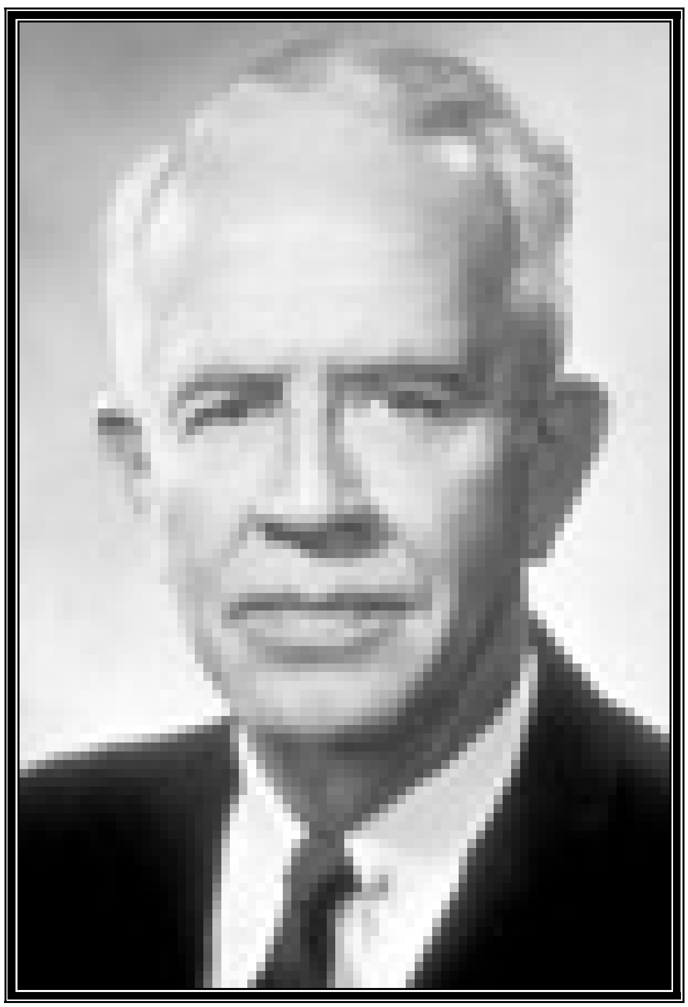



JOHN ENGALITCHEFF Jr
1907-1984

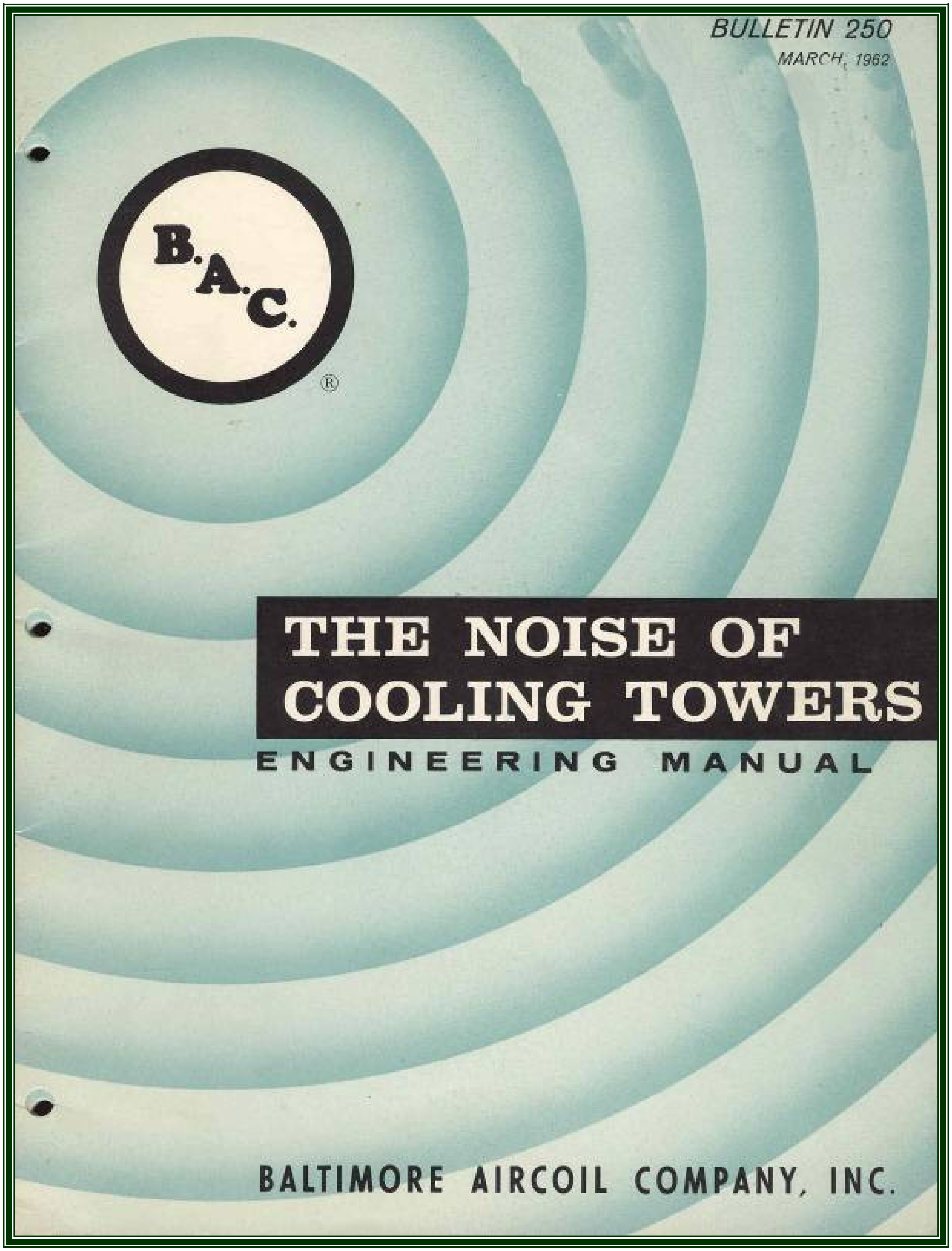


Founded Baltimore Aircoil Company

JOHN ENGALITCHEFF Jr **1907 – 1984**

Engalitcheff was born in Moscow, Russia. He received a special scholarship from Johns Hopkins University and graduated as a Mechanical Engineer in 1930. In 1938, Engalitcheff founded the Baltimore Aircoil Company, which began producing finned coils and ultimately developed a "blow through" evaporative condenser. In the ensuing years, the company developed packaged "blow through" evaporative condensers and cooling towers, V-Line cooling towers and condensers, and the Ejector cooling tower. John Engalitcheff held 47 patents on heating and air conditioning equipment. His work in the field of evaporative heat transfer made possible compact energy efficient cooling towers and evaporative condensers, which led to the displacement of water wasteful once-through systems and provided an alternative to dry cooling systems. He was a pioneer and innovator in the air conditioning industry. Engalitcheff received ASHRAE's Distinguished Service Award in 1963, became a Life Member in 1972, an ASHRAE Fellow in 1977, and received the F Paul Anderson Award in 1981. He died in 1984, just three days after personally receiving the Presidential Eagle Pin from President Ronald Reagan for his contributions to the American Security Council. John Engalitcheff Jr was inducted into the ASHRAE Hall of Fame in1996.

(Edited extract from ASHRAE "Hall of Fame" Citation)


BULLETIN 250
MARCH, 1962

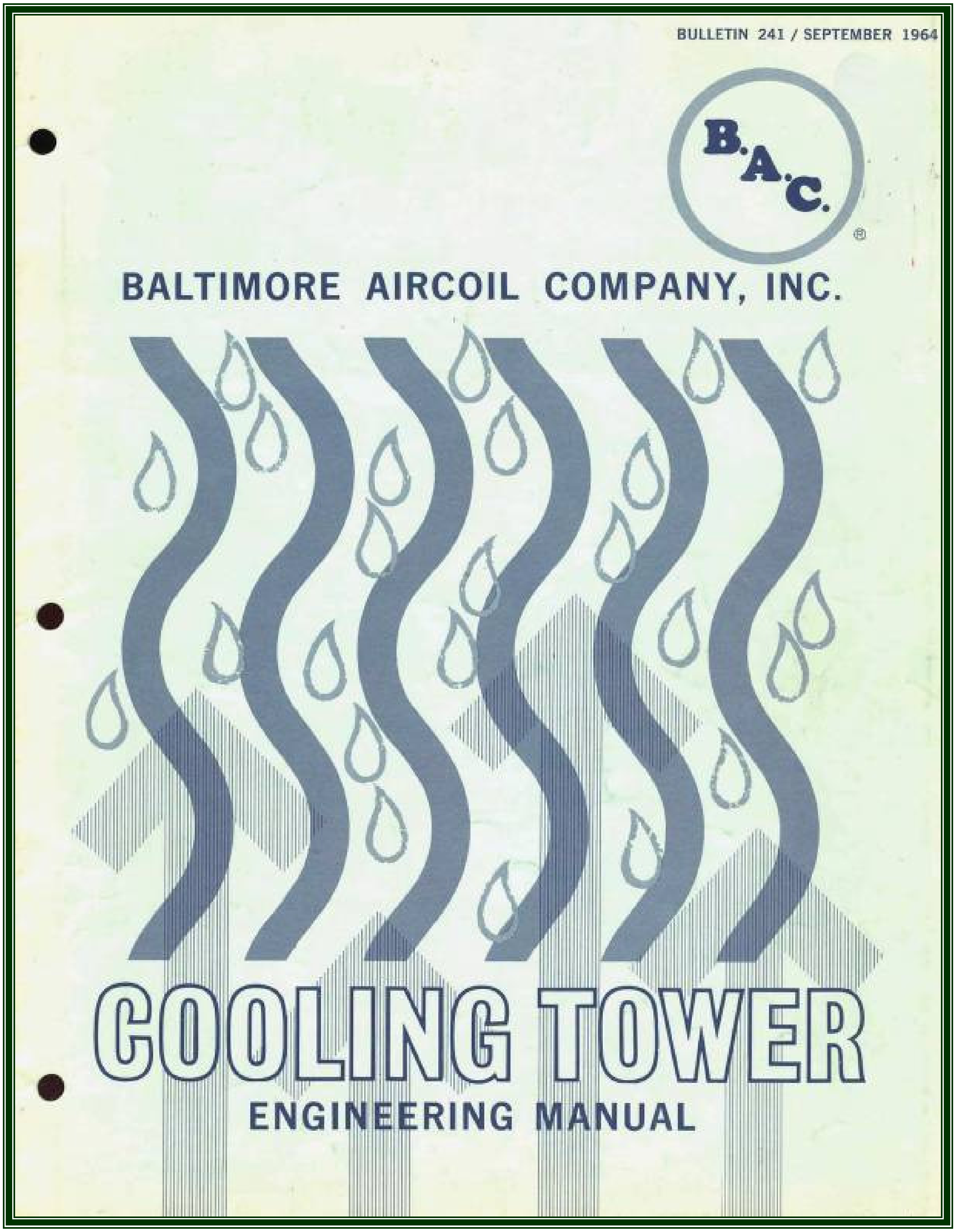
B.A.C.®

THE NOISE OF COOLING TOWERS

ENGINEERING MANUAL

BALTIMORE AIRCOIL COMPANY, INC.

