

C. A. ANDERSON.
THERMAL MOTOR.
APPLICATION FILED JUNE 8, 1912.

1,055,439.

Patented Mar. 11, 1913.

Fig. 1.

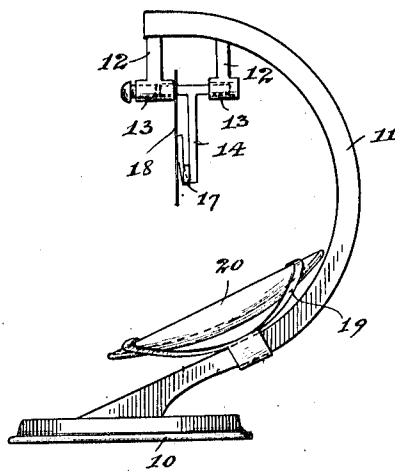


Fig. 2.

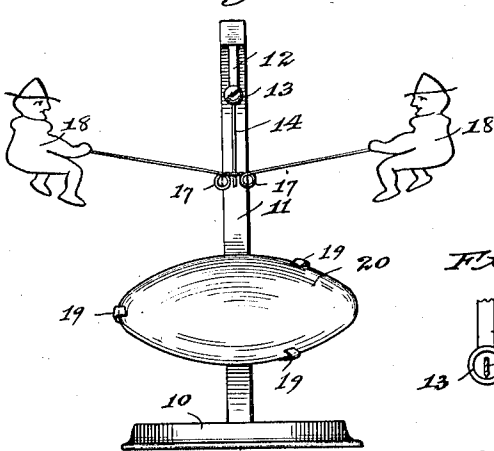


Fig. 3.

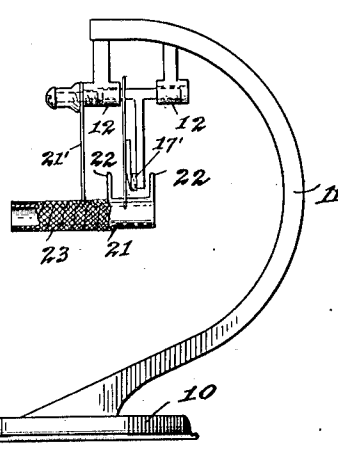


Fig. 6.

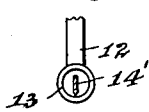


Fig. 4.

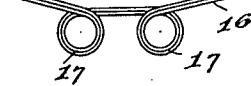


Fig. 5.



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THERMAL MOTOR.

1,055,439.

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To all whom it may concern:

Be it known that I, CHARLES A. ANDERSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Thermal Motors, of which the following is a specification.

My invention relates to motors of that general type wherein the motive effect is produced through the agency of successive variations in temperature imparted to a metal member to cause alternate expanding and contracting or contracting and expanding movements of the latter.

The principle of my invention can be carried out through the creation in a local region of variations either above or below the normal temperature effecting the device as a whole; and in the accompanying drawings and the subjoined description I have disclosed forms of the invention operating upon the principle of both an increase and a decrease in such local region of the normal surrounding temperature.

I have herein illustrated my invention as taking the form of a toy balance; but the principle is capable of embodiment in a great variety of different forms as well as application to a considerable variety of different uses.

Referring to the accompanying drawings, Figure 1 is a side elevational view and Fig. 2 is a front elevational view of the form of the invention designed to operate through the application of heat, or a rise above normal temperature, in the local region. Fig. 3 is a side-elevational view of a form of the invention designed to operate through the application of cold, or a fall below normal temperature, in the local region. Fig. 4 is an enlarged fragmentary detail of the laminated balance-bar used in the embodiment of the invention illustrated in Figs. 1 and 2. Fig. 5 is a view similar to Fig. 4 of a fragment of the laminated balance-bar used in the embodiment of the invention shown in Fig. 3. Fig. 6 is an enlarged detail view in cross section through one of the bearings of the balance-bar.

Referring to the drawing, 10 designates a base or pedestal from which rises a curved, approximately semi-circular upright frame member 11, from the upper end of which are suspended by hangers 12 a pair of bearings 13 (Fig. 6) in which latter is journaled on knife-edge bearings 14' a pendulum rod

