June 16, 1925. 1,542,088

E. C. POST

THERMOSTATIC CELL

Filed May 26, 1924

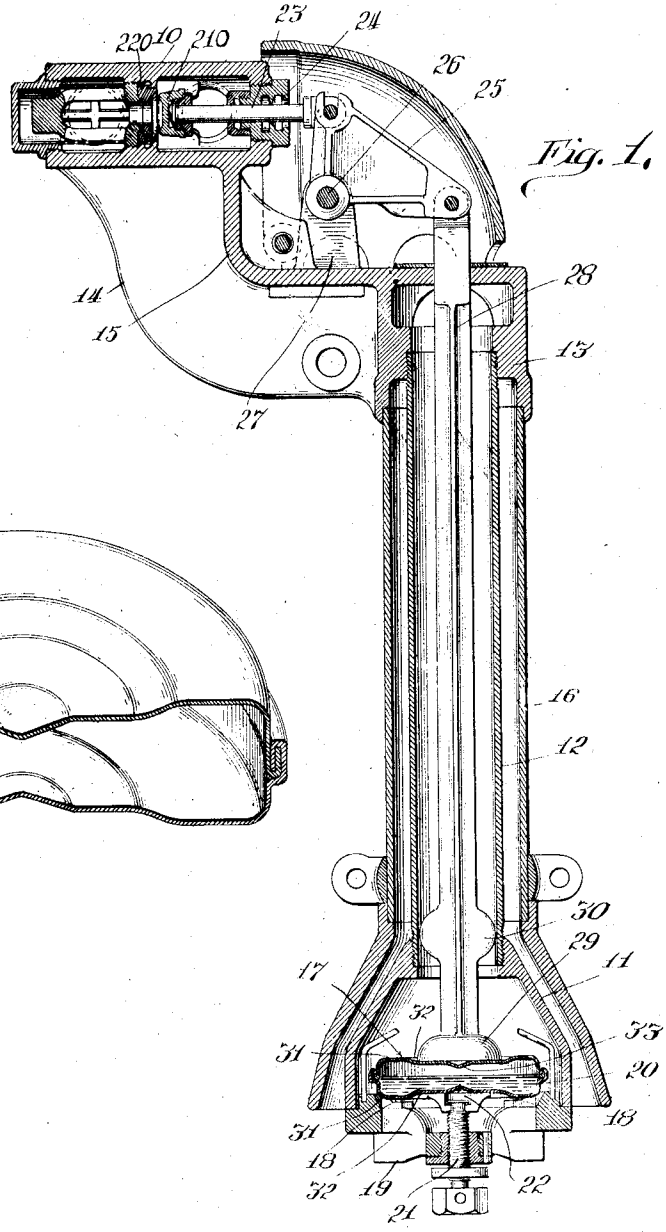


Fig. 1.

Fig. 2.

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UNITED STATES PATENT OFFICE.

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THERMOSTATIC CELL.

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To all whom it may concern:

Be it known that I, EDWARD C. POST, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Thermostatic Cells, of which the following is a specification.

My invention relates to thermostatic devices such, for example, as vapor regulators so-called, or steam traps, of the type using an expansive fluid for bringing about the required movement of some element, the closing of the valve, for example; and the primary object of the invention is to provide, in an apparatus of this sort, an improved flexible cell, or diaphragm as it is known in the art, which will have greater capacity for expansion, will expand more accurately and reliably, and will be less affected, so far as its expansive functions are concerned, by the tendency of the metal to fatigue and become stretched as the result of repeated vibratory movements under temperature fluctuations than the thermostatic cells which have heretofore been used in devices of the type referred to.

The invention is illustrated, in connection with a common form of vapor regulator for vapor car heating systems, in the accompanying drawing in which—

Fig. 1 is a longitudinal sectional view of the vapor regulator, and

Fig. 2 is a sectional perspective of the improved thermostatic cell.

The invention is not to be considered as limited to a vapor regulator. The improved cell might be used in steam traps employed in connection with a high pressure steam heating system or other situations where a mechanical movement is to be effected, through the expansion and contraction of an inclosed fluid.