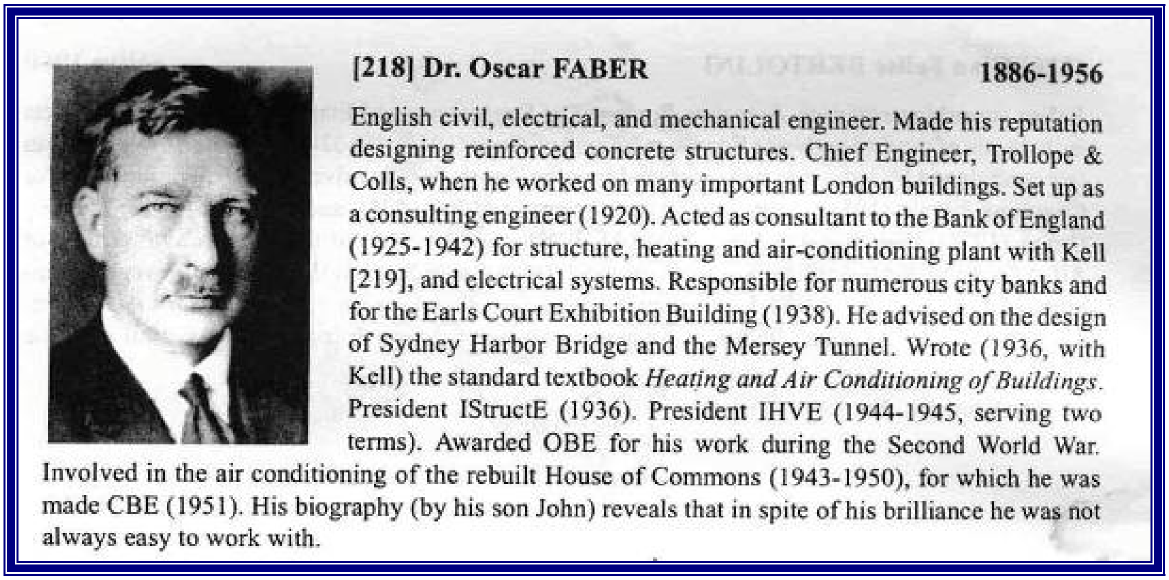
BAC Cooling Tower Engineering Manual 1962 (CIBSE Heritage Group Collection)



BAC Cooling Tower Engineering Manual 1965 (CIBSE Heritage Group Collection)

Dr OSCAR FABER CBE
1886-1956

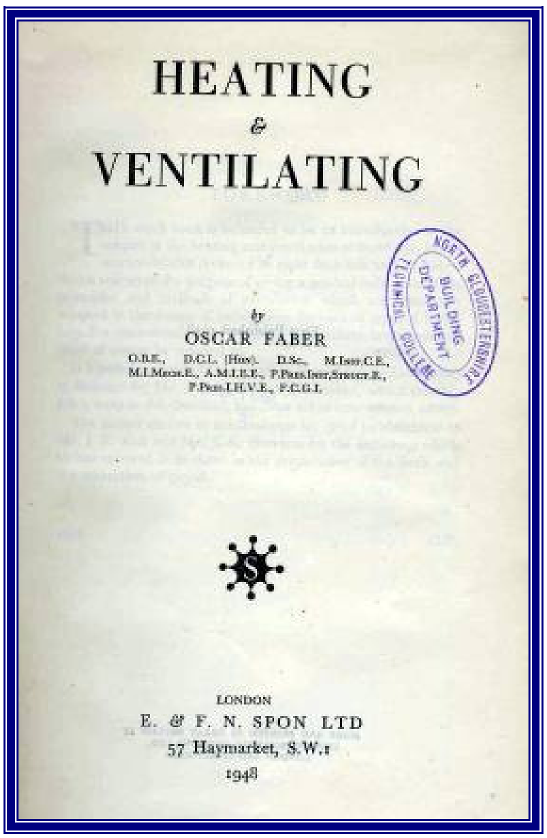
Civil, electrical and mechanical engineer



[218] Dr. Oscar FABER **1886-1956**

English civil, electrical, and mechanical engineer. Made his reputation designing reinforced concrete structures. Chief Engineer, Trollope & Colls, when he worked on many important London buildings. Set up as a consulting engineer (1920). Acted as consultant to the Bank of England (1925-1942) for structure, heating and air-conditioning plant with Kell [219], and electrical systems. Responsible for numerous city banks and for the Earls Court Exhibition Building (1938). He advised on the design of Sydney Harbor Bridge and the Mersey Tunnel. Wrote (1936, with Kell) the standard textbook *Heating and Air Conditioning of Buildings*. President IStructE (1936). President IHVE (1944-1945, serving two terms). Awarded OBE for his work during the Second World War. Involved in the air conditioning of the rebuilt House of Commons (1943-1950), for which he was made CBE (1951). His biography (by his son John) reveals that in spite of his brilliance he was not always easy to work with.

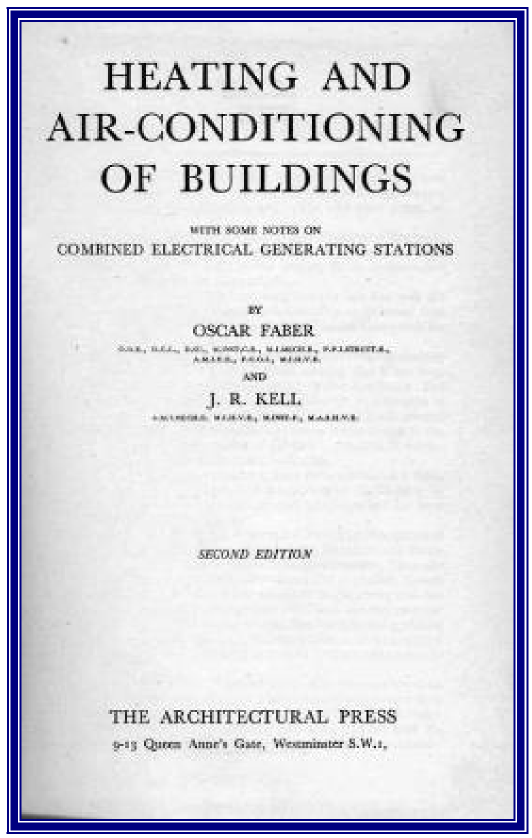
(Mini-biography from "The Comfort Makers," Brian Roberts, ASHRAE, 2000)



HEATING
&
VENTILATING

by
OSCAR FABER
O.B.E., D.C.L. (Hon). D.Sc., M.Inst.C.E., M.I.Mech.E., A.M.I.E.E., P.Pres.Inst.Struct.E., P.Pres.I.H.V.E., F.C.G.I.

LONDON
E. & F. N. SPON LTD
57 Haymarket, S.W.1
1948



HEATING AND AIR-CONDITIONING OF BUILDINGS

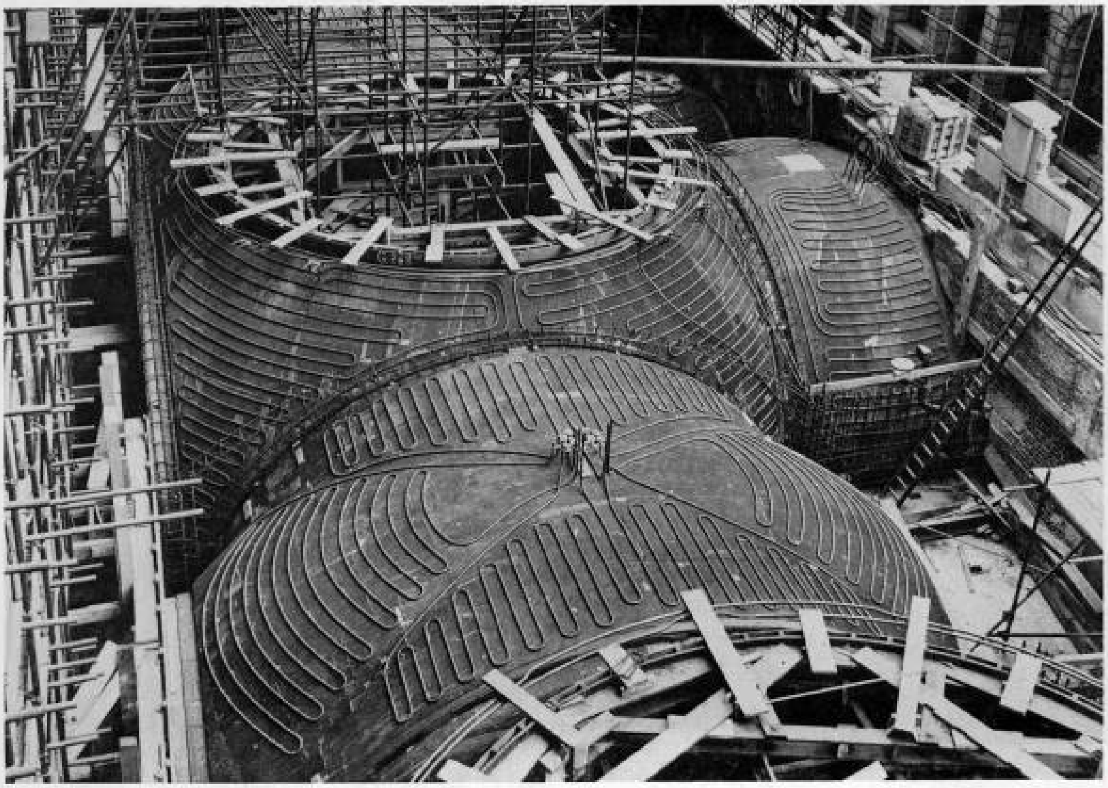
WITH SOME NOTES ON
COMBINED ELECTRICAL GENERATING STATIONS

BY
OSCAR FABER
AND
J. R. KELL

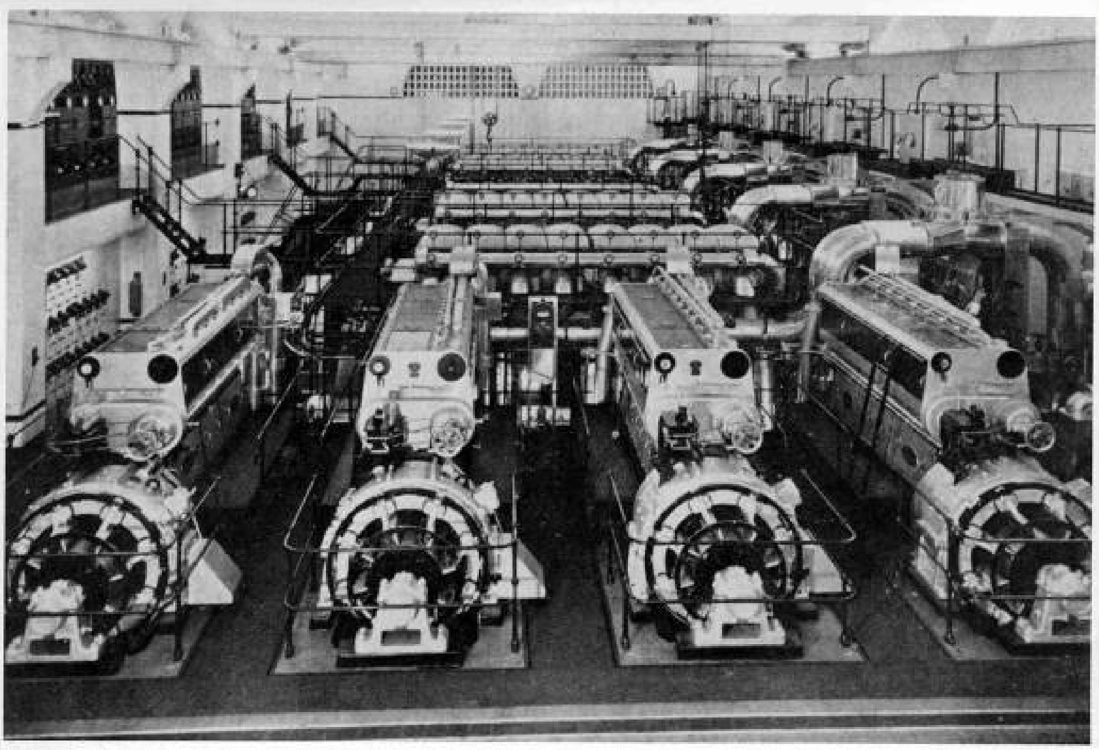
SECOND EDITION

THE ARCHITECTURAL PRESS
9-13 Queen Anne's Gate, Westminster S.W.1,

(Textbooks by Faber: CIBSE Heritage Group Collection)

