MARQUIS JEAN-FREDERIQUE DE CHABANNES 1753-1814

No portrait has so far been discovered

French aristocrat and engineer. Became interested in fresh air ventilation and respiration. Developed a system of heating and ventilation (1814). He advocated use of a centrifugal fan to force heated or cooled air through ducts to rooms (BP: 1815) stating, "My method of cooling air is by means of the air pump...causing the air to pass through a cool medium (evaporative cooling tower)." He also introduced the concept of hot water heating to England (1816) and claimed it as his own, though he appears to have absorbed the earlier ideas of Bonnemain [123]. Chabannes' *Patent Calorifère Fumivore Ventilating Furnace,* made at his factory and foundry at 121 Drury Lane in London, was used in a variety of commercial, industrial, and domestic heating and ventilating applications. He used his ventilating furnaces and gas ventilating chandeliers at Covent Garden Theatre to induce air movement and provide adequate ventilation "for drawing off continually the air breathed by two or three thousand persons." Chabannes (1817-1819) removed the apparatus of Wren [187] and Desaguliers [52] from the House of Commons and substituted a large air trunk over the ceiling, into which he led tubes that conducted vitiated air from the House. It is said he also provided steam heating. Around this time, he suggested the ventilating gas light. His calorifère, or fire-tube stove, system of heating became popular in both England and France. He wrote (1818), "The principle of the Patent Calorifère is to surround a fireplace with air tubes so disposed, that a much greater surface is brought into contact with the fire...." This system was later (1829) described in a pamphlet by Bruckmann [26]. He also designed a wrought-iron rivetted cylindrical boiler with a moveable fire grate.

(Mini-biography from "The Comfort Makers," Brian Roberts, ASHRAE, 2000)

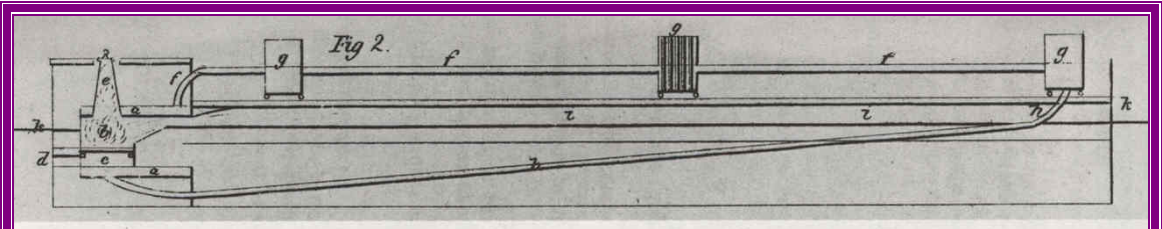


Fig. 10.6 Gravity-type hot water heating system, 1818. The furnace at left (e, b, c) supplies warmed water to large-diameter pipe f, f, f. Air is heated by the pipe and by "patent cylinders" g, g, g a rudimentary form of convector. Return pipe is marked h, h. Marquis de Chabannes, *On Conduction of Air by Forced Ventilation* (London, 1818) plate XIII.

But there was a third factor. Chabannes was at last on the brink of success as a speculating technologist. Somehow, during the chaos of 1814–15, the Marquis had found time to resurrect his heating schemes. This is how he describes it:

> In January 1814, writing the whole day in London before a very large fire, burnt on one side, and frozen on the other by the current of cold air rushing into the room at every aperture to supply the draught of the fire, I felt more sensibly than ever the great defects in the present construction of stoves. In this situation I first conceived the plan of the calorifere and had a model executed, with the intention of having some stoves made, and taking them with me into France for my own use.[48]

After the events of the First Restoration, he continues,

> I then had a calorifere made . . . with the sole design of guarding myself from cold, but the importance of the Invention appeared to me so great from the equal and agreeable warmth I immediately experienced in every part of my apartment, that I resolved to take out a Patent and to make public my long meditated plan for regulating the temperature and conducting and purifying the air in our dwellings. My chief aim in this was the ambition to abandon my patent to persons in trade, reserving to myself only a small acknowledgement from those licensed.[49]

There followed two patents, of 1815 for a calorifère fumivore stove and of 1816 for a ventilator.[50] Chabannes opened a showroom near the house he was occupying close to Fitzroy Square, to be followed by the grandly titled Patent Calorifere Fumivore Foundry at 121 Drury Lane.[51] And he issued three pamphlets in 1815–19, describing his innovations in detail and illustrating the most prestigious heating schemes he executed.[52] The most substantial of these pamphlets is called *On Conducting Air by Forced Ventilation* (1818).

If Chabannes' fugitive commercial career before this point suggests something of the crackpot or charlatan, the evidence of his successes in 1815–19 goes some way to disproving the charge. During these years he fulfilled contracts for heating and ventilating the Covent Garden and Olympic Theatres, the House of Commons, a hospital attached to Fort Clarence at Chatham, Nash's new Ophthalmic Hospital near Regent's Park, Lloyds, a shop and office in the Burlington Arcade, and a variety of lesser undertakings. Many of these jobs were large. The Covent Garden commission, for instance, involved replacing and supplementing the inadequate steam-heating which Boulton and Watt had installed when London's premier theatre was rebuilt by Smirke in 1809, with a hot-air system for the auditorium and steam-heating round the stage.[53] Chabannes placed three huge moving cowls on the roof, one of which took off the fumes of the new gas-lighting (not installed by him) in the centre of the auditorium; he set a variety of large and small iron stoves at points in the circulation space, mainly at the base of staircases; and he arranged large-bore pipes all round the edges of the stage, connected to an immense steam boiler in the basement. The installation is discussed and illustrated in some detail in *On Conducting Air . . .* (figs. 8 & 9). The independent stoves had no real claim to originality; they were simple supplementary devices which, Chabannes claimed, produced 'three times more heat than a common stove' and were

used flexibly to keep the circulation spaces up to a temperature of 60°F. One of the larger stoves shown in section is connected by means of a battery of pipes with the private boxes, so that the action of the stove draws off the impure air from the boxes and helps ventilate the theatre. The steam boiler, though not dimensioned, appears to have been a thing of monstrous size but no special sophistication; Chabannes acknowledged that steam had been used for 'the last twenty years' to heat factories and houses, but claimed his Covent Garden boiler as an improvement. The fire acted directly upon a series of five separate 'pipe boilers' with twelve pipes each and communicated with 44 'patent steam cylinders', essentially large-bore steam radiators, immediately under the stage.[54]