Referring to the drawing, 10 designates the valve casing of the vapor regulator and 11 the thermostat casing, the latter being secured to the end of a tube 12 which is screwed into a socket 13 connected to casing 11 by webs 14, 15. 16 is a housing enclosing tube 12 and thermostat casing 11. 17 is a thermostatic cell of the device which is supported on lugs 18 on a spider construction 19 at the bottom of the thermostat casing 11. The cell contains a body of fluid 20 which vaporizes at or somewhat below the temperature at which the device is adjusted to function. The adjustment is brought about by a set screw 21, the swiveled head 22 of which bears against the under side of the cell.

The valve controlled by the expansion and contraction of cell 17 is designated 210 and the valve seat with which it cooperates is designated 220. Valve 210 is arranged on a stem 23 passing through a stuffing box 24 and engaged by a bell crank lever 25 pivoted at 26 on a bracket 27. The other arm of the bell crank has pivoted thereto an operating rod 28 which extends through the tube 12 and is formed at its lower end with an enlargement 29 adapted to bear upon the upper surface of the cell 17, rod 28 being guided in tube 12 by lugs 30.

The construction of the vapor regulator, except so far as concerns the improved form of the thermostatic cell to be hereinafter described, is known and no claim is made thereto.

It has been customary to make thermostatic cells, for apparatus of this type, with their upper and lower flexible side walls flat, or substantially so, the usual practice being to form the center portions of these walls with depressed portions of approximately the diameter of the enlargements 29 of the operating rod. That is, the metal of one or both of walls 31 of the cell is bent in obliquely, as indicated at 32, 32, the circular portions within the inwardly bent portions being substantially flat. This construction of the side wall, due to the depressed portion or concavity 32, provides the necessary surplus area in the wall to increase its flexibility, so that the expansion or contraction of the fluid in the cell 17 will, through the movement of this wall, impart the desired longitudinal movements to operating rod 28. By making both walls 31 of this form the flexibility of the cell is correspondingly increased. It has been found that with thermostatic cells so constructed fatigue of the metal and stretching resulting from repeated vibratory movements of the flexible walls under changes in internal pressure brings about a tendency on the part of the side walls to buckle out or "oil can," to use the colloquial term, when the cell expands. That is, the cell walls, instead of expanding proportionately with the increase of internal pressure, spring out of themselves, to some extent,

after the fluid has begun to vaporize but before the vaporization has proceeded far enough to warrant an amplitude of movement as between the walls of the cell as great as actually takes place. This springing out or buckling of the flexible walls of the cell will operate, in a vapor regulator, for instance, to close valve 210, or, at least, to move the valve closer to its seat than it should be moved so as to shut off or throttle to too great an extent the inflow of steam to the system. As a result the heating system functions sluggishly, particularly in the matter of expulsion of accumulated air and water of condensation. I have found that this defect can be remedied, and, additionally, the power of expansion of the cell increased, for the same vapor pressure, by rigidifying the flexible walls, or one of them, through forming one or preferably each of such walls with a central indentation 33, preferably conical in form. A thermostatic cell or diaphragm so constructed will expand accurately in proportion to the increase of internal pressure even after the device has been in service for a considerable period of time. The tendency to buckle or spring does not develop with use as in the thermostatic cells heretofore employed. Moreover, the amplitude of normal expansion is somewhat increased.

I claim:

1. In a thermostatic device, an expansible metal cell to contain a thermostatic fluid, having a flexible side wall formed with a single concavity to provide for expansion under internal pressure having a central indentation to prevent snap action.

2. In a thermostatic device, an expansible metal cell to contain a thermostatic fluid, having a flexible side wall formed with a single flat bottomed concavity to provide for expansion under internal pressure, which has a central indentation to prevent snap action.

3. In a thermostatic device, an expansible metal cell to contain a thermostatic fluid having a pair of similar flexible side walls each formed with a central substantially flat bottomed depression, there being an inwardly projecting indentation at the center of each depression.

4. In a thermostatic device, an expansible metal cell to contain a thermostatic fluid having a pair of similar flexible side walls each formed with a central substantially flat bottomed depression, there being an inwardly projecting conical indentation at the center of each depression.

5. In a thermostatic device an expansible metal cell having a side wall formed with a single depression having an oblique side portion and a flat bottom portion formed centrally with a conical indentation to prevent snap action.

EDWARD C. POST.