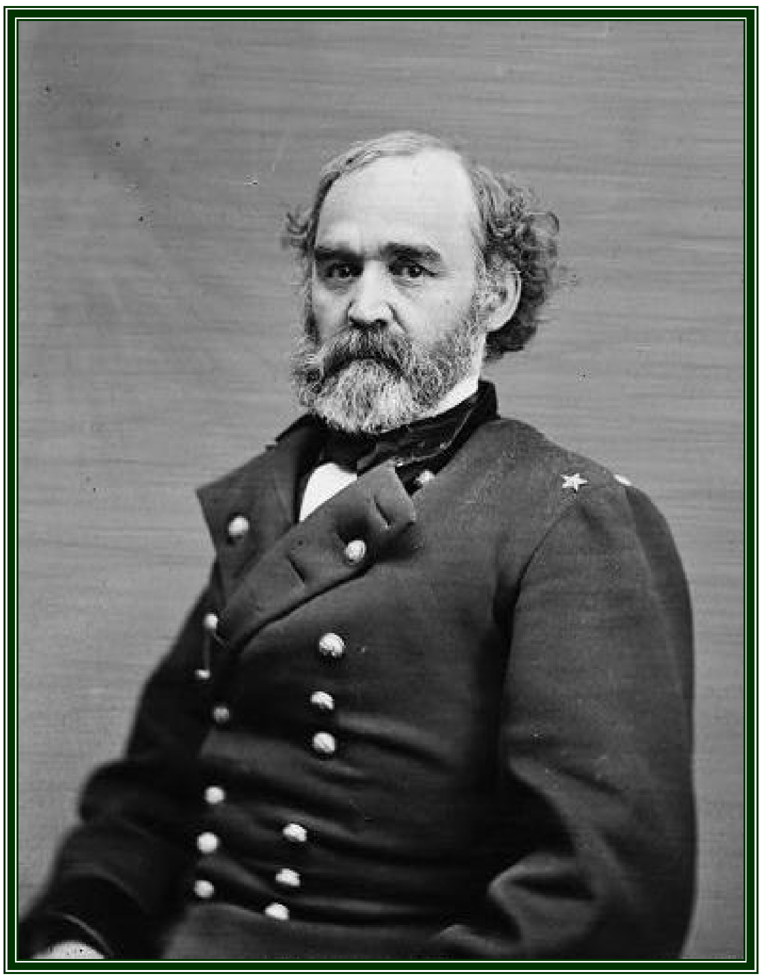
GENERAL MONTGOMERY CUNNINGHAM MEIGS 1816-1892



Supervised the design and installation of the heating and ventilation for the US Capitol, Washington DC

[207] General Montgomery Cunningham MEIGS 1816-1892

While a Captain in the U.S. Army Engineers, Meigs was appointed (1853) by the Secretary of War, Jefferson Davis, to be Superintendent at the Capitol for the rebuilding and enlargement. This placed him over the architect, Thomas U. Walter, and gave him responsibility for coordinating the overall design and installation of the heating and ventilating system. Meigs appointed Nason [206], who in turn enlisted the help of Briggs [205]. Though the House of Representatives moved in 1857, followed by the Senate (1859), the relationship with Walter had deteriorated to the point where Walter refused to share his drawings (reminiscent of the similar feud between Barry [191] and Reid [58] during the rebuilding of the Houses of Parliament.) Meigs (like Reid) was dismissed (1859). Later (1861) he noted, the system having been in use for some time, that it "realized all that I undertook to accomplish in regard to light, warmth, ventilation and fitness for debate and legislation." This opinion was not unanimous. Later (1881-1887), Meigs was responsible for the oldest and one of the largest atrium buildings in the USA—the Old Pension Office in Washington (now, appropriately, the National Building Museum). "One of Meig's primary concerns was the welfare of the workers and the pensioners who visited on a monthly basis. He wanted a thoroughly ventilated building with no dark passages or corners, but curiously the building has no skylights; all natural light for the atrium enters through clerestory (double-pane) windows."

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

The apparatus of the House wing was thoroughly tested during the winter of 1857–58, while the House was in session; the Senate system was completed soon after. In the Senate chamber, warm air was initially introduced through registers in risers just behind the Senators' chairs. Complaints by the Senators forced Meigs to change the duct locations immediately, and he also added deflectors to wall registers because drafts annoyed visitors sitting on sofas nearby.[54]

In 1861, nevertheless, Meigs noted that the new wings, having been in use for some time, had "realized all that I undertook to accomplish in regard to light, warmth, ventilation, and fitness for debate and legislation. The health of the legislative bodies has been better, [he asserted, and] more business has been accomplished in the same time than in the old halls."[55]

On April 4, 1853, after construction of the wings was well under way, Captain Meigs was directed by the Secretary of War to restudy the arrangement for warming and ventilating the House and Senate chambers – as well as their acoustics. Six weeks later, after a visit to leading theaters and other notable places of assembly in the East, a drastic change in the floor plan of both wings was recommended. The two great halls were thereupon moved away from exterior walls with windows that could open, to become interior spaces lit only through glass ceilings and ventilated through air ducts. Four and a half years later Meigs, speaking of the new installations, reported: "This apparatus is one of the most extensive and complete in the world. Its arrangement and details have required a vast amount of study, of scientific and mechanical knowledge, and experience, in which I have been ably assisted by the manufacturers, Messrs. Nason & Dodge, and their agents."

The halls were soon in use and in the summer of 1858, Speaker of the House James L. Orr complimented Meigs on the acoustics:

> The ventilation is equally successful. The densest crowd in the galleries, during the most protracted sittings, breathed a fresh atmosphere, free from all heaviness or impurity.
>
> The heating apparatus is so perfect that the engineer had only to be notified what temperature was desired, when in a few minutes it was supplied.
>
> The arrangement for lighting the hall is admirable.

Not a burner is seen, and yet such a flood of softened light is poured down through the stained glass ceiling of the hall that it was difficult to distinguish when the day ended and the night commenced.

The hall and its fixtures are a splendid triumph of your professional skill, and will ever remain a proud monument to your genius.

But Congress was not all that pleased and as time went by, the euphoria diminished. As early as March, 1860, there was an abortive move in the Senate to move their chamber back to the outer walls with windows.

Four years later a great deal was heard in the House along the same lines. One congressman declared that "this is an unfit place to do business in, especially when the furnaces are going . . . it is impossible to stay in this House any length of time without going out to seek the fresh air . . . Members must breathe, they must have fresh air. Here the air is artificial and the light is artificial." Mr. Trumbull later (July 23, 1866) thought that the Hall should be moved back to the exterior of the building. "What a relief it would have been during the late hot and oppressive weather . . . to have the benefit of windows upon the exterior . . . to look out upon the world and not to be shut up here like prisoners in a jail or school-boys in a school-room."

The problem was studied and restudied for years afterward as new experts and new types of equipment were considered. These issues which arose here so early are almost universal today and very much alive.

(Text from "Building Early America," Charles E Peterson (Ed), 1976)

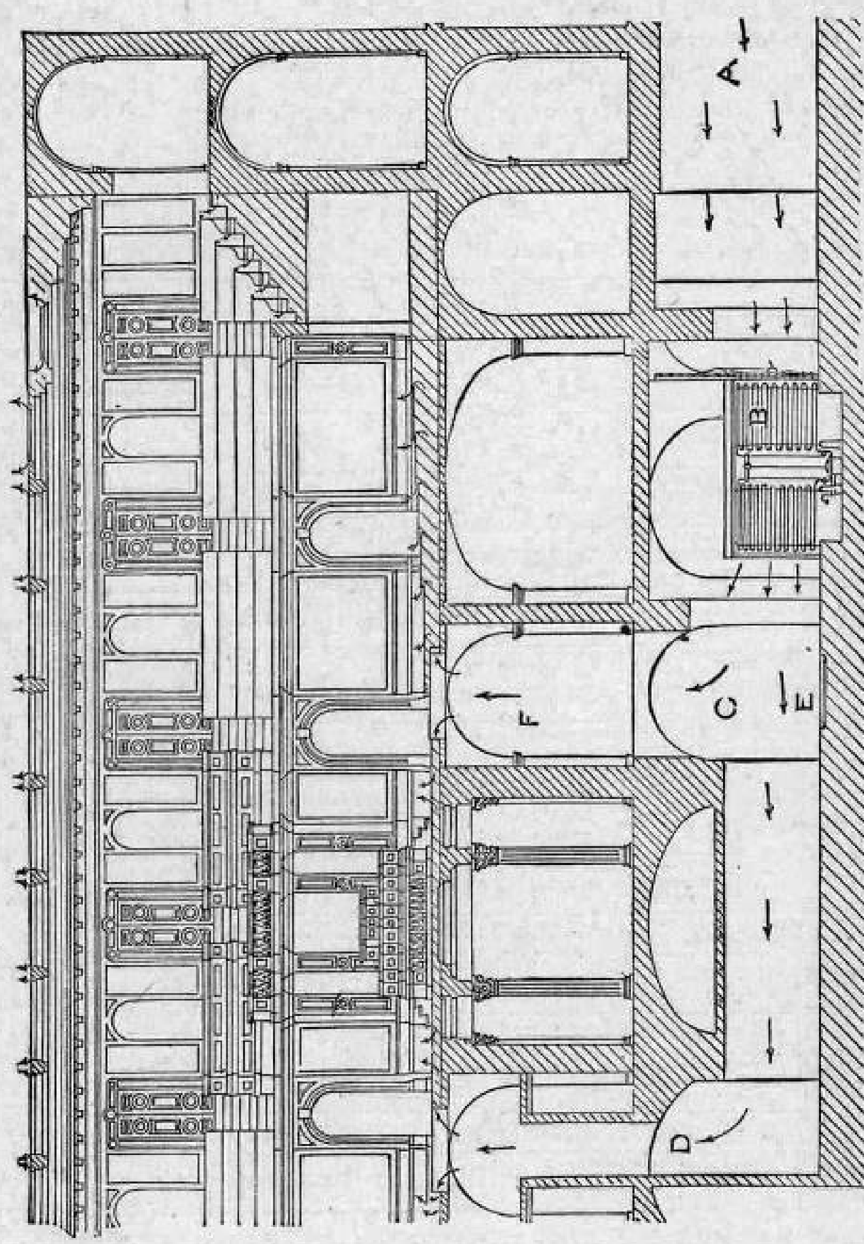


FIG. 127.—SECTION THROUGH AIR DUCTS AND HEATING APPARATUS OF SOUTH WING, U. S. CAPITOL.

