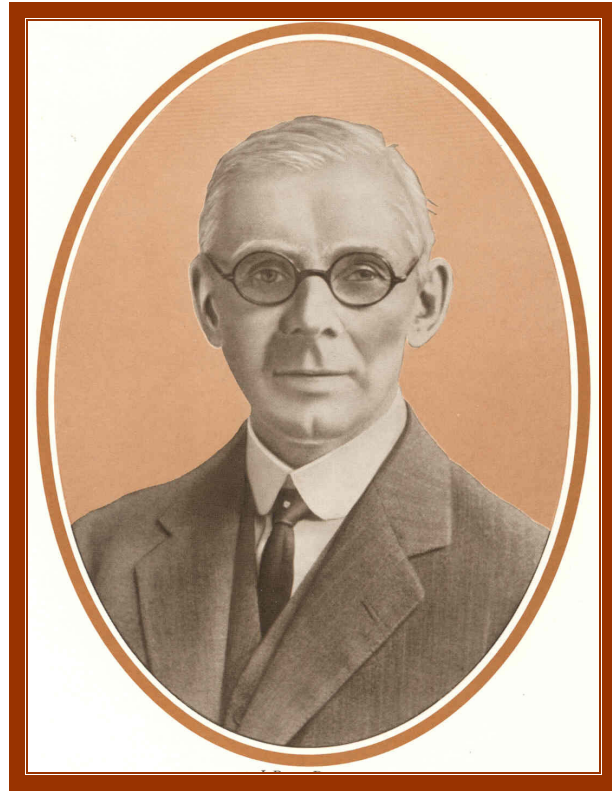
**[8] David Mein NESBIT 1855-1929, PIHVE 1900**

First President of HVCA (1904-1909). Ashwell & Nesbit, Leicester and London. Third President of IHVE (1900). Nesbit addressed the Master Steam and Hot Water Fitters' National Association in New York (1894), but the discourtesy shown at his reading of his technical paper so incensed Hugh Barron that, with others, he founded ASHVE. Nesbit was one of ASHVE's first international members and can thus claim the unique distinction of having been involved in the founding of three great "comfort" organizations.



### **[9] Thomas POTTERTON 1847-1926**

English engineer and businessman. Expanded his father's building business, first improving the efficiency of kitchen ranges and boilers (BP 5182: 1894). Introduced what is claimed as the world's first gas boiler for central heating using town's gas (1902). Other inventions followed, including the first cut-out valve system and an ether capsule thermostat, "which he designed for the comfort of a relative dying from consumption." He developed the "Victor" boiler, the "Sealed" oven cooker and the "Queen" combined gas and coal ranges. Potterton was a pioneer in the introduction of multiple gas boiler installations for large systems of hot water supply, such as the 16-boiler plant provided for bath service at Sandow's Curative Institute in Piccadilly, London (1909). Later (1922-1923) he perfected the "Victory" combination boiler for the use of solid and gaseous fuels. He was an IHVE founding member (1897).



**[10] J Roger PRESTON 1878-1949, PIHVE 1929**

English contractor, then consulting engineer. Apprenticed to firm of A Seward, Lancaster. Won first prize at IHVE Assistant's Competition two years running (1906-1907). Awarded Saxon-Snell Prize (1907) of Royal Sanitary Institute for his paper, "Suggestions for Improvements in Sanitary Appliances for Use in Workmens' Dwellings and Labourers' Cottages." Later, won RSI Special Prize for "Heating and Ventilating of Public Buildings." Worked for Walter Jones of Jones & Attwood, Stourbridge, helping him with his researches into boiler explosions. Then joined (1910) Maguire & Gatchell, Dublin, taking charge of the heating department. Later, became a director of Mumford Bailey & Preston, London. Set up (1924) as a contractor, later (1926) turning the firm into a consultancy practice. He developed an electric air speed meter (1907), a double-duct air-conditioning system (1909), and a Heating Main Calculator slide-rule. Preston was President IHVE (1929).



