G. H. COVE.

CLOCK OR WATCH.

APPLICATION FILED FEB. 26, 1913.

1,175,610.

Patented Mar. 14, 1916.

Fig. 1.

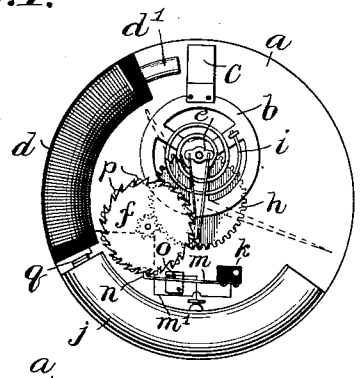


Fig. 2.

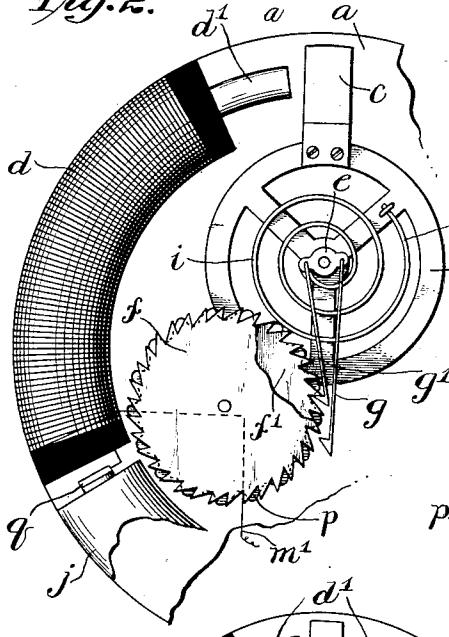


Fig. 3.

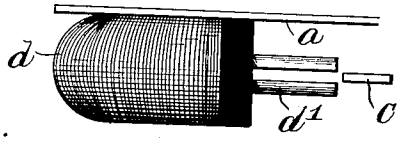
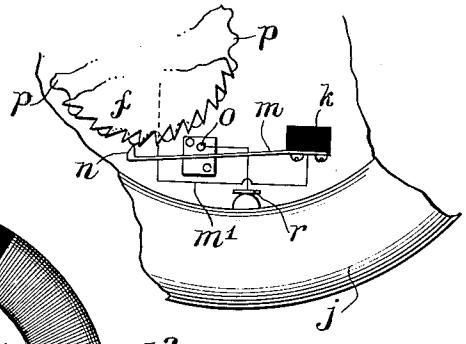


Fig. 4.



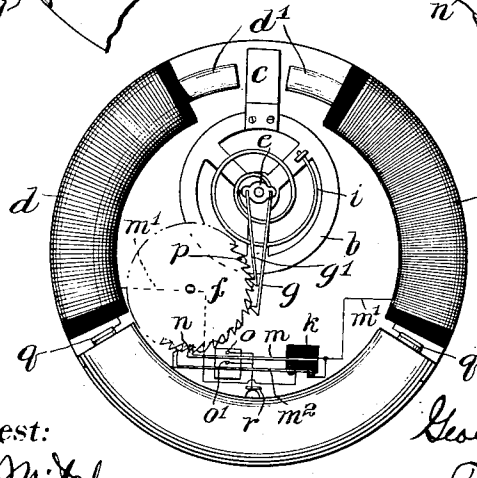


Fig. 5.

Attest:

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UNITED STATES PATENT OFFICE.

GEORGE H. COVE, OF NEW YORK, N. Y.

CLOCK OR WATCH.

1,175,610. Specification of Letters Patent. Patented Mar. 14, 1916.

Application filed February 26, 1913. Serial No. 750,736.

To all whom it may concern:

Be it known that I, GEORGE H. COVE, a subject of the King of the United Kingdom of Great Britain and Ireland, residing at Beechurst, in the borough of Queens, city of New York, county of Queens, and State of New York, have invented certain new and useful Improvements in Clocks or Watches, of which the following is a specification, reference being had therein to the accompanying drawings, which form a part thereof.

My invention relates to clocks or watches, and more particularly to a type thereof which is actuated electrically.

The main object of the invention is to provide a simple watch or clock mechanism wherein the escapement mechanism is actuated through the agency of an electro-magnet, the energization of which is controlled through said escapement mechanism in a manner to insure the timely and continuous operation of this mechanism.

A further object is to provide a watch or clock of this character wherein the magnet controlling the escapement mechanism will be energized intermittently so as to insure regularity in the actuation of the escapement mechanism.

