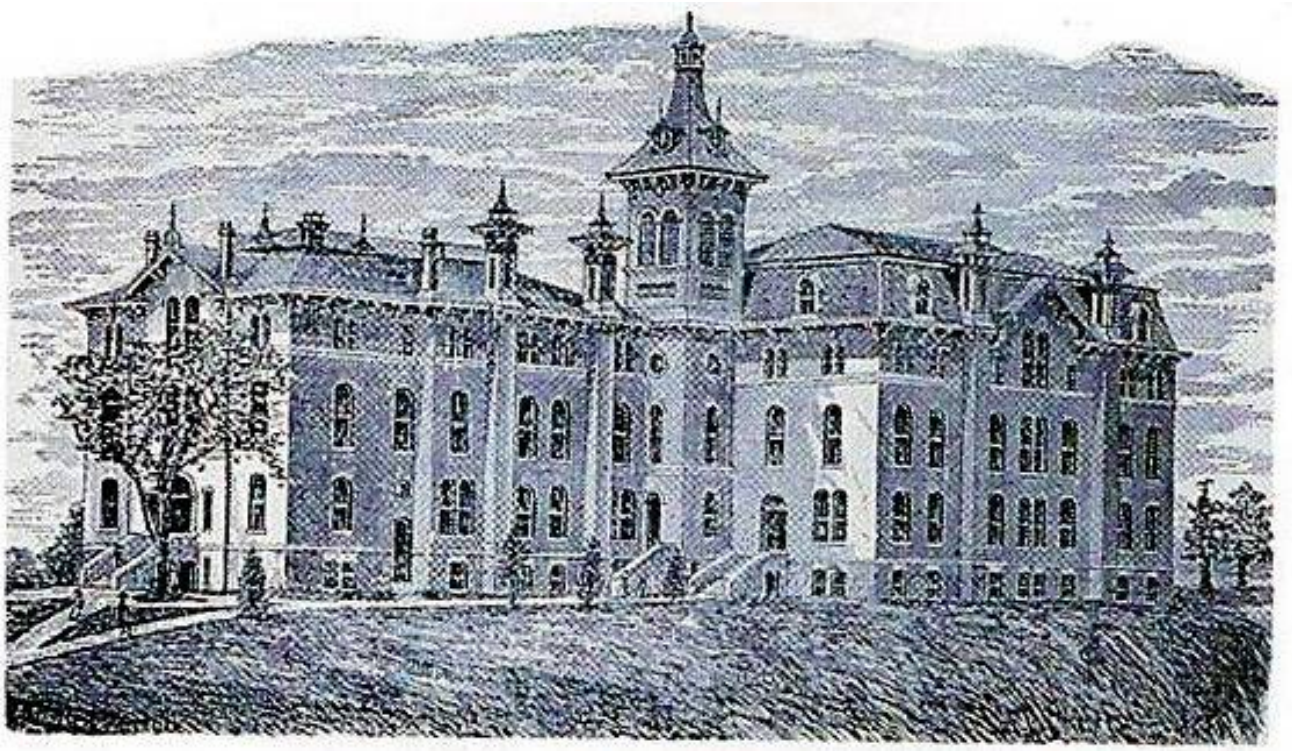
WARREN S JOHNSON and AUTOMATIC CONTROLS

by Brian Roberts, CIBSE Heritage Group

Warren Seymour Johnson, 1847-1911

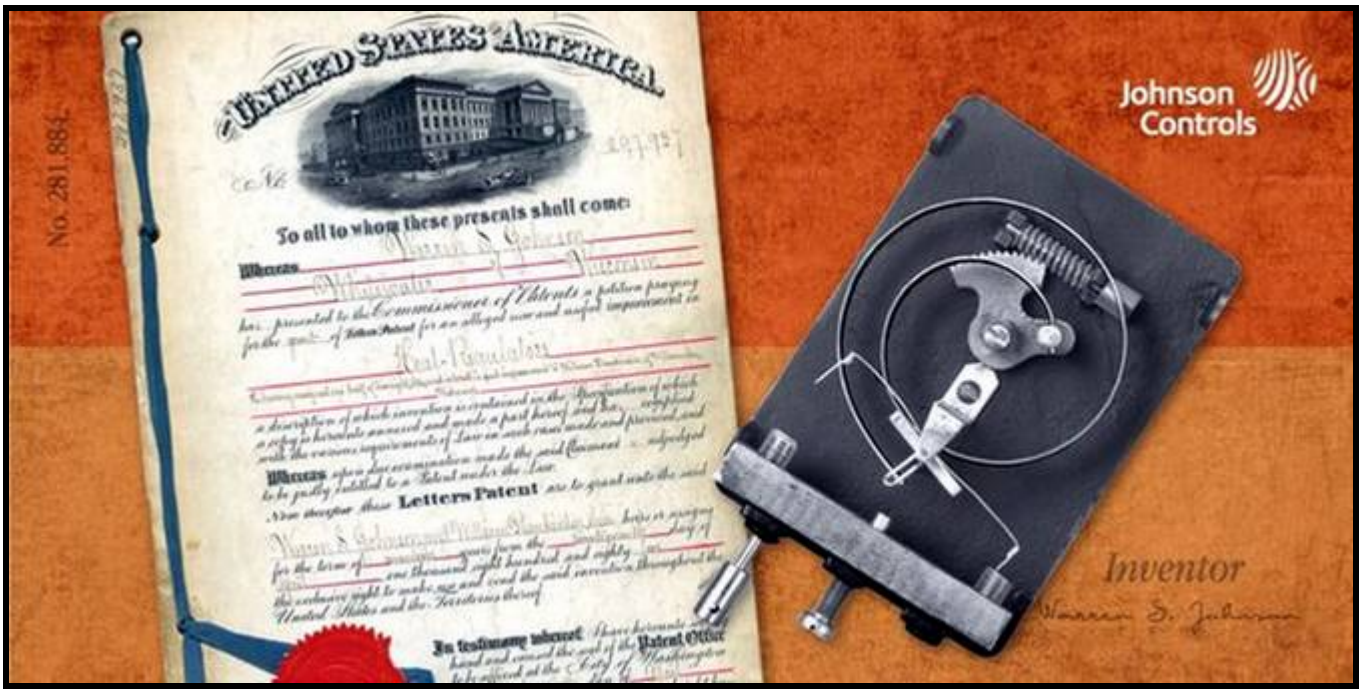
Johnson was born on the 6th November, 1847, in Leicester, Vermont, his family shortly moving to Wisconsin, eventually settling in Menomonie. He had only a limited formal education but taught himself by studying scientific subjects. He worked for a time as a printer, surveyor and then schoolteacher before becoming first principal and finally school superintendent. In 1876, he obtained a teaching position at the State Normal School in Whitewater (now the University of Wisconsin). In about 1881, he was appointed Professor of Natural Science.



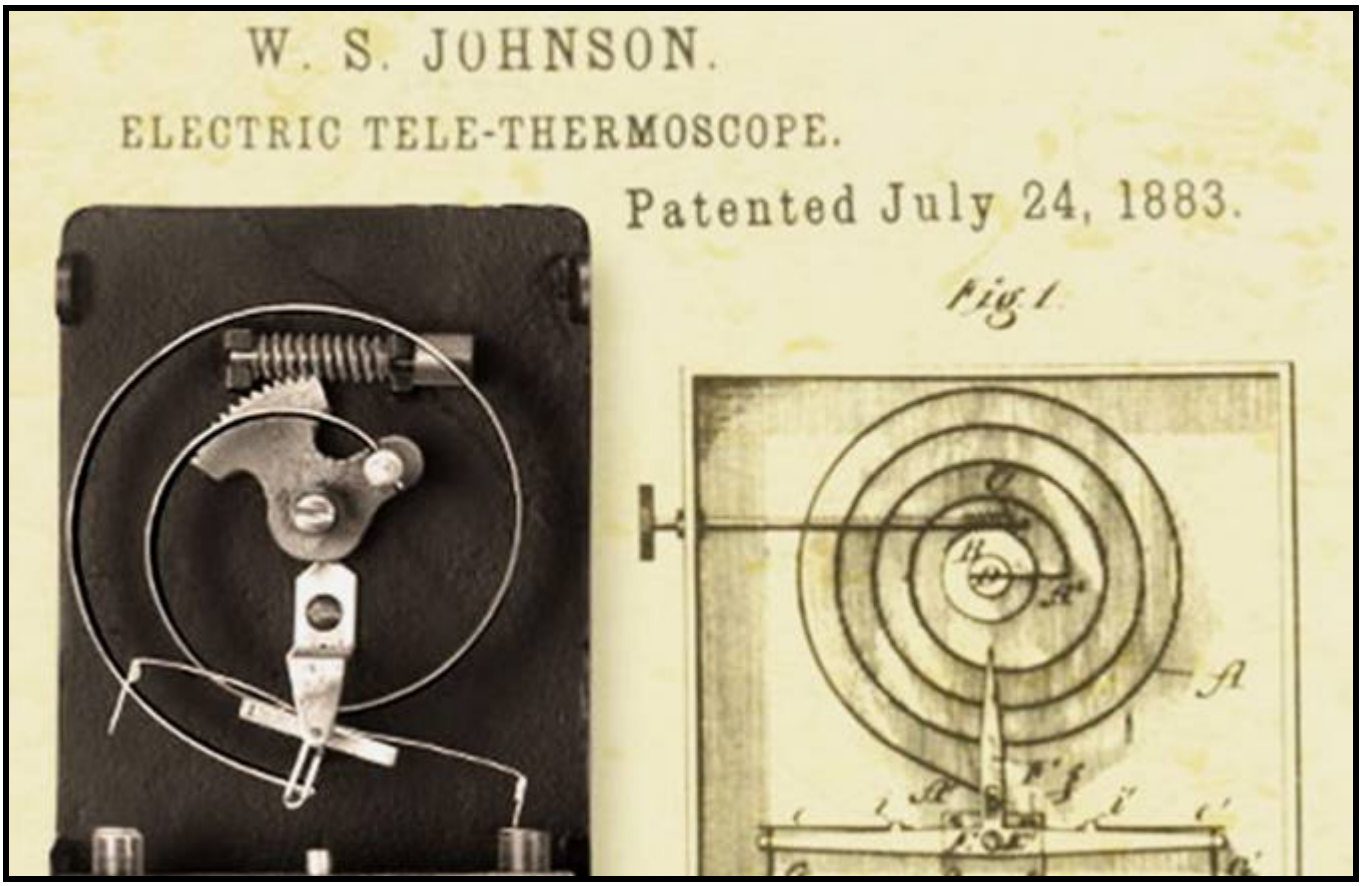
The State Normal School in Whitewater, Wisconsin

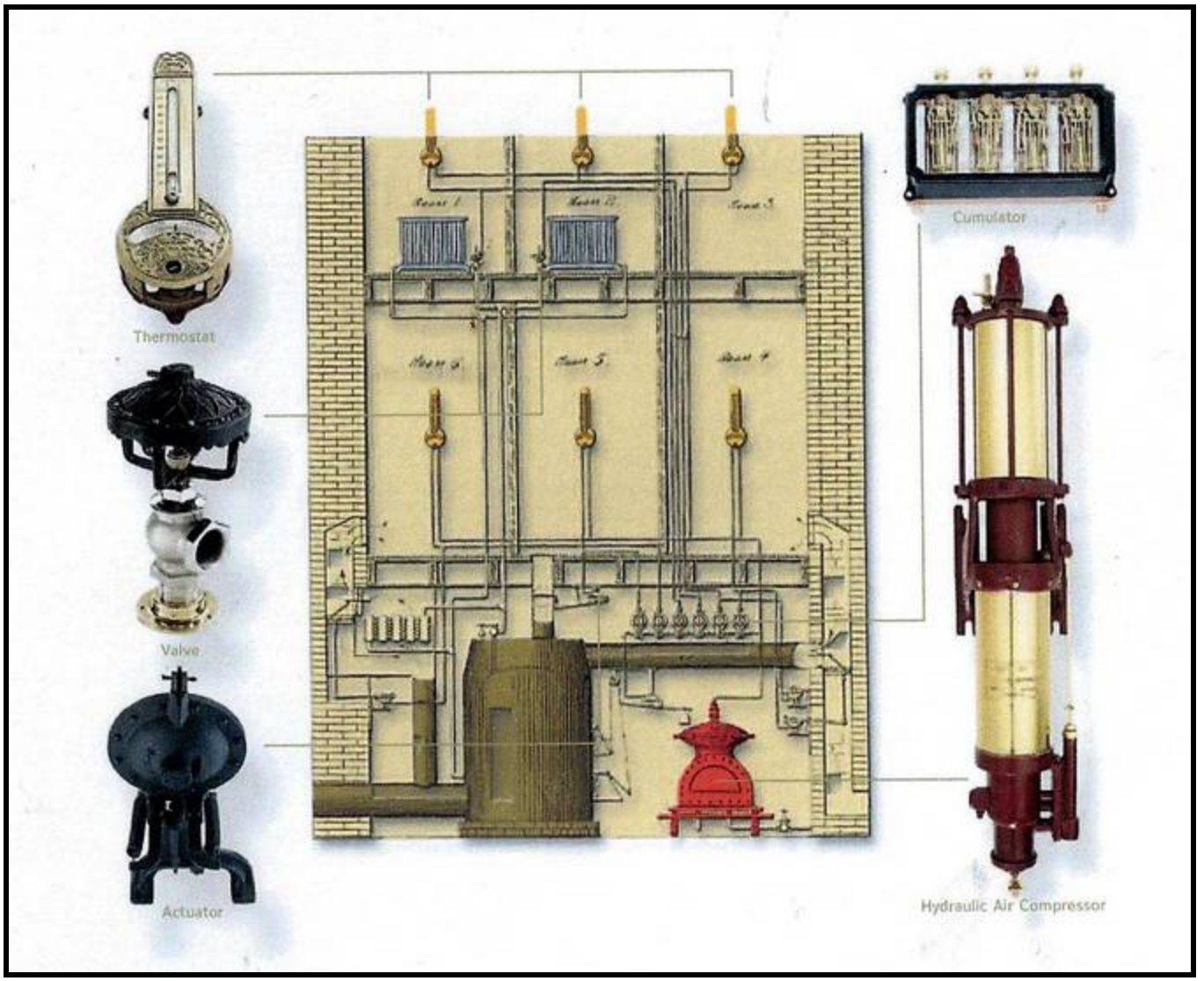
It is said that Johnson had an enquiring mind, being particularly interested in electricity. The story is he "came up with the ideas for automatic temperature control while teaching at Normal School in Whitewater, Wisconsin in the 1880's. Originally, janitors would have to enter each classroom to determine if it was too hot or too cold and then adjust the dampers in the basement (warm air system) accordingly. Johnson sought a way to end, or at least minimise the classroom interruptions and increase the comfort level of the students."

