Jan. 14, 1930. H. W. PARTLOW 1,743,385

THERMOSTAT

Original Filed Dec. 5, 1927

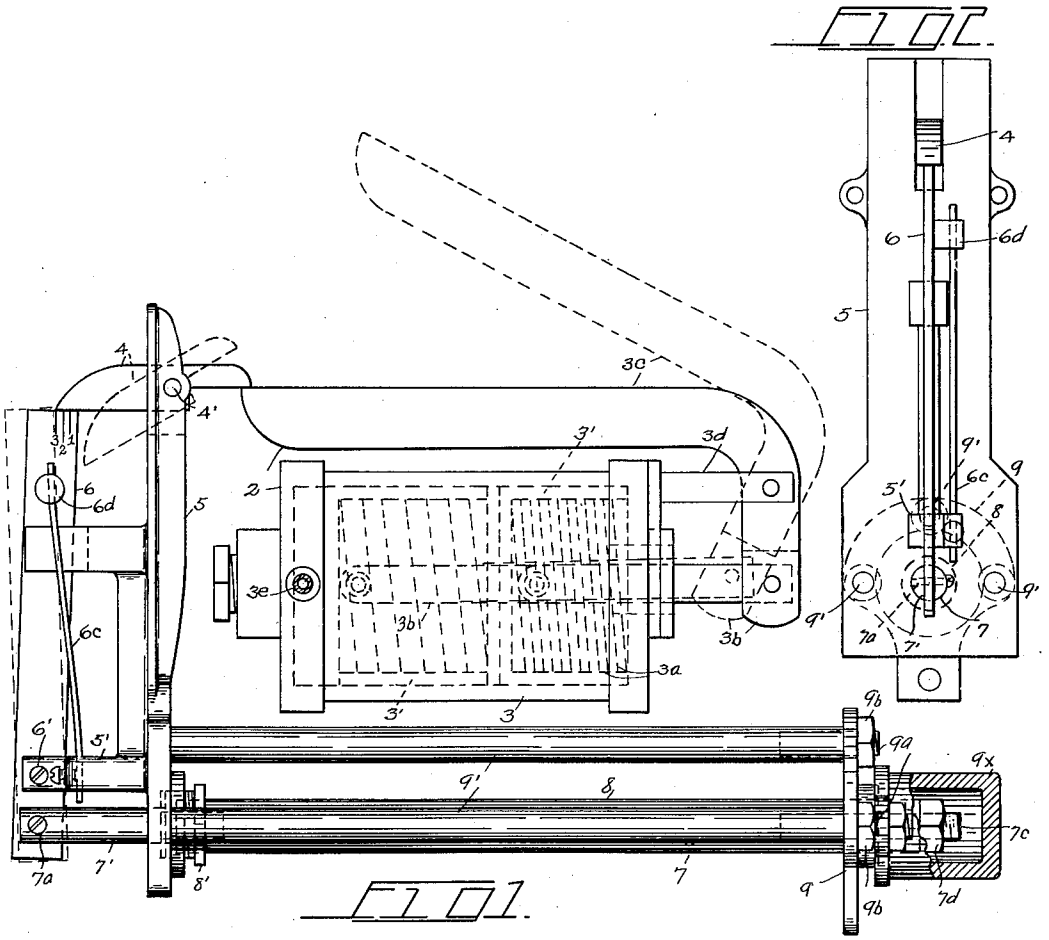


FIG 1.

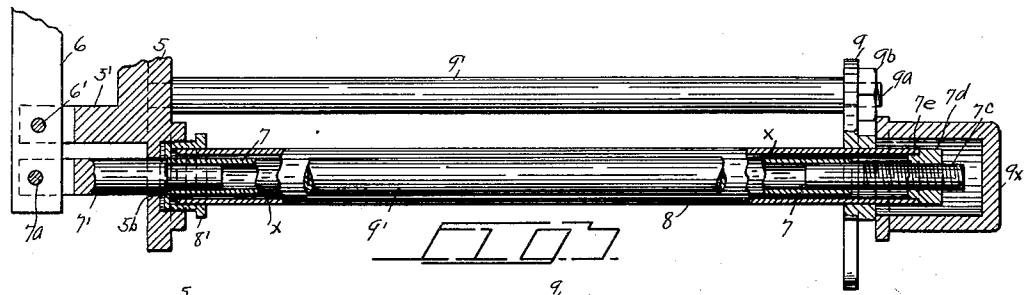


FIG 2.

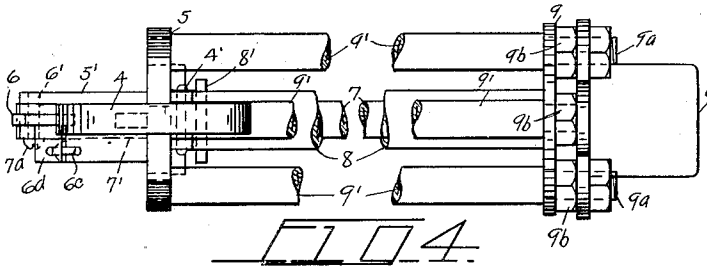


FIG 4.