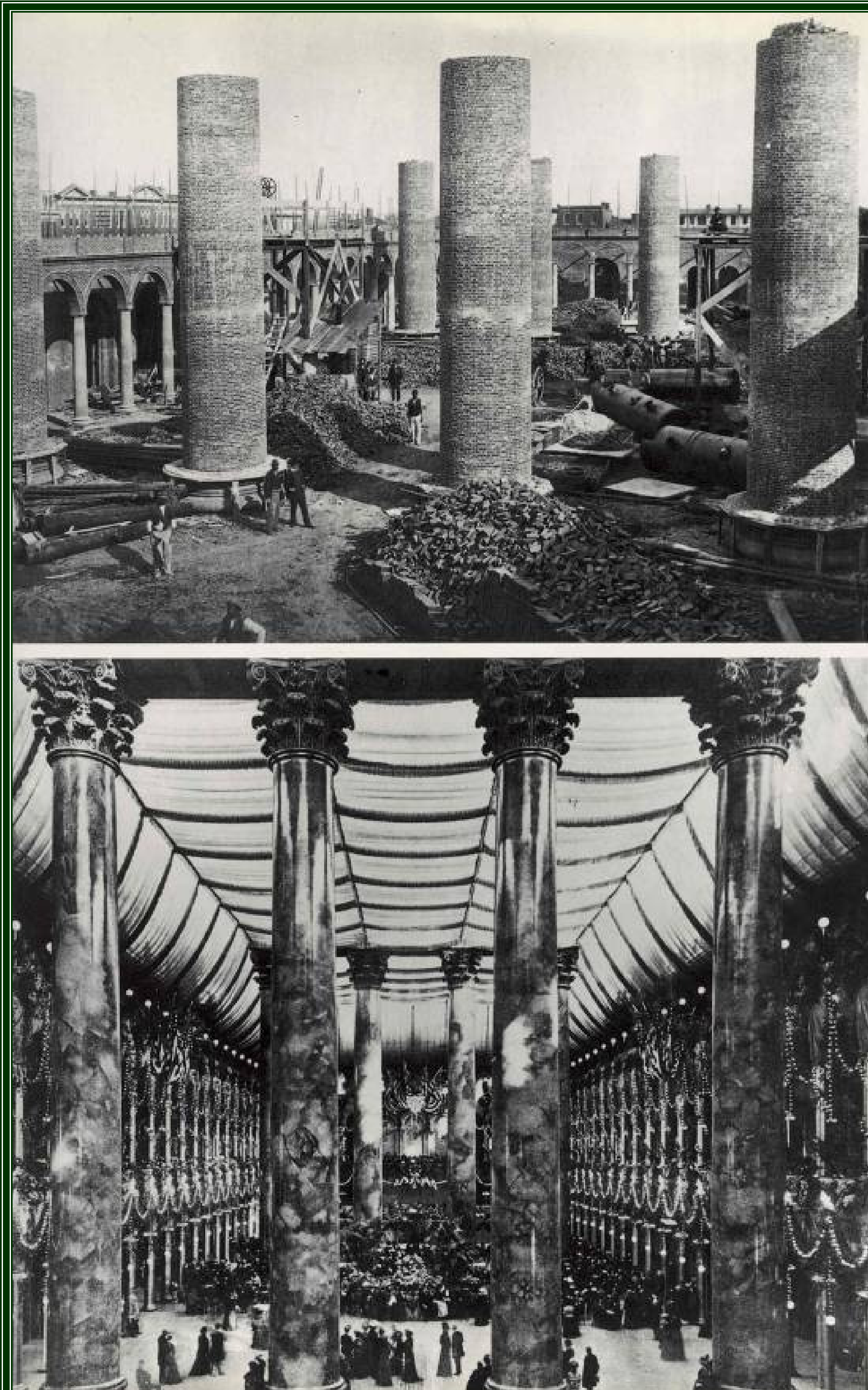
A.—Cold-air duct.
B.—Heating coil.
C.—Mixing chamber.
D.—Fresh-air shaft.
E.—Evaporator.
F.—Fresh-air shaft.

(From "Ventilation and Heating," John S Billings, 1896)

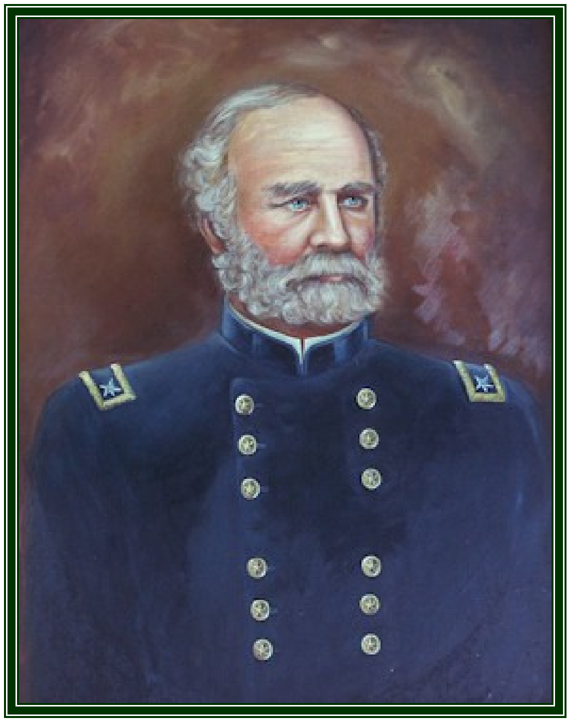
The oldest, and one of the largest, atrium buildings in the United States is the Pension Building in Washington DC (Meiggs, 1887). It housed the Pension Bureau, containing offices for 600 clerks located in galleries surrounding a grand atrium. Its designer, an army engineer named General Montgomery Meiggs, also borrowed ideas from the palazzos of Rome, including the Farnese.

One of Meigg's primary concerns was the welfare of these workers and of the pensioners who visited on a monthly basis. He wanted a thoroughly ventilated building with no dark corridors, passages or corners, but curiously the building has no skylights; all natural light for the atrium enters through gable-end clerestory windows.

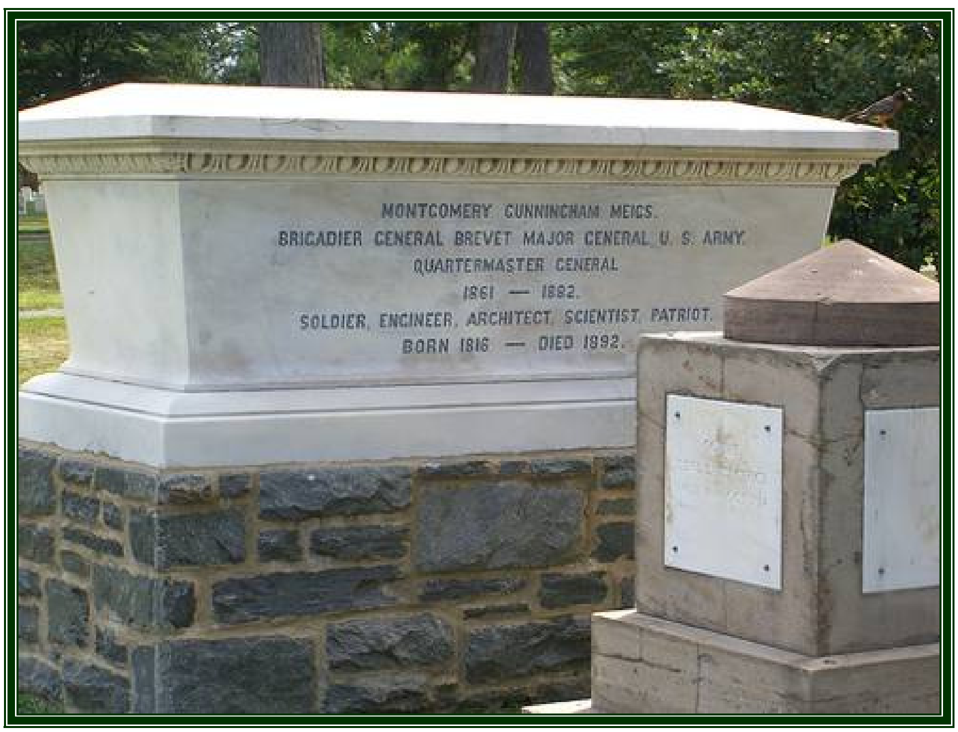
(From "Atria Revisited," Brian Roberts, Building Services, (CIBSE Journal), September 1993)



The Old Pensions Building ("Works in Progress," Alvin Rosenbaum, 1994)

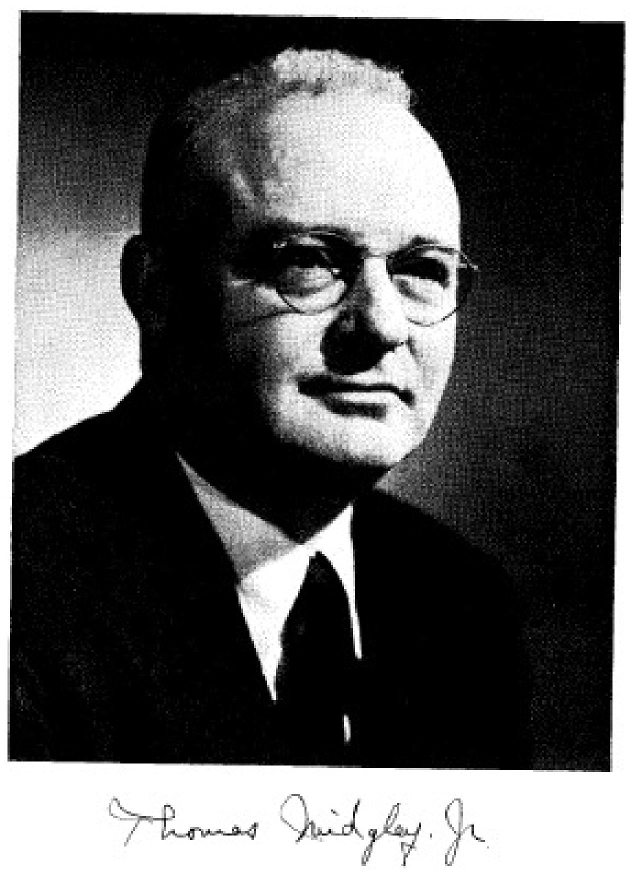


Portrait of Meigs



Tomb of Meigs at Arlington National Cemetery

THOMAS MIDGLEY Jr
1889-1944



Developed the "Freon" CFC Refrigerants

[95] Thomas MIDGLEY, Jr. **1889-1944**

American chemist. Discovered that tetraethyl lead was an effective anti-knock agent for fuel (1921). Turned his attention to discovering a suitable refrigerant for use in domestic refrigerators (late 1920s), since ammonia, methyl chloride, and sulphur dioxide were all poisonous. Much earlier (1893-1907), Swarts of Ghent had published his work on the production of fluorinated and chlorinated hydrocarbons. Midgley, with associates Albert Henne and Robert McNary, recognized their potential as refrigerants and successfully developed the first CFC refrigerant (R-12) under the trade name "Freon" (1930). Later, Midgley was struck down by polio (1940) and tragically strangled himself in a special support harness that he had devised (1944).

