Nov. 2, 1926. 1,605,153

W. W. WEIR

TEMPERATURE RESPONSIVE DEVICE

Original Filed Dec. 20, 1923

FIG. 1.

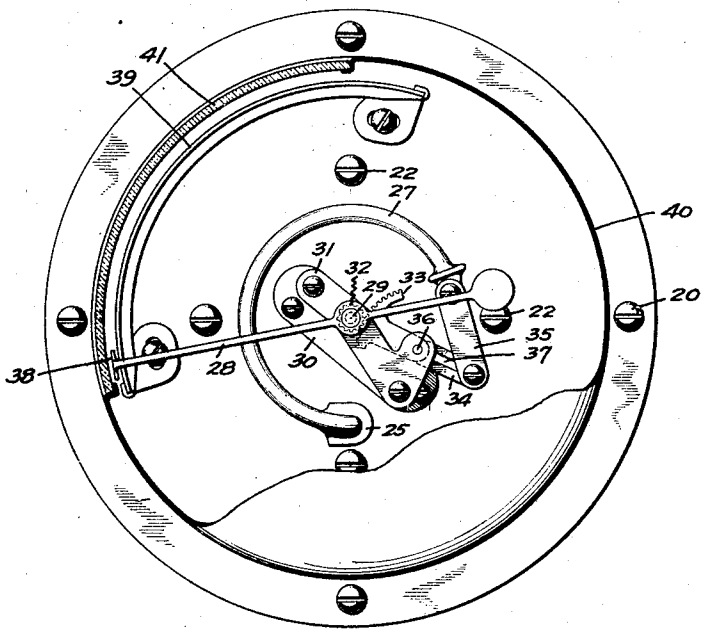
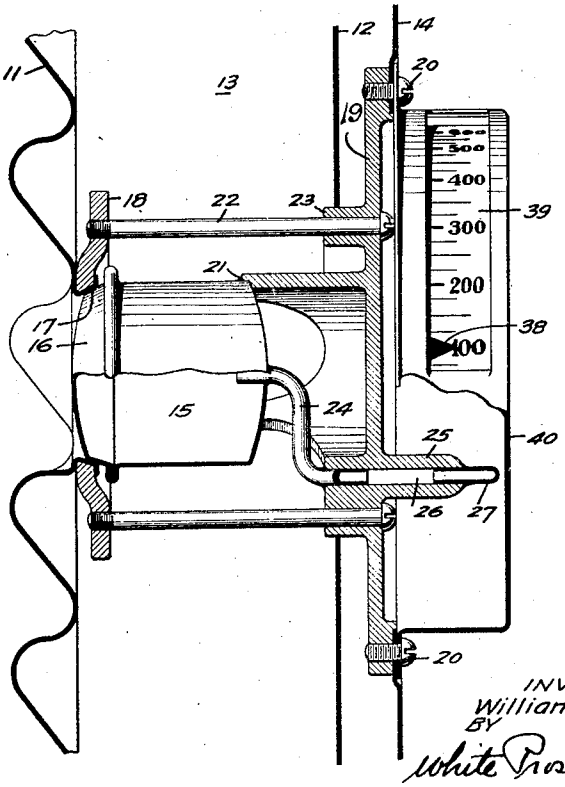


FIG. 2.



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UNITED STATES PATENT OFFICE.

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TEMPERATURE-RESPONSIVE DEVICE.

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This invention relates to a device that may be used for indicating temperature or of performing a controlling function in response to temperature variations, and more particularly to such a device adapted to be used in connection with electrically operated ranges.

It is one of the objects of my invention to provide a temperature responsive device that will accurately follow the temperature variations occurring in an enclosed space, such as in an oven of a range.

Another object of my invention is to simplify the construction of such temperature responsive devices.

Still another object of my invention is to make it possible to mount the device on the side of the oven structure in a very simple manner, and so that it may be maintained always in proper position, although in a sheltered place, for responding to the temperature variations.

My invention possesses other advantageous features, some of which with the foregoing, will be set forth at length in the following description, where I shall outline in full that form of the invention which I have selected for illustration in the drawings accompanying and forming part of the present specification. Although I have shown in the drawings but one embodiment of my invention, I do not desire to be limited thereto, since the invention as expressed in the claims may be embodied in other forms also.

Referring to the drawings:

Figure 1 is a face view of a thermometer built in accordance with my invention, a part of the cover being shown as broken away, in order to expose the operating parts; and

Fig. 2 is a view, mainly in section, illustrating the application of the device to a heated oven.

In Fig. 2 I show a double-walled oven structure, including the inner wall 11 and the outer wall 12, between which a heat insulating filling 13 may be placed. Another wall 14 is shown, which is sometimes provided as a vitreous enamelled plate, for imparting a pleasing exterior to the oven. Only enough of the oven walls is shown to illustrate how the thermometer cooperates therewith. The inner wall 11 is shown as corrugated for the purpose of providing a support for the usual removable racks.

That portion of my device which is directly subjected to the heat of the oven includes a surface of container 15; in this container there is either a gas or a liquid that has a tendency to expand upon the application of heat. I have found that nitrogen gas is well adapted for this purpose, and may be used to exert a considerable gas pressure at operating temperatures. One of the features of my invention resides in the manner in which this container 15 is mounted on the oven. For this purpose it is provided with a tapered cover 16 which is permanently fastened to the container 15 and forms its top surface or inner end. This cover is wedged into a cooperating tapered hole 17 which is defined in the inner wall 11, by the aid of a washer or collar 18. The inner wall, being formed of thin sheet metal, may readily be used to hold this collar 18 in place, by upsetting the sheet metal and causing it to extend through the aperture in the collar 18, as clearly indicated in Fig. 2.

