R. JAEGERMANN.

ELECTRIC CLOCK.

APPLICATION FILED FEB. 14, 1910.

959,864.

Patented May 31, 1910.

3 SHEETS—SHEET 1.

FIG. 1.

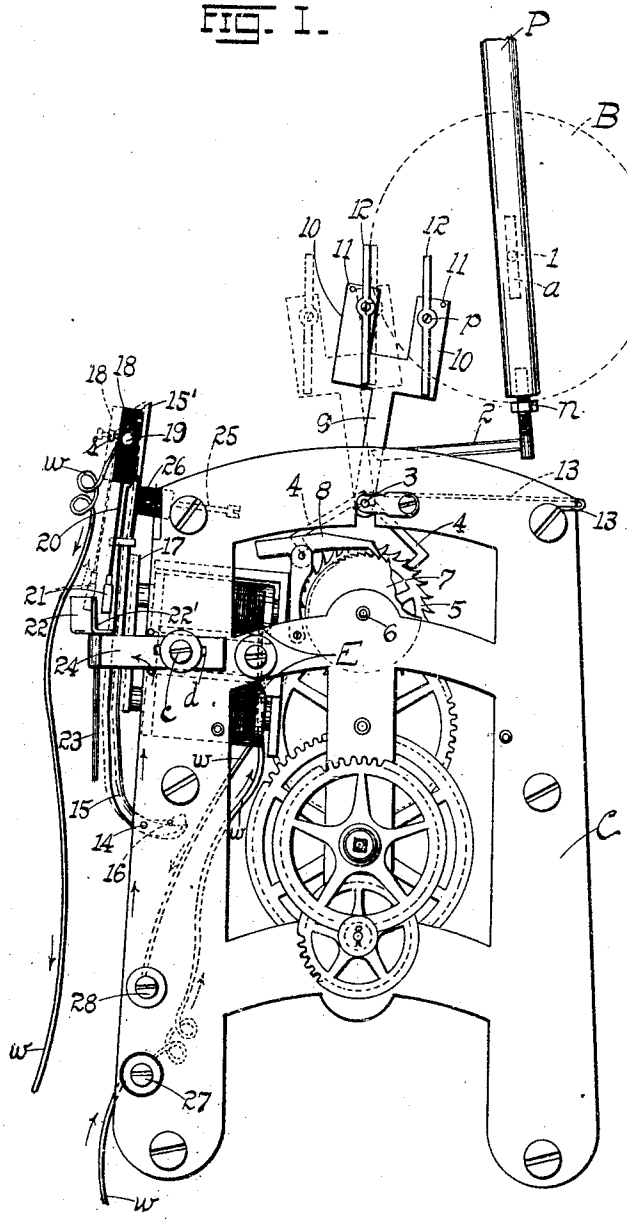
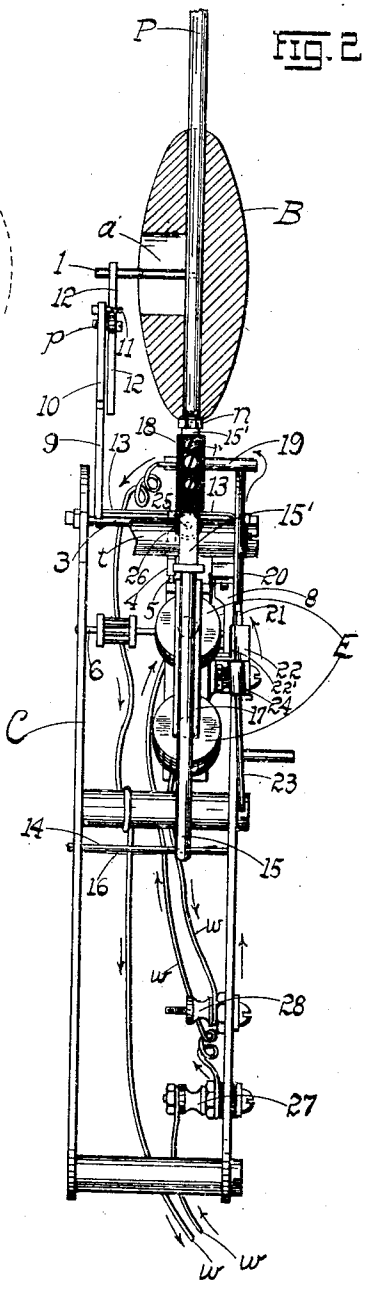


FIG. 2.



