

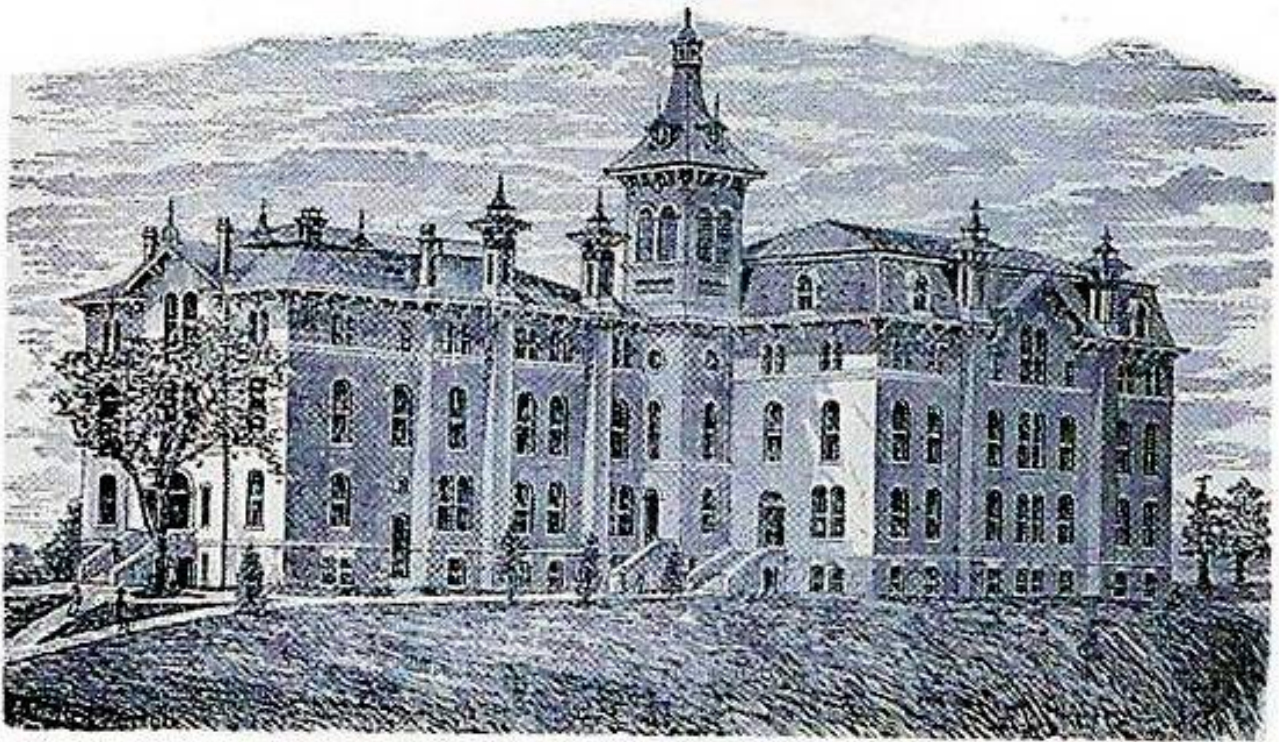
WARREN S JOHNSON and AUTOMATIC CONTROLS

by Brian Roberts, CIBSE Heritage Group



Warren Seymour Johnson, 1847-1911

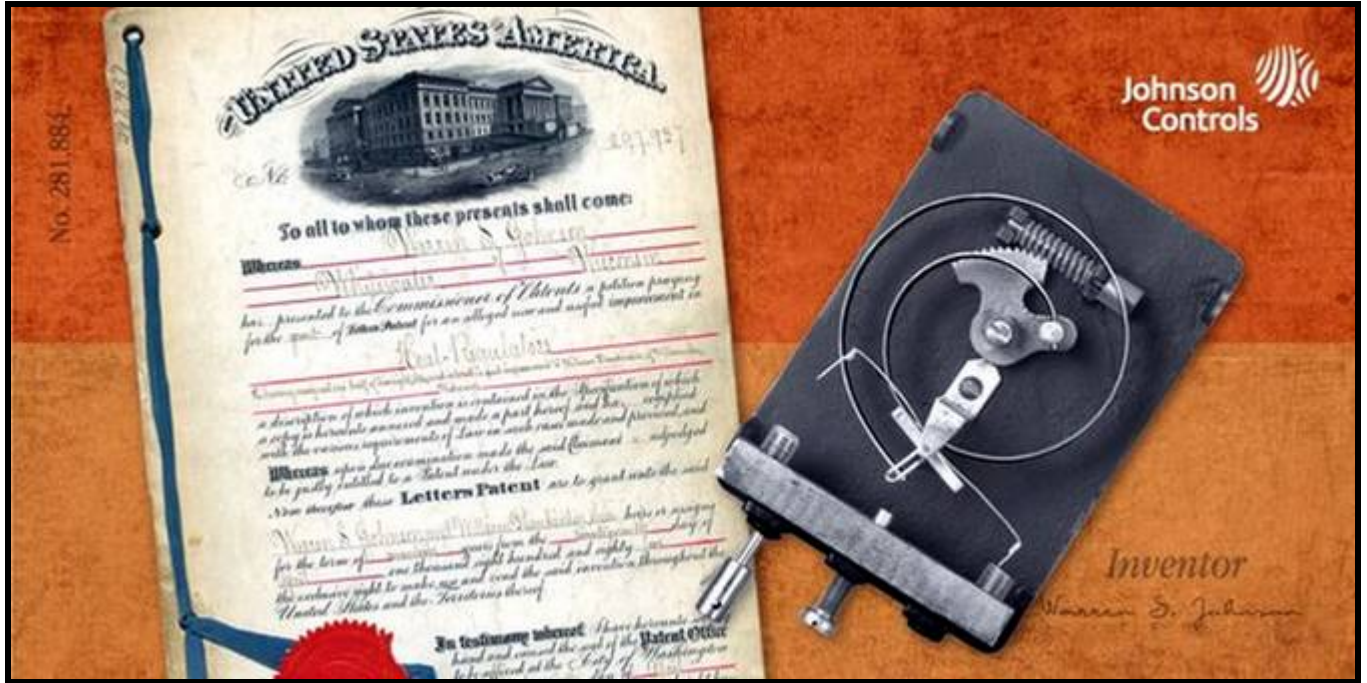
Johnson was born on the 6th November, 1847, in Leicester, Vermont, his family shortly moving to Wisconsin, eventually settling in Menomonie. He had only a limited formal education but taught himself by studying scientific subjects. He worked for a time as a printer, surveyor and then schoolteacher before 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.



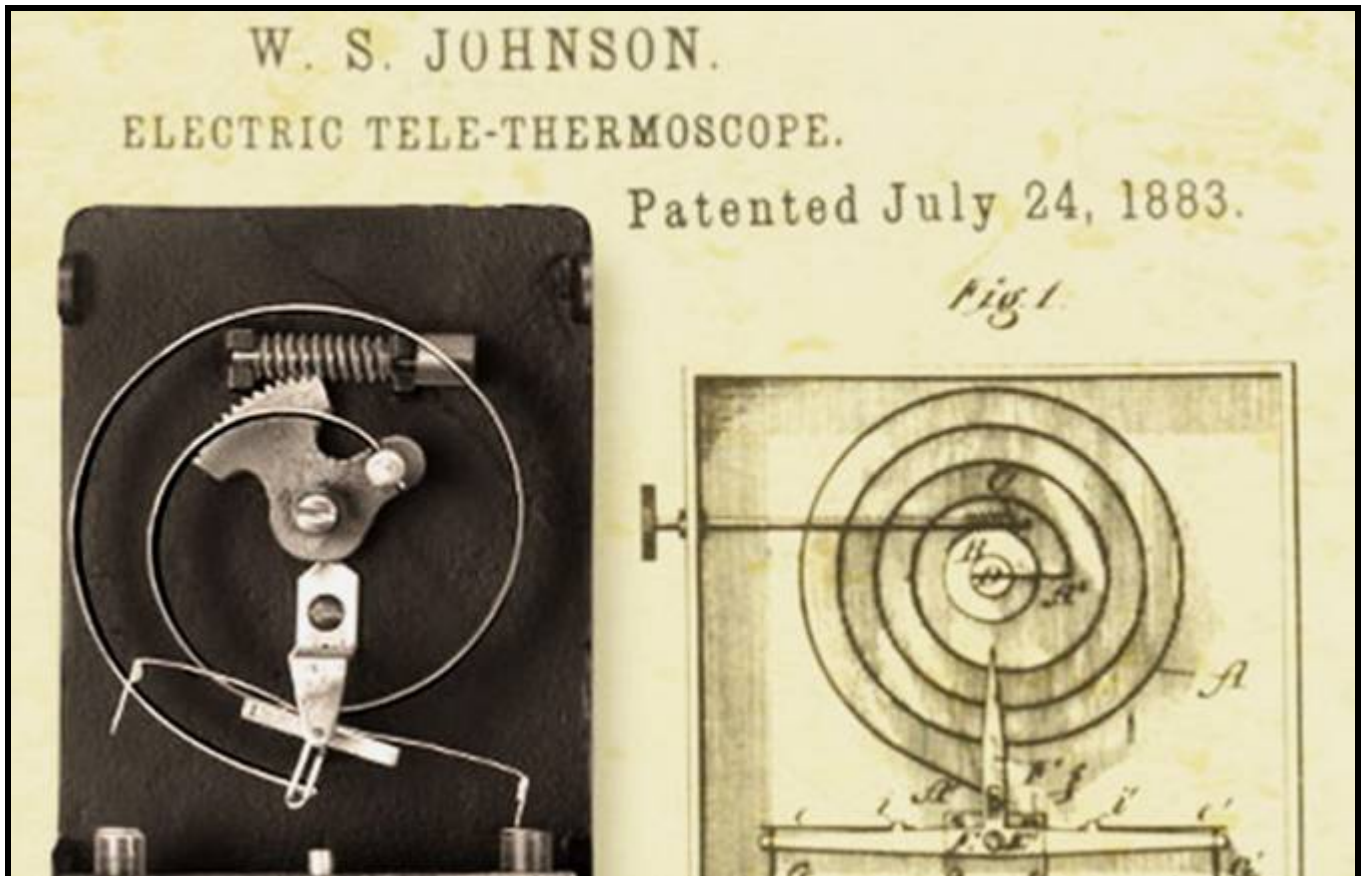
The State Normal School in Whitewater, Wisconsin