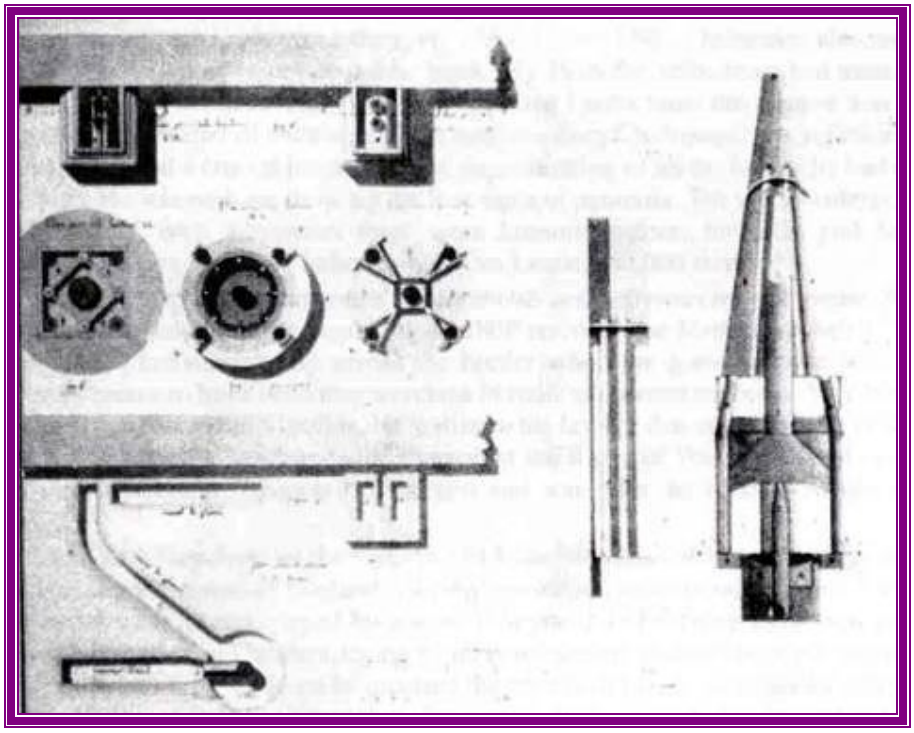
At the House of Commons, long subject to stuffiness, Chabannes in 1819 spent £1678 on a similar mixed steam-heating and ventilating system. There was trunking connected to existing apertures in the ceiling, which were once again crowned with his ugly cowls.[55]

How original and effective were Chabannes' methods? For want of fuller information about rival systems of heating at this date, it is hard to be definite. At the time, most heating that went beyond simple fireplaces or free-standing close-stoves was still primitive and cumbersome; the Marquis's installations were far from trouble-free, but they seem to have been of at least equal standing with others, and tolerably effective. His virtue was to publish his work, which rivals did not do.

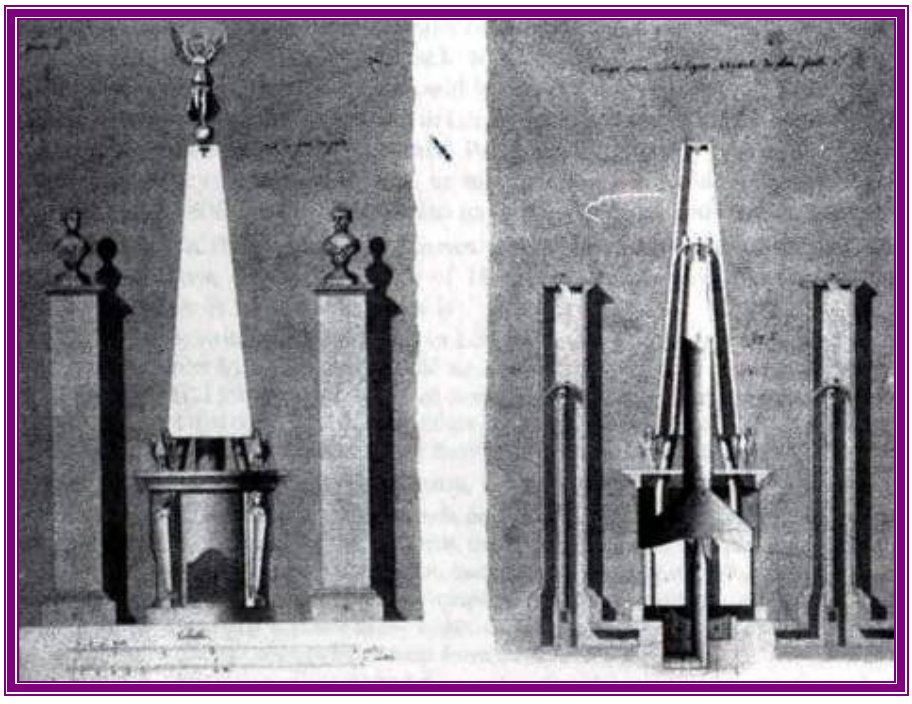
Chabannes' diagrams show that he employed all three main techniques of warming and ventilating—hot air, hot water and steam, often in some kind of mixed system. In the tentative fumbling towards full central heating that took place in the last quarter of the eighteenth century, notably in the 1790s, Britain broadly took precedence in the development of hot air and steam systems, while France had the edge in hot-water systems following the hothouse experiments of Bonnemain in the 1770s. Chabannes asserts that his hot-water heating is 'entirely novel in England',[56] while steam has 'long since been used here'.[57] In relation to both steam and hot air, he claims originality for his manner of application, not the principle. His greatest innovation, though he does not stress it in his pamphlets, seems to have been to extend complete circulating hot water systems of heating from hothouses to multi-storey domestic buildings, in which the more difficult vertical circulation had to be achieved without pumping machinery. From today's viewpoint, the most striking of his illustrations is a section through the shop and house in Burlington Arcade (fig. 11). Here every element of central heating as later practised in English town houses is present: the basement boiler attached to the kitchen range, the water tank in the roof, pipes for water to ascend and descend, and radiators in each room, shown on one floor in the form of pretty French lyre-shaped stoves. If anything so advanced had been done by others by 1818, we do not know of it.

Chabannes, however, took greatest pride in his stoves (fig. 11). Essentially they are all enclosed iron boxes on the model he had developed in France in 1807–8 and perhaps earlier, with a large central furnace for the fire, through which pass a multitude of large-bore pipes, sometimes carrying water or steam, sometimes just air. In the English context, where open fires and smoky rooms were the norm, he laid great weight upon the absence of smoke, which was carried off by a separate flue; hence the pretentious title Calorifere Fumivore, retained in French to give his inventions a touch of *chic* for the British market. The three pamphlets show many different shapes and sizes of caloriferes, and many different applications, including one on a boat (fig. 10). No two models were exactly alike. They may have been made by an ironmonger called James Lewis, who supplied the apparatus for the House of Commons in 1819.[58]

