(No Model.)

A. LUNGEN.

SELF WINDING ELECTRIC CLOCK.

No. 528,960. Patented Nov. 13, 1894.

Fig. 1.

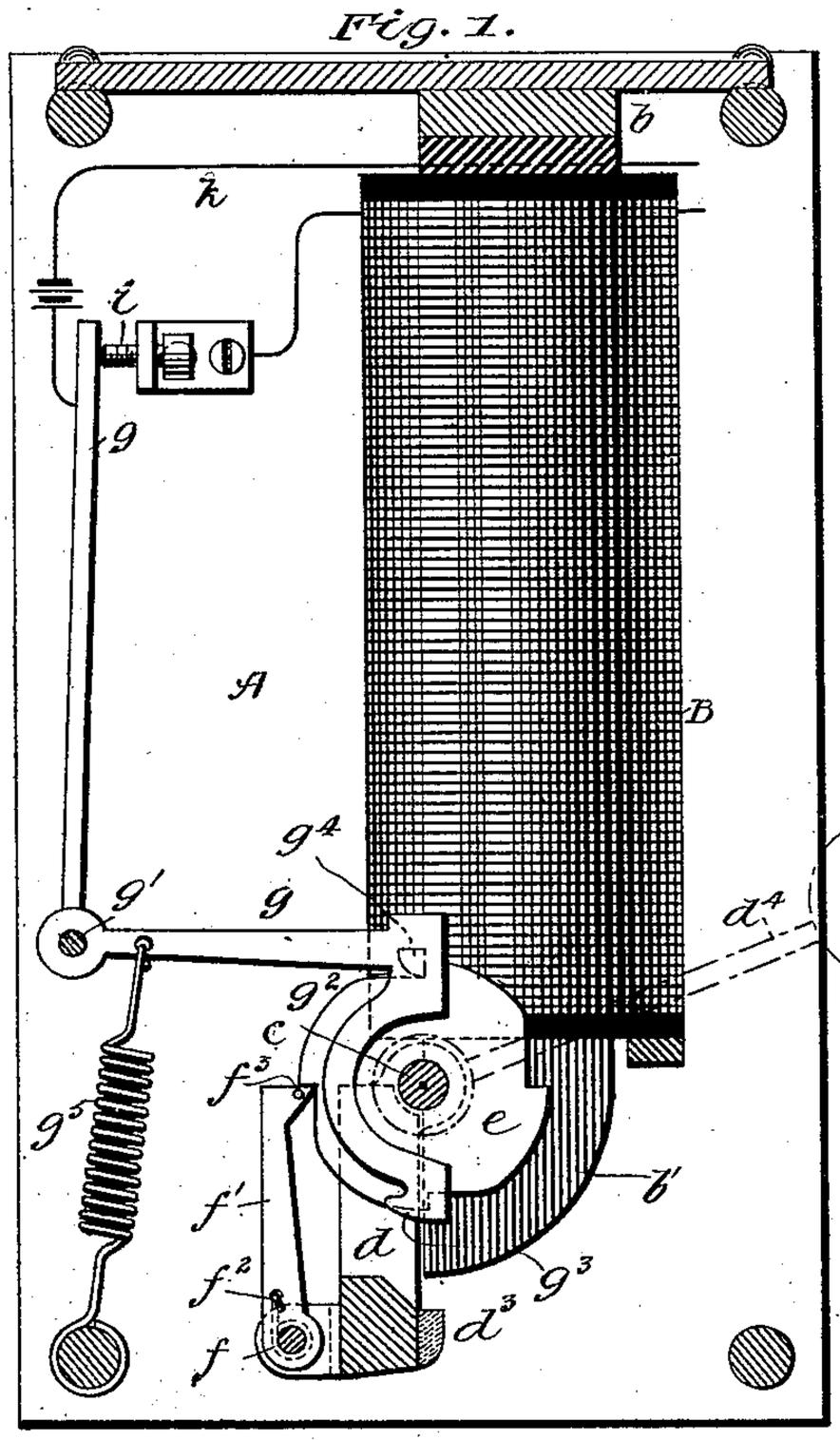


Fig. 2.