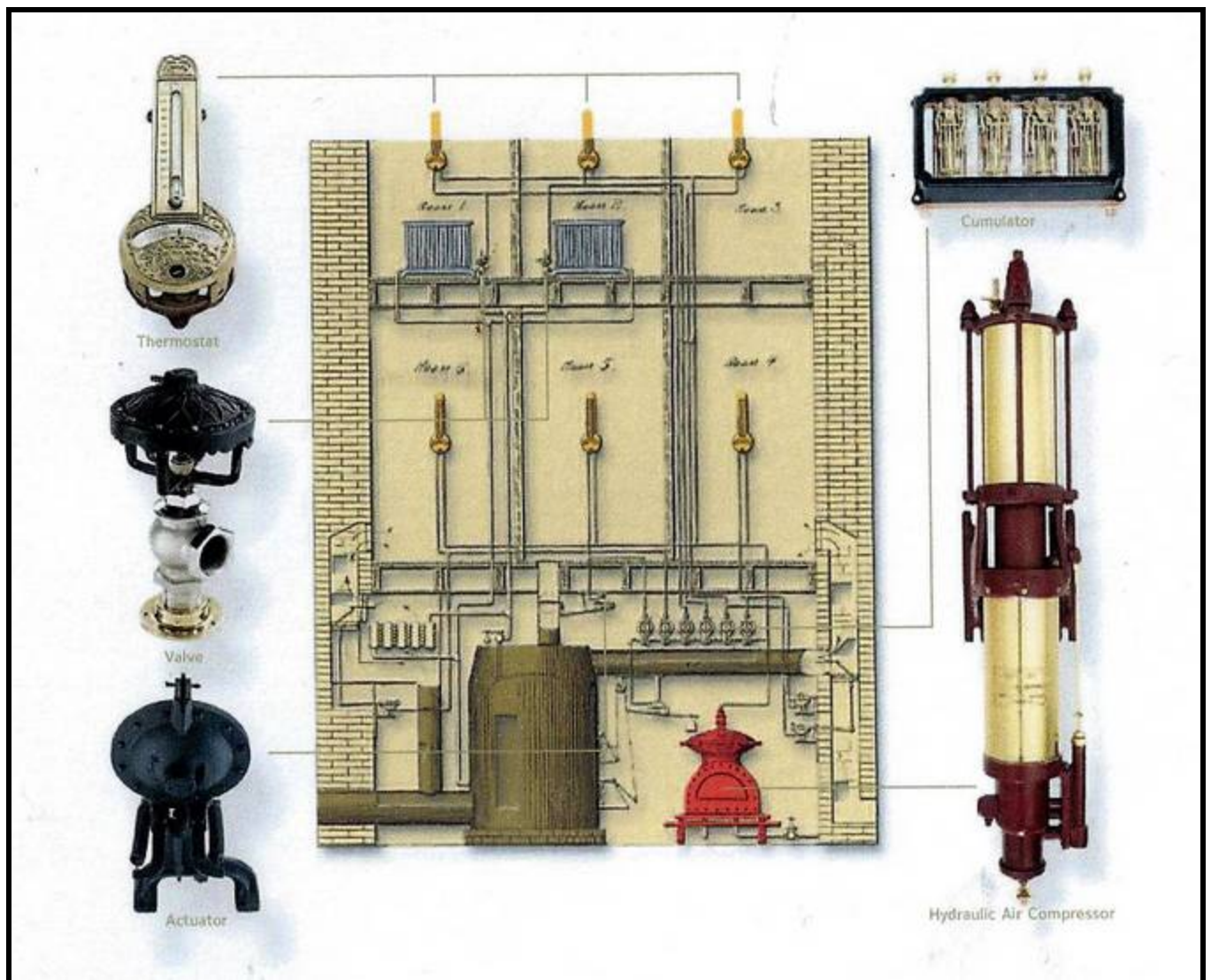
It is said that Johnson had an enquiring mind, being particularly interested in electricity. The story is he “came up with the ideas for automatic temperature control while teaching at Normal School in Whitewater, Wisconsin in the 1880’s. Originally, janitors would have to enter each classroom to determine 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.



1883





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).”