So Johnson developed a thermostat which he named an *electric tele-thermoscope* in his US Patent No. 281,884 of 24th July, 1883. "It was a bi-metal coiled thermostat with a mercury switch, which could be used to ring a bell to alert the fireman to open or close the heating damper." While not the first bi-metal thermostat, Johnson received financial backing to manufacture the device, establishing the Johnson Electric Service Company in Milwaukee in 1885.


No. 281,884.
UNITED STATES PATENT OFFICE.
To all to whom these presents shall come:
Letters Patent
In testimony whereof
Johnson Controls
Inventor

1883


W. S. JOHNSON.
ELECTRIC TELE-THERMOSCOPE.
Patented July 24, 1883.
Fig. 1.
A



Johnson's Multi-Zone Temperature Control System

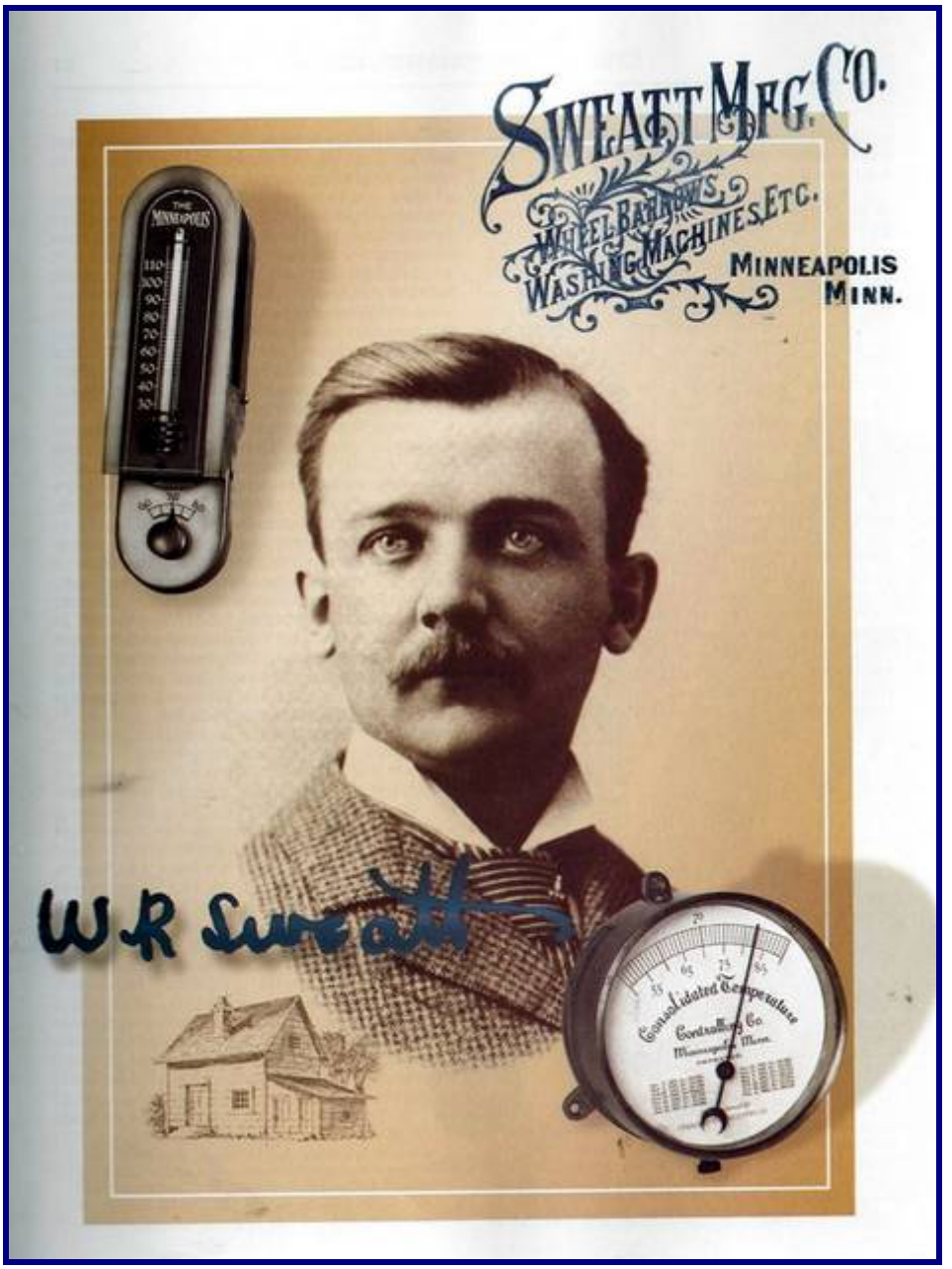
"Johnson's most notable contribution to temperature control was the automatic multi-zone temperature control system- a pneumatic system that used a bi-metal thermostat to control air flow through a nozzle and thereby operate a pilot regulator. The amplified air signal from the regulator was then used to control a steam or hot water valve on a heat exchanger, or to control a damper of a forced air system. He received a patent for the system in 1895 (US Patent No. 542,733)."

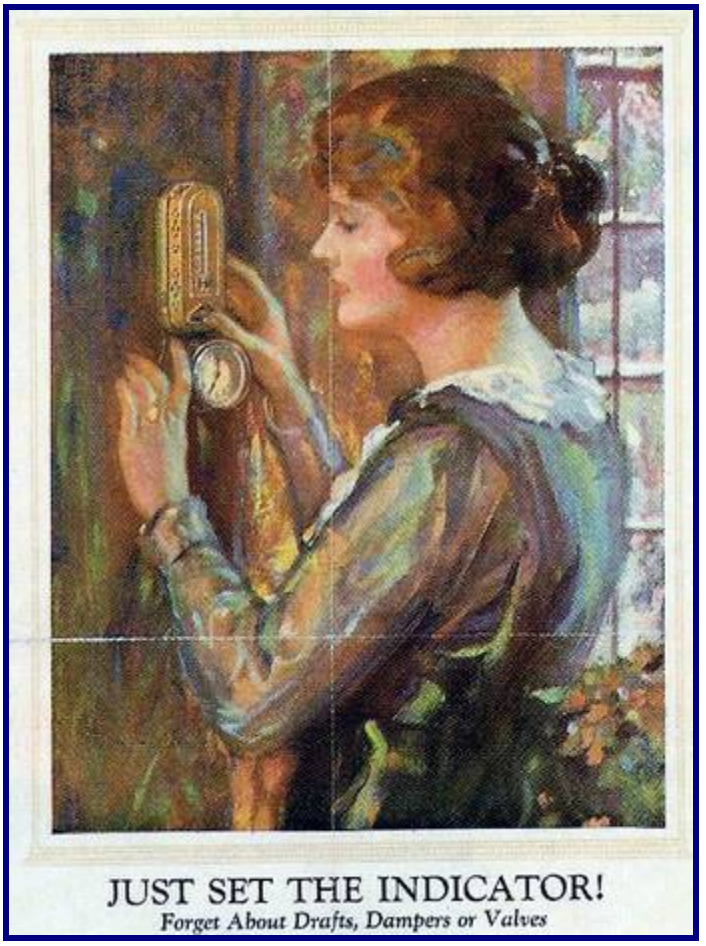
An early Johnson combined thermostat and thermometer

DEVELOPMENT OF AUTOMATIC CONTROL SYSTEMS IN THE USA

Warren Johnson was granted patents for his electric thermostat in 1883, established the Johnson Electric Service Company in 1885 and went on to develop a complete range of pneumatic controls. The company now operates world-wide.

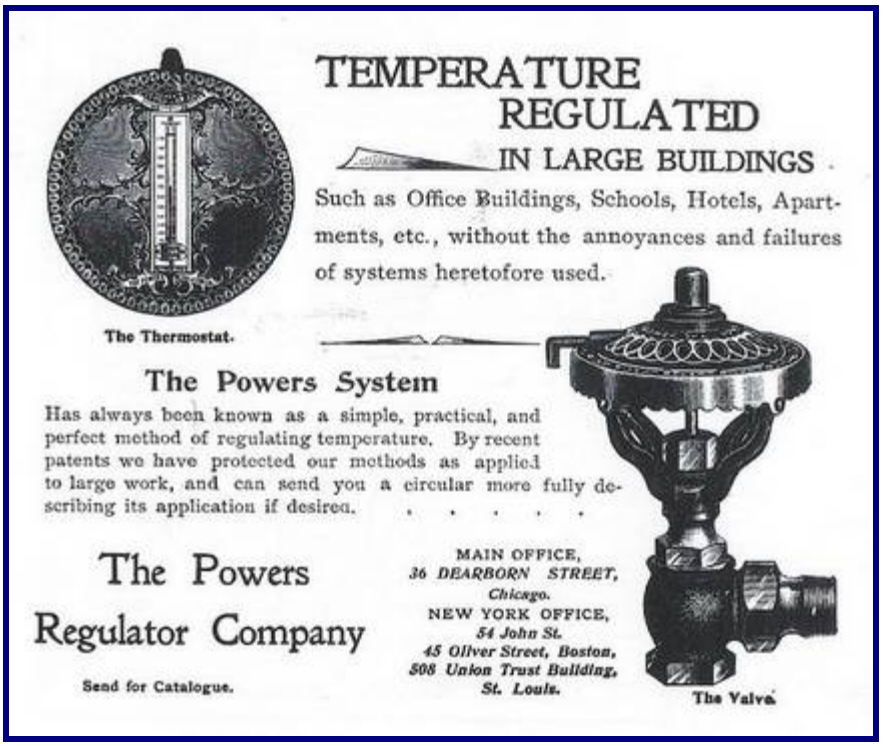
Meanwhile at the same time in Minneapolis, Albert Butz invented his *damper flapper* for heating furnace control and formed the Butz Thermo-Electric Regulator Company. When he left the company in 1888, it became the Consolidated Temperature Controlling Company which struggled financially. With the assistance of William Sweatt its fortunes improved and it became the Minneapolis Heat Regulator Company in 1912. In the 1920's, its largest competitor was the Honeywell Heating Speciality Company which had been started by Mark Honeywell. In 1927, William Sweatt and Mark Honeywell merged their companies to form the Minneapolis-Honeywell Regulator Company which grew to operate world-wide as Honeywell.