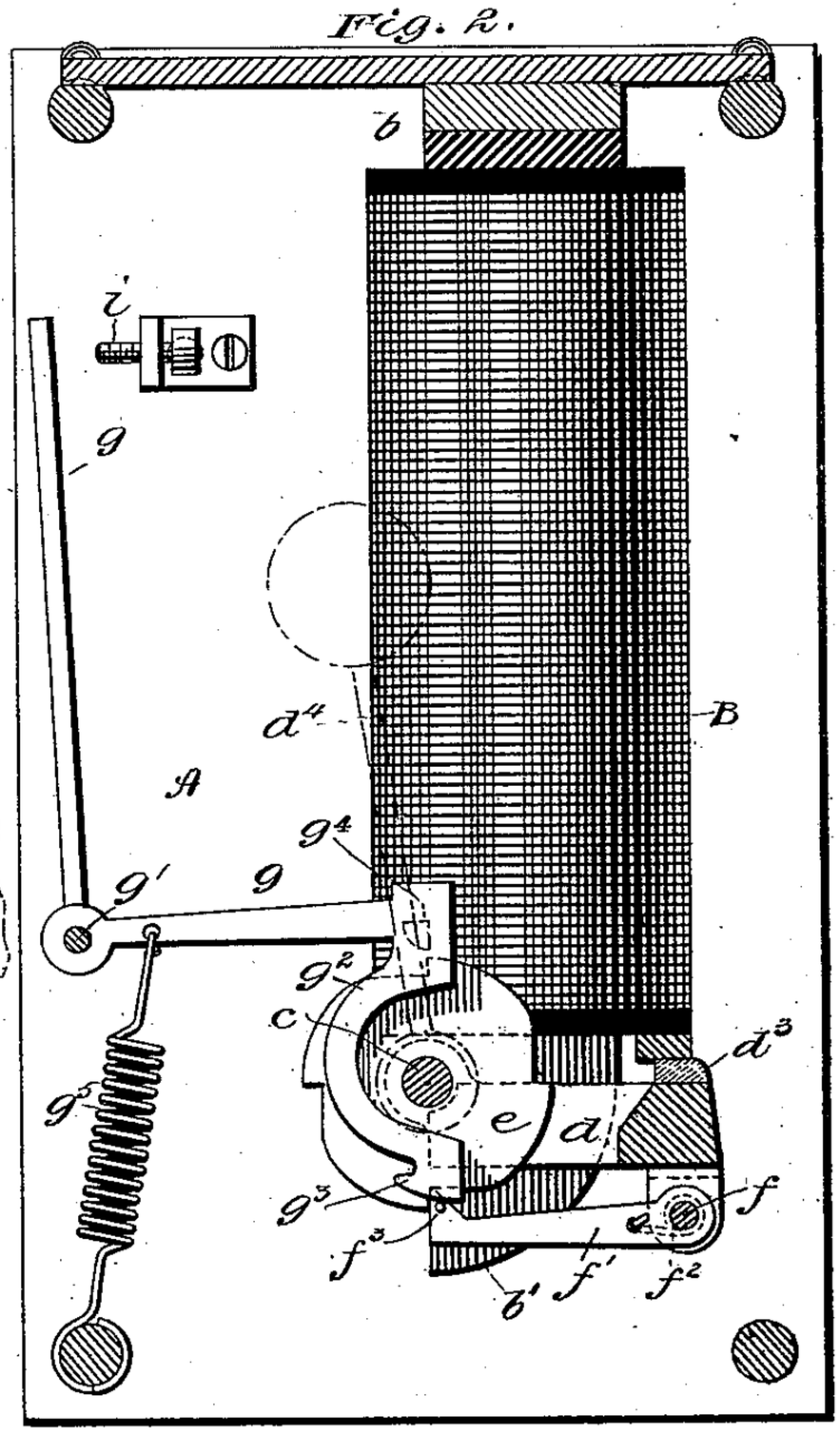
