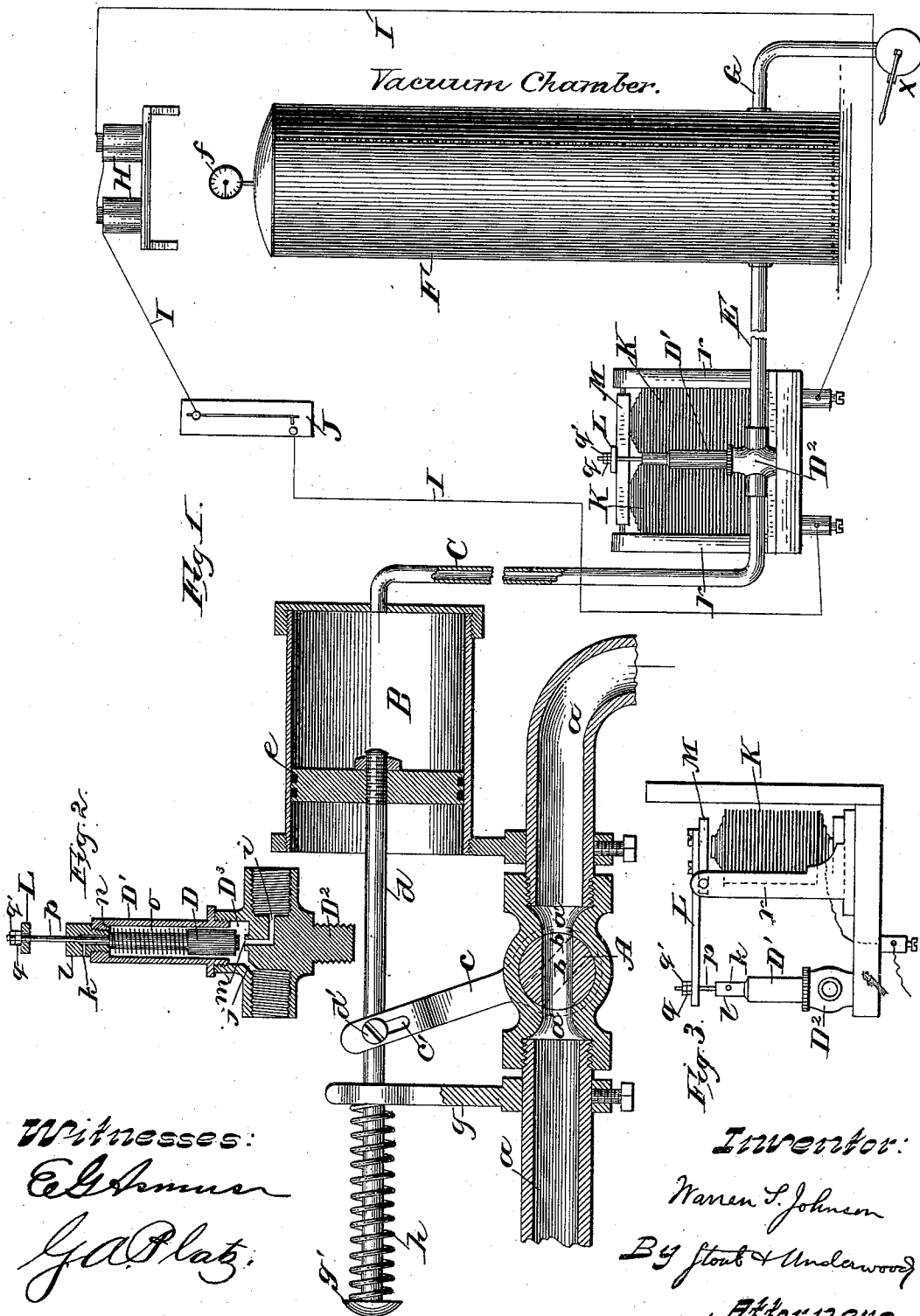


(No Model.)

W. S. JOHNSON.
ELECTRIC VALVE.

No. 351,702.

Patented Oct. 26, 1886.



Witnesses:

E. G. Amner
J. A. Plat.

Inventor:

W. S. Johnson
By J. H. & A. Underwood
Attorneys.

UNITED STATES PATENT OFFICE.