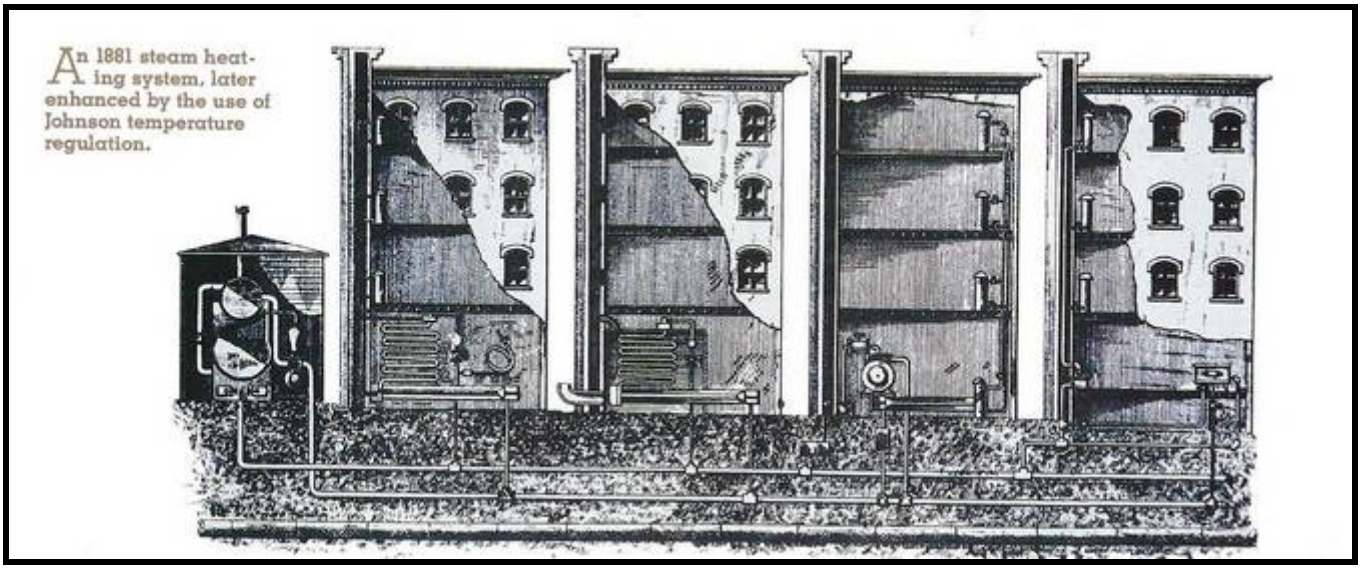
1926 Honeywell

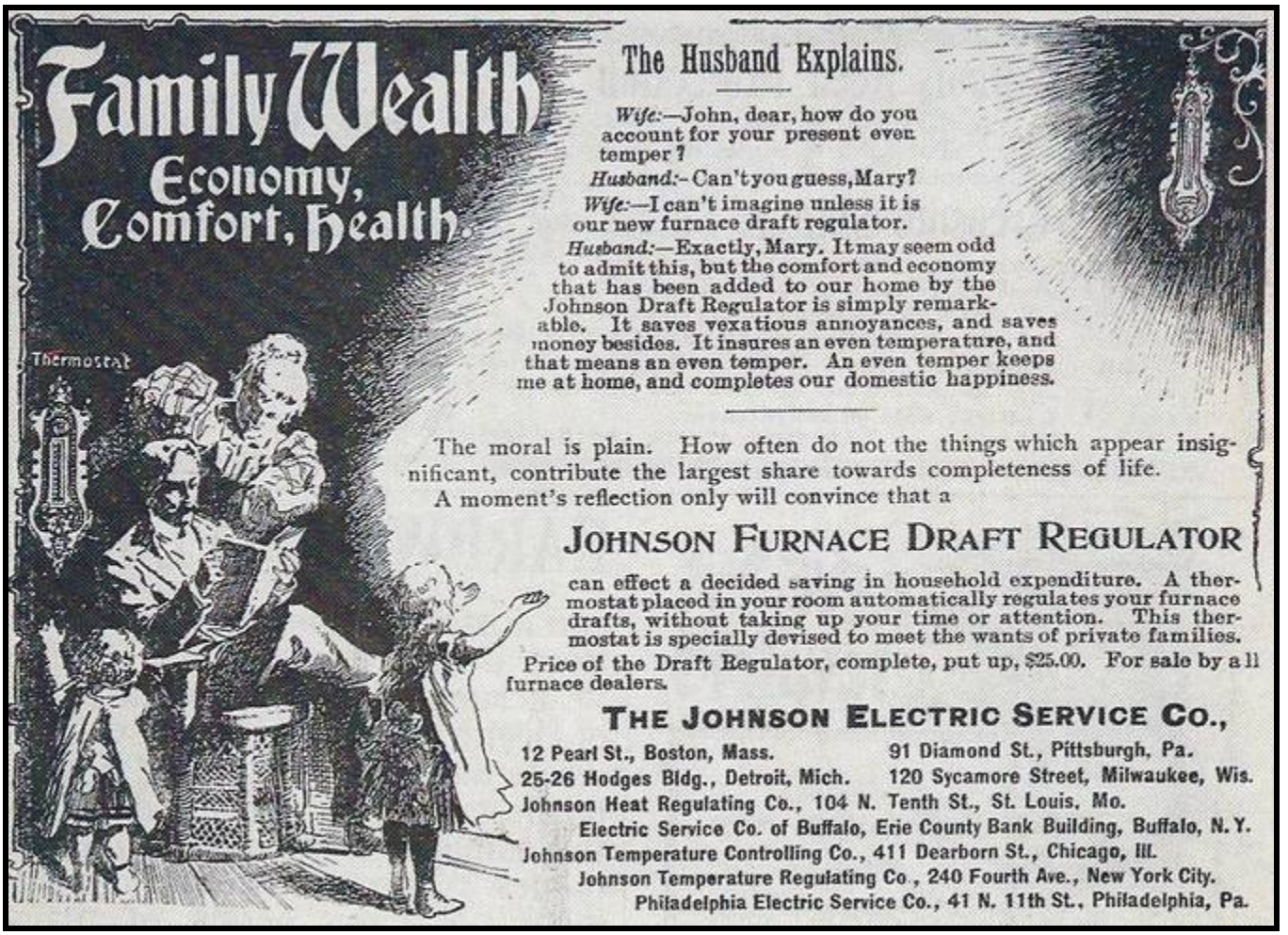
William Penn Powers formed his first company in LaCrosse, Wisconsin in 1867, entering the field of automatic controls when he set up the Powers Regulator Company in Chicago in 1890. The company manufactured a complete range of controls and provided systems for the new Chrysler and Empire State buildings.



1897

Development of Johnson thermostats from 1885 to 1970





An 1896 magazine advertisement

Wrecking A Building Soon As Completed

In addition to furnishing fuel consumption saving of from 15 to 35 per cent—often greater—The Johnson Pneumatic System of Temperature and Humidity Control *saves the building*. Without automatic control, offices are constantly overheated, and the humidity in offices decreased to naught. This excess, dry heat dries out the walls, floors and woodwork, warps them, cracks, opens the joints, and reduces the building's materials to lifeless brittle. Natural building depreciation is rapid enough, without hurrying it at the building's very beginning by this process of rack and ruin. Moreover, the building's desirability and rental value go down. All-told, the loss is enormous: and easily can be avoided.

For this very reason architects specify The Johnson Pneumatic System of Temperature and Humidity Control: to save the building from the foregoing disasters.

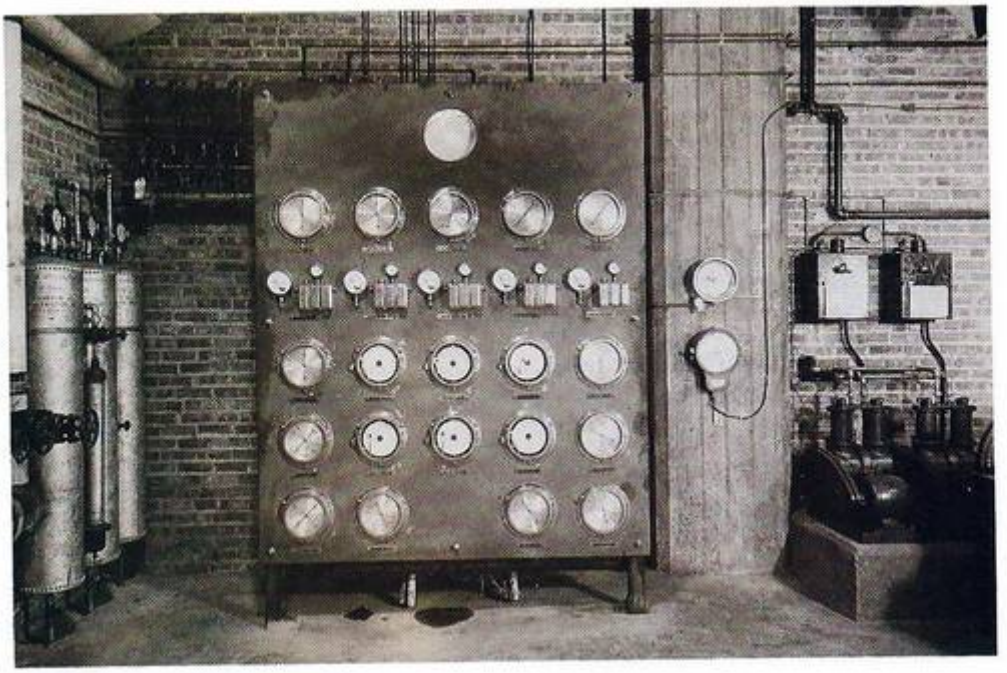
For the same reason install The Johnson System in your building: and, too, save the great difference of 15 to 35 per cent in annual fuel consumption cost.

JOHNSON SERVICE COMPANY

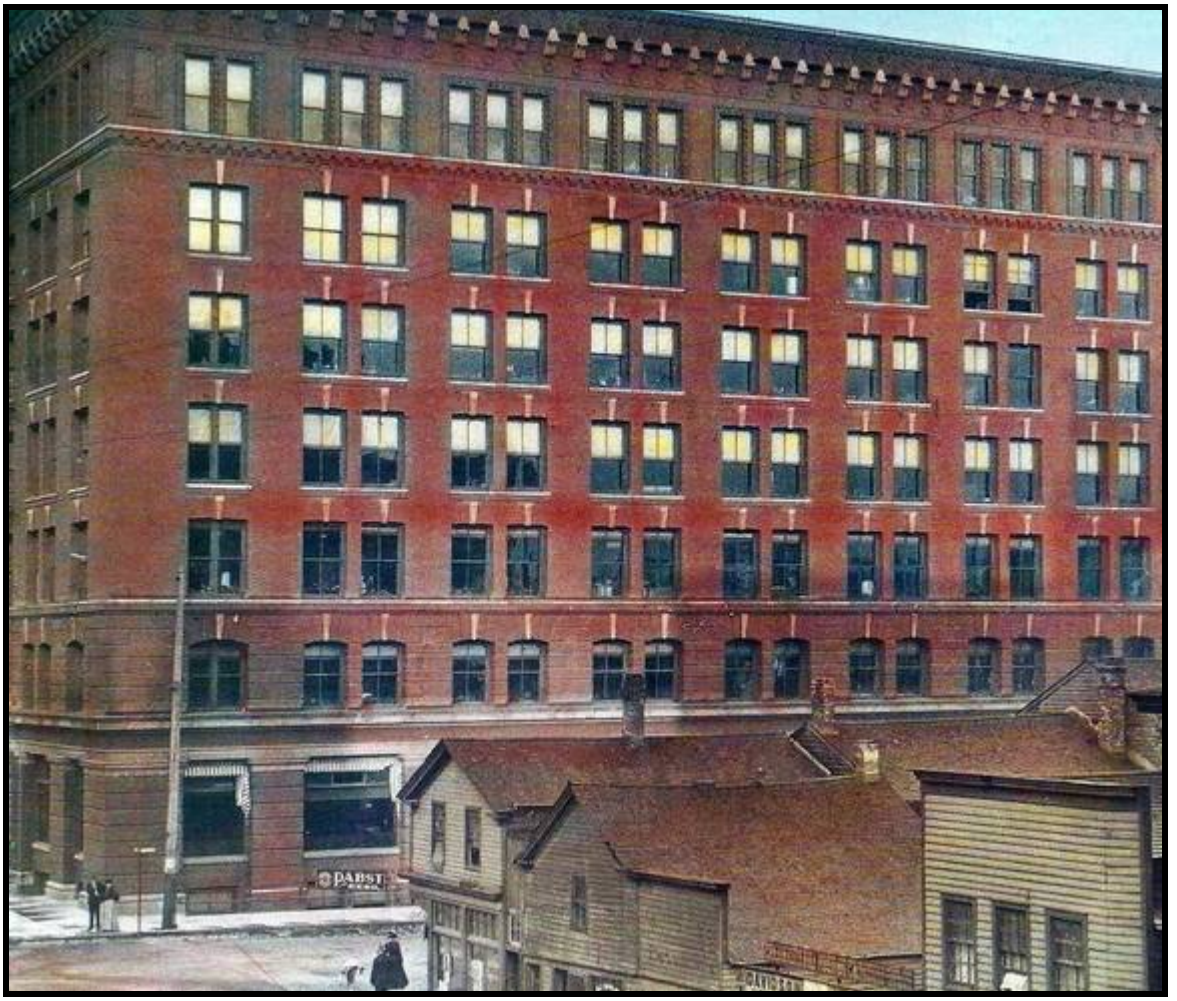
Factory and Main Office Milwaukee, Wisconsin

AUTOMATIC TEMPERATURE CONTROL FOR 30 YEARS TWENTY-EIGHT BRANCHES, UNITED STATES AND CANADA

A 1922 advertisement promoting energy saving



A typical control switchboard used in schools about 1920. A slate board displays the position of a number of valves and dampers located throughout the building.