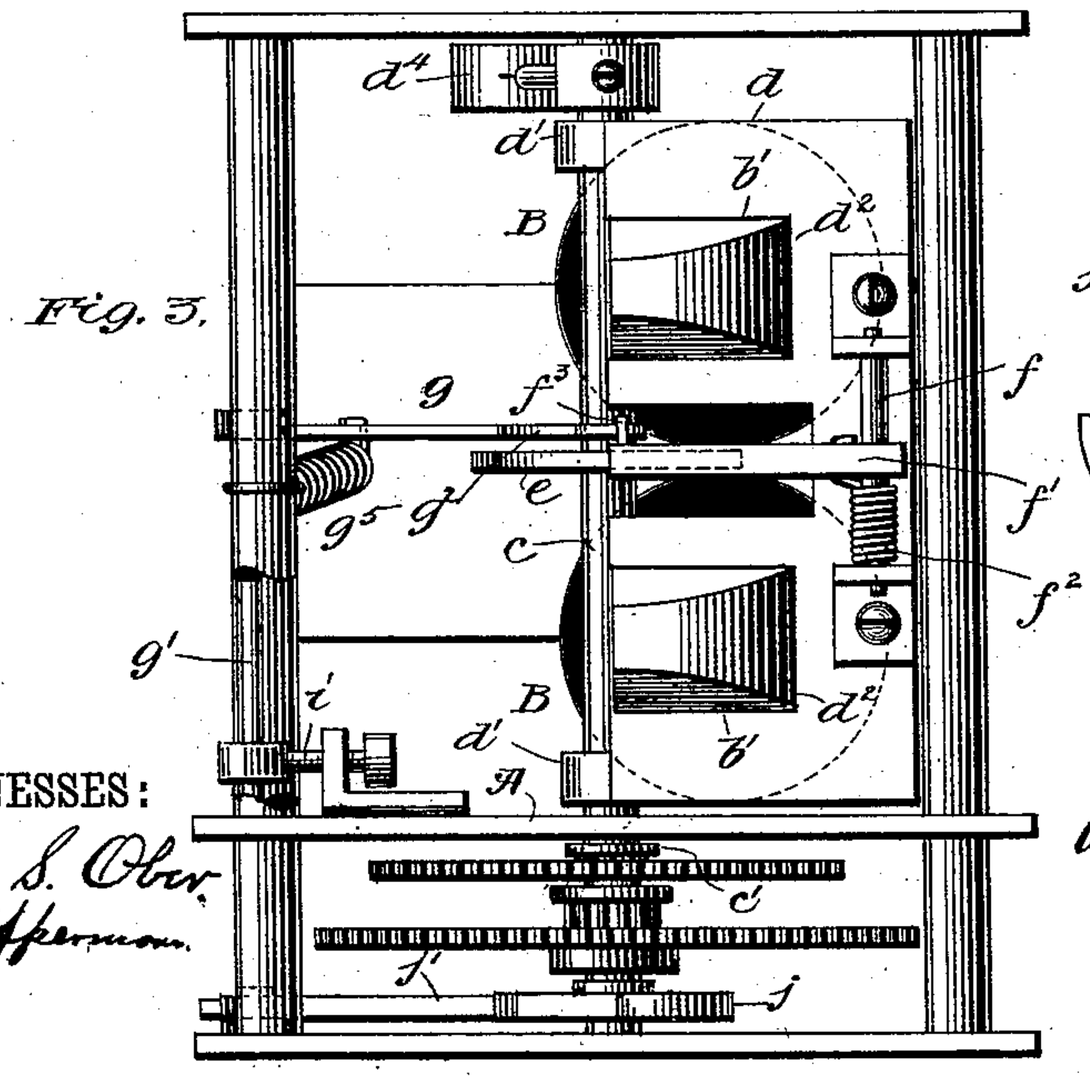


