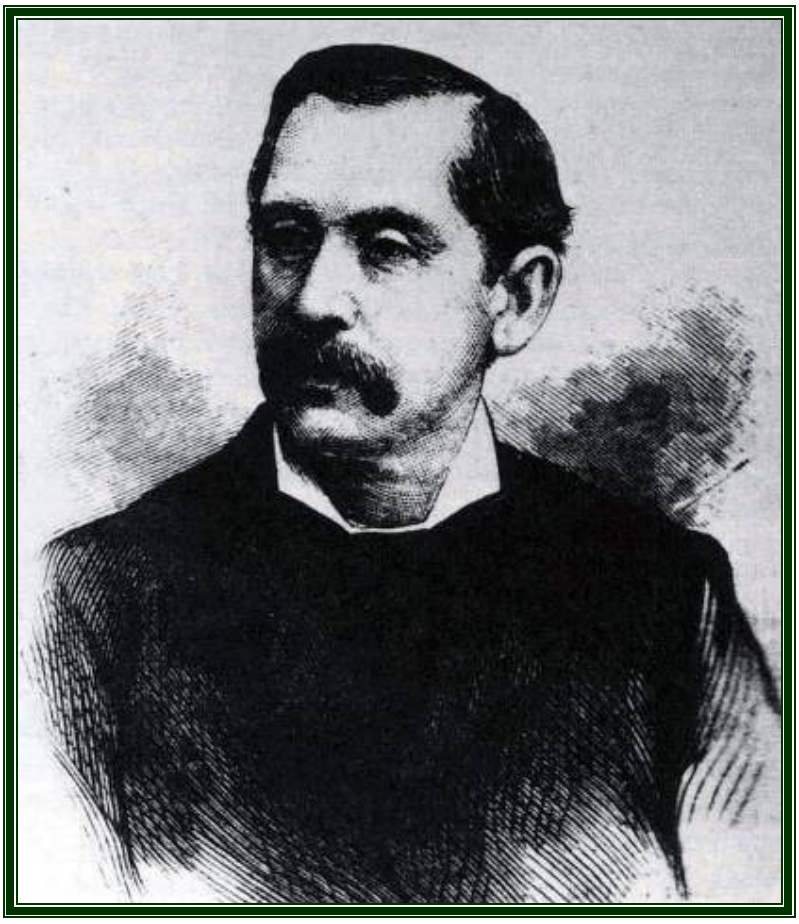
DANIEL LIVINGSTONE HOLDEN
1837-1924



Pioneer in the ice-making business

[89] Daniel Livingstone HOLDEN **1837-1924**

Born in Kentucky, USA. He purchased a Carré [81] absorption machine (c. 1865) that had been smuggled into the Confederacy during the Civil War when the Union had denied supplies of natural ice to the South. He put it to work in San Antonio, but dissatisfied with the off-color ice, he placed steam coils in the generator to heat the aqua-ammonia and substituted distilled water. These changes quickly led to public acceptance of machine-made ice. Later, Holden worked on improving the "chimogene" (petroleum distillation mixture) compressor of P.H. Van der Weyde (USP 87,084: 1867); he also produced his "Regealed" freezing machine (USP 95,347: 1869), which was manufactured for some years in Philadelphia.

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

HOLDEN Daniel Livingstone (1837-1924)

Born at Higginsport, Kentucky, U.S.A.

About 1865, during the civil war, he developed and perfected a Carré absorption machine at San Antonio, Texas. In 1866, with his brother Elbridge, he set up an ice factory of 1.5 t/day, using a Carré machine, in the same town. This was the first factory to work in a normal commercial way, in the U.S.A., if we disregard the attempt by A.C. Twining a little after 1850.

At the same time, in 1866, after P.H. Vanderweyde's patent, he built a compressor using the "Chemogene" mixture of petrol ether and naphtha. In 1869, five such compressors were in use in the Southern States. From 1871 to 1875, Holden and his brother equipped a large abattoir (100 head of cattle per day) belonging to G.W. Fulton, in Texas, using "Chemogene" compressors or an absorption refrigerating machine (?).

In 1877, Holden took out a patent for his "Regealed Ice Machine" (ice made in flakes and afterwards pressed into blocks), the first example of which was installed in Philadelphia.

(From "The History of Refrigeration," Roger Thevenot, International Institute of Refrigeration, Paris, 1979)

Perhaps the earliest of the successful commercial pioneers in the U.S. were Daniel Livingston Holden and David Boyle. Daniel Holden entered the ice-making business in 1865 and by the 1870s was engaged in building refrigerating plants using a petroleum ether refrigerant called "chimogene" (also spelled "chymogene" or "cryogene"). Holden had purchased rights to the use of this refrigerant from its patentee, Peter Van der Weyde, about 1870[59] (Figures 8-27 through 8-30). Holden was a prominent manufacturer of refrigerating systems through the end of the century.[60]

