March 26, 1940. O. H. HURST 2,195,311

NOVELTY PENDULUM MECHANISM

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Fig. 1.

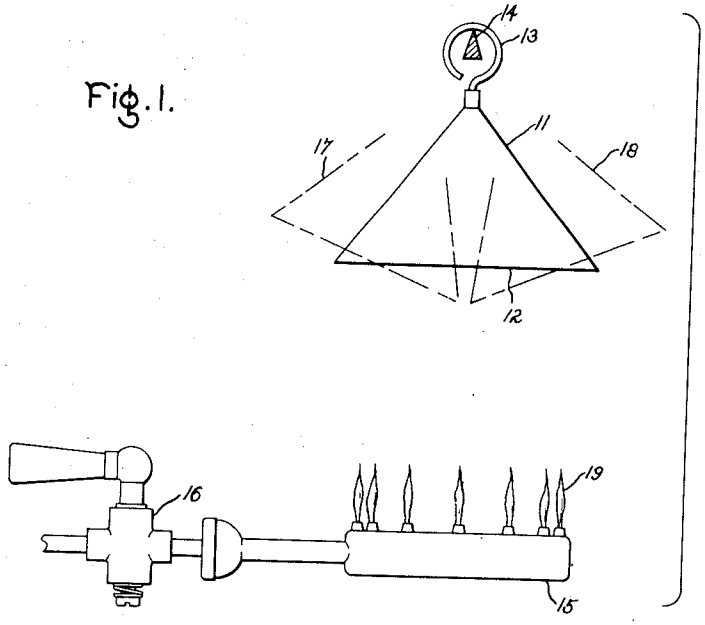


Fig. 2.

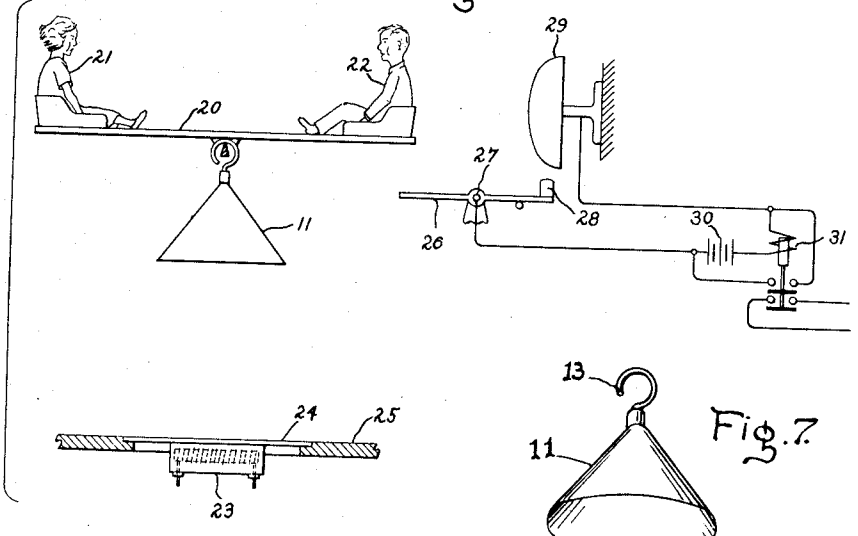


Fig. 7.

Inventor:
Orion H. Hurst,
by Harry E. Dunham
His Attorney.

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Fig. 3.