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

Figure 10-71 *Thomas Midgley, a practical-minded mechanical engineer (left) was assigned by Charles Kettering (right) of the General Motors Research Laboratories to search for a safe refrigerant in 1928. Midgley, with associates Albert Henne and Robert McNary, developed the chlorofluorocarbon refrigerants, announcing them publicly in 1930. Dr. Henne often had to correct Midgley's chemistry but saw him as a man of great brilliance, vision, and enthusiasm. Midgley could generate ten ideas a minute, nine of them screwy, but the tenth a "lulu." One of Midgley's "lulu's," the CFC refrigerants, in retrospect, was one of the great refrigeration advances of the twentieth century (from General Motors Institute, Collection of Industrial History, Flint, Michigan).*

(From "Heat & Cold: Mastering the Great Indoors,"
Barry Donaldson & Bernard Nagengast ASHRAE, 1994)

A historical look at CFC refrigerants

A look back reveals the role of the news media, politics & public alarm in the development of CFCs

By Bernard Nagengast
ASHRAE Member

(ASHRAE Journal, November 1988)

CFC development

The largest company involved in the light commercial and household sector by 1930 was Frigidaire Corporation, which was a division of General Motors. Frigidaire possibly had the best engineering department in this sector, plus they had the resources of General Motors at their disposal. Throughout its history, Frigidaire had used sulphur dioxide in its products, but subsequent developments apparently led the corporation to conclude that "...the refrigeration industry needs a new refrigerant if they ever expect to get anywhere" (Midgley 1937). Frigidaire asked the General Motors research laboratory to develop such a refrigerant, and the chlorofluorocarbon (CFC) family of refrigerants was the result. The research team, headed by Thomas Midgley, Jr. and including

Albert Henne and Robert McNary, developed the first family, dichloromonofluoromethane (R-21), within three days. Soon after, several others were made, and the team settled on dichlorodifluoromethane (R-12) as the refrigerant most suited for commercial use, coining the tradename "Freon" for the family. The work had begun in 1928, but the world did not find out for two years. Shortly before his death a few years ago, G. Ralph Fehr, head of Frigidaire's patent department at the time, told the author that he insisted that Midgley develop all the chlorofluorocarbon refrigerants that might be useful before Fehr would file any patent claims. This demand, plus difficulties in perfecting the manufacturing process, resulted in the delayed announcement of the new refrigerants at the April 1930 Atlanta meeting of the American Chemical Society. Commercial production of Freon 11 and Freon 12 (tm) was begun in 1931 by Kinetic Chemicals Company, a joint stock company formed by General Motors and E. I. duPont deNemours and Co., Inc. (A fairly complete history of the CFC refrigerants can be found in Downing 1984, Midgley 1937 and Midgley and Henne 1930.)

(From Nagengast)

Thomas Midgley Jr.

Thomas Midgley, Jr., was born on May 18, 1889. He graduated from Cornell University in 1911, and he soon found employment with Delco, a company in Dayton, Ohio. In 1916, Charles F. Kettering, founder of Delco, assigned Midgley to eradicating the persistent and loud knocking sound that early automobile engines made. Midgley quickly discovered that the knocking sound resulted from the gasoline currently being produced in the United States. Several more years of research led Midgley to discover that placing tetraethyl lead additives in the gasoline would eliminate the knocking sound. Midgley discovered this new version of gasoline, ethyl gasoline, on December 9, 1921. Unfortunately, the lead caused deposits to form on engine valves, causing engines to cease operating. Midgley then added ethylene dibromide to ethyl gasoline, which prevented the lead deposits. This new version of ethyl gasoline was sold for the first time on February 2, 1923, in Dayton, Ohio.

Unfortunately, leaded gasoline proved harmful for the environment, and today, leaded fuel is no longer used. Midgley eventually became well aware of the harmful effects of lead exposure. In 1924, he left his job for a period of time to recover from lead poisoning. Upon returning to work, Midgley held a press conference, touting the safety of lead. Eventually, he recanted his endorsement of lead.

Over the course of his life, Midgley developed 170 patents. Ethyl gasoline and chlorinated fluorocarbons, originally used in refrigeration, were his two most famous inventions. In 1940, Midgley contracted polio, which left him severely disabled and bed ridden. To assist him in getting out of bed, Midgley designed a system of ropes and pulleys. Unfortunately, on November 2, 1944, Midgley became tangled in the ropes and suffocated to death.

Discovery of Freon

In 1930, General Motors charged Midgley with developing a non-toxic and safe refrigerant for household appliances. He (along with Charles Kettering) discovered dichlorodifluoromethane, a chlorinated fluorocarbon (CFC) which he dubbed Freon. CFCs replaced the various toxic or explosive substances previously used as the working fluid in heat pumps and refrigerators. CFCs were also used as propellants in aerosol spray cans, metered dose inhalers (asthma inhalers), and more. He was awarded the Perkin Medal in 1937 for this work.

(Edited extracts from Wikipedia)

Later life

In 1941, the American Chemical Society gave Midgley its highest award, the Priestley Medal, and followed up with the Willard Gibbs Medal in 1942. He also held two honorary degrees, and was elected to the National Academy of Sciences. In 1944, he was president and chairman of the American Chemical Society.[2]

In 1940, at the age of 51, Midgley contracted polio which left him severely disabled. This led him to devise an elaborate system of strings and pulleys to help others lift him from bed. This system was the eventual cause of his ironic death when he was accidentally entangled in the ropes of this device and died of strangulation at the age of 55.[6][7] Midgley died before the effect of CFCs upon the ozone layer became widely known in 1974.

Thomas Midgley Succumbs At Home Near Here

Was Nationally Known Chemist And Inventor Of Ethyl Gasoline

Dr. Thomas Midgley, Jr., 55, inventor of ethyl gasoline, and nationally known chemist, was found dead in bed, Thursday morning of last week, at his home on Wilson Road, north of Worthington.

Although Dr. Midgley carried on with his work he had been ill with infantile paralysis for the past four years.

DR. THOMAS MIDGLEY, JR.

Inventor Thomas Midgley's Obituary (Worthington Historical Society)

NATIONAL ACADEMY OF SCIENCES

OF THE UNITED STATES OF AMERICA

BIOGRAPHICAL MEMOIRS

VOLUME XXIV—ELEVENTH MEMOIR

BIOGRAPHICAL MEMOIR

OF

THOMAS MIDGLEY, JR.

1889–1944

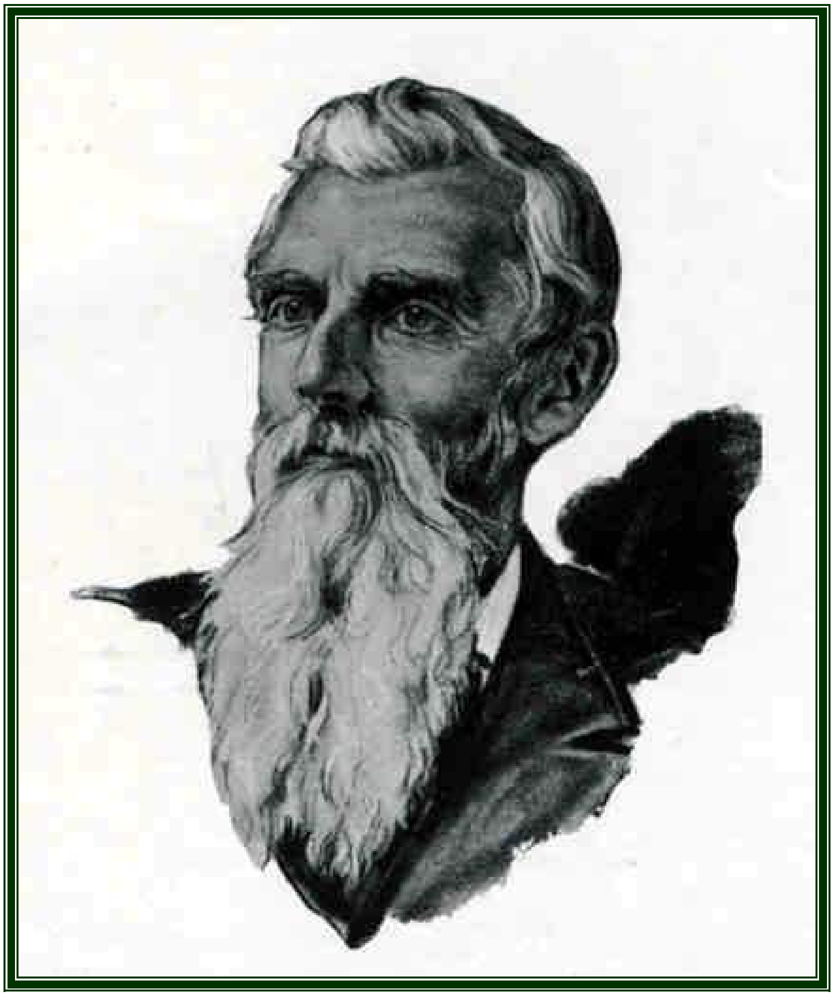
BY

CHARLES F. KETTERING

PRESENTED TO THE ACADEMY AT THE ANNUAL MEETING, 1947

Biographical Memoir, 1947

JOHN HENRY MILLS
1834-1908



Renowned steam boiler engineer

[37] John Henry MILLS **1834-1908**

American heating contractor, consultant, and inventor. Patented a cast-metal sectional steam boiler, designed for use with an engine (1867). Later, designed boilers specifically for heating (1869-1874). His steam boilers were manufactured by H.B. Smith & Co. (from 1871). Mills then turned to water as "a superior heating agent." He also developed direct and indirect radiators. Wrote *Heating by Steam* (1877), then the two-volume *Heat, Science & Philosophy of its Production and Application to the Warming and Ventilating of Buildings* (1890). In the last quarter of the 19th century, he was considered "one of the most widely renowned engineers in the United States." Though he made a fortune, it is believed he finished his days virtually penniless.