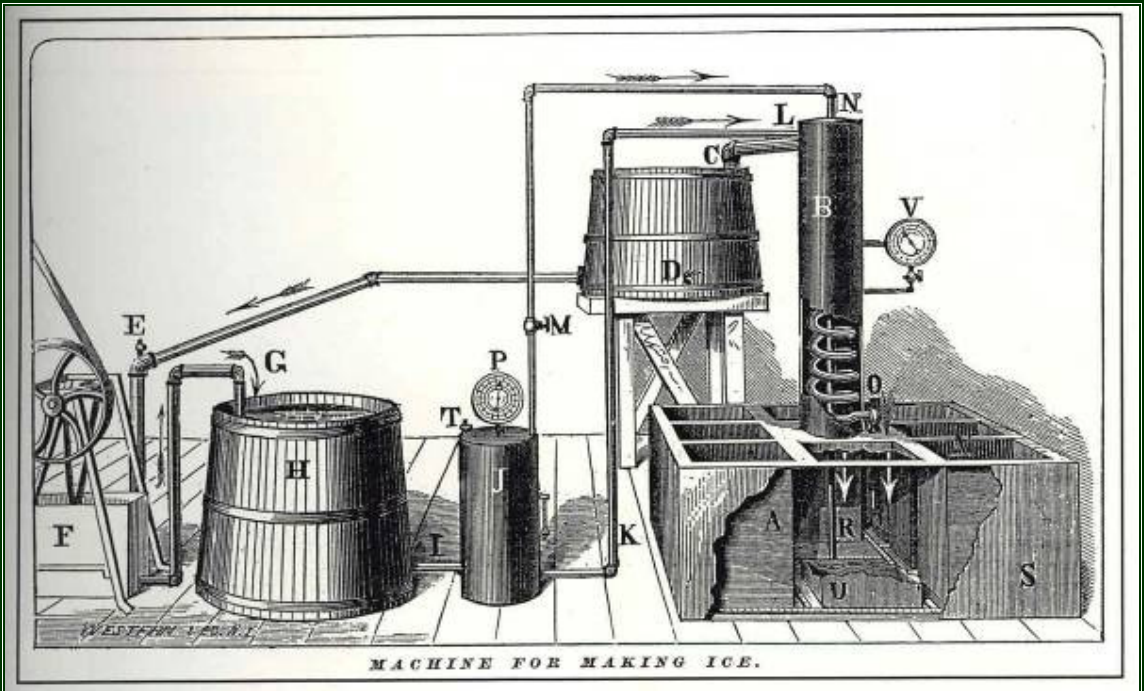


Figure 8-28 *Ice-making plant erected at New Orleans in 1869 by D.L. Holden, which used "chimogene" as the refrigerant. The design featured some advanced design ideas. The device at the right marked B was a suction-to-liquid heat exchanger, and the vat marked D contained water to be frozen, which was cooled by the suction gas before it entered the compressor. The tube M-N served to remove flash gas from the receiver J, admitting it underneath the liquid refrigerant in the evaporator at point U, which served to agitate the boiling liquid and increase heat transfer. The plant was of the "can" type, the ice cans being inserted into the cavities in the evaporator. The heat transferred from the ice cans to the evaporator walls (unlike most later plants, which used brine, etc. as a secondary heat transfer agent) (from "Making ice by machinery," 1869,* The Manufacturer and Builder, *vol. 1, December, p. 353).*

THE REGEALED ICE MACHINE,

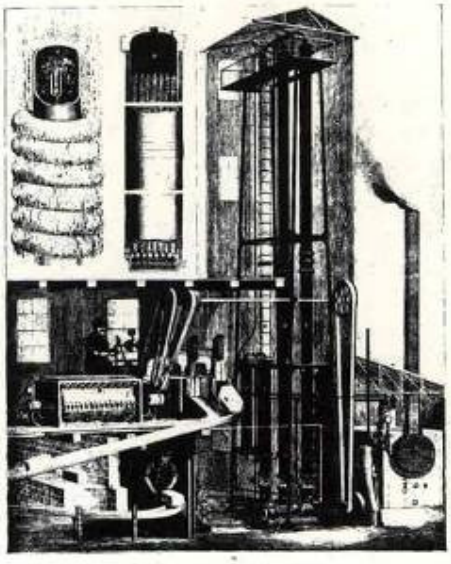
MANUFACTURED SOLELY BY

D. L. HOLDEN,

1336 Beach St., PHILADELPHIA, PA.

Makes Ice at 50 Cents a Ton.

THE FRUIT OF THIRTY-FIVE YEARS OF EXPERIENCE.



THE HOLDEN SYSTEM OF ICE MANUFACTURE.

AN ABSOLUTELY NEW WAY OF MANUFACTURING ICE.

A COMBINATION OF THE COMPRESSION and ABSORPTION AMMONIA SYSTEMS.

Description of Machine as Shown in Cut.—A, the Still; B, Absorber; C, Condenser; D, Section of Still, showing Steam Pipes; E, 1-inch Steam Pipe; H, Interchanger; K, Cooler; W, Wire Coil; e, Internal ¼-inch Pipe; a, b, c, Receivers; F, Freezing Cylinder; T, Compression Pump; M, Screw Conveyor; Hydraulic Presses to the right.

D. L. HOLDEN, 1336 Beach St., Philadelphia, Pa.,

SOLE MANUFACTURER OF THE

REGEALED ICE MACHINE.

NEW YORK OFFICE: 123 Liberty Street.

Figure 8-30 *"The regealed ice machine" was Holden's most sophisticated system. Flake ice was made and then compressed into blocks (from* Cold Storage, *vol. 3, May 1900, p. 99).*