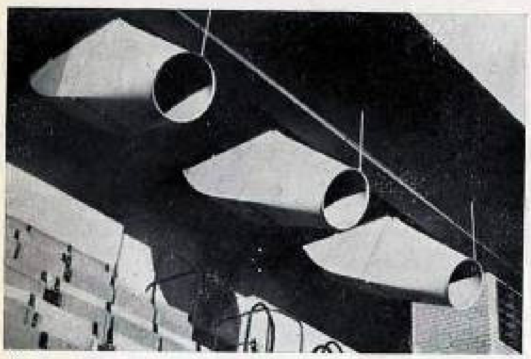


Copper piping for panel-heating, ready for concreting to form the Soane domes at the Bank of England (1924–1942).

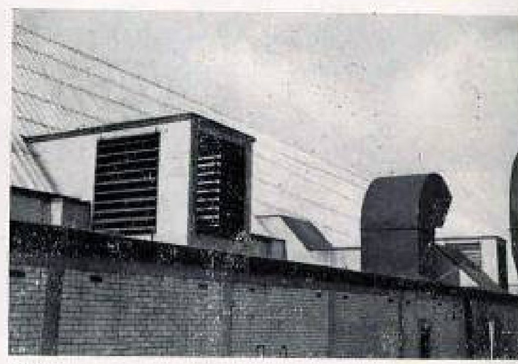


The generating station in the basement of The Bank of England – the waste products being conserved for heating within the building.

(a)



(b)



(c)

Plate XXVII. Earl's Court, London. (a) View of main hall showing nozzles at high level. (b) Detail view of nozzles. (c) Outside view of fresh air intakes and exhaust discharges

JOURNAL *of* THE INSTITUTION OF HEATING & VENTILATING ENGINEERS

Vol. 12 MARCH-APRIL 1944 No. 122

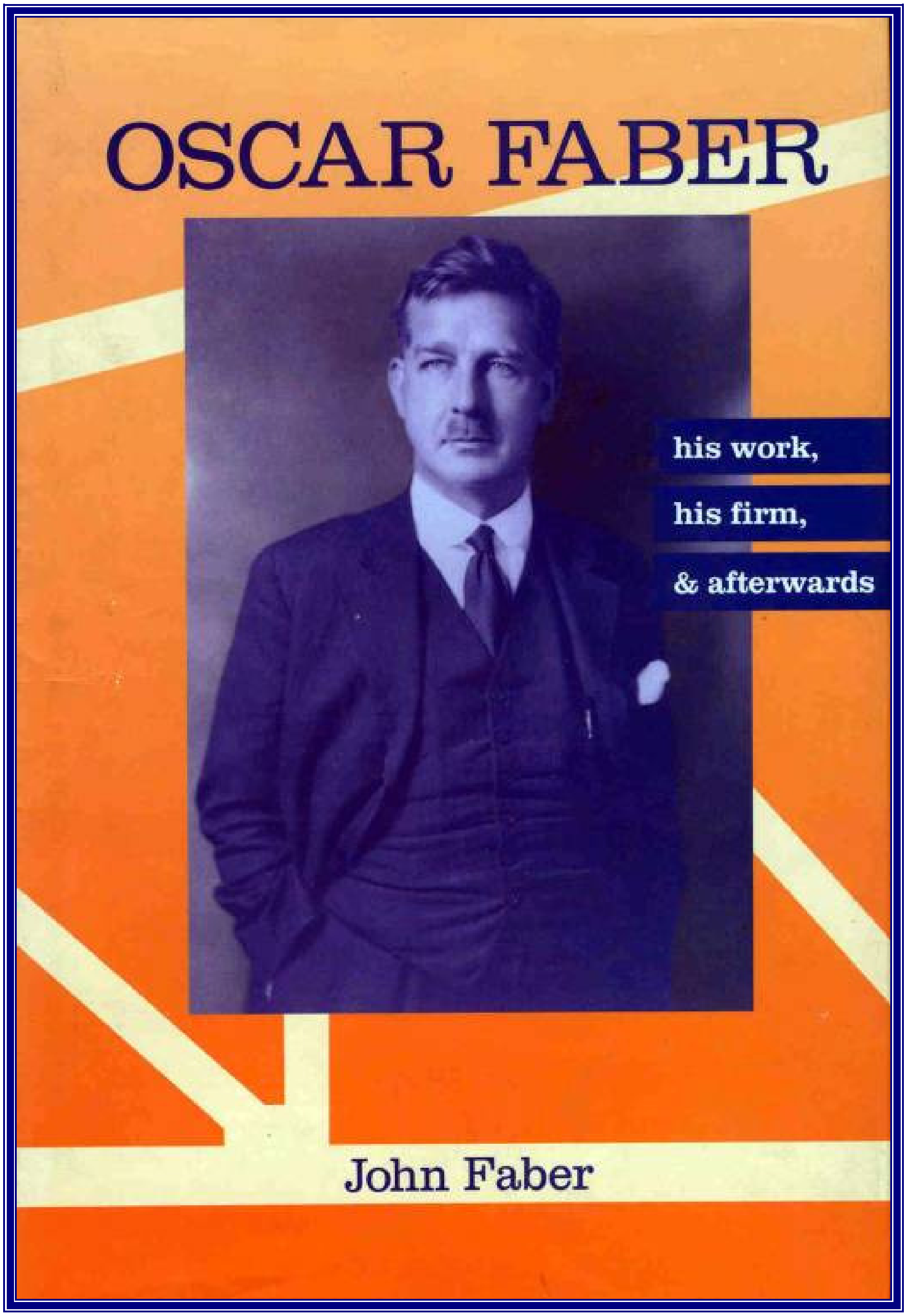
OSCAR FABER

PRESIDENT 1944

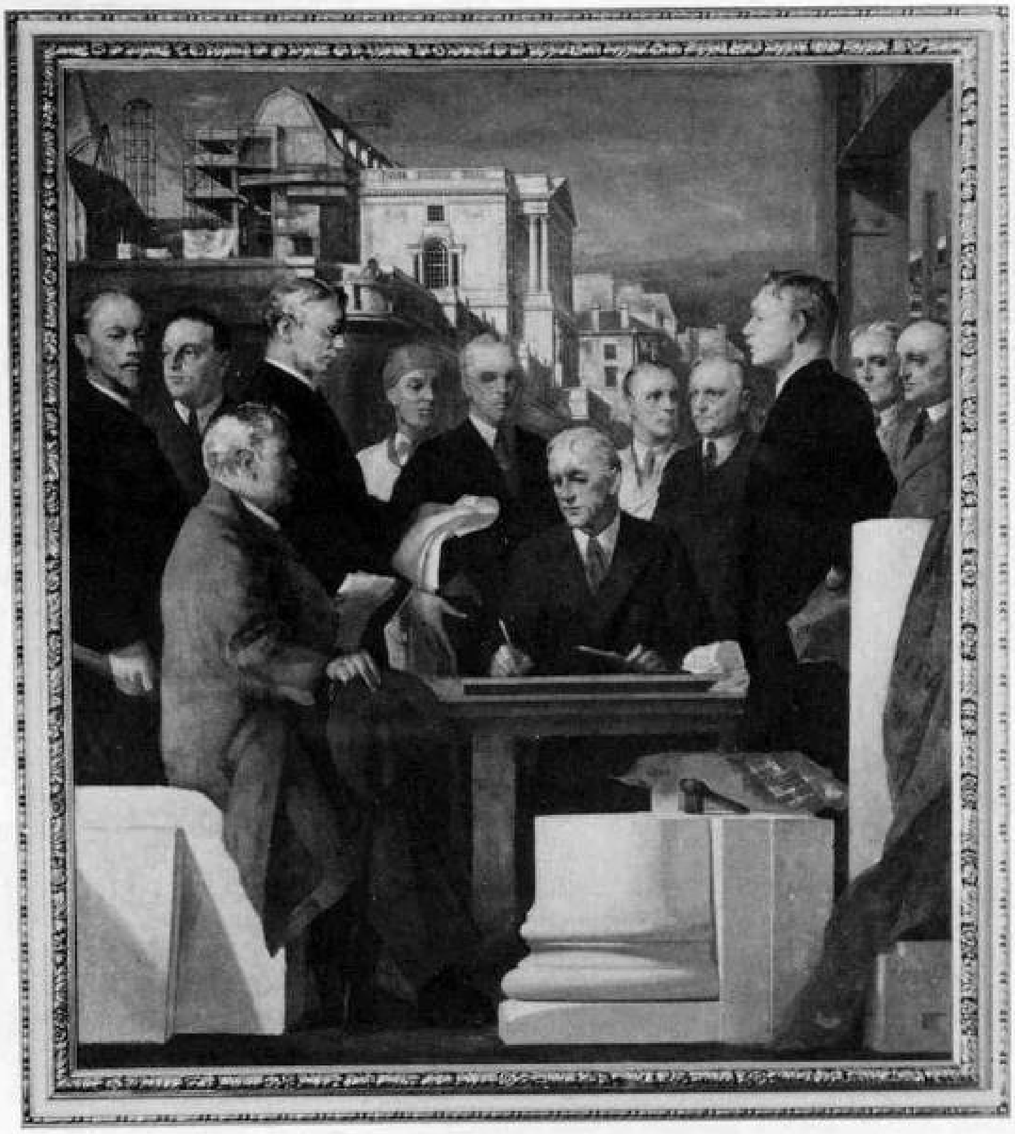
THE new President of the Institution of Heating and Ventilating Engineers, Mr. Oscar Faber, was born 1886, in London, and was educated at St. Dunstan's College, Catford, and City and Guilds (Engineering) College, South Kensington (Cloth-workers Scholar) 1903-1906, obtaining the A.C.G.I., first in Electrical Engineering and subsequently in Civil and Mechanical Engineering. He took the B.Sc., Engineering, London University and subsequently the D.Sc., by thesis on Research. He became assistant civil engineer to A.P.C.M. and worked on jetties, wharfs, and Civil Engineering Works, chiefly of timber and reinforced concrete. Later he became assistant engineer to Indented Bar Engineering Co. and was responsible for designs of many important R.C. structures. When chief engineer with Trollope & Co. Ltd. he was responsible for design of engineering work in many large London buildings, such as Hong Kong Bank, Chartered Bank of India, London House, etc. During the last War he did important research work and production for the Admiralty for which he was awarded O.B.E.