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

John Henry Mills (1834-1908)

The practical application of steam heating was greatly advanced by the work of John Henry Mills, a "mechanical genius, who was in turn craftsman, inventor, heating contractor, scientific investigator, and engineering consultant." He became one of the most widely renowned engineers in

(Extract from "Heat & Cold: Mastering the Great Indoors,"
Barry Donaldson & Bernard Nagengast, ASHRAE, 1994)

the United States during the last quarter of the nineteenth century.[42]

> Following Brayton's lead, John H. Mills in 1867, patented his first cast-metal sectional boiler. This one was designed for use with an engine but others, for heating, appeared in the years between 1869 and 1874. A Walworth catalog of 1892 makes the statement: "It was at our factory in Cambridgeport, Massachusetts, in 1870 that the first Mills Sectional Boilers were made and a little later his direct and indirect radiators." Mills himself regarded his third boiler as his "first practicable boiler," the manufacture of which, he says, was begun by George W. Walker & Co. at Watertown, Massachusetts, in the foundry of Miles Pratt & Co.
>
> The first reference to a Mills Product which appears in the records of the H.B. Smith & Co. is under date of 28 August 1871, when 300 pounds of Mills boiler grates at 7 cents a pound were ordered by the Union Steam and Water Heating Company of New York through the Westfield firm. Eighteen months later (1 March 1873), the Smith Company was in complete control of Mills boiler manufacture.[43]

"In spite of his success with steam, Mills soon turned to water as a superior heating agent. As early as 1877, he had observed its increasing popularity and admitted that it was more silent and steady than steam and more economical of fuel. His extensive work with water began in the mid-eighties."[44] Mills worked on water-heating systems for a number of notable projects, such as the Pierce Building (1887) in Boston and substituting a hot water system for the existing air system in Trinity Church (1888), also in Boston.

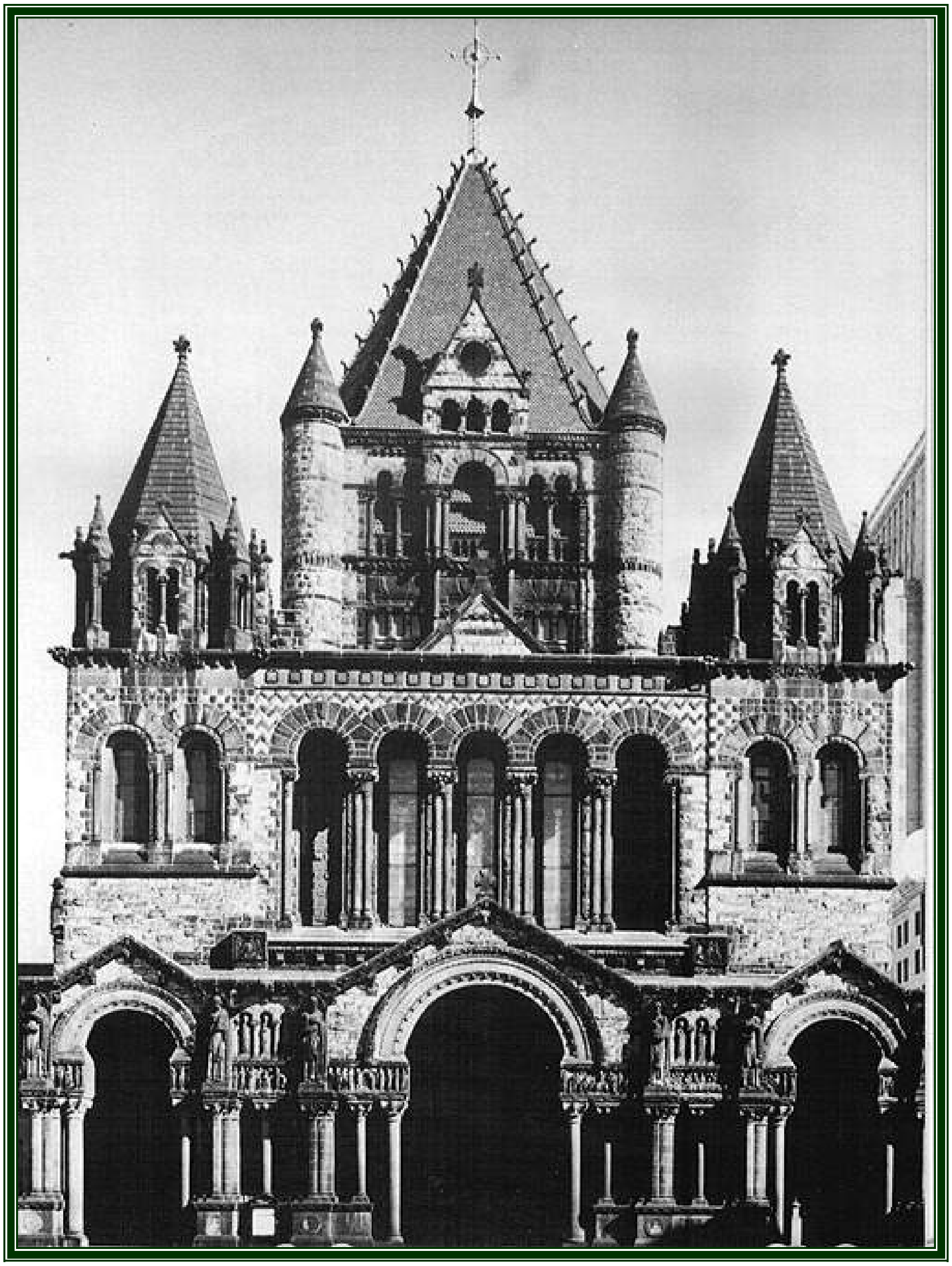
In 1877, John Mills wrote a small treatise on *Heating by Steam*, and between 1888 and 1890, he wrote his two-volume book *Heat, Science and Philosophy of its Production and Application to the Warming and Ventilation of Buildings*, which was published in 1890. "The book is a curious mixture of science, history, and current practice, but is a mine of miscellaneous technical information, with elaborate diagrams and charts."[45] This two-volume opus was an important resource for boiler and steam heating engineers for years to come.

In his later years, John Mills achieved enormous success in his industry. "Money came so easily before 1897 that, as he grew older, with no one dependent on him, Mills was inclined to indulge in ultra extravagant experiments."

> There is a story, still current at the Westfield foundry, that at some time in 1905 or 1906, John Mills drifted into town shabbily dressed and practically penniless. J.R. Reed, shaking his head sadly but with a characteristic twinkle in his eye, remarked: "John Mills, I always warned you of this. Didn't I say that if you kept on at the rate you were going you would surely scratch a poor man's pants?" Then, putting a check in the old man's hand, he added, "You are not going to give this money away or use it for any more experimenting. It is to take care of John H. Mills." This was the last time that Mills was seen in Westfield. The check was for $5,000.[46]

The Pierce Building, Boston (centre) 1888

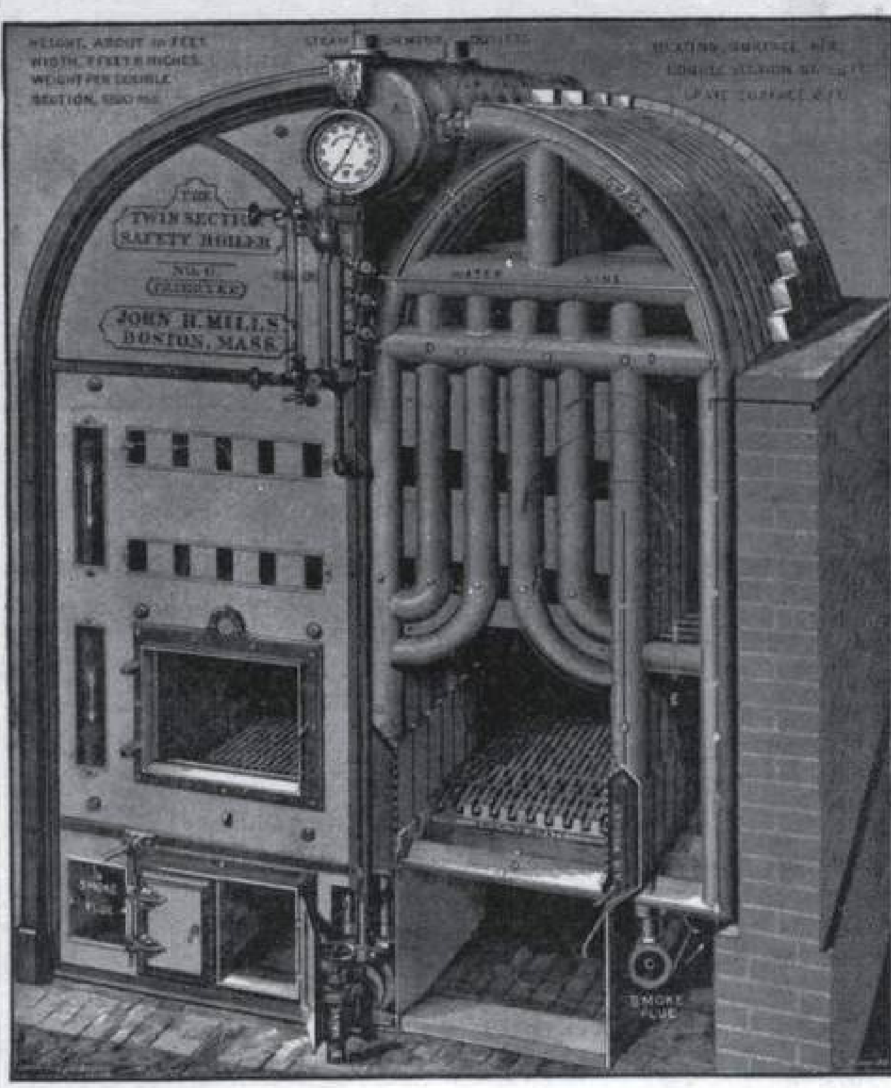
The Pierce Building, Boston (left rear) 1888



Trinity Church, Boston

PLATE No. 14.

