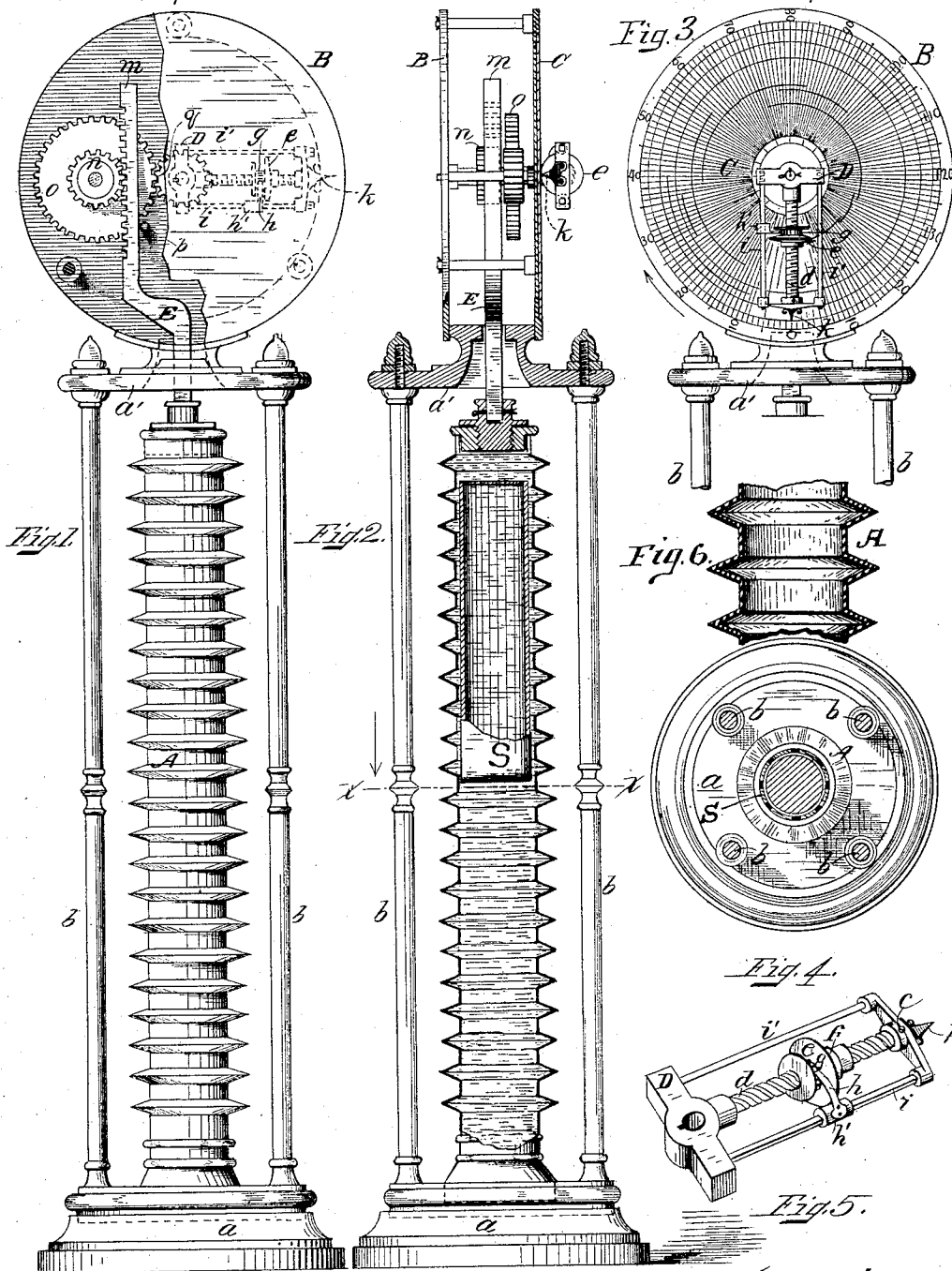


(No Model.)

W. E. EASTMAN.
RECORDING THERMOMETER.

No. 476,374.

Patented June 7, 1892.



Witnesses:
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UNITED STATES PATENT OFFICE.

WILLIAM E. EASTMAN, OF BOSTON, MASSACHUSETTS.

RECORDING-THERMOMETER.

SPECIFICATION forming part of Letters Patent No. 476,374, dated June 7, 1892.

Application filed October 5, 1891. Serial No. 407,726. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM E. EASTMAN, a citizen of the United States of America, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Thermometers, of which the following is a specification, reference being had therein to the accompanying drawings.

The object of my invention is to provide an indicating and a combined self-recording maximum and minimum thermometer which shall have a powerfully-acting motive power to do the recording upon a dial; and I attain these results in the following-described manner:

Figure 1 is a back elevation of my thermometer with back cover removed from a portion of the dial-case. Fig. 2 shows the same with the dial-case turned edgewise and shows a part of the motor in section. Fig. 3 shows the front of the dial and the recording-indicator in position, indicating zero. Fig. 4 is a transverse section of Fig. 2 in line *xx*. Fig. 5 is an enlarged detail of the registering-indicator. Fig. 6 is an enlarged view in section of tube A, the cylinder S being omitted.