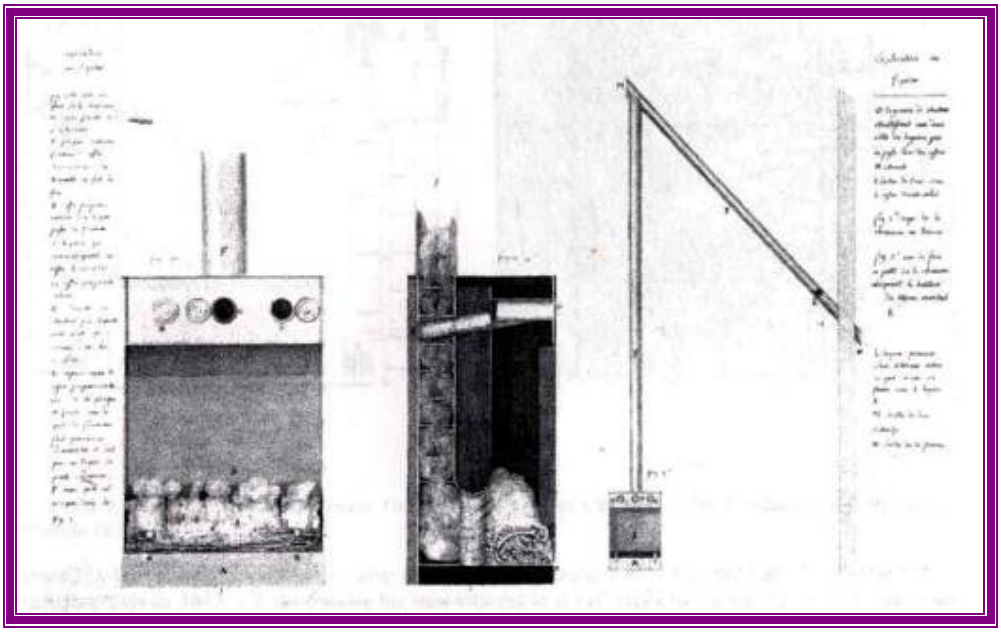
(Text extract from "The Marquis de Chabannes, Pioneer of Central Heating and Inventor," Martin Meade & Andrew Saint, date/reference not known)



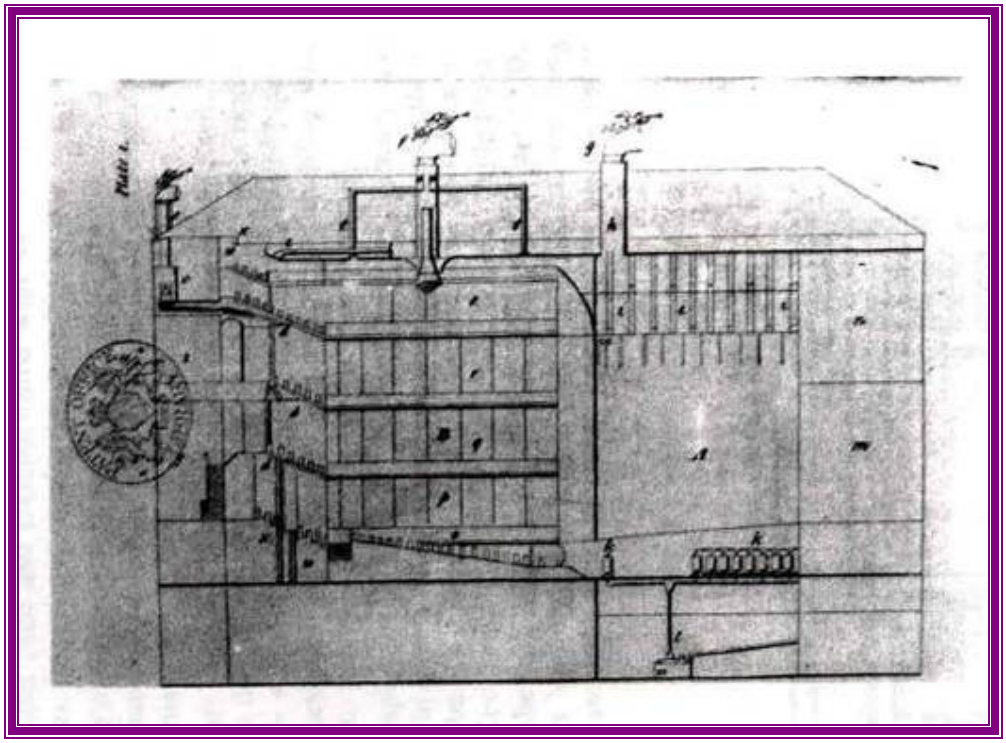
Plan & section of Chabanne's Pyramid Stove, 1808



