

A. D. BLODGETT & F. S. ATKINSON.  
 SELF WINDING MECHANISM.  
 APPLICATION FILED MAR. 1, 1909.

939,791.

Patented Nov. 9, 1909.  
 2 SHEETS—SHEET 1.

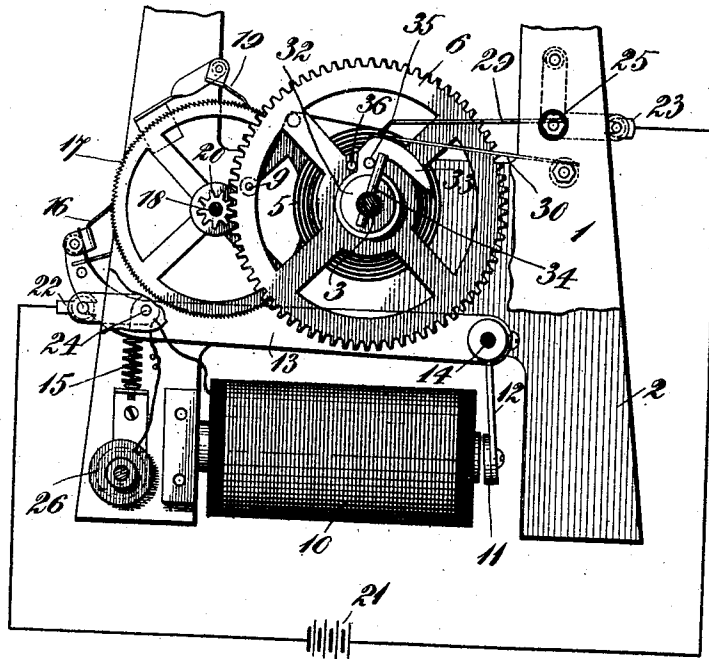


FIG. 1.

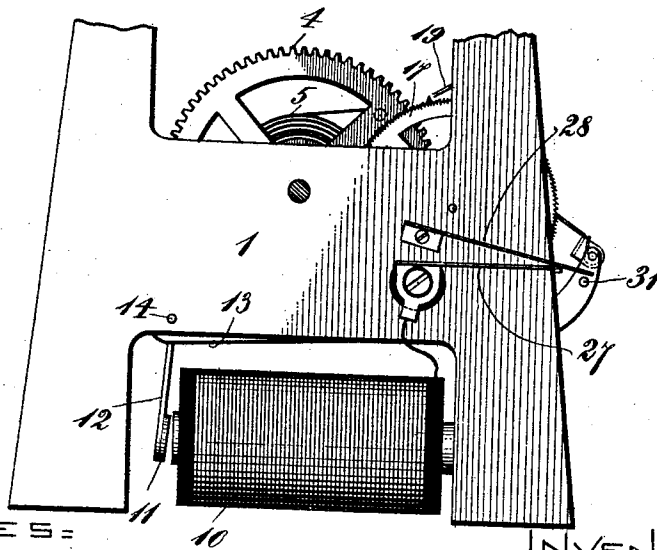


FIG. 2.

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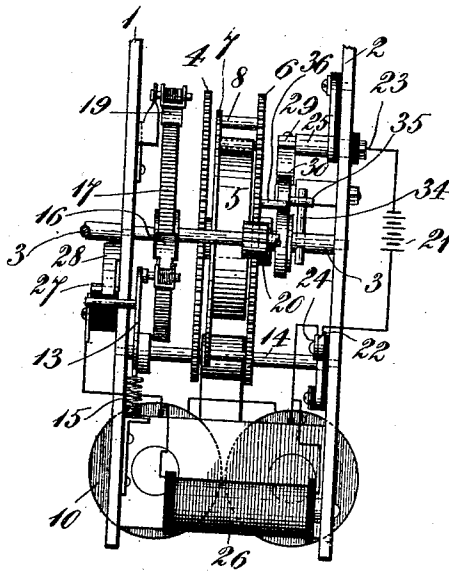


Fig. 3.

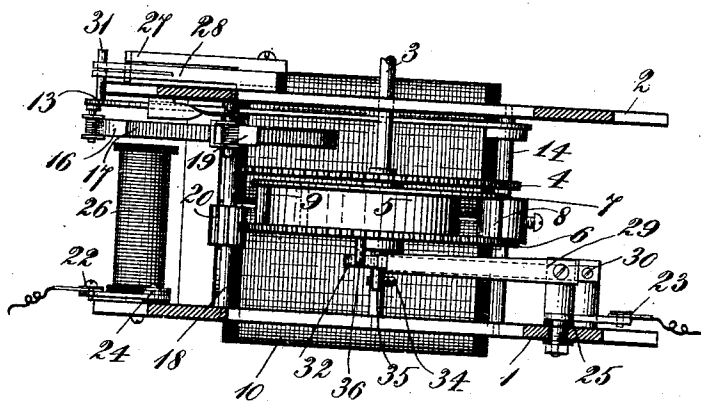


Fig. 4.