### **[11] Dr David Boswell REID 1805-1863**

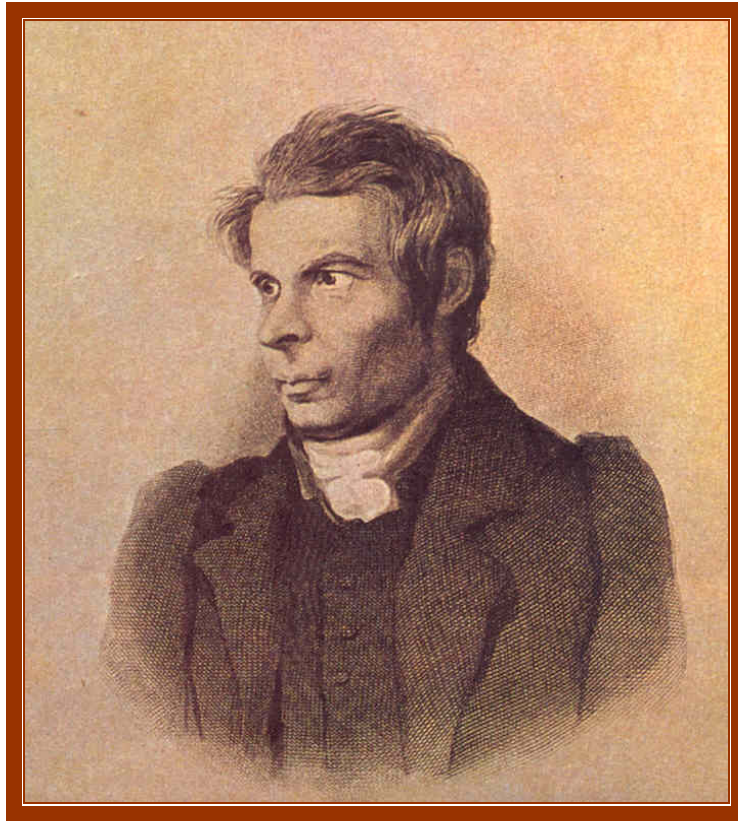
Scottish doctor, chemist, and ventilating engineer. Admitted to the Royal College of Physicians, Edinburgh (1831). He devised an experimental chamber to investigate respiration and fresh air needs. Advocated the addition of various chemicals to ventilating air, some to aid recovery in hospital wards, others to counteract the deleterious effects of vitiated air. Reid demonstrated his theories at a dinner in Edinburgh, claiming that, as a result of his methods of ventilation, the diners consumed two or three times as much alcohol as usual, without ill effect. He devised the heating and ventilating of St. George's Hall in Liverpool (1842-1851). Worked on the ventilation of the House of Commons (rebuilt after the Great Fire of 1834). He proposed to introduce filtered and humidified air through holes in the floor and to extract the vitiated air by means of a chimney at its base. The scheme included provision for summer cooling "by nocturnal ventilation, by evaporation of water, by passing cold water through a heater battery, and in rare cases by the use of ice (a rudimentary form of air conditioning)." His recommendations for acoustic treatment were well in advance of their time. Wrote "Illustrations of the Theory & Practice of Ventilation" (1844), which was a major influence on ventilating engineers for many years thereafter.





**[12] John THOMPSON 1839-1909**

Bought back (1860) the boiler making business started by his father, William Thompson. Moved the factory to Ettingshall, near Wolverhampton, where the company, now John Thompson, prospered. "Most of the work still had to be manhandled, with boilerplates brought in by wagons. Few of the shops had roofs, and in winter, plates often had to be dug out from under snow or ice. After rolling, the plates were cotted up, three in a row for hand rivetting" (description c.1885). By the time of John's death, the company, now with some 600 employees, specialised in the manufacturing of large dish-ended steel Lancashire boilers, shipping them to locations all around the world.