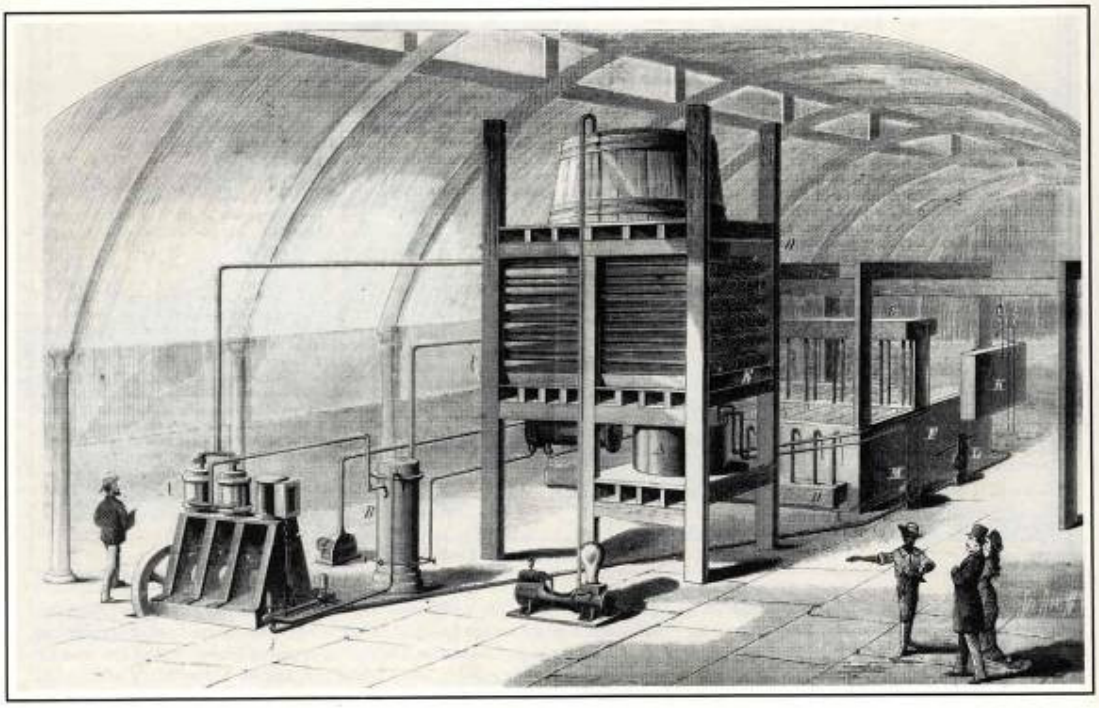
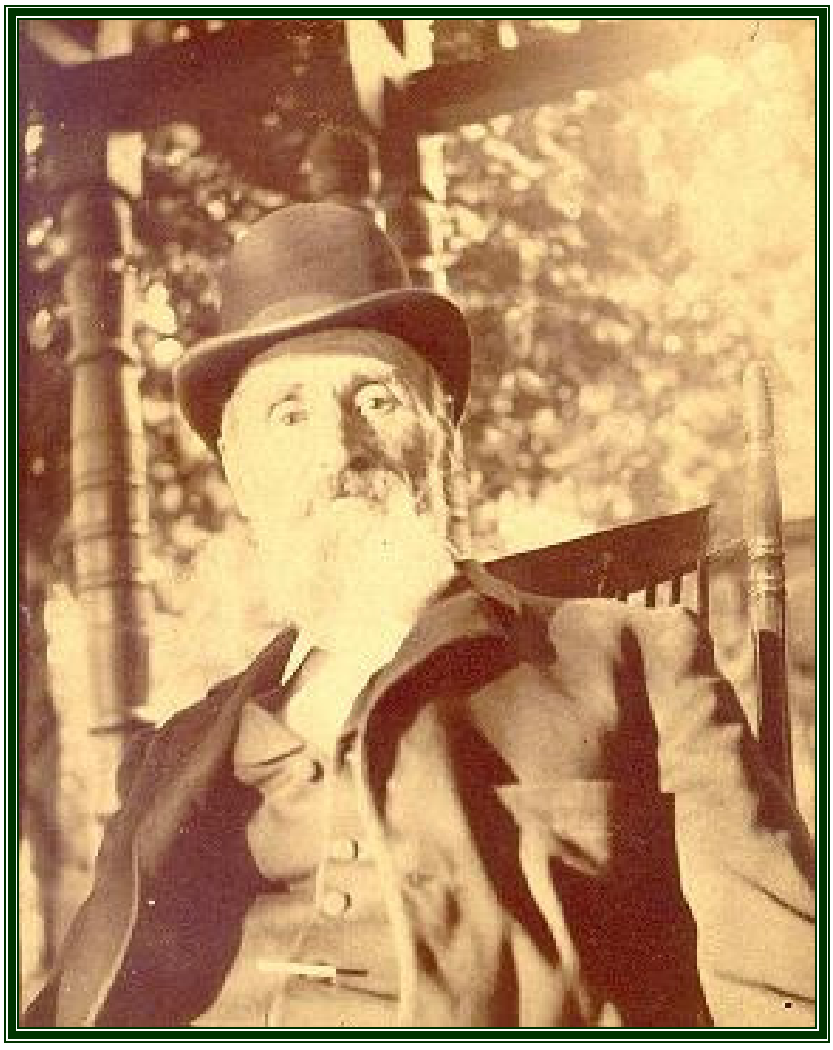


Figure 8-29 *Holden's improved ice plant. The large device in the center is a condenser featuring a "zig-zag" heat exchanger. To its left is the shell-and-tube brine chiller marked B. By 1878, Holden was in business with his two brothers building machines at the Penn Iron Works in Philadelphia (from* Scientific American, *May 22, 1880, p. 322).*

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

BIRDSILL HOLLY
1820-1894

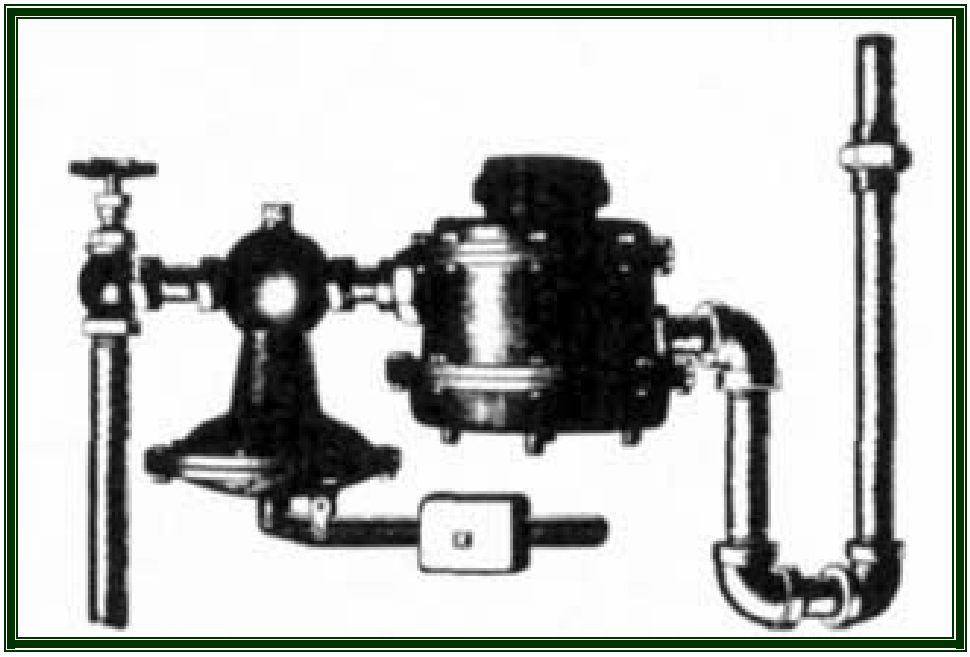


Often called "The Father of District Heating"

[235] Birdsill HOLLY **active 1876**

American hydraulic engineer and inventor. Took an interest in the possibilities of district heating and began experiments (1876-1877). Earlier pioneers of "group schemes" include Benjamin Franklin [8], who heated a row of houses from an iron stove-furnace (1748), Loddidge, who steam heated his Hackney nursery with "over half a mile of 4-inch cast-iron pipes (c. 1818), and Paxton [192] at the Sydenham Crystal Palace (1853). Schemes had also been suggested (c. 1834) by Brunel [59] and Wilhelm Siemens for the city of Birmingham (1863). Holly, at Lockport, N.Y., "built a boiler in the cellar of his home. He buried 160 m of 25-mm pipe and successfully furnished (steam) heat to his own and nearby homes. He followed this up with an extension of 160 m of 37-mm pipe to a neighbor's home. This also being a success, Mr. Holly decided to start a heating utility in Lockport. For this, he used a boiler 2 m in diameter and 3 m high, serving a total of 750 m of 50-mm and 100-mm pipeline laid in bored-out wooden water pipe for insulation. Steam service began in October 1877, when 14 customers were connected to the boiler, operated at 300 kPa." To improve performance, Holly invented a steam trap, an expansion joint, a pressure regulator, and a condensate meter. The pioneering work of Holly was reported by Captain Galton* [171], who saw benefits in reducing atmospheric pollution. District steam heating was introduced in New York (1879), largely through the efforts of Andrews [226].