A still further object is to provide a watch or clock, the escapement mechanism of which is actuated by an electro-magnet, wherein to economize electrical energy the magnetic force actuating the escapement mechanism may be supplemented by a hair spring to effect one oscillatory movement of the balance wheel.

A still further object is to provide a watch or clock of this character wherein the parts are so arranged as to permit compactness in structure without sacrificing reliability in the operation of the clock or watch. And a still further object is to provide a clock or watch which may be economically produced.

The invention consists primarily in a clock or watch embodying therein a balance wheel, an armature carried thereby, an electro-magnet whereby said armature is adapted to be oscillated, an escapement wheel, a pawl mechanism actuated by said balance wheel and adapted to actuate said escapement wheel, a source of electrical energy, connections between said source of electrical energy and said magnet, embodying therein a make and break mechanism controlled by said escapement wheel, whereby said magnet is intermittently placed in circuit with said source of electrical energy, and a gear train connecting said escapement wheel with the hands of the clock or watch; and in such other novel features of construction and combination of parts as are hereinafter set forth and described, and more particularly pointed out in the claims hereto appended.

Referring to the drawings:—Figure 1 is an elevation of the clock or watch works with the face removed and the hands shown in dotted lines; Fig. 2 is a detail view of the escapement mechanism and the electro-magnet mechanism actuating same; Fig. 3 is a detail top view of the magnet and the oscillatory armature showing the relation of these parts; Fig. 4 is a detail view of the make and break mechanism; and Fig. 5 is a view similar to Fig. 2, showing a modified arrangement of electro-magnets for actuating the escapement mechanism.

Like letters refer to like parts throughout the several views.

In the embodiment of my invention shown in the accompanying drawings, *a* indicates one of the plates of the works in which the various bearings are journaled. Mounted between said plates is a balance wheel *b* carrying an armature *c* by means of which said balance wheel is oscillated to accomplish the actuation of the escapement mechanism in a manner to be hereinafter referred to.

In the accompanying drawings, I have shown two forms of the invention, in one of which the direct oscillation of the escapement wheel is effected by an electro-magnet and the return oscillation by a hair or balance spring, while in the other form of the invention shown, both the direct and return oscillations are effected by means of electro-magnets. I prefer to use but a single electro-magnet, as this structure is not only lighter, but may be more economically produced.

In the preferred form of the invention shown, the electro-magnet acting upon the armature *c* is indicated at *d*, the core of this magnet being disposed upon one side of the armature *c* when the latter is on center.

Mounted adjacent to the balance wheel *b* is an escapement wheel preferably composed of two ratchet wheels *f f'* set side by side and secured to the same shaft. This escapement wheel is intermittently actuated from the balance wheel through the spring pawls *g g'* adapted to engage the ratchets

f f' respectively, one end of each of said pawls being connected to the balance wheel at diametrically opposite points thereof through the plate e, so as to cause a unidirectional actuation of the escapement wheel with the oscillation of said balance wheel in both directions. The escapement wheel is entrained with the minute and hour hands of the clock or watch through the gear train indicated at h, the various gears of which must be so proportioned as to secure the desired relative movement of the minute and hour hands.

By the construction heretofore described, the escapement wheel is positively driven from the balance wheel in part by the electro-magnet, and in part by the hair spring, and the hands are positively driven by said balance wheel through said escapement wheel and the gear train above referred to.

To permit the utilization of a single magnet of small capacity, I provide the balance wheel e with a hair spring i, which is adapted to be tensioned through the movement of the balance wheel under the control of the electro-magnet.

Removably mounted within the works plates is a source of electrical energy, as the dry cell j, one terminal of which is in direct electrical connection with one terminal of the winding of the magnet d and the other terminal of which is in electrical connection with the other terminal of said winding through a make and break mechanism by means of which said magnet is intermittently energized. This make and break mechanism comprises an insulation block k having mounted thereon the spring contact m carrying the pawl tooth n adapted to mesh with the teeth of the ratchets f f', or either of them in a manner to cause the movement of said escapement wheel to alternately open and close the circuit to the magnet d. The spring contact m is in electrical connection with one terminal of the winding of the electro-magnet d through the wire m'.

Mounted in a position where it is adapted to be engaged by the spring contact m is the fixed electrical contact o which is in electrical circuit with that pole of the battery which is not in permanent connection with the electro-magnet.

The pawl n and the escapement ratchet f or f' with which it coöperates are so constructed as to permit said pawl to engage only every second tooth of this ratchet, thus causing the circuit to be closed only upon every second oscillation of the balance wheel. This means may be an ordinary abutment p on one side of every second tooth of the ratchet wheel f or f', and adapted to engage the pawl and prevent its entering that tooth of the ratchet.