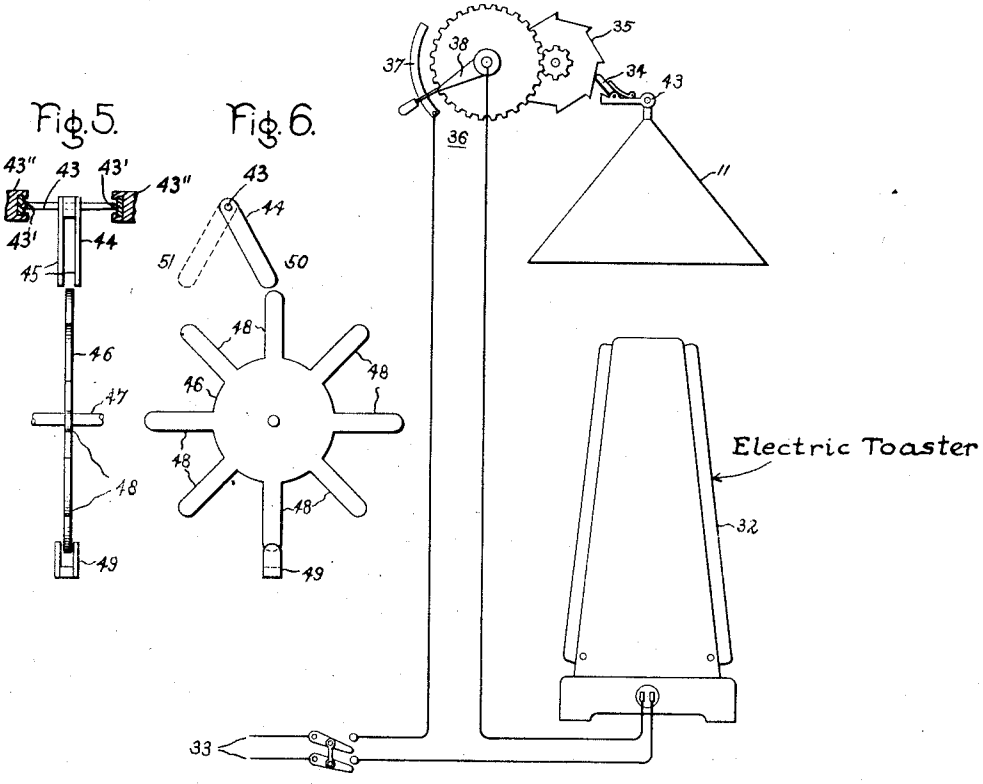
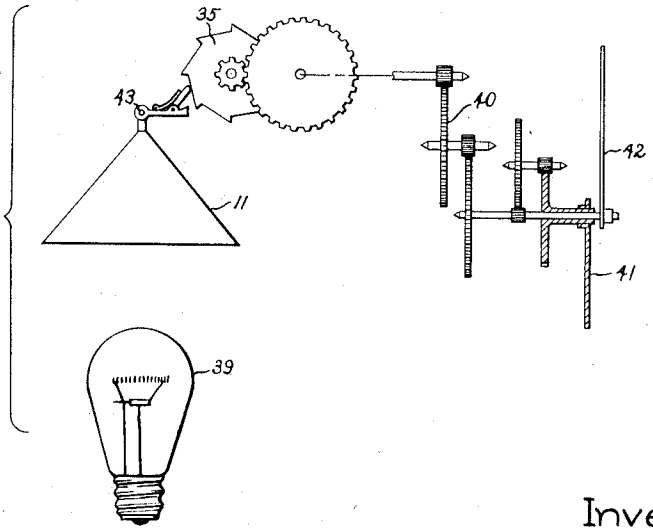


Fig. 5.

Fig. 6.

Fig. 4.



Inventor:
Orion H. Hurst
by Harry E. Dunham
His Attorney.

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UNITED STATES PATENT OFFICE

2,195,311

NOVELTY PENDULUM MECHANISM

Orion H. Hurst, Morristown, N. J., assignor to General Electric Company, a corporation of New York

Application November 27, 1936, Serial No. 113,047

6 Claims. (Cl. 60—9)

My invention relates to pendulum mechanisms and methods of driving them.

It is an object of my invention to provide novel and improved toys, advertising devices, and timing devices, particularly such devices with concealed or unobvious driving force.

Another object of the invention is to provide temperature alarms.

Still another object of my invention is to provide an improved ratchet device.

Other and further objects and advantages will become apparent as the description proceeds.

