H. B. McCABE.
ELECTRIC SECONDARY CLOCK.
APPLICATION FILED NOV. 12, 1906.

904,001. Patented Nov. 17, 1908.

Fig. 1.

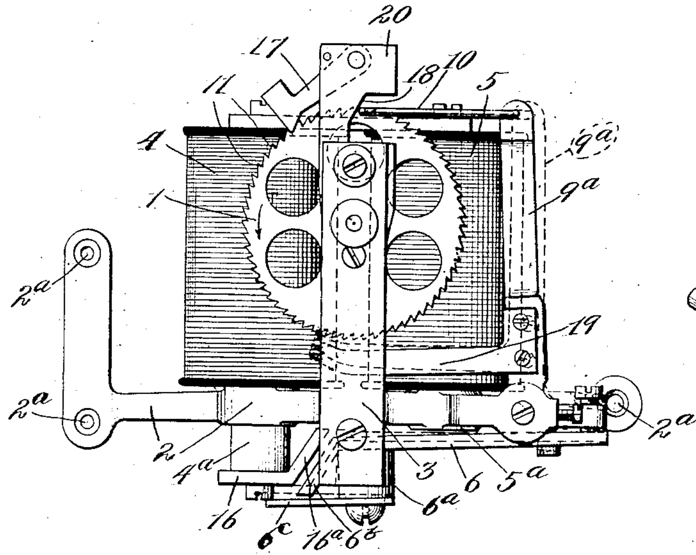


Fig. 2.

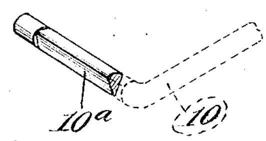


Fig. 3.

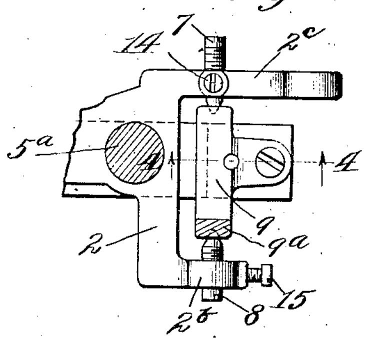


Fig. 4.

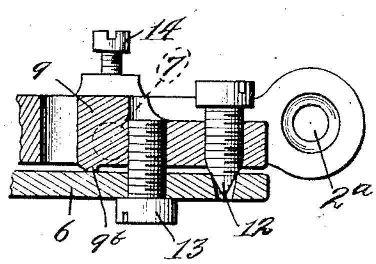


Fig. 5.

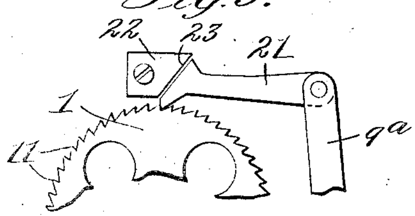
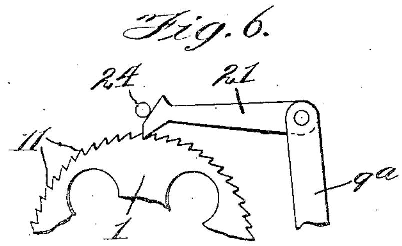


Fig. 6.



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UNITED STATES PATENT OFFICE.

HORACE B. McCABE, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO JOSEPH E. COCHRAN, OF CHICAGO, ILLINOIS.

ELECTRIC SECONDARY CLOCK.

No. 904,001. Specification of Letters Patent. Patented Nov. 17, 1908.

Application filed November 12, 1906. Serial No. 342,933.

To all whom it may concern:

Be it known that I, HORACE B. McCABE, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electric Secondary Clocks, of which the following is a full, clear, and exact specification.

The invention relates to improved mechanism for operating electric clocks and particularly to what are known as secondary clocks which are connected in a circuit controlled by a primary clock.

The primary object of the invention is to provide an improved ratchet mechanism adapted to transform the reciprocating or vibrating movement of an armature into the rotary movement required to drive the clock hands, which is simple, cheap and absolutely accurate in its operation.

To the attainment of these ends and the accomplishment of other new and useful objects, as will appear, the invention consists in the features of novelty in the construction, combination and arrangement of the various parts, hereinafter more fully described and claimed and shown in the accompanying drawings, illustrating an exemplification of this invention, and in which:—

Figure 1 is a rear elevation of a clock movement embodying the invention, the limits of movement of the operative parts being shown in dotted lines. Fig. 2 is a broken detail view of the pawl which engages the teeth on the ratchet wheel. Fig. 3 is a broken plan view of the lower supporting frame work. This view shows the means employed in pivoting the member to which the armature is attached. The view also shows the metal core of the magnet adjacent to the pivoted member in horizontal section, as well as horizontal section of the upright arm on the pivoted member to which the driving pawl is attached. Fig. 4 is a vertical sectional view on line 4—4, Fig. 3. Figs. 5 and 6 are modified views of driving pawls and modified views of their coöperating locking members.