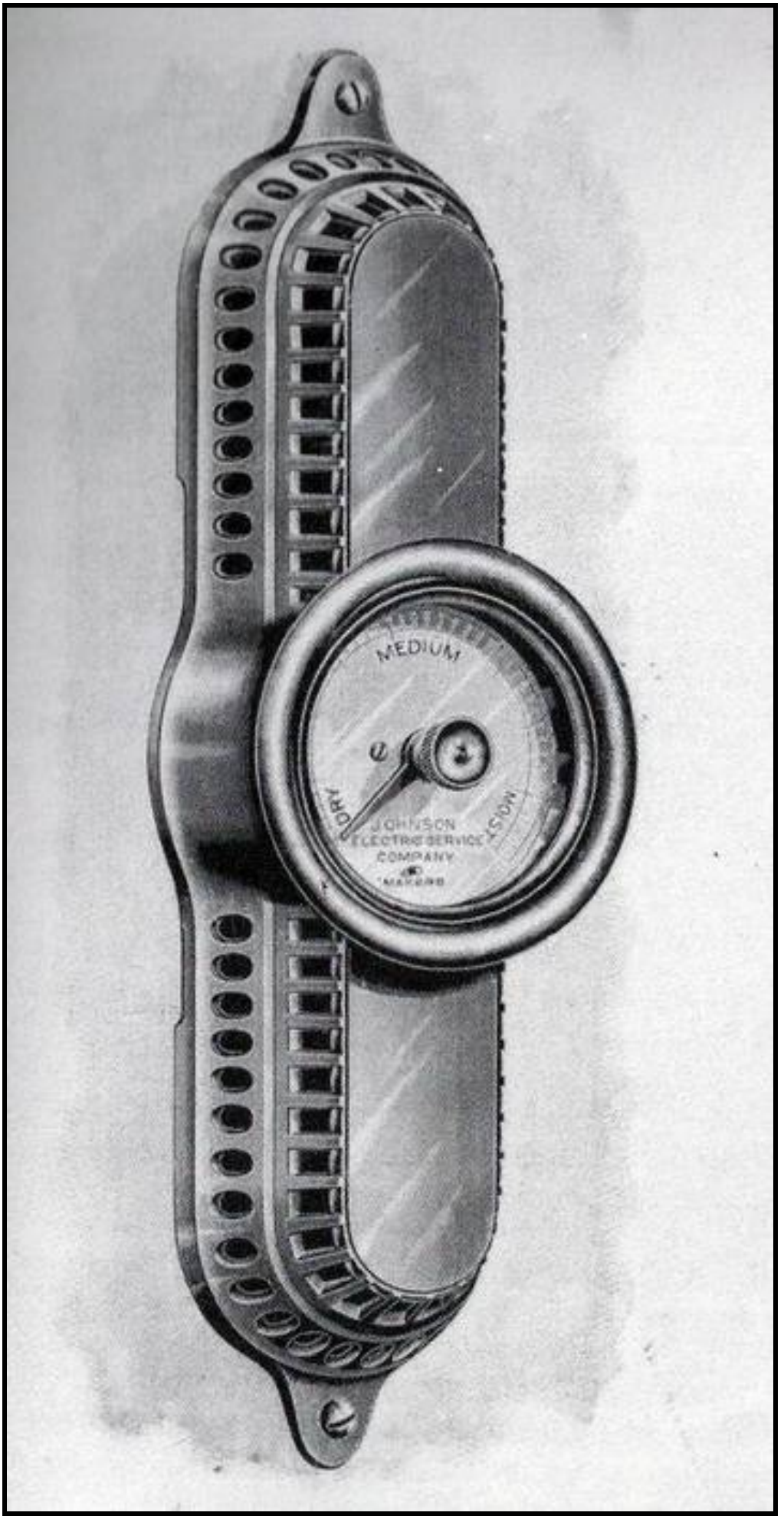


Johnson Controls headquarters building in Milwaukee from 1902

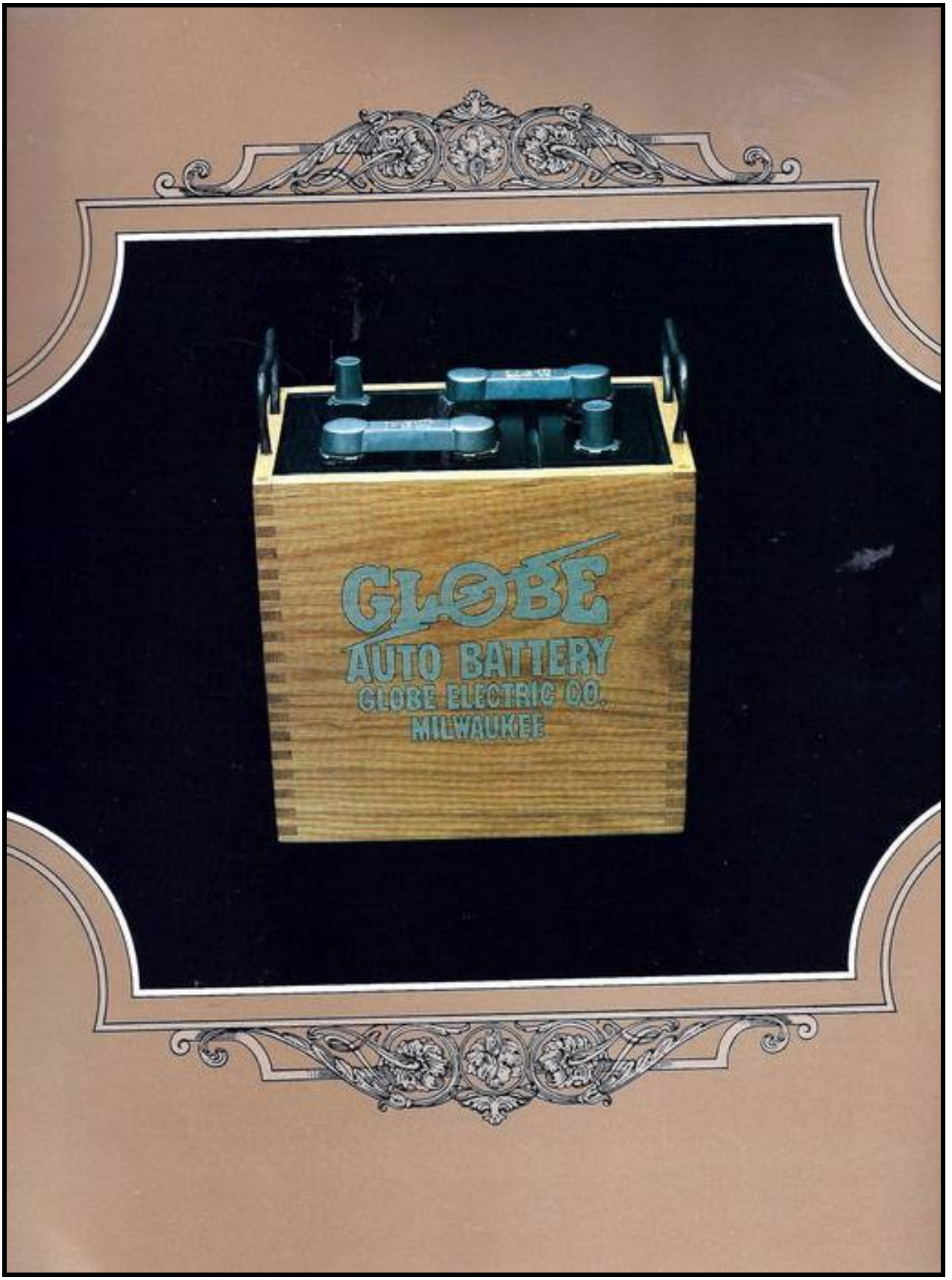
Johnson continued to produce many inventions: a humidistat, chandeliers, springless door locks, puncture-proof tyres, thermometers and a hose coupling for providing steam heating to railway passenger coaches. He designed pneumatic tower clocks, including one for the Milwaukee City Hall Tower.

Johnson also experimented with wireless communications, forming the American Wireless Telegraph Company, which exhibited at the Paris Exposition of 1900, winning Second Prize to beat Marconi. They built a radio tower south of Milwaukee but tests were unsuccessful.

For about three months Johnson had worked with Lee de Forest, who was later to become the famous inventor of the *grid Audion*, the first successful three-element (triode) vacuum tube, that made radio possible. De Forest had designed this by placing a *grid* between the *cathode* and *anode* of his two-element vacuum tube (the diode).



Johnson Humidistat, c.1905



The Globe Electric Company of Milwaukee manufactured car batteries from about 1911

The Battery Division of Johnson Controls played a major part in the development of this product.

NOTABLE BUILDINGS PROVIDED WITH EARLY JOHNSON CONTROLS

The US Capitol in Washington DC

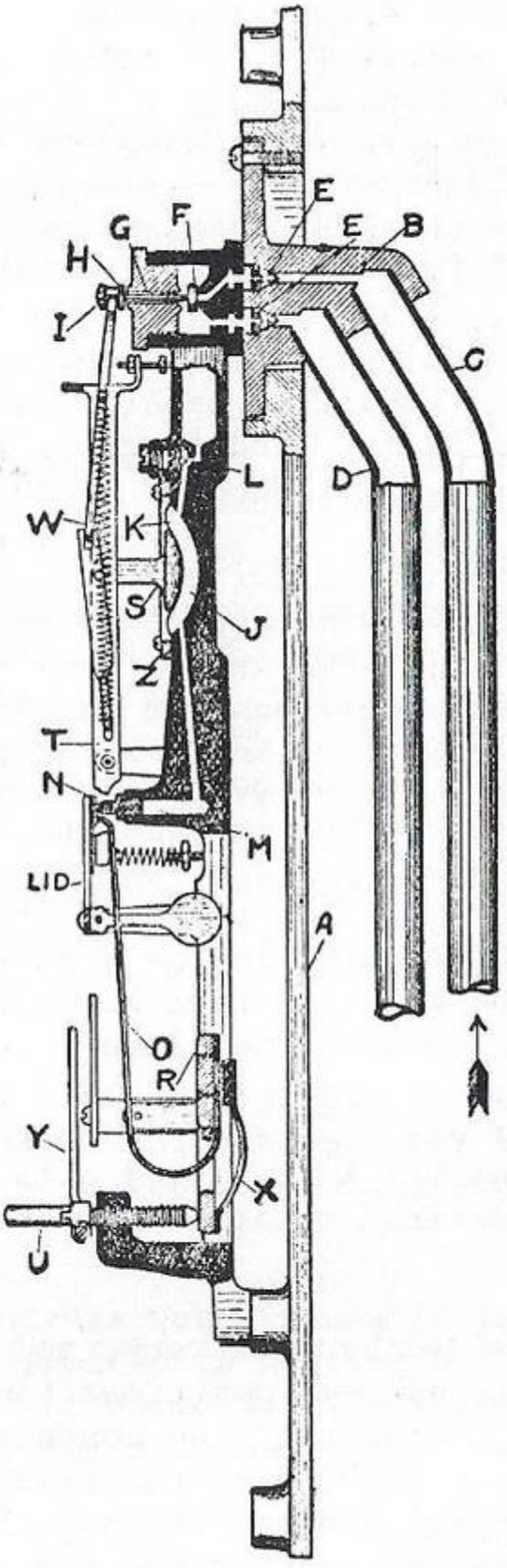
The Chicago Post Office

The Metropolitan Museum of Art, New York

West Point Military Academy

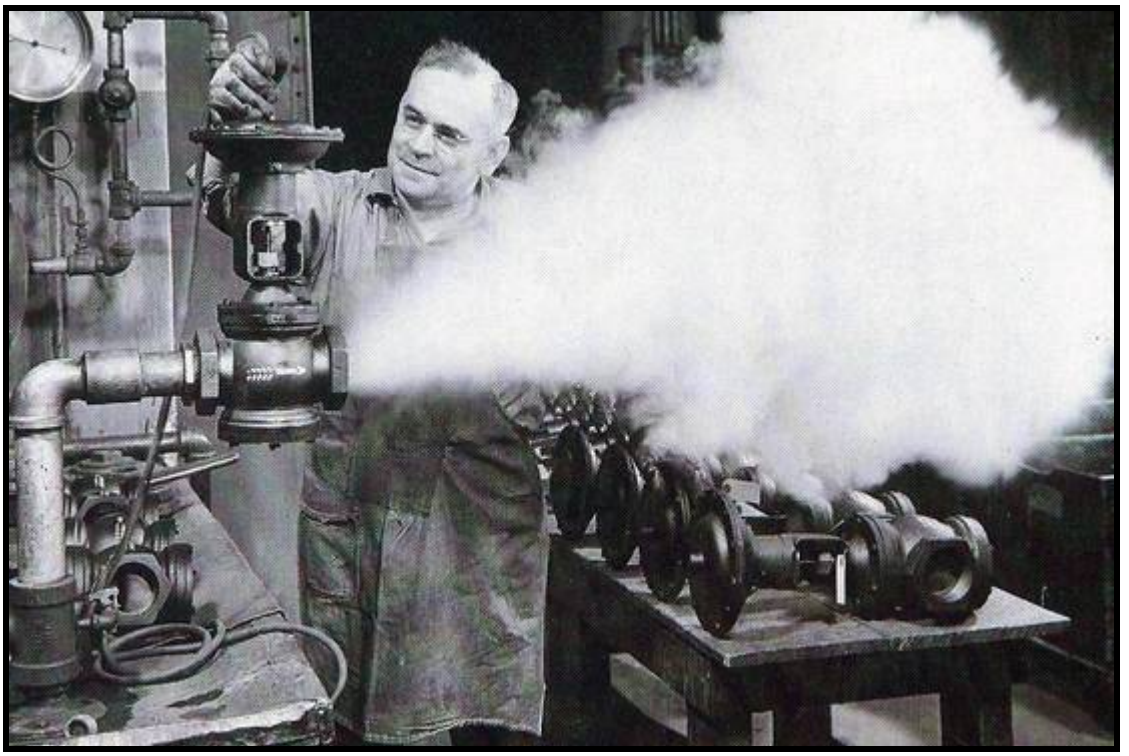
The Waldorf-Astoria Hotel in New York

The New York Stock Exchange opened in 1903, with the first large-scale combined Air Conditioning & Co-generation system, designed by Alfred Wolff.