In accordance with my invention in its preferred form, I provide a canopy which is in the shape of a bell or an inverted cone and is freely suspended in the air above a source of heat so that the convection currents strike the canopy. Upon starting the canopy in oscillation, the force of the convection current becomes unbalanced and causes the canopy to swing further one way or the other to a given limit, depending upon the force exerted and, thus, the canopy is maintained in oscillation.

The invention may be understood more readily from the following detailed description when considered in connection with the accompanying drawings, and the features of the invention which are believed to be novel and patentable will be pointed out in the claims appended hereto. In the drawings, Fig. 1 represents one embodiment of my invention in which a gas flame is used as a source of heat; Fig. 2 illustrates an embodiment of my invention taking the form of a novelty device or toy and also illustrates the use of my invention as a temperature alarm; Fig. 3 illustrates an embodiment of the invention taking the form of a timing device for an electric toaster; Fig. 4 illustrates another embodiment of the invention serving as a clock; Figs. 5 and 6 are a side view and a front view, respectively, of a magnetic ratchet device which may be employed in connection with the embodiments of Figs. 3 and 4 and Fig. 7 is a perspective view of the pendent cone shown in the other figures. Like reference characters are utilized throughout the drawing to designate like parts.

Referring now more in detail to Fig. 1 representing a simple form of the invention by way of illustration, there is a canopy or inverted cone 11 (shown in perspective in Figure 7), open at the bottom 12, and preferably composed of relatively light material, such as paper, parchment, or other suitable material of sufficient lightness and stiffness. The canopy 11 is pivotally suspended by means of an eye 13, resting upon a knife edge 14 above a gas burner 15 supplied from a suitable gas source controlled by a valve 16.

It will be seen that the suspended member or canopy 11 consists of sheet material in the form of a cone generated by elements passing through the apex of the cone. Since the cone is suspended with the apex upward, the apex is above the center of gravity of the cone and is on the line passing through the center of gravity of the cone and the point of suspension, that is, the portion of the knife edge 14 bearing the eye 13.

It may be necessary to start the operation of the device by deflecting the cone 11 to either side of its equilibrium position by hand. Once the cone is deflected, however, the upward forces exerted thereon by the rising current of air become unbalanced and the cone is further deflected with greater and greater force owing to the fact that one side of the cone presents a greater and greater surface to the force of the air and the other side presents a smaller and smaller surface. For example, when the cone is deflected to the left, the horizontal projection of the side 17 becomes progressively greater and departs further and further from the pivot center 14 so that the deflecting force increases. The deflecting force continues to increase until it is overcome by the increasing effect of the force of gravity, whereupon the cone 11 falls to its middle position, is carried past the middle position by inertia, and deflects in the other direction until it assumes the position 18. If the gas flame 19 issuing from the burner 15 is turned up, the amplitude of the oscillations of the cone 11 increases, whereas, if the gas flame 19 is turned down, the amplitude decreases. The apparatus thus affords not merely a novel and somewhat mystifying arrangement for producing oscillations but also provides an arrangement for controlling the amplitude of the oscillations. It will be understood that suitable sizes and arrangements of parts will suggest themselves to those skilled in the art according to the equipment at hand and the purpose for which the apparatus is to be used. Although satisfactory operation may be obtained notwithstanding substantial variations in proportion, for the sake of illustration, I shall state certain specific values which I have found to produce successful operation. In the arrangement of Fig. 1 the canopy 11 may be conical in shape with an altitude of 2½ inches and a base diameter of 4 inches and the gas burner 15 may be one of the size most commonly used in ordinary household gas ranges. When such a canopy was suspended

about a foot above the gas burner an amplitude of swing of at least 30 degrees was maintained with the gas turned down to the lowest point at which it would continue burning. Since a pendulum tends to oscillate with the same time period with small changes of amplitude, the device may also be used as a timing device or as the driving element of a clock.

In Fig. 2, I have illustrated the use of the oscillating canopy in connection with a toy or novelty advertising device in which a teeter 20, a swing, or other similar toy, carrying two figures 21 and 22 attached to the suspended canopy 11, is kept in oscillation by a concealed heat source 23 which may take the form of an electric heater under a plate 24 flush with the floor 25 of a show case or counter. It will be understood, of course, that the teeter 20 and the figures 21 and 22 are preferably of extremely light construction such as Celluloid or other hollow ware.

