(No Model.)

A. D. BLODGETT.

SECONDARY ELECTRIC CLOCK.

No. 604,453. Patented May 24, 1898.

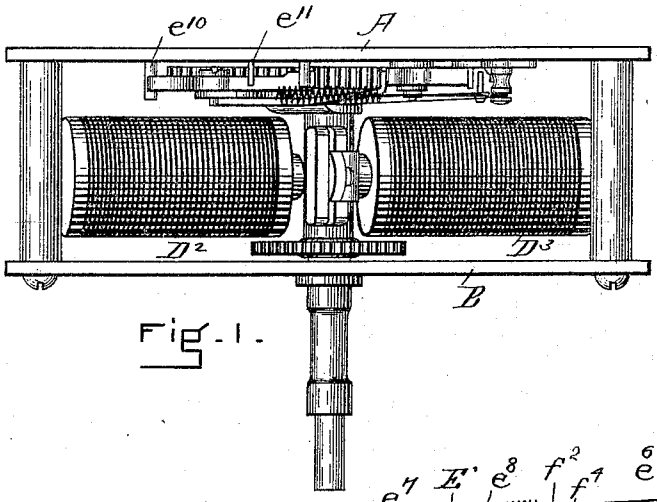

Fig. 1.

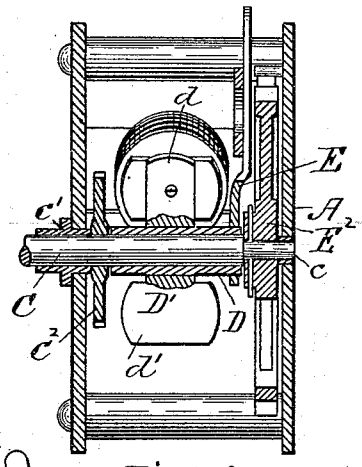

Fig. 4.

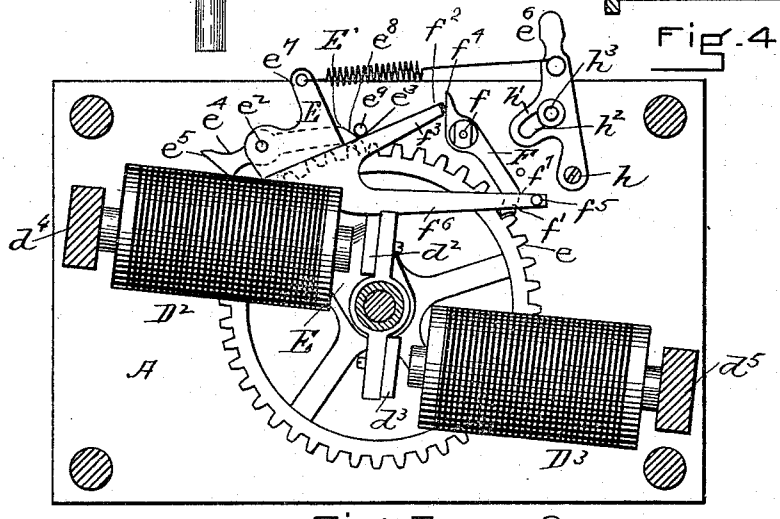

Fig. 2.

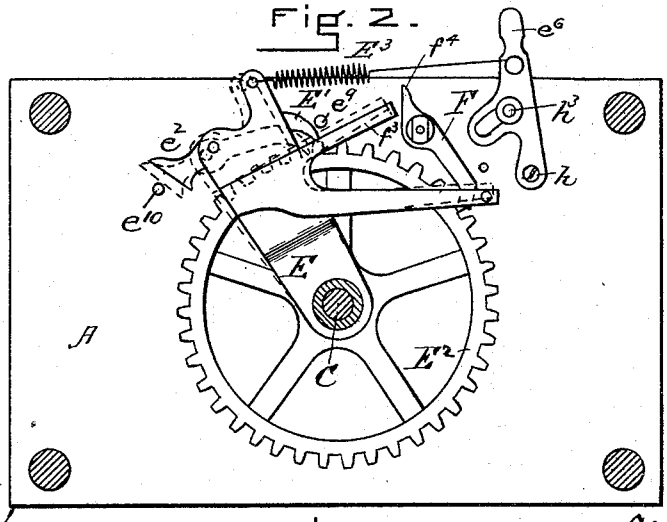

Fig. 3.