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UNITED STATES PATENT OFFICE

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THERMOSTAT

Original application filed December 5, 1927, Serial No. 237,887. Divided and this application filed December 26, 1928. Serial No. 328,407.

This invention relates to improvements in thermostats, designed for use generally where temperature changes affect the safety or working conditions of plants, machinery, or the like, and more especially where prompt and reliable automatic regulation or control of the same is desired.

The object of the invention is to provide novel construction and arrangement of the thermal couple, which comprises two tubular members, preferably of the same material and conductivity, the said members being of different caliber and telescoping loosely, the primary or outer member being unprotected and therefore more sensitive to temperature changes, expands and contracts more rapidly and to greater extent than the secondary or inclosed member, and is relied upon in the present case to reliably initiate the controlling work, which is carried out mechanically by the secondary member and related parts. A further object is to provide means for supporting the extremities of the thermostatic members, one end of the primary member being fixed rigidly to the main portion, while the other end loosely engages an extended portion of the support, and is therefore free to expand linearly when subjected to variations of heat and cold. The secondary member is virtually suspended within the primary member, and is spaced therefrom to provide an annular air chamber, which tends to insulate and retard the expansion and contraction of the inclosed member, and renders said member still less sensitive to temperature changes, due to the fact that heat and cold must first penetrate the primary member and also temper the air in said chamber before the secondary member starts expanding. By this arrangement, any abnormal rate of rise of temperature amounting to 10° or more per minute, causes the linear expansion of the primary member, which bodily moves the secondary member axially, and in case the secondary member is mechanically connected to or with a fire extinguisher, machine element, or a signal device, the said parts will be operated and reliably brought under proper control before the secondary member has time to expand and neutralize the action of the primary member.

The present application is a division of application Number 237,887, filed December 5, 1927.

A practical embodiment of the invention is shown in the accompanying drawing, forming a part of this specification, and in which—

Figure 1 is a side elevation of the thermostat and the parts controlled thereby. Fig. 2 is a front end elevation of the same. Fig. 3 is a broken side elevation and partial central vertical section, showing the relation of the telescoping thermostats. And Fig. 4 is a broken top plan view of the thermostat and its supports.

In the present case, the thermostatic couple is shown in operative connection with a distant control for automatic fire extinguishers, which forms a part of my pending application referred to, merely for the purpose of showing the working of my improved temperature control, as well as its adaptability to analogous uses.

In the drawing, referring to Fig. 1, 2 represents certain parts of an actuator for fire extinguishers, of the type wherein blasts of air are produced by a quick-acting compressing mechanism, which transmits the blasts to the usual extinguisher-releasing device, shown in the former application, by abnormal rises of temperature which may result from incipient fires, the flashings of dipping-tanks, or the overheating of furnaces, ovens or the like. 3 represents the compressor cylinder, that incloses a plunger 3′, which is actuated by a coil spring 3^a. 3^b represents a rod that operates the plunger against the tension of said spring, and to which is connected a lever 3^c, the latter being pivoted to a bracket 3^d supported by the cylinder. The full lines in Fig. 1 show the lever 3^c holding the plunger ready to operate while the dotted lines show the lever tripped, and the release and movement of the plunger, by the spring 3^a, in the direction for compressing the air, which may be delivered to any destination, by means of a pipe 3^e, for sounding an alarm, or actuating, con-

trolling or stopping another mechanism. The free end of lever 3^c underlaps one end of a rockable lever 4, which is pivoted near the top end of a frame 5, by a pin 4'. The opposite end of lever 4 is arranged to overlap the top end of an upright lever 6, which is pivoted at 6' to a horizontal arm 5' of the frame. A spring 6^c anchored in the arm 5' loosely engages a stud 6^d carried by the lever 6, and tends to resiliently hold the top end of lever 6 interlocked with lever 4, as shown in Fig. 1.

The lever 6 is inscribed near its top end with a scale, by means of which said lever may be adjusted for predetermining different rises of temperature by which lever 4 may be tripped, as shown in Fig. 1, for enabling the plunger 3' to effect the compression strokes. The graduations of this scale are numbered 1, 2 and 3, and denote respectively rises of 30°, 40° and 50° are required to operate the train of interlocking levers, as 6, 4, and 3^c. According to Fig. 1, the lever 6 is so adjusted as to bring the tip 4^a of lever 4 into registry with graduation 3, which signifies that lever 4 will be tripped in case there is an abnormal rate of rise of temperature of 50° within the space of one minute.