MILLS STEAM AND WATER SAFETY BOILER, No. 6.



Regular steam and water circulating boiler of 50 to 100 horse-power. Three of these are in use at the Pierce Building, Boston, Mass., three at the county buildings, Springfield, Mass., and three at State Prison, Cranston, R. I. (See evaporative experiment, page 265.)

Figure 7-28 *Mills steam and water safety boiler, no. 6 (from J.H. Mills, 1890).*

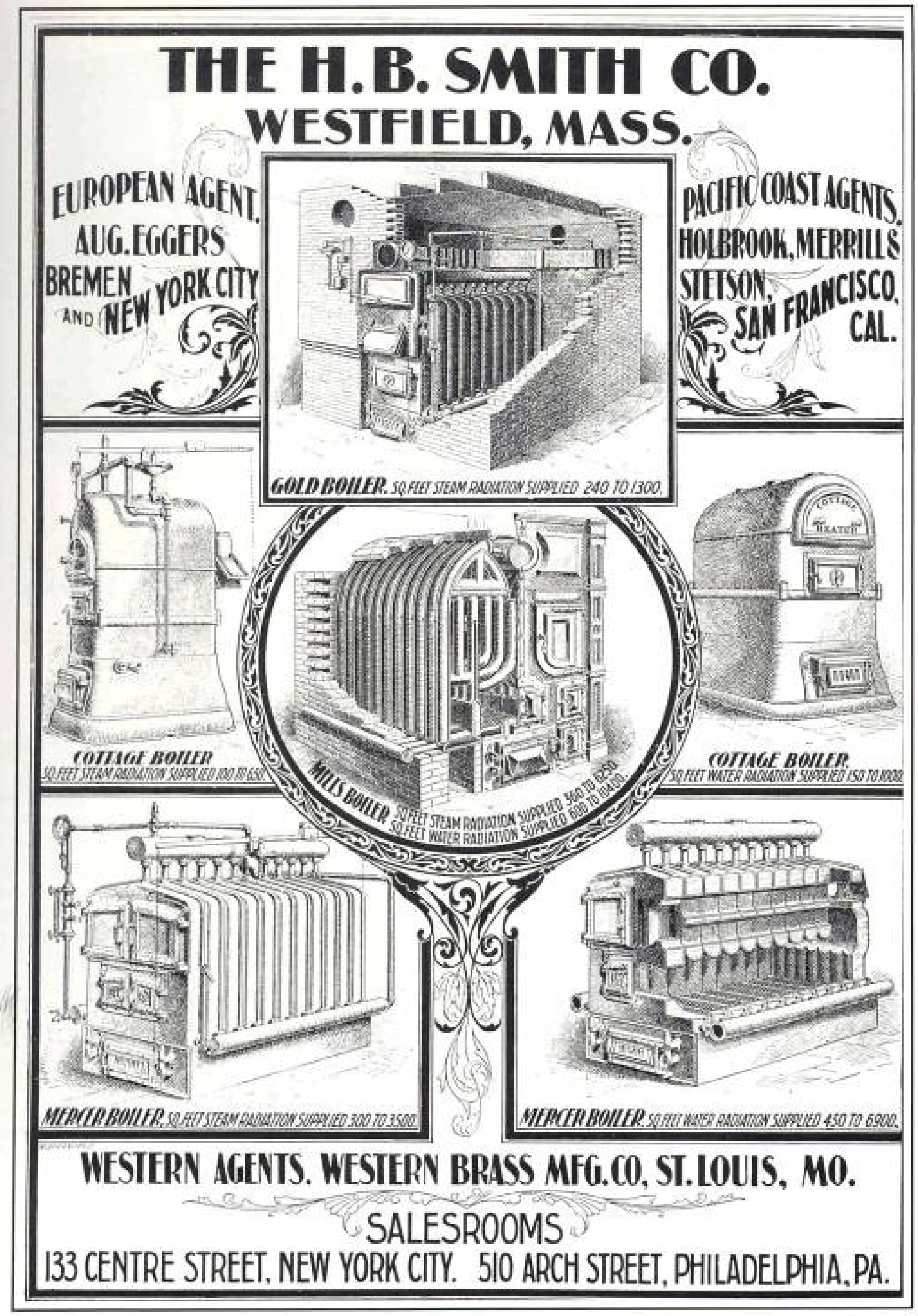


Figure 7-30 *Advertisement, H.B. Smith Co., Westfield, Mass. (from* Domestic Engineering, *April 1900, p. 46).*

Advertisement featuring Mills Boiler (centre)

BALDWIN ON HEATING;

OR,

STEAM HEATING FOR BUILDINGS REVISED.

BEING A

DESCRIPTION OF STEAM HEATING APPARATUS FOR WARMING AND VENTILATING LARGE BUILDINGS AND PRIVATE HOUSES, WITH REMARKS ON STEAM, WATER, AND AIR, IN THEIR RELATION TO HEATING; TO WHICH ARE ADDED USEFUL MISCELLANEOUS TABLES.

BY

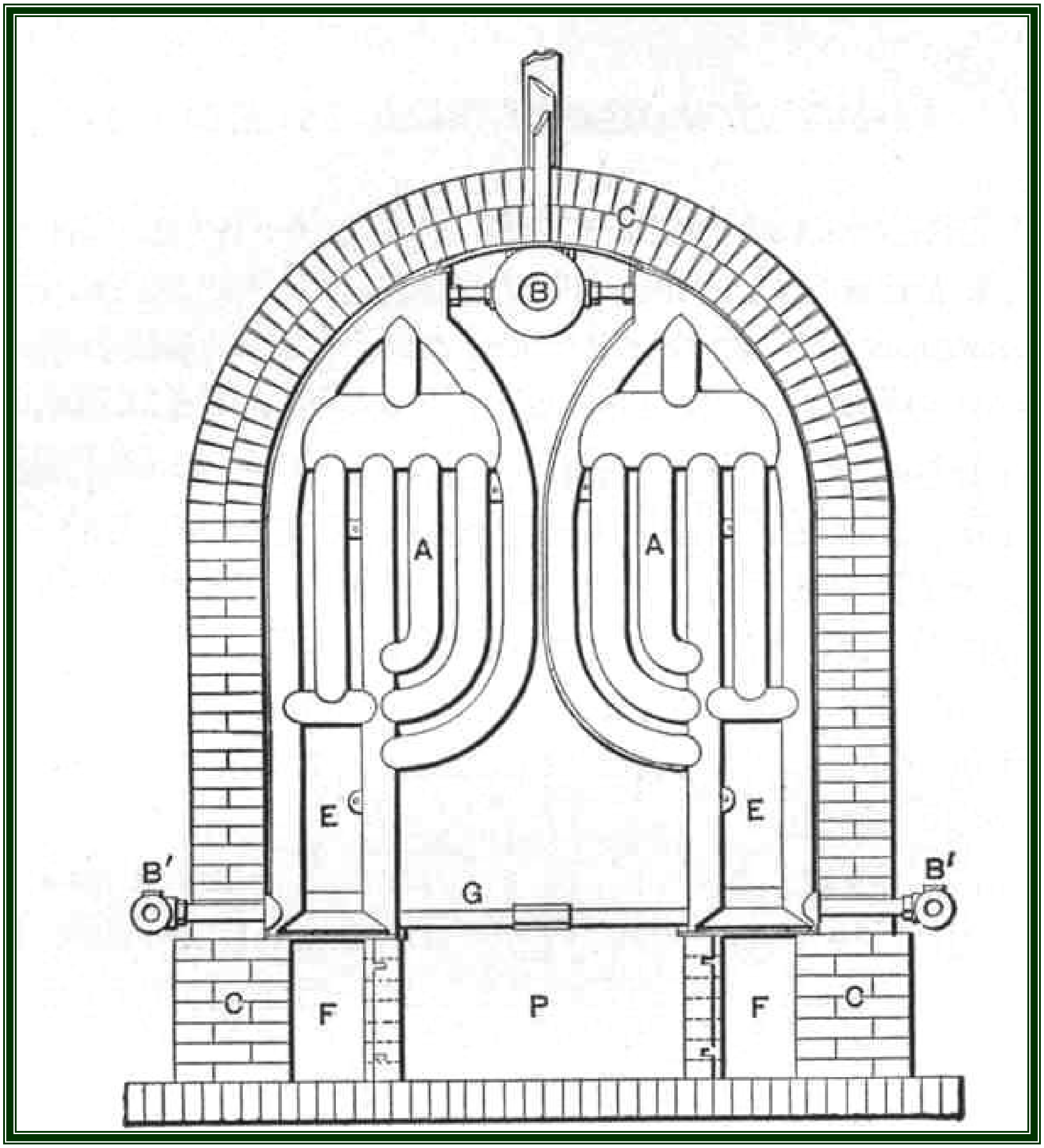
WILLIAM J. BALDWIN, M. AM. SOC. C. E.,
Member American Society of Mechanical Engineers.

With many Illustrations.

FIFTEENTH EDITION, REVISED AND ENLARGED.
FIRST THOUSAND.

NEW YORK:
JOHN WILEY & SONS.
LONDON: CHAPMAN & HALL, LIMITED.
1900.

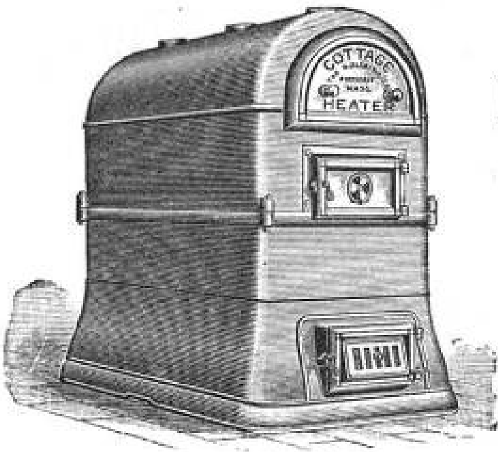
(CIBSE Heritage Group Collection)



Mills Boiler (from Baldwin 1900)

THE H. B. SMITH CO.,

133-135 CENTRE STREET, NEW YORK,



COTTAGE BOILER.