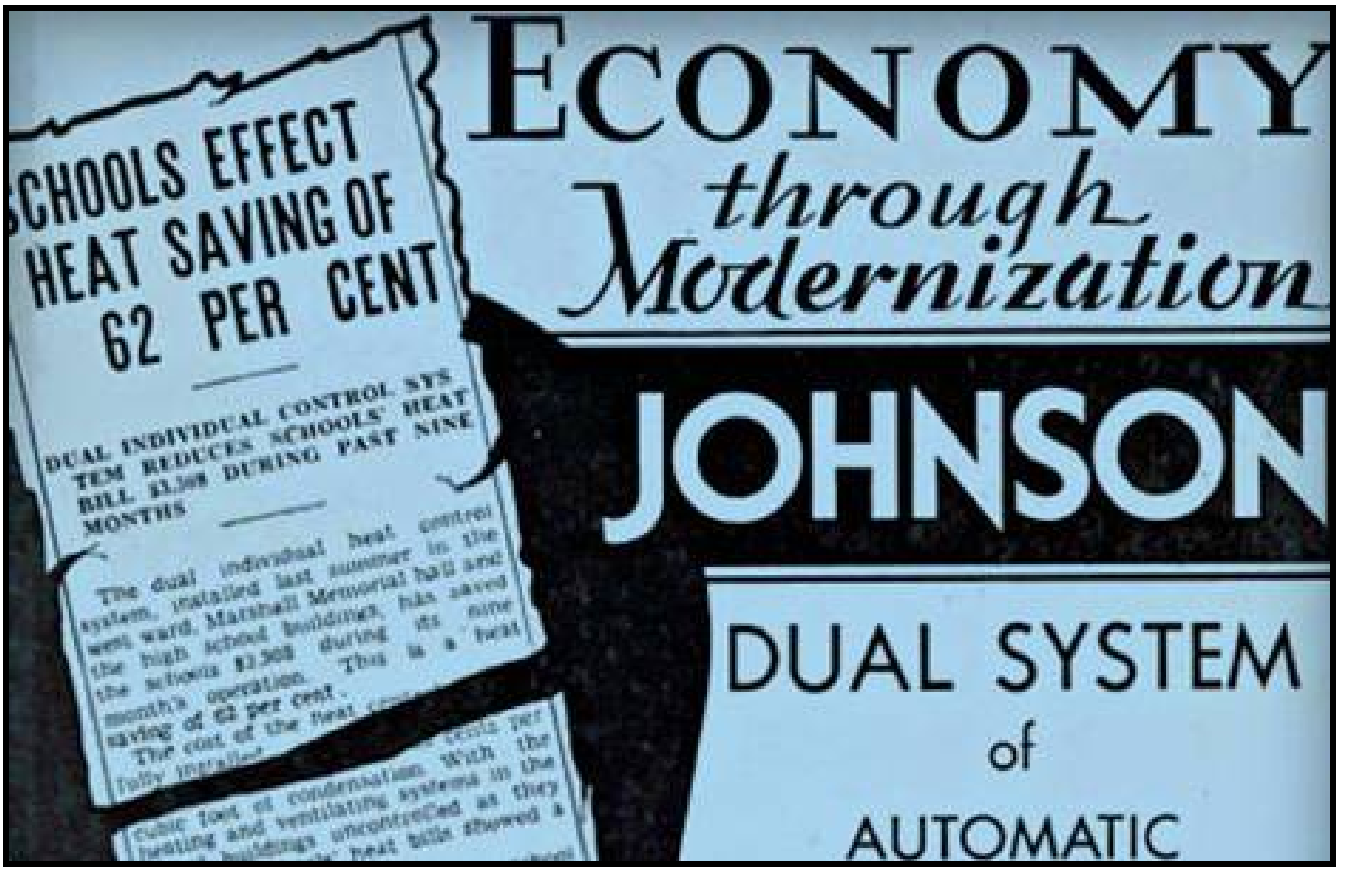


Johnson pneumatic bimetal thermostat (*ca.* 1912).

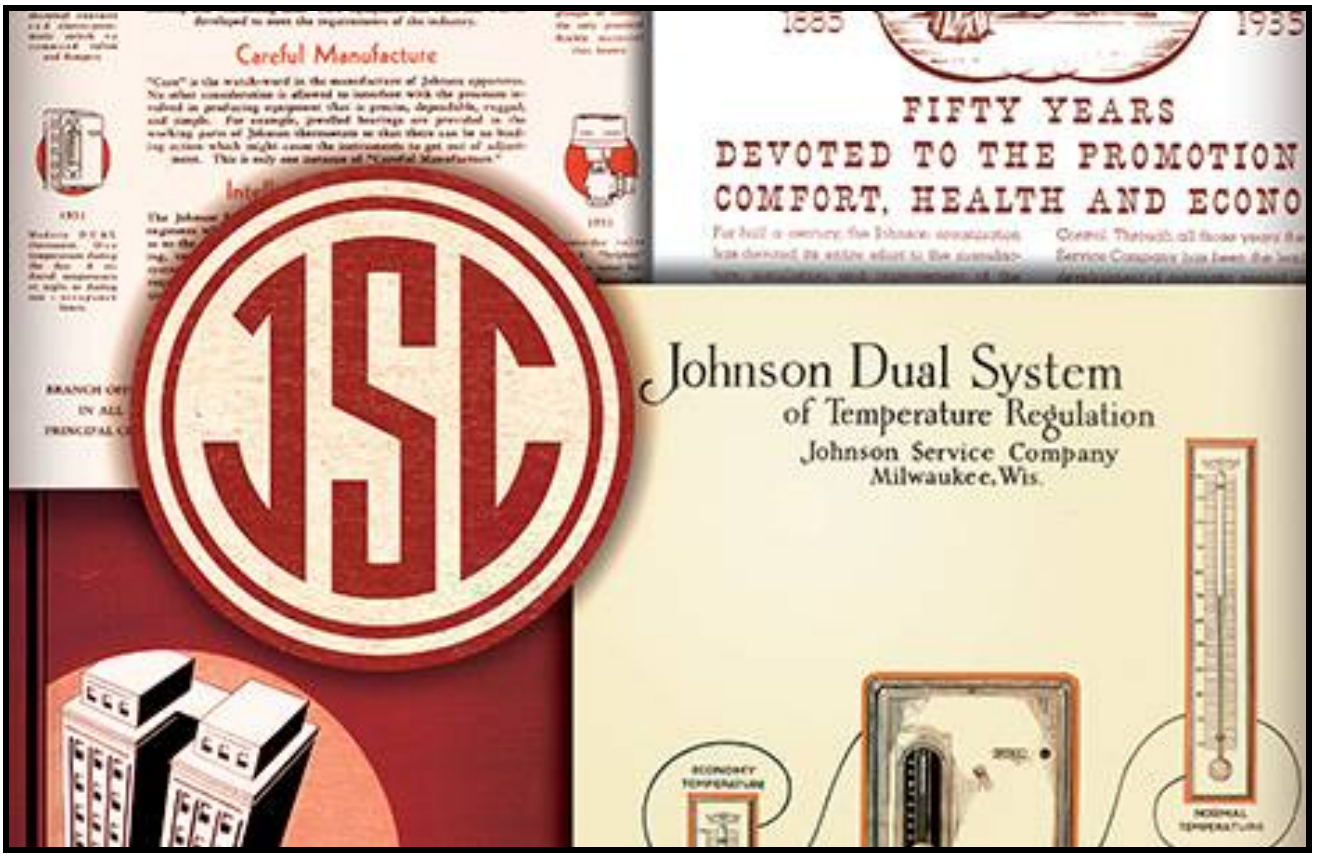
The Sales Team of 1900 with Warren Johnson seated front row, 3rd from left



Factory testing of steam valves, 1940


SCHOOLS EFFECT
HEAT SAVING OF
62 PER CENT
DUAL INDIVIDUAL CONTROL SYS
TEM REDUCES SCHOOLS' HEAT
BILL $1,308 DURING PAST NINE
MONTHS
ECONOMY
through
Modernization
JOHNSON
DUAL SYSTEM
of
AUTOMATIC

1929


Careful Manufacture
1885
1935
FIFTY YEARS
DEVOTED TO THE PROMOTION
COMFORT, HEALTH AND ECONO
JSC
Johnson Dual System
of Temperature Regulation
Johnson Service Company
Milwaukee, Wis.

1935

FIFTY YEARS
DEVOTED TO THE PROMOTION OF COMFORT, HEALTH AND ECONOMY

For half a century, the Johnson organization has devoted its entire effort to the manufacture, installation, and improvement of the Johnson System of Temperature and Humidity Control. Through all those years the Johnson Service Company has been the leader in the development of automatic control apparatus for heating, ventilating, and air conditioning.

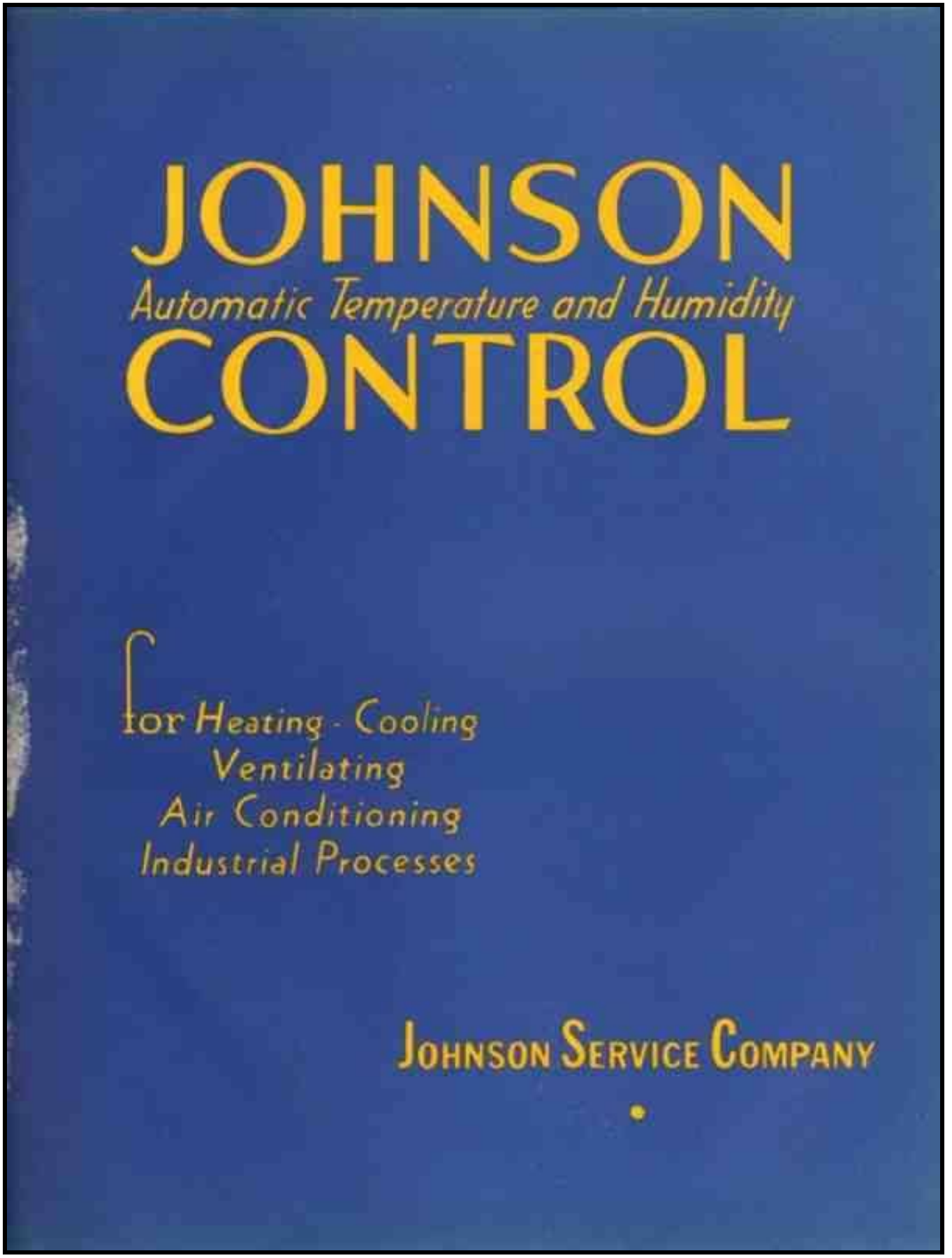
SPECIAL PROBLEMS are not new to Johnson Service Company engineers and installation men. Whatever the means adopted to accomplish heating, cooling, humidification, and dehumidification, there are Johnson devices, tried and tested, to secure the particular effect desired. A back-ground of fifty years of continual development and progress is assurance to architects, engineers, and contractors who refer automatic control problems to the Johnson Service Company. Their clients, the building owners, benefit by the experience of a nation-wide organization devoted to just this one line of business. The Johnson Service Company never has failed to execute any contract entrusted to it.