It is to be noted that the container 15 does not appreciably extend into the oven. It is subjected to the heat within the oven partly by the exposure of its cover 16, but mainly by heat conduction from the inner wall 11 to the cover, which conduction occurs around the inner periphery of the aperture 17. This mode of operation of the thermal responsive element ensures against breakage, which might occur if it were projected so as to extend a material distance into the oven. Furthermore, more space is left in the oven, and yet the container 15 responds accurately to the oven heat, since there is a large area of intimate contact between it and the wall 11. The thermometer responds accurately to the mean oven temperature, which is highly important, so that it may serve as an accurate guide to the house-wife. This is produced by the fact that the exposed surface of the end 16 is not affected by the direct rays of the heating elements located at the top and bottom of the oven; and that the heat affecting the element is conducted to it from substantially all parts of the oven interior.

In order to ensure a sufficiently intimate contact between these two parts, I provide appropriate fastening means for the container 15, whereby it may be urged strongly toward the aperture 17, and wedged therein. For this purpose a support or standard 19 is used, which is fastened as by screws 20 to the plate 14, and covers an aperture in said plate. A seat 21 is formed on this support,

on which the container 15 rests. Several screws 22 or other fastening means pass through flange 23 appropriately formed on the back of the support 19 and engage threaded apertures in the collar 18. The flange 23 passes through an aperture formed in the outer plate 12. By tightening up on screws 22, the sensitive element 15 is properly positioned and tightened between the shoulders of aperture 17 and the seat 21.

The gas chamber in container 15 is in communication with a pipe 24 that serves to conduct the pressure of the gas to the indicating or controlling elements. Thus the support 19 may be provided with a projection 25 extending through the support and having an aperture 26 into which the pipe 24 fastens. The other side of this aperture communicates with one end of the Bourdon tube 27. As is well understood, such tubes alter their shape upon variation in liquid or gas pressure within them, and this alteration is made use of to operate an indicator or to produce a controlling act. In the present instance a pointer 28 (Fig. 1) is mechanically connected to the free end of the tube 27. One example of such a mechanical connection will now be described. The pointer 28 is pivoted for free rotation upon a shaft 29 which is supported between two spaced plates 30 and 31. Attached to the pointer and also freely rotatable on the shaft 29, is a pinion 32 with which meshes a segment 33. This segment has an arm 34, one end of which is connected as by link 35 to the free end of the tube 27. The segment 33 may rotate about a pivot pin 36 fastened to the top plate 31 and playing in a groove 37 in the arm 34. From this description, it is seen that for instance an increase in pressure will cause the tube 27 to pull on link 35 upwardly, which link in turn will rotate segment 33 in a counterclockwise direction; pinion 32 and pointer 28 will correspondingly move in a clockwise direction. A decrease in pressure will produce opposite results.

The pointer 28 has a bent over end 38 which cooperates with an appropriately supported band scale 39. A cover 40 is provided, having a flange by which it may be fastened to the wall 14 by the screws 20. A sight glass 41 is fastened into the edge of the cover 40 so as to permit the reading of the indications. The cover 40 extends over the exposed side of the support 19, and is of substantially the same size as this support.

The operation of the device is apparent from the foregoing. Due to the use of a tapered aperture, a firm contact is established between the container 15 and the walls of the oven; and the container is rigidly secured in place. The temperature response is accomplished by heat conduction, which is much more accurate than by subjecting the device merely to the heat of the air inside of the oven. Furthermore, there is no loss of space as would be the case if the device projected into the oven.

I claim:

1. In a temperature responsive device, a wall of a heated space, said wall having a tapered aperture therein, a container having a fluid in which variations in pressure occur in response to temperature variations, said container having a tapered portion adapted to fit in the tapered aperture, means for holding said container firmly in the aperture, a movable member, and means for moving said member in response to variations in pressure in said container.

2. In a temperature responsive device, a wall of a heated space, said wall having a tapered aperture, a container having a fluid in which variations in pressure occur in response to temperature variations, said container having a rigid, tapered end adapted to fit into without passing through the tapered aperture, means for holding the end of said container firmly in said aperture, a movable member, and means for moving said member in response to variations in pressure in said container.

3. In a temperature responsive device, a double walled structure defining a heated space, said structure having an aperture in the inner wall, a container having a fluid in which variations in pressure occur in response to temperature variations, means located substantially entirely between the double walls for firmly holding said container in said aperture in such a manner that substantially no portion of the container extends beyond the inner wall into the heated space, a movable member, and means for moving said member in response to pressure variations in the container.

4. In a temperature responsive device, a double walled structure defining a heated space, the inner wall having an aperture, a container having a fluid in which variations in pressure occur in response to temperature variations, and adapted to expose one of its surfaces through said aperture, a movable member, means for moving said member in response to pressure variations in the container, and means for rigidly holding said container in place, comprising a support having a seat for the container and adapted to be held on the outer wall between the same and said inner wall, and fastening means between the support and the inner wall whereby a shoulder formed on the container is urged against the inner wall.

5. In a temperature responsive device, a thin wall defining a heated space, said wall having an aperture, a container having a fluid in which variations in pressure occur in response to temperature variations, and adapted to expose one of its surfaces through

said aperture, a collar defining the aperture in such a way that it is tapered inwardly toward the heated space, said container having a shoulder arranged to fit into the aperture, a movable member, means for moving said member in response to pressure variations in the container, and means for firmly urging the container into the aperture, comprising a support having a seat for the container, and fastening means between the support and the aperture defining collar.

In testimony whereof, I have hereunto set my hand.

WILLIAM W. WEIR.