



GEORGE JENNINGS
1810-1882



Sanitary Pioneer and Company Founder



GEORGE JENNINGS was born at Totton, Southampton on 11 November 1810. He had no formal apprenticeship, but worked with his uncle who was a plumber and glazier. He moved to London in 1831 and set up on his own in Lambeth and then in 1838 at Charlotte Street, Blackfriars. In 1857 he moved to Holland Street, Blackfriars and finally to Palace Wharf, Stangate, where, by the 1890s, the company employed over 1,000 men.

George Jennings was unquestionably one of the greatest sanitary pioneers of Victorian Britain. He displayed considerable technical ingenuity and was responsible for many important innovations between the 1850s and the 1870s. Not all his ideas were a success, but he can be credited with the invention of wash-out closets, twin basin or plug closets, valveless water waste preventers and tip-up wash-basins. His first patent, for india-rubber lined taps, was taken out in 1847, and for this he was presented with a Royal Society of Arts medal in person by Prince Albert. In 1851 he offered to install the public conveniences at the Great Exhibition. His offer was initially turned down, but eventually accepted and he was awarded a prize for his water closet. The success of his facilities led to similar contracts at many important international trade fairs, including London in 1862, Paris in 1867 and Philadelphia in 1876, ensuring worldwide recognition for his sanitary fittings. He also constructed the sanitary fittings at the British hospitals at Varna and Scutari during the Crimean War.

In his early patents Jennings described himself as a brass founder, but he subsequently became involved in other manufactures relating to the production of sanitaryware. In 1854 he founded the South Western Pottery at Parkstone, Poole, Dorset. This became famous for its manufacture of sanitaryware and his own patent drain pipes as well as chimney pots, decorative brickwork and terracotta. His stoneware drain pipes were used for the laying of main drains in Portsmouth. Appreciating the value of india-rubber as a sealant in sanitaryware, he began his own production of rubber goods in London and at a branch factory in Birmingham. His forty or so patents included an improved rubber band and several varieties of seals for bottles and jars. His other business ventures included the development of housing in Clapham near his home.

He died on 17 April 1882 following a carriage accident and was buried at Norwood Cemetery, London. He married twice and had fifteen children and after his death the business was carried on by his sons who continued to use his name. They introduced one of the very first pedestal water closets, the 'Pedestal Vase' in 1884, and then in 1894, 'The Closet of the Century', one of the best-known British syphonic closets.



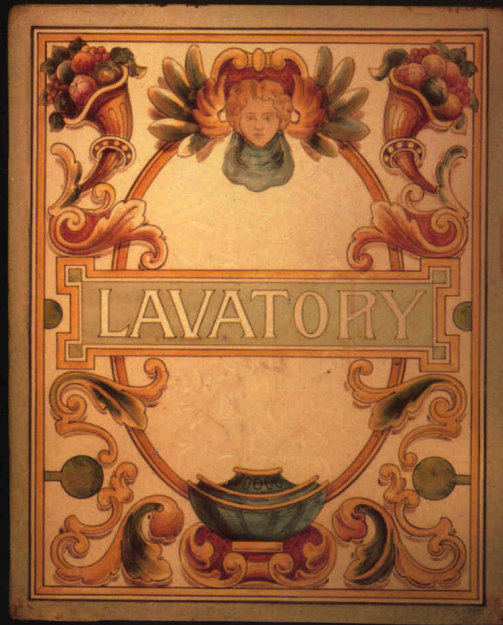
George Jennings. (*Russell-Cotes Art Gallery and Museum*)

From Bogs, Baths & Basins," David J Eveleigh, 2002 (CIBSE Heritage Group Collection)



Detail of Jennings's "Lift Up Wash Basin, c.1900

TEMPLES OF CONVENIENCE
AND
CHAMBERS OF DELIGHT



LUCINDA LAMBTON

A Look at Water Closets, 1997 (CIBSE Heritage Group Collection)