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



Holly's steam trapping apparatus

Holly's Factory & Offices shortly after his death in 1894

His principal business was fire protection. In total he secured 150 patents being only outclassed by Thomas Edison

MARK CHARLES HONEYWELL
1874-1964

Co-founder of the international company which bears his name

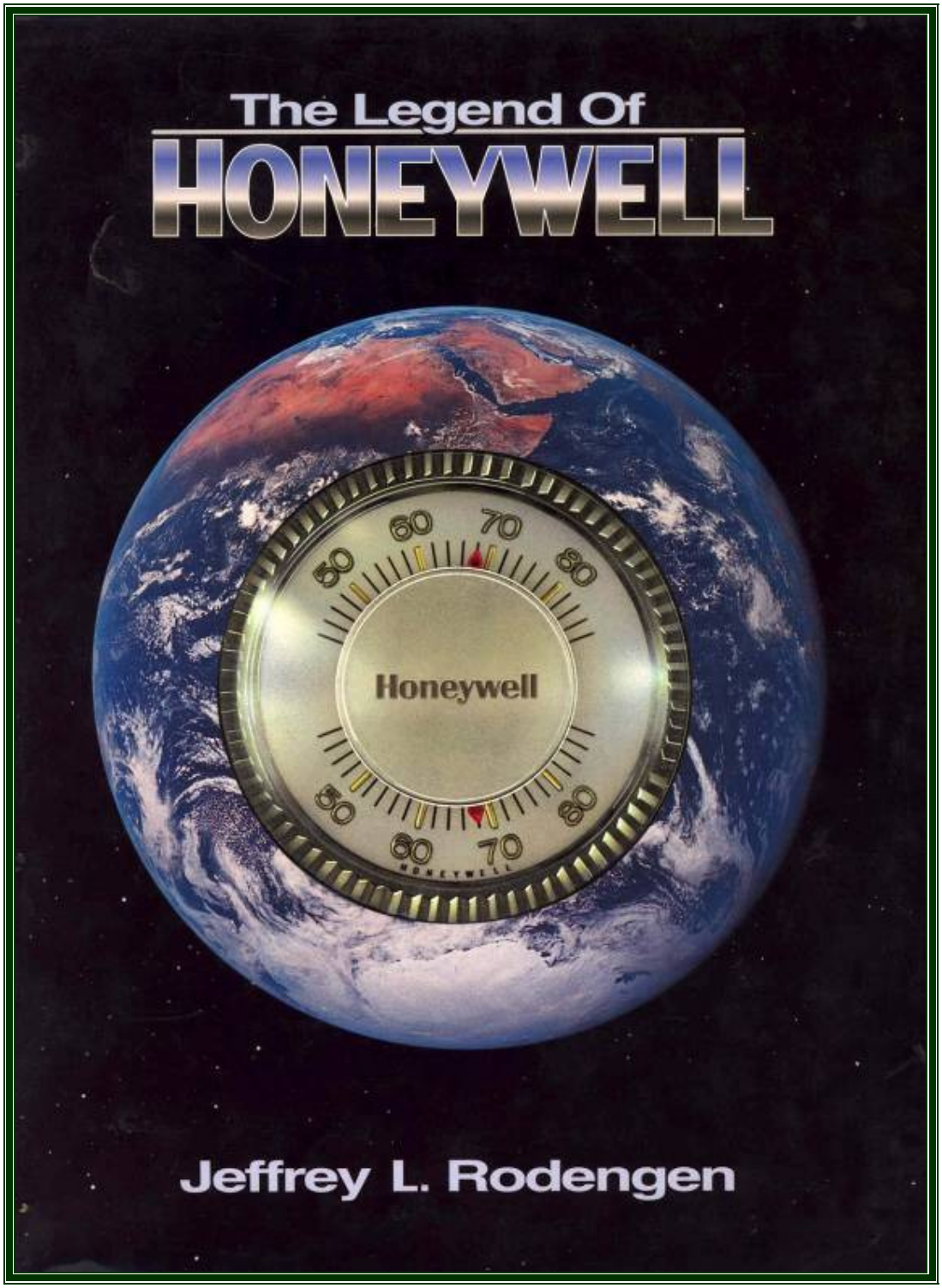
[133] Mark HONEYWELL **active 1920s**

American inventor. Went into business as a plumbing and heating engineer in Wabash, Indiana (1906). Later invented the Honeywell Heat Generator that allowed heating systems to be pressurized. Formed the Honeywell Heating Specialty Co. and its success eventually led to a merger (1927) between the Minneapolis Heat Regulator Co. of Sweatt [130] and Honeywell. The new company soon became the U.S. leader in home heating controls and developed into one of the world's leading automatic control manufacturers.

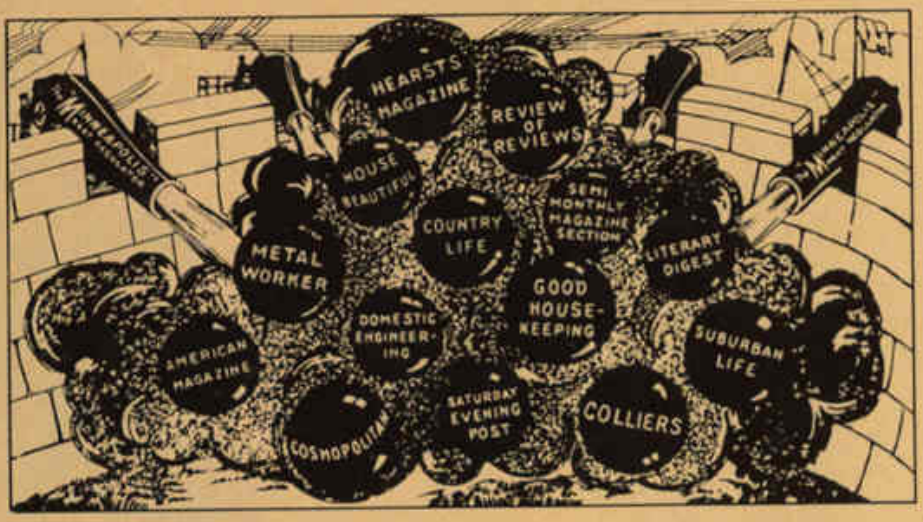
(Mini-biography from "The Comfort Makers," Brian Roberts, 2000)

Mark Honeywell and company in front of his plumbing shop in Wabash, Indiana, about 1906.