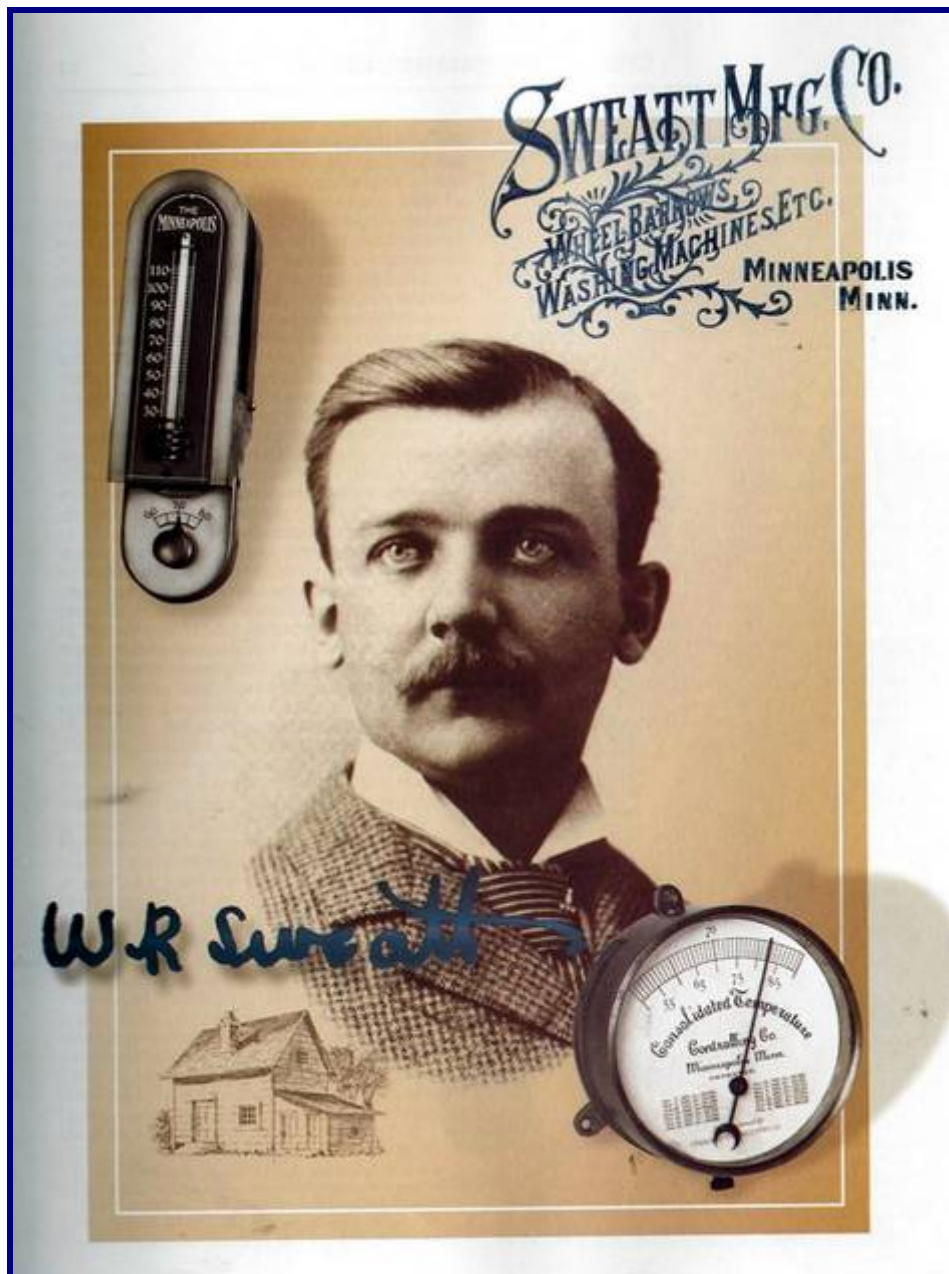


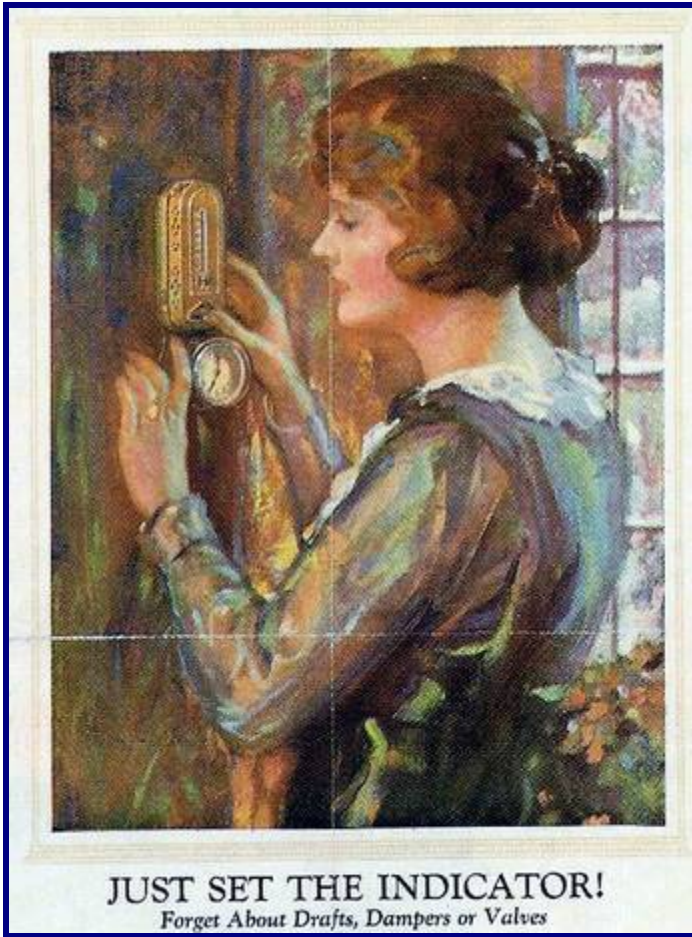
An early Johnson combined thermostat and thermometer

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.

**TEMPERATURE REGULATED
IN LARGE BUILDINGS**

Such as Office Buildings, Schools, Hotels, Apartments, etc., without the annoyances and failures of systems heretofore used.

The Thermostat.

The Powers System

Has always been known as a simple, practical, and perfect method of regulating temperature. By recent patents we have protected our methods as applied to large work, and can send you a circular more fully describing its application if desired.

**The Powers
Regulator Company**

Send for Catalogue.

MAIN OFFICE,
36 DEARBORN STREET,
Chicago.

NEW YORK OFFICE,
54 John St.

45 Oliver Street, Boston.

508 Union Trust Building,
St. Louis.

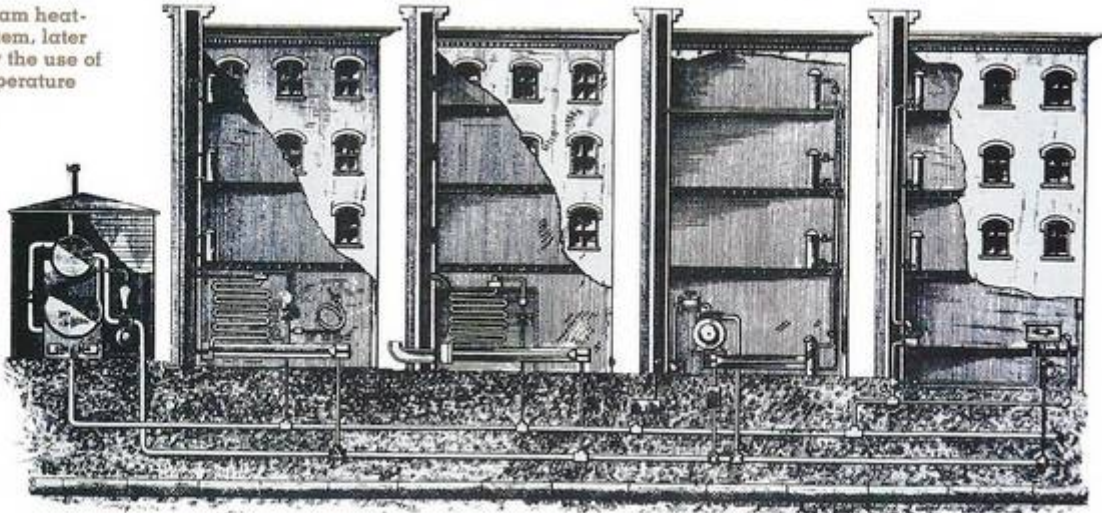
The Valve.

1897



Development of Johnson thermostats from 1885 to 1970

An 1881 steam heating system, later enhanced by the use of Johnson temperature regulation.



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.



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 wood-work, 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.

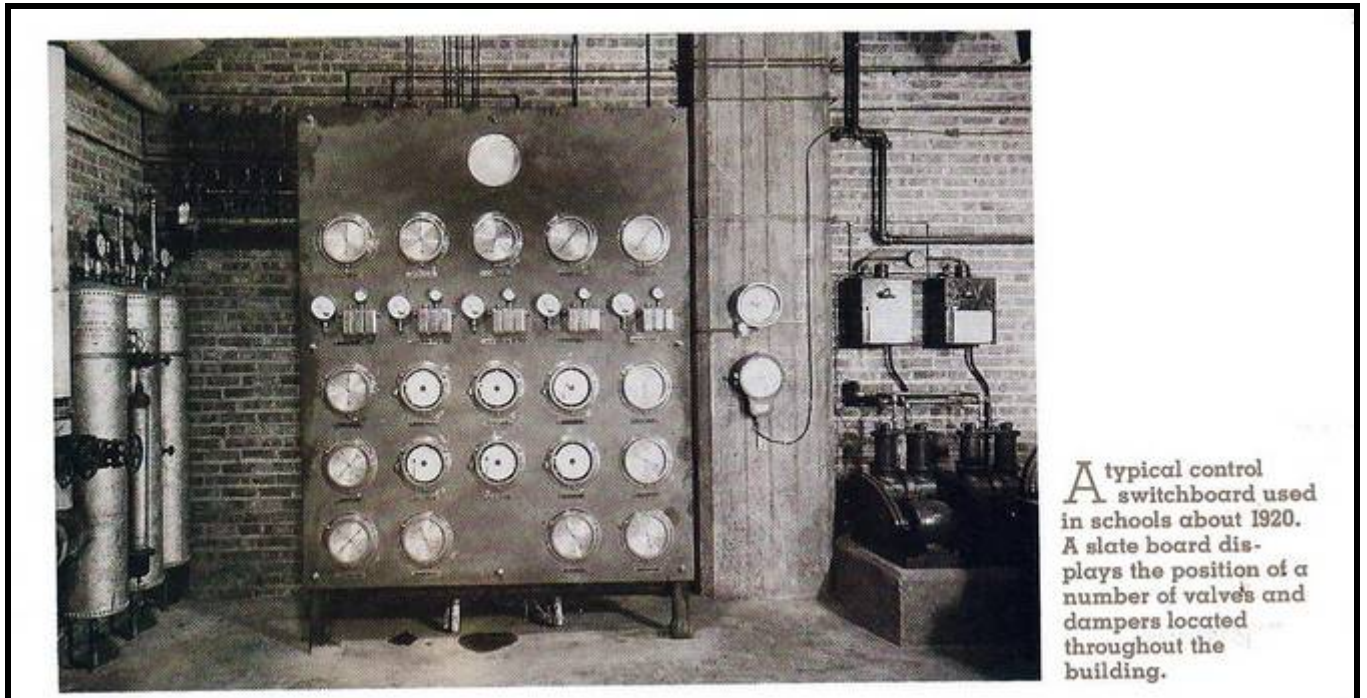
JOHNSON SERVICE COMPANY

Factory and Main Office

Milwaukee, Wisconsin

AUTOMATIC TEMPERATURE CONTROL FOR 39 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