JOHNSON SERVICE COMPANY - - MILWAUKEE, WIS.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

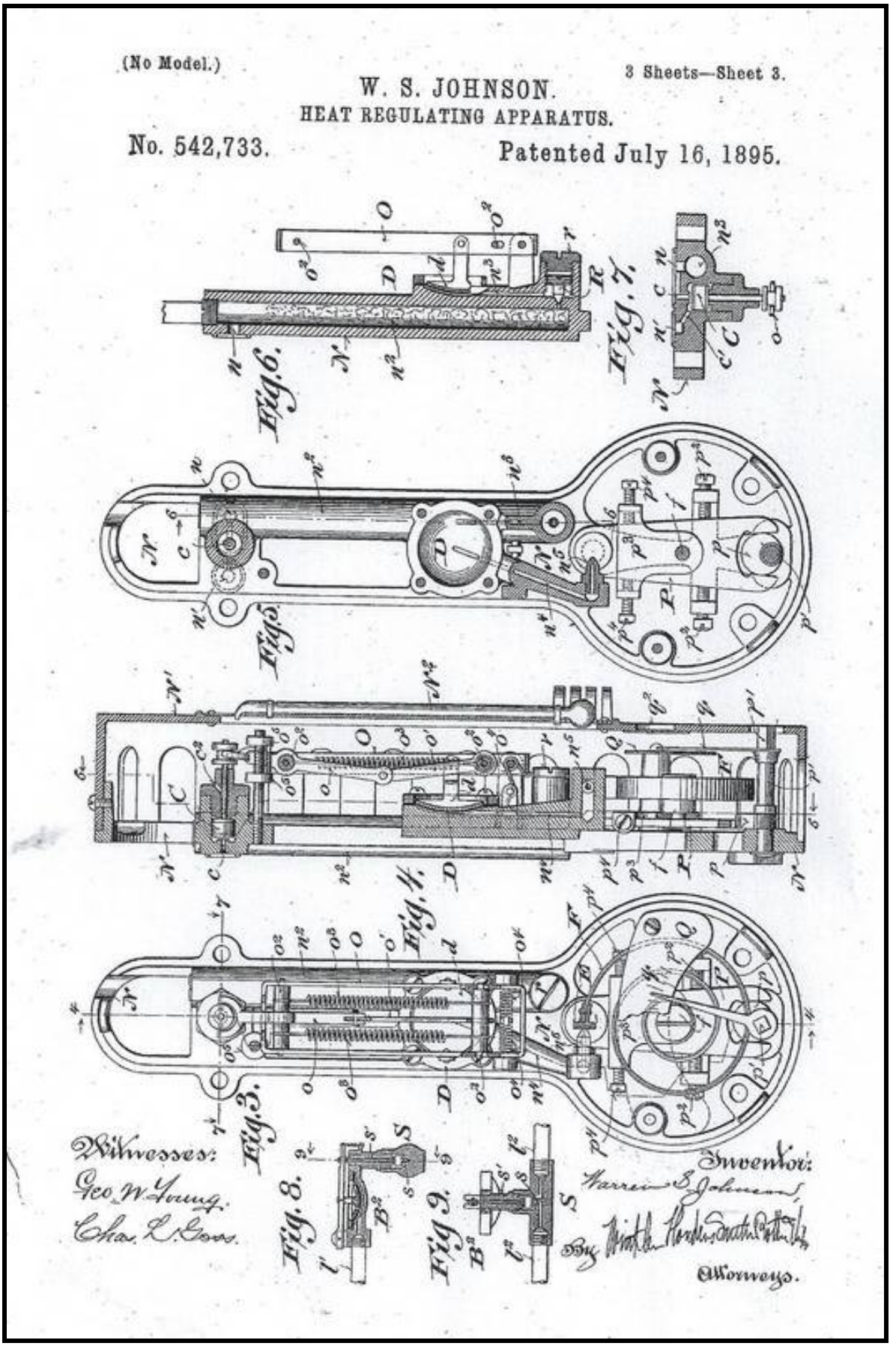
INCORPORATED: NOVEMBER 1885

1935


JOHNSON
Automatic Temperature and Humidity
CONTROL
for Heating - Cooling
Ventilating
Air Conditioning
Industrial Processes
JOHNSON SERVICE COMPANY

1938

APPENDIX I: EARLY AMERICAN PATENTS OF W S JOHNSON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W. S. JOHNSON.

HEAT REGULATING APPARATUS.

No. 542,733. Patented July 16, 1895.

Fig. 6.

Fig. 7.

Fig. 5.

Fig. 4.

Fig. 3.

Fig. 8.

Fig. 9.

Witnesses:
Geo. W. Young.
Chas. L. Goss.

Inventor:
Warren S. Johnson
By Wright Brown Quinby & Potter
Attorneys.

(No Model.) 3 Sheets—Sheet 2.

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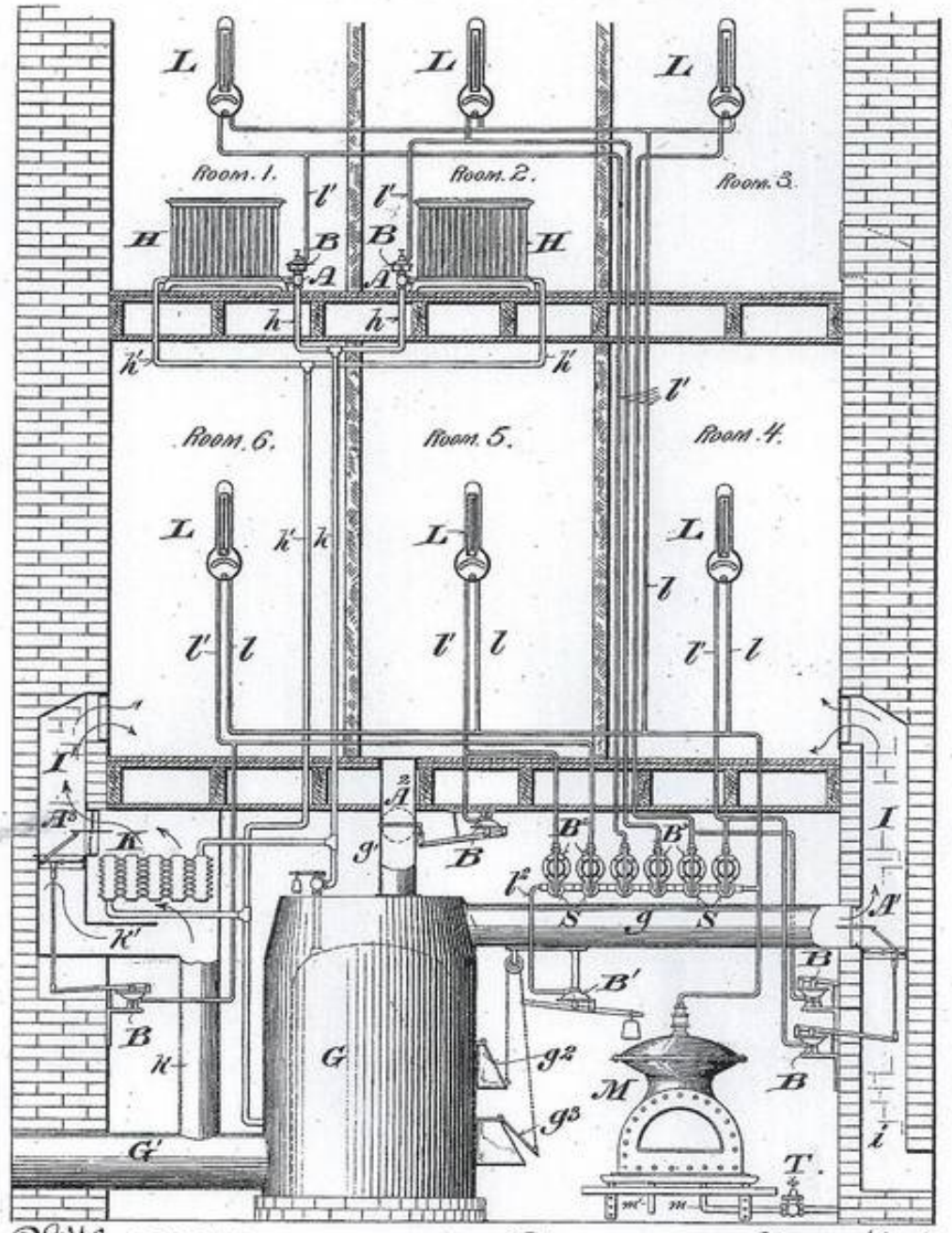

Fig. 2.

Witnesses:
Geo. W. Young.
Chas. L. Goss.

Inventor:
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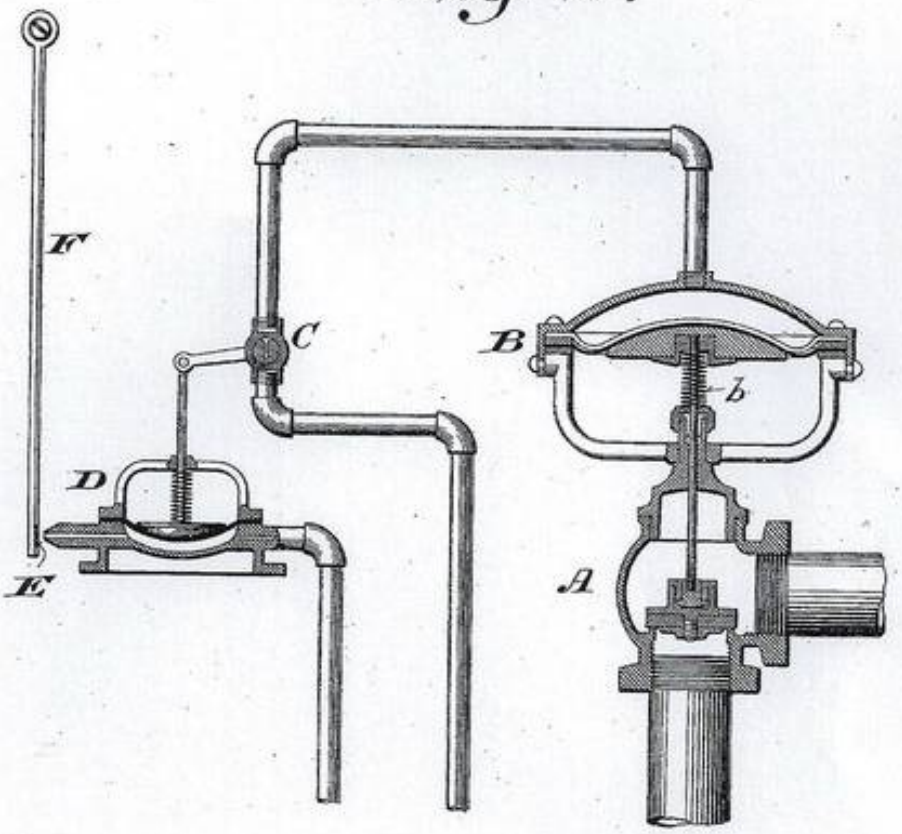


Witnesses
Geo. W. Young.
Chas. L. Gans.

Inventor:
Warren S. Johnson,
By Wirth, Howden, Smith & Pollitz,
Attorneys.

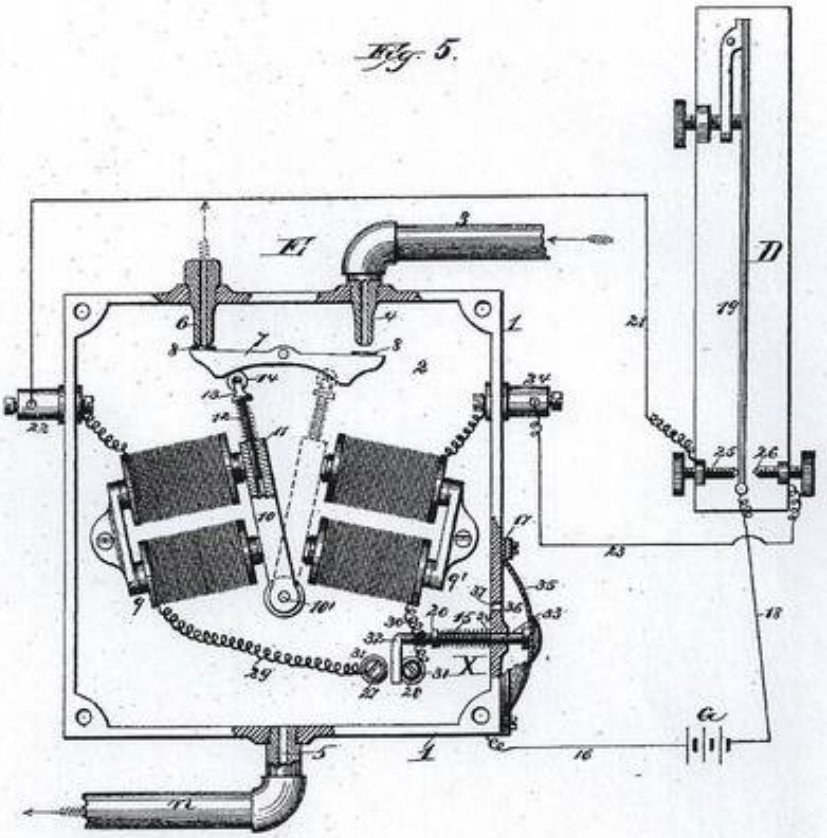
(No Model.) 3 Sheets—Sheet 3.

