J. L. FITTS.

MULTIPLE CELL THERMOSTAT.

APPLICATION FILED AUG. 3, 1912.

1,070,027.

Patented Aug. 12, 1913.

FIG. 1.

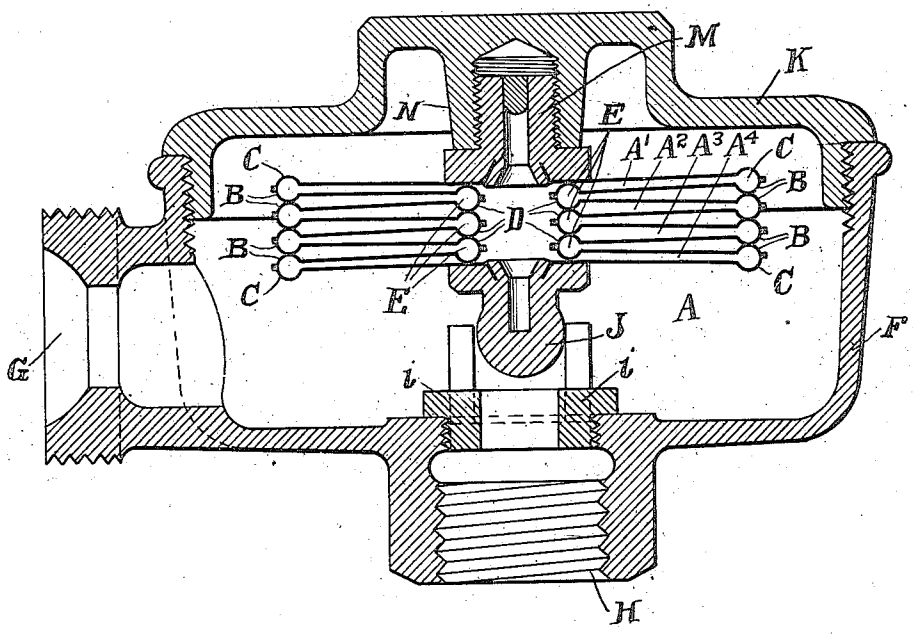
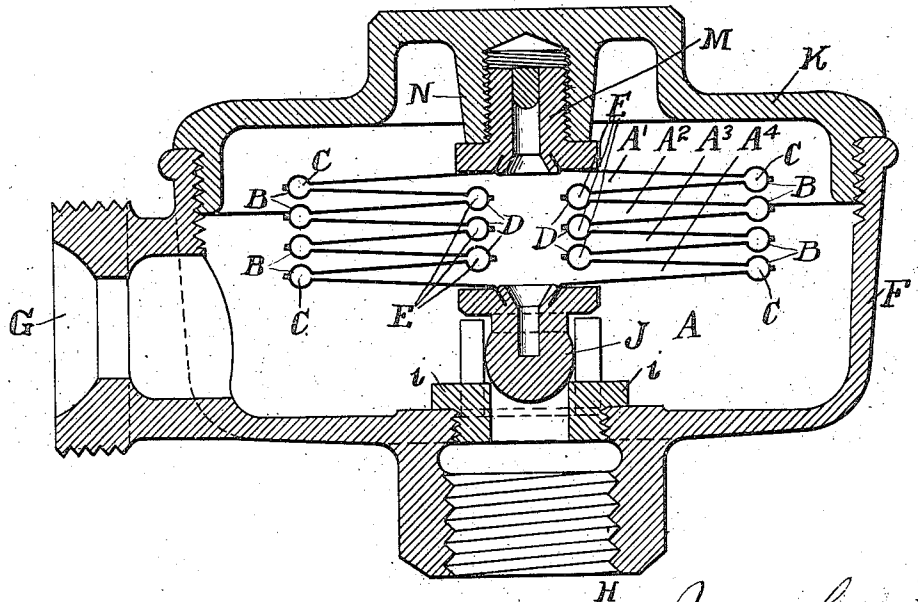


FIG. 2.



WITNESSES

Daniel Webster, Jr.

R. M. Kelly.

INVENTOR

James Logan Fitts,

BY

ATTORNEY

UNITED STATES PATENT OFFICE.

JAMES LOGAN FITTS, OF PENSAUKEN TOWNSHIP, CAMDEN COUNTY, NEW JERSEY, ASSIGNOR TO WARREN WEBSTER & COMPANY, A CORPORATION OF NEW JERSEY.

MULTIPLE-CELL THERMOSTAT.

1,070,027. Specification of Letters Patent. Patented Aug. 12, 1913.

Application filed August 3, 1912. Serial No. 713,094.