**[13] Thomas TREDGOLD 1788-1829**

English engineer. Received only an elementary education. Apprentice carpenter. Later (from 1813) worked in London office of William Atkinson, architect. Studied chemistry, mechanics, geology, mathematics, French, and German. Published many technical papers on elasticity, strength of materials, flow of fluids, and heat. Wrote books on carpentry, cast-iron, railways, and the steam engine. Published “Principles of Warming and Ventilating Public Buildings, Dwelling Houses, Manufactories, Hospitals, Hot Houses, Conservatories, etc.” (1824), which transformed an empirical art into a numerate technology and brought together engineering, physiology, and comfort. Tredgold made experiments on the cooling of cylinders, deduced the heat emission of steam and water pipes, and estimated the heat loss through a window. He determined the quantity of fresh air needed to support life and to remove exhaled moisture and combustion (gas lighting) products at  $4 \text{ ft}^3/\text{min}$  per person. Hon. Member Institution Civil Engineers (1821) He “worked himself to death.”



#### [14] **Richard TREVITHICK 1771-1833**

English mining engineer. Invented a water-powered pumping engine (1798) and a high pressure steam engine (1802). He and Oliver Evans developed the *Cornish* boiler. "Trevithick eventually raised the steam pressure to 1 MPa, this being accomplished even with such imperfect methods of construction as hammering the plates to shape by hand, punching and drifting the rivet holes into rough alignment, whilst it was customary to lay in the joint a piece of rope yarn before riveting up, to ensure steam tightness." He worked as a refrigeration consultant for J & E Hall, and his advice was sought by Jacob Perkins. He also explained the working principles of the cold air refrigerating machine (1828). Later, he developed a portable stove (BP 6083: 1831). Died in poverty and buried at the expense of his fellow workers.

## **PART TWO: PORTRAIT GALLERY**

*In alphabetical order*

**[16] FABER Dr. Oscar**

**[17] JEBB Major Joshua**

**[15] GRUNDY John**

**[18] KELL John Robert**

**[19] PAXTON Sir Joseph**

**[20] SOANE Sir John**

**[21] SYLVESTER Charles**

**[22] SUGG William**

**[23] YATES Walter**

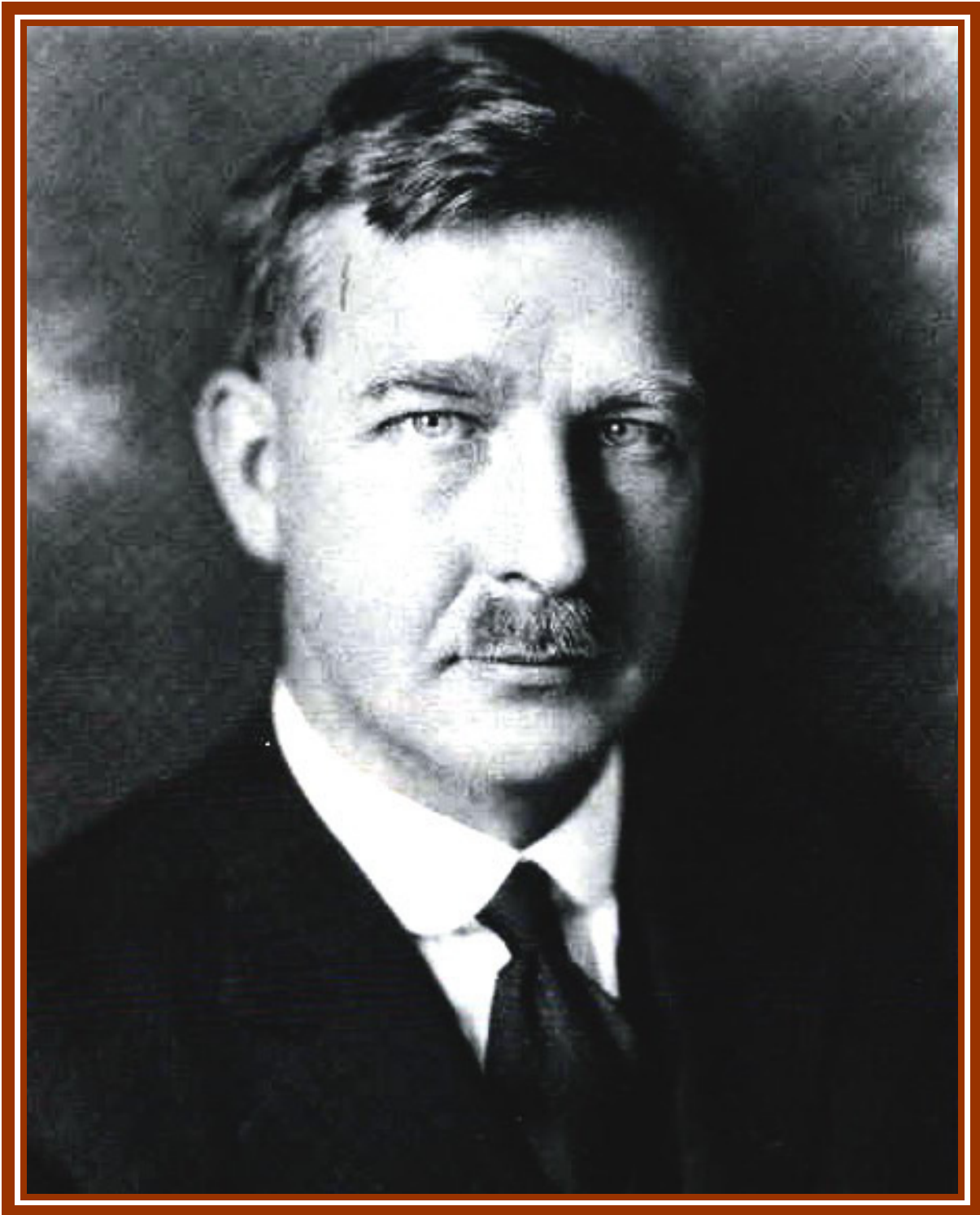
*Though much has been done by ingenious men in the art of distributing heat for household uses; it must be confessed that in one or two instances only have they been able to make a permanent impression or bring their contrivances into that general use as to constitute the "machines of society."*