W. S. JOHNSON.

SYSTEM OF TEMPERATURE REGULATION.

No. 352,874. Patented Nov. 16, 1886.

Fig. 5.



Witnesses:
E. G. Jones
N. E. Oliphant

Inventor:
Warren S. Johnson
By Stuart Underwood
Attorneys.

(No Model.) 3 Sheets—Sheet 2.

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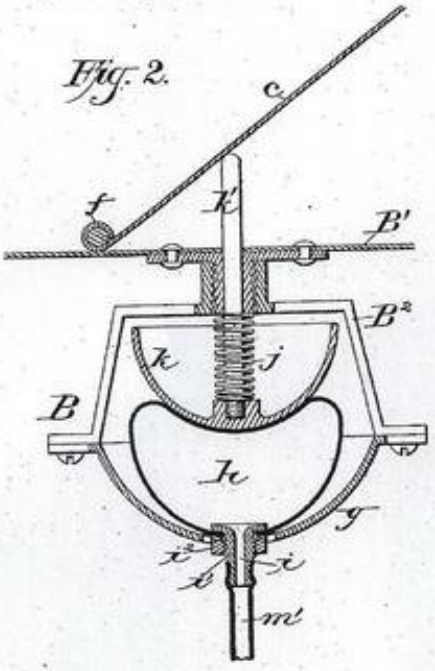


Fig. 3.

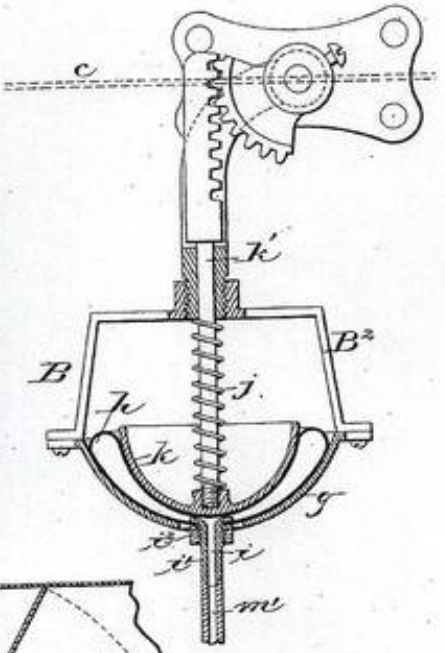
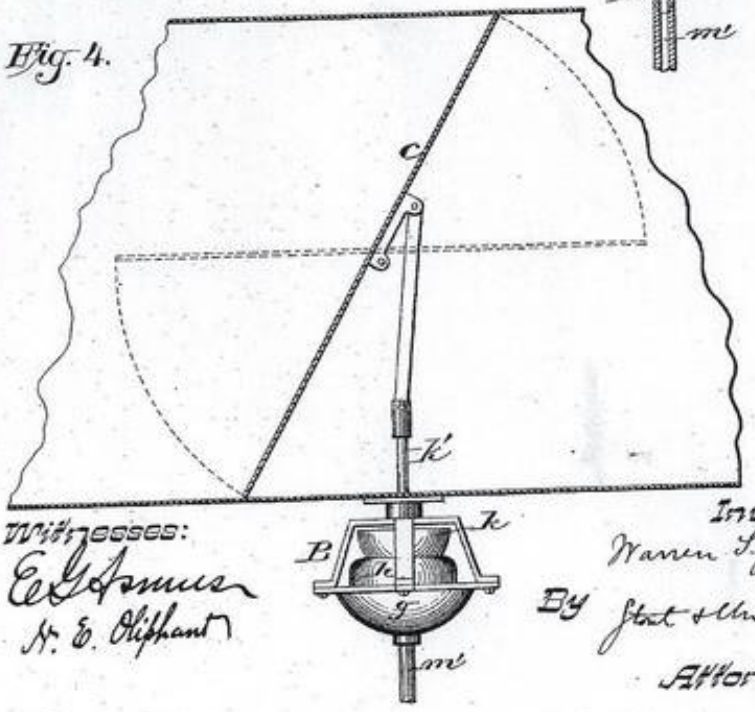


Fig. 4.



Witnesses:
E. G. Ames
N. E. Oliphant

Inventor:
Warren S. Johnson
By Stetson & Underwood
Attorneys.

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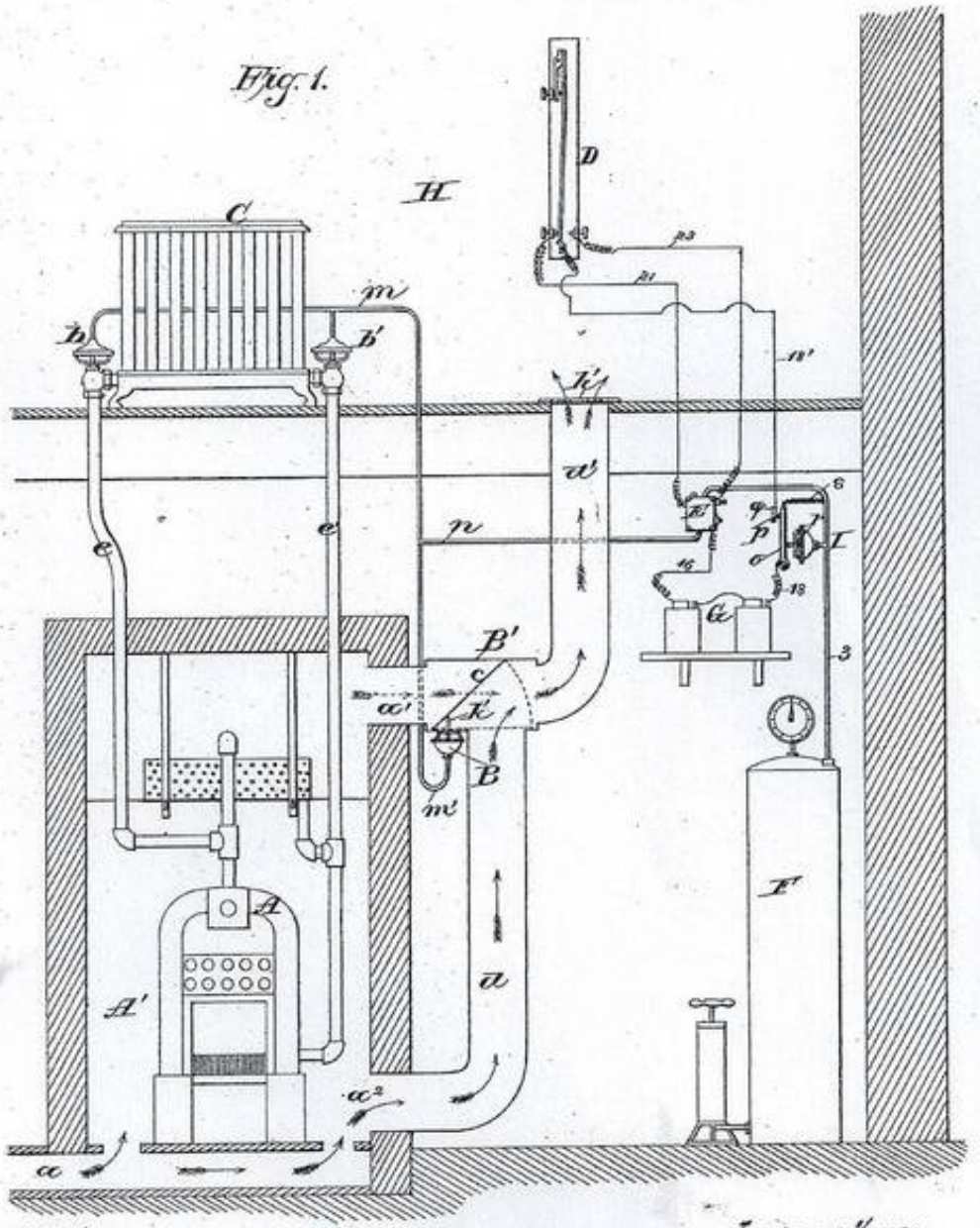

Witnesses:
E. G. Siggers
N. E. Oliphant

Inventor:
Warren S. Johnson
By Stuart + Underwood
Attorneys.

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W. S. JOHNSON.

PIPE COUPLING.

No. 423,323. Patented Mar. 11, 1890.

Fig. 3.

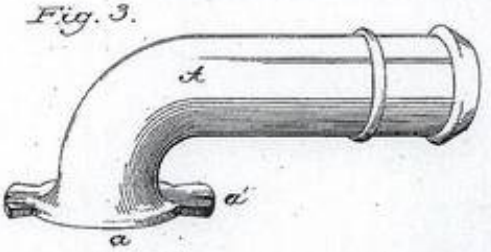
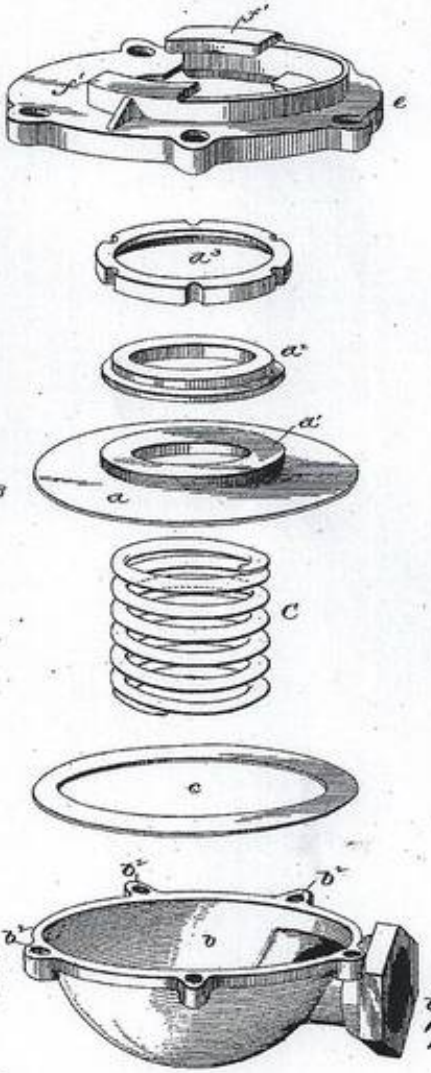


Fig. 4.



Attest:
W. B. Mortimer
F. Stanley Elmore

Inventor:
W. S. Johnson
By his atty
Chas. T. Dodge

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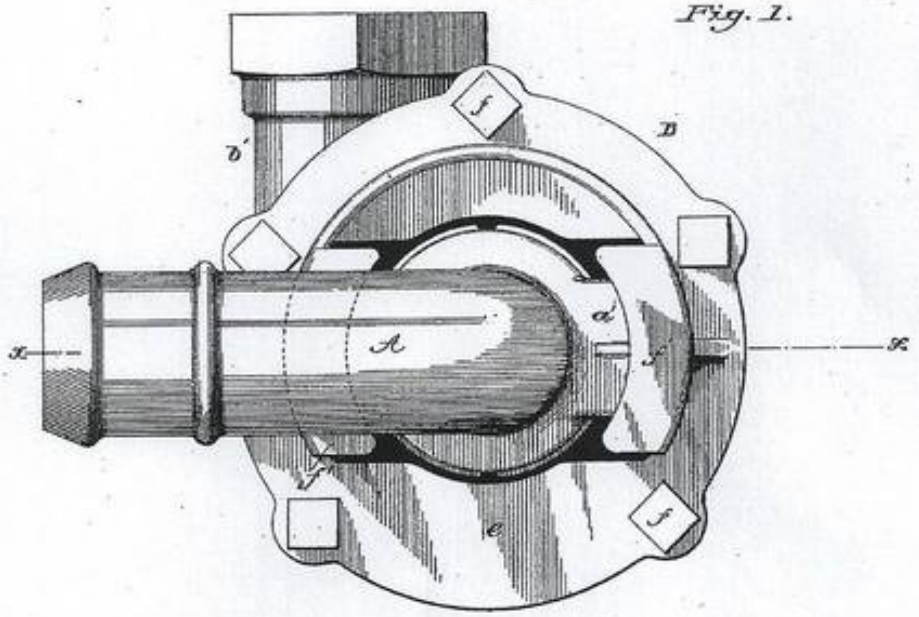
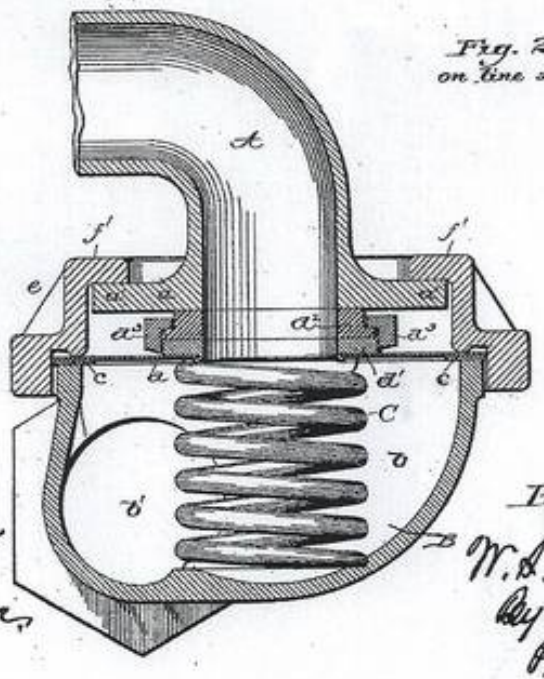