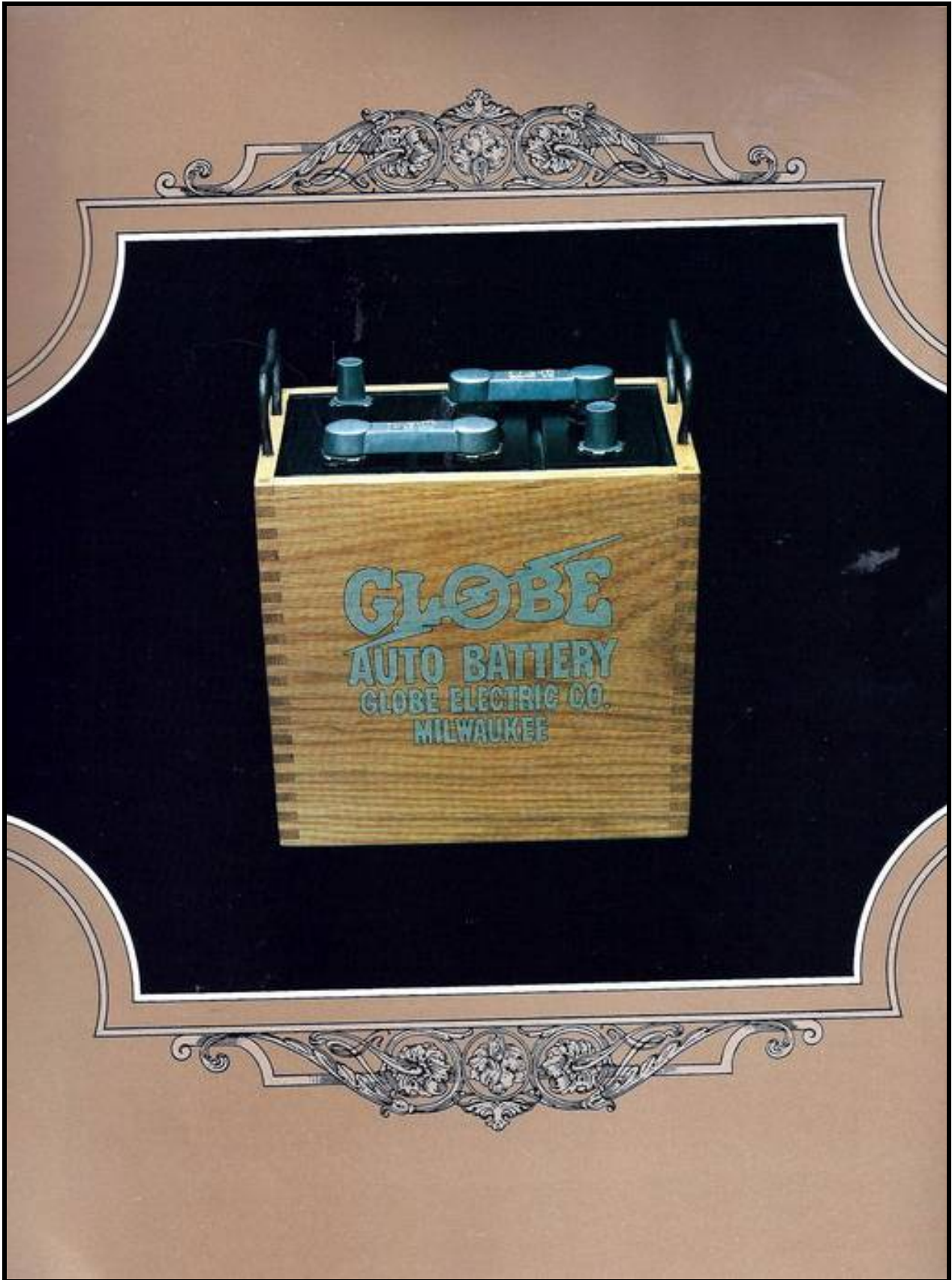
Johnson continued to produce many inventions: a humidistat, chandeliers, springless door locks, puncture-proof tyres, thermometers and a hose coupling for providing steam heating to railway passenger coaches. He designed pneumatic tower clocks, including one for the Milwaukee City Hall Tower.

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



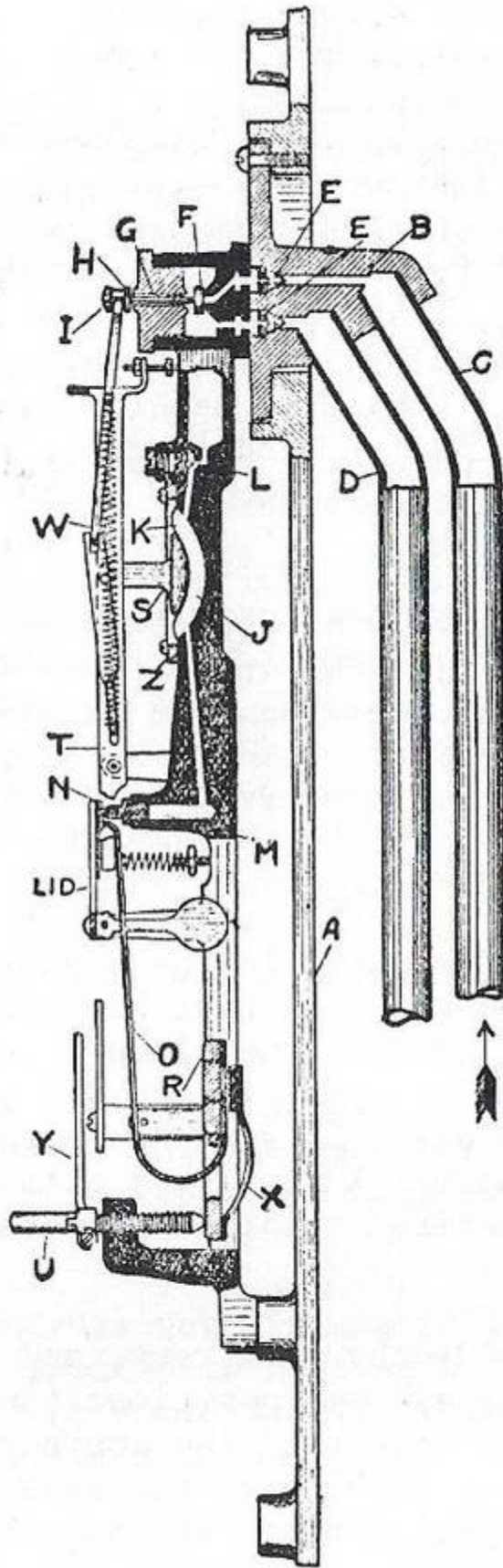
West Point Military Academy



The Waldorf-Astoria Hotel in New York



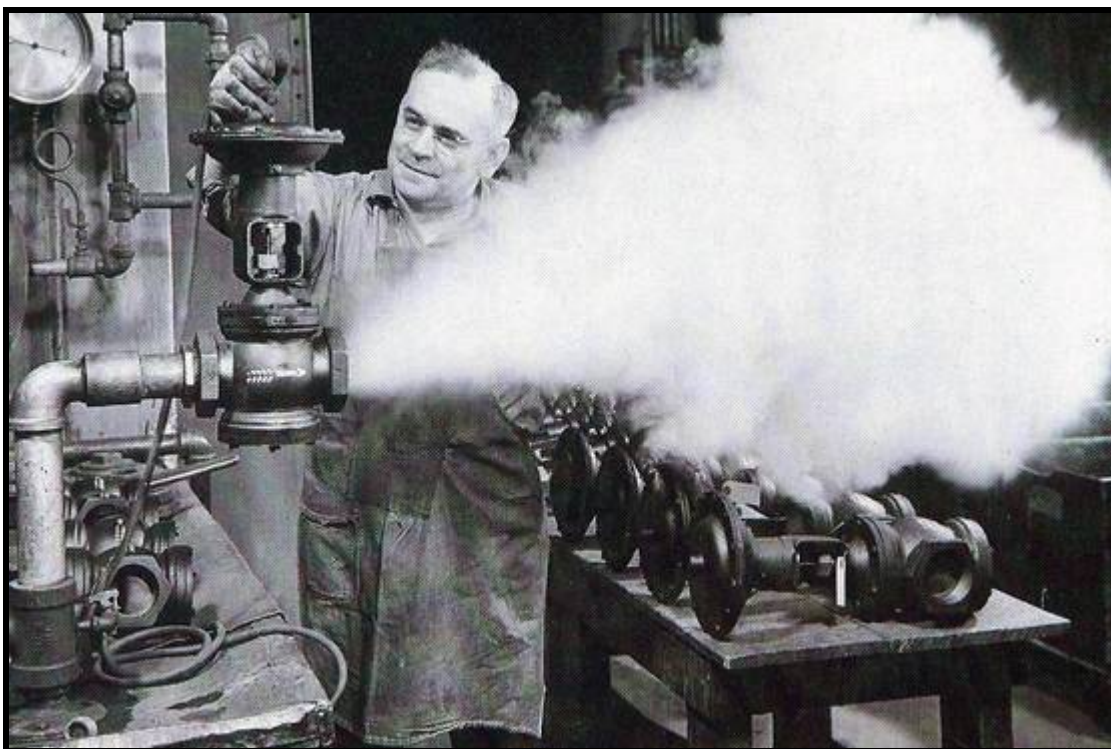
The New York Stock Exchange opened in 1903, with the first large-scale combined Air Conditioning & Co-generation system, designed by Alfred Wolff.



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 SYSTEM REDUCES SCHOOLS' HEAT BILL \$3,308 DURING PAST NINE MONTHS

The dual individual heat control system, installed last summer in the west ward, Marshall Memorial hall and the high school buildings, has saved the schools \$3,308 during its nine month's operation. This is a heat saving of 62 per cent.

The cost of the heat control system is fully repaid.