To permit the convenient removal and substitution of batteries, I provide a fixed contact such as q or r, adjacent to the contact pin o, and one terminal of the magnets d, which contacts are adapted to be engaged by pole pieces carried by the dry cell.

To insure accuracy in the movement of the armature c, I slot the cores d' of the magnet d as shown in Fig. 3 of the drawings, the armature c being adapted to enter and move in this slot.

In the embodiment of the invention shown in Fig. 5 of the drawings, the construction differs from that of the preferred form in that I provide a magnet d^2 disposed oppositely to the magnet d, which magnet is adapted to be energized alternately with the magnet d, and thus cause both the direct and return oscillations of the balance wheel to be under the control of a magnet. When two oppositely disposed, alternately energized magnets are thus used, I vary the make and break mechanism by adding to the structure heretofore described a second spring contact arm m^2 acting upon the ratchet wheel f or f' in the same manner as described in connection with the contact m, which contact m^2 is carried by the plate k and is in electrical connection with one pole of the dry cell j. Coöperating with said contact is a fixed contact o' which is in the same electrical circuit and connected to the battery j in the same manner as the contact o.

The operation of the herein described clock or watch is substantially as follows:— When a watch or clock is stopped, the balance wheel b will be at rest with its armature centered and adjacent to the core d' of the magnet d. When a battery is placed in the circuit, and the balance wheel b moved so as to cause the contact o to close the circuit to the magnet d, the armature c will be attracted toward this magnet, imparting a direct oscillation to the balance wheel b which in turn will oscillate the plate e' and cause the spring pawl g or g' to move the escapement wheel a distance equal to one tooth thereof, which movement is imparted through the gear train h to the hands of the watch or clock. With the movement of the escapement wheel, the pawl n will ride upon the tooth following that with which it is in engagement, thus moving the spring contact m out of engagement with the fixed contact o and breaking the circuit, deënergizing the magnet and permitting the hair or balance spring i to oscillate the balance wheel in the opposite direction. The direct oscillation of the balance wheel in addition to actuating the escapement wheel e in the manner described, through the pawl g or g', will set the other of these pawls g' or g, preparatory to the return oscillation of said balance wheel, so that as this balance wheel is oscillated under the hair or balance spring i, it will advance the escapement wheel the dis-

tance of one tooth, and at the end of this movement cause the spring contact m to be again brought into engagement with the contact o to again close the circuit and repeat this cycle of operations. The abutment p will prevent the closing of the circuit during the movement of the balance wheel under the hair or balance spring and cause the intermittent energizing of the magnet.

In the modified form of the invention shown in Fig. 5, the operation is substantially identical with that heretofore described, excepting that the spring contacts m and m' will be actuated alternately to alternately energize the magnets d and d^2 so that both the direct and return oscillations of the armature c will be influenced by magnetic force.

By using magnets in the manner described, I am enabled to dispense with the main spring of the watch or clock and at the same time secure all the advantages of a balance wheel watch or clock structure.

The magnetic force developed by the magnets d d^2 need not be great, as the force required is merely sufficient to prevent the balance wheel stopping upon a center, the magnets in fact serving merely to assist the hair or balance spring in maintaining the pendulous movement of this balance wheel. This force will also serve to consume a part of the load of moving the escapement wheel, which however, is so small as to be of no great importance.

By using a small electro-magnet, and a very small dry cell battery, I am enabled to include my structure in an ordinary watch and by reason of the manner of making the connection between the dry cell and the make and break mechanism, I am enabled to readily remove and replace the battery as it becomes exhausted.

It is not my intention to limit my invention to the precise details of construction shown in the accompanying drawings, it being apparent that such may be varied without departing from the spirit and scope of the invention.—

Having described my invention, what I claim as new and desire to have protected by Letters Patent, is:—

1. A clock or watch embodying therein a balance wheel, an armature carried thereby and projecting radially thereof, an electro-magnet disposed at one side of said armature, whereby said armature and said balance wheel are adapted to be oscillated, an escapement wheel, a pawl mechanism actuated by said balance wheel comprising a plurality of pawls alternately operative upon and adapted to actuate said escapement wheel, whereby said escapement wheel will receive an impulse with each movement of said armature toward or from said magnet, a source of electrical energy, connections between said source of electrical energy and said magnet embodying therein a make and break mechanism controlled by said escapement wheel, whereby said magnet is intermittently placed in circuit with said source of electrical energy, and a gear train connecting said escapement wheel with the hands of the clock or watch.