Fig. 2.
on line x-x



Attest:
W. B. Mason
F. Gaulay Elmore

Inventor:
W. S. Johnson
By his Atty
Phil. T. Dodge

BIBLIOGRAPHY

1985 *Right for the Times*, 100th Anniversary, Johnson Controls

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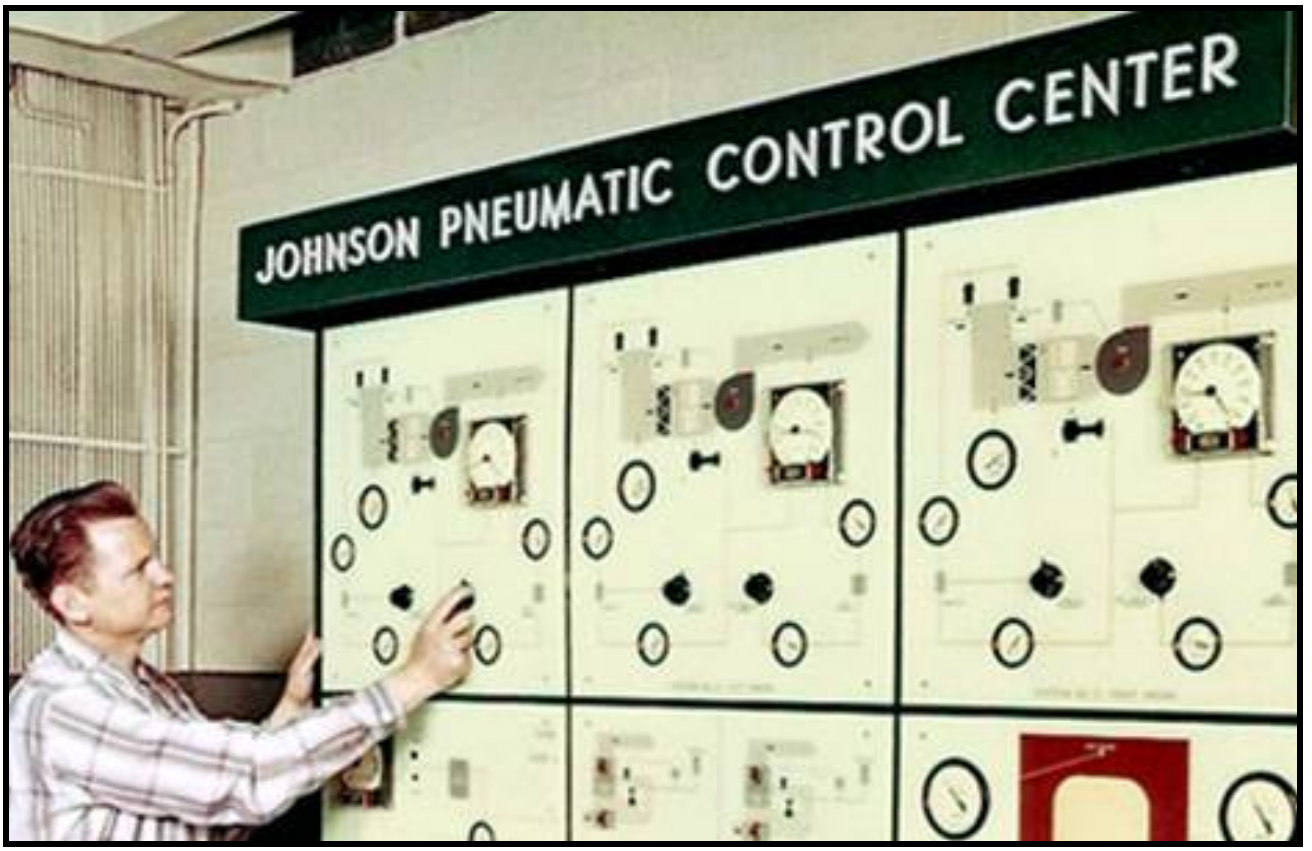
1994 *Heat & Cold: Mastering the Great Indoors***,** Barry Donaldson & Bernard Nagengast, ASHRAE

2000 *The Comfort Makers*, Brian Roberts, ASHRAE

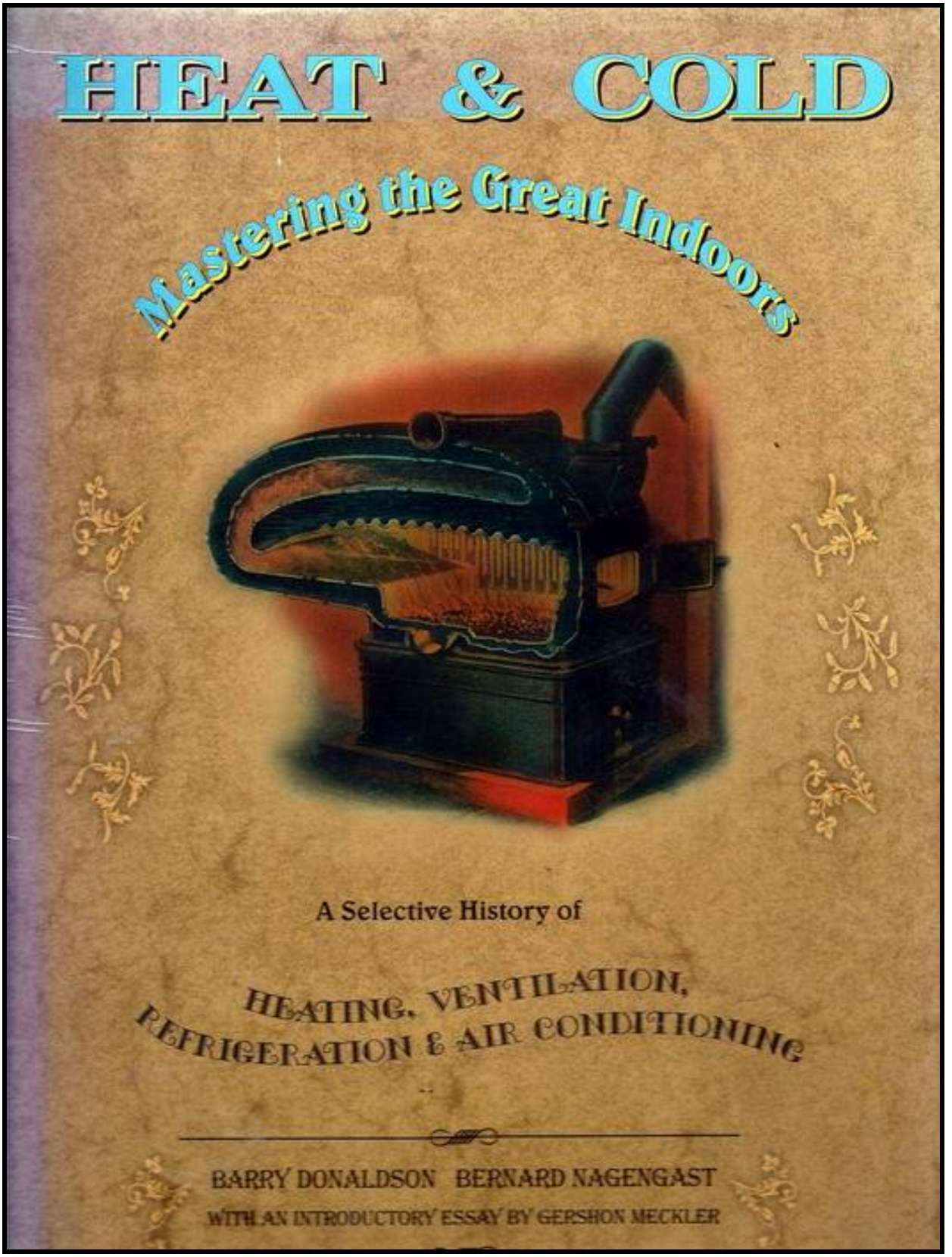
------ *Multi-Zone Automatic Temperature Control System (1895)*, ASME #244

https://en.wikipedia.org/wiki/Warren-S-Johnson



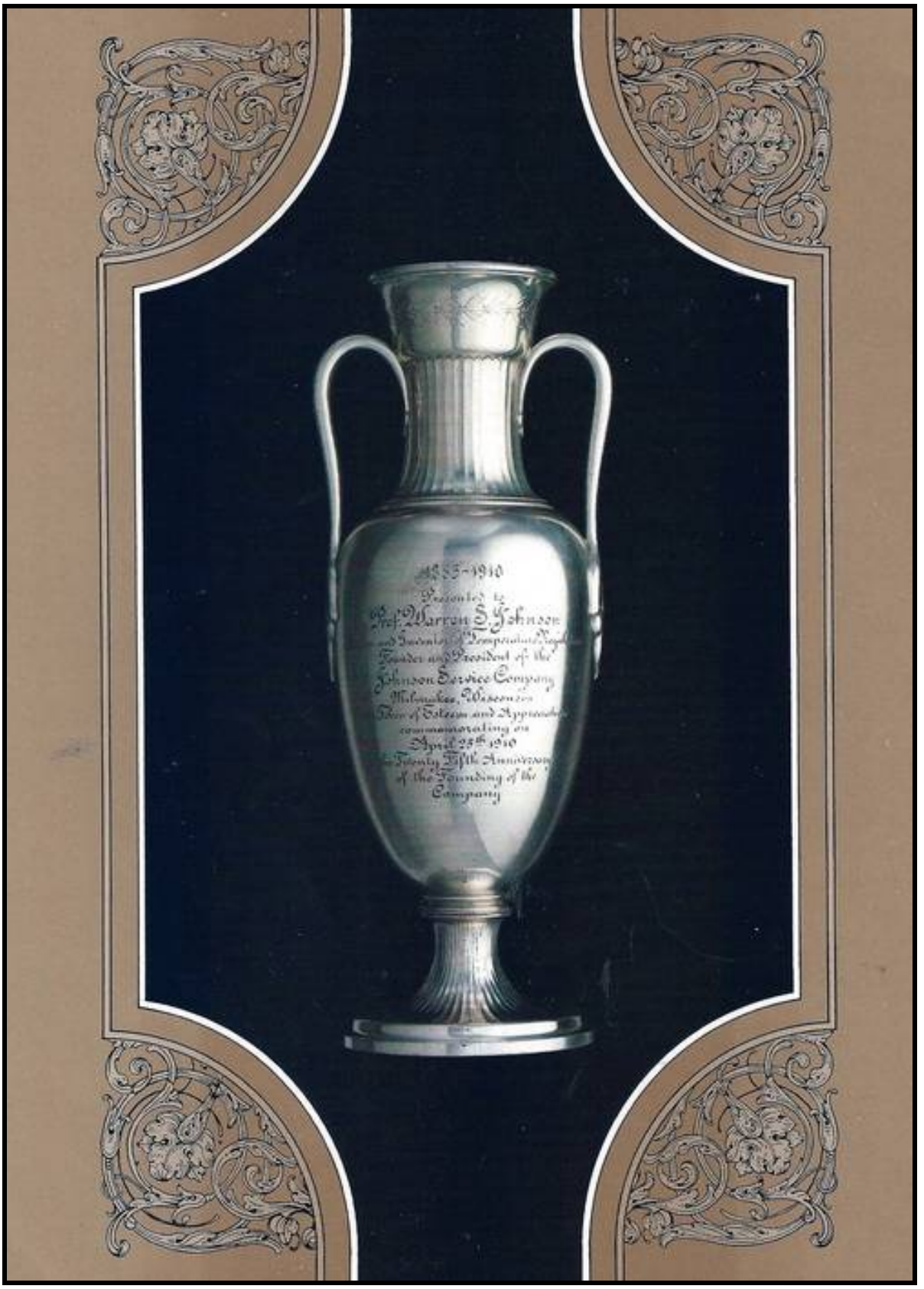
FURTHER READING

1985


HEAT & COLD
Mastering the Great Indoors
A Selective History of
HEATING, VENTILATION,
REFRIGERATION & AIR CONDITIONING
BARRY DONALDSON BERNARD NAGENGAST
WITH AN INTRODUCTORY ESSAY BY GERSHON MECKLER

1994

EPILOGUE



Warren Seymour Johnson is credited with more than 50 patents. He died on the 5th December, 1911, in Los Angeles.

Johnson Controls, the company he founded “exhibits the enduring legacy of Warren Johnson and his inventions through its 140,000 employees and services evident in 200 million vehicles, 12 million homes, and 1 million commercial buildings.”