WITNESSES:

Harry A. Beines.

Josamichel

INVENTOR.

Rudolph Jaegermann.

BY

Ernst Starcke

ATTORNEY.

R. JAEGERMANN.

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3 SHEETS—SHEET 2.

FIG. 3.

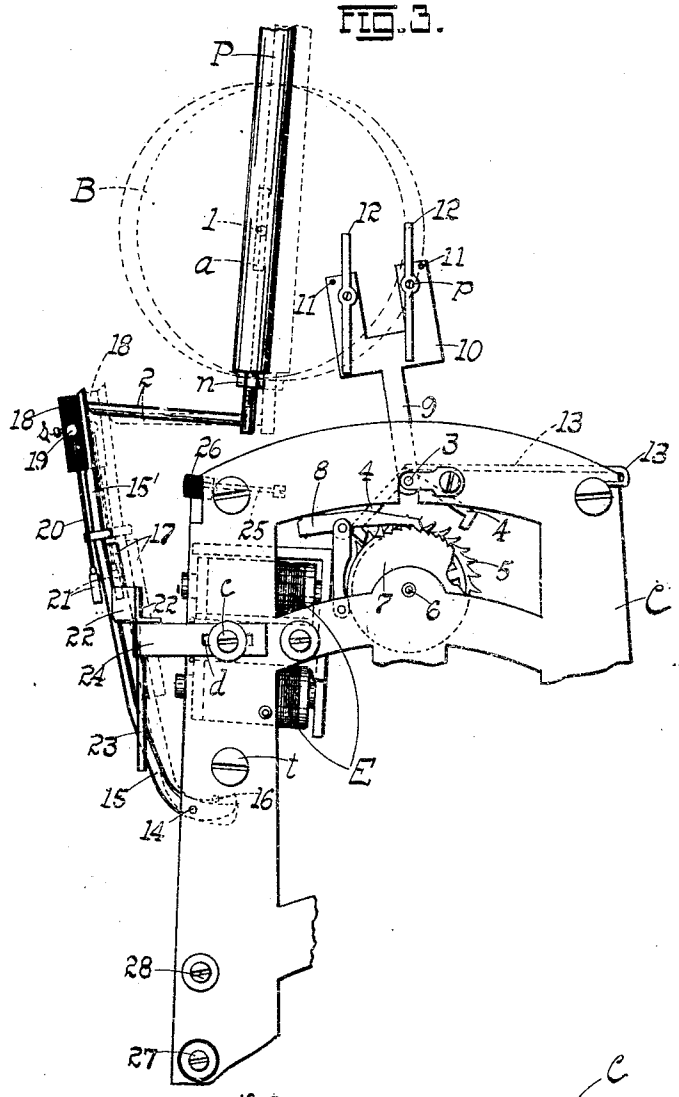
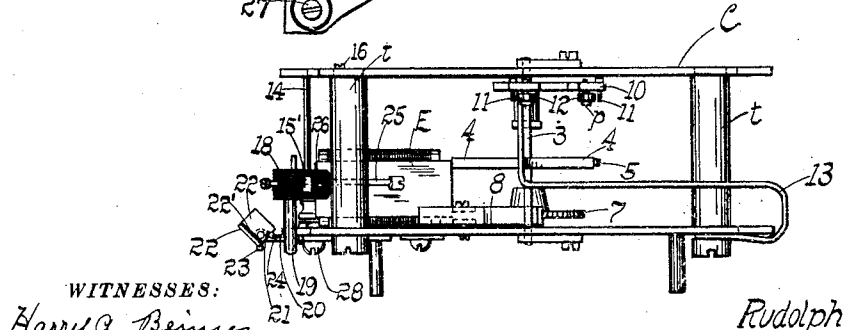


FIG. 4.