The lever 6 is controlled and operated directly by the secondary member 7 of the thermostat, which preferably comprises a relatively thin brass tube that passes loosely through an opening 5^b near the bottom of the frame 5, the said tube being fitted with a forked extension 7' that embraces the lower end of lever 6, and to which the lever is pivoted by a pin 7^a. 8 represents the primary thermostatic member, which preferably comprises a tube of the same material and conductivity, but of larger caliber than, and which loosely telescopes the member 7, as best seen in Figs. 3 and 4. The forward end of member 8 is fitted with a sleeve-nut 8', which screws into a threaded socket formed in the frame 5 concentric to the opening 5^b and member 7. The bore of member 8 and the diameter of member 7 are such as to provide an annular air-chamber x between the members, which plays a prominent part in the working of the thermal device. The rear end of member 8 passes loosely through, and extends beyond, a perforated bracket 9. The corresponding end of member 7 preferably extends into the bracket 9, and said end is provided with a threaded extension 7^c that projects beyond the end of member 8 and is fitted with a nut 7^d, the latter having a reduced portion 7^e that enters the member 8 and tends to hold the tubes truly concentric, as shown in Fig. 3. The turning of the nut 7^d in opposite directions, mover member 7 axially bodily for adjusting lever 6, as explained. The bracket 9 is supported in extended relation to frame 5, by a cage-like arrangement of rods 9', the forward ends of which are threaded into the frame, while their rear ends 9^a which are reduced and threaded pass loosely through the bracket, and are fitted with nuts 9^b, by which the bracket and frame are made rigid as one part. By this arrangement, the member 8, when subjected to changes of temperatures, is free to expand, i. e. lengthen or shorten, and by the provision of the nut 7^d, which is constantly held against the free end of member 8, by the tension of spring 6^c, the member 7 may be moved linearly, and mechanically alone by the expansion and contraction of the member 8. This is especially true, in case of an abnormal rate of rise of temperature, of say 10° or more in the space of one minute. When such a sudden rise of temperature occurs, the member 8 quickly responds to the excess heat by lengthening, and in view of the fact that its forward end is rigid to the frame 5, this elongation of member 8 must be in the opposite direction, or towards the bracket 9. This expansive action of member 8 exerts sufficient pressure against the nut 7^d to move the member 7 bodily in the direction for operating the train of interlocking levers, as shown by dotted lines in Fig. 1. The provision of the chamber x between the members of the couple retards the thermal action of the secondary member sufficiently to enable the primary member to perform its work. This air space may be varied for quickening or still further retarding the expansion or contraction of the member 7, in order to adapt the controlling means to different conditions and uses.

When the members 7 and 8 are subjected to a relatively slow rate of rise of temperature, they expand and contract substantially to the same extent and there can be no appreciable movement of the lever 6. If, however, the temperature rises abnormally at either of the rates named, the member 8, which is exposed substantially its full length will start expanding immediately, and effect the operation of the train of interlocking levers before the heat has time to penetrate member 8 and effect the expansion of member 7. If the rate of rise is sufficiently high, the connection between the levers 4 and 6 will be broken, and the compressor, for example, will be set in motion, as explained. Whatever may be the predetermined degree of temperature, as evidenced by the adjustment of member 7 and lever 6, the actuator 2 will be operated, provided however, that the rise of temperature approximates the said safety degree, within a minute's time. The present thermostat has been subjected to practical tests and use, and perform its work promptly and accurately, and the reckonings and results referred to herein are based upon abnormal rates of rise

of temperature occurring in substantially one minute. This enables the present controlling means to effect the extinguishment of fires occasioned by the flashing of highly inflammable materials, such as gasoline, enameling compounds, and the like, as well as the starting, stopping, or safeguarding of machinery.

Having thus described my invention, what I claim, is—

1. In a thermostat of the character described, a support having an opening therein, a rod extending outwardly from said support, a depending arm carried by the free end of said rod and provided with an opening, a tubular expansion member having one end rigidly secured in the opening in the support and having its free end loosely received through the opening in said depending arm, a second tubular member received within the first named tubular member and spaced therefrom and having its outer end rigidly secured to the free end of the first named tubular member and having its inner free end provided with a part formed for sliding movement through the opening in the support, and operating means actuated by the inner free end of the second tubular member upon axial movement of the first named tubular member in a direction outwardly from the support.

2. In a thermostat of the character described, a support having an opening therein, a rod extending outwardly from said support, a depending arm carried by the free end of said rod and provided with an opening, a sleeve member threadedly received in the opening in said support, a tubular expansion member having one end secured within said sleeve and having its free end loosely received through the opening in said depending arm, a second tubular member received within the first named tubular member and spaced therefrom and having its outer end formed with a threaded part extending beyond the free end of the first named tubular member, an internally threaded collar secured to the free end of the first named tubular member adapted to engage and hold the threaded part of the second tubular member spaced from the first member said second tubular member having its inner free end provided with a part formed for sliding movement through the opening in the support and operating means actuated by the inner free end of the second tubular member upon axial movement of the first named tubular member in a direction outwardly from the support.

In testimony whereof I affix my signature.

HOWARD W. PARTLOW.