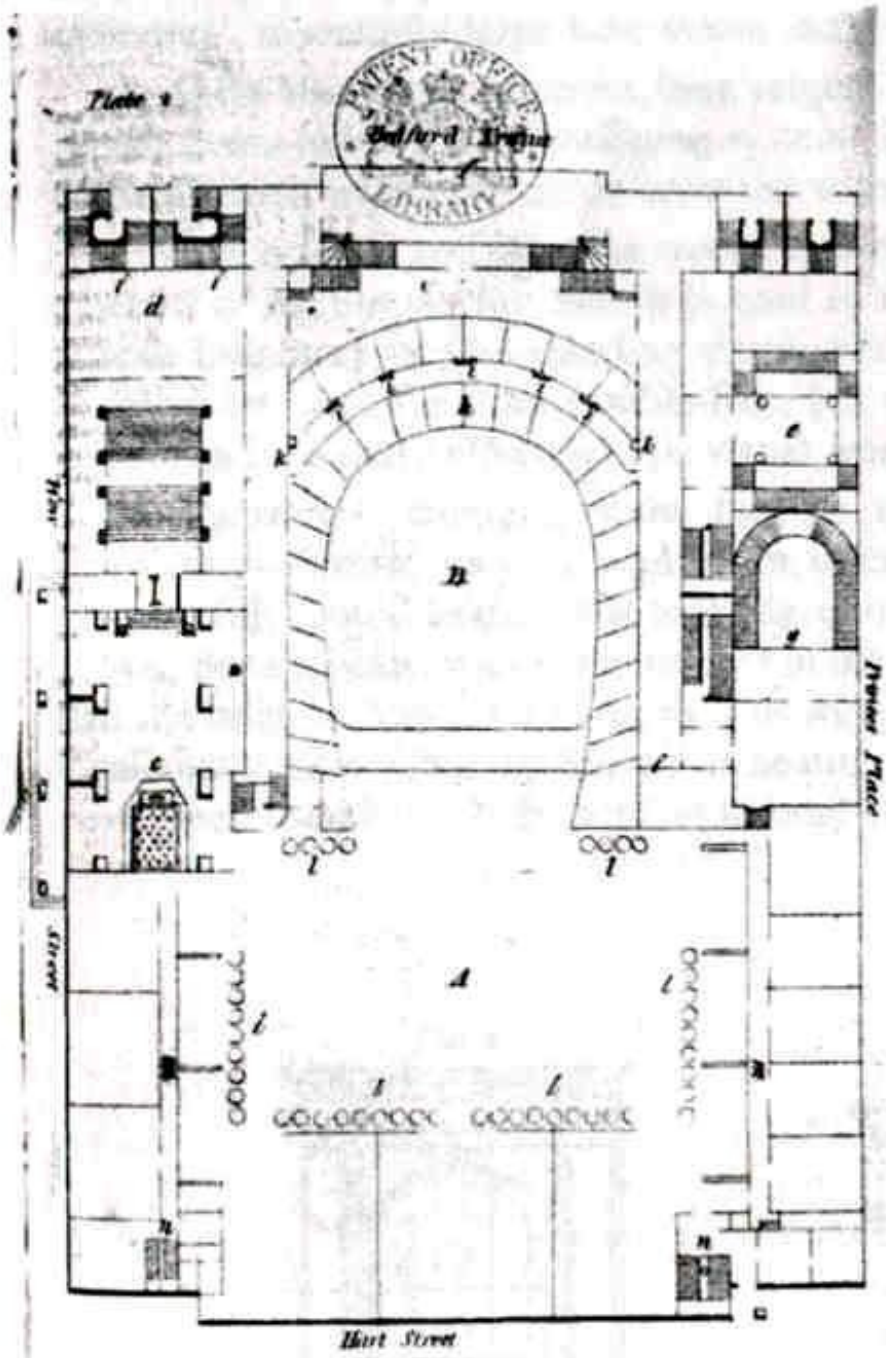
Pyramid Stove Fireplace, 1808



Glazed Firebox by Chabanne, 1808

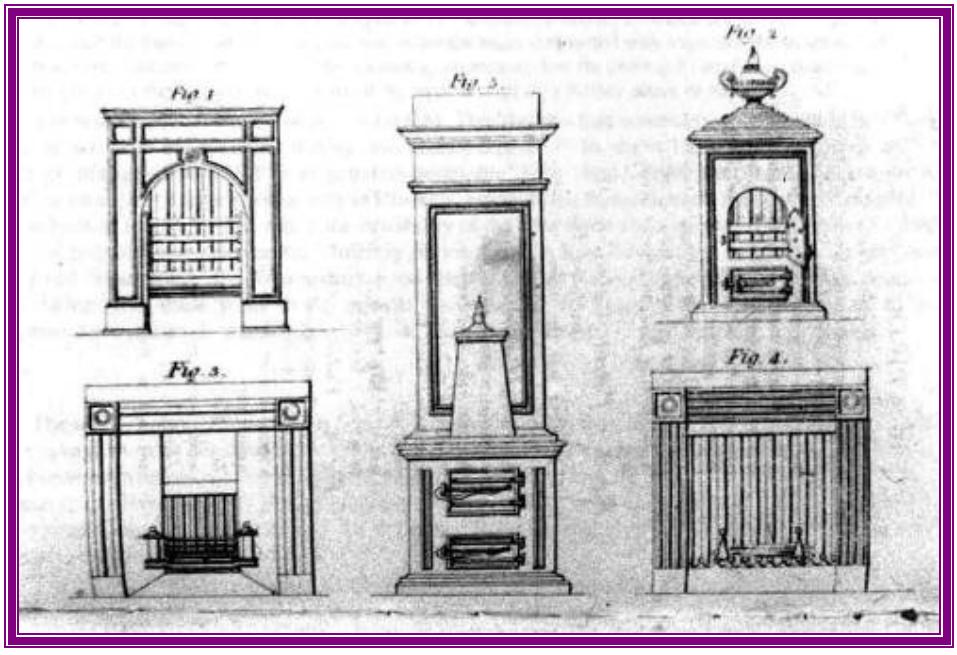


Section of heating scheme for Covent Garden Theatre
("On Conducting Air by Forced Ventilation," 1818)

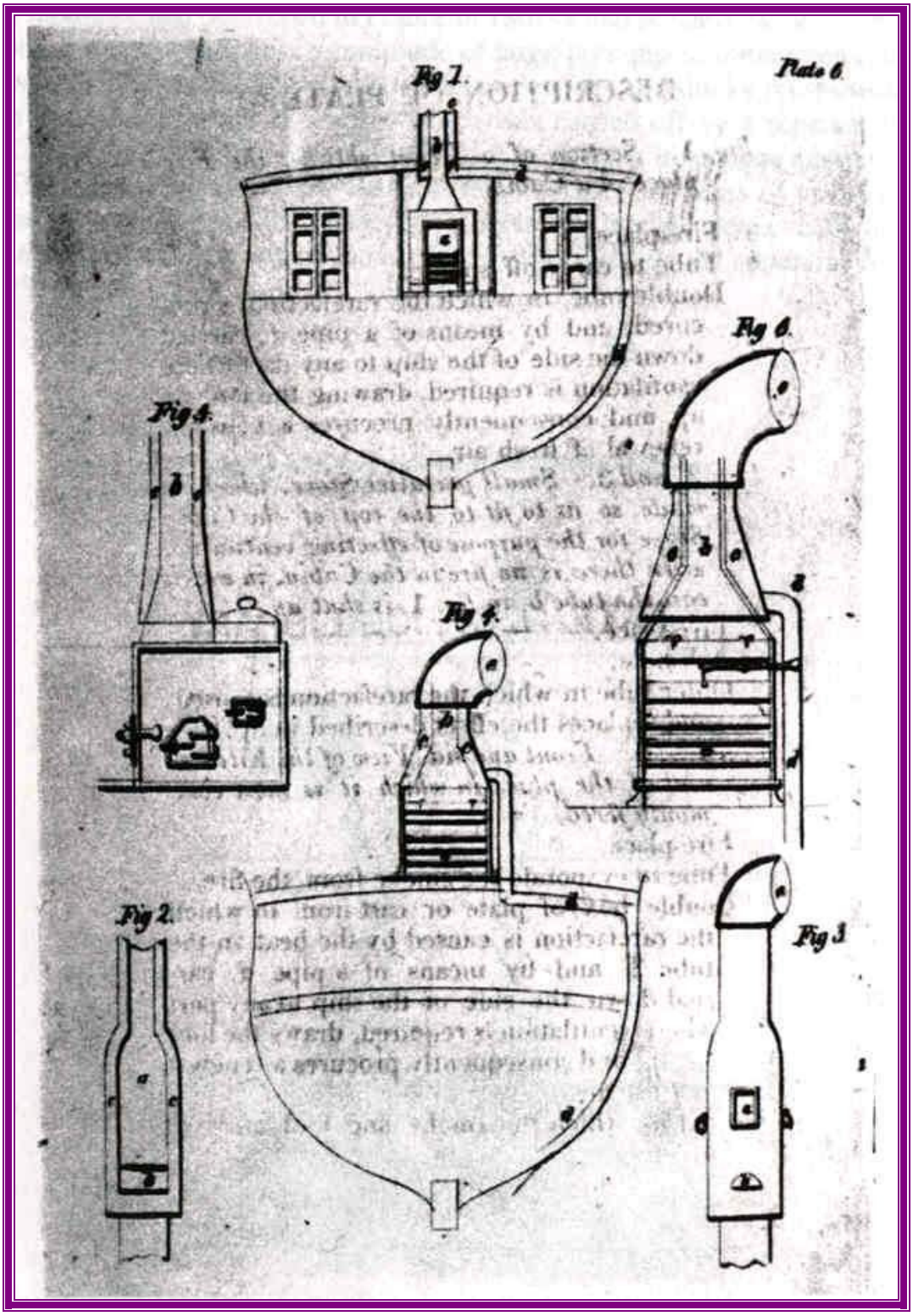


Plan of heating scheme for Covent Garden Theatre
("On Conducting Air by Forced Ventilation," 1818)