In order to provide an alarm in case of overheating of the coil 23, a limit stop 26 is provided, which consists of a lever pivoted at 27 carrying a bell clapper 28 co-operating with an alarm bell 29. When the temperature of the heater 23 or the heat produced thereby exceeds a predetermined value, the amplitude of oscillation of the cone 11 becomes so great that the limit stop 26 is struck by the teeter 20, causing the clapper 28 to strike the bell 29 and give the alarm. If desired, an electrical temperature or heat alarm may be utilized, in which case, a source of current 30 and a current-responsive device or relay 31 are provided which are so connected to the clapper 28 and the bell 29 that an electrical circuit is closed through the relay 31 when the clapper 28 strikes the bell 29.

In Fig. 3, there is shown an electric toaster 32, which is energized by current source 33. A pivotally suspended cone 11, similar to those illustrated in Figs. 1 and 2, is hung above the toaster 32 so as to be caused to oscillate by the heat produced by the toaster. A ratchet 34 is attached to the cone 11 and a ratchet wheel 35 co-operating therewith is provided so that the oscillation of the cone 11 causes progressive rotation of the ratchet wheel 35. A switch 36 in series with the current source 33 and the toaster 32 is also provided, having a stationary contact 37 and a movable contact 38. The movable contact 38 is mechanically connected to the ratchet wheel 35 by suitable gearing so that the contact 38 is rotated in a clockwise direction at a uniform rate and, after a predetermined time interval, rides off the ends of the stationary contact 37 so as to open the electrical circuit of the toaster 32. It will be understood that the apparatus is so adjusted that the current to the toaster 32 is cut off after a time interval corresponding to that required to toast bread in the toaster the desired amount. It will also be understood that the construction is made as light and as low in friction as possible. If desired, a relay may be employed for breaking the toaster circuit in order to lighten the construction of the switch 36.

In the arrangement of Fig. 4, an electric lamp 39 serves as the source of heat and may be energized by either alternating or direct current. The ratchet wheel 35, which is similar to that described in connection with Fig. 3, is connected by means of suitable clockwork gearing 40 to the hour hand 41 and the minute hand 42, respectively, of a clock. The apparatus of Fig. 4 thus serves as a simple clock which may be driven by either alternating current or direct current and, while obviously not of a high degree of accuracy, will keep time with fair accuracy owing to the tendency of the pendulum cone 11 to oscillate with a uniform time period. The apparatus is also of interest for advertising purposes as it provides a timekeeping mechanism with a driving force which will not readily be apparent even to persons of some scientific knowledge. It thus serves to attract attention for advertising purposes.

Although I have shown mechanical ratchets in the embodiments of Figs. 3 and 4, it will be understood that my invention is not limited to the precise construction shown therein. For example, if desired, a magnetic ratchet may be employed for converting the oscillatory motion of the cone 11 into rotary motion. The magnetic ratchet device of Figs. 5 and 6 is relatively uncritical in amplitude factor so that it will cause the rotary element to advance one pitch at each swing of the cone even though the amplitude of the swing of the latter should vary within reasonable limits.

When employing the form of magnetic ratchet device shown, the cone 11 is mounted on a freely rotatable shaft 43, and the shaft 43 also carries a U-shaped permanent magnet 44 having pole pieces or polarized portions 45. Any suitable mounting arrangement may be employed for making the shaft 43 freely rotatable, that is, for obtaining relatively low friction. For example, the ends of the shaft 43' may be formed as hardened conical pivots cooperating with jewel bearings 43''. A magnetic ratchet wheel 46 is provided, which is mounted on a rotatable shaft 47 and includes a plurality of spokes or pole pieces 48. To avoid confusion in the drawings, eight pole pieces 48 are shown but preferably I employ a ratchet wheel with sixteen or more such pole pieces in order to obtain satisfactory operation with relatively small amplitude of swing of the cone 11. The ratchet wheel 46 is composed of magnetizable material, such as soft iron, and is so mounted that the pole pieces 48 may rotate through the zone of influence of the pole pieces 45 of the permanent magnet 44 as the latter oscillates. There is also a stationary U-shaped permanent magnet 49 so mounted that the pole pieces 48 pass through the zone of influence of the magnet 49 as the ratchet wheel 46 rotates. However, the relative strengths and mounting positions of the magnets are such that the attraction of the magnet 49 is weaker than that of the magnet 44 when the magnet 44 is in the right-hand position 50 shown in full lines in Fig. 6 and is stronger than the attraction of the magnet 44 when the latter magnet is in the left-hand position 51 shown in dotted lines in Fig. 6.