...loss of condensation. With the heating and ventilating systems in the buildings uncontrolled as they are, the heat bills showed a

ECONOMY

through Modernization

JOHNSON

DUAL SYSTEM of AUTOMATIC

1929

Developed to meet the requirements of the industry.

Careful Manufacture

"Care" is the watchword in the manufacture of Johnson apparatus. No other consideration is allowed to interfere with the process involved in producing equipment that is precise, dependable, rugged, and simple. For example, profiled bearings are provided in the working parts of Johnson elements so that there can be no heating action which might cause the instruments to get out of adjustment. This is only one instance of "Careful Manufacture."

Intelligence

The Johnson Dual System is designed to meet the requirements of the industry. It is the only practical method available for the control of temperature in buildings.

1885  1935

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

For half a century the Johnson apparatus has been the standard of temperature control. Through all these years the Johnson Service Company has been the leader in the industry.

Johnson Dual System of Temperature Regulation
Johnson Service Company
Milwaukee, Wis.

BRANCH OFFICES IN ALL PRINCIPAL CITIES

ECONOMY TEMPERATURE

NORMAL TEMPERATURE

1935



1885

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

JOHNSON

Automatic Temperature and Humidity

CONTROL

for Heating - Cooling
Ventilating
Air Conditioning
Industrial Processes

JOHNSON SERVICE COMPANY

•

APPENDIX I: EARLY AMERICAN PATENTS OF W S JOHNSON

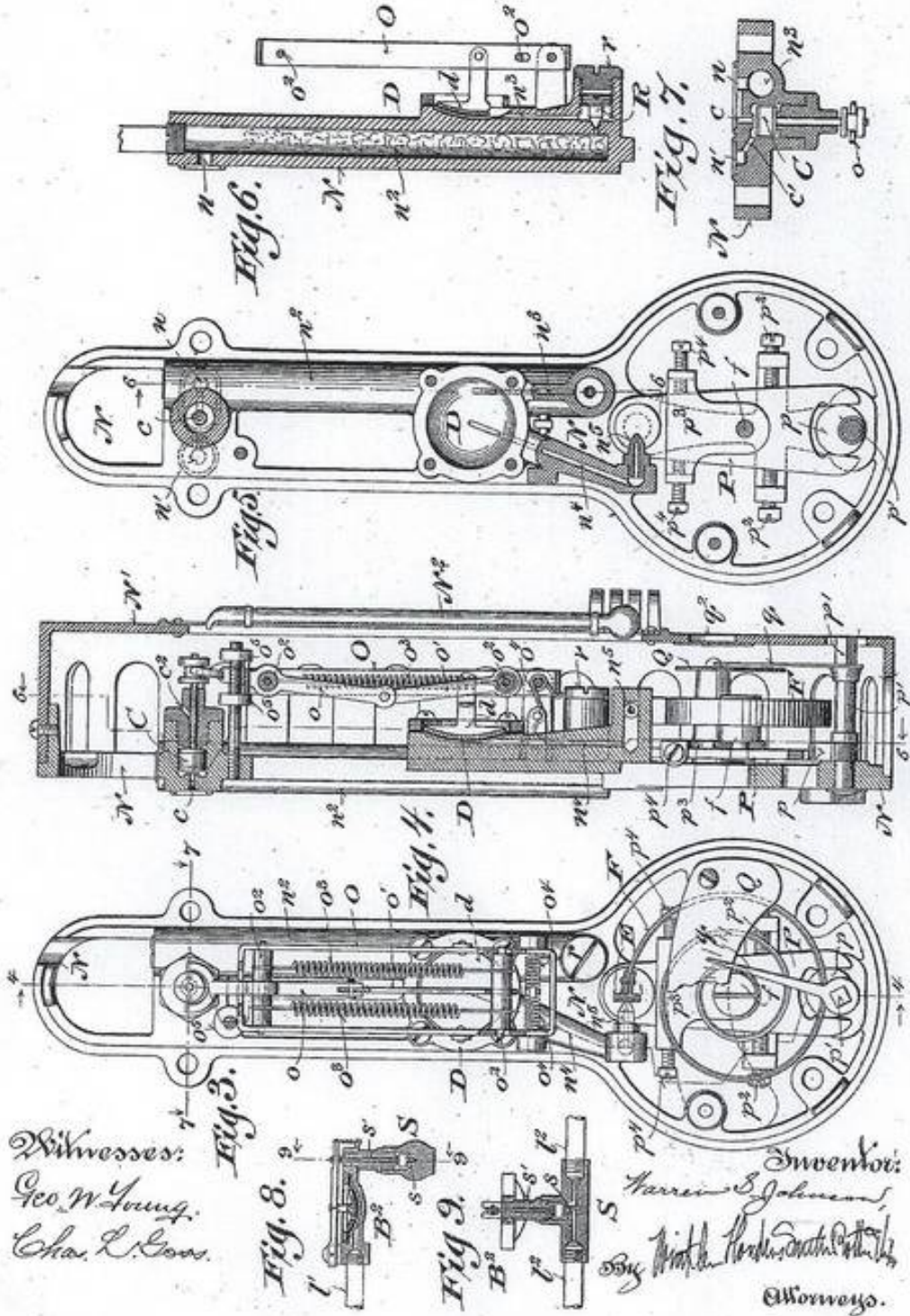
(No Model.)

3 Sheets—Sheet 3.

W. S. JOHNSON.
HEAT REGULATING APPARATUS.

No. 542,733.

Patented July 16, 1895.



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

Inventor:
Wm. S. Johnson,
By [Signature]
Attorneys.

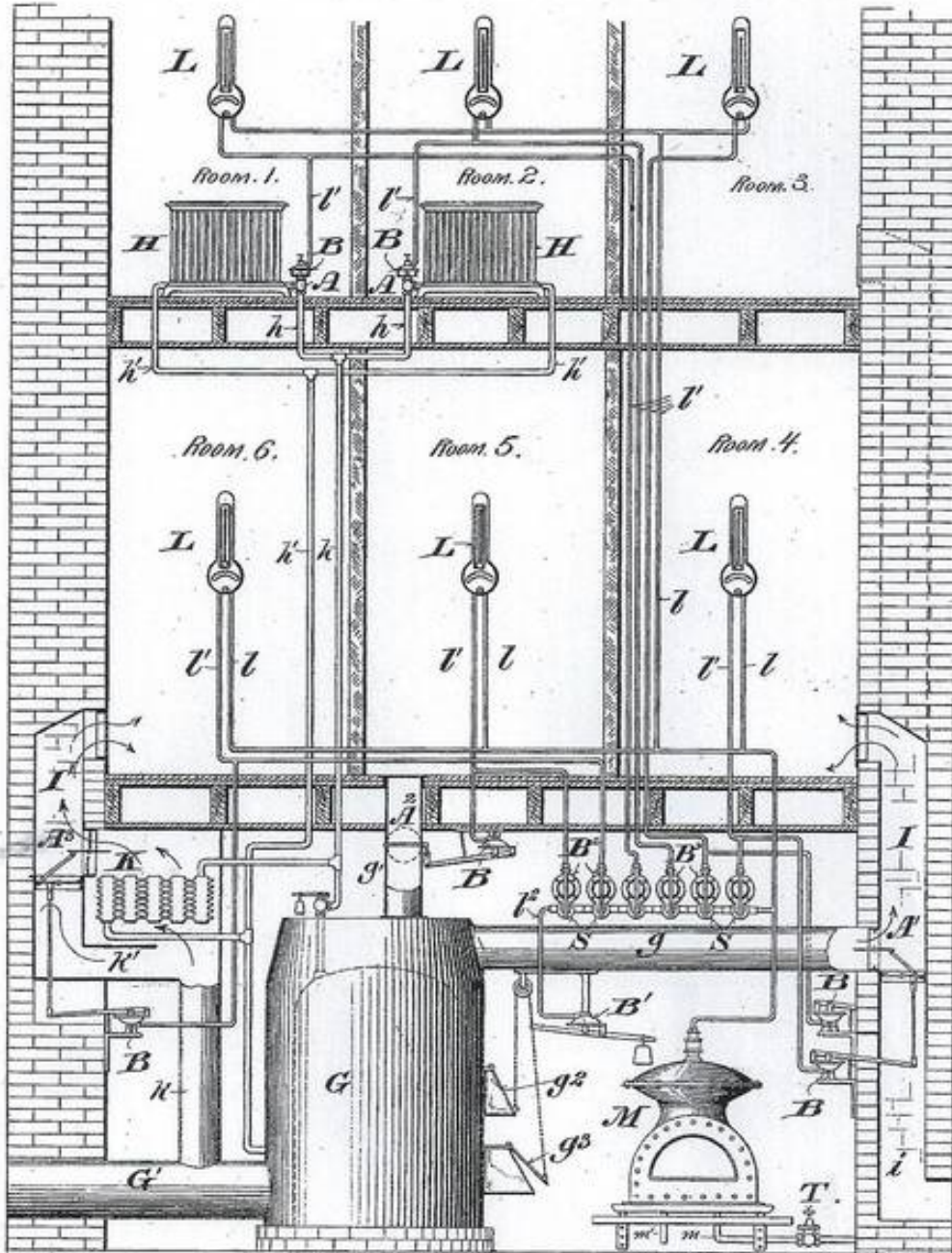
(No Model.)

