(No Model.)

T. L. STURTEVANT.

METALLIC THERMOMETER.

No. 406,152. Patented July 2, 1889.

Fig. 1.

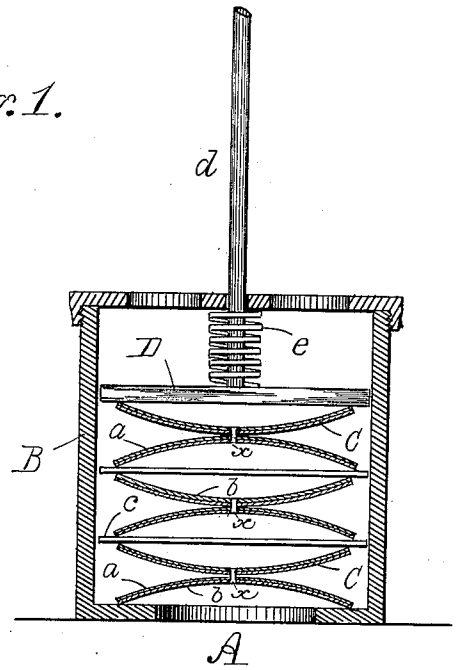


Fig. 2.

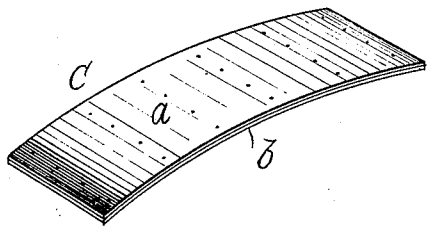
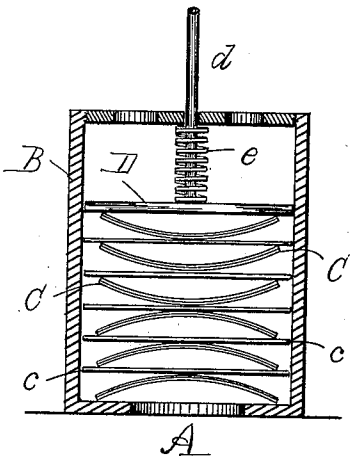


Fig. 3.



Witnesses.
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UNITED STATES PATENT OFFICE.

THOMAS L. STURTEVANT, OF FRAMINGHAM, MASSACHUSETTS.

METALLIC THERMOMETER.

SPECIFICATION forming part of Letters Patent No. 406,152, dated July 2, 1889.

Application filed February 20, 1889. Serial No. 300,526. (No model.)

To all whom it may concern:

Be it known that I, THOMAS L. STURTEVANT, a citizen of the United States, residing at Framingham, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Metallic Thermometers; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

This invention relates to thermometers, particularly that class termed "metallic," in which the action depends upon the expansibility of a single metal or the inequality of expansion of different metals.

The object of my invention is to create an instrument of the above-mentioned class which shall not only have a large movement corresponding to a change of temperature, but in which said movement is accompanied with considerable force. Thus this instrument can be used not only to indicate automatically variations of temperature, but the energy created by such variations can be employed practically for various mechanical purposes.

The drawings represent in Figure 1 a central vertical sectional elevation of a thermometer embodying my invention. Fig. 2 represents a plan view of a single element composed of two metals having unequal expansion. Fig. 3 is a modified form of arrangement.

In such drawings, A represents the instrument as an entirety, composed of a metallic receptacle B, of any suitable shape or construction and adapted to the purposes for which the instrument is to be employed. Said receptacle in the present instance is open, rectangular in shape, and adapted to receive the co-operating elements C C, which are likewise and preferably rectangular in shape. Said elements are composed of two plates of metal *a b*, having unequal coefficients of expansion—as, for instance, zinc and iron—and these are united in this instance by rivets. To complete the element, I prefer to give it initial curvature, thereby causing it to assume a shape concavo-convex in a section lengthwise thereof. When so curved the convex surface portion consists of the metal having the larger coefficient of expansion, as zinc, while the concave portion is composed of the metal with the smaller coefficient, as iron. The said elements are secured together by rivets *x*, passed through the middle parts of them, as shown in Fig. 1, each upwardly-bent element being fastened in this way to the proximate downwardly-bent element at their central point of contact. This keeps them in proper position and insures their even and equal action together. The elements after being united are then arranged, preferably, in couples, as shown, oppositely disposed, and are further provided with a flat intervening plate *c*. Thus when said elements are multiplied and caused to operate, said plates perform such office that all the couples rise or fall with perfect uniformity. Surmounting said elements C C, and within the receptacle B, I have placed a piston D and attached thereto a rod *d*, which extends upward and serves as the indicator in connection with a graduated scale. (Not shown.) Moreover, a coil-spring *e* or its equivalent is located between the top of the piston and that of the receptacle, to insure constant contact of said piston with the elements C C. In many instances gravity may be depended upon. However, in the employment of this instrument to actuate a valve, the expansion of the plates may cause it to open, while the spring is used to close the same, in which event the spring should be a strong one.

It will be observed that by the employment in couples of the elements C C, which may be multiplied to any desired extent, a large movement of the indicator-rod may be produced with a small change in temperature. This movement is attended with considerable energy, and therefore can be used practically for many mechanical purposes. Consequently this thermometer is equally serviceable as a thermostat, since the latter is a self-acting apparatus for regulating temperature. Inasmuch as my instrument is capable of exerting considerable energy, it follows that the indicator-rod *d* may be attached to a connecting-rod or lever or levers for operating and controlling mechanism which it is desir-

able should be actuated according to the temperature or the heat which influences the elements C C, thereby regulating the temperature in any desired locality.

In Fig. 3 is shown a modified arrangement of the elements, since it is not necessary to have them placed in couples oppositely disposed; but instead they may be disposed in any manner desired, with a plate *c* intervening between every element. The action of the instrument will be similar with either method employed, and regardless of the curvature of said elements.

What I desire to claim is—

1. An instrument for measuring variations of temperature, consisting of a series of cooperating elements, each element formed of two metallic plates with unequal coefficients of expansion, said plates having initial curvature, arranged oppositely in couples and capable of multiplication, in combination with a piston resting on said elements, an indicating-rod attached to said piston and movable therewith, and a returning-spring bearing on said piston, substantially as and for the purposes herein described.

2. An apparatus for indicating variations of temperature, as herein described, consisting of a series of confined metallic plates formed of two metals having unequal expansion, a series of flat plates alternating with said bimetallic plates, and a piston and indicator-rod actuated by the expansion and contraction of said bimetallic plates, substantially as specified.

3. The combination, with the box B, its piston D, the rod *d*, and its spring *e*, of a series of elements C, composed of two metals *a b*, with unequal expansion, united together, and the intervening flat plates *c*, between which a single bimetallic plate or pair of plates may be disposed, substantially as herein set forth.

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

THOMAS L. STURTEVANT.

Witnesses:

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W. H. BLACKNALL.