He set up in private practice as consulting engineer about 1920, became consulting engineer for New Bank of England, including structure, heating and air-conditioning plant, electrical system, and all engineering services (1925-1942). He acted in similar capacity in regard to many buildings in London and abroad, such as Lloyds Bank, Glyn Mills Bank, Martin's Bank, Barclay's Bank, India House, S. Africa House, Church House, Royal Empire Society, Earls Court Exhibition, including all heating, air conditioning, electrical work, and all services. He designed many flour mills, silos, etc. and was consulting engineer for many large buildings in Shanghai and Hong Kong, Nairobi, Cape Town, Pretoria.

He is a Past-President, Institution of Structural Engineers and author and joint author of many technical papers and books on reinforced concrete, constructional steel, heating and air conditioning, foundations, etc. The Hon. D.C.L. of Durham University was awarded him in recognition of work in underpinning Durham Castle under conditions of considerable risk and difficulties. He was elected a Member of Institution of Heating and Ventilating Engineers in 1933, and Vice-President in 1939.

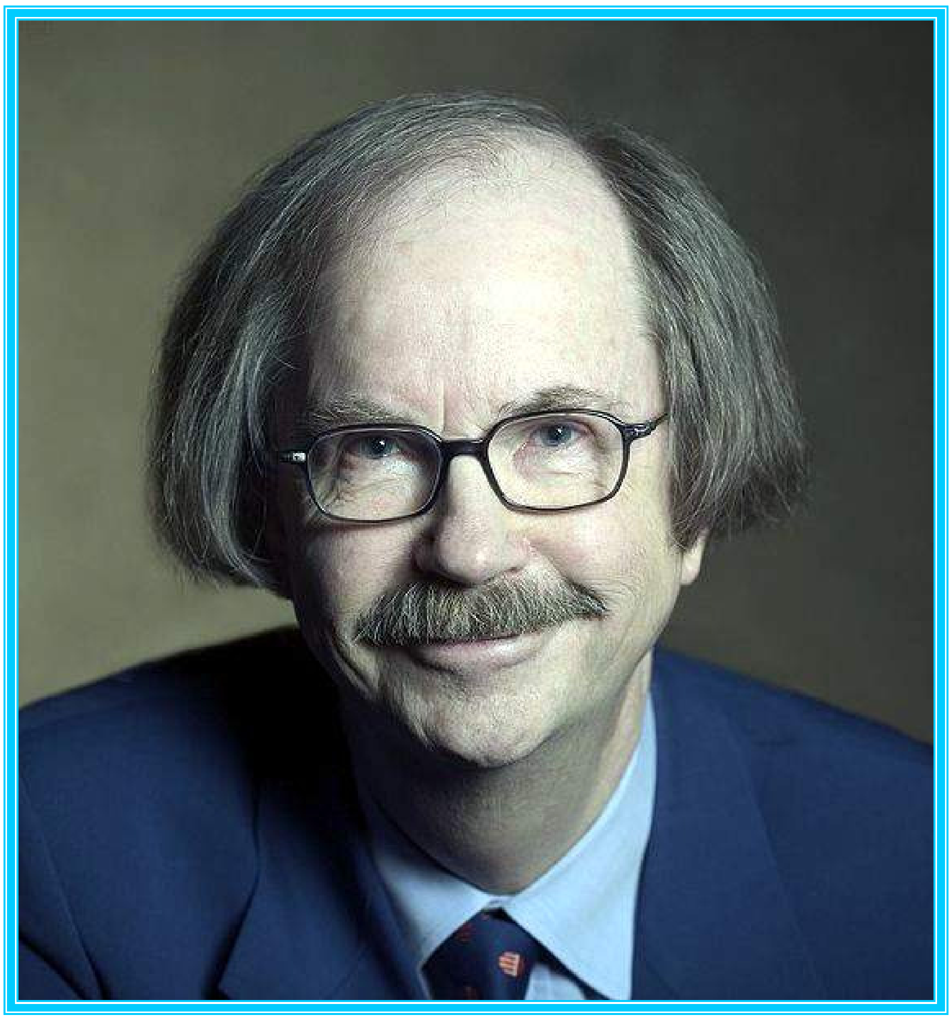


(CIBSE Heritage Group Collection)



A. K. Lawrence's painting "The Builders" (1932) which hangs in The Bank of England. Sir Herbert Baker seated. Oscar Faber standing right foreground.

PAVEL OLE FANGER
1934-2006



Leading Comfort Researcher and Educator

PAVEL OLE FANGER **1934 - 2006**

Ole Fanger received his MS (1957) and DSc (1970) from the Technical University of Denmark (DTU). He joined the faculty of DTU in 1959, and was promoted to Professor in 1977. He guided more than 100 MS and PhD students, published 12 books or book chapters, was author or co-author of over 300 technical papers, and presented more than 300 invited lectures. Fanger established the International Centre for Indoor Environment and Energy (ICIEE) at the DTU in 1998, and served as its Founding Director until 2004. In 2003, an international evaluation declared ICIEE to be the best in the world within the field of indoor environment and energy. He became an ASHRAE member in 1968, and attended most of the biannual meetings for nearly 40 years. Fanger's research was almost exclusively directed toward people's response to the indoor environment. Specifically, he introduced in the 1960s indices for the quantification of thermal sensation and comfort. He and his associates identified for the first time a significant impact of indoor air quality on productivity (office workers, factory workers, etc.) and on Sick Building Syndrome symptoms. He was arguably the most decorated Dane in scientific and technical affairs. He was elected to 7 international academies and given honorary membership in 17 engineering societies in Europe and Asia. He was the recipient of 8 awards from ASHRAE, including the Holladay Distinguished Fellow and the F Paul Anderson Award. He was awarded 9 honorary doctorates, and was honorary professor at 6 major Chinese universities. He was awarded 28 medals, plaques, and prizes by engineering societies throughout the world. In 2002, the Queen of Denmark made him Knight of the Order of Dannenbrog, Premier Degree. Pavel Ole Fanger, widely considered the world's leading expert on the effect of the indoor environment on human comfort, health, and productivity, was inducted into the ASHRAE Hall of Fame in 2008.

(Edited extract from ASHRAE "Hall of Fame" Citation)

Fanger[56] has established the Predicted Mean Vote index which aims to predict man's thermal sensation as a function of activity level, clo value, air and mean radiant temperatures, relative air velocity and vapour pressure. From experiments, which were carried out using 1300 Danish and North American subjects in a climatic room, Fanger has correlated physical and physiological measurements with subjective thermal sensation votes made on the seven-point scale: cold (−3); cool (−2); slightly cool (−1); neutral (0); slightly warm (+1); warm (+2); and hot (+3). A complete set of comfort diagrams which enables combinations of environmental parameters to be selected for given activity levels is available[56].

Example of Fanger's Work (From "Air Conditioning and Ventilation of Buildings," D J Croome-Gale & B M Roberts, 1975)

FRANK H FAUST
1905-1995

Air Conditioning & Refrigeration Pioneer

FRANK H FAUST **1905 – 1995**

After graduating from Yale in 1926, Faust joined the General Electric Company where he remained until his retirement in 1970. Some of the highlights of his work at GE include design of the first hermetically sealed self-contained room air conditioner and assisting with the design of the first all-electric railroad car air-conditioning system and with the industry's first self-contained, refrigerated drinking water cooler. The first direct-reading psychometric chart was designed under his supervision. During World War II, he was instrumental in the design of food refrigeration systems for Navy and Coast Guard vessels.

Faust served ASHRAE and its predecessor societies for more than 60 years. He joined ASHVE in 1930 and ASRE in 1931. He served on the committee that wrote the 1930 edition of the Safety Code for Mechanical Refrigeration. As the first chair of the Committee on Cooperation, he helped implement the ASHAE/ASRE merger studies leading to the formation of ASHRAE in 1959. From 1971-1985, he was active in solicitation of funds from government agencies, netting nearly $8.5 million for joint ASHRAE and outside agency research projects He was a recipient of the ASHRAE F Paul Anderson Award, the Distinguished 50-Year Member Award and the Louise and Bill Holladay Distinguished Fellow Award. Presidential Member Frank H Faust was inducted into the ASHRAE Hall of Fame in 2000.

(Edited extract from ASHRAE "Hall of Fame" Citation)

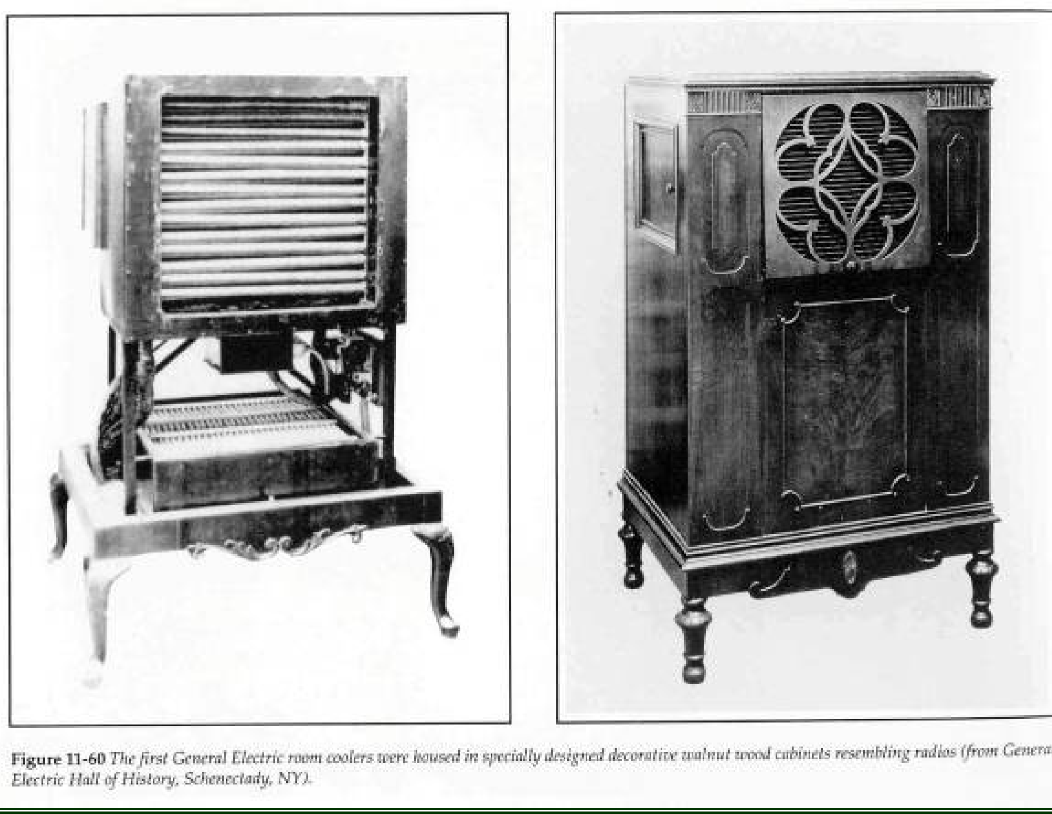


Figure 11-60 *The first General Electric room coolers were housed in specially designed decorative walnut wood cabinets resembling radios (from General Electric Hall of History, Schenectady, NY).*

Another refrigerator manufacturer, General Electric, also became interested in room coolers about the same time. In 1928, Frank Faust, development engineer in the Electric Refrigerator Department of GE, was asked ". . . to develop a demonstration of the feasibility of applying the General Electric Refrigerator development to room cooling." Faust designed a water chiller using "Monitor Top" household refrigerator units, the chilled water being pumped to a finned coil in an air handler that had been obtained on consignment from Willis Carrier. The system was installed in the office of a New York psychiatrist, a friend of Gerard Swope, president of General Electric Company (Figure 11-59). Faust recalled:

> I personally tested this system and prepared a technical report. The system worked perfectly. The demonstration apparently was very successful in convincing the top officials of the company to finance further development of room cooling. It may also have influenced Carrier to develop their so-called "Atmospheric Cabinet," first installed in 1931.