WITNESSES:

Harry A. Beinus.

Joamicus

INVENTOR.

Rudolph Jaegermann.

BY Emil Stark

ATTORNEY.

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3 SHEETS—SHEET 3.

FIG. 5.

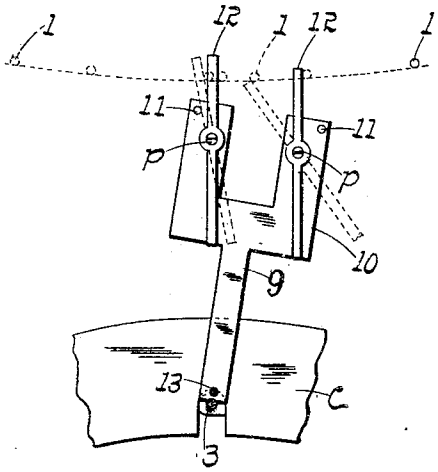


FIG. 6.

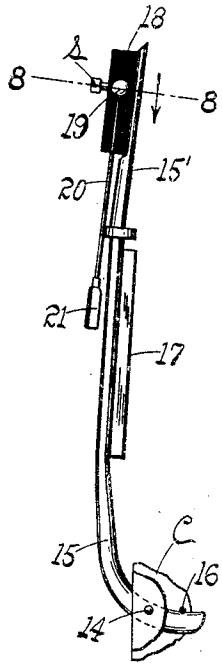
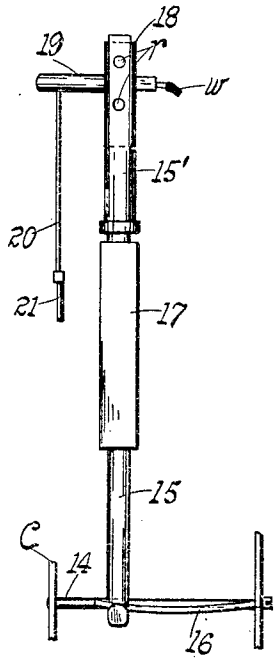


FIG. 7.



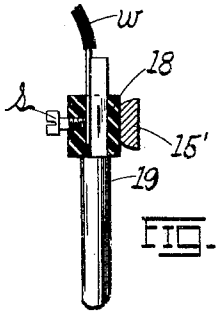


FIG. 8.

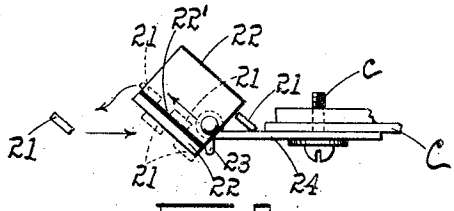


FIG. 9.

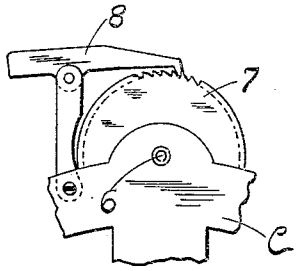


FIG. 10.

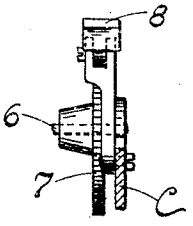


FIG. 11.

WITNESSES:

Harry A. Beines.

Josamichy

INVENTOR.

Rudolph Jaegermann.

BY Emil Starck

ATTORNEY.

UNITED STATES PATENT OFFICE.

RUDOLPH JAEGERMANN, OF ST. LOUIS, MISSOURI.

ELECTRIC CLOCK.

959,864. Specification of Letters Patent. **Patented May 31, 1910.**

Application filed February 14, 1910. Serial No. 543,744.

To all whom it may concern:

Be it known that I, RUDOLPH JAEGERMANN, citizen of the United States, residing at St. Louis, State of Missouri, have invented certain new and useful Improvements in Electric Clocks, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part hereof.