**Walter Bernan**, *Civil Engineer*, in his introduction to "On the History and Art of Warming and Ventilating Rooms and Buildings," Vol. I, 1845

## PORTRAIT GALLERY EARLY BRITISH PIONEERS



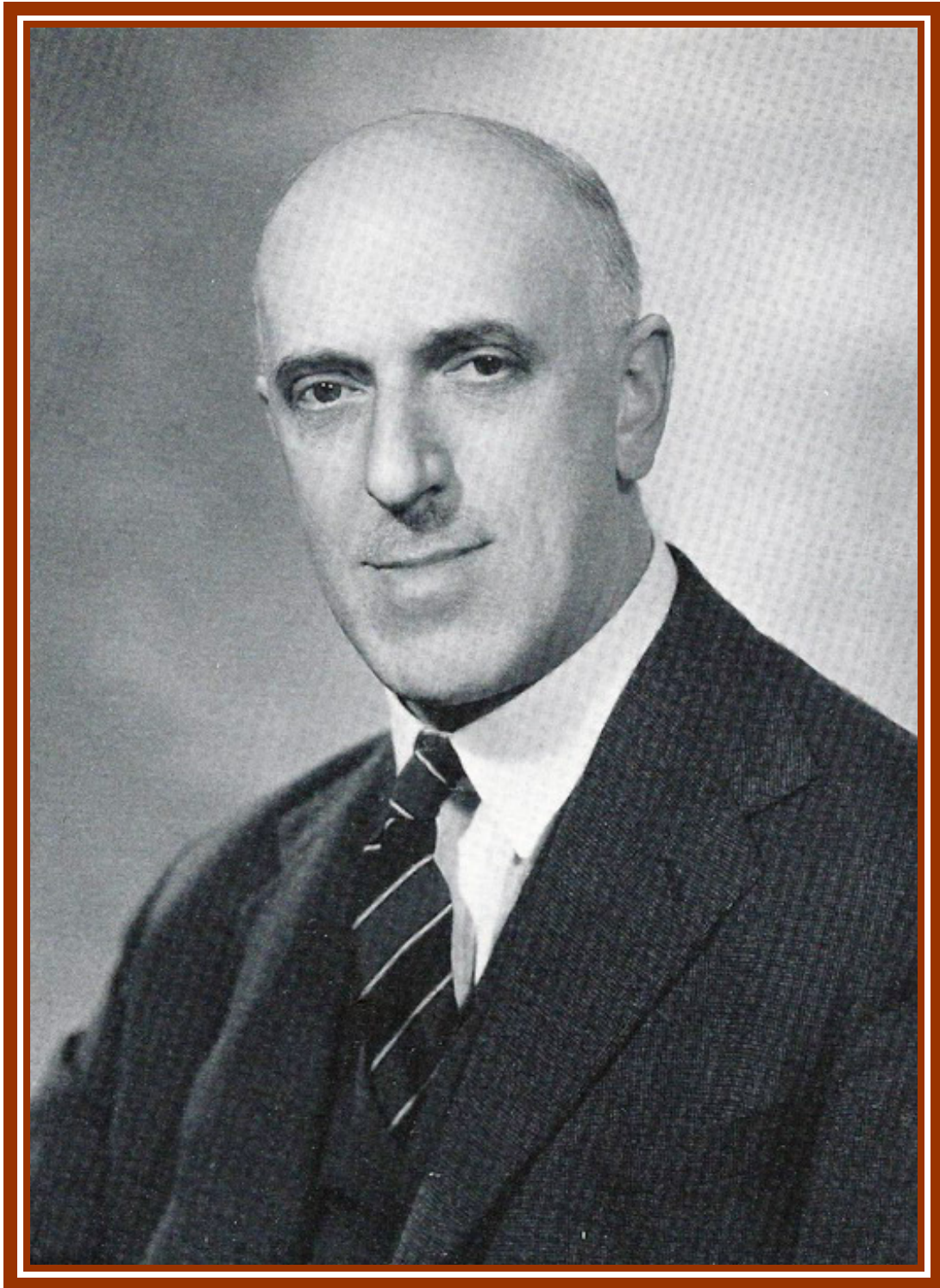
**[15] John GRUNDY**  
**First President Institution Heating & Ventilating Engineers 1898**