Faust was then assigned to develop a room cooler, which, unlike Frigidaire's split system, was to be self-contained. The coolers used the Monitor Top hermetic sulfur dioxide compressor, a water-cooled condenser, and a thermostatic expansion valve with a finned-coil evaporator and fan. The assembly was housed in a specially designed wood housing resembling a radio cabinet. Thirty-two of these prototypes were produced in 1930 and 1931. In parallel, a self-contained oil-fired boiler-burner unit was developed. On the basis of these two projects, General Electric established the Air Conditioning Department in 1932[114] (Figures 11-60 and 11-61).

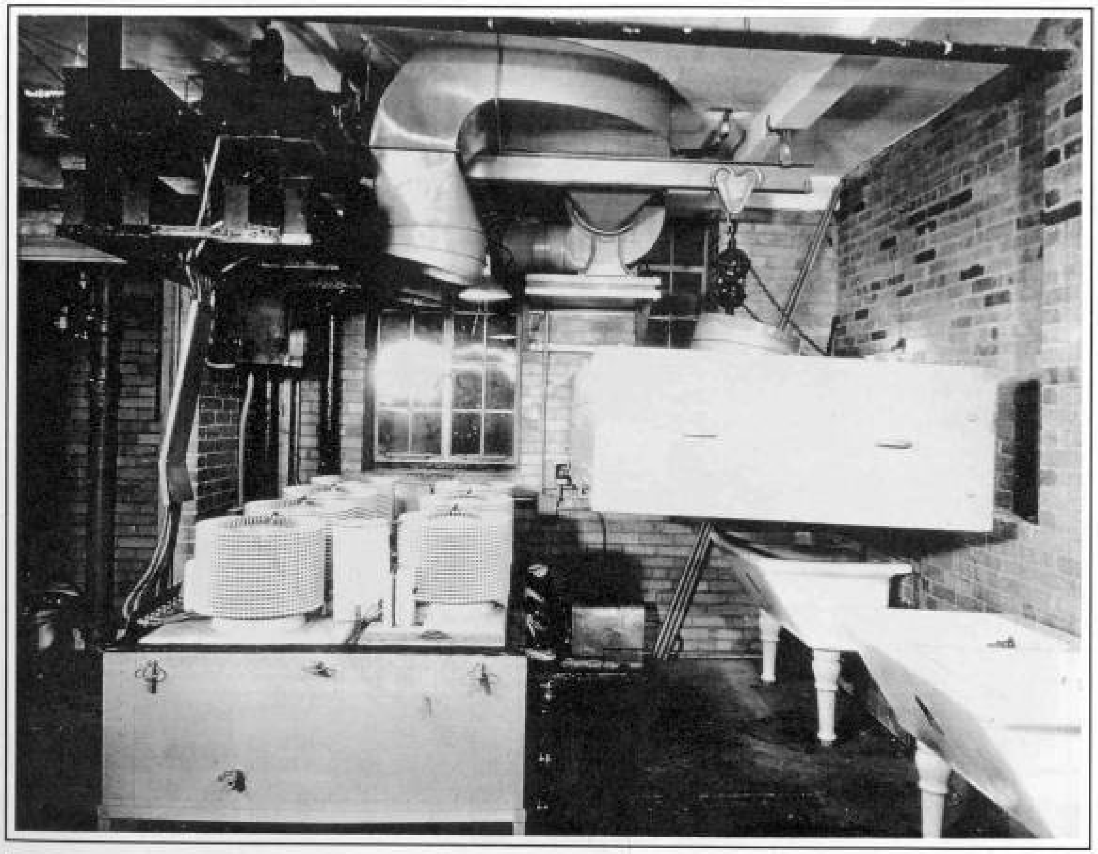


Figure 11-59 *Experimental water chiller designed and tested in 1928 by Frank Faust of General Electric Co. The chiller, using "Monitor Top" household refrigerator units whose evaporator coils were suspended in the water tank, supplied cold water to an air handler for a New York doctor's office. The metal cover lying at right was placed over the refrigerator unit's condensers and a blower forced air over the coils, the rejected heat being ducted outdoors. This installation proved the feasibility of room cooling to the General Electric management, with the result that Faust was asked to develop a self-contained room cooler (from General Electric Hall of History, Schenectady, NY).*

(Text and pictures from "Heat & Cold: Mastering the Great Indoors,"
Barry Donaldson & Bernard Nagengast, 1994)

Figure 11-61 *Advertisement (from* Fortune, *April 1934, p. 186).*

80 Years of ASHRAE Standard 15, Safety Code for Mechanical Refrigeration

This history of ASHRAE Standard 15 covers the development of the industry's first consensus standard

By Frank H. Faust, P.E.
Presidential Member and Fellow ASHRAE

In this year of ASHRAE's Centennial, it is appropriate to review the development of *ASHRAE Standard 15, Safety Code for Mechanical Refrigeration*, because it is perhaps the most important of a long list of standards promulgated by ASHRAE and its predecessor societies, the American Society of Refrigerating Engineers (ASRE) and the American Society of Heating and Ventilating Engineers (ASHVE).

The promulgation of standards was one of several principal objectives of ASRE and ASHVE. Founded in 1905, ASRE chose refrigeration safety for its first standards project. This was appropriate because cold storage and ice making plants were being designed and installed at a rapid rate and some had accidents involving loss of life and property damage. This prompted some cities to develop codes, but differences of code requirements in different cities were becoming burdensome to manufacturers and contractors.

ASRE and ASHVE chose from the first to promulgate their codes and standards for voluntary acceptance. However, regarding matters of life safety and property, it is vital to provide for mandatory enforcement by a government agency. In such cases, the term *code* is used instead of *standard*, and the code is written to require actions rather than to guide or advise such actions. The code can then be enacted into law by means of enabling provisions or by promulgation of the code by the government agency involved.

The first safety codes

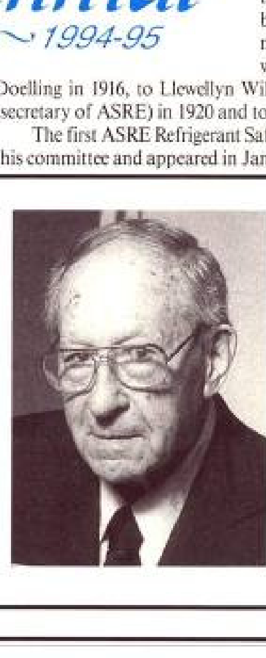
In November 1914, an ASRE committee, in consultation with New York City fire prevention officials, proposed regulations for refrigerating plants in that city. These regulations became law on May 11, 1915.

The regulations were very brief and elementary. They called for a permit to build and operate any plant, specified the use of safety valves, required a machinery room and limited the maximum pressures for ammonia, carbon dioxide, ethyl chloride and sulfur dioxide refrigerants.

The committee also worked with the state of Massachusetts during the same year on a more comprehensive law. ASRE recognized the need for municipalities and states to enact regulations for safety and for ASRE to assist by preparing a code that could be used as a model.

In 1915, the ASRE Council (Board of Directors) established the Committee on Municipal and State Regulations for Refrigerating Plants and Refrigerants. This, in effect, was the original committee of four members with the addition of six more members. It continued under chairman W.E. Parsons, who gave way as chairman to Louis H. Doelling in 1916, to Llewellyn Williams in 1917, to W.H. Ross (secretary of ASRE) in 1920 and to F.E. Matthews in 1922.

The first ASRE Refrigerant Safety Code was promulgated by this committee and appeared in January 1919. It included defini-



About the author

Frank H. Faust was employed by the General Electric Company from 1926 to 1970, was an engineering consultant from 1970 to 1986, and was also ASHRAE Consultant-Special Projects. He received his BSME from Yale University. Faust was the chairman of the ASHVE Standards Committee (1954-57) and served on numerous committees of ASHRAE and other technical associations. Faust also received the ASHRAE 50 Year Distinguished Service Award, Bill and Louise Holladay Award, and Andrew J. Boggs Award.

June 1963-June 1964

ASHRAE

FRANK H. FAUST

1905-

TYLER, TX

"Substantial progress has been made since the merger...Despite [an] impressive list of accomplishments there are still a number of problems...Some of these include the necessity of fulfilling our obligations to the United Engineering Center Fund, the necessity of rebuilding contributions from industry for research, continued improvement of editorial content in and increased advertising income from our Journal...and the acceleration of membership growth." (p. 23, July 1963, *ASHRAE Journal*)

(From "Proclaiming The Truth," ASHRAE, 1995)

WALTER L FLEISHER Sr
1888-1959

Inventor of the Air Conditioning Bypass System

[107] Walter L. FLEISHER, Sr. **1888-1959**

American air conditioning engineer. Designed the air-cooling system for the Folies-Bergere Theatre, New York City (1911), which "used a Thomas air washer, apparently with no mechanical refrigeration. The Thomas washer was one of the first to be mass manufactured and widely sold. Fleisher admitted that the system was not very good, saying, 'We were able to cool about 7 degrees (F) below outdoors, but only the inefficiency of the apparatus saved the installation from being unbearable'...." Later, improved on the work of Lewis [103] (USP 1,670,656: 1928; 1,751,805/806: 1930). Wrote *Air Conditioning: Its Development in Industry* (1929), which reviewed the application of humidification apparatus in textile mills since the turn of the century. President ASHRAE (1941). His Presidential Address summarized the contribution of the Society and its members to the war effort. Recipient of ASHRAE's F. Paul Anderson Award (1954).

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

1941

ASHVE

WALTER L. FLEISHER, SR.