MANUFACTURERS

OF

HEATING APPARATUS

FOR

Warming All Classes of Buildings with

STEAM

OR

WATER.

MILL'S SAFETY SECTIONAL BOILER,

ADAPTED FOR STEAM OR WATER.

MERCER, GOLD, and COTTAGE

BOILERS,

Arranged for Hard or Soft Coal and Wood.

UNION, ROYAL UNION, CHAMPION, CORONET, and CROWN

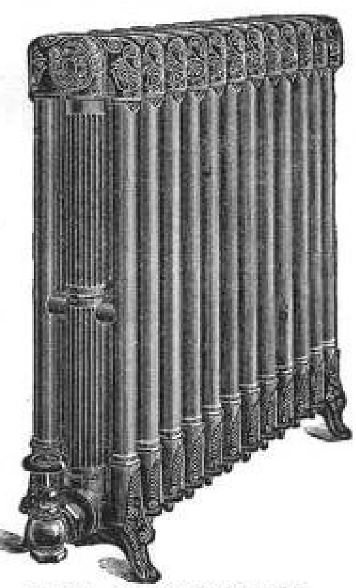
RADIATORS.

GOLD'S PIN INDIRECT RADIATORS.

New York, Providence, Philadelphia.

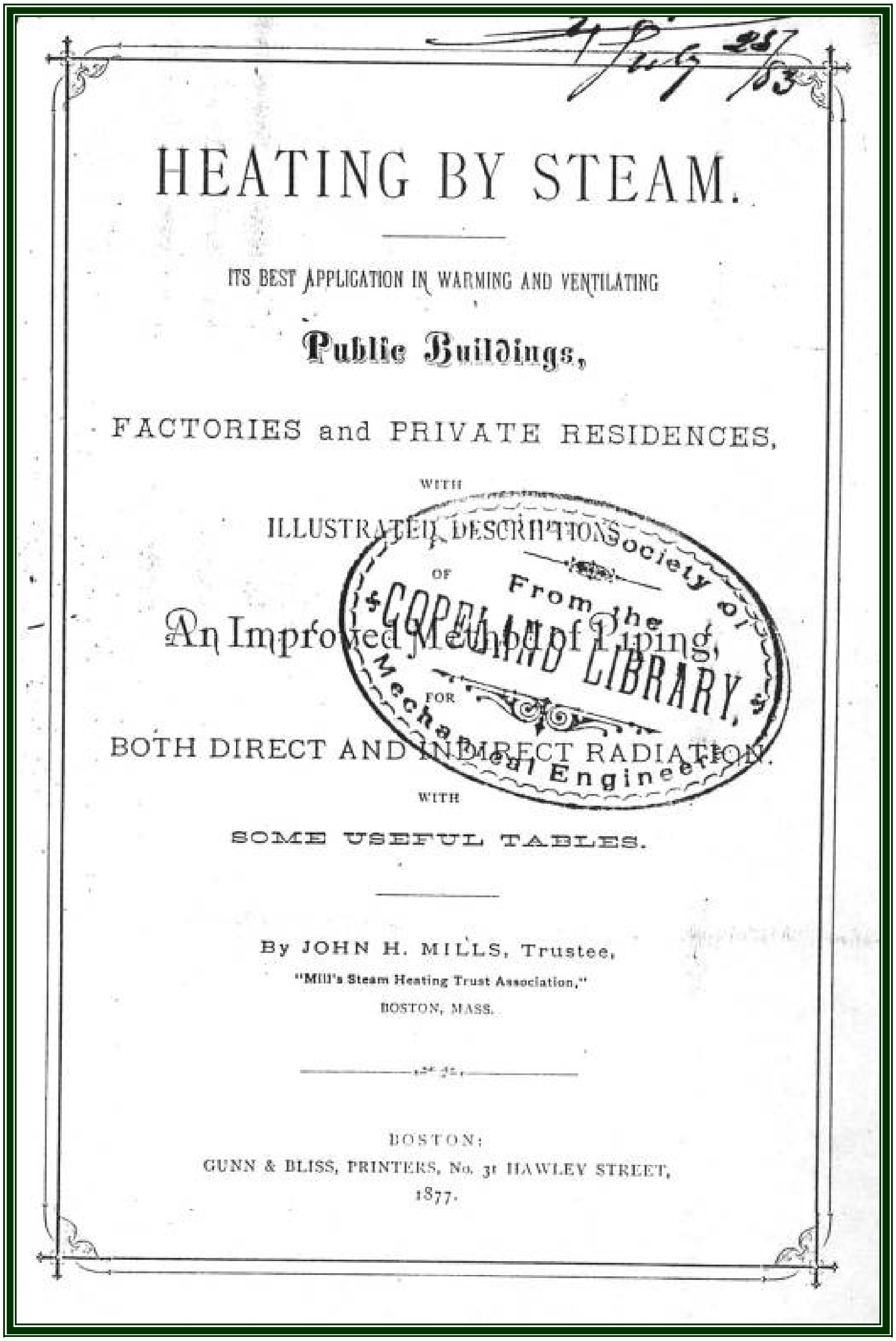
Foundry: WESTFIELD, MASS.

SEND FOR CIRCULAR.



ROYAL UNION RADIATOR.

(Advertisement from "Baldwin" 1900)



HEATING BY STEAM.

ITS BEST APPLICATION IN WARMING AND VENTILATING

Public Buildings,

FACTORIES and PRIVATE RESIDENCES,

WITH

ILLUSTRATED DESCRIPTIONS

OF

An Improved Method of Piping,

FOR

BOTH DIRECT AND INDIRECT RADIATION.

WITH

SOME USEFUL TABLES.

By JOHN H. MILLS, Trustee,

"Mill's Steam Heating Trust Association,"

BOSTON, MASS.

BOSTON:

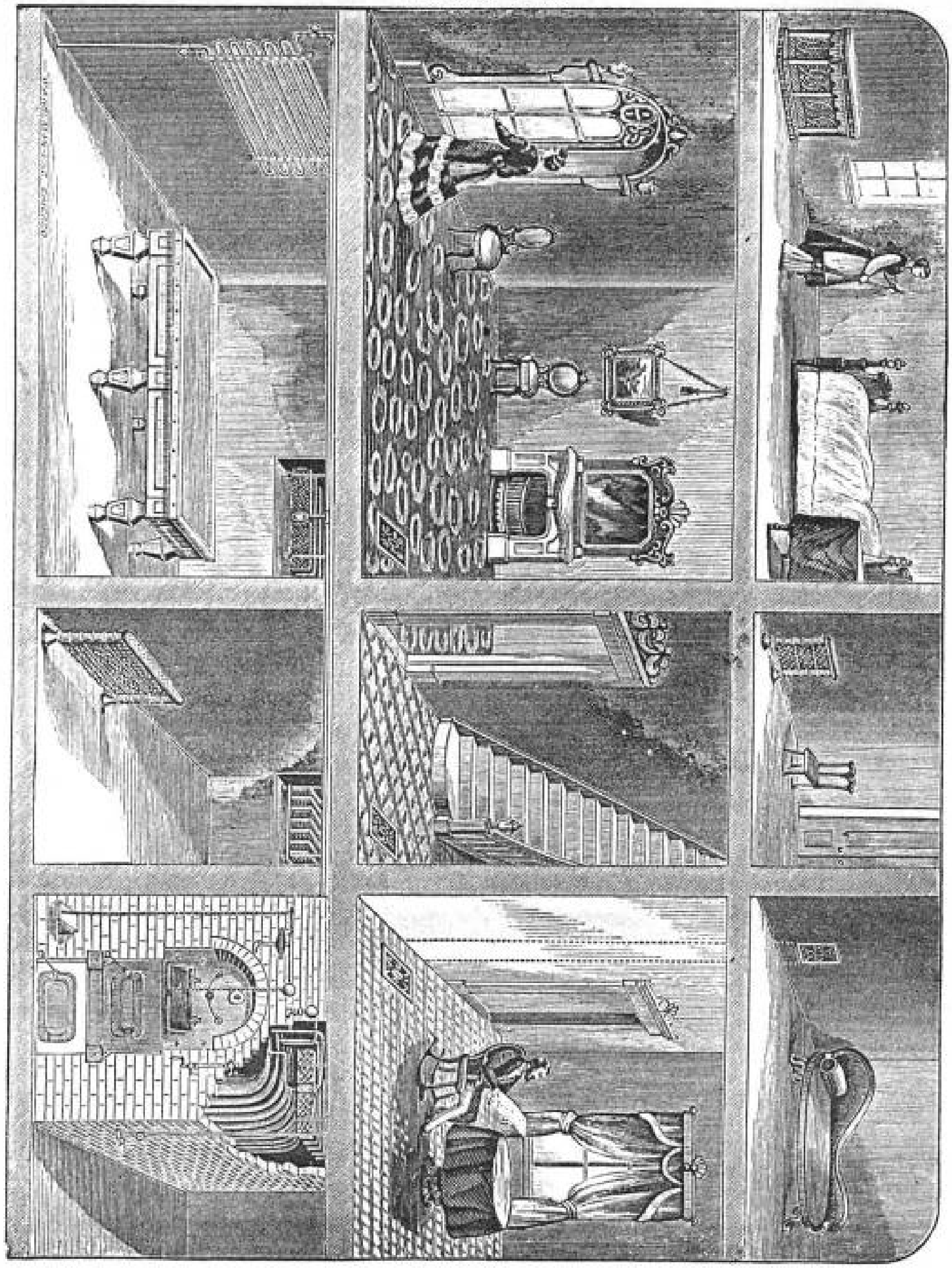
GUNN & BLISS, PRINTERS, No. 31 HAWLEY STREET,

1877.

Mills book of 1877 (The CIBSE Heritage Group has a photocopy: The original book is extremely rare)

PLATE NO. 4.

HEATING BY STEAM.