WARREN S. JOHNSON, OF WHITEWATER, ASSIGNOR TO THE JOHNSON
ELECTRIC SERVICE COMPANY, OF MILWAUKEE, WISCONSIN.

ELECTRIC VALVE.

SPECIFICATION forming part of Letters Patent No. 351,702, dated October 26, 1886.

Application filed July 6, 1885. Serial No. 170,735. (No model.)

To all whom it may concern:

Be it known that I, WARREN S. JOHNSON, of Whitewater, in the county of Walworth, and in the State of Wisconsin, have invented certain new and useful Improvements in Electric Valves; and I do hereby declare that the following is a full, clear, and exact description thereof.

My invention relates to electric valves, and will be fully described hereinafter.

In the drawings, Figure 1 is a view, partly in elevation and partly in section, of devices embodying my present invention. Fig. 2 is a section through the vertical center of the secondary valve and coupling for controlling the passage of air to and its exit from the main cylinder. Fig. 3 is a side elevation of the said secondary valve.

My invention belongs to that class of devices wherein the movements of valves are controlled by means of the pressure of fluids, the flu is which operate the valves being in turn controlled by a secondary or electric valve. Patent No. 301,059 and allowed application No. 156,767, granted to me heretofore, as well as my pending application, executed May 2, 1885, show devices whereby a main valve is controlled by a fluid under pressure, the said fluid being itself controlled by an electric valve. My present invention differs from such in that, instead of operating the main valve by means of the expansion of a fluid, it is operated by the direct pressure of the external atmosphere, when the air is exhausted from a chamber which is in mechanical connection with the main valve to be operated.

A is the aforesaid main valve, which controls the flow of hot air, steam, &c., through the pipe *a*.

B is the exhaustion-chamber or main cylinder, from which the air is removed when the main valve A is to be operated in one direction.

C is an air-tube leading from the chamber of the electrically-actuated secondary valve D, which controls the exhaustion-chamber B.

E is the continuation of the said air-tube C, and connects the said chamber of valve D with the vacuum-cylinder F, preferably provided with a gage, *f*, to indicate the degree of vacuity.

From the vacuum-cylinder F another pipe, G,

leads to an exhausting pump. (Not fully illustrated in the drawings, but indicated at X.)

H is the electric battery, which furnishes the electricity to operate the secondary valve D by means of the connecting-wires I I I, and J is a circuit-closing device operated by the temperature of the atmosphere about it, to control thesecondary valve D by means of the electro-magnet K, as hereinafter explained.

In Fig. 1 the main valve A is represented as a plug-cock, which serves to close the steam or other passage *a* when turned in one direction, as indicated by the dotted lines *b b*, which closes the ports *a' a'*, and to open said passage when turned in another direction, as shown in full lines on the drawings. This plug-cock A is provided with a slotted arm, *c*, which is wristed (by pin *d'* passing through the slot *c'* in said arm) to the piston-rod *d*, which latter passes at one end through a standard, *g*, and terminates in a flange, *g'*, and between the said parts *g* and *g'* this free end of the piston-rod *d* carries a retracting-spring, *h*, while the other end of said piston-rod *d* carries a piston-head, *e*, which is accurately fitted in the cylinder B. When the air is exhausted from the chamber B, the atmospheric pressure upon the piston-head *e* will move the arm *c* forward and close the ports *a' a'* in the passage *a* by the valve A; but when air is again admitted to said cylinder B, the retractile force of the spring *h* will serve to move the piston-rod back, and thereby turn the valve A and open the ports again.

In place of the spring *h*, I may use any of its well-known equivalents—such as a weight, opposing cylinder, &c.

In Fig. 2 I show the construction of the valve D, its casing D', and connecting passages. The valve D controls the passage and exit of air to and from the chamber or cylinder B. The valve-casing D' screws into the coupling D², which coupling receives the pipes C and E, already described, which are connected to the valve-chamber D³ within the casing D' by the ports or passages *j* and *i*, respectively, formed in said coupling. At *k* (in the screw-cap or upper part, *l*, of the casing D') is the inlet for the external air. As shown in Fig. 2, the passage from *i* to *j* is fully open, as the lower head of the valve D is raised from its seat *m*, and

at the same time it will be seen that the port *k* is closed, since the upper head of the said valve is raised against its seat *n*; and the said upper head of the valve carries a spring, *o*, surrounding it and abutting against the screw-cap *l* and against the top of the lower head of the valve, and this valve has a stem, *p*, which projects up through the screw-cap *l* and receives the end of the armature-lever *L*, above which the end of the stem *p* is screw-threaded to receive the nuts *q q'*.