In clocks of this character it is customary to provide a number of them in a single circuit controlled by means of one primary clock. The common manner of operating the secondary clocks is to provide mechanism whereby the primary clock closes the circuit at convenient intervals. In the present device provision is made for the operation of the mechanism in secondary clock at intervals of one minute. The ratchet wheel 1 is journaled on a rotating shaft designed to carry the minute hand.

2 is the main frame provided with convenient means, as for example, screw holes 2^a, for attachment to the clock casing.

3 is an upright support attached to frame 2 and serves as one of the supports for sustaining the journal on which ratchet wheel 1 is mounted.

4 and 5 are common form of electro magnets supported on frame 2 by having their metal cores 4^a and 5^a extending into frame 2 (see Figs. 1 and 3). When the primary clock closes the circuit magnets 4 and 5 become energized and attract armature 6 which is pivotally mounted adjacent to the lower ends of the magnet cores 4^a and 5^a. Frame 2 is provided with branch members 2^b and 2^c for holding adjustable pivots 7 and 8. Armature 6 is adjustably secured to member 9 which is mounted to rock on pivots 7 and 8. Pivots 7 and 8 may be adjustably secured in frame 2 by means of suitable set screws 14 and 15. Pivoted rocking member 9 is provided with an upwardly extending arm 9^a near the top of which driving pawl 10 is pivotally secured.

In this embodiment of the invention the minute ratchet wheel is provided with 60 teeth evenly spaced on the periphery of the wheel in order that the wheel may be advanced one of these spaces each time the circuit is closed by the primary clock. In the illustration (Fig. 1) the ratchet teeth are designated by numeral 11. The wheel moves in the direction indicated by the arrow and it will be noted that teeth 11 are so inclined to the circumference of the wheel that the driving ratchet is effective to move them only in the direction indicated by the arrow. The driving pawl 10 is provided with suitable means, as branch 10^a, for taking into teeth 11 and this pawl is allowed to rest normally on top of the wheel in contact with the teeth with which it is held in constant engagement by gravity.

By referring to Fig. 1 it will be seen that the position of the armature indicated by full lines is out of contact with the magnet. When the circuit is closed by the primary clock and the magnet energized the armature is thrown upwardly into contact with the

magnet cores which rocks member 9 and upwardly extending arm 9^a in the manner indicated in dotted lines. This movement, it will be seen, causes the withdrawal of driving pawl 10 which movement of the pawl is in the direction opposite to the movement of wheel 1 as indicated by the arrow. Armature 6 is provided with the weight member 6^a which contains sufficient material to cause the armature to move downwardly away from the magnet cores when the current is broken by the primary clock. The downward movement of armature 6 it will be seen again restores member 9 and upright member 9^a to normal position as indicated in the illustration, which movement also operates driving pawl 10 which, in turn, in engaging with one of the teeth 11 causes wheel 1 to rotate in the direction of the arrow one space or the distance between two of the adjacent teeth. In order that the movement of pawl 10 may be adjusted in relation to armature 6 provision is made for varying the relation between armature 6 and pivoted member 9 and member 9 is provided on the lower surface with the small depending lug or support 9^b and the adjustable support 12. The member 12 is screw threaded into member 9. 6 is held in contact with 9^b and 12 by means of suitable adjusting screw as 13 passing therethrough and threaded into member 9.

In order that the armature 6 may not become too widely separated from the magnet pole 4^a pole contact member 16 having angular branch 16^a is provided and the outer end of armature 6 is depressed at an angle to correspond with the angular branch 16^a. The member 6^c which is attached to weight 6^a may also be employed in order that the armature may be provided with a surface to correspond with the surface of pole member 16 and to keep the armature from direct contact with magnet cores. This arrangement of the parts, it will be seen, causes members 16^a and 6^b to move more or less longitudinally with reference to each other when the armature is rocked which enables them to retain about the same lateral distance between each other as do the armature 6 and the pole 5^a.