WARREN SEYMOUR JOHNSON
1847-1911



Pioneer of pneumatic control systems



[128] Warren S. JOHNSON

1847-1911

Born in Vermont. Worked in Wisconsin as printer, superintendent of schools, and then a surveyor of the Plains. Later appointed Professor at the State Normal School, Whitewater (1876). Used his laboratory for experiments with electric storage batteries. Johnson also experimented with control of the school's heating system. As recounted by his son, Paul, many years later (1939), "The Normal School was heated by enormous hot-air furnaces. On cold days when they were going full blast, from the large registers in the floor of the lower halls, we could see the red glow of the cast-iron furnaces. The only control of room heat was by hand-operated dampers at the furnaces. Once an hour or so, the janitor would make the rounds of the rooms and note which rooms were too warm or too cold. He would then go to the basement to open or close dampers accordingly. This disturbed the classes considerably, so Professor Johnson installed electric thermostats in each room and connected them to annunciators, which he invented, so that when the thermostat made contact on the warm side, the indicator for that room would show 'Warm' and ring a bell, and when the contact was on the cold side, the indicator showed 'Cold.' All the janitor had to do besides firing his furnaces and keeping the place clean, was to watch the annunciator every time it rang and shift the proper damper. That was the first Johnson System of Temperature Regulation." Warren Johnson was granted a patent (USP 281,844: 1883) for an *electric tele-thermoscope*. Two years later the Johnson Electric Service Co. was established in Milwaukee. However, Johnson soon received a patent for his first pneumatic system of temperature regulation (1885) using his experience of developing giant public clocks powered by air pressure. He went on to obtain some 50 patents in fluid-powered control devices.

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

Family Wealth
Economy,
Comfort, Health.

The Husband Explains.

Wife.—John, dear, how do you account for your present even temper?

Husband.—Can't you guess, Mary?

Wife.—I can't imagine unless it is our new furnace draft regulator.

Husband.—Exactly, Mary. It may seem odd to admit this, but the comfort and economy that has been added to our home by the Johnson Draft Regulator is simply remarkable. It saves vexatious annoyances, and saves money besides. It insures an even temperature, and that means an even temper. An even temper keeps me at home, and completes our domestic happiness.

The moral is plain. How often do not the things which appear insignificant, contribute the largest share towards completeness of life. A moment's reflection only will convince that a

JOHNSON FURNACE DRAFT REGULATOR

can effect a decided saving in household expenditure. A thermostat placed in your room automatically regulates your furnace drafts, without taking up your time or attention. This thermostat is specially devised to meet the wants of private families.

Price of the Draft Regulator, complete, put up, \$25.00. For sale by all furnace dealers.

THE JOHNSON ELECTRIC SERVICE CO.,
12 Pearl St., Boston, Mass. 91 Diamond St., Pittsburgh, Pa.
25-26 Hodges Bldg., Detroit, Mich. 120 Sycamore Street, Milwaukee, Wis.
Johnson Heat Regulating Co., 104 N. Tenth St., St. Louis, Mo.
Electric Service Co. of Buffalo, Erie County Bank Building, Buffalo, N. Y.
Johnson Temperature Controlling Co., 411 Dearborn St., Chicago, Ill.
Johnson Temperature Regulating Co., 240 Fourth Ave., New York City.
Philadelphia Electric Service Co., 41 N. 11th St., Philadelphia, Pa.

Advertisement of 1896 ("Right for the Times")


JOHNSON
CONTROLS

RIGHT FOR THE TIMES

100TH ANNIVERSARY



*Johnson Controls centenary brochure "Right for the Times," 1985
(CIBSE Heritage Group Collection)*



AT THE START. Warren Johnson fostered many of the principles that have guided the Company through its 100 years. Among them, unquestioned integrity and a single-minded dedication to deliver on its promises.

In July of 1911, Warren Johnson wrote to his sons, Paul and Carl, from Los Angeles regarding the disposal of the few personal belongings he had left behind in Milwaukee. Among the furniture and knick-knacks was a silver loving cup presented to him by his employees. Johnson expressed that he would like it to remain in the office because "except for the business which I have built up, it will be my only monument."

