J. A. SERRELL & J. L. FITTS.

THERMOSTATIC VALVE.

APPLICATION FILED JUNE 30, 1911.

1,109,705.

Patented Sept. 8, 1914.

2 SHEETS-SHEET 1.

FIG. 1.

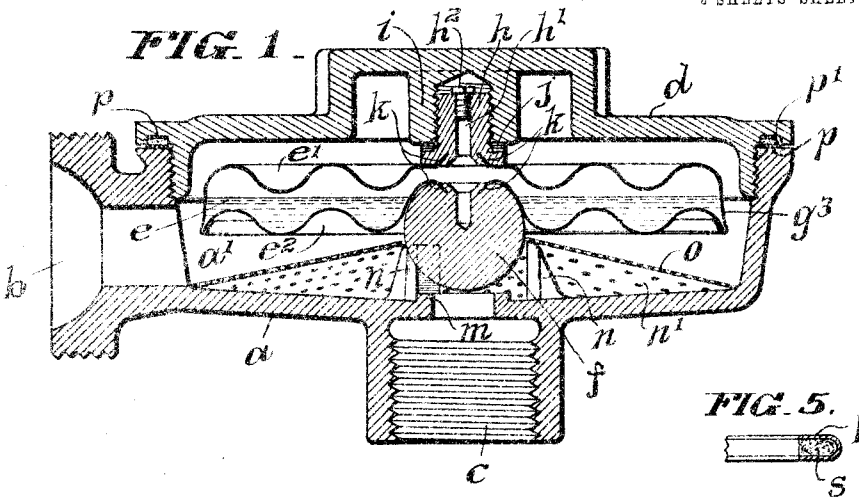


FIG. 5.

FIG. 2.

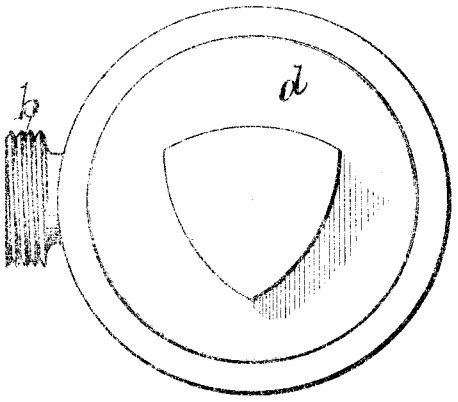


FIG. 3.

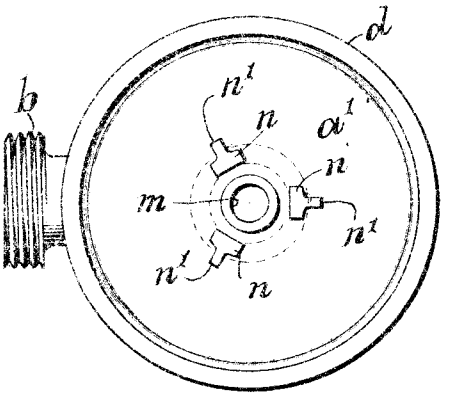
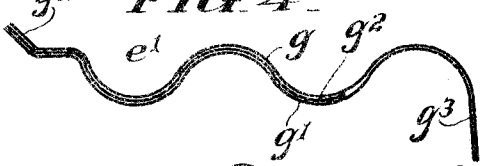


FIG. 4.



Witnesses

Daniel Webster, Jr.

A. M. Kelly.

Inventors

John A. Serrell and

James Logan Fitts

By

Attorney

J. A. SERRELL & J. L. FITTS.

THERMOSTATIC VALVE.

APPLICATION FILED JUNE 30, 1911.

1,109,705. Patented Sept. 8, 1914.

2 SHEETS—SHEET 2.

FIG. 6.

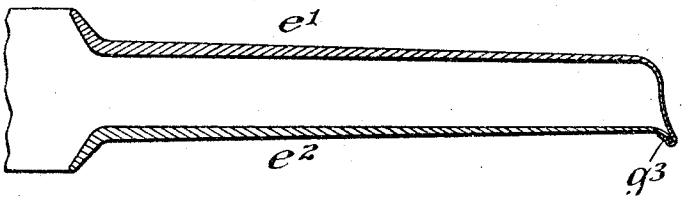


FIG. 7.