In a clock movement of this character the minute hand, which is carried directly by shaft supporting ratchet wheel 1 is ordinarily of metal and several inches in length. To overcome this weight it is common to put a counter balance on wheel 1 or to extend the minute hand rearward of its point of attachment to the shaft and place the counterweight thereon. This adds weight to the parts, and one of the difficulties heretofore experienced has been due to the fact that the inertia of the mechanism when moved a space by the driving pawl has had a tendency to overrun or move more than a single space at each closing of the circuit. Excessive jarring of the movements of such clocks, due to vibrations of buildings, may in some cases also cause the movement to overrun when the hands are in certain favorable positions. Such jars or vibrations imparted to the movement may also cause the mechanism to be carried in the opposite direction. To prevent the possibility of any such inaccuracies in the movement the gravity pawl 17, the driving pawl lock 18 and the auxiliary ratchet stop 19 are provided. The upright member 20, supporting pawl 17 and angular locking surface 18 may be conveniently attached to upright member 3. Gravity pawl 17 pivoted on member 20, it will be seen, acts as a positive stop against any retrograde movement. When the driving pawl 10 has reached the limit of its forward movement and has moved wheel 1 a single space it will be seen that the inclined surface 18 will depress the end of the pawl and hold it in engagement with the bottom of the notch between two adjacent teeth as long as the armature remains in its depressed position and that this position of the pawl will lock the wheel 1 against further advance motion until the movement of the armature releases the pawl by withdrawing it. When the circuit is closed and the driving pawl 10 is withdrawn in the manner heretofore described it will be seen that the locking effect of pawl 10 is released and during the interval between the withdrawal of the pawl and the breaking of the circuit the wheel 1 will again be free to rotate in a forward direction. To supply an auxiliary lock during this interval the member 19 is provided. This member may be attached to upright arm 9^a or to any of the parts operated by the armature and should be so positioned that when driving pawl 10 is in locking position the engaging end of lock 19 should not contact with teeth 11 but when the mechanism has withdrawn pawl 10 from locking position auxiliary lock 19 should be brought into operative position which will cause it to contact with the periphery of the wheel between two adjacent teeth.

In Figs. 5 and 6 modifications of driving pawl 10 are shown, also modifications in construction and arrangement of mechanism for locking the driving pawl in the normal position to prevent overrunning of ratchet wheel, as above described. In Fig. 5 driving pawl is designated by numeral 21, the locking member by 22 and its beveled engaging surface by 23. In Fig. 6 pawl 21 is of the same form as shown in Fig. 5. 21 is shown in conjunction with a locking member of cylindrical form which may be a pin or rod supported in any desired manner.

In order that the invention might be fully

understood, the details of an embodiment thereof have been thus specifically described, but

What I claim is:

1. In a device of the character described, the combination with a toothed wheel and its reciprocating actuating pawl, said actuating pawl being provided with an engaging end projecting transversely outside the plane of the wheel, a stop member for the actuating pawl having an engaging surface outside the plane of the wheel, and a pawl carried by the stop member.

2. In a device of the character described, the combination with a toothed wheel and its reciprocating actuating pawl, of a stop member for the actuating pawl having an engaging surface outside of the plane of the wheel.

3. In a device of the character described, the combination with a frame, of magnetic cores mounted thereon, a yoke joining said cores at one end thereof, a movable armature at the other end of said cores, a shaft journaled in said frame and disposed transversely between said yoke and said armature, and means for transmitting the movement of said armature to said shaft.

4. In a device of the character described, the combination with a frame, of an electro magnet having cores passing through said frame, coils on said cores on one side of the said frame, a movable armature in the magnetic field of the cores on the reverse side of said frame, an upwardly extending branch on said frame, an arbor or shaft carrying a toothed wheel journaled therein, a pawl in engagement with the wheel, and means for actuating the pawl from the said armature.

5. In a device of the character described, the combination with a main frame, of an electro-magnet secured to the main frame, an upright branch on the main frame, a toothed wheel carried thereby, a vertically extending rocking member pivotally secured to the main frame at its lower extremity, a pawl carried near the upper extremity thereof and having an engaging portion in contact with said toothed wheel, an armature coöperating with the said electro-magnet and adjustably secured to the pivoted rocking member at the lower extremity thereof, a member secured to the upper extremity of the said upright branch and provided with an angular surface adapted to coöperate with the pawl on the said pivoted rocking member and a gravity pawl carried by the member on the upright branch and adapted to prevent a reverse movement of the toothed wheel.

6. In a device of the character described, the combination with a main frame, of an electro-magnet secured to the main frame, an upright branch on the main frame, a toothed wheel carried thereby, a vertically extending rocking member pivotally secured to the main frame at its lower extremity, a pawl carried near the upper extremity thereof and having an engaging portion in contact with said toothed wheel, and an armature coöperating with the said electro-magnet and adjustably secured to the said pivoted rocking member at the lower extremity thereof.

7. In a device of the character described, the combination of a toothed wheel, a pivoted member, a driving pawl carried by said pivoted member and adapted to engage said toothed wheel, engaging means adapted to force said pawl into contact with said toothed wheel, and auxiliary locking means mounted on said pivoted member and adapted to contact with said toothed wheel when said driving pawl has been withdrawn from its engaging means by said pivoted member.

8. In a device of the character described, the combination with a frame, an electro-magnet mounted thereon, a pivoted member, an armature secured thereto and extending into the field of the said magnet, and means for angular adjustment between said armature and said pivoted member comprising two opposing adjusting screws adapted to hold one of said parts against a lug on the other part.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, on this third day of November A. D. 1906.

HORACE B. McCABE.

Witnesses:

FRANCIS A. HOPKINS,

CHAS. H. SEEM.