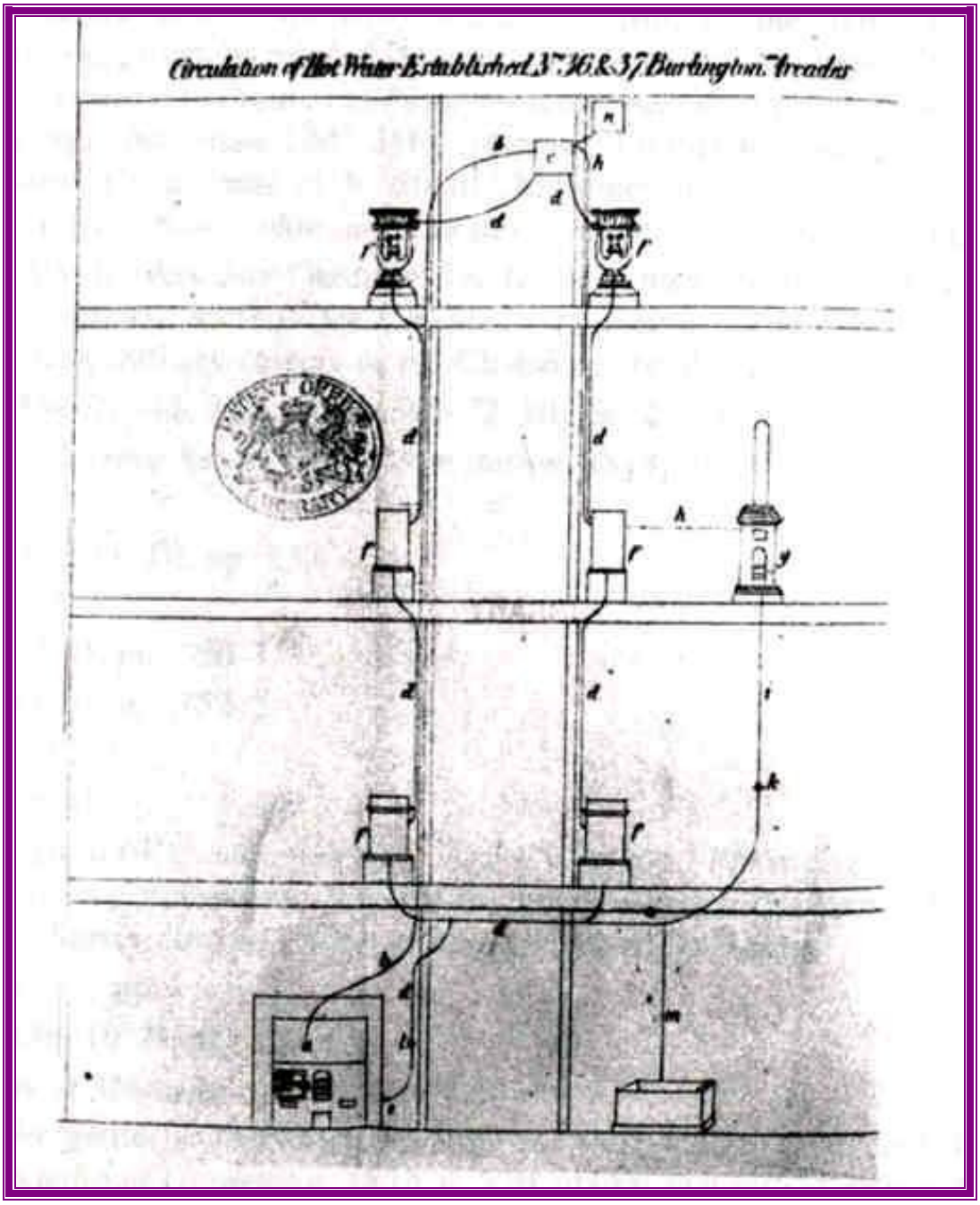
The second Covent Garden Theatre in 1808
("Ackermann's Illustrated London," Fiona St Aubyn, 1985)



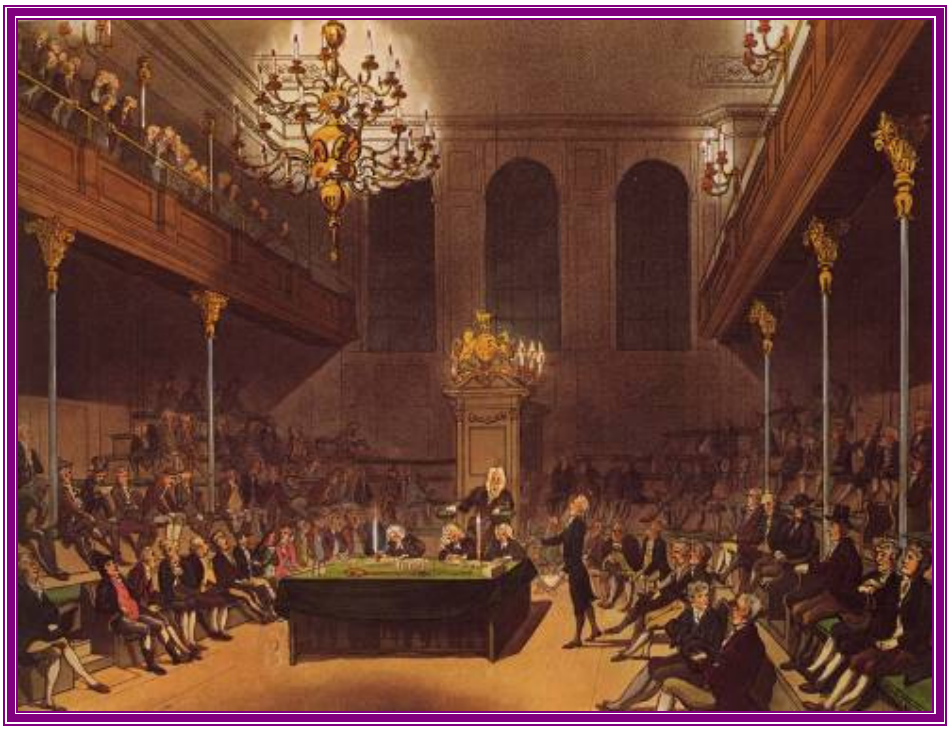
Simples Stoves (Caloriferes)