That Johnson foresaw the endurance of the business he created has proved to be one of his truest

visions. Whether the Company that continues to bear his name is the monument of which he dreamed is impossible to tell.

THE INVENTOR

Warren Seymour Johnson, a member of the family's tenth generation, was born in Rutland County, Vermont in 1847. Two years later his family moved to Wisconsin, first to Waukesha, then Kilbourn City (Milwaukee) and then, nearly 300 miles northwest to Dunn County.

In western Wisconsin Warren Johnson was a printer for a Durand newspaper, taught in Menomonie and for a time was superintendent of schools and a surveyor of this part of Wisconsin's central plain. After moving southeast and fulfilling a two-year term as Juneau County's superintendent of schools, Johnson was appointed a professor at the State Normal School in Whitewater in 1876. It was recalled that Johnson was "one of the most strikingly original teachers," at times impressing his students with the merits of science, mathematics, drawing and penmanship, and even co-authoring a textbook, "Work with Words."

(From "Right for the Times")

Warren S. Johnson

Although thermostats were manufactured "in considerable quantity" prior to 1885, one thermostat design for widespread application to heating depended on the combined use

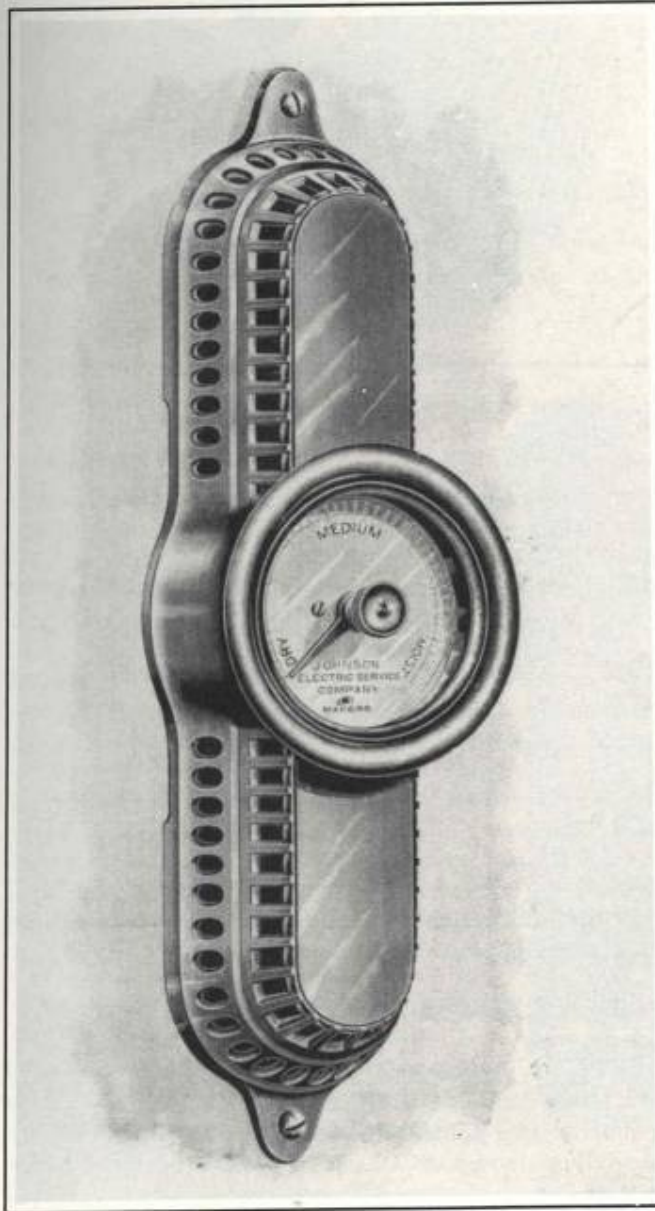


Figure 10-13 Johnson humidistat, c. 1905 (Johnson Controls).