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SECONDARY ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 604,453, dated May 24, 1898.

Application filed May 29, 1897. Serial No. 638,670. (No model.)

To all whom it may concern:

Be it known that I, AARON D. BLODGETT, a citizen of the United States, residing at Newton, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Time-Dial Movements, 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 invention relates to the herein-described improvement in time-dial movements, whereby the operation of the same is made more positive and certain and the construction simplified.

In the drawings, Figure 1 is a view in plan of my improvement. Fig. 2 is a view in front elevation thereof, the front plate of the frame or casing being removed. Fig. 3 is a view in elevation of the parts back of the magnets. Fig. 4 is a view in vertical section upon the dotted line 4 4 of Fig. 1.

I have represented the movement as actuated by electrical impulses delivered from an energizing source through a pair of magnets and an armature connected with and forming a part of the movement; but I would say that I do not limit myself to this particular medium for providing the movement with an intermittent or step-by-step motion and may use in lieu of the magnets and armature any mechanical device for providing the feed-pawl of the device with oscillatory movements.

In the drawings, A represents what may be called the "back" plate, and B the "front" plate. These plates are held apart and connected in the usual manner, and across them extends the shaft C, which has a bearing at c in the rear plate A and in the front plate a bearing provided by the long sleeve c'.

Upon the shaft between the plates B and A is the armature-sleeve D, which is mounted upon the same, to be turned back and forth by the armature D′, having the wings or extensions d d' and the magnets D^2 D^3. The armature surrounds the sleeve, and its wings extend radially from it and are faced with the blocks d^2 d^3. (See Fig. 2.) The magnets are supported by cross-bars d^4 d^5, respectively, which are fastened to the front and back plates, and they preferably are inclined in relation to the armature, as represented in Figs. 1 and 2.

The shaft C has attached to it the pinion c^2, forming one of a train. The armature-sleeve D has attached to it the outwardly-extending arm E, which carries at its outer end a feed or driving pawl E′, and there is fast to the shaft C the large driving-gear E^2, having teeth e in the nature of spur-teeth. The driving-pawl is pivoted to the lever E at e^2, and its tooth-engaging end e^3 is shaped substantially as represented in Figs. 2 and 3. Its rear end e^4 is widened and has the inclined surface e^5. The arm E is moved backward by the magnets and armatures and forward by the spring E^3, one end of which is connected with an adjustable support e^6 and the other end with an extension e^7 of the arm. The feed-point of the pawl has the inclined upper surface e^8, which as the pawl is moved forward closes under the stationary stop or pin e^9, extending outward from the inner surface of the back plate A.

A stationary stop or pin e^{10}, projecting inward from the face of the back plate A, (see Figs. 1 and 3,) is arranged so that the inclined rear surface e^5 of the pawl shall come into contact with it at the end of the backward movement of the arm E and pawl and be thereby moved, the rear end upward and the forward or tooth-engaging end downward behind one of the teeth of the spur-wheel E^2, to make engagement therewith, the pawl at the end of the backward movement of the arm being always thus moved and seated. As the feed-pawl approaches the end of its feed movement its inclined end rides under the stop or pin e^9, and no shock or jar can then disengage it from the tooth of the spur-wheel with which it is in contact, and it thereby is bound to move the wheel the full limit of its throw and cannot become disengaged from it during the latter part of it. A stationary stop or pin e^{11}, extending from the back plate over the feed-pawl, prevents it from rising during its backward movement more than is desirable. The pin e^9 and the pawl-feeding end of the pawl also serve to lock the pawl at the end of the feed movement, so that it may not then be moved in either direction until the reverse movement of the

pawl begins, and to prevent the backward movement of the pawl from then moving the spur-wheel backward I employ a detent-pawl F, which is pivoted at f to the back plate A, and the end f' of which is adapted to enter the cavity between the two teeth when the feed-pawl has reached the end of its forward or feed movement, and it is moved into such position in case it shall not have fully seated itself therein, and it is held in such position by the end f^2 of the movable arm f^3, extending forward from the arm E, which at or near the end of the movement of the arm and the feed-pawl comes into contact with the upward extension f^4 of the detent F, and as the arm and feed-pawl draw near the end of their backward movement a pin f^5, extending laterally from the end of the arm f^6, also carried by the arm E, closes upon the inclined end f^7 of the detent-pawl and moves it into locking position, if it requires to be moved, or closes against it and holds it.