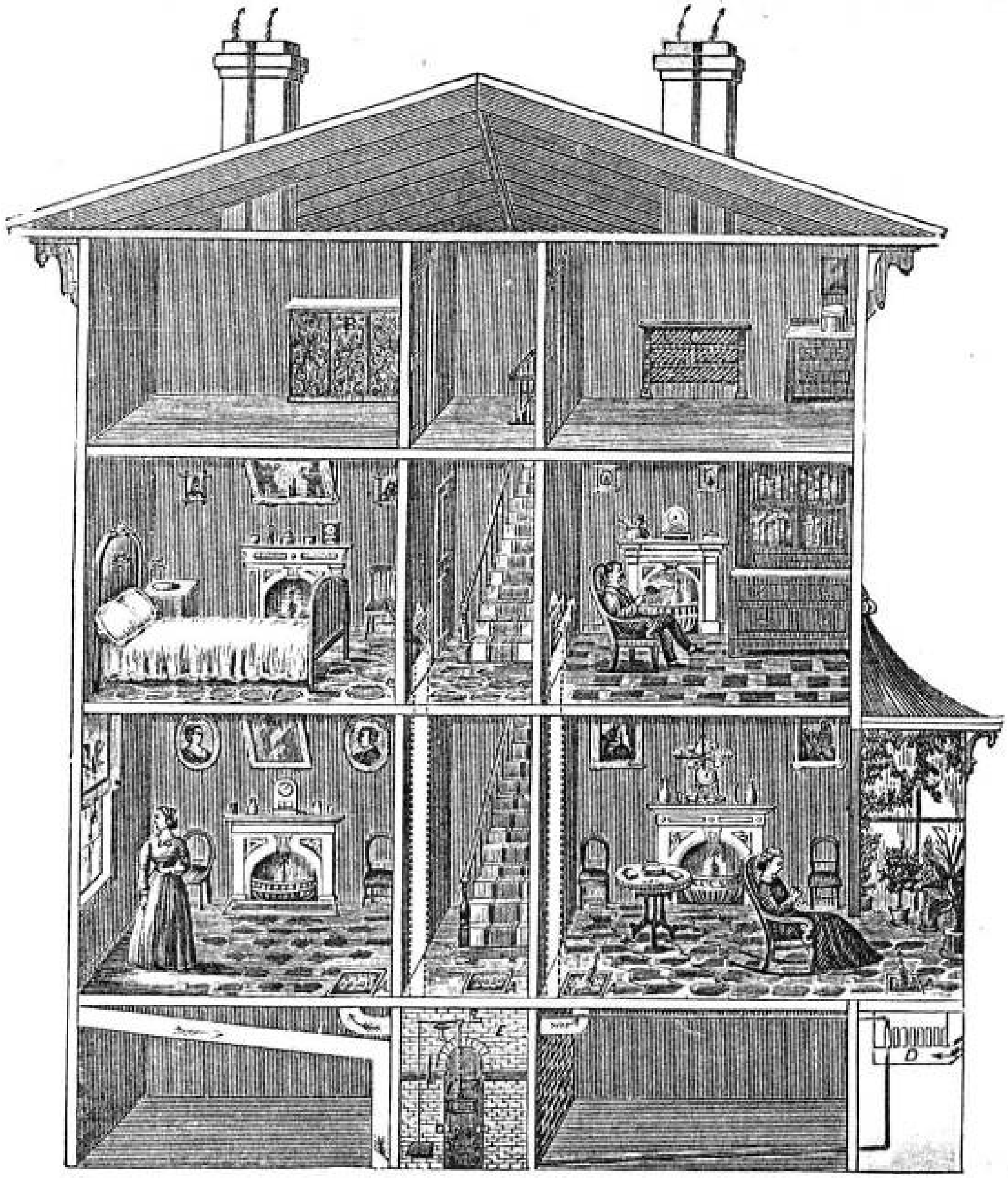


HEATING OF A PRIVATE DWELLING SHOWING GENERAL ARRANGEMENT OF BOILER, AND HEATING SURFACES

(From "Mills" 1877

PLATE No. 5.

HEATING BY STEAM.



HEATING BY INDIRECT RADIATION, ALSO THE REMOVAL OF THE VITIATED AIR THROUGH THE CHIMNEYS.

(From "Mills" 1877)

General ARTHUR JULES MORIN
1795-1880

Ventilation Pioneer

[64] General Arthur MORIN **active 1864**

French military hygienist and ventilator. Made studies of ventilation and appeared to prefer to introduce warm air near the ceiling and to extract near the floor. Developed a system for warming hospitals and infirmaries "effective but expensive." This was a development of the scheme (1840) employed at Pentonville Prison by Jebb [204] and comprised "a hot water system with cased coils (calorifères) in the wards and other rooms, each case having a fresh air inlet." Morin proposed ventilation "for the renewal of air in buildings...only rendered necessary by the vitiation resulting from the respiration and exhalations of the occupants, and by the accumulation of the products of combustion from artificial lighting." His recommended ventilation rates were generally greater than those previously used. He gave the figures required for barracks as 1059 ft^3 per hour by day and twice that amount at night for each man (1860).

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

It was on 7 April 1855 that Morin reached the rank of General of Division, having been made général de brigade on 26 March 1852. However, he had much more to his life than a military career. In the 1830s he taught mechanics at Metz, He was appointed to the newly created chair of mechanics at the Conservatoire National des Arts et Métiers in 1839. This National Conservatory of Arts and Crafts had been opened in 1802 and ordered to:-

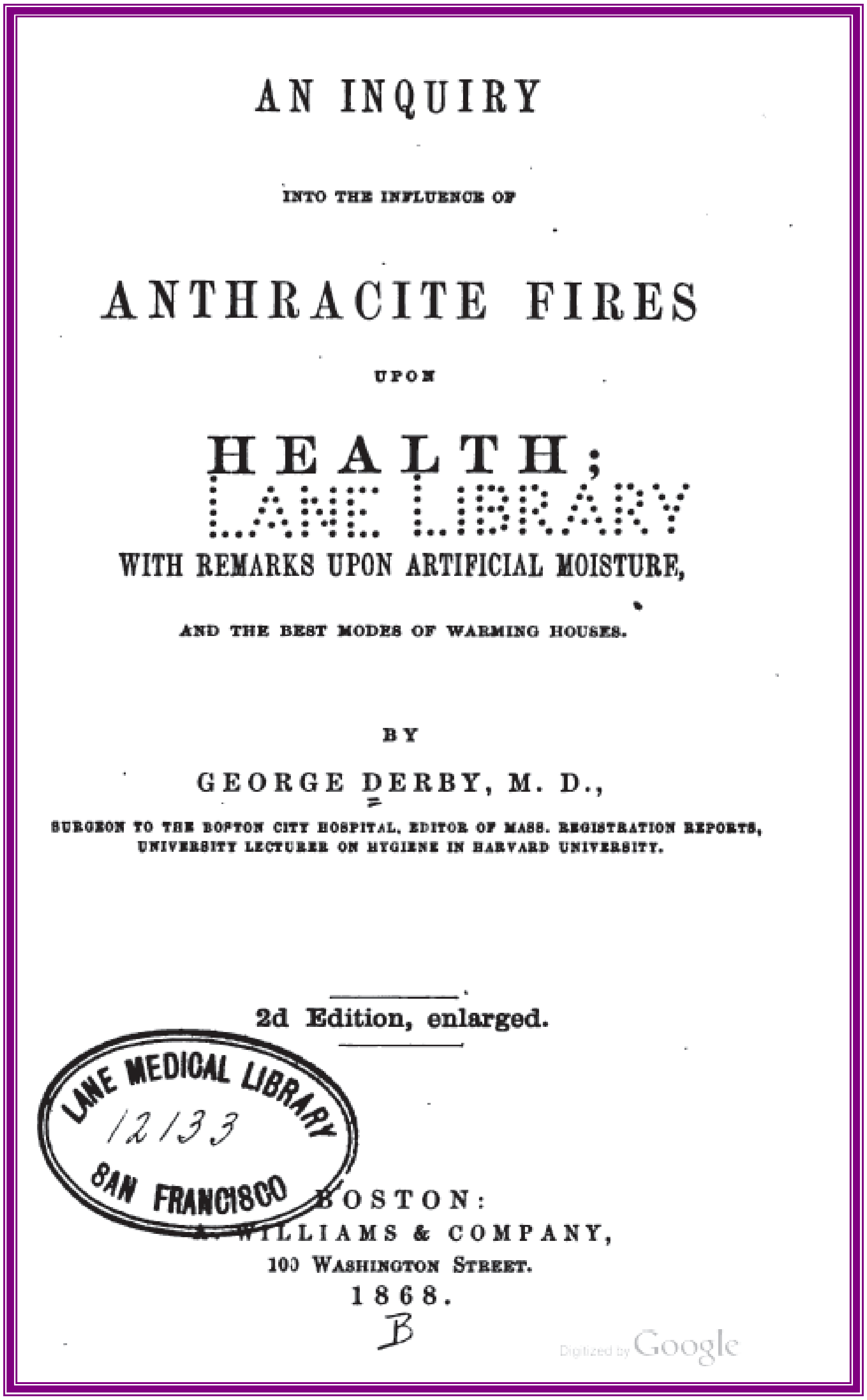
... improve the nation's industry, cultivate engineering methods, teach widely and illuminate ignorance.

The teaching of mechanics at the Conservatoire National des Arts et Métiers had begun in 1819 and other theoretical subjects had been introduced in the 1820s. As professor of mechanics Morin, who never renounced his army commission, drew heavily on the theoretical and practical work of his friend and teacher Poncelet and of other military officers. He also used the Conservatoire National des Arts et Métiers to promote a two-way flow of theory and practice between the military and private industry. Morin was Professor of Mechanics for ten years, and then in 1849 he became Director of the Conservatoire. He served in this leading role for 30 years and greatly improved the efficiency and influence of the Conservatoire. One of his greatest achievements was opening the first teaching laboratory of engineering in 1852.