To all whom it may concern:

Be it known that I, JAMES LOGAN FITTS, citizen of the United States, and resident of Pensauken township, county of Camden, and State of New Jersey, have invented an Improvement in Multiple-Cell Thermostats, of which the following is a specification.

My invention relates more particularly to multiple cell thermostats having a thermally expansible element of the diaphragm type in which each cell is composed of diaphragms formed of thin metal disks connected together at their outer edges, and in which the adjacent cells are directly connected together at central openings in the contacting diaphragms, so that the cells communicate directly with one another. Such thermostats usually contain substance which expands or contracts under changes in temperature.

It is the primary object of my invention to provide a thermally expansible element of the character described with means to limit the extent of contraction without impeding the extent of expansion, thus rendering the device more reliable and better adapted to certain uses.

It is also my object to provide a thermostat of the character specified which shall be compact, firm and not liable to be injured by rough handling.

The invention also relates to the combination of such an expansible element with a controlling valve carried by one of the outer cells and an attaching device carried by the other outer cell for attachment to a valve body or casing, said controlling valve and attaching device sealing the thermally expansible element.

In the drawings: Figure 1 is a vertical sectional view of a valve containing my improved thermostat with the thermostat contracted and the valve open, and Fig. 2 is a similar view with the thermostat expanded and the valve closed.

The thermally expansible element A is of the multiple communicating-cell type formed of directly connected diaphragms. In thermostats of this type each cell is composed of a pair of thin metallic circular diaphragms united at their outer edges, and these cells are placed one against another with the inner edges of adjacent diaphragms, which are formed with circular openings, united together to form a communication between the series of cells. The cellular structure thus formed is filled with an expansible substance which expands when heated and forces the diaphragms apart, thus separating the cells and causing the structure as an entirety to expand. The extent of expansion will be proportional to the number of cells employed.

My invention relates to a thermostat of this type and while I have shown the expansible element composed of four connected and communicating cells A′, A^2, A^3, A^4 it will be understood that more or less may be employed.

In my thermostat, as shown in the drawings, each diaphragm is formed of a thin circular piece of sheet metal provided at the outer edge with an outwardly curved, and preferably semi-circular, portion B, so that when the two outer edges are connected together these portions B B will form a more or less round annular connecting head or bead C.

The inner edges of the diaphragms—except those of the two outer diaphragms—are provided at the central openings with similar outwardly curved or semi-circular portions D forming annular connecting heads or beads E on the inner connected edges of adjacent diaphragms which connect adjacent cells. These heads C and E are of such size that when the expansible element is contracted, *i. e.* either empty, or filled with the expansible fluid at normal low temperature, they will be in contact with one another, as shown in Fig. 1. They thus form limit stops to the contraction of the thermostat, fixing absolutely the extent to which it can move the valve piece, or other part controlled by it under contraction, and at the same time they make of the contracted or unexpanded thermostat a substantially solid structure, which will not be affected by very rough handling to which such devices before they are assembled are often subjected by fitters and laborers.

When the thermostat expands as shown in Fig. 2, the diaphragms composing each cell are moved apart and the heads C, E, move out of contact, but when the thermostat contracts the heads come in contact again and thus limit the extent of contraction. It follows, therefore, that, having the limit of contraction absolutely fixed, a more accurate regulation of the valve may be obtained

to produce the desired extent of movement which is due to the extent of expansion only, and cannot be affected by any extra contraction due to accidental or abnormal condition. This is of great importance in a thermostat adapted to control a valve, as in the outlets of a steam heating system, where the limits of the movement of the valve should be controlled with precision. A valve controlled by such a thermostat cannot move to open the outlet to a greater extent than that for which it is set.

While the thermostat may be used in any application for the purpose of producing motion, I have shown it applied to a return valve or steam trap of a steam heating system.

F is the body or casing having the usual inlet G adapted to be connected with the radiator outlet, the outlet H leading to the return pipe and the seat *i*.

As shown the lower diaphragm of the cell A^4 is connected to the valve-piece J which controls the thoroughfare through the seat to the outlet H, and the upper diaphragm of the upper cell A′ is connected with the usual movable cap or bonnet *k* screwed into the top of the body. I have shown the thermostat connected with the cap by means of a thimble M adapted to be screwed into a threaded boss N in the cap. The expansible element A with the attached thimble M and valve-piece J is a complete article in itself adapted to be applied to any suitable valve body and detachable therefrom.

The operation of the thermostat as thus applied to the return valve of a radiator is obvious.