1888-1959

NEW YORK, NY

"During the October Council meeting in Washington, I tried to summarize the contribution of the Society to national defense, and it was a revelation to find how...the research of the Society has contributed considerably to the development of the implements of war...There is...not a single phase of production for defense in which the work of the Society is not playing a prominent part." (p. 4, *ASHVE Trans.*, 1942)

(From "Proclaiming the Truth," ASHRAE, 1995)

AIR Conditioning
Its Development in Industry

By Walter L. Fleisher

> *"Manufacturers noted in the early stages of industry that there were certain days when their goods seemed to work better than at other times. Those days were measured for atmospheric conditions and then duplicated mechanically. It was from these duplications that modern air conditioning has progressed."*

NOTHING can possibly give a better idea of the advancement and development of air conditioning in industry than a comparison of the comments of Eugene N. Foss before the New England Cotton Manufacturers' Association in 1889, on the cost of installation and operation of air conditioning in an industrial plant, and the elaborate and expensive installations which are regularly being installed today. A brief quotation from this address, is as follows:

Cost and Operation Then and Now

"In reference to regulating the humidity of the air, we have stated that it was not in the range of this paper to discuss the advantages of moistening the air in cotton mills. We take it as an accepted fact that a high and constant humidity in the spinning of yarns and in weaving is necessary. All are undoubtedly more or less familiar with the Garland apparatus, and have read the admirable treatise of Mr. Garland upon the subject. We suppose that the Garland apparatus had heretofore been accepted as the most modern and the best device in the market, and we know that it has been largely adopted. This apparatus utilizes the principle of an atomizer, and calls for an extended circulation of water and air pipes through the mill, together with a water tank and filtering device. This complication of parts and elaborate arrangement offers all the disadvantages of overhead steam pipes, in being the receptacle of dust and lint, of danger from damage by leakage, annoyance from leaky valves, and the breaking of glass air tips, with the care of the water tank and filtering devices, to say nothing of the cost of running the air pump. The first cost is necessarily great, and the results are by no means satisfactory, since some of the same objections that are offered to steam pots and other devices are applicable here, in that the moisture is not uniformly distributed, and the relative humidity will vary with the location of the atomizer. . . .

"The cost of installation of any one of the modern and approved moistening systems calls for a large outlay for the plant itself. Mr. Sanford of the Globe Yarn Mills, states that the Garland moistening plant at Mill No. 1 cost $2,800; and, from inquiries that we

(From Heating, Piping & Air Conditioning, March 1929)

Bypass circulation was essential to any economical comfort air-conditioning system. Carrier Engineering Corp. owned Lewis's bypass patent, while rival Walter Fleisher held a patent on a similar design.[99] Despite this legal division of rights, Carrier acknowledged that his firm installed approximately 300 air-conditioning systems that infringed upon Fleisher's patent. In the midst of the resulting litigation over the infringement of bypass rights, Carrier and Fleisher agreed to form a patent pool. In 1927 they formed the Auditorium Conditioning Corporation with the Lewis and Fleisher inventions as a core, and eventually acquired thirty-one more related patents.

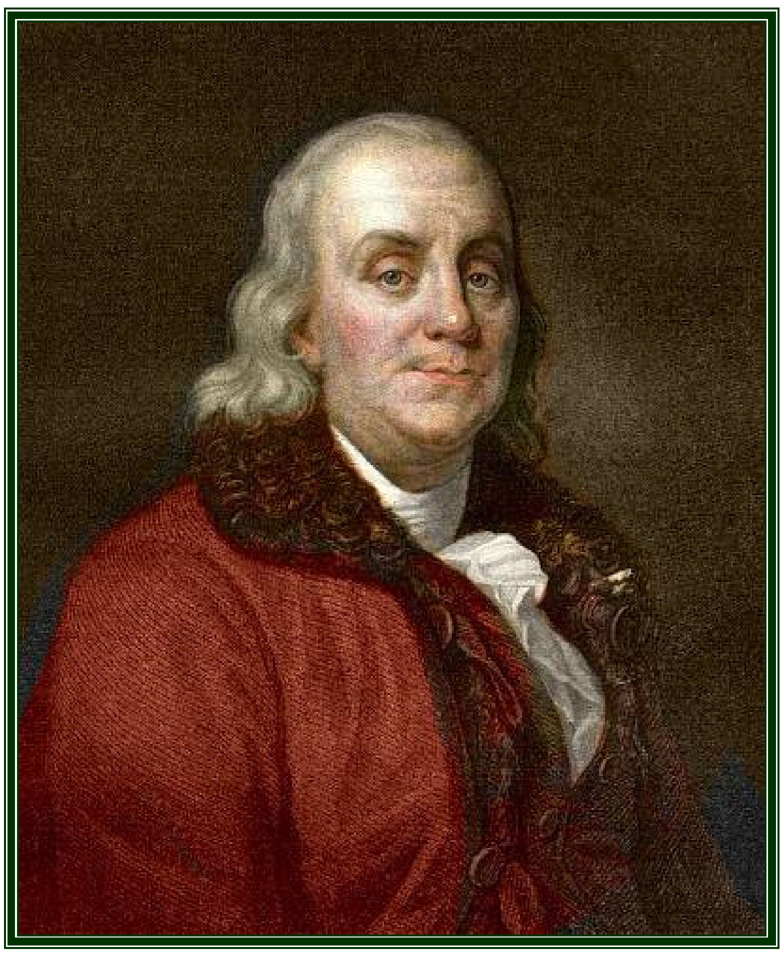
The centrality of the bypass patents excited a great deal of resistance to the new corporation. York Ice Machinery Corporation filed the first test case and lost. In 1929 the triumphant Auditorium Conditioning Corporation defined its victory for potential clients:

(From "Air Conditioning America," Gail Cooper, 1998)

The Folies-Bergere Theater in New York City installed an air cooling system in 1911. This system, designed by Walter Fleisher, used a Thomas air washer, apparently with no mechanical refrigeration. The Thomas air washer was one of the first to be mass manufactured and widely sold. Fleisher admitted that the system was not very good, saying, "We were able to cool about 7 degrees below outdoors, but only the inefficiency of the apparatus saved the installation from being unbearable."[6]

*(From "The 1920s: The First Realization of Public Air Conditioning,"
Bernard A Nagengast, ASHRAE Journal, January 1993)*

BENJAMIN FRANKLIN
1706-1790



Elected Patron Saint of the ASHVE in 1927

[8] Benjamin FRANKLIN **1706-1790**

American statesman, printer, and scientist. Started a fire service (1736). Developed bifocal spectacles. Founded American Philosophical Society (1743). Turned his attention to the problems of the open fire. Published a description (1745) of his *Pennsylvanian* fireplace commenting "my common room is made twice as warm as it used to be, with a quarter of the wood formerly consumed there." Heated a row of houses by means of an iron stove-furnace set in a chamber beneath the ground (1748). Best known for his experiments in static electricity, including his famous, but dangerous, flying of a kite in a thunderstorm (1752). This led to the invention of the lightning conductor. He devised a back-to-back revolving grate that could be turned to face either of two rooms (1785). Later wrote *Observations on the Causes and Cures of Smokey Chimneys*, his recommendations being expanded by Rumford [15]. Held many important posts, awarded many honors, and helped draft the American *Declaration of Independence* (1776). At an ASHVE meeting (1927), Thornton Lewis (ASHVE President 1929) declared Franklin "one of the greatest men the world has ever known, and strange to say the same gentleman, Benjamin Franklin, was also a heating and ventilating engineer." By resolution of the Council, Franklin was adopted as the Patron Saint of the ASHVE.

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

Benjamin Franklin (1706-1790) worked on the problem of fireplace design and in 1740 invented the "Pennsylvania" fireplace to solve the inconveniences of smoky downdrafts and provide an efficient means of heating. Franklin commented on his new fireplace that "my common room is made twice as warm as it used to be, with a quarter of the wood formerly consumed there." Franklin gave the model to a friend, Robert Grace, who manufactured it at his iron works, and some were sold at Franklin's post office and by his brothers John and Peter.[9] One was purchased by Governor Thomas of Pennsylvania, who was so pleased with the results that he offered Franklin an exclusive patent, which Franklin declined. He felt inventions should serve society, not enrich inventors (Figure 4-3).

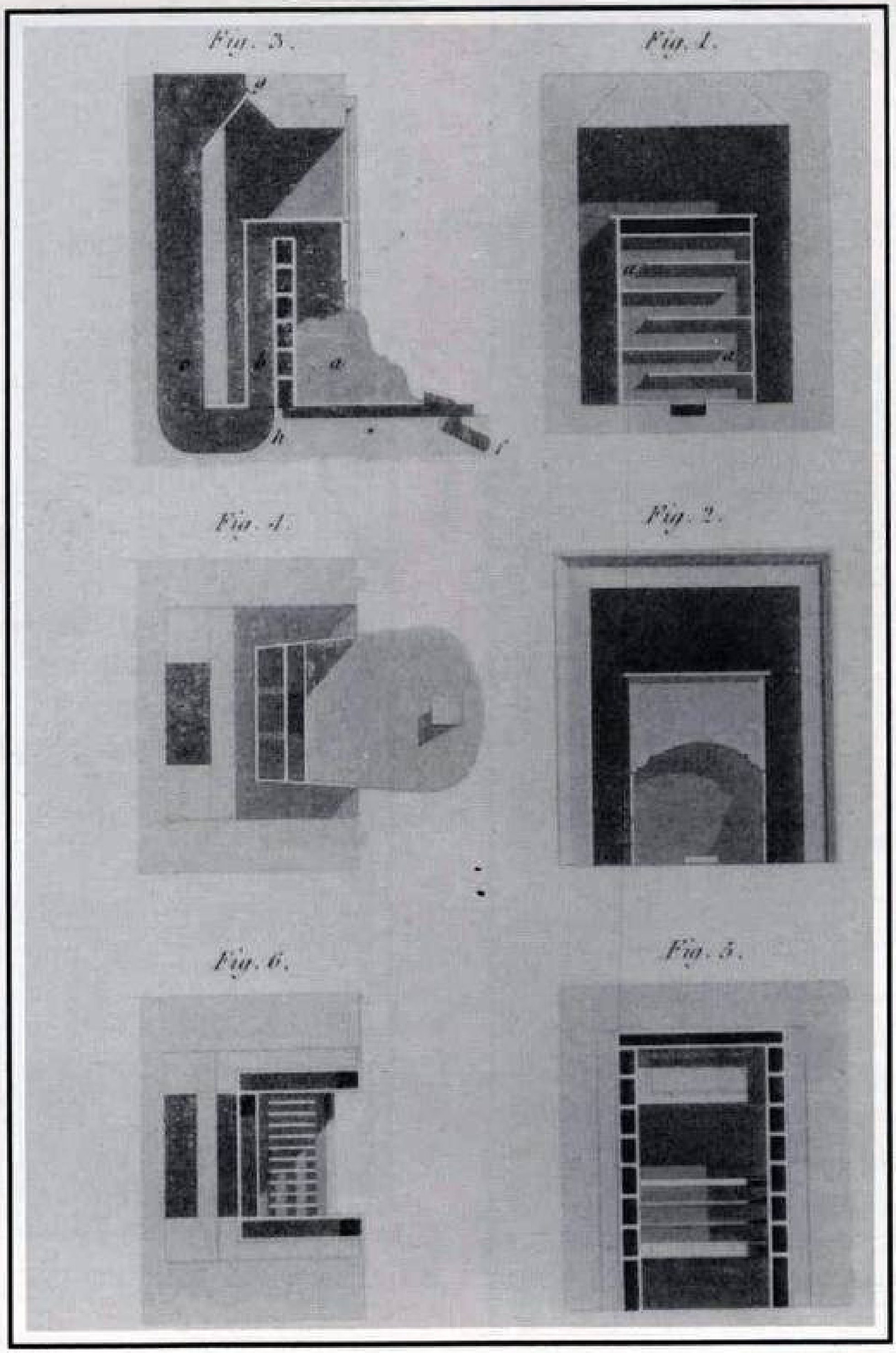


Figure 4-3 *Ben Franklin's Pennsylvania stove, 1745 (from "An Engineer," 1825).*

Benjamin Franklin published his *Observations on Smokey Chimneys* in 1793, proposing rules for the proportioning of fireplaces, as well as the design of various fireplace types. In determining the source of the problem of smoky chimneys, Franklin pointed out nine reasons for the cause of smoke:

- want of air,
- openings being too large,
- too short a funnel (flue),
- chimneys overpowering one another,
- downdrafts due to higher buildings or hills,
- positive pressure built up by the house,
- improper door location,
- descending smoke due to warm outside air and cool inside air,
- strong winds that blow smoke down the chimney.