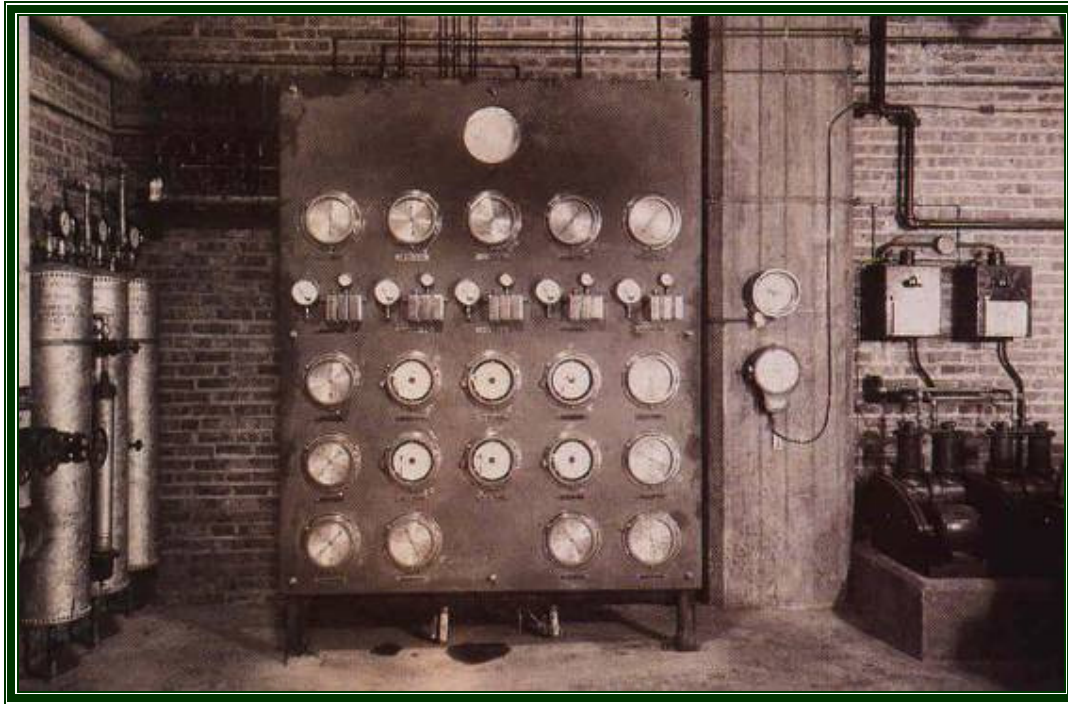
of electricity and compressed air, a concept pioneered during this time by Warren S. Johnson. Johnson was born in Rutland County, Vermont, and as a young boy showed a strong interest in inventions, from sketches and descriptions "covering a wide range of subjects in mechanics, chemistry and electricity." He became a country schoolteacher and later a professor of science and art in Wisconsin. In 1873, he invented an "annunciator" system at Whitewater College, Wisconsin, to alert the janitor as to which room required heat, but "his first bonafide venture was the development of a storage battery in 1883." In that same year, he began to experiment on electric thermostats and, on July 24, was granted a patent for the "electric thermoscope."³⁵

The idea of using compressed air to operate his valves and dampers suggested itself to Prof. Johnson through his familiarity with the small hand air compressors used in various experiments in his physical laboratory at the Norman School. It was both powerful and elastic in its operation. It could be used to close a steam valve and hold it closed against pressure by means of piston or rubber diaphragm attached to the end of the valve stem. Air for his first systems was supplied from a hand compressor and by the use of a storage air tank, the janitor need pump up air once in a while between his other duties.³⁶

“Johnson’s ‘electro-pneumatic’ valve, patented in 1885, consisted of a very small compressed air valve which could be successfully operated by an electric thermostat and which in turn operated to supply and exhaust compressed air to and from the diaphragm valve or damper. Electricity was supplied from salammoniac batteries as dry batteries were not yet perfected. Compressed air was supplied by a diaphragm hydraulic air compressor at 15 lbs. per square inch pressure.”³⁷