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# UNITED STATES PATENT OFFICE.

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## SELF-WINDING MECHANISM.

939,791.

Specification of Letters Patent.

Patented Nov. 9, 1909.

Application filed March 1, 1909. Serial No. 480,638.

*To all whom it may concern:*

Be it known that we, AARON D. BLODGETT, of Newton, in the county of Middlesex and State of Massachusetts, and FRED S. ATKINSON, of Brookline, in the county of Norfolk, in said State, both citizens of the United States, have invented a new and useful Improvement in Self-Winding Mechanism, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification in explaining its nature.

The essential objects of our invention are three: simplicity of construction, rapidity of operation and the use of a minimum amount of power or electrical energy for actuating the mechanism. The mechanism is especially adapted for the purpose of inducing the self-winding of clocks although of course it may be used for any other purpose to which it is adapted.

Our invention may best be seen and understood by reference to the drawings, in which—

Figure 1 shows a side elevation of the machine with a supporting side broken away to show the interior mechanism. Fig. 2 shows in elevation the other side of the machine. Fig. 3 is a front elevation of the machine, and Fig. 4 is a plan looking down on the same.

Referring to the drawings:—The frame of the machine is represented as consisting of two supporting sides or uprights 1 and 2 spaced apart and suitably connected. Interposed between and having bearing to turn in the two sides of the frame is a spindle 3. Mounted upon this spindle is a driving wheel or gear 4. Mounted also upon the spindle is a coil spring 5, one end of which is attached to the spindle. It is by means of this spring that the spindle is turned for driving any mechanism with which the wheel 4 connects. The outer or loose end of the spring is attached to a toothed wheel 6 loosely mounted upon the spindle. In fact the spring is interposed between the wheel 6 and a wheel 7 likewise loosely arranged upon the spindle, these two wheels 6 and 7 being connected together by pins 8 which act to prevent any undue loosening of the spring and to one of which at the point 9 the loose end of the spring is secured. Thus mounted and fixed the spring may be wound up by turning the wheel 6 around the spin-

dle, assuming of course that the spindle is held fixed or that it is turning in the same direction at a lesser rate of speed than the wheel is being turned.

Referring now to the mechanism for turning the wheel 6 and winding the spring, attention is first directed to the electro-magnet 10 arranged in the base portion of the frame and which is adapted to be excited by the passage of a current of electricity through it in the manner hereinafter to be explained.

11 is the armature of the magnet. This armature is arranged upon the power-receiving arm 12 of an angularly bent lever of which 13 represents the actuating arm. The lever is affixed to a shaft 14 interposed between and journaled to turn within the two sides of the frame. The angular form and arrangement of the lever are such also that the armature attached to the power-receiving arm 12 of the lever will lie in the field of the magnet, while the actuating arm of the lever extends forward toward the front of the machine. In this connection attention is directed to the fact that the actuating arm of the lever is relatively very much longer than the power-receiving arm, on which account the movement imparted to the arm 12 will be much increased in the actuating arm. By reason of its form and disposition the normal effect is for the lever to gravitate to or assume such position that its arm 12 and the armature carried by it will normally assume a position away from the pole or poles of the magnet. By means of a cushion spring 15 mounted upon a bracket fixed to the frame beneath the actuating arm of the lever provision is made for the spring to so yieldingly maintain the lever that the power-receiving arm of the lever and armature carried by it will normally be maintained not only within the field of the magnet but in close proximity to its pole or poles. It is understood that power for winding the spring is initially obtained by intermittently sending a current of electricity through the magnet and causing its armature to reciprocate or vibrate, thereby reciprocating or vibrating the actuating arm of the lever. By normally maintaining the armature in close proximity to the pole or poles of the magnet the armature and lever operated by it will receive the full benefit of the magnet; in other words,

the force generated by the magnet when excited will more strongly influence the armature than if it were permitted to assume a normal position farther away from the pole or poles of the magnet. Accordingly not only may a battery of low capacity be used, but the current generated by it be utilized to the best advantage.

Arranged upon the end of the actuating arm 13 of the lever is a pawl 16 spring-pressed to coöperate with a large toothed wheel 17 arranged upon a shaft 18 interposed between and journaled to turn within the sides of the frame. As the lever is actuated its actuating arm moving with a reciprocating or vibratory motion acts through the pawl 16 to drive or turn the wheel 17.