14. Secured to the lower end of said pendulum rod, as by soldering or otherwise, is the balance-bar which, as shown in Fig. 4, is a laminated structure comprising two metal strips of unequal coefficients of linear expansion soldered together, one of said strips being designated by 15 and the other by 16. This balance-bar is formed with a pair of integral loops 17 approximately centrally thereof and located on opposite sides of the pendulum rod 14. On the outer ends of the balance-bar are preferably mounted equal balanced weights, herein shown as dummy figures 18. Supported near the base of the upright 11 is a shallow pan or holder 19 containing a concave mirror 20, the focal point of which lies mid-way between the loops 17 of the balance-bar when the latter is in neutral or balanced position. In the operation of this form of the invention, the device is so positioned with reference to the sun's rays, or the rays from any other source of heat, that the latter are caught by the mirror 20 and focused at a point, as stated, mid-way between the loops 17 of the balance-bar. In the balance-bar shown in Figs. 1, 2 and 4 the lower metal strip 16 is the more sensitive, or possessed of the higher coefficient of linear expansion. By starting the figures 18 and the balance-bar in a rocking or see-saw motion by the finger, the loops 17 are alternately brought into the focus of the heat rays from the mirror 20, thereby suddenly expanding the two metal layers of the balance-bar unequally, the inner layer of the coil being expanded more than the outer layer. This expands the coil and thereby throws the weight 18 at the end of the arm containing the loop thus affected upwardly or toward the center and destroys the previously balanced condition of the two weights, thus causing the pendulum, balance-bar and weights to begin a swinging motion. In this way the pendulum and the suspended balance-bar and weights are caused to swing back and forth continuously so long as the action of the heat-ray on the loops 17 is maintained.

In the form of the invention illustrated in Figs. 3 and 5, I produce the same effect by causing the loops 17' to be alternately affected by decreases in the normal temperature surrounding the device. In this form of the invention, I suspend from one of the bearings 13 by a hanger 21' a metal cylinder 21 that is formed on one end with a pair

of upstanding metal lugs 22 so positioned that the loops 17' of the balance-bar, as the latter swings, alternately move to positions between them. The major portion of the cylinder 21 is wrapped with a moisture-absorbent material, such as any suitable cloth 23, which is saturated by water, alcohol, gasolene, or any more or less volatile liquid. The evaporation of this moisture is, of course, attended by a lowering of the temperature of the cylinder 21 and its lugs 22 below the normal temperature obtaining in the room or other place where the device happens to be. In this form of the invention the more sensitive metal 16' or that having the higher coefficient of expansion constitutes the upper layer of the balance-bar and the outer layer of the loops 17' since the disturbance of the balance is, in this case, produced by the greater contracting movement of the more sensitive metal 16', as the coil swings into or across the region of abnormal cold between the two lugs 22. In this form of the invention, the cylinder coating need be moistened only at very considerable intervals to keep the device continuously running.

It will be obvious that, in cases where the two arms of the balance-bar extend horizontally or downwardly from the loops, instead of upwardly as shown, the described relative arrangement of the strips of the balance-bar would be simply reversed, since in such cases the contracting action of the loops 17 and 17' would alternately disturb the balanced condition of the weights by throwing the latter inwardly or toward the axis of suspension, precisely as occurs in the device shown and described under the expanding action of the loops.

From the foregoing it will be seen that the principle of the invention comprehends the creation of a local region of abnormal temperature (and by the expression "abnormal temperature" I mean a temperature either above or below the mean or normal temperature prevailing in the locality where the device happens to be), in association with a suspended balance in which is formed a readily expansible or contractible part that, under the swinging or rocking movement of the balance moves into or across such local region of abnormal temperature and by its distortion destroys the equilibrium of the balance.

In its chief intended application, the principle of my invention is designed to be employed as an advertising novelty for window display to attract attention, owing to the apparent mystery involved in the cause of sustained movement of the balanced figures; although the device constitutes also a clever

and attractive toy to interest and amuse children.

I claim—

1. In a thermal motor, members movably mounted in approximate equilibrium, a thermostatic member operatively associated with said movably mounted members, and means for changing the temperature locally in the vicinity of said thermostatic member.

2. In a thermal motor, a thermostatic member comprising two parts having different coefficients of expansion and united to warp the member on change of temperature, a pivotal support, weights shiftable toward and from said pivotal support by warping of said thermostatic member, and means for producing a localized change in temperature in the vicinity of said thermostatic member.

3. In a thermal motor, the combination of a balance-bar having formed therein between its ends an expansible or contractible loop, means for pivotally supporting said balance-bar between its ends, and means for creating a local region of abnormal temperature into and out of which the loop of said balance-bar passes as the latter oscillates.

4. In a thermal motor, the combination of a balance-bar having formed therein between its ends an expansible or contractible loop, means for pivotally supporting said balance-bar between its ends, balanced weights on the opposite ends of said balance-bar, and means for creating a local region of abnormal temperature into and out of which the loop of said balance-bar passes as the latter oscillates.

5. In a thermal motor, the combination of a balance-bar made of two strips of metal having unequal coefficients of expansion formed with a loop intermediate its ends, means for pivotally supporting said balance-bar between its ends, balanced weights on the opposite ends of said balance-bar, and means for creating a local region of abnormal temperature into and out of which the loop of said balance-bar passes as the latter oscillates.

6. In a thermal motor, the combination of a balance-bar made of two strips of metal having unequal coefficients of expansion formed with a pair of loops intermediate its ends, means for pivotally supporting said balance-bar between said loops, balanced weights on the ends of said balance-bar, and means for creating a local region of abnormal temperature into and out of which the loops of said balance-bar alternately pass as the latter oscillates.

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