3 Sheets—Sheet 2.

W. S. JOHNSON.
HEAT REGULATING APPARATUS.

No. 542,733.

Patented July 16, 1895.



Witnesses:
Geo. W. Long,
Chas. L. Coan.

Fig. 2.

Inventor:
Wm. S. Johnson
By *[Signature]*
Attorneys

(No Model.)

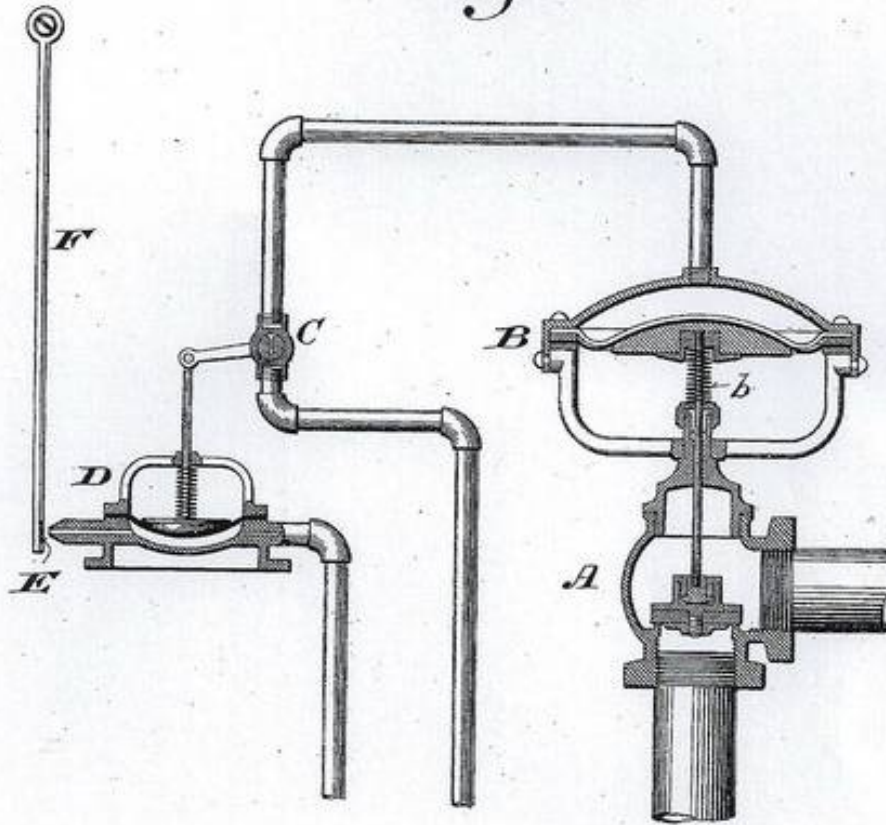
3 Sheets—Sheet 1.

W. S. JOHNSON.
HEAT REGULATING APPARATUS.

No. 542,733.

Patented July 16, 1895.

Fig. 1.



Witnesses

Geo. W. Young,

Chas. L. Coors,

Inventor:

Warren S. Johnson,

*By Wm. H. H. Smith & Co.,
Attorneys.*

(No Model.)

3 Sheets—Sheet 3.

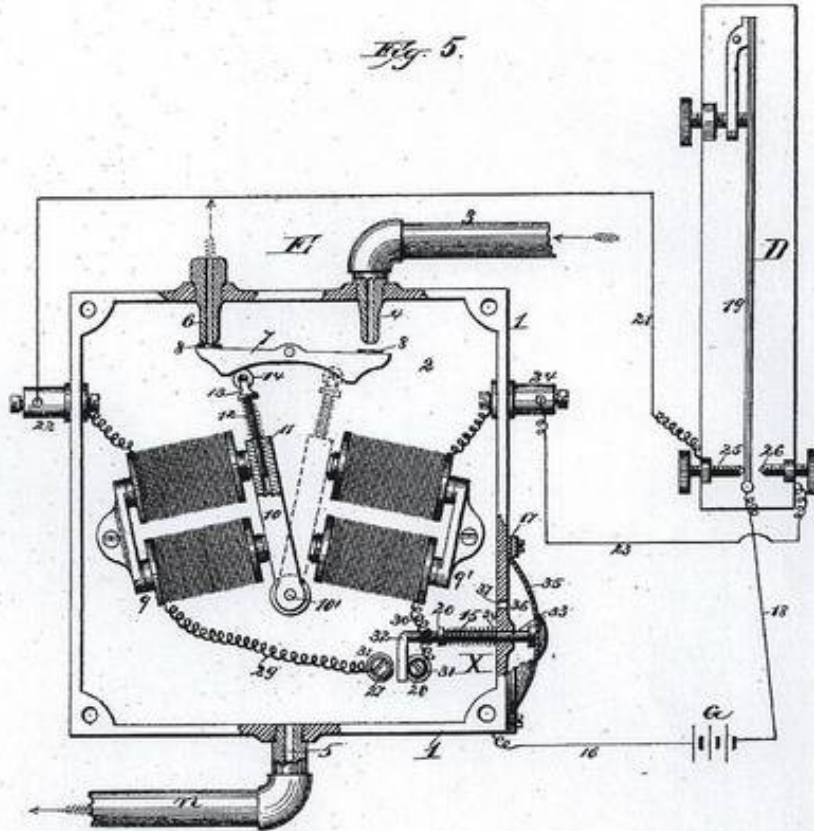
W. S. JOHNSON.

SYSTEM OF TEMPERATURE REGULATION.

No. 352,874.

Patented Nov. 16, 1886.

Fig. 5.



Witnesses:

E. G. James
N. E. Oliphant

Inventor:

Wm. S. Johnson
By J. H. Woodward
Attorneys.

(No Model.)

3 Sheets—Sheet 2.

W. S. JOHNSON.
SYSTEM OF TEMPERATURE REGULATION.

No. 352,874.

Patented Nov. 16, 1886.

Fig. 2.

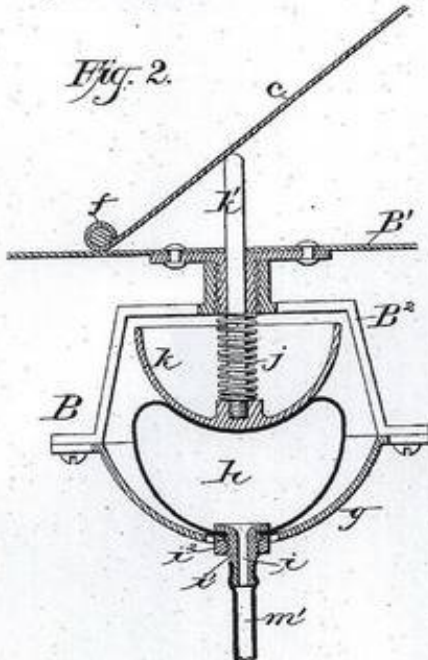


Fig. 3.

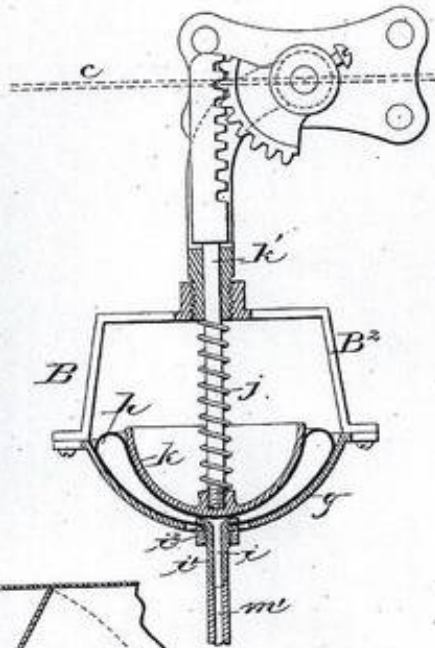
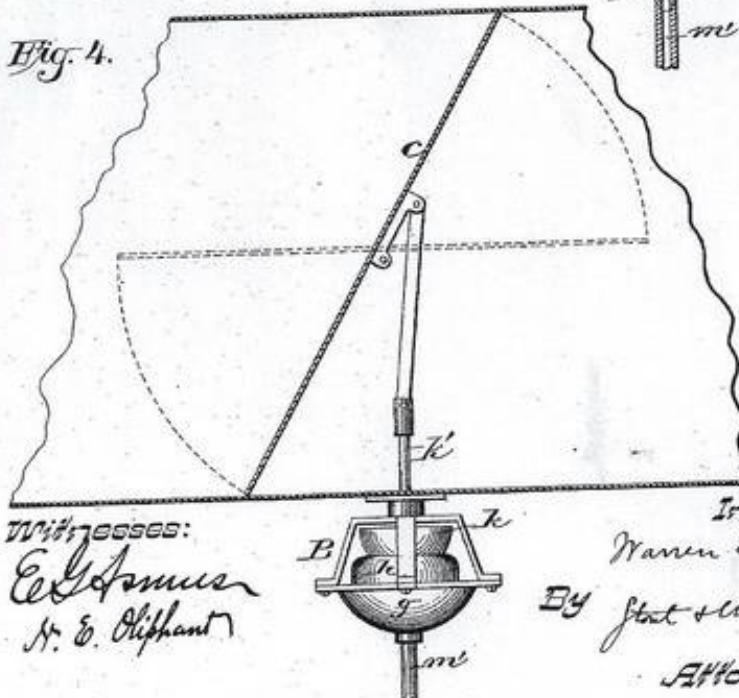
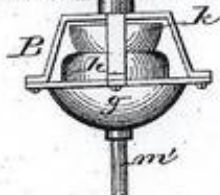


Fig. 4.