2. A clock or watch embodying therein a balance wheel, an armature carried thereby and projecting radially thereof, a spring acting on said wheel, an electro-magnet disposed at one side of said armature, whereby said armature and said balance wheel are adapted to be oscillated, an escapement wheel, a pawl mechanism actuated by said balance wheel comprising a plurality of pawls alternately operative upon and adapted to actuate said escapement wheel, whereby said escapement wheel will receive an impulse with each movement of said armature toward and from said magnet, a source of electrical energy, connections between said source of electrical energy and said magnet embodying therein a make and break mechanism controlled by said escapement wheel, whereby said magnet is intermittently placed in circuit with said source of electrical energy, and a gear train connecting said escapement wheel with the hands of the clock or watch.

3. A clock or watch embodying therein a balance wheel, an armature carried thereby, an electro-magnet whereby said armature is adapted to be oscillated, an escapement wheel, a pawl mechanism actuated by said balance wheel and adapted to actuate said escapement wheel, including therein a plurality of spring pawls mounted at diametrically opposite points of said balance wheel and adapted to alternately actuate said escapement wheel, a source of electrical energy, connections between said source of electrical energy and said magnet embodying therein a make and break mechanism controlled by said escapement wheel, whereby said magnet is intermittently placed in circuit with said source of electrical energy, and a gear train connecting said escapement wheel with the hands of the clock or watch.

4. A clock or watch embodying therein a balance wheel, an armature carried thereby and projecting radially thereof, an electro-magnet disposed at one side of said armature, whereby said armature and said balance wheel are adapted to be oscillated, an escapement wheel, a pawl mechanism actuated by said balance wheel comprising a plurality of pawls alternately operative upon and adapted to actuate said escapement wheel, whereby said escapement wheel will receive an impulse with each movement of said armature toward or from said magnet, a source of electrical energy, connections between said source of electrical energy

and said magnet embodying therein a make and break mechanism comprising a spring contact having a pawl engaging said escapement wheel, a fixed opposed contact whereby when said pawl is engaged with a tooth of said wheel the circuit will be closed, and means permitting said pawl to engage alternate teeth of said wheel whereby said magnet is intermittently placed in circuit with said source of electrical energy, and a gear train connecting said escapement wheel with the hands of the clock or watch.

5. A clock or watch embodying therein an escapement wheel having a plurality of ratchet teeth thereon, a balance wheel, a hair spring thereon, a pendulous armature carried by said balance wheel, an electro-magnet adapted to attract said armature, fixed contacts, electrical connections between said contacts and the opposite terminals of the winding of said magnet, one of said connections including therein a make and break mechanism, a dry cell battery adapted to be removably mounted adjacent to, and with its opposite poles in electrical connection with, said contacts, and means carried by said escapement wheel whereby the electrical circuit is intermittently opened and closed to intermittently energize said magnet.

6. A clock or watch embodying therein a balance wheel, an armature carried thereby and projecting radially thereof, a hair or balance spring acting upon said balance wheel, a single electro-magnet whereby said armature is adapted to be oscillated in one direction against the tension of said spring, an escapement wheel having a sequence of ratchet teeth thereon, a pawl mechanism actuated by said balance wheel comprising a plurality of alternately operative pawls adapted to alternately engage said ratchet teeth and actuate said escapement wheel, a source of electrical energy, connections between said source of electrical energy and said magnet embodying therein a make and break mechanism controlled by said escapement wheel, whereby said magnet is intermittently placed in circuit with said source of electrical energy, and a gear train connecting said escapement wheel with the hands of the clock or watch.

7. A clock or watch embodying therein an escapement wheel having a plurality of ratchet teeth thereon, a pendulous armature, a plurality of pawls operative under the control of said armature and alternately operative upon said ratchet teeth whereby said escapement wheel will receive uni-directional movement with each oscillatory movement of said armature, an electro-magnet adapted to attract said armature, a source of electrical energy, electrical connections between said source of electrical energy and said magnet embodying therein a make and break mechanism consisting of a spring member forming one electrical contact, a fixed contact opposite thereto, and a pawl carried by said spring member and adapted to engage the teeth of said escapement wheel, whereby the circuit will be intermittently closed through the movement of said escapement wheel, said escapement wheel being provided with means whereby said pawl is operative with the alternate teeth of said wheel only.

In witness whereof, I have hereunto affixed my signature in the presence of two witnesses, this 21st day of February, 1913.

GEORGE H. COVE.

Witnesses:
F. T. WENTWORTH,
EUGENE WENING.