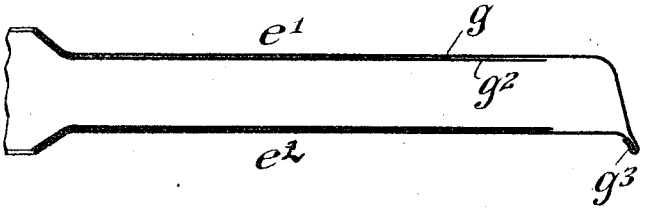
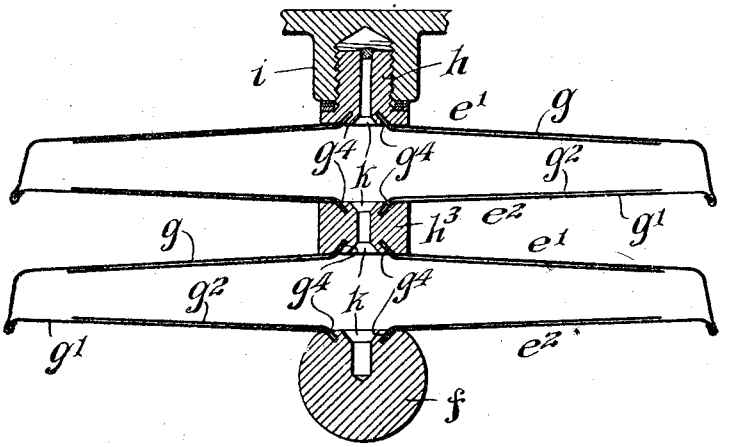


FIG. 8.



Witnesses

Daniel Webster Jr.

A. M. Kelly

Inventors

John A. Serrell

James Logan Fitts

By

Attorneys

UNITED STATES PATENT OFFICE.

JOHN A. SERRELL, OF NORTH PLAINFIELD, AND JAMES LOGAN FITTS, OF PENSAUKEN TOWNSHIP, CAMDEN COUNTY, NEW JERSEY; SAID FITTS ASSIGNOR TO WARREN WEBSTER & COMPANY, A CORPORATION OF NEW JERSEY.

THERMOSTATIC VALVE.

1,109,705. Specification of Letters Patent. Patented Sept. 8, 1914.

Application filed June 23, 1911. Serial No. 634,224.

To all whom it may concern:

Be it known that we, JOHN A. SERRELL, a citizen of the United States, and resident of North Plainfield, Somerset county, State of New Jersey, and JAMES LOGAN FITTS, a citizen of the United States, and resident of Pensauken township, Camden county, State of New Jersey, have invented an Improvement in Thermostatic Valves, of which the following is a specification.

More particularly our invention relates to that type of thermostatic valves in which the valve-piece is controlled by an expansion-cell containing an expansible fluid or substance.

Our object is to provide a valve of this type which shall be durable, clean and generally highly efficient.

A part of our improvements relates to the construction of the expansion-cell so formed as to increase the strength of the walls at the center where the greatest tendency to break occurs, without impairing the elasticity near the outer edge.

Another part of our improvements relates to the manner of securing the diaphragms or walls of the expansion-cell to the valve-casing and to the valve-piece.

Our invention also embraces improvements in the construction of the valve-piece, and in the means for guiding it; in the form of the dirt screen and in the manner of supporting it in the casing; in the packing between the body of the casing and the removable cap; and in the means for supporting the expansion-cell adjustably in the casing.

In the drawings: Figure 1 is a vertical sectional view of a thermostatic valve, or steam-trap, embodying the improvements; Fig. 2 is a plan view of the same on a reduced scale; Fig. 3 is a plan view of the body with the cap, screen, and operative parts removed; Fig. 4 is an enlarged sectional view of a portion of one of the diaphragms forming the walls of the expansion-cell; Fig. 5 is a cross sectional view enlarged of part of the packing ring; Figs. 6 and 7 are enlarged sectional views of a portion of an expanding cell illustrating modifications, and Fig. 8 is a vertical sectional view of an expanding member composed of a plurality of connected cells.

a is the body of the valve having an inlet *b* and outlet *c*.

d is the cap adapted to be screwed into the open top of the body to form the valve chamber *a'*.

e is the expansion-cell in the chamber *a'* which controls the valve-piece *f*.

The expansion-cell *e* is composed of two diaphragms e', e^2, having their outer edges secured together and forming a chamber which contains an expansible substance. These diaphragms are preferably of laminated form. As shown in Fig. 4, they are composed of three sheets g, g', g^2, of which the outer sheets are of full width, and the middle sheet g^2 is shorter and does not extend the full width of the diaphragm. In the construction shown in Figs. 7 and 8 but two leaves g, g^2 are used. The walls are preferably corrugated as shown in Figs. 1 and 4, but they may be flat as shown in Figs. 6, 7 and 8. They are connected together at their outer edges. In the particular constructions shown, the upper diaphragm e' is considerably longer than the lower diaphragm e^2 and its outer edge g^3 is bent down to form the perimeter of the cell with its extremity bent over and soldered to the outer edge of the lower diaphragm.

The special advantage of making the diaphragms of the expansion-cell of laminæ as described, is that they possess great flexibility and strength. It has been found that corrugated diaphragms have a tendency to break near the center. Our diaphragm has a greater thickness at the center, and less thickness near the outer edge. The strength of the diaphragm is thus increased near the center where the tendency to break is greatest, but is not correspondingly increased near the outer edge, so that the flexibility at that point is not impaired. While we prefer to make the diaphragm of laminæ or leaves for the purpose of obtaining this result we may form the walls of a single tapered sheet as shown in Fig. 6.