In connection with the movement of the lever, attention is again directed to the cushion spring 15, this spring acting not only to position the lever as aforesaid, but as the actuating arm of the lever is reciprocated or vibrated the spring provides a yielding stop for limiting and facilitating the vibratory movement imparted thereto. In other words, upon the magnet ceasing to attract the armature by the shutting off of the current through the magnet the lever will drop or gravitate to assume its normal position as above described with the armature assuming a position slightly away from the pole or poles of the magnet. Inasmuch as the cutting out of the current through the magnet is accomplished with great rapidity, the magnet and lever carrying it will necessarily have a very rapid vibratory movement and the spring 15 will assist in effecting this movement both by acting as a yielding stop to the actuating arm of the lever, thereby breaking its fall and limiting its stroke, but will also assist in effecting the reverse movement of the lever at the moment the magnet by a further excitation acts by attracting the armature to induce a like movement.

19 is a spring-pressed pawl normally co-operating with the toothed edge of the wheel 17 for preventing a return movement thereof.

Arranged upon the shaft 18, which is turned as the wheel 17 is turned, is a pinion 20. This pinion intermeshes with the toothed wheel 6 to which the loose end of the spring is secured with the effect that as the lever is vibrated the motion thereof will through the interposed chain of mechanism above noted be imparted to the wheel 6 for turning it and winding the spring.

In connection with the above mechanism, attention is directed to the fact that by reason of its relative length the actuating arm of the lever will have a relatively long swing during the vibration thereof on which account the driving pawl will rapidly turn

the wheel 17. By reason of the comparative size between the wheel 17 and the pinion 20 and the comparative size also between the pinion and the gear 6 to which the spring is secured, it is obvious that the power imparted by the actuating arm of the lever for winding up the spring will be very much increased, which also enables the spring to be wound through the initial influence of a battery or cells of very low capacity.

Reference will now be made to the means employed for intermittently exciting the electro-magnet 10. 21 represents a storage battery or cells wired to connect with the respective terminals 22, 23, arranged upon the terminal supports 24, 25, affixed, respectively to the frame of the machine, but insulated from it. The circuit is completed between these terminals by the passage of the current through the frame of the machine and the mechanism supported by it (the machine is usually mounted upon an insulated support), the current in its passage between the terminals passing also through the electro-magnet 10 supplemented by a shunt 26 which is preferably used in the circuit to prevent sparking. Now the arrangement is such that in the passage of the current between the terminals the circuit will be completed through two sets of contacts, viz: the set of contacts 27, 28, connecting with the frame of the machine at a point adjacent to the actuating arm 13 of the lever, and the set of contacts 29, 30, arranged on the frame of the machine at a point adjacent to the spindle. Of the contacts 27, 28, the contact 27 is arranged upon a support insulated from the frame of the machine, while the contact 28 is arranged upon a support directly fixed to the frame. Both the contacts are preferably spring contacts, the contact 28 being necessarily so. The relative disposition of these contacts 27, 28, is such that they will normally touch one another. The arrangement and extension of the contacts is such, however, that the contact 28 will extend beyond the end of the contact 27 when touching it so that the contact 28 may be lifted away from the contact 27, breaking the circuit, by a pin 31 affixed to the actuating arm 13 of the lever as the lever is vibrated thereby breaking the circuit and causing an intermittent excitation of the battery and consequent vibration of the lever. In this connection it is to be observed that the adaptation of the parts is such that the pin 31 will not engage the contact 28 for lifting it until the actuating arm of the lever is approaching the limit of its upward stroke during the vibration of the lever on which account the lever will receive the actuating influence of the magnet during the full extent of its working stroke to the limit thereof at which time the influence of the magnet will cease by the separation of the contacts and break-

ing of the circuit. Thereupon the lever will gravitate to its normal position to again become influenced as the fall of the lever and pin carried by it allows the contacts 27, 28 to touch one another for completing the circuit.