Like letters of reference indicate the same parts in the several views.

A is an annularly-corrugated elongating cylinder containing an expansible fluid. It stands upon the base-plate *a*. Above the cylinder is the top plate *a'*, held rigidly in position with relation to the bed or base plate *a* by rods or columns *bb*. Attached to this top plate, as shown, is the dial-case B, constructed, as clocks usually are, with front and back plates and bearings for the journals of a train of gearing. Attached fixedly to the front of the dial-case is the dial C, bearing radial lines, one for each degree of temperature, and showing figures around the periphery like those on the scale of ordinary thermometers. Attached to a central shaft is the recording and indicating device D. The frame of the indicator carries a screw *d*, which is held rigidly by the set-screw *c* and cannot revolve upon its axis. The recording-wheel *e*, of slate, graphite, silver, or any substance that will leave a mark upon a suitable surface, is mounted upon a nut *f*, whose internal thread

fits the external thread of the screw *d*, which it encircles. This nut *f* carries besides the recording-wheel the ratchet-wheel *g*. Playing into this ratchet-wheel *g* is the pawl or click *h*, which is mounted upon a sliding sleeve *h'*, which may move from end to end of the yoke-rod *i*. At the outer end of the indicator-frame is a pointer *k*, which at all times indicates upon the dial the true temperature.

From the top of the motor-cylinder rises the rod E, carrying the rack *m*. As will be seen and readily understood, this rack when in motion imparts a rotary motion to the pinion *n* and through the gear *o* to the pinion *q* on the central shaft and to the pointer. The pin *p* insures contact of the rack *m* and the pinion *n*.

The motor-cylinder A is preferably composed of brass and has annular corrugations, which by the expansion of the inclosed fluid (preferably alcohol or kerosene) allow of an elongation of the cylinder. On the contraction of the fluid the cylinder is shortened by the resiliency of the corrugations plus atmospheric pressure. This elongation and shortening of the cylinder by changes of temperature is positive and powerful and will move the recording-wheel borne by the indicator against considerable resistance. The recording by the wheel is effected as follows: As has been indicated, the wheel is composed of a substance that will leave a mark upon the dial when the wheel is not allowed to revolve, but is rubbed across its surface. On a rise of temperature the indicator moves upward, as indicated by the figures on the dial, and the pawl *h* prevents the recording-wheel from revolving. Hence it rubs along and leaves a mark showing the extent of the rise. If now the temperature falls, the indicator moves back and the recording-wheel, no longer held from revolving by the pawl, rolls along the surface of the dial, leaving no mark. Should, however, the temperature again rise and the indicator move upward, the recording-wheel would again make its mark, and the degree at which this mark commences would be the degree at which it arrived in its descent, thus recording the minimum as well as the maximum. As the nut *f*, working upon the screw *d*, constantly moves the recording-wheel toward the

center of the dial when the pawl allows the same to revolve, (and that will always be during the fall of temperature,) the wheel at every rise has a clear surface on the dial to make its record upon. If the wheel and dial are both made of slate, the marks can be readily removed by a moist sponge, and the recording-wheel can at any time be replaced at the outer end of the screw by revolutions by hand and the apparatus be again set to record.

In the construction of the motor-cylinder here shown an empty floating sealed cylinder S fills about one-half the length of the corrugated cylinder, which allows a smaller quantity of fluid to be used in relation to the number of corrugations, thus allowing less motion in each corrugation. By "empty cylinder" I mean one containing air only.

I have more fully set forth the construction of my corrugated cylinder in another application for patent for improvement in governors and motors, filed September 4, 1891, Serial No. 404,720, and have therein more fully claimed it.

It will be understood that the motor-cylinder is completely filled and hermetically sealed.

Having thus described and explained my invention, I claim as new the following:

1. In a self-registering thermometer, a wheel which when not allowed to revolve is pushed forward in contact with the dial and marks upon its surface by abrasion during a rise

of temperature and which on being allowed to revolve actuates a nut upon a relatively stationary screw to move said marking-wheel, in combination with an hermetically-sealed corrugated motor-cylinder containing an expansive fluid for giving motion to a pivoted frame carrying said marking-wheel.

2. In a self-registering thermometer, a wheel which when not allowed to revolve is pushed forward in contact with the dial and marks upon its surface by abrasion during a rise of temperature and which on being allowed to revolve actuates a nut upon a relatively stationary screw to move said marking-wheel, in combination with an hermetically-sealed corrugated motor-cylinder containing an expansive fluid which actuates the said mechanism by changes of temperature.

3. A recording-indicator consisting, essentially, of a marking-wheel mounted upon a nut traversing a relatively stationary screw, a ratchet-wheel mounted upon said nut, and a pawl not attached to but moving laterally with said wheel.

4. The frame D, screw d, nut f, marking-wheel e, ratchet g, pawl h, mounting h', and rod i, and means for moving said combination in front of a dial.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM E. EASTMAN.

Witnesses:

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