M is the armature, journaled in suitable standards, *r r*, and properly secured to its lever *L*. When the circuit is closed, the armature *M* is attracted by the magnet *K*, and the outer end of the lever *L* consequently is raised, pulling the stem *p* upward with it and raising the lower head of the valve *D* from its seat *m*, thereby opening the passage *j D³ i* and closing the port *k*, all as shown in Fig. 2; but when the current is broken, the said valve-head falls by reason of gravity and the force of the spring *o*, thus closing the port *i* and opening the passage *j D³ k*.

The part *J*, hereinbefore named, may be any one of the well-known forms of thermostats which will serve to make or break the electric circuit by the fluctuations of temperature in the apartment where it is situated.

To better explain the working of my devices in a given case, let it be supposed that the valve *A* controls the admission of steam for heating purposes to the apartment in which the thermostat *J* is situated. The valve *A* is now open and the electric circuit is broken at *J*. Should the temperature rise sufficiently at *J* to close the electric circuit, the valve *D* will be operated and the chamber *B* will be exhausted of air, and by the described pressure of the external atmosphere on the outside of the piston-head *e* the latter will be forced inward in the cylinder *B*, and by means of the pin *d'* on the piston-rod *d* the arm *c* will be drawn forward and the valve *A* turned so as to close the ports *a' a'* and shut off the steam. When the temperature falls sufficiently to again break the circuit at *J*, the head of the valve *D* will fall and open the passage *j D³ k*. The external air now rushes into the chamber *B*, leaving the spring *h* free to operate the valve *A* in the opposite direction.

The use of a vacuum in place of a fluid under pressure for the operation of valves is especially desirable when the air-pump is to be run continuously, from the well-known fact that while compression-pumps in constant use become excessively heated and often disarranged, exhaustion-pumps, on the other hand,

remain constantly cool and in a properly-lubricated condition.

Having thus fully described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In electrically-actuated valves, the combination, with a main valve, of an exhaustion-chamber whose movable wall operates said valve when the air is withdrawn from said chamber, a vacuum-chamber connected therewith, an electrically-actuated secondary valve arranged to control the passage of air from the exhaustion-chamber to the vacuum-chamber, an electric circuit, and a thermostatic circuit-closing device, whereby the closing of the electric circuit operates the said secondary valve, substantially as set forth.

2. In electrically-actuated valves, the combination, with a main valve, of an exhaustion-chamber whose movable wall operates said valve when the air is withdrawn from said chamber, a vacuum-chamber connected therewith, an electrically-actuated secondary valve arranged at an intermediate point between the exhaustion-chamber and the vacuum-chamber, and adapted to admit the passage of air from the exhaustion-chamber to the vacuum-chamber, as well as from the outside atmosphere to the exhaustion-chamber, an electric circuit, and a thermostatic circuit-closing device, whereby the closing of the electric circuit operates the said secondary valve, substantially as set forth.

3. In electrically-actuated valves, the combination of a steam or other passage provided with suitable ports, a main valve adapted to control said ports and having a slotted arm connected thereto, an exhaustion-chamber, a piston-head moving therein and connected to a piston-rod having a pin working in the slotted arm, a retracting-spring arranged upon said piston-rod, a vacuum-chamber connected to the exhaustion-chamber, an electrically-actuated secondary valve adapted for controlling the passage of air from the exhaustion-chamber to the vacuum-chamber and from the outside atmosphere to the exhaustion-chamber, an electric circuit, and a thermostat in said circuit, substantially as set forth.

In testimony that I claim the foregoing I have hereunto set my hand, at Milwaukee, in the county of Milwaukee and State of Wisconsin, in the presence of two witnesses.

WARREN S. JOHNSON.

Witnesses:

H. G. UNDERWOOD,
G. A. PLATZ.