**[16] Dr. Oscar FABER CBE 1886-1956, PIHVE 1944-45  
English civil, electrical & mechanical engineer**



**[17] Major Joshua JEBB active 1850  
English Military Officer, Royal Engineers**



**[18] John Robert KELL 1902-83, PIHVE 1952  
English Consulting Engineer**





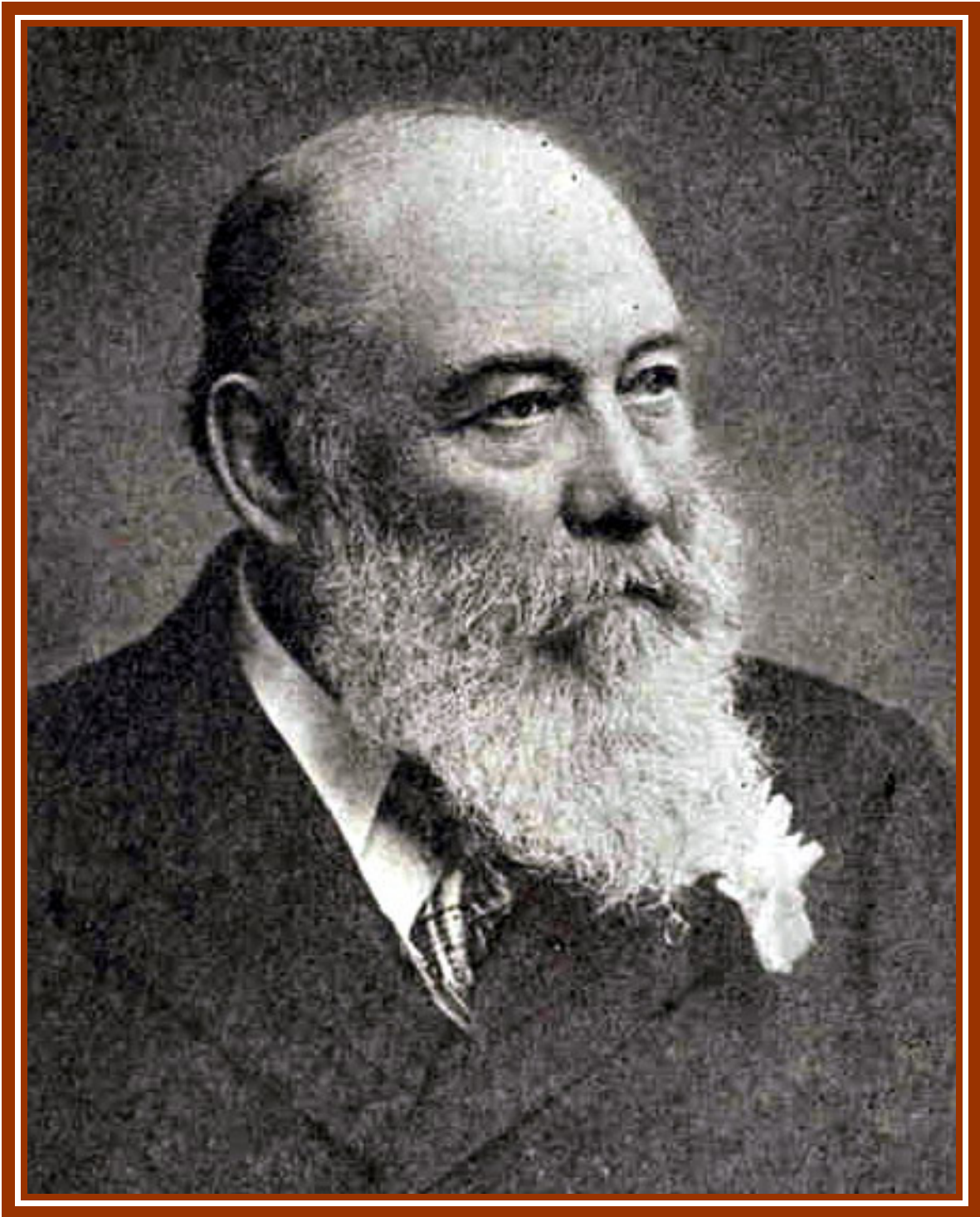
**[19] Sir Joseph PAXTON 1803-65**  
**English gardener, architect & engineer**



