L. F. STADEL.

ELECTRIC CLOCK.

APPLICATION FILED AUG. 4, 1909.

**987,768.** **Patented Mar. 28, 1911.**

2 SHEETS—SHEET 1.

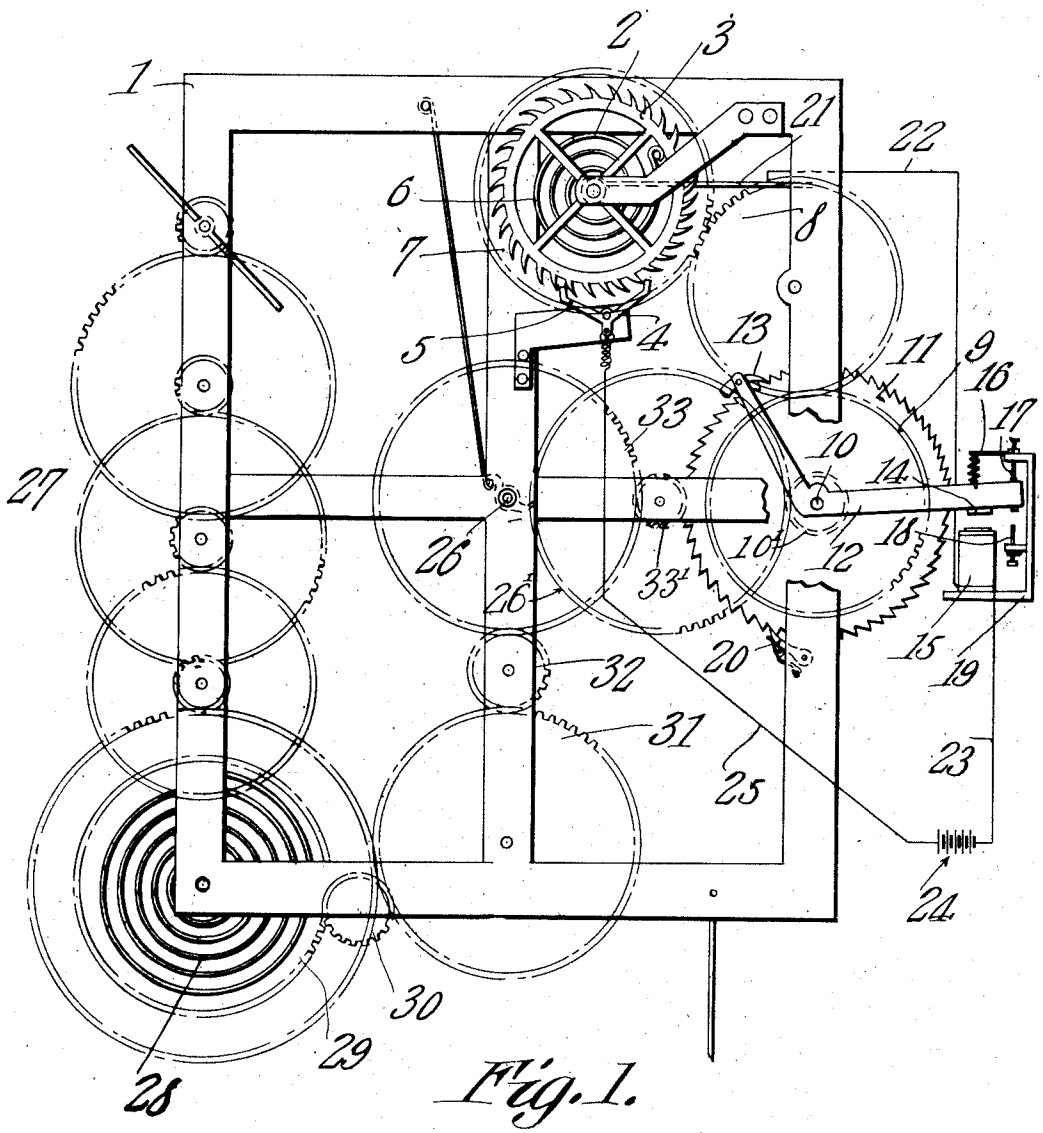


Fig. 1.