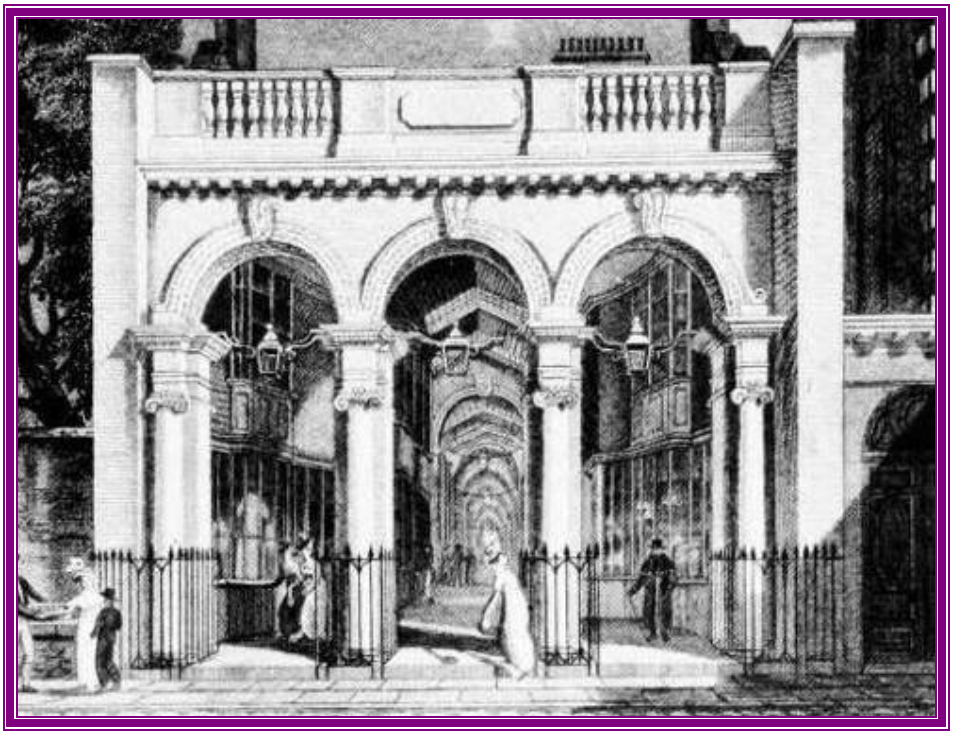
A stove for heating and ventilating a ship
("On Conducting Air by Forced Ventilation," 1818)



Chabanne's design for a house and shop in Burlington Arcade, 1819

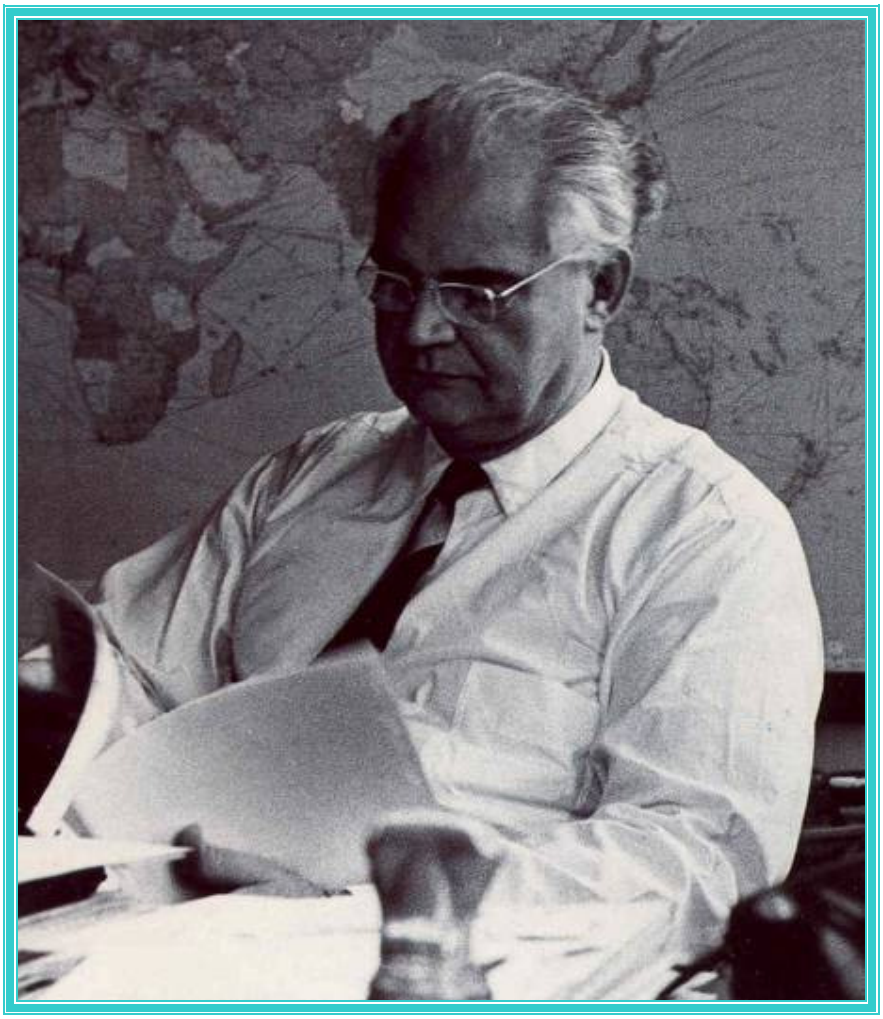


The House of Commons, 1809
("Ackermann's Illustrated London," Fiona St Aubyn, 1985)