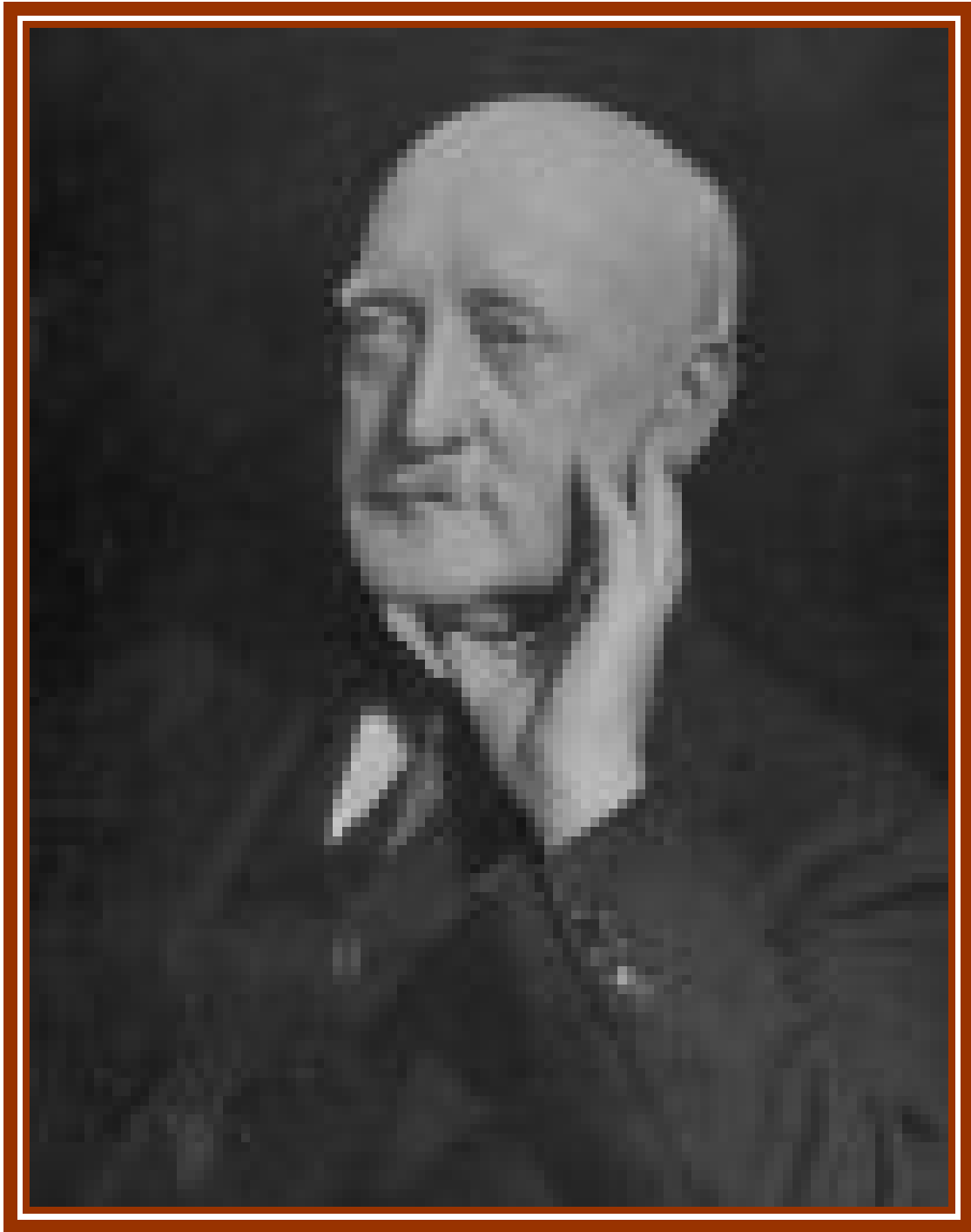
**[20] Sir John SOANE 1753-1837**  
**English architect who embraced central heating**



**[21] Charles SYLVESTER 1724-1828**  
**Chemist, mechanical & heating engineer**



**[22] William SUGG 1832-1907**  
**Gas lighting pioneer & manufacturer**



**[23] Walter YATES d.1953, PIHVE 1909  
Fan engineer & manufacturer**



## Institution of Heating and Ventilating Engineers Council 1910

(left to right, from top row) **John S Palmer**    **Robert E Atkinson**  
**Walter Jones**    **Chas Mason**    **Walter Yates**  
**Thos Potterton**    **E W Mayner**    **Louis F Pearson**  
**W R Macguire**    **C Ingham Haden**    **S Naylor**  
**John Grundy**    **C T O Trotman**    **George Crispin**    **E Taylor**  
**W Nelson Haden**    **J Nelson Russell**    **J N Greenhall**  
**A B Simpson**    **A B Taylor**    **J L Saunders**

Portraits back cover

**Top Row-1 (l-r)**

**H B Watt**

Secretary of the IHVE c.1926-35  
*A part-time post. He was also Secretary  
of the NAMH & DE (later HVCA)*

**Miss Jessie Moran**

Assistant Secretary  
*Ran the Institution during the war years*

**Bottom Row-2 (l-r)**

**Horace Swain**

Secretary of the IHVE 1947-55  
*First full-time Secretary*

**Bernard Hodges**

Secretary of the IHVE 1956-76  
and then CIBSE until 1985

*The responsibilities of the Institution are of two kinds.  
There is the duty to ensure the development of the industry in  
readiness for anticipated future needs; and there is the duty of any  
professional body to speak on matters of public concern.*

*Of Shoes and Ships and Sealing Wax  
**N S Billington**, IHVE Presidential Address, 1970*