Witnesses

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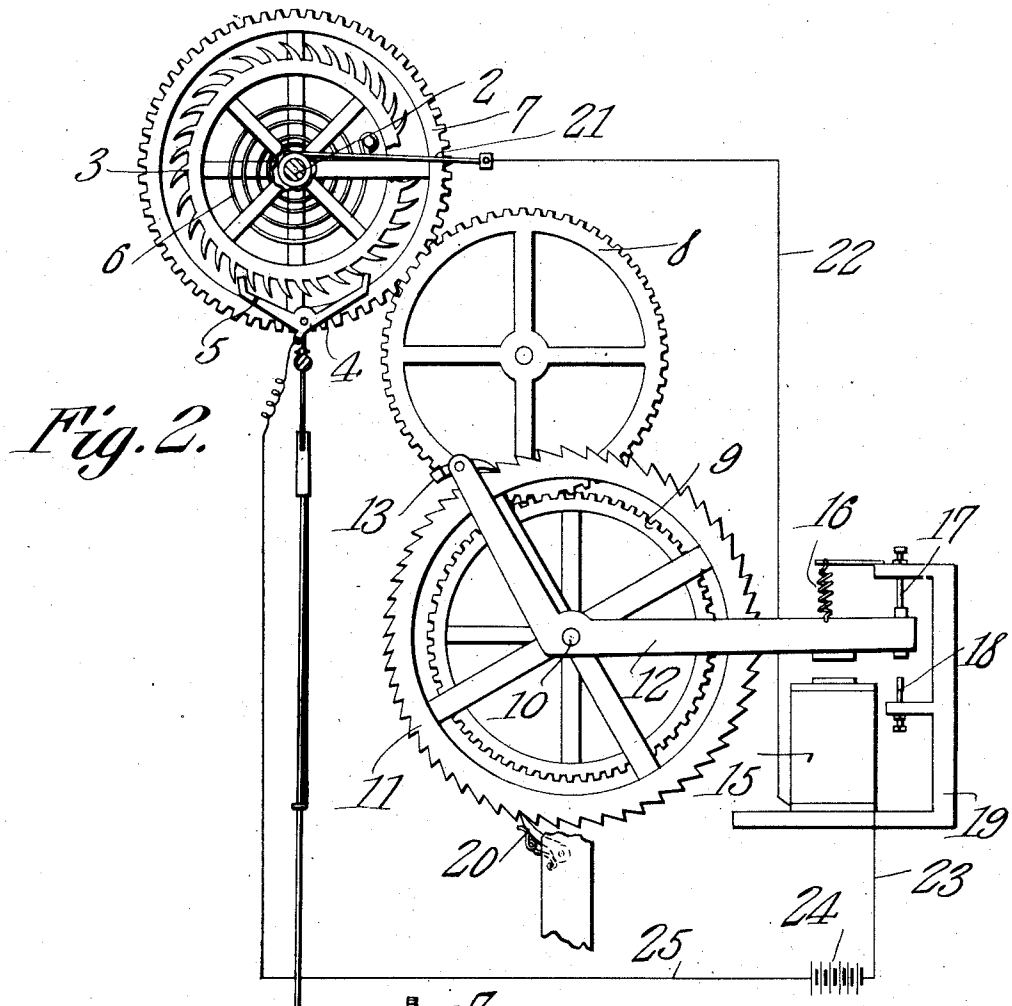


Fig. 2.

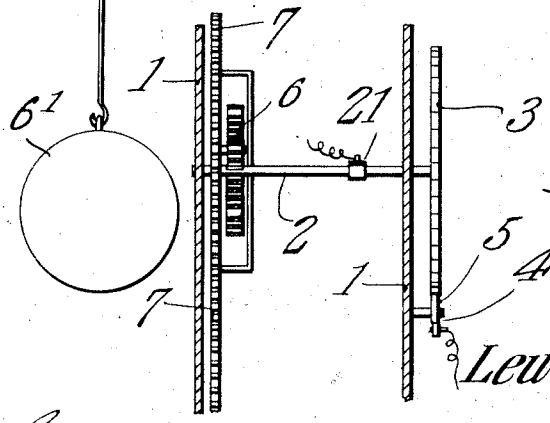


Fig. 3.

Witnesses

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# UNITED STATES PATENT OFFICE.

LEWIS F. STADEL, OF FREEPORT, MICHIGAN.

## ELECTRIC CLOCK.

987,768. Specification of Letters Patent. Patented Mar. 28, 1911.

Application filed August 4, 1909. Serial No. 511,132.