(From "The Legend of Honeywell")



A history of the Company, 1995
(CIBSE Heritage Group Collection)



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It Is a National Campaign

That gives a grand total circulation of over 6,000,000 each month.

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Write us for folders, window cards, sample board proposition and get in close touch with our selling organization.

Be the "wise dealer." Be the one who is "there with the goods."

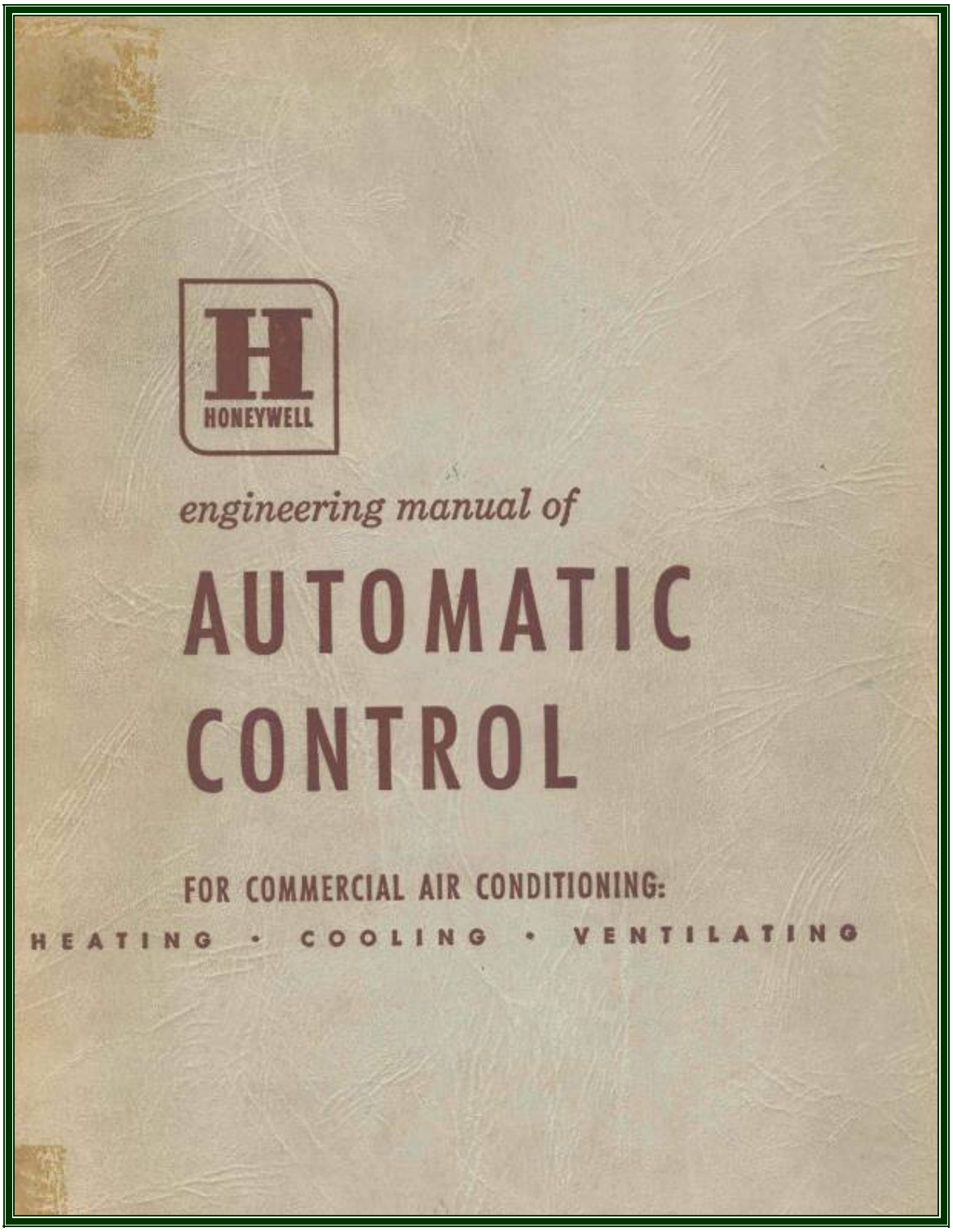
MINNEAPOLIS HEAT REGULATOR CO.

Executive Offices and Factory:

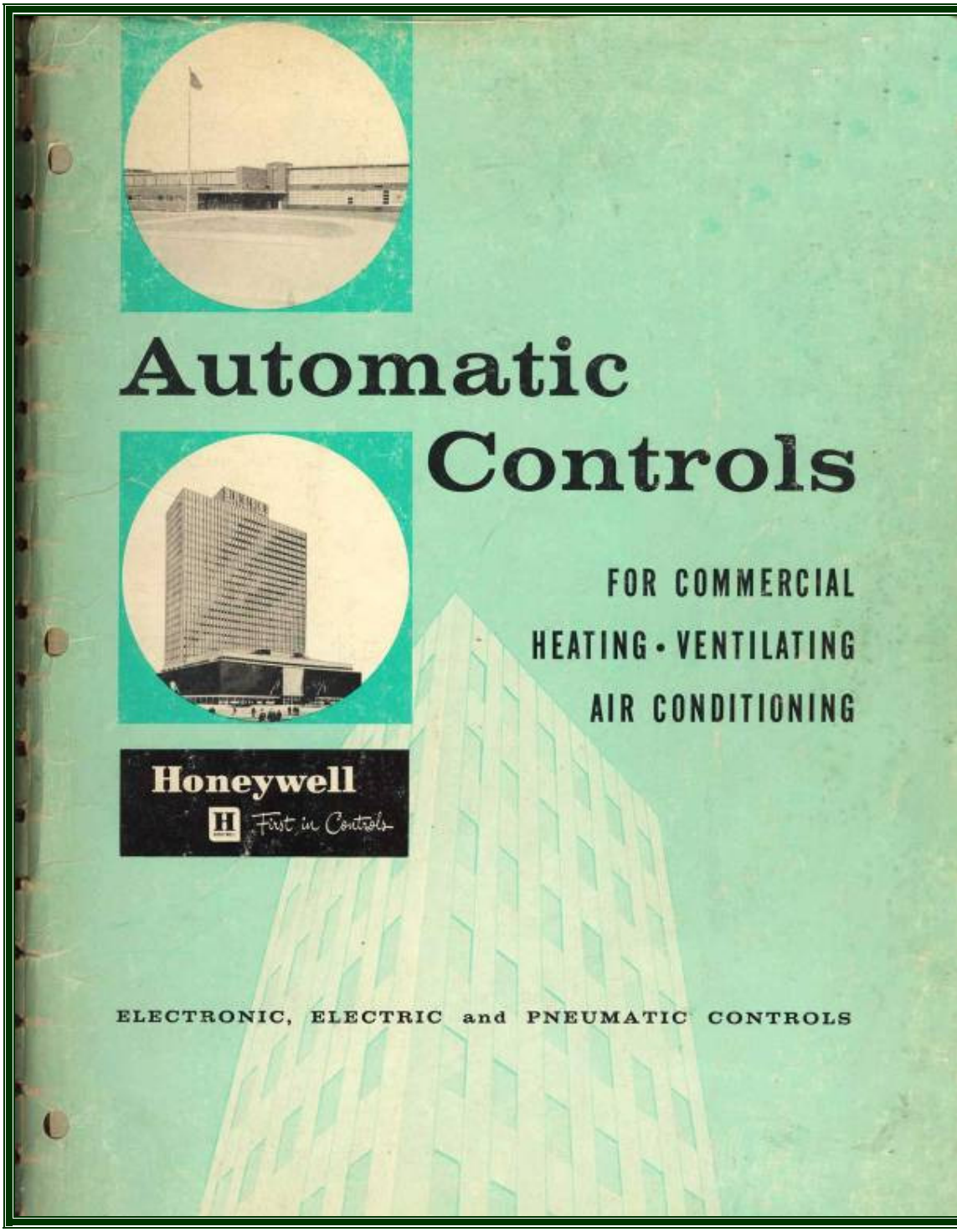
Minneapolis Minnesota

Advertisement from 1917 ("Honeywell –The First 100 Years")

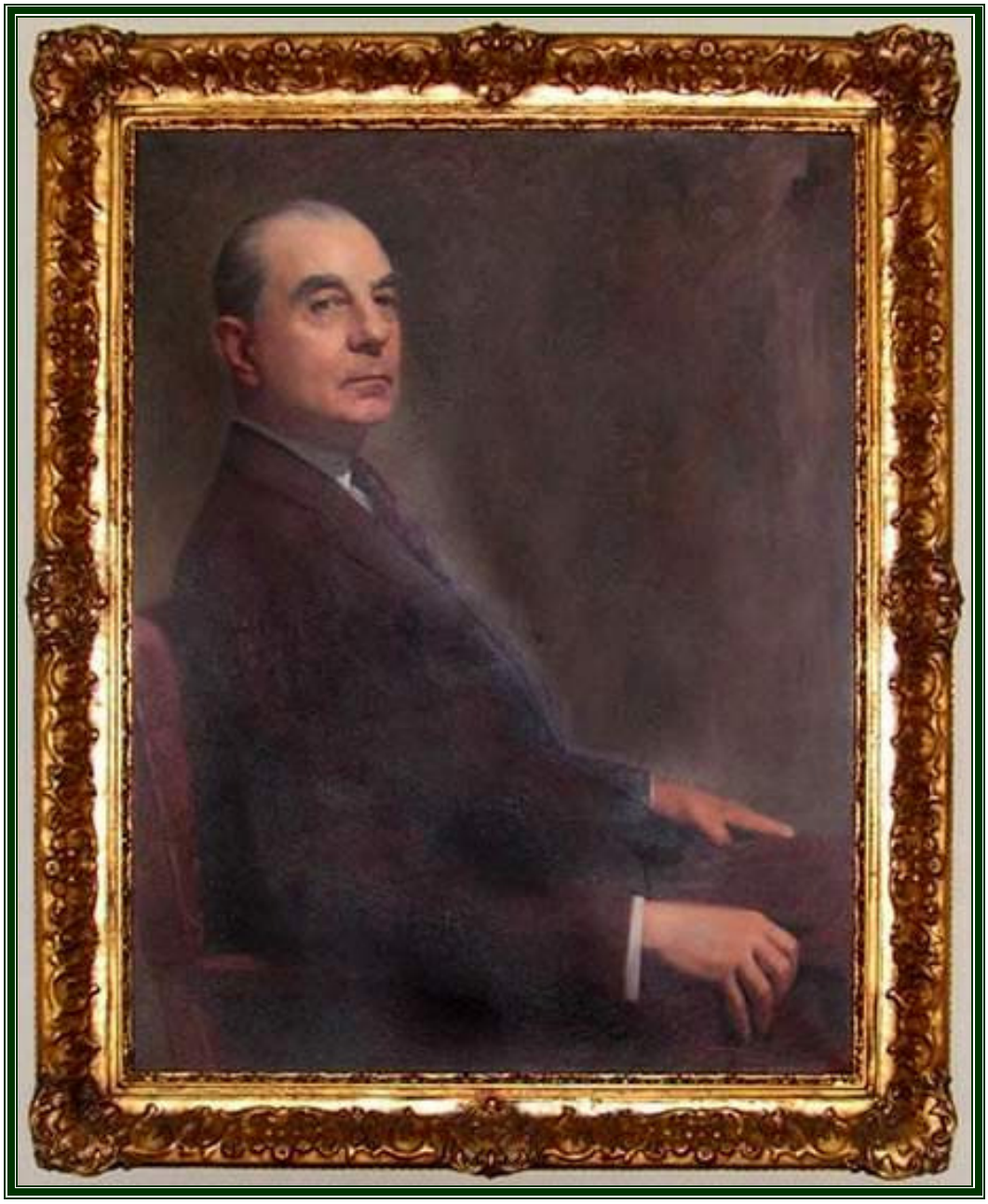
Advertisement from 1959 ("Honeywell –The First 100 Years")