My invention has relation to improvements in electric-clocks; and it consists in the novel features of construction more fully set forth in the specification and pointed out in the claims.

In the drawings, Figure 1 is a face view of the clock mechanism with pendulum at one end of its swing (the pendulum ball being shown dotted) and with escapement lever and electro-magnetic armature in proper relations thereto; Fig. 2 is a side view of Fig. 1, with pendulum ball however, shown full; Fig. 3 is a view similar to Fig. 1 (with parts omitted) showing the pendulum at the opposite end of its swing, and with escapement lever and armature conforming thereto; Fig. 4 is a top plan of Fig. 3 with pendulum removed; Fig. 5 is a detached elevational view of the escapement lever in one of its extreme positions showing the manner of tripping and engaging the pendants carried thereby, by the tappet of the pendulum; Fig. 6 is a detached front elevational veiw of the oscillating armature and its extension and wiper carried thereby; Fig. 7 is an inner face view of Fig. 6; Fig. 8 is a cross-sectional detail on line 8—8 of Fig. 6 showing the manner of attaching the conducting wire in circuit with the energizing coil of the armature; Fig. 9 is a top plan view of the contact member showing diagrammatically how the wiper coupled to the armature alternately rubs against the conducting and insulated faces of said member with the reciprocations or oscillations of the armature; Fig. 10 is a detail of the drop-pawl and ratchet connected to the escapement shaft; and Fig. 11 is an edge view of Fig. 10.

The present invention has special application to pendulum clocks and has for its object to provide means for imparting to the pendulum the necessary impulses by which it may be maintained in constant motion, such impulses being preferably delivered with each forward swing of the pendulum, the latter swinging backward under the action of gravity alone. The impelling mechanism herein is in the form of an electro-magnetically operated armature of the oscillating type, the armature in its partial approach toward the energizing coil closing the electric circuit by which the coil is energized and under the influence of which the armature is impelled against the pendulum thereby driving the same before it, after which the circuit is broken, leaving the armature free to be returned to its original position under the momentum of the pendulum in its return swing.

A further object is to utilize the swinging pendulum for the purpose of actuating the pallet or escapement lever by which the clock mechanism is advanced, in lieu of the prevailing method of utilizing the escapement to swing the pendulum.

No attempt is made herein to extend the invention to include means for maintaining the time-piece in unison with a standard chronometer, as any of the prevailing electric and mechanical methods of rectifying errors at stated intervals may be resorted to for purposes of equalizing the times of all the clocks in a given circuit. The present invention is therefore, restricted to the means for imparting motion to the pendulum and the manner of communicating that motion to the clock mechanism through the escapement which the pendulum directly actuates.

The advantages of the invention will be fully apparent from a detailed description thereof, which is as follows:—

Referring to the drawings C, represents a conventional clock including frame and its works, the details of which need not here be entered into as they form no part of the present invention. Suspended from a point above the clock is a pendulum rod P (shown broken herein) provided with the usual pendulum-ball B the position of which is accurately adjusted on the rod by an ad-