From the invention of the “electro-pneumatic” valve, Johnson formed the Johnson Electric Service Company to manufacture temperature control systems to be distributed through local offices in Wisconsin, Minneapolis, New York, and Chicago. “The system was first applied to buildings heated by direct steam radiators with a diaphragm mounted on top of the valve”³⁸ (Figure XIV, color section). In 1902, the company moved to its own seven-story building in Milwaukee, which it still occupies. From 1914 to 1920, the company dominated three quarters of the temperature control market and worked on improvements to the design of thermostats to make them more reliable and serviceable and to be smaller in size. The Johnson Electric Service Company produced a number of thermostat cover designs to fit different needs, ranging from an ornate residential thermostat (Figure XV, color section) to hotel, office, and bath thermostats. During this time, the company also developed an entire line of temperature control systems (Figure 10-13).

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



A Johnson pneumatic control board ("Right for the Times")

11.4 PNEUMATIC CONTROL

According to Hollman, W. S. Johnson, a physics teacher from Wisconsin, was the first to use a pneumatic thermostat in about 1880.⁽¹¹⁾ The Powers patent (USA, 1889) used vapour pressure to move a diaphragm, the other side of which was connected by a tube to the actual regulating mechanism. The first application seems to have been in 1901. Little development took place until compressed air was used as the source of power. An electro-pneumatic system (Fig. 11.6) was described in *The Engineering Record*, of 9th August, 1890, having been installed in the Mechanics Bank Building in New York:⁽⁴⁾

"This thermostat may be set to work at any temperature, and is claimed to operate satisfactorily within a range of 1 degree. The figure shows the back of the instrument that is mounted on a brass bed plate P, to which are fixed the standards A B B that carry the mechanism and have holes Z Z for attaching to the wall or other convenient support. One end of the lever C is connected to A by the pivot D, and the other end by a screw F tapped through lug E.

The expansion bar I is made of a plate of brass and a plate of rubber riveted together and attached to lever C at pivot D.

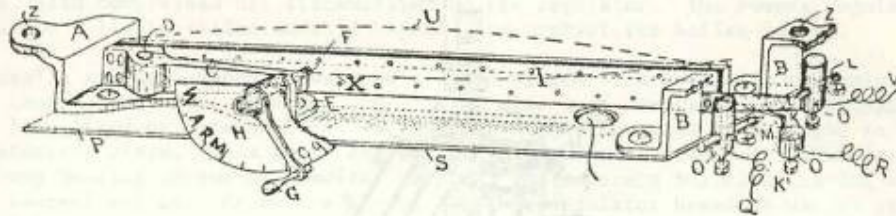


Fig. 11.6. Electro-pneumatic control system - the electric thermostat (ca. 1890).

The other end of the bar is free and carries a platinum contact bar K. O O O are bind posts fixed on plate B, and receiving the circuit wires Q R V, and the adjustable contact points L and M. The rubber and brass in bar I expand and contract differently for the same differences of temperature, so that a rise in temperature will make it bow out to the (exaggerated) position U, and throw K to K' in contact with M, thus completing the electric circuit from R through Q and opening the valve.

A fall in the temperature bows out I in the opposite direction to the (exaggerated) position X and makes contact between K and L, thus completing the circuit from R to V and closing the valve.

By moving lever G along the scale H, screw F is turned and swings lever C on its pivot D so as to set the bar K nearer to either L or M and make the thermostat operate at any desired temperature within 15 degrees of that originally provided for".

The electricity supply was provided by a battery, and in order to prolong its life when the armatures reached their extreme positions the current through the conductors was switched off by movement of the contact springs. The steam valve itself was operated by compressed air fed to the side of a circular rubber diaphragm. With air pressure removed, a spiral spring returned the valve to the open position. On some models the valve stem passed out through the top of the valve, through a stuffing box, and was fitted with a hand wheel to give independent manual regulation.