It will further be seen that the detent F is positively locked at the end of each movement of the feed-pawl E′, and that it is also adapted to be moved into position in advance of said locking movement either by the end of the arm f^3, as the feed-pawl is moved forward to feed, or by the pin f^5 as the feed-pawl reaches the end of its backward movement, and that there is thus insured a positive engagement between the detent and the spur-wheel during the backward movement of the feed-pawl and while the feed-pawl is making engagement at the end of its backward movement with the next tooth of the spur-wheel in order.

The support or arm e^6, to which one end of the feed-pawl-actuating spring E^3 is attached, is pivoted to the back plate A at h. It has the extension h', provided with the curved slot h^2, through which a clamping stud or screw h^3, screwing into a hole in the back plate, extends and by which the support or arm is locked in any desired position.

It will be understood that to adjust the spring the clamping stud or screw is released and the support or arm moved to any desired position and then locked in such position by the tightening of the clamping stud or screw. The arm or support e^6 extends above the upper edge of the plate and forms a projecting handle by which it may be readily and easily reached and moved.

One of the plates A B is of iron, and forms a magnetic field for the magnets D^2 D^3 through the iron connections and supports d^4 d^5.

It will be understood that in the operation of the device the actuating impulses are intermittent, the intervals between the movements of the feed-pawl being of any desired extent. Usually in a time-dial they are of a minute's duration.

It will also be understood that when the device is not in action, which is the greater part of the time, the feed-pawl is in its forward position, with its point beneath the pin e^9 and locked between the teeth of the spur-wheel, and the tooth of the detent is also held positively locked between two teeth of the spur-wheel, and that therefore no jar or disturbing cause can then actuate the spur-wheel or cause the feed-pawl or detent to become disengaged from it.

It will also be understood that the feeding movement is a very short and quick one, and that the feed-pawl is then moved rapidly backward by the energizing of the magnets or other actuating cause and an engagement with a tooth of the spur-wheel immediately made, which is instantly followed by the forward movement of the feed-pawl to its original position of rest, and that also during the forward movement of the feed-pawl in feeding the spur-wheel the detent F is released sufficiently to permit the riding of one or more teeth of the spur-wheel by it, but that it is relocked at the end of the feed movement.

The method of actuating the feed-pawl by means of a magnet or magnets energized to draw back and immediately release the feed-pawl and a spring which is given tension by the said action of the magnet or magnets and then released by them or the feed-pawl is a very desirable one, as it is very economical in respect to its use of the electrical energy and requires but small battery-power, there being in case of a time-dial but one contact of an instant's duration between the magnets and the armature for each minute feed of the pawl, and the tension upon the spring E^3 is at its greatest only during this instant, and at all other times it is relaxed.

I would not be understood as limiting the invention to its employment as a time-dial movement, but may use it wherever it is desirable to provide any mechanism with a step-by-step action or movement.

It is unnecessary to illustrate trains of gears by which the movement of the spur-wheel is communicated to the actuating-hands or employed in connection with a dial, and I would say that trains of any suitable construction can be so used and operated.