It is necessary of course that the excitation of the magnet in winding the spring should take place only at periodical intervals. In the mechanism shown the arrangement is such that the magnet will be excited for winding the spring after it has turned the spindle through a single complete revolution. This effect is accomplished in the following manner:—Again referring to the contacts 29, 30, it will be observed that the contact 29 is arranged upon or connects with the terminal support 25 fixed to but insulated from the frame of the machine. The contact 30 is arranged upon a support fixed directly to the frame of the machine, the circuit in other words, being completed through these contacts. The contacts are normally arranged out of touch with one another. Both the contacts are preferably spring contacts, the contact 30 being necessarily so in order that the circuit may be completed by bending the contact 30 to engage with or touch the contact 29. For this purpose there is loosely arranged upon the spindle a cam 32 of which 33 represents the head of the cam presenting a drawing edge of some considerable length. Affixed to and projecting from the spindle at a point alongside the cam is a pin 34. Projecting from the side of the cam is a pin 35. Now the relative arrangement of these pins and the relative disposition and arrangement of the cam with respect to the contacts 29, 30, is such that as the spindle is turned by the force developed by the unwinding of the spring, the pin 34 will engage the pin 35 on the cam thereby acting to pick up the cam and carry it around the spindle until it engages the spring contact 30 bending this contact to touch the contact 29 when the circuit will be completed and the winding mechanism will begin to operate to wind the spring in the manner above explained by a rotary motion imparted to the wheel 6 to which the loose end of the spring is secured. The winding operation will continue as long as the cam remains in the determinate position above described where it is holding the contacts in touch with one another. The cam would eventually be forced away from the contacts by the rotary action of the spindle, but, the spindle moving at a relatively low rate of speed, unless a very delicate mechanism were provided too long a time would elapse before the spindle would rotate so far as to dislodge the cam from its engagement with the contacts. Provision is made, however, so that the cam may be dislodged by the

rotary action of the wheel 6 to which the loose end of the spring is secured and this at a period when the winding operation is continued during the period of a single revolution of said wheel.

As may be seen the cam 32 is arranged upon the spindle at a point just adjacent to the wheel 6. The wheel, also, during the operation of the winding is moved in the same rotary direction as the spindle but at a very much faster rate. Projecting from the side of the wheel is a pin 36 bearing such relative arrangement with respect to the cam that as the wheel is rotated through the space of a single revolution for winding the spring, this pin will be carried around and engage the cam forcing it out away from the contact when the winding operation will immediately cease by the breaking of the circuit.

The operation of the mechanism has already been fully described in connection with the description of the various parts of the machine. It is therefore necessary only to give a brief summary as follows:—Assuming that a winding of the spring has just been accomplished, the spindle will then revolve one complete revolution when it will again bring the cam into operative engagement with the contacts 29, 30, for completing the circuit. Thereupon the winding mechanism will be operated through the excitation of the magnet and consequent vibration of the lever causing the wheel 6 to which the loose end of the spring is secured to turn thereby winding the spring, which winding continues during the period of one complete revolution of the wheel 6 as it turns around the spindle when the cam will be forced away from its engagement with the contacts thereby breaking the circuit when the winding operation will cease. After the spring has been thus wound it is held by means of the pawl 19 which as before described acts to prevent a reverse motion of the toothed wheel 17. This wheel forms a part of the winding mechanism and accordingly by reason of its geared connection with the wheel 6 acts when held by the pawl to prevent any reverse motion of the wheel 6 to which the end of the spring is secured.

Having thus fully described our invention, we claim and desire to secure by Letters Patent of the United States:—

1. In a machine of the character specified, the combination with a spindle, of a spring connecting therewith for turning it, means for winding said spring, said means comprising a toothed wheel loosely arranged on said spindle and with which the loose end of the spring connects, means whereby said wheel may be turned for winding said spring, said means comprising an electromagnet, means whereby said magnet may be

intermittently excited, an armature, an angularly bent lever to the power-receiving arm of which said armature is secured and the actuating arm of which lever is longer  
 5 than the power-receiving arm thereof, means for pivotally supporting and arranging said lever whereby the actuating arm thereof and armature carried by it may assume a normal position away from the pole or poles of said  
 10 magnet, yielding stop for limiting the movement of the actuating arm of said lever whereby said armature may continuously be maintained closely adjacent to the pole or  
 15 poles of said magnet, a driving pawl carried by the actuating arm of the lever, a wheel driven by said pawl, and means whereby the rotary force of said wheel when driven by the pawl may be increased and transmitted to said toothed wheel with which the spring  
 20 connects for turning said wheel and winding the spring, and means for holding the spring when wound.

2. In a machine of the character specified, the combination with a spindle, of a spring  
 25 connecting therewith for turning said spindle, a rotary spring-retaining member loosely arranged upon said spindle and to which the loose end of the spring is secured, mechanism for turning said member for winding  
 30 said spring, said mechanism comprising in part an electro-magnet, means whereby said magnet may be intermittently excited, an armature, an angularly bent lever to the power-receiving arm of which said armature  
 35 is secured, the actuating arm of which lever is longer than the power-receiving arm thereof, means for pivotally supporting and arranging said lever whereby said armature may be normally supported in the field of  
 40 said magnet closely adjacent to the pole or poles thereof and assume a normal position away from the same, means whereby power received and imparted by said lever may be received, increased and transmitted to said  
 45 spring-retaining member for turning said member and winding said spring, and means for holding the spring when wound.