Fig. 3.



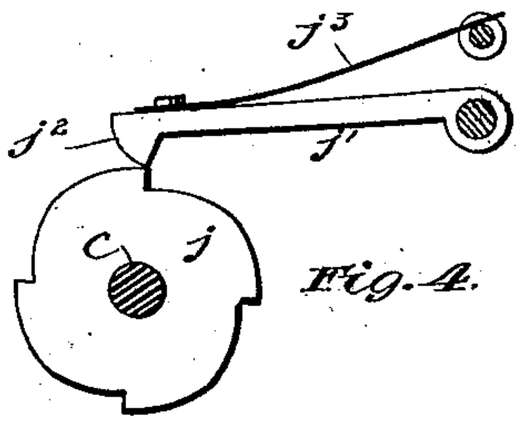


Fig. 4.

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ADAM LUNGEN, OF NEW YORK, N. Y., ASSIGNOR OF ONE-HALF TO ROBERT EDWARDS, OF SAME PLACE.

SELF-WINDING ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 528,960, dated November 13, 1894.

Application filed May 13, 1893. Serial No. 474,118. (No model.)

To all whom it may concern:

Be it known that I, ADAM LUNGEN, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Electric Self-Winding Clocks, of which the following is a full, clear, and exact description.

This invention is an electro-mechanical apparatus for automatically storing power at regular intervals to drive a train of wheels or a clock.

The object of the invention is to provide an apparatus of this description, which shall be as simple as possible in its construction and which shall be economical in the use of the electric current which supplies the power.

In many of the self-winding clocks heretofore produced, the motor has been found to consume more power than was actually used in winding the spring or driving the train, the reason for this being that the making and breaking of the circuit through the motive device is not accomplished simultaneously with the times when the useful work of the motor begins and ends. In other words, the circuit is kept closed after the motor has done its work, and when the motor is energized at short intervals the aggregate loss in battery power, which is the power commonly used, makes this kind of apparatus expensive.

My invention is specially designed with a view to using open circuit batteries wherein the length of time the circuit remains closed during each period is of great importance.

My invention consists of the construction and combination which will now be described with reference to the accompanying drawings, in which—

Figures 1 and 2 represent vertical sections through the frame of the apparatus showing the parts of the invention in elevation. Fig. 3 is a bottom view of the apparatus, and Fig. 4 is a detail.

Referring to the drawings by letter, A represents the frame in which is supported a number of wheels constituting the clock train or any train of gearing, through which power is to be transmitted.

B represents an electro-magnet consisting of two coils having a back yoke *b* and pole pieces *b'*, *b'*. The pole-pieces project somewhat from the heads of the magnet spools and are made in the shape of a quadrant, one of the vertical sides of the quadrant being parallel to the axis of the coil. Along the base of these vertical sides of the poles and close against the heads of the magnet spools, one of the shafts *c* of the gear train is suitably mounted. This shaft carries a pinion *c'* which transmits power to the train shown in Fig. 3. Arranged upon this shaft at the points *d'*, *d'* is a soft iron plate *d*, forming the armature of the electro-magnet. One edge of this armature extends along close beside the shaft *c* and it is notched or provided with openings d^2, which permit the pole-pieces of the magnet to pass through the armature as it swings upon the shaft *c*. The center of the armature between the pole-pieces is also cut away to make room for the wheel *e* on shaft *c*. The face of the armature is provided with a strip of felt or rubber d^3 which acts as a cushion when the armature is drawn against the heads of the magnet spools. Owing to the location of the pivot of the armature and the shape of the pole-pieces, the armature has a clear swing of ninety degrees.

The armature is made sufficiently heavy so that in falling from its horizontal position, it will have power enough to drive the train of wheels, and in order that the power exercised by the armature when thus moving may be uniform throughout the full movement of ninety degrees a counterpoise d^4 is fixed to an arm upon the shaft *c*, and arranged in such a position that it will retard the first portion of the downward movement of the armature and accelerate the last portion.