As the cone 11 and the permanent magnet 44 oscillate, the pole portions 45 of magnet 44 intermittently approach one of the pole pieces 48 of the ratchet wheel 46. Upon reaching the position 50 shown in Fig. 6, the magnet 44 attracts one of the pole pieces 48 and, during the return swing to the left, the ratchet wheel 46 is caused to rotate, the attraction of the stationary magnet 49 being overcome. However, after the magnet 44 has traveled through an angle corresponding to approximately a half pole pitch of the ratchet wheel 46, the attraction between the magnet 44 and the nearest pole piece 48 becomes relatively weak and further rotation of the ratchet wheel 46 is then produced by momentum and by the attraction of the permanent magnet 49 for one of the approaching pole pieces 48 until

the approaching pole piece has reached its closest position to the stationary magnet 49. The ratchet wheel 46 then remains in the same position during the next right-hand swing of the permanent magnet 44 until after the extreme right-hand position of the permanent magnet 44 is reached when the cycle is repeated by advancing the ratchet wheel 46 another pole pitch.

I have herein shown and particularly described certain embodiments of my invention and certain methods of operation embraced therein for the purpose of explaining its principle and showing its application, but it will be obvious to those skilled in the art that many modifications and variations are possible and I aim, therefore, to cover all such modifications and variations as fall within the scope of my invention which is defined in the appended claims.

What I claim as new and desire to secure by Letters Patent of the United States is:

1. In a horological device, a pendular mechanism including a hollow cone freely suspended to allow oscillation, a heating device below said cone for causing convection currents to flow upward against said cone and oscillate it, and mechanism for converting oscillation of said pendular mechanism into rotary motion.

2. In combination an electrical heating device with a supply circuit including a movable switch normally continuously closed during operation of the device, a convection motor supported above the heating device so as to be actuated by convection currents rising from said device, and an operative connection between said motor and switch for moving the switch to an open position in response to operation of said motor.

3. A supply circuit for an electric heating device and a convection motor adapted to be supported above the position in which a device may be electrically connected to the supply circuit so that the motor is actuated by convection currents rising from the device, said circuit including a movable switch normally continuosly closed during operation of a device connected to the circuit and having an operative connection to said motor for being moved to open position in response to operation of the motor.

4. A temperature alarm comprising in combination, a source of heat placed in the open so as to cause convection currents to rise therefrom, a pendular mechanism including a suspended hollow cone pivotally mounted above said source of heat and capable of being oscillated by such convection currents, and an alarm so located as to be operated by said pendular mechanism when oscillation thereof exceeds a predetermined angle.

5. In combination a suspended member comprising sheet material in a form generated by elements passing through a point which is above the center of gravity of the member and is on a line through the point of suspension and the center of gravity of the member, said suspended member being capable of being oscillated by convection currents, a heat producing device located under said member for causing convection currents to flow upward against said member and a motion responsive device so located as to be operated by said suspended member when oscillation thereof exceeds a predetermined angle.

6. In combination a hollow suspended member comprising sheet material formed with a broad open base downward and a relatively narrow apex, said suspended member being capable of being oscillated by convection currents, a heat producing device located under said member causing convection currents to flow upward against said member and a motion responsive device so located as to be operated by said suspended member when oscillation thereof exceeds a predetermined angle.

ORION H. HURST.