Burlington Arcade, 1819

MADS CLAUSEN
1905-1966

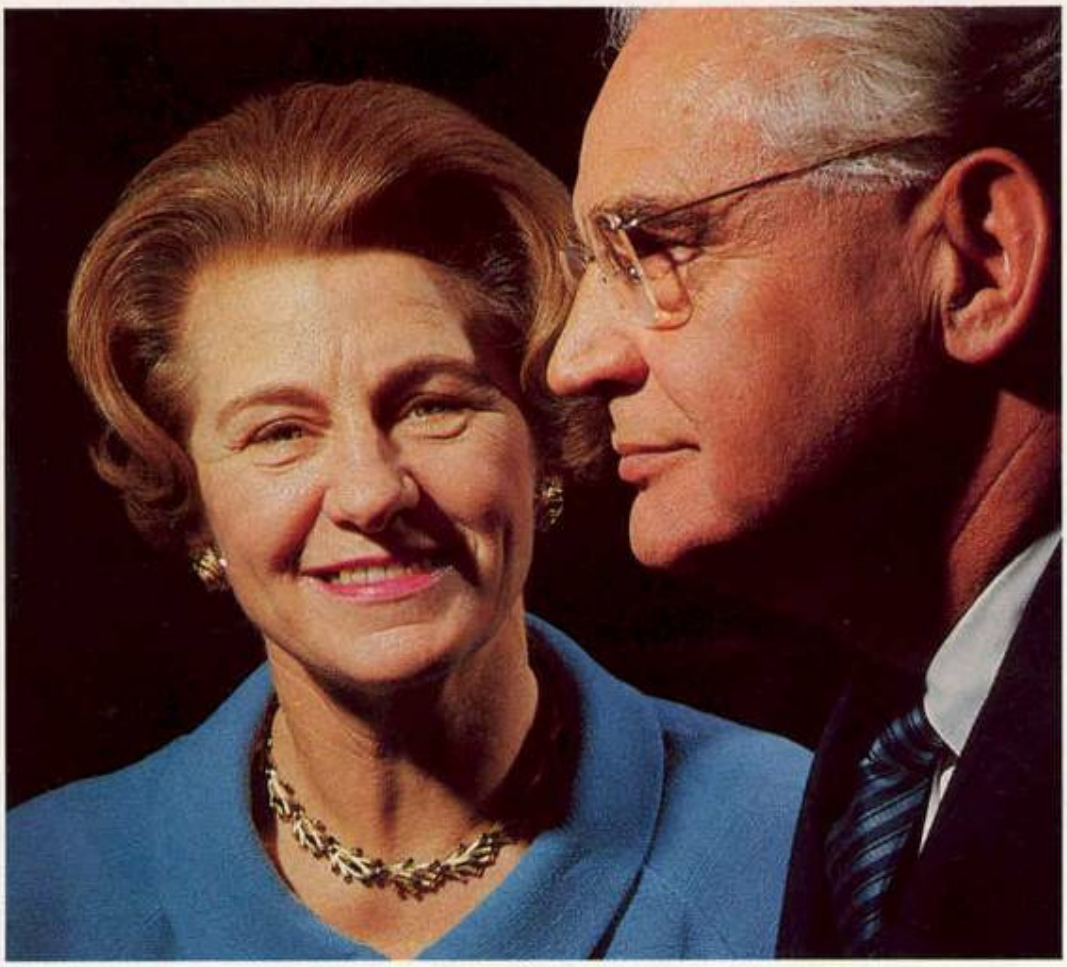


Founder of Danfoss

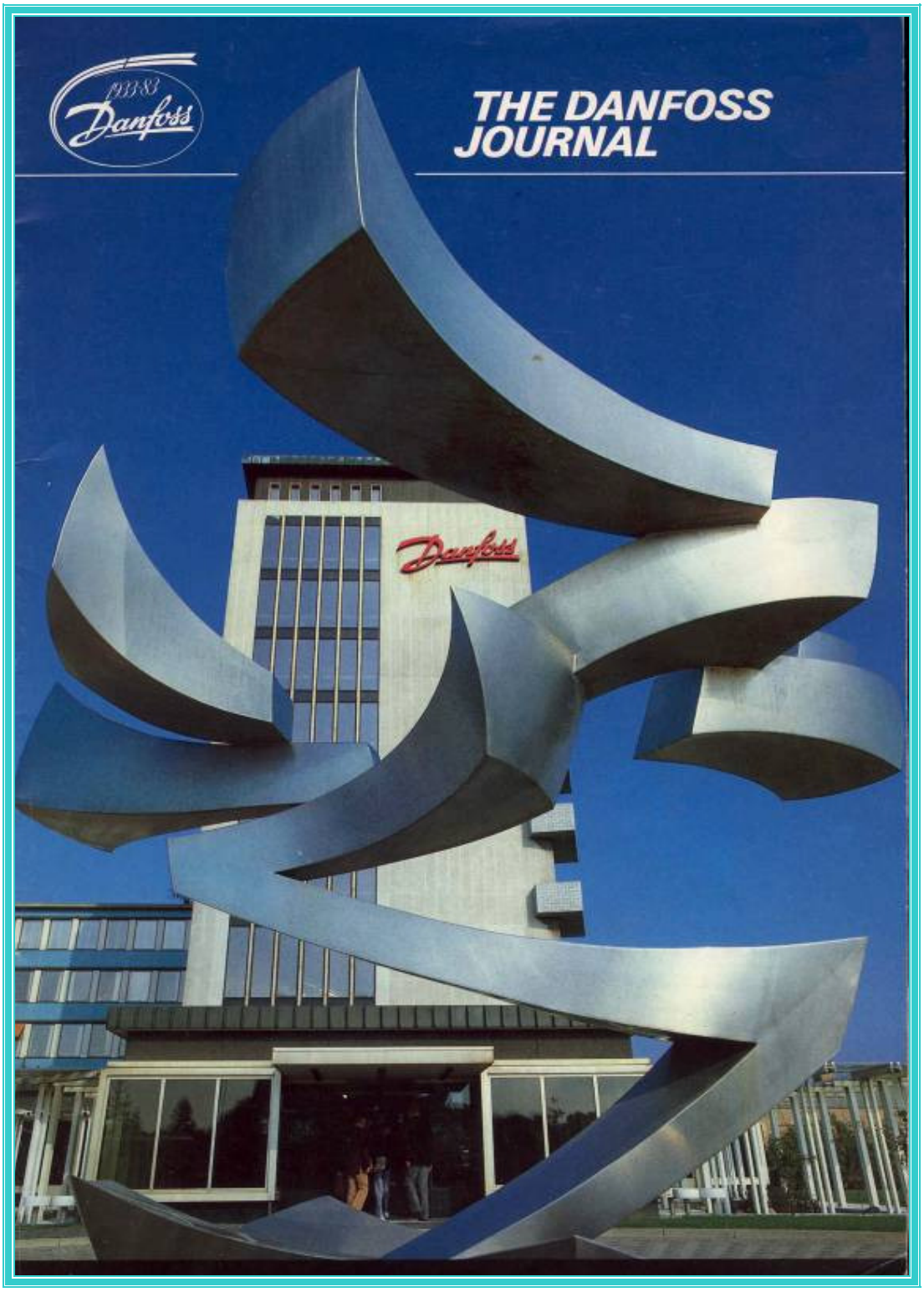
[134] Mads CLAUSEN **1905-1966**

Danish engineer and businessman. Like Carrier [101], he was born on a farm. Founded Danfoss (1933) and directed his first efforts to the production of controls for refrigerating plants. His first success was with an expansion valve. Clausen was described as "a man who could both inspire people and see matters from all sides, while never losing sight of the main objective." The company he founded has grown to one of the largest in its field.

(Mini-biography from "The Comfort Makers," Brian Roberts, ASHRAE, 2000)



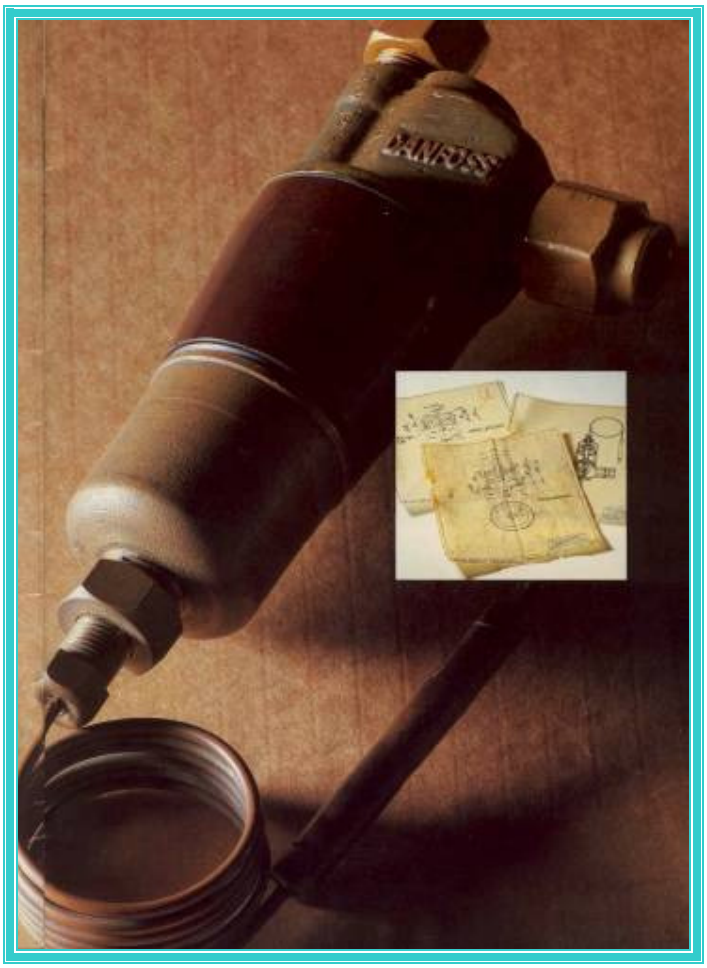
Bitten and Mads Clausen.