*To all whom it may concern:*

Be it known that I, LEWIS F. STADEL, a citizen of the United States, residing at Freeport, in the county of Barry and State of Michigan, have invented a new and useful Electric Clock, of which the following is a specification.

This invention has relation to improvements in electric clocks in which the impelling power for the time and the striking side of the clock is caused by the action of an electric current.

In accordance with the present invention there is provided a pendulum and escapement mechanism therefor arranged to periodically close an electric circuit which in turn causes the energization of a magnet connected up to a train of gearing in such manner as to drive the same. The electrically driven gear train is properly proportioned for imparting to time indicating hands the proper relative movement and at the same time the electric driving mechanism is utilized for winding a spring which latter in turn causes the actuation of the escapement thus keeping the pendulum in motion.

A striking movement is provided, being driven by a spring, but the spring is maintained in a wound condition by connections to the time movement which latter is actuated by the electric devices.

The invention will be best understood from a consideration of the following detail description taken in connection with the accompanying drawings forming a part of this specification, in which drawings—

Figure 1 is a view of a clock movement, in part diagrammatically represented, embodying the present invention. Fig. 2 is a detailed view of the electric and escapement sides of the clock movement. Fig. 3 is a detail section showing the escapement wheel and adjacent parts.

Referring to the drawings, there is shown a clock movement 1 including both a time movement and a striking movement, these two movements being interconnected in a manner which will hereinafter appear.

At an appropriate point in the clock movement there is provided an arbor 2 to one end of which there is secured an escapement wheel 3 preferably with thirty-six teeth, but since the number of teeth may vary with the general proportions of the movement such number may be taken simply as indicative and no attempt is made to show any correct number in the drawings. The escapement wheel is under the control of an anchor escapement 4 which may be of any approved type except that one end 5 is insulated from the remainder of the anchor for a purpose which will presently appear.

In the structure shown an ordinary pendulum 6′ is illustrated and this may be taken as indicative of any suitable pendulum or any other governing means for the escapement mechanism.

Secured to the arbor 2 is one end of a spring 6, shown as a spiral spring, and the other end of this spring is secured to a spring drum loose on the arbor 2 but fast to a gear wheel 7 which gear wheel is also loose on the arbor 2. By applying a suitable power to the gear wheel 7 in the proper direction the spring 6 may be wound, and, unwinding, actuate the escapement wheel 3 and so keep the pendulum or other governing means in motion the same as though the escapement wheel was driven from a main spring as is the case in ordinary clock movements.

In the showing of the drawings the gear wheel 7 is in mesh with an idler or transfer gear wheel 8 and this gear wheel 8 is in mesh with another gear wheel 9 on an arbor 10. Fast on the arbor 10, preferably at the end remote from the gear wheel 9 is a ratchet wheel 11 which latter, if the escapement wheel has 36 teeth, may have 72 teeth, but as before stated the number of teeth are not at all mandatory and may vary with different movements.

Mounted on the arbor 10, or pivotally supported in the axis of the arbor 10 is a lever 12 having one end bent relative to the other in the particular structure shown in the drawings and this end terminates adjacent to the periphery of the ratchet wheel 11 where it carries a pawl 13 adapted to engage the teeth of the ratchet wheel in such manner that when the lever 12 is moved about its pivot in one direction the pawl 13 will ride idly over one or more teeth of the ratchet wheel though in practice the movement of the lever will include but one tooth at a time. The other end of the lever 12 is carried to one side of the clock movement and there is provided with an armature 14 within the attractive influence of an electromag-

net 15. The lever 12 is normally constrained in a direction to carry the armature 14 away from the magnet 15 by a suitable spring 16 and adjustable stops 17 and 18 mounted on a post 19, which latter may have a base supporting the magnet, are provided for limiting the movement of the lever 12 under the action of the magnet and of the spring 16.