Johnson soon turned to an entirely pneumatic system (Fig. 11.7). The positive type thermostat was described by Jones at the IHVE Annual General Meeting of 1912:

"A is a wall plate which is fastened to the wall and is generally put in place before the walls are plastered and is therefore left flush with the surface of the wall. A brass block, B, serves for the attachment of the thermostat to the air pipes, which are usually concealed behind the wall surface, in the plaster. Pipe C leads from the air compressor, and pipe D leads to the air motor at the valve or damper which it operates.

E E, are two pin valves used to regulate the air. The upper one is used to shut off the main air supply (if it is desired at any time to remove the thermostat); the lower one is used to retard the air going to the motor on the valve or damper when it is desired that they should move slowly.

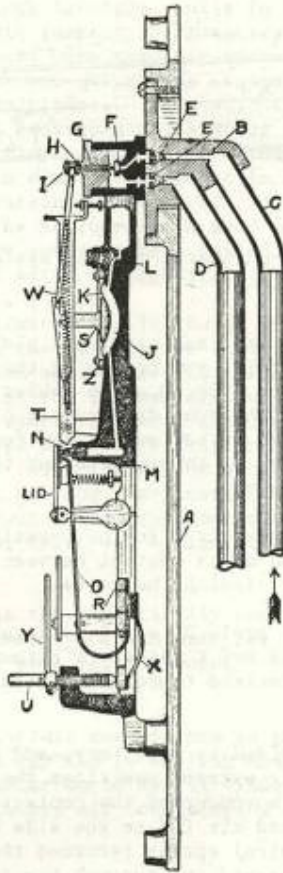


Fig. 11.7. Johnson pneumatic bimetal thermostat (ca. 1912).

From the valve E, the air is led up the crooked passage shown to the air valve F. When in the position shown it will be seen that the air can go no further. F is attached to the stem, G, which passes up through the outlet, H, and has the grooved head, I. Now, if F be moved up to the inside opening of H, it will close the opening and will open the pipe C. It is evident that since F is against H, this air cannot escape to the opening, but it can pass to the pipe D, and thus to the air motor or diaphragm valve on the steam or hot water (or damper) and close same."

For operation to be automatic the valve F must respond to movements of the thermostat strip caused by temperature changes. This is achieved by a small "air motor" with a rubber diaphragm.

This so-called "positive" thermostat was designed for steam service. Other types were designed to provide a "graduate" action, so that the valve or damper being controlled operated gradually. Many of these positive thermostats were used together with a diaphragm valve for the control of radiator systems.

(Extract from "Building Services Engineering,"
Neville S Billington & Brian M Roberts, 1982)



WALTER JONES

c.1846-1924



8. The First IHVE Summer Meeting, Stourbridge, 1899. President Walter Jones. CIBSE Archives.

2nd President IHVE 1899

EARLY IHVE ASSOCIATIONS

It was in 1836 that John Jones set up a foundry in Enville Street, Stourbridge, and penny-farthing bicycles are known to have been one of his original products. Walter Jones joined his father in 1862 and his inventive brain was soon at work in the area of hot waterheating. The 'Jones Improved Expansion Joint' and his 'Patent Pipe Cutter' were two early products that established the company. In 1896 Jabez Attwood joined Walter Jones to form the new company **Jones and Attwood Ltd.** This partnership was to last only ten years, after which Jones continued on his own, although the name remains to this day. The early catalogues produced by the company offered for sale a complete range of heating equipment from the

(From "The Building Services Engineer (CIBS Journal)," April 1977)

pipe work through to the boilers, all designed and developed by Walter Jones.

In 1890 Jones issued his *Heating by Hot Water*, a most advanced and respected text book on hot water systems. This book was to become a standard reference book for many years.

The company expanded rapidly and it became clear that a larger area was necessary. The company moved to its present location in Old Wharf Road in 1894. This was an ideal site, for the canal next to it was in full use and the now vanished Stourbridge Railway Goods Station was fully operational.

Recognition of Walter Jones' ability in the heating and ventilating industry was confirmed when he was appointed the second President of the IHVE in 1899. His son E. Reginald Jones was President in 1930.