Franklin described the design of multiple flues in a single chimney, which allowed for the heating of multi-story buildings and apartments (Figures 4-4 and 4-5).

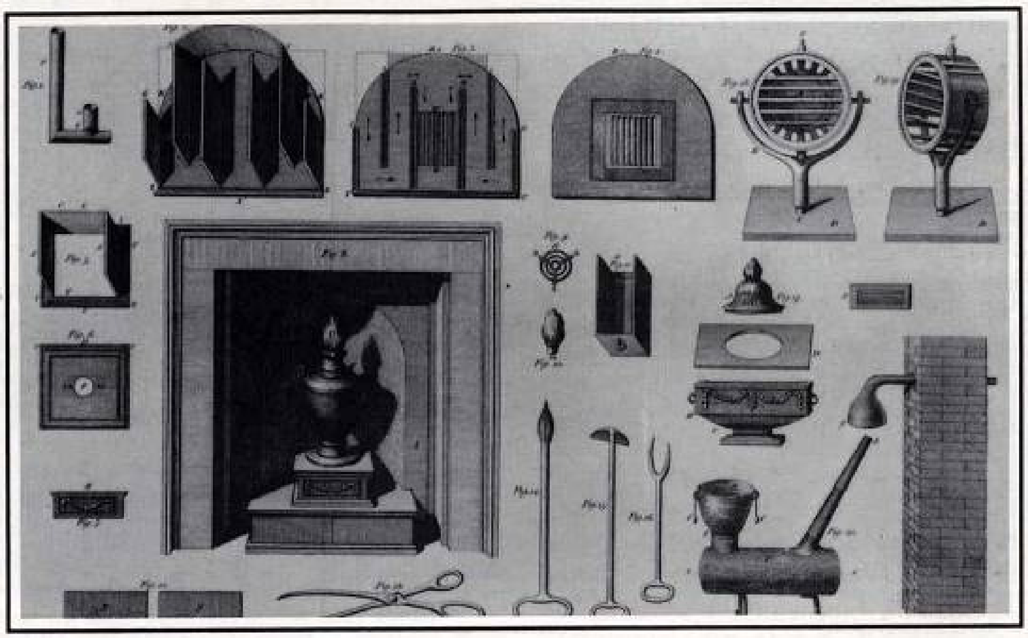


Figure 4-4 *"Fancy Grates" (from Benjamin Franklin's* Observations on Smokey Chimneys, *1793).*

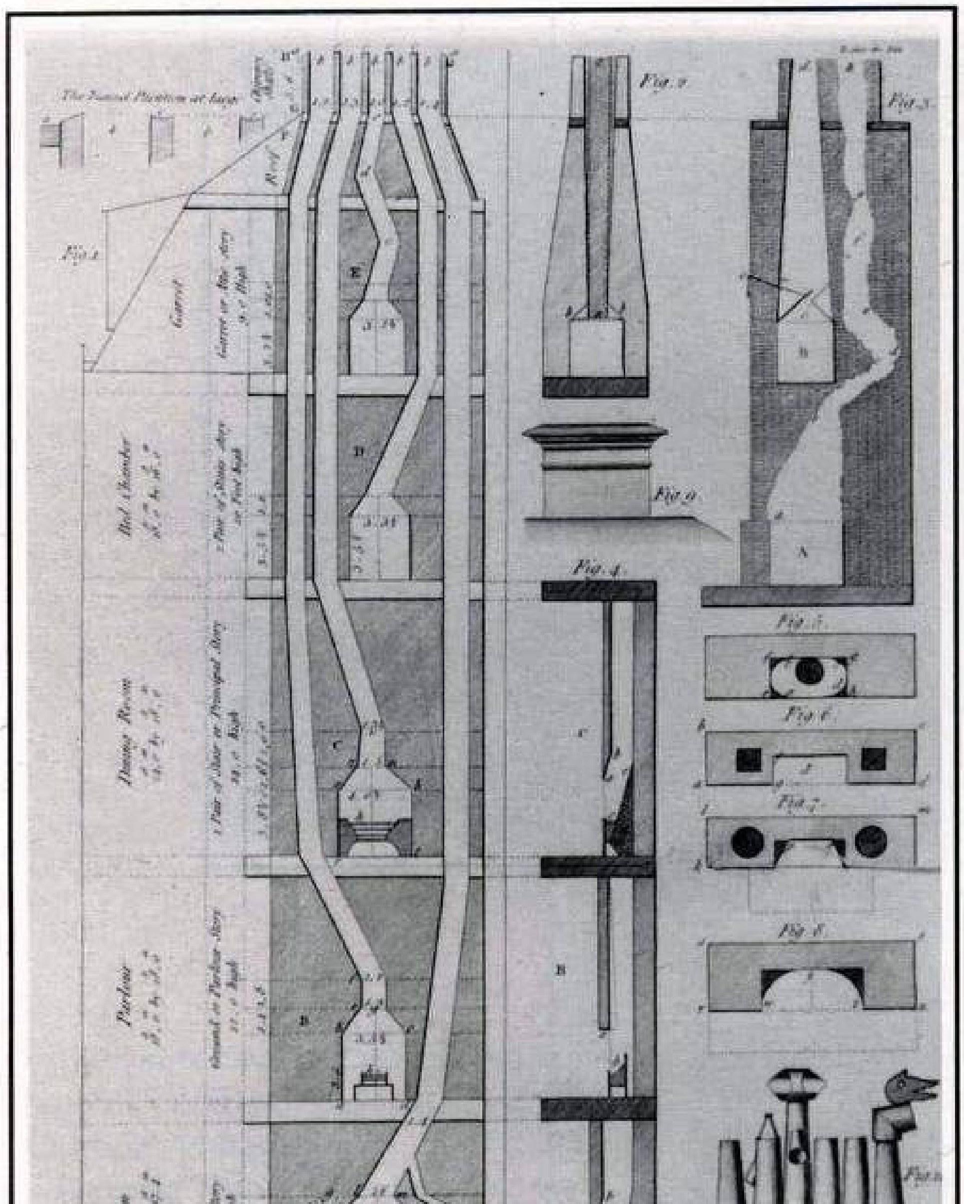


Figure 4-5 *Multiple flues (from Franklin 1793).*

(Above text and pictures from "Heat & Cold: Mastering the Great Indoors," Barry Donaldson & Bernard Nagengast, ASHRAE, 1994)

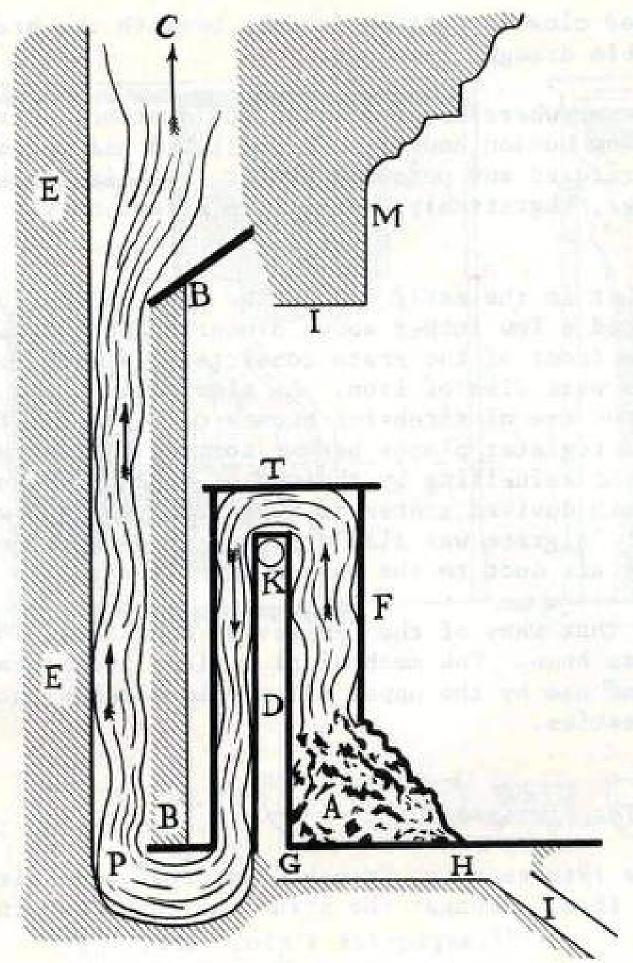


Fig. 3.4. Pennsylvania fireplace.

Between 1740 and 1750, Benjamin Franklin turned his attention to the problems of the open fire. In 1745, he published a description of his Pennsylvania fireplace (Fig. 3.4). Designed for burning wood, it was a 6-plate closeable stove, set in an ordinary fireplace recess.(35)(96) Fresh air was admitted both to supply air for combustion, at the front of the hearth, and for room warming by means of an air-heating box in the stove. The flue gases were made to pass upwards and downwards over the air-box on their way to the chimney. A register plate at the front of the fire was used to control the rate of burning and to close the fire at night. The top of the stove was available for simple cooking. He also designed a down-draught fire, and was the first to advocate that chimneys should be built on inside walls.