1958 (CIBSE Heritage Group Collection)



1959 (CIBSE Heritage Group Collection)



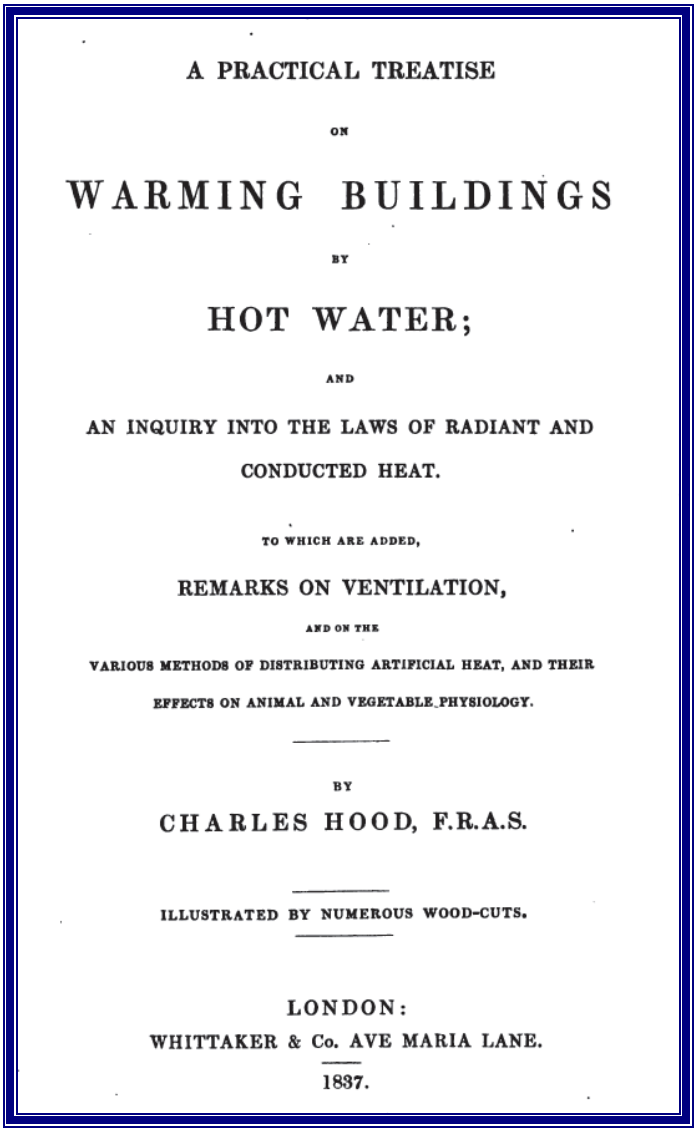
Portrait of Mark Honeywell

CHARLES HOOD
1805-1899

No portrait has so far been discovered

London ironmonger in business at Blackfriars. Became interested in practical science, astronomy, and later "the Chemistry of the Combustion of Coal." Being an ironmonger, he was able to manufacture various designs of stoves and grates. He experimented with different types of coal, noted how combustion varied according to thickness of fuel on the fire bars, and deduced equations for complete and incomplete combustion. For this work he was awarded the Silver Medal of the Society of Arts. Hood was encouraged to write *A Practical Treatise on Warming by Hot Water* (1837), which led to his election as Fellow Royal Society. Hood studied the heat emission of pipes and heat losses from buildings. He tabulated the amount of heating surface required for various types of buildings. Many of his rules and tables remained in widespread use until the turn of the century.

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



A PRACTICAL TREATISE

ON

WARMING BUILDINGS

BY

HOT WATER;

AND

AN INQUIRY INTO THE LAWS OF RADIANT AND CONDUCTED HEAT.

TO WHICH ARE ADDED,

REMARKS ON VENTILATION,

AND ON THE

VARIOUS METHODS OF DISTRIBUTING ARTIFICIAL HEAT, AND THEIR EFFECTS ON ANIMAL AND VEGETABLE PHYSIOLOGY.

BY

CHARLES HOOD, F.R.A.S.

ILLUSTRATED BY NUMEROUS WOOD-CUTS.

LONDON:
WHITTAKER & Co. AVE MARIA LANE.
1837.

Title page of Hood's Book of 1837

(The CIBSE Heritage Group Collection has an 1879 edition)

PREFACE.

A NATURAL inclination for philosophical inquiries, first led me to investigate the principles of the invention for heating buildings by the circulation of hot water; and the many favourable opportunities that have occurred for proving the accuracy of my theoretical views, have encouraged me to persevere in the investigation.

Frequent applications having been made to me, by persons who were aware that the subject had engaged my attention, to recommend to them a practical treatise on its principles and application, the utility of such a work, in forwarding the progress of the discovery, became obvious. And finding that nothing relating to the invention had hitherto been published, except a few scattered and unimportant notices, it appeared probable that the materials I possessed might form a treatise which would be

useful, not only in showing the practical application of the invention, but also in explaining the scientific principles upon which the various effects depend. The following pages are therefore offered, in the hope of supplying the desideratum.

The different parts of the subject have been arranged, as far as possible, under distinct heads. The primary object has been to explain the principles, in a manner perfectly clear and intelligible to such as are unacquainted with those branches of physical science on which the philosophy of the invention is based: and, while endeavouring to remove the erroneous notion, which is entertained by some persons, that a certain degree of danger is inseparable from the plan, to show that danger can occur only through a misapplication of the principles.

In order to pursue the inquiry in a popular manner, all abstruse calculations and scientific technicalities have been, as much as possible, avoided; and the most simple definitions the subject would admit of have been adopted, as far as is consistent with perspicuity.

The Rules, Calculations, and Tables, which are given in the body of the work, have, nearly all, been constructed expressly with reference to the present inquiry; and the Tables given at the end of the volume are compiled from the best authorities: the whole comprising, it is hoped, all the information which the subject requires.