Limited liability was granted in 1910 and the company has remained a private company. Sales were mainly to the trade through the catalogue and by reputation. The design and installation of heating systems in large public and private buildings throughout the area was undertaken, a division of the company which has been expanding ever since.

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WITH
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ON THE BEST METHODS OF

HEATING

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BUILDINGS.

*TREATING ON THE HIGH AND LOW PRESSURE SYSTEMS,
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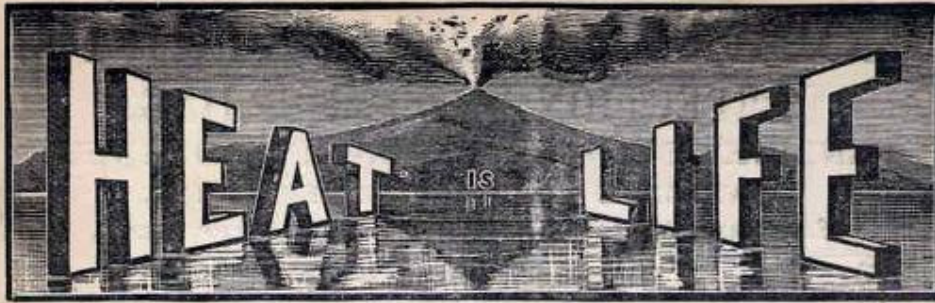
LONDON

CROSBY LOCKWOOD AND SON

7, STATIONERS' HALL COURT, LUDGATE HILL.

1890.

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LOW PRESSURE,

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1894.

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Either fixed complete or materials supplied.