3. In a machine of the character specified, the combination with a supporting frame, of  
 50 a spindle, a spring connecting therewith by which the spindle is turned, a spring-retaining member loosely arranged to turn around said spindle for winding said spring, mechanism comprising in part a lever  
 55 through which power may be imparted to said spring-retaining member for turning said member and winding said spring, means whereby said lever may be vibratorily actuated by the intermittent breakage and completion of an electric circuit completed  
 60 through the frame of the machine and mechanism carried by it, said circuit comprising in part contacts one of which is affixed directly to the frame of the machine and the  
 65 other insulated therefrom, said contacts be-

ing arranged to normally contact with one another and of which contacts also the one affixed to the frame of the machine extends beyond the end of the other contact when the contacts are in normal position touching  
 70 one another, and a member affixed to the actuating arm of said lever for intermittently engaging the end of said projecting contact, lifting the same and breaking the circuit as the actuating arm of the lever is  
 75 vibrated, substantially as and for the purposes set forth.

4. In a machine of the character specified, the combination with a spindle, of a spring  
 80 connecting with the spindle for turning it, a wheel loosely arranged on said spindle and to which the loose end of the spring is secured, mechanism whereby said wheel may be turned for winding said spring and hold the spring when wound, means for actuat-  
 85 ing the winding operation of said mechanism through the completion of an electric circuit, said means having in its circuit contacts arranged to lie normally out of contact with one another and at a point adjacent to  
 90 said spindle, and means for bringing said contacts into contact with one another for completing the circuit, said means comprising a cam loosely arranged upon said  
 95 spindle the head of which cam is adapted to close said contacts when said cam has been turned to a determinate position, means whereby said spindle may act to pick up said cam and carry it to said determinate  
 100 position, and means attached to said wheel for releasing said cam by the turning of the wheel for winding the spring.

5. In a machine of the character specified, the combination with a spindle, of a spring  
 105 connecting with the spindle for turning it, a spring-retaining member to which the loose end of the spring is secured and by which the spring is wound upon turning said member around said spindle, mechanism for  
 110 turning said member and winding said spring, means for actuating the winding operation of said mechanism through the completion of an electric circuit, said means comprising in part contacts for completing the electric circuit, said contacts being  
 115 normally out of touch with one another, a cam loosely arranged upon said spindle for closing said contacts, a pin projecting laterally from said cam, a pin projecting from said spindle arranged to engage the pin on  
 120 said cam for turning the same to a position where the cam may close said contacts, and a pin on said spring-retaining member adapted and arranged to engage said cam releasing it from said contacts upon the  
 125 turning of said member for winding the spring.

6. In combination, a spindle, a spring connecting therewith and means for winding  
 130 said spring, said means comprising a wheel

loosely arranged on said spindle and to which wheel the loose end of said spring is attached, a toothed wheel, interposed mechanism between said wheels by which power 5 may be imparted from one to the other, a pawl for preventing a reverse movement of said toothed wheel, a driving pawl, an angularly bent lever to one arm of which said driving pawl is secured whereby it may be actuated by said lever for turning said 10 toothed wheel, an armature connecting with the other arm of said lever for actuating it, an electro-magnet for attracting and actuating said armature, means for pivotally supporting said lever whereby said armature 15 may be maintained in the field of said magnet, a stop for said lever, means whereby said magnet may be intermittently excited by the completion of an electric circuit, said 20 means having in circuit therewith for completing said circuit two sets of contacts, the one set of contacts being arranged at a point adjacent to the pawl-driving arm of said lever and which contacts are normally in contact with one another, and the other of 25 said sets of contacts being arranged adjacent to said spindle and normally out of contact with one another, a member affixed to said lever and arranged to engage one of the adjacent sets of contacts for breaking 30 the circuit as said lever is turned and at the end of the stroke imparted thereby to said driving pawl, a cam loosely arranged on said spindle to engage the other of said sets of contacts adjacent to said spindle as said 35 cam is turned around said spindle to a determinate position, a member affixed to said spindle for turning said cam to said determinate position as said spindle is turned when the winding mechanism will be actuated to wind said spring, and a member 40 rotarily carried by the wheel to which said spring is secured and which member is arranged whereby it may engage said cam and release it from its engaging position as 45 aforesaid upon said wheel being turned through a complete cycle of movement for winding said spring.

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