The Danfoss Journal celebrating 50 Years, 1933-1983
(CIBSE Heritage Group Collection)

When, as a young engineer, Mads Clausen founded Danfoss in 1933, he had not formulated a definitive goal for his firm. Neither had he considered general strategy nor carried out a detailed market analysis.
Everything was based on an idea, backed by tremendous willpower and an exceptional ability to see and exploit opportunities.
Mads Clausen was, above all, an individualist. He achieved results by making saleable products. The money earned was the tool with which to build the company, the products were the means.
His was a complex nature com-

bining the spirit of the pioneer with talent, stubbornness and vision. He listened, read and thought, and thoughts became actions. His endeavours bore fruit; indeed after a time far beyond what he himself had believed possible.



The Danfoss Expansion Valve

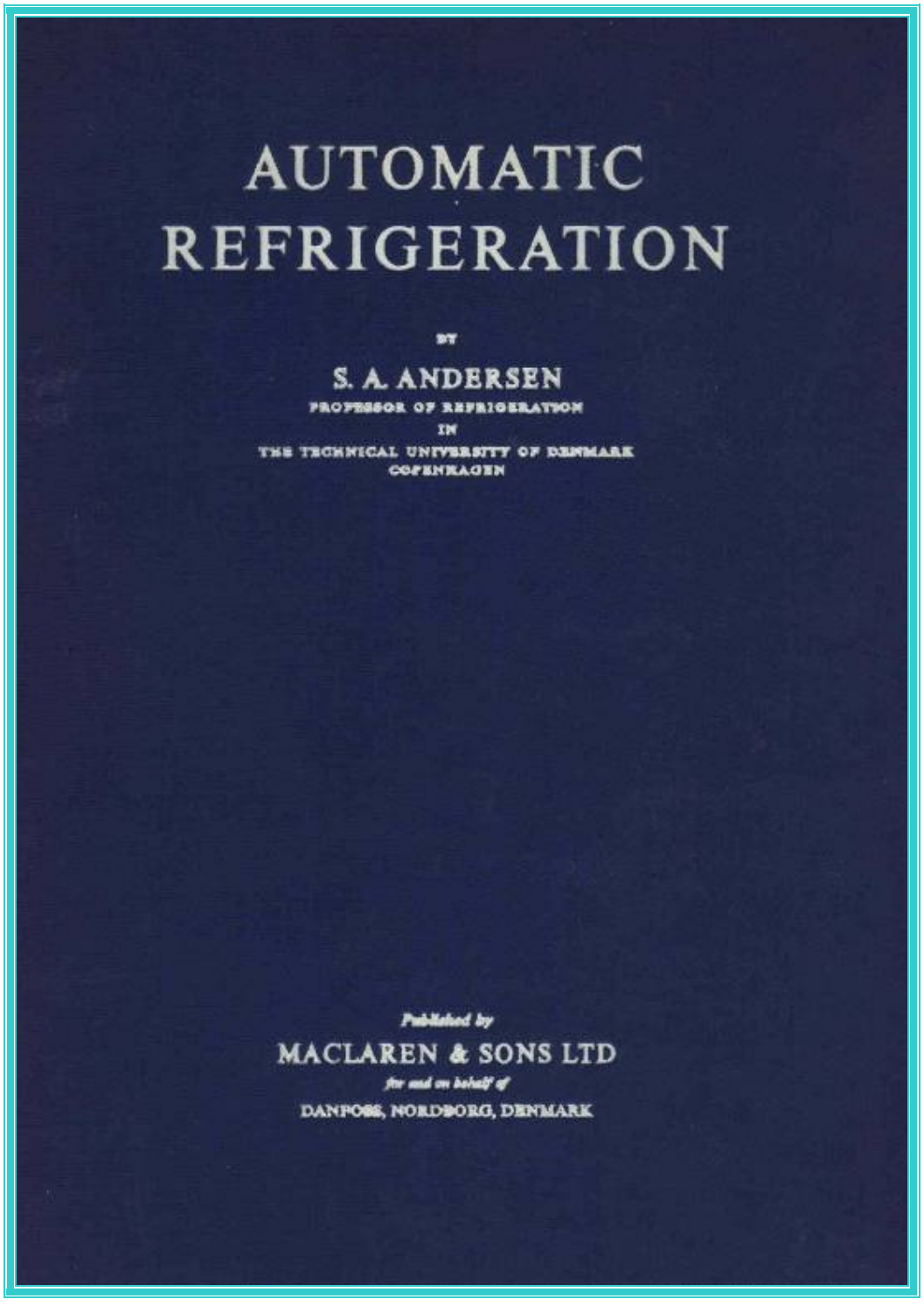
Mads Clausen's original technical sphere was refrigeration. Not unnaturally, therefore, his first efforts were directed at the production of automatic controls for refrigeration plant. For the initiated, such plant offers countless control possibilities and the process that takes place in the closed tube system covers a spectrum of flow conditions and changes in physical states. The ability to control this circuit paved the way for the development of automatic controls for many other applications and it was this path with its many offshoots that Danfoss followed.

The keyword was versatility and the product range was extended to cover a variety of trades widely different in character. The know-how gained in one product line was extensively used in others so that there was a constant influx of new know-how.

From 1945, the whole world became a natural market for Danfoss products and Mads Clausen recognized the importance of matching sales effort to foreign demand. As early as 1950, Danfoss was represented by a sales organisation in so many countries that it became appropriate to invite the managers concerned to the first international meeting in Nordborg – an arrangement that became known as the Danfoss Convention 1950.

Gradually, as the firm grew, the choice of the right personnel to perform the different tasks became critical for Mads Clausen. His "talent-spotting" ability was undoubtedly one of the secrets behind the success of the firm, as was his appreciation of the importance of teamwork.

Regardless of the value of the knowledge and ability of personnel, it is however only through the coordination of views and activities that real results emerge. Mads Clausen was a man who could both inspire people and see matters from all sides, while never losing sight of the main objective.



"Automatic Refrigeration," the Danfoss Bible, 1959
(CIBSE Heritage Group Collection)

Mads Clausen in front of the Nordborg offices of Danfoss