justing nut n as well understood in the art. For purposes of the present invention, the rear wall of the ball is provided with an elongated slot or socket a for the free passage therethrough of a rearwardly projecting tappet arm or pin 1 carried directly by the rod P. The slot a is thus necessary to allow for the proper adjustment of the ball B along the rod P. Projecting laterally from the bottom of the pendulum (and below the ball B) is an impact arm 2 disposed in the general plane of oscillation of the pendulum and at right angles to the rod P. Mounted at one end of a rocker-shaft 3 are the pallets 4, 4, directly engaging the scape-wheel 5 on the shaft 6, the latter having mounted thereon the ratchet wheel 7 controlled by a drop-pawl 8 as well understood in the art. Projecting upward from the rear end of the rocker-shaft 3 is a lever-arm 9 which for convenience will be herein referred to as the escapement lever (being that by its oscillations it directly rocks the shaft 3 and actuates the pallets 4, 4, which in turn release the scape-wheel 5). The escapement lever terminates at its free end in the fork members or arms 10, 10 spaced a suitable distance apart, the respective arms having projecting from their front faces at the outer upper corners of the arms, the arresting pins 11, 11, for a purpose presently to appear. Loosely pivoted about a stud or pin p on the front face of each arm 10, is a pendent lever or member 12, the center of gravity of the lever being below the axis of suspension thereof so that it shall always tend to assume a truly vertical position (Figs. 1, 3, 5). To bring the center of gravity below the point of suspension, the lower arms of the said pendants are preferably made the longer, though the same result could be accomplished by weighting them down in any equivalent manner. It may be stated in passing that the upper arms of the pendants 12, 12 (those projecting above the forks 10, 10) are directly in the path of oscillation or vibration of the tappet 1 projecting from the pendulum, and as the latter vibrates these pendants are struck by the tappet and the escapement lever oscillated, in turn rocking the shaft 3, pallets 4, 4, and advancing the scape-wheel 5. To steady the lever 9 in its oscillations I attach to the base thereof one end of a resilient spring wire 13 bent substantially as shown in Fig. 4, the outer end of the wire being fastened to the clock-frame.

It may be convenient at this point to describe the manner in which the vibrating pendulum actuates the escapement lever 9 (and hence the scape-wheel 5 through the rocking of the shaft 3 and oscillation of the pallets 4, 4, carried thereby). Let us assume (Figs. 1, 5) that the escapement lever 9 occupies its extreme right hand position, the pendulum having also swung to the right hand end of its vibration. As already stated the pendent levers 12 will hang vertical. Now, as the pendulum swings to the left, the tappet 1 will trip the right hand pendant 12 (see dotted position Fig. 5), slip off the same and then impinge against the left hand pendant; but as the same is tripped it encounters the arresting pin 11 and can move no farther, so that it follows that the driving pendulum will simply oscillate the entire escapement lever 9 about the axis of the shaft 3, and by the time the lever has reached the limit of its oscillation in the opposite direction the tappet 1 will have passed off the partially tripped pendant 12, leaving the escapement in the position shown in full in Fig. 3, or dotted in Fig. 1. The pendants 12 being weighted below their respective axes of suspension will of course, instantly right themselves the moment they have been released from the influence of the tappet 1. It follows therefore, that when the pendulum swings back from left to right (Fig. 3) the tappet 1 will first trip and slip off the left hand pendant 12, then drive the right hand pendant against its pin 11 after which the weight of the vibrating pendulum will oscillate the lever 9 bodily to the right or to the place of beginning, the same operations being repeated with each pendulum vibration; and as the escapement lever 9 is oscillated the pallets 4 will release the scape wheel 5 one tooth at a time as is quite obvious from the drawings.

The pendulum in the present invention actuates the escapement as already stated, so that some provision must be made to impart the necessary vibrations to the pendulum. This is accomplished by giving the pendulum an impulse in one direction through the means of an oscillating electro-magnetic armature, the vibration of the pendulum in the opposite direction being accomplished by gravity alone. The mechanism for driving the pendulum may be described as follows:— Mounted on the side of the clock-frame on a medially disposed transverse rock-shaft 14 is a bent lever 15 against the top of whose short arm bears the free end of a slightly flexed spring or arm 16, the fixed end of which is secured to the clock-frame in any mechanical manner. The tendency of the spring 16 is to drive the short lever arm downward, that is to say to oscillate the long arm of the lever 15 against or toward the clock-frame. To the long arm of the lever 15 is secured an armature 17 which, under circumstances to be presently described, is attracted toward the energized electro-magnetic coil E carried by the clock-frame. Beyond the armature the lever 15 is provided with an extension 15′ to the outer face of which is secured by means of rivets r, an insulating block 18 from which projects