It will be understood that the feeding impulses are imparted to the lever E at relatively long intervals, and that at all other times it is at rest at the forward end of its stroke, and that the feed-pawl and the detent-pawl are then held locked in engagement with the teeth of the spur-wheel, so that it is locked and held locked until an impulse is communicated to the lever E, and that when said impulse is imparted to said lever it, with the feed or driving pawl, is moved backward, moving the driving-pawl over the teeth of the spur-wheel, which is still positively locked by the feed-pawl, and the driving or feed pawl is automatically seated between the teeth of the spur-wheel or in a new notch at the end of its backward movement, and that upon its forward movement, which immediately takes place, the detent-pawl is released and the feed-pawl moves the spur-wheel a por-

tion of a revolution, the feed-pawl and the detent-pawl being locked, as above described, at the end of the feed movement.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a device of the character specified, the combination of the lever E adapted to be reciprocated, with the portion E′ pivoted to the said lever at e^2 having its feed-pawl provided with an inclined surface e^8 and having its rear end provided with the face e^5, with the stop or pins e^9, e^{10} arranged as specified and acting in conjunction with the teeth or notches of the feed-wheel as described, and said feed-wheel.

2. The combination in a device of the character specified of the spur-wheel having the feeding teeth or notches, the detent-pawl having a point to engage said teeth or notches and the extension f^4, and a movable projection or lock moved against said extension to lock the detent as the feed-pawl approaches or reaches the end of its forward feeding movement, and said pawl.

3. The combination in a device of the character specified of the oscillating arm E, the spring E^3, the support e^6 pivoted at h, having the curved slot h^2 and a clamping nut or device h^3, as and for the purposes described.

4. The combination in a device of the character specified of the main shaft C, the feed-wheel E^2 mounted thereon having feeding spurs or notches, the sleeve D mounted upon said shaft and free to be turned backward and forward a limited extent thereon, an arm E extending outward from said sleeve, an armature attached to said sleeve and having outwardly-extending arms, the magnets D^2, D^3 arranged in respect to the arms of the armature as shown and described, a feed-pawl E′ pivoted to the arm E and shaped at its end as specified, the arm moving spring E^3, the stops or pins e^9, e^{10}, the detent F having the inclined end f^7 and the extension f^4 and the movable detent-locks f^5, f^2, all arranged to operate as and for the purposes set forth.

5. In a time-dial movement of the character specified, the combination of a spur-wheel having a single set of teeth, a lever adapted to be oscillated at stated intervals, a feed or driving pawl carried by said lever, a detent-pawl and means substantially as specified for seating the driving-pawl between the teeth of the said wheel at the end of its backward movement, for seating the detent-pawl between the teeth of said wheel at the end of the driving or forward movement, and for locking the driving-pawl and detent-pawl in engagement with the teeth of said wheel while the lever is stationary or at rest.

6. The combination in a time-dial movement of a wheel having a single set of teeth, a lever adapted to have oscillating movements imparted to it at stated intervals, a feeding or driving pawl for imparting an intermittent progressive feeding movement to said wheel carried by said lever, means for seating said pawl between the teeth of the wheel as said lever approaches the end of its backward movement and made operative because of said backward movement of the lever, a detent-pawl and a projection upon said lever adapted to be brought into contact with said pawl as the said lever is approaching the end of its forward movement, and to be held in contact with said pawl while the lever is in its forward position, and an additional projection upon said lever adapted to be brought into contact with said pawl as the said lever approaches the end of its backward movement, whereby the said lever acts to lock the detent as it approaches and recedes from the end of each of its movements, and to hold the said detent while at the end of said movements.

7. The combination in a time-dial movement of a wheel having a single set of teeth, a lever adapted to have oscillating movements imparted to it at stated intervals, a feeding or driving pawl for imparting an intermittent progressive feeding movement to said wheel carried by said lever, means for seating said pawl between the teeth of the wheel as said lever approaches the end of its backward movement and made operative because of said backward movement of the lever, a detent-pawl and a projection upon said lever adapted to be brought into contact with said pawl as the said lever is approaching the end of its forward movement and to be held in contact with said pawl while the lever is held in its forward position, as and for the purposes set forth.

8. The combination in a time-dial movement of a wheel having a single set of teeth, a lever adapted to have oscillating movements imparted to it at stated intervals, a feeding or driving pawl for imparting an intermittent progressive feeding movement to said wheel carried by said lever, and means such as a pin and a coöperating surface or arm of the feed-pawl for seating said pawl between the teeth of the wheel as said lever approaches the end of its backward movement, and made operative because of said backward movement of the lever, as and for the purposes set forth.

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