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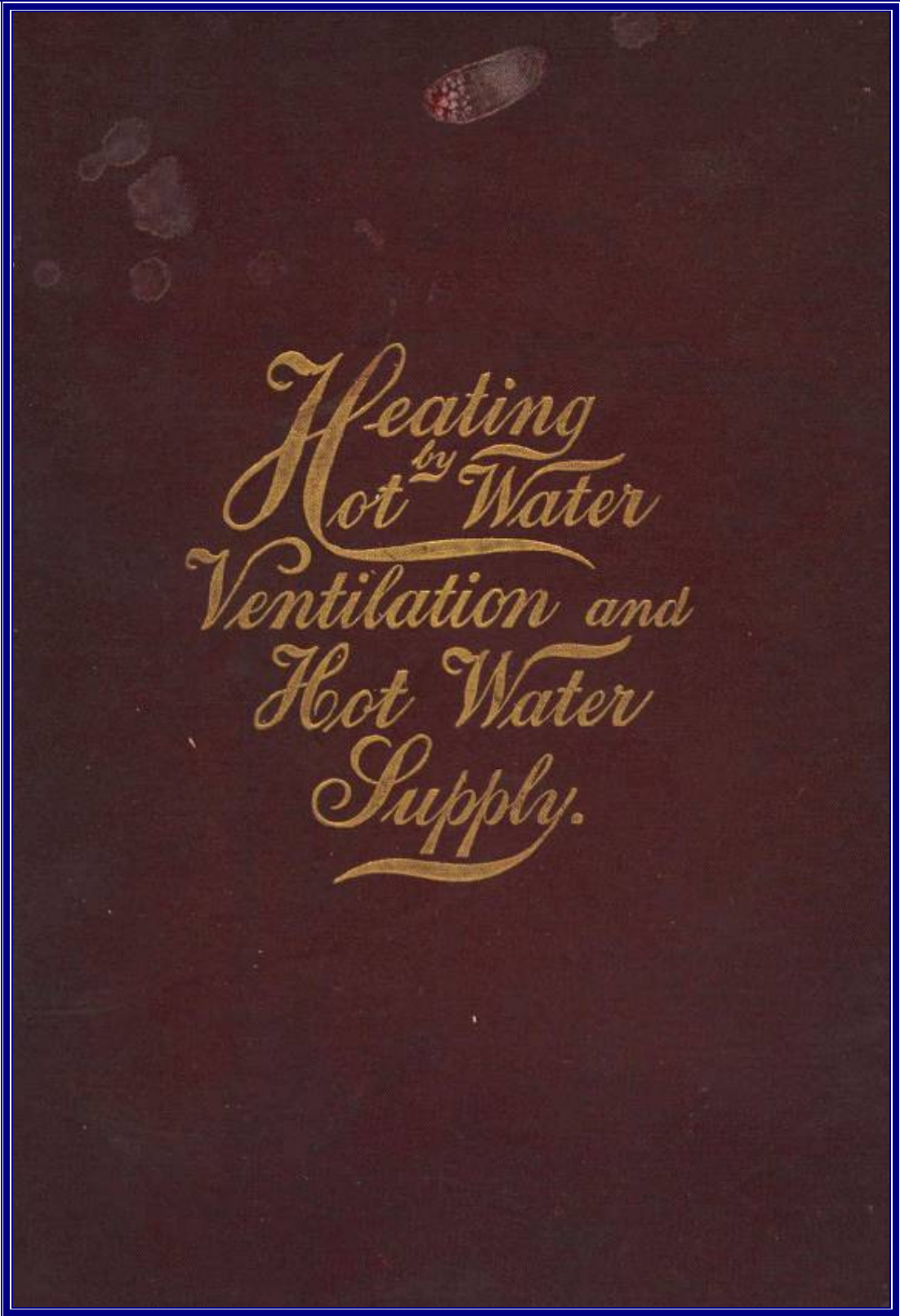
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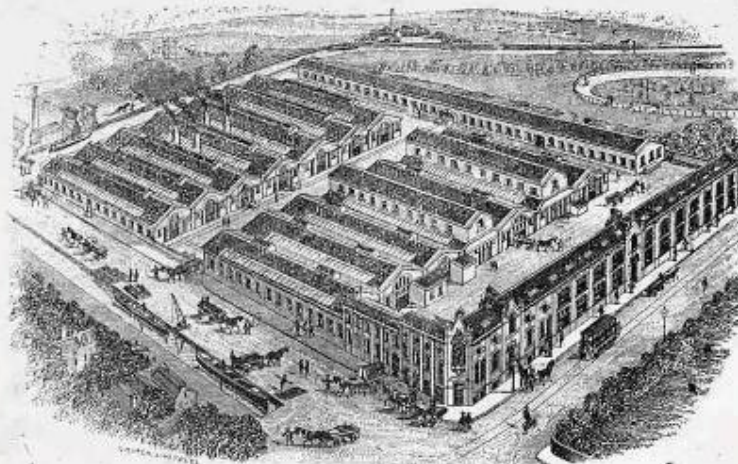
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*Heating
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*Walter Jones' textbook 3rd edition 1904
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(xxxii.)

FOOTNOTE

JONES

Jones & Attwood, ## Titan Works, Stourbridge. Telegraphic address "Heat". In 1836, John Jones established a foundry in Enville Street, Stourbridge. His products included "penny-farthing" bicycles. Walter Jones joined his father in 1862 and took an interest in the area of hot water heating. He developed the "Jones's Improved Expansion Joint" and his "Patent Pipe Cutter". The Company manufactured a range of heating appliances, including "duplicate boilers", and installed high and low pressure hot water and steam heating systems. They won exhibition medals in 1875, 1881 & 1904. At the turn of the century, they carried out heating in public, private and horticultural buildings, and specialised also in laundries, swimming baths and Turkish baths. Walter Jones wrote the classic textbook "Heating by Hot Water", first published in 1890 and spent much time investigating the cause and prevention of boiler explosions (though some of the more dangerous experiments were wisely left to an assistant). **Jabez Attwood** joined Walter Jones to form the new Company in 1896, but the partnership was dissolved some ten years later. [BSE,1/45]. *Walter Jones, 2nd President IHVE 1899; E Reginald Jones, 29th President IHVE, 1930.*

(Entry from CIBSE Heritage Group Records)

*The three editions of Walter Jones' textbook shown above are
from the CIBSE Heritage Group Collection*