Each diaphragm has an opening at the center, and by means of the edges g^4 of the metal at these openings the diaphragms are

attached to the cap and valve-piece respectively. For this purpose an annular groove is formed in the metal of the part to which the diaphragm is to be attached. The edge g^4 of the diaphragm is bent out for the purpose and is inserted in this groove and the metal inside of the groove is then spun or swaged over the edge g^4. This is shown at k, k, in Fig. 1. Solder may then be applied to make the connection hermetically tight.

Instead of attaching the upper diaphragm e' directly to the cap d, it is preferably attached to a tubular thimble h screwed into a threaded boss i on the inside of the cap. By the adjustment of the thimble h in the boss the position of the expansion-cell may be adjusted. As a convenient means of determining and limiting the adjustment, washers j may be inserted between the head of the thimble and the boss.

The thimble h is provided with a passageway h' which opens into the interior of the expansion-cell and which may be closed by a small plug h^2. This passageway forms a means of filling the expansion-cell with such expansible fluid or substance as may be used.

The valve-piece f is preferably ball-shaped or spherical, as shown, and the seat m has a flat top with an angular edge. The contact of the ball on its seat produces a cleaning or cutting action, and prevents particles lodging between the valve-piece and its seat and preventing the tight closing of the valve. While we have shown the valve-piece f of spherical shape we do not mean to limit ourselves to this exact form.

n, n, n, are guides extending from the base of the body a and arranged about the valve-seat m, which act to guide the valve-piece to its seat.

o is a screen which is shaped like the frustum of a shallow cone with its inner edge supported by the guides n and its outer edge resting on the base of the body a. The screen preferably extends out to the corner of the body a, and while thus firmly supported, and not liable to be displaced during the use of the valve, the screen may be easily lifted out when the cap and operative parts are removed for the purpose of cleaning.

Between the flange of the cap d and the upper edge of the body a, preferably in a recess p' in the cap, is a packing p which preferably consists of a ring of thin copper U-shaped in cross section and filled with asbestos or equivalent compressible material s (see Fig. 5). When the cap is screwed down the asbestos is tightly compressed between the layers of copper. The valve may be made with an expanding member composed of a plurality of expansion-cells. An expanding member of this kind, is shown in Fig. 8, in which two cells are coupled together through the medium of a tubular thimble or coupling h^3, with which the walls of the cells may be connected by the edges g^4 in the same manner that they are connected to the thimble h and valve-piece f.

What we claim is as follows:

1. In a thermostatic valve of the character described, the combination with a casing having an inlet and an outlet, and a valve-piece to control the thoroughfare through said valve, of a removable cap for said casing, and an expansion-cell to control said valve, said cell having the diaphragm forming one of its walls provided with a central hole and having the edge of the metal about said hole inserted in a groove in the valve-piece and the metal of said valve-piece within said groove spun or swaged over said inserted edge.

2. In a thermostatic valve, the combination with a casing having an inlet and an outlet and a valve-piece to control the thoroughfare through said valve, of an expansion-cell in said casing controlling said valve-piece, and a screen of shallow cone shape supported in the bottom of said casing and having a central opening for the valve-piece.

3. In a thermostatic valve, the combination with a casing having an inlet and an outlet and a valve-seat, of a valve-piece adapted to fit said seat, upright guides in the casing arranged about said seat and adapted to guide the valve-piece, and an expansion-cell in said casing controlling said valve-piece, and a screen of shallow cone shape extending from said guides to the bottom of the casing and having a central opening for the valve-piece.

4. In a thermostatic valve, the combination with a casing having an inlet and an outlet and a valve-seat, of a valve-piece adapted to fit said seat, upright guides in the casing arranged about said seat and adapted to guide the valve-piece and having radial arms tapering down toward the bottom of the casing, an expansion-cell in said casing controlling said valve-piece, and a screen of shallow cone shape resting on said guide arms and having a central opening for the valve-piece.

5. In a thermostatic valve of the character described, the combination of a plurality of expansion cells and a connecting thimble uniting adjacent cells together, the edges of the metal about a central hole in the adjacent walls of the cells being each inserted in a groove in said thimble and the metal of said thimble inside of said groove being spun or swaged over said inserted edge.

6. In a thermostatic valve, a supporting member having a groove therein, a valve

piece having a groove therein, an expansion cell diaphragm comprising walls spaced apart and having a centrally disposed opening in each wall, the edge of the material about the respective openings being respectively arranged in the grooves of the supporting member and the valve piece, and the material of said member and said valve piece forming the inner boundaries of said grooves being spun or swaged over said inserted edges.

In testimony of which invention, we hereunto set our hands.

JOHN A. SERRELL.
JAMES LOGAN FITTS.

Witnesses as to John A. Serrell:
RUSSELL G. BROWN,
CHAS. J. KOPF.
Witnesses as to James L. Fitts:
WILLIAM H. SNYDER,
PHILIP Y. QUINN.