(From “”Building Services Engineering,” Neville S Billington & Brian M Roberts, 1982)

Benjamin Franklin's response to the English fireplace was to improve it without shutting up the cheerful blaze. By conducting fire and smoke over and around an air box before discharging them into the chimney, his Pennsylvania stove of the 1740s introduced fresh, heated air into the room, which the unaided common fireplace was unable to do (Fig. 10.2). Franklin thus reduced substantially the general complaint regarding fireplaces that he had put in the words of Everyman: "A man is scorch'd before," he wrote, "while he's froze behind."[9] The Pennsylvania stove was superseded before 1800 in the United States by freestanding cast iron stoves, which permitted the heat source to be placed well out into the room, requiring only a simple stovepipe connection to a chimney.[10]

(Text and picture below from "Building Early America," Charles E Petersen (Ed) 1976: "An Historical Sketch of Central Heating 1800-1860," Eugene S Ferguson)

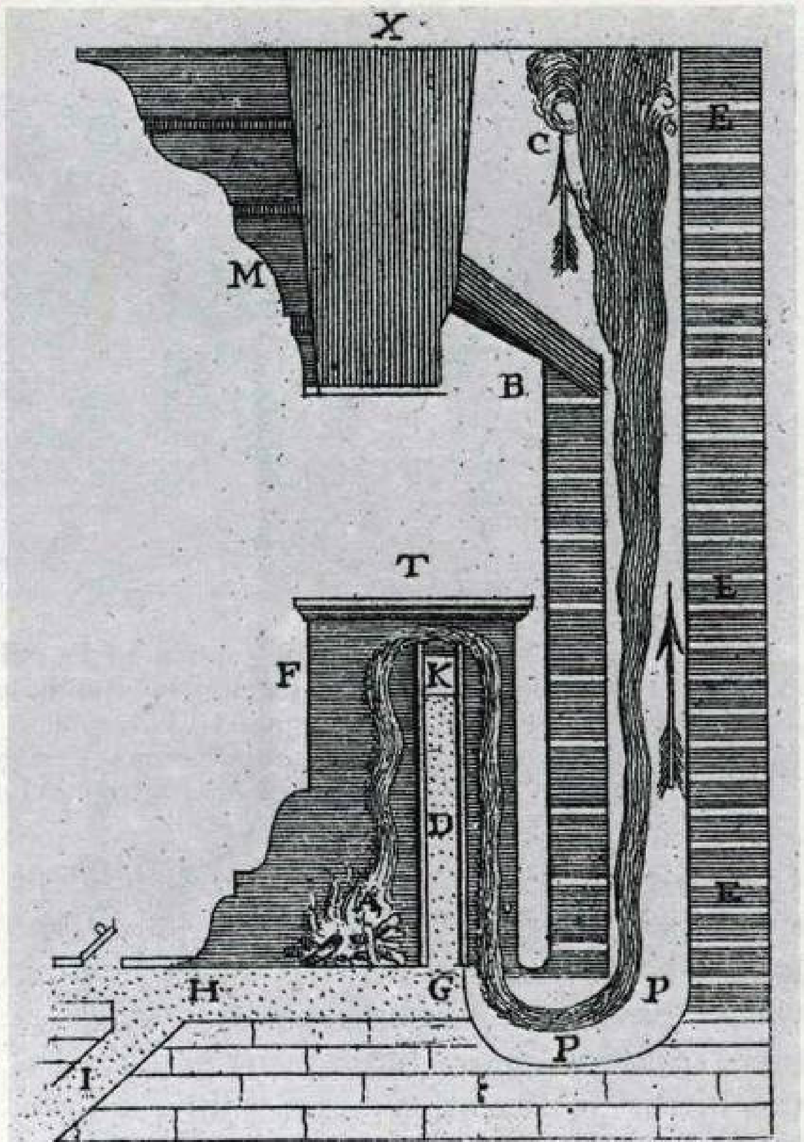
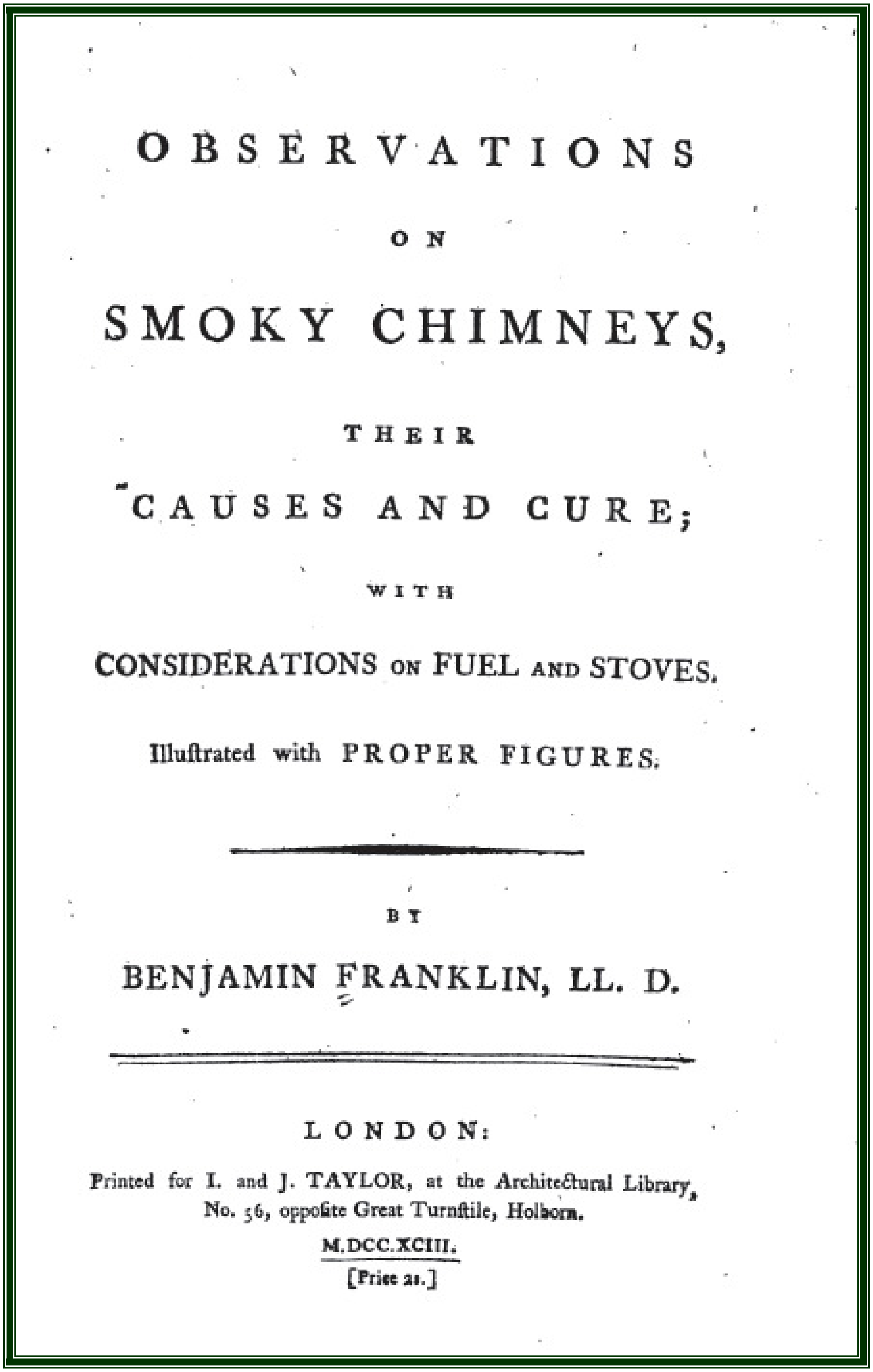


Fig. 10.2 Pennsylvania Fireplace, 1744. Designed by Benjamin Franklin, the Pennsylvania fireplace permitted the discharge of fresh heated air into the room through opening K in the fireplace casing. Fresh air, brought in through passage IHG, was warmed in box D by the hot products of combustion as they made their way toward the chimney. The flap valve at the left admitted cold outside air to the hearth. Benjamin Franklin. *Descrizione della Stufa di Pensilvania* (Venezia, 1791) fig. X.



OBSERVATIONS

ON

SMOKY CHIMNEYS,

THEIR

CAUSES AND CURE;

WITH

CONSIDERATIONS ON FUEL AND STOVES.

Illuſtrated with PROPER FIGURES.

BY

BENJAMIN FRANKLIN, LL. D.

LONDON:

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TO any work on Philoſophy which bears the name of BENJAMIN FRANKLIN, eulogium is unneceſſary. It will ſuffice therefore to ſay, the following ſheets were penned by that great Philoſopher, and make part of the publiſhed Tranſactions of the American Philoſophical Society.

The ſubject is one which claims particular attention in England, where, from the accuſtomed mode of warming rooms, ſmoke is liable to be very obnoxious to perſons, and detrimental to furniture. The means to preſerve the one, and to augment the comforts of the other, are clearly pointed out in the following Eſſay, which may be conſidered as divided into two parts: the firſt contains an enquiry into the cauſes of ſmoky chimneys; the ſecond points out the remedies. To ſpread therefore the knowledge which theſe ſheets contain, will it is hoped be conſidered as rendering a ſervice to the community in general.

To theſe reaſonings on the cauſes and cure of ſmoky chimneys are ſubjoined, by the ſame able hand, conſiderations and experiments on ſtoves or fire-places; in which will be found many valuable obſervations and hints for the œconomical management of fuel; an article in general coſtly, but particularly ſo in this metropolis.

LONDON, 1793.

OBSERVATIONS

ON

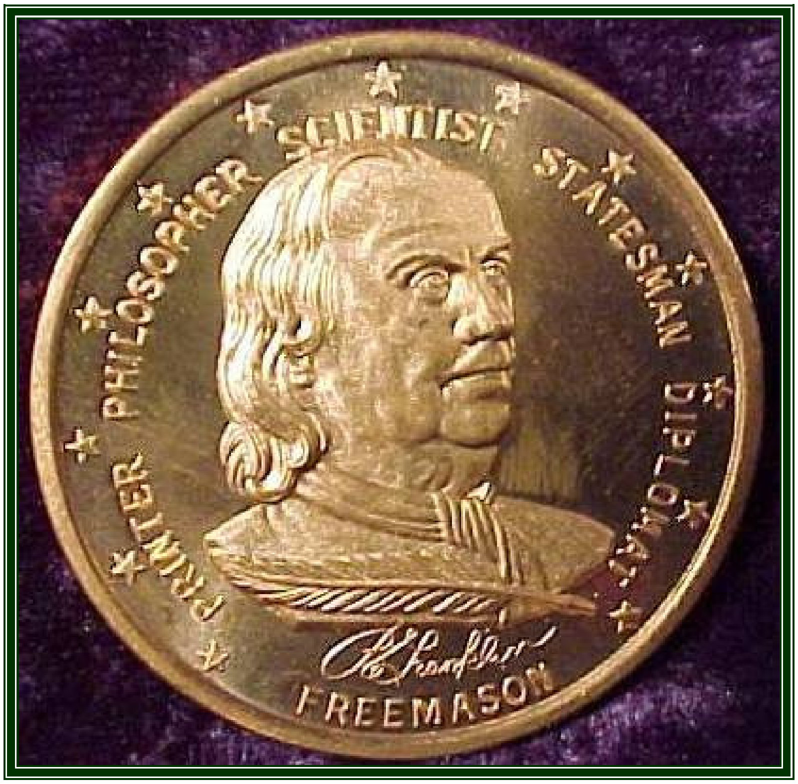
SMOKY CHIMNEYS.

A Letter from Dr. B. FRANKLIN *to Dr.* INGENHAUSZ, *Physician to the Emperor, at Vienna.*

At Sea, August 28th, 1785.

Dear Friend,

IN one of your letters, a little before I left France, you desire me to give you in writing my thoughts upon the construction and use of chimneys, a subject you had sometimes heard me touch upon in conversation. I embrace willingly this leisure afforded by my present situation to comply with your request, as it will not only shew my regard to the desires of a friend, but may at the same time be of some utility to others, the doctrine of chimneys appearing not to be as yet generally well



The Franklin Medal