One might wonder how a military man became Professor of Mechanics. Well he had spent much time undertaking research into problems of mechanics and between 1833 and 1835 he had submitted a number of important memoirs to the Academy of Sciences. These memoirs presented the results of a series of carefully executed experiments on friction which he began planning in 1829. Due to the complicated experimental apparatus used, built under the supervision of Poncelet, the experiments only began in May 1831. They then continued without interruption until September of that year, when funds given for the research were used up. The results confirmed and extended Coulomb's work on friction, verifying its three general laws: friction is proportional to the normal force exerted; friction depends upon the nature of the surfaces in contact but is independent of the area of contact; and, within large limits, friction is independent of velocity. He also devised an apparatus to study the laws of falling bodies. It consisted of a cylinder rotating beside the falling body, set up in such a way that a marker on the falling body describes a curve on the cylinder. He was able to give an accurate experimental proof of Galileo's result that distances travelled by a falling body increase as the square of the times. In 1849 Morin, working with Poncelet, invented the dynamometer of rotation, which together with later refinements, became the basic investigative tool in the study of work. He had already published work on dynamometers in *Notice sur divers appareils dynamometriques* (Paris, 1841), a work which describes the recording mechanism onto paper, as well as describing a mechanical integrator used so that results of longer experiments could be read off directly. His results on mechanics were all published in the five volume work *Leçons de mécanique pratique à l'usage des auditeurs des cours du Conservatoire des arts et métiers* (1846-1853). Joseph Bennett made an English translation under the title *Fundamental ideas of mechanics and experimental data* which was published in 1860.

During 1853-56 Morin undertook a series of experiments on the resistance of building materials which he published in a series of papers. This work was important in having practical applications to architecture. He published the results in a book form in 1863 when the two volume work *Résistance des matériaux* appeared. Let us mention a selection of his other works: *Nouvelles expériences sur le frottement, faites à Metz en 1831* (1832), *Expériences sur les roues hydrauliques à axe vertical appelées turbines* (1838), *Expériences sur le tirage des voitures, faites en 1837 et 1838* (1839), *Notice sur divers appareils dynamométriques* (1841), *Conservatoire des Arts et Métiers. Catalogue des collections* (1851), *Notions géometriques sur les mouvement et leurs transformations, où élémens de cinématique* (1857), *Rapport de la commission sur le chauffage et la ventilation du Palais de Justice* (1860), *Etudes sur la Ventilation* (1863), *Des machines et appareils: destines a l'elevation des eaux* (1863), *Notes sur les appareils de chauffage* (1866), and *Salubrité des habitations. Manuel pratique du chauffage et de la ventilation* (1868). His work on ventilation made him a leading world expert on the topic, and he used this knowledge in undertaking research into carbon monoxide in rooms heated by iron stoves in 1869 and research into the preservation of flour in 1870.

Edited extract from gap-system.org/~history/Biographies/Morin)


AN INQUIRY

INTO THE INFLUENCE OF

ANTHRACITE FIRES

UPON

HEALTH;

WITH REMARKS UPON ARTIFICIAL MOISTURE,

AND THE BEST MODES OF WARMING HOUSES.

BY

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BOSTON:
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100 WASHINGTON STREET.
1868.

Deals with Morin's Research into Stoves (Google Books)

Dr. Carret of Chambery reported in 1865 that the substitution of cast iron for porcelain stoves had produced, within his own knowledge, serious effects upon public health. No attention seems to have been given to this communication until the application of the observation of Carret to the remarkable discovery of the porosity of cast iron by Deville and Troost, was made by General Morin, January 13, 1868, as appears from the published proceedings of the French Academy.

This statement is now made as adding proof of the correctness of some of the opinions expressed in the following pages, since the observations at Boston in 1868, were made without any knowledge of those at Chambery in 1865; in so far as cast iron stoves are concerned, both lead to similar conclusions; and both become more intelligible in the light of the experiments of the French chemists, and of Professor Graham. The communications of General Morin and M. M. Deville and Troost, are now reprinted in the Appendix. General Morin is the present Director of the "Conservatoire des Arts et Metiers," and the highest authority in France on the subject of ventilation.

It is to be hoped that the influence of hard coal will be shown in the experiments which are now to be made by the committee of the Academy. The fuel commonly used in French stoves is bituminous coal, a far less dangerous substance in the products of its combustion than our anthracite.

In the present treatise the important subject of ventilation has been referred to only when its connection with the matter in hand was so intimate that it could not be avoided.

BOSTON, October 20, 1868.

(From Derby's book)

APPENDIX.

(Translation from the "Comptes Rendus de l'Academie des Sciences.")

PUBLIC HEALTH.

NOTE ON THE SUBJECT OF THE RECENT EXPERIMENTS, BY M M. H. ST. CLAIRE DEVILLE AND TROOST, ON THE PERMEABILITY OF CAST IRON BY GASES.

BY GENERAL MORIN.

The Academy has doubtless not forgotten that in 1865, our late associate, the lamented Velpeau, communicated some observations made by Dr. Carret, Surgeon-in-chief of the Hotel Dieu at Chambery, on occasion of an epidemic which manifested itself in different parts of the Department of Haute-Savoie, and particularly at the College of that city, in buildings heated by cast iron stoves, whilst in the same localities the houses furnished with porcelain stoves were completely exempt.*

Since that communication was made I have abstained from all comment upon it, but subsequent reflection upon the curious experiments, by which MM. Deville and Troost have proved the permeability of iron heated to a high degree by gases, have

* Since his communication to the Institute, Dr. Carret has addressed to the "Minister of Agriculture, Commerce and Public Works" a memoir, rich in facts bearing upon the unhappy influence which the use of cast iron stoves exercises upon the public health. In this memoir the author arrives at the conclusion that cast iron stoves, in permitting the passage through their walls of carbonic oxide gas, are the direct cause of very serious results. He furnishes numerous, and varied, and unquestionable instances.

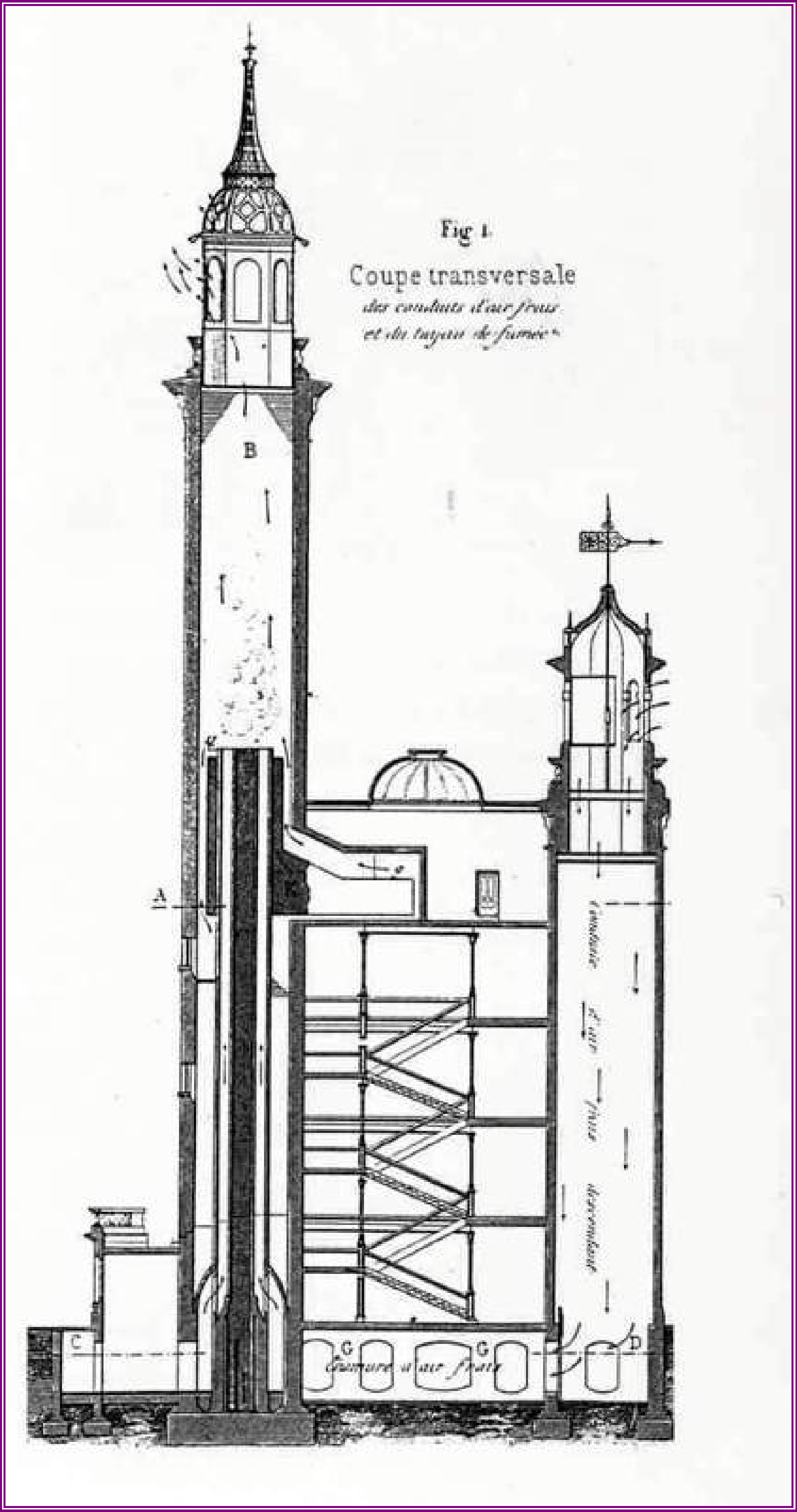
led me to think that these facts might explain the insalubrity of cast iron stoves heated by pit coal, of which the use is too general in schools, colleges, barracks, guard-houses, and in a great number of public and private establishments.

I therefore requested MM. H. St. Claire Deville and Troost to make, upon an apparatus similar to the guard-house stoves, experiments which would conclusively show the degree of permeability of cast iron heated to a high temperature by the gases resulting from combustion.

By the aid of such apparatus, these accomplished chemists have not only put beyond doubt this question of permeability, but they have determined the proportions of carbonic oxide gas which pass through a given surface of a cast iron stove, as well as that which the metal absorbs and retains.

The importance of these results for the public health is so evident that for this reason they should be known and examined in detail. This I propose to do in a subsequent paper, leaving to the more competent hands of MM. Deville and Troost other deductions useful to science which are involved in the facts referred to.

(From Derby's book)



Heat-assisted Ventilation Scheme for Guys Hospital, London by John Sylvester
(From "Etudes sur la Ventilation," A J Morin, Paris, 1863)