

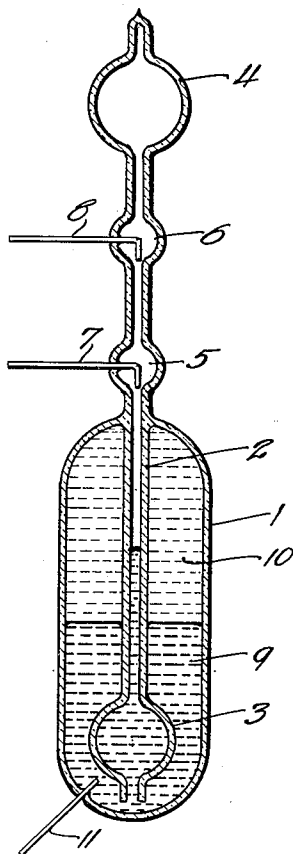
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J. G. GOODHUE

THERMOSTAT

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UNITED STATES PATENT OFFICE.

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THERMOSTAT.

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To all whom it may concern:

Be it known that I, JULIAN G. GOODHUE, a citizen of the United States, and resident of Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Thermostats, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to a thermostat, comprising expansible and conducting fluids, wherein the fluid expansion causes the conducting fluid to make or break an electrical contact.

One object of my invention is to provide such a thermostat which will successively make or break different electrical contacts whereby a plurality of electrical devices may be caused to function or cease to function at predetermined temperatures.

Another object of my invention is to provide an improved design of container for such a thermostat whereby the opportunity for mixing of the several fluids is greatly minimized.

A further object of my invention is the provision of a thermostat of the type referred to comprising a major fluid chamber having a stem of small diameter extending therinto, the stem being provided with a bulb adjacent its inner end to form a trap or reservoir to facilitate the functioning of the fluid.

Other advantages of my invention may be found from the following description thereof in connection with the accompanying drawing, which somewhat diagrammatically illustrates an embodiment of my invention, the view being a longitudinal cross section of the thermostat.

A vertically disposed cylindrical receptacle 1, having closed ends, supports a tube or stem 2, which passes downwardly through the upper closure of the receptacle, the glass of the stem and the glass of the receptacle being fused together. The lower end of the stem 2 extends almost to the bottom of the receptacle 1 and is provided adjacent its lower end with a bulb 3. The other portion of the stem 2, which lies without the receptacle 1, is provided at its upper end with an expansion chamber 4, and intermediate the expansion chamber and the top of the receptacle carries bulbular enlarge-

ments 5 and 6 into which are fused platinum contacts 7 and 8, respectively.

The platinum contacts 7 and 8 are preferably turned down into the small diameter bores of the stem 2, as shown, when it is desired that the mercury make and break contact with each of the platinum contacts within a small temperature range.

When the thermostat of my invention is fully assembled for use, the lower portion of the receptacle 1, as well as the bulb 3 and lower end of the stem 2, are filled with mercury 9, while the upper portion of the receptacle 1 lying about the stem 2 is filled with benzine, ether, whale oil, olive oil, or some like fluid 10, having a coefficient of expansion considerably greater than that of mercury, having a reasonably high boiling point and, under ordinary circumstances, remaining practically inert with mercury. These two fluids are so introduced into their glass containers that all, or at least very nearly all, gas is removed from the receptacle 1, the two fluids alone occupying all of the space therein. The space in the stem 2 above the level of the mercury therein is emptied of air and an inert gas, such as nitrogen, substituted for the air. Nitrogen thus occupies all of the space in the expansion chamber 4 and the bulbular enlargements 5 and 6, as well as the stem, down to the mercury. A platinum terminal wire 11 enters the bottom of the receptacle 1 to provide an electrical contact with the body of the mercury 9.

With an increase in temperature, the rapidly expanding fluid 10 pushes down the level of mercury 9 in the receptacle 1. The mercury then rises in the tube 2, due partly to the expansion of the mercury itself and partly to the expansion of the fluid above the mercury. When the small column of mercury in the tube 2 reaches the first enlargement 5, it makes electrical contact with the terminal wire 7 whereby an electrical circuit may be closed. A continued rise in the external chamber will cause the mercury to rise still farther in the tube 2, filling the remainder of the enlargement 5 and continuing upwardly until it reaches the second enlargement 6, at which time contact will be made with the terminal 8 to close another or second circuit.

Such an expansion of the liquid, of course, results in a lessening of the volume

of the nitrogen compressing it in the expansion chamber 4. Because of the non-compressibility of the two liquids, however, the pressure of the nitrogen will have no appreciable effect upon the successful functioning of the contacts at predetermined temperatures.

The device is intended for use only in an upright position and should not be inverted or placed in a position which would permit the oil to flow into the bulb 3. Sufficient mercury should be employed so that during periods of contraction enough mercury will remain in the bulb 3 to prevent the withdrawal of the gas in the stem 2 and into the reservoir 1. Sufficient mercury should also be provided to meet the demands during periods of expansion without permitting oil to enter the bulb 3.

The bulb 3 also acts as an expansion chamber for the nitrogen should the temperature fall unusually low, the capacity of the bulb being enough to prevent the nitrogen from bubbling into the receptacle 1 under such conditions.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent of the United States is:

1. A thermostat for making electric contact, comprising a container, a stem extending into said container to form a trap therein and extending outwardly therefrom, a contact point in said outwardly extending portion of said tube, a bulb at the inner end of said inwardly extending portion of said stem, an expanding fluid in said container, a conducting fluid in said stem, the level of

said conducting fluid being responsive to expansion of said expanding fluid under variations in temperature and means for making electrical contact with said conducting fluid at another point.

2. A thermostatic control for an electric circuit, comprising a container, a vertically disposed stem within said container communicating with the interior of said container, said tube having an enlargement within said container and above said communication, said stem extending without said container and there having an electrical contact point, a fluid in said container expandible under heat, an electrical conducting fluid in said container and rising within said stem under expansion of said expanding fluid to make electric contact with said contact point, and means for making electrical contact with said conducting fluid at another point.

3. A thermostatic control device comprising a receptacle, a stem extending thereinto, a bulb in said stem adjacent the inner end thereof, an expanding fluid in said receptacle, a conducting fluid in said stem, an electrode in said stem, the level of said conducting liquid being responsive to temperature variation of said expanding liquid to make and break electrical contact with said electrode and means for making electrical contact with said conducting fluid at another point.

In witness whereof, I hereunto subscribe my name this 17th day of July, 1923.

JULIAN G. GOODHUE.