Witnesses:

E. J. Amis
H. E. Oliphant



Inventor:

Warren S. Johnson

By J. H. & W. H. Wood

Attorneys.

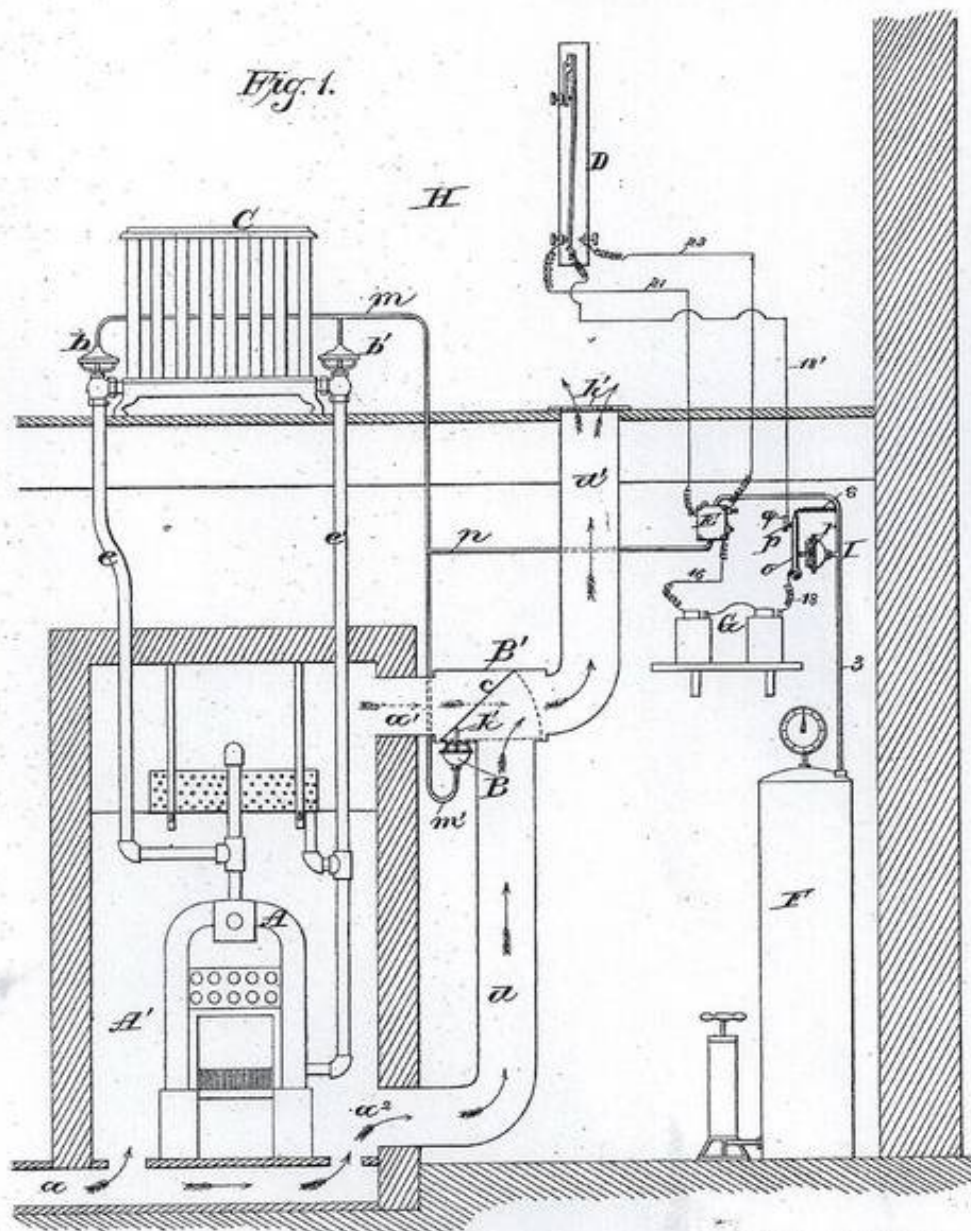
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Patented Nov. 16, 1886.



Witnesses:

E. G. Ames
N. E. Oliphant

Inventor:

Warren S. Johnson

By *John H. Underwood*
Attorneys.

(No Model.)

2 Sheets—Sheet 2.

W. S. JOHNSON.
PIPE COUPLING.

No. 423,323.

Patented Mar. 11, 1890.

Fig. 3.

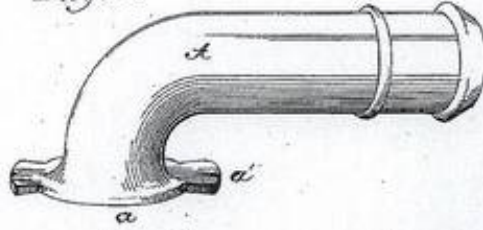
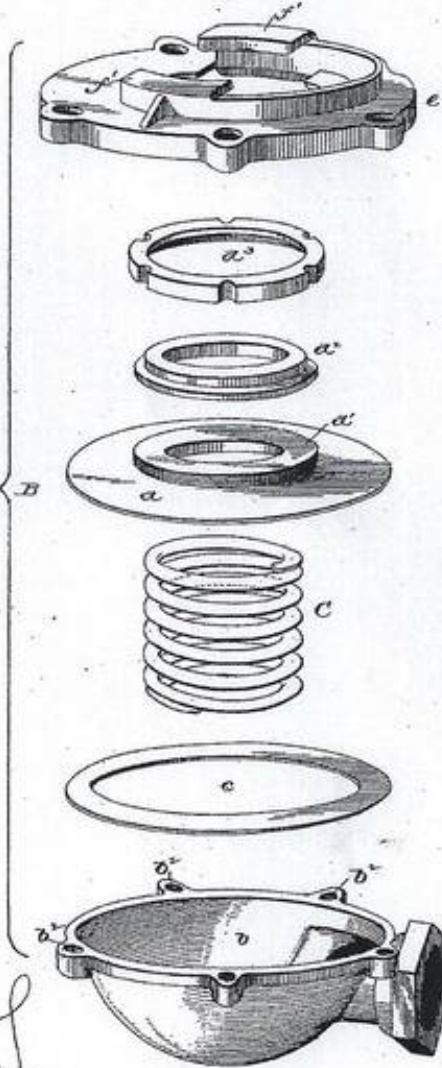


Fig. 4.



Attest:
M. M. Masterson
J. Family Elmer

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

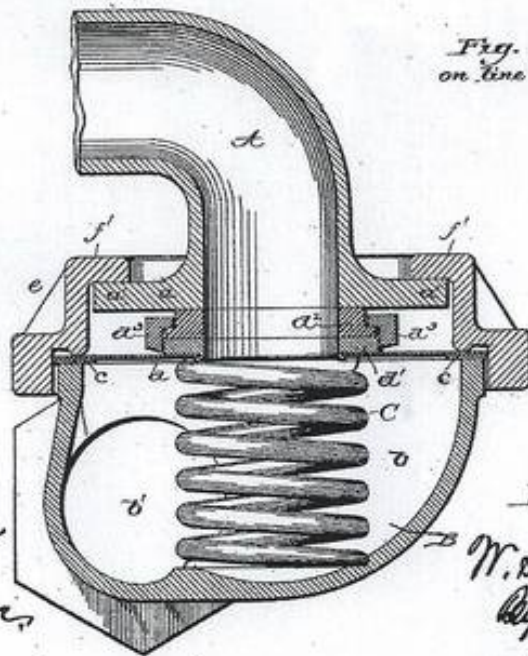
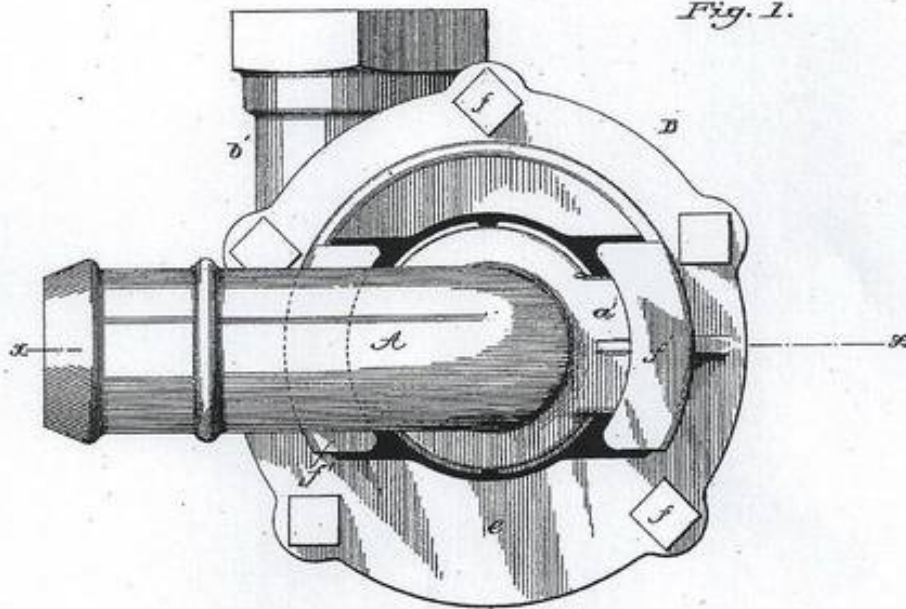
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No. 423,323.