On the back of the armature is suitably mounted a short shaft *f* carrying a pawl *f'*. A coil spring f^2 surrounds the shaft, and acts upon the pawl with a tendency to force it inward or toward the armature. The pawl bears at its free end upon the periphery of wheel *e*, which is notched at points ninety degrees apart to engage with the pawl. The wheel is set upon the shaft so that when the armature is horizontal the pawl will be in one of the notches. The pawl is provided

with a laterally projecting pin f^3 located at the tip for a purpose which will hereinafter appear.

g represents a bell crank lever, the two arms of which are fixed to a rock shaft g'. One of the arms is adapted to engage with an electrical contact i, and the other occupies a plane parallel and closely adjacent to wheel e. Spring g^5 acts upon one arm of this bell crank. The outer end of this arm carries a depending bracket g^2 which extends around the shaft c, and is provided with a short cam surface g^3 standing beside the periphery of the wheel. At the point where this bracket joins the arm g there is a laterally projecting lug g^4 which is adapted to engage with the notches in wheel e.

On one of the shafts of the train and preferably on shaft c is a disk j, having four notches arranged ninety degrees apart upon which a pawl j' bears. The end of the pawl has a cam surface j^2 and it is held against the periphery of the wheel by a spring j^3. When the end of the pawl drops into one of the notches the spring forces the cam surface against the shoulder of the notch and forces the wheel forward.

The arm g and the contact i are the terminals of an electric circuit k including the electro-magnet.

The operation of the device is as follows: At starting, we will assume the parts to be in the position shown in Fig. 1. The circuit is closed and the magnet becoming energized lifts and swings the armature through ninety degrees or into the position shown in Fig. 2. In making this movement pawl f' moves from one notch to the other of wheel e. When it drops into the second notch pin f^3 strikes the cam surface of bracket g^2 and lifts it, thus carrying the lug g^4 out of the notch of wheel e, and releasing the wheel and simultaneously breaking the circuit between g and i. The magnet then being de-energized, the weight of the armature carries it downward and it acts as a crank upon shaft c by reason of the engagement of pawl f' with the wheel e. The movement of the armature is therefore imparted to the train of wheels. After the armature has traveled a short distance the pin f^3 is carried out of engagement with bracket g^2. The bracket then falls by the action of spring g^5 and the lug g^4 slides upon the periphery of wheel e, the notch in said wheel having been carried past the lug. When the armature reaches the vertical position shown in Fig. 1, wheel e has presented the next notch to lug g^4, which permits the bracket g to fall and swing the bell crank forward until it strikes i, thus closing the circuit and again energizing the magnet, when the same operation is repeated. Just as the armature reaches the position shown in Fig. 1, the pawl j' drops into one of the notches of disk j and during the movement of the armature back to its horizontal position which is very quick, this pawl forces the train along thus continuing its movement. As the train will be provided with the usual regulating escapement this action of the pawl will not make the movement at all irregular. It will be seen that the moment the magnet has done its work the circuit is opened, and the moment the armature has done its work the circuit is closed. The circuit of the magnet is closed but a moment, while the armature is a comparatively long time in falling. An open circuit battery can therefore be used with this device with good results.

It is to be observed that springs may be employed in the place of gravity wherever the latter is utilized in this apparatus, in which case the apparatus may be turned on its side or into any other position, if desired.

The peculiar shape of the pole-pieces of the magnet and the location of the pivot of the armature keep the armature under the influence of the magnet throughout the entire length of its stroke and permits of a very long stroke.

Having thus described my invention, I claim—

1. In an electric clock the combination of an electro-magnet, an electric circuit, a vibrating armature, a notched wheel engaged and moved by the armature, a circuit-closing lever also engaging with said notched wheel, the armature engaging said circuit closing lever and lifting it out of engagement with the wheel before it engages and moves the wheel, itself.

2. In an electric clock the combination of an electro-magnet, an electric circuit, a vibrating armature, a pawl carried by said armature a notched wheel adapted to be engaged by said pawl and moved by the armature and a circuit-closing lever adapted to engage said notched wheel, the pawl when entering a notch before it engages and moves the wheel, itself acting upon the lever and throwing it out of a notch for the purpose set forth.

3. In an electric clock the combination with the magnet, armature and pawl of the circuit-closing lever provided with bracket g^2 and cam surface g^3, and the notched wheel e adapted to be engaged by the pawl and lever in alternation, substantially as described.

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

ADAM LUNGEN.

Witnesses:
FRANK S. OBER,
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