When the radiator is cold, or water or air is passing, the thermostat will be more or less contracted lifting the valve J from its seat and permitting the water and air to pass out to the outlet H, but when steam enters the valve-body, the thermostat will expand and close the outlet. In no event, however, can the thermostat be contracted to lift the valve and increase the thoroughfare through the seat *i* to a greater extent than is permitted by the limit stops formed by the heads C and E. Thus the thermostat may be adjusted to limit the maximum area of the thoroughfare at each radiator as conditions may require.

The edges of the diaphragms may be united in any convenient manner, but it is a further advantage of my improvement that the heads or beads C, E separate the contacting edges of the diaphragms apart at such distance that such edges may be easily united together without liability of the brazing material or solder passing by capillary action between the edges of the adjacent diaphragms and uniting them.

While I have shown the limit stops C and E in the form of round beads formed by semi-circular ribs on the diaphragms, I do not mean to limit myself to such form as it is immaterial to the invention how the stops are formed provided the construction is one in which the adjacent cells are separated to a substantial extent from one another—as illustrated in the drawings—from their inner points of connection toward the periphery, but have enlargements or extended portions—whether in the form of rounded heads or not—at or near the periphery which are normally in contact when the thermostat is unexpanded to form stops against contraction.

What I claim is as follows:

1. A thermally expansible element for thermostats consisting of a plurality of communicating cells each composed of two metal diaphragms having their opposing faces permanently out of contact and connected together at their outer edges, with adjacent cells connected together at their inner edges, each cell being provided at its outer edge with an enlarged hollow annular bead or head normally contacting with the corresponding bead or head of the adjacent cell when the cells are contracted or unexpanded.

2. A thermally expansible element for thermostats consisting of a plurality of communicating cells each composed of two metal diaphragms having their opposing faces permanently out of contact and connected together at their outer edges, with adjacent cells connected together at their inner edges, and provided at each connection between said inner edges with an enlarged hollow annular bead or head the adjacent beads or heads normally contacting with one another when the cells are contracted or unexpanded.

3. A thermally expansible element for thermostats consisting of a plurality of communicating cells each composed of two metal diaphragms having their opposing faces permanently out of contact and connected together at their outer edges, with adjacent cells connected together at their inner edges, each cell being provided at its outer edge with an enlarged hollow annular bead or head, and the inner connecting edges of adjacent cells being also provided at each connection with an enlarged hollow annular head or bead, the heads or beads on the outer edges of adjacent cells contacting together, and the adjacent heads or beads on the inner connections between adjacent cells also contacting, when the cells are in normal or unexpanded condition.

4. A thermally expansible sealed element for thermostats containing expansible fluid and consisting of a plurality of communicating cells each composed of two metal diaphragms connected together at their outer edges with adjacent cells con-

nected together at their inner edges, said cells having their opposing faces permanently out of contact and being separated to a substantial extent from one another from their inner points of connection toward the periphery, but having portions at or near the periphery normally contacting when the thermostat is unexpanded to form stops to limit contraction and thereby maintain the cells open to contain the expansible fluid.

5. A thermally expansible sealed element for thermostats containing expansible fluid and consisting of a plurality of communicating cells each composed of two metal diaphragms connected together at their outer edges with adjacent cells connected together at their inner edges, each cell having its opposing faces permanently out of contact and being provided at its outer edge with an annular enlargement normally contacting with the corresponding enlargement of the adjacent cell when the thermostat is contracted or unexpanded, in combination with a controlling valve carried by one of the outer cells.

6. A thermally expansible element for thermostats consisting of a plurality of communicating cells containing expansible fluid each composed of two metal diaphragms connected together at their outer edges with adjacent cells connected together at their inner edges, each cell being provided at its outer edge with an annular enlargement normally contacting with the corresponding enlargement of the adjacent cell when the thermostat is contracted or unexpanded, in combination with a controlling valve carried by one of the outer cells, and an attaching device carried by the other outer cell, said controlling valve and attaching device sealing the thermally expansible element.

7. A thermally expansible element for thermostats consisting of a plurality of communicating cells containing expansible fluid each composed of two metal diaphragms connected together at their outer edges with the adjacent cells connected together at their inner edges, each cell having its opposing faces permanently out of contact and being provided with an annular enlargement at its outer edge, and the inner connected edges of adjacent cells being also provided with similar annular enlargements, said enlargements being such that the enlargements at the outer edges of adjacent cells and the adjacent enlargements at central connections of successive cells will respectively be in contact with one another when the cell is contracted and thereby maintain the cells open to contain the expansible fluid.

In testimony of which invention, I hereunto set my hand.

JAMES LOGAN FITTS.

Witnesses:

WILLIAM H. SNYDER,

WALTER A. REYNO.