laterally a conducting arm 19, the part within the block serving to afford contact for the exposed end of the conducting wire *w* in circuit with the coil, the same set screw *s* securing both wire *w* and arm 19 within the block 18 (Fig. 8). From the arm 19 depends a spring wiper-arm 20, the free end being provided with a wiper 21 which, with an oscillation of the armature 17 toward the coil, rubs over the outer conducting face of a contact member 22, and over the insulated face of said contact member with an oscillation of the armature away from the coil, as presently more fully explained. The contact member 22 is in the form of an angle-piece the vertical leg thereof serving as the contact member proper, the rear face of said leg being provided with an insulated layer 22′ as shown (Fig. 9). To the horizontal leg is secured a depending stem 23 which is inserted through and frictionally held in a terminal loop or socket of a bracket arm 24 secured to the clock-frame by a screw *c* as shown, the arm being provided with an elongated slot *d* by which the position of the arm, and hence that of the contact member 22 may be accurately adjusted relatively to the wiper 21. Of course, the contact member might be secured to the arm 24 in any mechanical manner, that here shown being but a single example. Secured at the outer end of a screw-stem 25 passed through one of the cross tie-members *t* of the clock-frame is a rubber buffer 26 against which the lever extension 15′ may impinge in the sudden attraction of the armature 17 toward the coil E with the closing of the circuit. The wire ends *w*, *w* (Figs. 1, 2) lead to, or may be coupled up to any ordinary incandescent-light socket or equivalent fixture (not shown) one of the wires leading to a binding post 27 which is insulated from the metallic clock-frame (Fig. 2). From this the wire continues through the coils E coupling up to a binding post 28, the current traversing the clock-frame, following the arm 24, thence the contact member 22, wiper 21, and wiper arm 20 (when the wiper is rubbing against the conducting face of the contact member) thence arm 19 and return wire *w* (Fig. 8) leading therefrom and back to the socket or source of electric energy, as shown by the arrows in Figs. 1 and 2. Of course, in these figures the wiper 21 is out of contact with the contact member 22, but Fig. 1 shows these parts in actual contact in dotted position, so there is no difficulty in tracing the current.

From the foregoing, the manner of imparting the necessary impulses to the pendulum may now be described, and particular reference will be made to Figs. 1, 3, 5 and 9. It was stated above that the spring 16 (or its equivalent) tends to tilt or oscillate the armature-supporting lever 15 toward and against the clock-frame (Fig. 1) and this would be the position in which it would remain were it not dislodged by the pendulum. The lever extension 15′ is disposed in the plane of vibration of the pendulum and the impact arm 2 and is extended high enough to come in contact with said arm 2. When the pendulum has swung to the right, it vibrates to the left under the action of gravity, and when at the end of its right-hand swing, the armature-lever 15, 15′ is well up against the buffer 26, the wiper being to the right of the contact member (Figs. 1, 9) and opposite the insulated face 22′, it being remembered that the plane of oscillation of the wiper arm 20 if left unobstructed is across the center of the inclined or angularly disposed vertical leg of the contact member 22 (Fig. 9). As the pendulum therefore, swings from right to left the arm 2 thereof strikes the extension 15′ of the armature-lever 15 forcing it to oscillate to the left (against the tension of the spring 16) the arm 2 following up the lever 15′ to the full end of the pendulum's vibration in that direction. As the lever 15, 15′ oscillates to the left the wiper 21 at the end of the yielding spring arm 20 follows along the rear inclined or angularly disposed insulated face 22′ of the contact member, thereby leaving the circuit broken for this particular oscillation (see left-hand arrows Fig. 9). When now the pendulum begins its right-hand vibration, the lever 15′ under the action of the spring 16 keeps following up the pendulum (dotted position Fig. 3) but in thus following it, the wiper 21 (which had previously passed off the surface 22′ and by the resilience of the spring 20 was again restored to its position in the general plane of oscillation of the said spring 20) will now rub up along the conducting face of the contact member 22 (see right-hand arrow Fig. 9) and thus close the circuit. The moment the circuit is closed however, the energizing action of the coils E will exert a powerful draft on the armature 17 and (with the cooperation of the spring 16) will suddenly attract the armature thereby imparting a quick inward oscillation to the lever 15, 15′ which, by its contact with the arm 2, will impart a corresponding impulse or shove to the pendulum thus driving it back to its right-hand position. Of course, in the sudden attraction of the armature 17 by the coil E the wiper 21 will pass off the contact member 22 and to the right of the latter and back to its original position opposite the face 22′ (Fig. 9). The pendulum now being at the end of its right-hand vibration again swings back under the action of gravity to its left-hand position to again repeat the operation already described. It thus follows that the pendulum is driven in one direction under a positive impulse which it receives