A back stop pawl 20 is appropriately mounted on the frame of the clock movement to cause the ratchet wheel 11 to move in one direction only when actuated by the lever 12. A brush 21 is so supported in the clock movement frame as to bear upon the arbor 2 and make electrical connection therewith. This brush may be connected by a conductor 22 to one side of the magnet 15 and the other side of this magnet may be connected by a conductor 23 to a battery 24 or other suitable source of electric energy. The other side of the battery 24 is connected by a conductor 25 to the anchor 4. Let it be assumed that the pendulum 6′ is in motion then the ends of the anchor 4 will make alternate engagement with the escapement wheel 3. On each alternate engagement of the anchor with the escapement wheel there is established a circuit from the battery 24 to the conductor 23 and magnet 15, thence by the conductor 22 to the brush 21 and to the arbor 2, from whence the circuit is completed through the end of the anchor 4 connected to the conductor 25 and by the latter back to the battery 24. This will cause the energization of the magnet 15 during the brief period of time that the circuit is completed and the armature 14 will be attracted against the action of the spring 16. The attraction of the armature 14 and the participation in movement therewith of the lever 12 causes the engagement of the pawl 13 with the teeth of the ratchet wheel 11 and the turning of this wheel a distance equal to the length of a tooth. This motion of the ratchet wheel is transmitted to the gear wheel 9 and by the latter to the gear wheel 8 and from the said gear wheel 8 to the gear wheel 7 and so to the spring 6, winding the latter a commensurate amount. The power thus stored within the spring 6 is transmitted to the arbor 2 by the reaction of the spring and the escapement wheel 3 is urged in the proper direction by the unwinding of the spring 6 and the power thus transmitted is further transmitted by the anchor escapement 4 to the pendulum 6′ thus maintaining the latter in motion. The spring 6 constitutes the intermediate power storing means receiving the power intermittently and giving it out continuously so that the escapement wheel 3 is subject to the continuous driving power intermittently renewed. As soon as the anchor 4 has swung in the opposite direction the circuit is broken because the opposite end of the anchor is insulated from the end first under consideration. The magnet 15 is therefore deënergized and the action of the spring 16 is to move the lever 12 in a direction to cause the pawl 13 to pass over a tooth into engagement with its active shoulder ready for the next impulse transmitted to the magnet 15. These impulses come at regular intervals as determined by the speed of the pendulum 6 or whatever other governing means may be employed for the escapement mechanism.

On the time side of the clock movement there is provided the usual hand arbor 26 coupled up by a suitable gear train 33, 33′, 26′, 10′, to the arbor 10. It will be understood that the arbor 26 is provided with the usual slow down gear train for the hour hand of the clock movement, the minute hand as usual being carried by the arbor 26. There is also shown a gear train 27 being that usually employed for striking movements and therefore only diagrammatically represented in the drawings. This gear train is under the control of a spring 28 of the usual type used in connection with striking movements and one end of this spring 28 is connected to a gear wheel 29 which in turn is connected by idler gears 30, 31, and 32 respectively to the gear wheel 33 on the arbor 26. The movement of the arbor 10 imparted thereto by the ratchet wheel, is transmitted first to the arbor 26 through the gear wheels, 10′, 26′, 33′, 33 and to the time indicating hand of the clock, and from there is transmitted by the gears 33, 32, 31, 30 and 29 to the spring 28 so that the latter may be wound between the times of its release for causing the actuation of the striking movement.

In large clocks the weight of the hands tends to accelerate the movement of the clock at times and retard it at other times. With the movement constructed in accordance with the present invention the weight of the hands is immaterial since the actuation of the time side of the clock is positive irrespective of any unbalancing of the movement and any tendency of the hands to move too fast under the action of gravity is prevented by the connection of the hand arbor with the striking side of the clock.

The clock is complete in itself but where a number of clocks are to be used in one system the pendulum or governing side of the clock may be present in but one clock and the actuating magnets of all the other clocks may be connected up in the same circuit controlled by the escapement mechanism of the one clock provided therewith.

To prevent shock or jar the lever 12 may be provided with elastic bumpers where it comes in contact with the screws 17 and 18.

In large clocks the striker-movement spring is so strong that a pawl and ratchet

escapement is usually necessary between the minute-hand arbor and the gear wheel driving the same, so that the hands may be set.

By securing a ratchet wheel rigidly to the minute-hand arbor and a pawl to the driving gear-wheel, which is then loose on the arbor, slipping, such as might occur in the connections usually employed for the purpose, is prevented.

What is claimed is:

In an electrically driven clock, the combination of an escape wheel, a spring for driving the escape wheel, means including an electromagnet for tensioning the spring, an anchor engaging the escape wheel and adapted to make electrical connection therewith, an electrical circuit and a hand arbor actuated by the aforesaid electromagnet independently of the spring.

In testimony that I claim the foregoing as my own, I have hereto affixed my signature in the presence of two witnesses.

LEWIS F. STADEL.

Witnesses:

ELLA C. HECOX,

WILLIAM L. THORPE.