Patented Mar. 11, 1890.



Attest:
N. H. Johnson
G. J. Johnson

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

BIBLIOGRAPHY

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

----- *W S Johnson*, US Patent Office Records

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

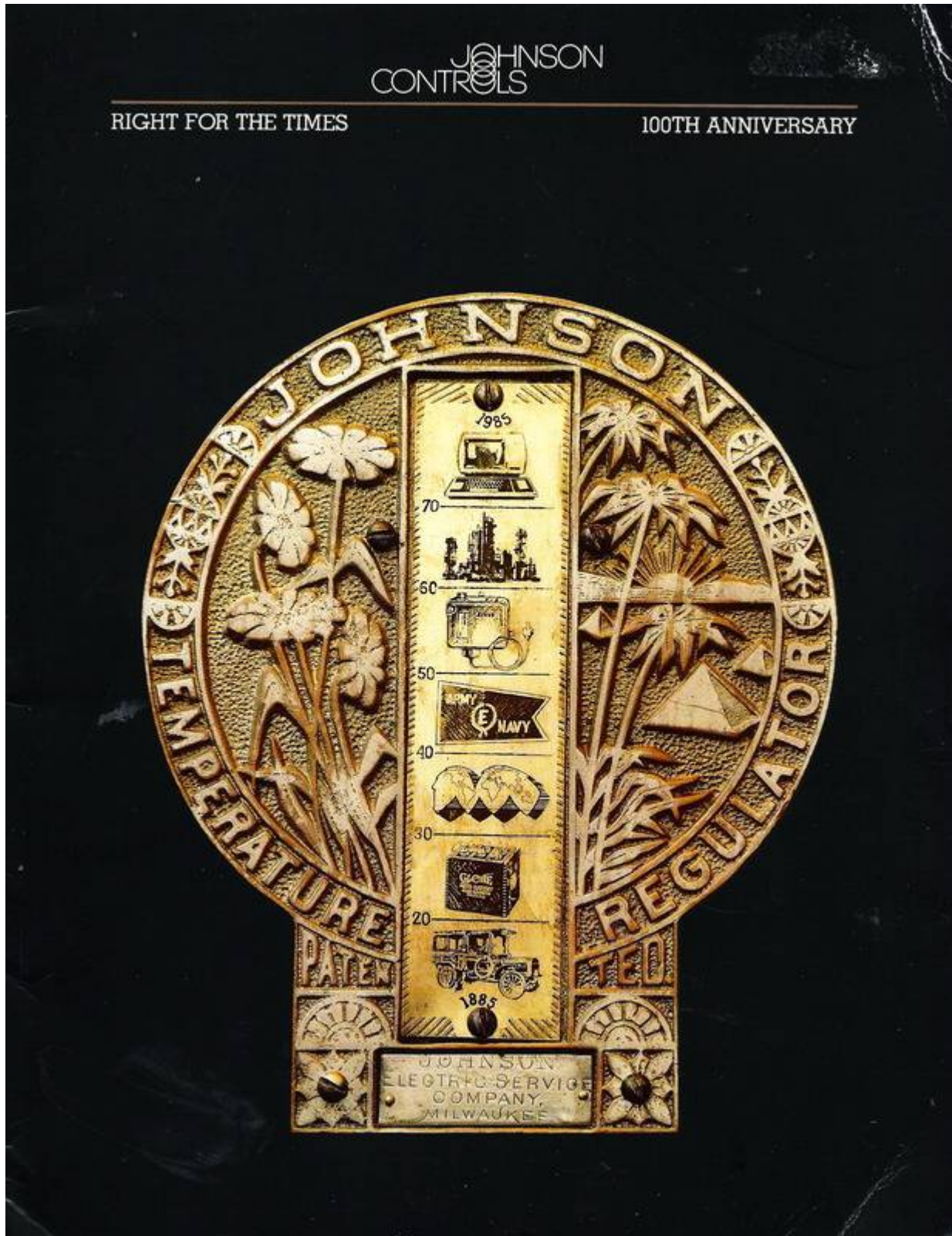
2000 *The Comfort Makers*, Brian Roberts, ASHRAE

----- *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

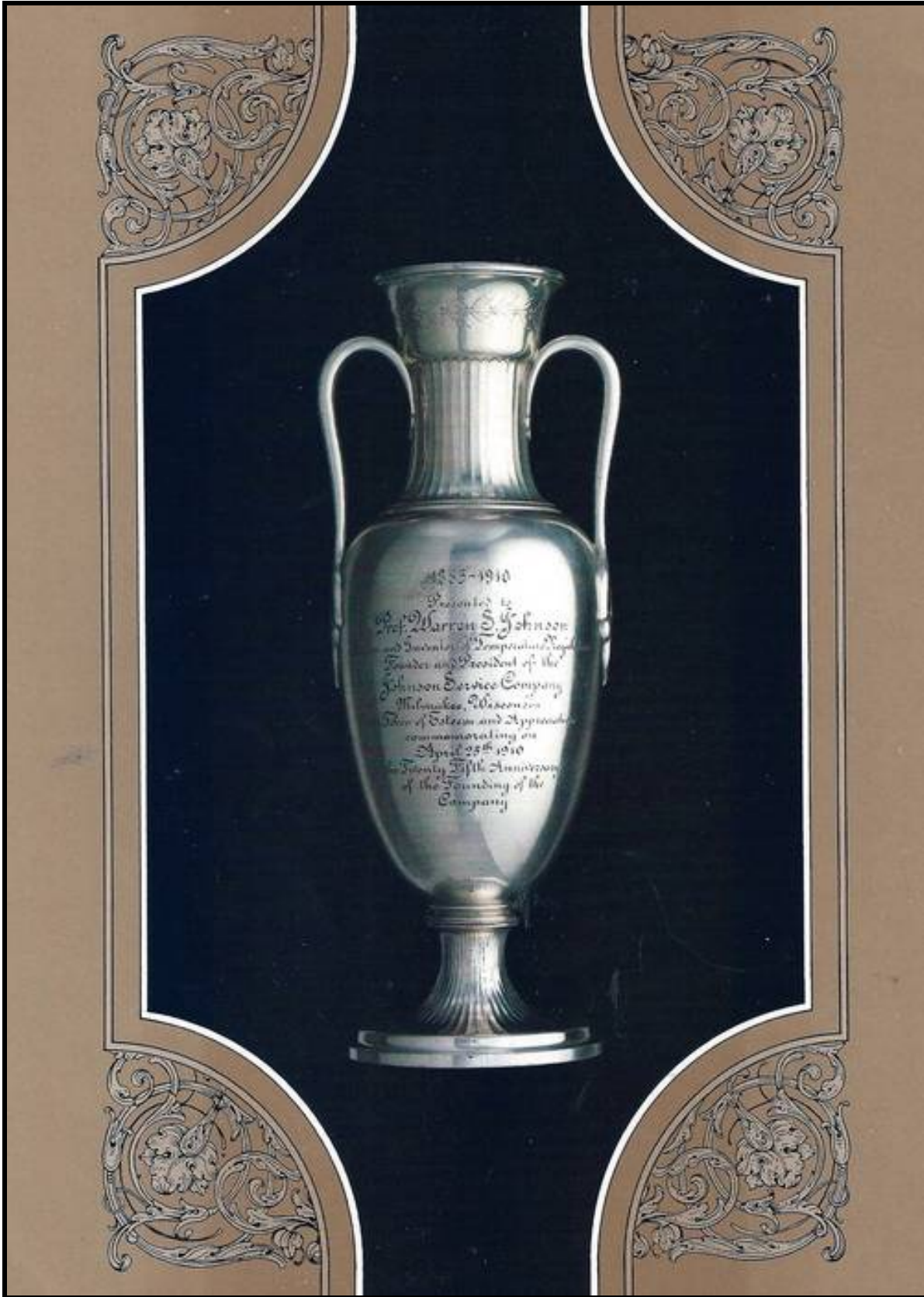


A Selective History of

HEATING, VENTILATION,
REFRIGERATION & AIR CONDITIONING

BARRY DONALDSON BERNARD NAGENGAST
WITH AN INTRODUCTORY ESSAY BY GERSHON MECKLER

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.”