In extenuation of any omissions or errors which may be found, it should be borne in mind that, hitherto, no attempt has been made to give a comprehensive view of this invention. The increasing attention of the public to the subject, however, renders the present time the most proper for the publication of such a treatise as the one now offered: and though probably much remains to be discovered relating to the invention, the communication of what is already known is the surer way of extending the sphere of its utility, than by waiting until its principles shall be more fully revealed by time, in the hope of producing a more complete work. But although no excuse is thus intended to be offered for any errors, other than such as are trivial and unimportant, if any omissions be found, the plea may be urged, and will, perhaps, be admitted—*Bis dat qui citò dat.*

To conclude these prefatory remarks: it may be observed that in pointing out, and freely commenting on the erroneous principles which have, in some instances, been both theoretically and practically promulgated by others, it is under the impression that such errors, carrying with them in general considerable plausibility, might, if unconfuted, lead not only to inconvenience, but even to danger; more particularly, as, on account of their emanating from men of ability, others may also be liable to fall into similar mistakes. However invi-

dious, therefore, the task of pointing out such errors may seem, it appeared to be necessary, when writing on this subject, not only to exhibit what were considered to be the true principles, but also to show where erroneous notions have been adopted. This must be the apology for the freedom with which the opinions and inventions of others are descanted on in the following pages; and, as these are not the production of an inventor, who is expatiating on the advantages of his own particular plan, they will, it is hoped, be found a candid inquiry into the merits of the various descriptions of apparatus which are brought under consideration, pointing out their philosophical principles, and displaying their utility in a practical manner.

C. H.

Earl Street, Blackfriars,
September, 1837.

A PRACTICAL TREATISE

ON

WARMING BUILDINGS

BY

HOT WATER;

ON

VENTILATION,

AND THE

VARIOUS METHODS OF DISTRIBUTING ARTIFICIAL HEAT,
AND THEIR EFFECTS ON ANIMAL AND VEGETABLE PHYSIOLOGY.

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AN INQUIRY INTO THE LAWS OF RADIANT AND CONDUCTED HEAT,

THE CHEMICAL CONSTITUTION OF COAL,

AND THE

COMBUSTION OF SMOKE.

By CHARLES HOOD, F.R.S. F.R.A.S. ETC.

SECOND EDITION, GREATLY ENLARGED, AND
ILLUSTRATED BY NUMEROUS WOOD CUTS.

LONDON:
WHITTAKER & CO., AVE-MARIA LANE.

1844.

Hood's book of 1844 (Google Books)

PART SECOND.

CHAPTER I.

ON THE GENERAL PRINCIPLES OF WARMING AND VENTILATING BUILDINGS, THE COMBUSTION OF FUEL, ETC.

Early Methods of Warming Buildings—the Romans—their Stoves —Baths—Flues—Mode of Preparing their Fire-Wood—the Persian Method of Heating—Chinese Method of Flues—Method of Ancient Britons—Invention of Chimneys—Burning of Coals in England—Early Writers on the subject—Improvements in the Form and Construction of Stoves and Fireplaces 200

CHAPTER II.

Forms of Fireplaces and Chimneys—should be made to reflect Heat—Construction of Chimney Breast—Hollow Hearths and Backs for Fireplaces—Rumford's Principles of Construction—Errors in the Construction of Stoves—Register-Stove in a case —Jeffrey's Stove—Franklin's Pennsylvania Stove—Cutler's Torch Stove—Sylvester's Radiating Stove—Russian and Swedish Stoves—German Stoves—Hot-Air Stoves—Cockle Stoves—Dr. Nott's Stove—Dr. Arnott's Stove—Franklin's Vase Stove—Gas Stoves—Joyce's Stoves—Beaumont's Stove 210

The origin of the invention of employing hot water for diffusing artificial heat, appears to be hid in considerable obscurity. It is not improbable that, similar to many other discoveries, it has been evolved at various periods from the Alembic of Time. It seems, in one instance at least, to have been used in France about sixty years since. After fading from recollection for a space of about forty years, it appears to have been re-invented by the Marquis de Chabannes, and subsequently by Mr. Bacon and Mr. Atkinson. And it was the latter, who, undoubtedly, first gave to the apparatus the arrangement, under which it is now generally used in its most simple form.

Hood's note on the invention of hot water heating

Charles Hood was born on the 10th of April, 1805 and was the son of William Hood, an ironmonger of 18 Earl St. Blackfriars. There is little information of his early years but it is known that he assisted his father and elder brother with the business.

When still a young man Hood became extremely interested in practical science and Astronomy and on the 11th January, 1833 he was elected a Fellow of the Royal Astronomical Society. He also began research work into the Chemistry of the Combustion of Coal and it's application to warming purposes by stoves and grates.

Being an ironmonger by trade he was able to manufacture all his apparatus and he designed various stoves and grates. Hood also experimented with various types of coals and he deduced equations for complete and incomplete combustion. He also investigated how combustion differed with varying thickness of fuel on the fire bars.

The foregoing work gained Hood much scientific eminence and amongst other things he was awarded the Silver Medal of the Society of Arts.

This success encouraged Hood into writing his treatise on Warming and Ventilation and this was to become the standard work upon the subject for many years although he probably did not realise this at the time. In his book he laid down many important principles.

Hood also made a few remarks about Ventilation but primarily his treatise dealt with heating.

In 1837 his complete writings were published and they were widely read throughout the country. He was awarded, for this, the Telford Medal by the Institution of Civil Engineers. The year 1843 saw him further honoured by being elected a fellow of the Royal Society. By now he was recognised as an authority on Heating and Ventilation and he was consulted by the government on the ventilation and warming of the new Law Courts but unfortunately the work had proceeded too far for his suggestions to be adopted.

While engaged on his scientific work he had still been running the ironmasters business with his elder brother but when their premises were taken to help form the new St. Paul's station they retired from business.

With the money that he had obtained from business and scientific work Hood was active in other fields. He founded the British Home for Incuribles to whom he was a generous donor and he was made Chairman from 1861 - 1866. He also took an active interest in the running of King's College and Westminster Hospital.

Hood was now living at Leinster Gardens, Bayswater and this was where he died on the 10th of December 1889 aged 84. At the time of his death he was nearly, if not quite the oldest fellow of the Royal Society in date of election

Opportunity should be taken to praise Hood for his labour and researches. When it is remembered that his book, now in the 6th edition, was first published in 1837 when warming by hot water was practically unknown it seems remarkable that the rules and tables he laid down were used for well over 50 years.

Finally it can be said that had it not been for Charles Hood and his contemporaries the Heating and Ventilating industry could never have made such great progress and reached the high standards of today.

(Text is from a National College Student Thesis of 1958)