from a reciprocating (and preferably oscillating) armature of an electro-magnet, the circuit being closed in the first portion of the travel of the armature toward the energizing coil, and again broken in the last portion of the travel of such armature; that the pendulum vibrates in the opposite direction by gravity alone; and that with each vibration the pendulum positively and mechanically actuates the escapement by which the clock-mechanism is controlled.

Features illustrated but not referred to are well known in the art and no description thereof is here attempted.

Having described my invention, what I claim is:—

1. In combination with a reciprocating electro-magnetically-actuated armature, a reciprocating escapement, a swinging pendulum, and members projecting from the pendulum in the respective paths of movement of the armature and escapement, whereby the pendulum is impelled in one direction by the armature, and the escapement is actuated by the pendulum with the successive vibrations thereof.

2. In an electric-clock, a swinging pendulum, an oscillating electro-magnetically-actuated armature, an energizing coal therefor, a wiper on said armature, a contact member having a conducting and an insulated face over which the wiper plays with the respective oscillations of the armature, suitable electric connections between the coil and wiper for closing the circuit during the passage of the wiper over the conducting surface of the contact member whereby the armature is suddenly attracted toward the coil and an impulse thereby communicated to the pendulum in one direction, means for breaking the circuit after said impulse has been effected, the opposite swing of the pendulum effecting a return of the armature to its original position in which return the wiper passes over the insulated face of the contact member.

3. In an electric-clock, a swinging pendulum, an oscillating spring-controlled electro-magnetically-actuated armature, an energizing coil therefor, a wiper in connection with said armature, a contact member having a conducting and an insulated face over which the wiper plays with the respective oscillations of the armature, suitable electric connections between the coil and wiper for closing the circuit during the passage of the wiper over the conducting surface of the contact member whereby the armature is suddenly attracted toward the coil and the wiper passes off the contact member, the pendulum receiving an impulse by said armature in the movement thereof aforesaid, the opposite swing of the pendulum effecting a return of the armature to its original position, in which return the wiper passes over the insulated face of the contact member.

4. In an electric-clock, an oscillating armature, an energizing coil therefor, a yielding wiper arm in connection with said armature, a contact member having opposite conducting and insulated faces respectively disposed in planes at an angle to the path of movement of the wiper arm and at an angle to the plane of oscillation of the armature, whereby with an oscillation of the armature in one direction, the wiper contacts along the conducting face of the contact member, and along the insulated face thereof with an oscillation of the armature in the opposite direction.

5. In an electric-clock, an energizing coil, an oscillating armature actuated thereby in one direction, an extension on the armature projecting beyond the energizing coil, a swinging pendulum, a member projecting from the pendulum toward the armature extension and swinging in the path of oscillation of the extension whereby with an oscillation of the armature in one direction an impulse in a corresponding direction is communicated to the projecting member and to the pendulum.

6. In combination with an oscillating electro-magnetically-actuated armature, an oscillating escapement lever, a swinging pendulum, and members projecting from the pendulum in the respective paths of oscillation of the armature and escapement lever whereby the pendulum is impelled in one direction by the armature, and the escapement lever is actuated by the pendulum with the successive vibrations thereof.

7. In combination with a mechanically impelled pendulum, an escapement lever, a tappet projecting from the pendulum across the path of oscillation of the lever, members mounted on the escapement lever and yielding to the tappet for a portion of the arc described by the pendulum, and devices on the escapement for arresting the members for another portion of the arc of oscillation of the pendulum whereby the escapement lever is actuated by the pendulum in said last portion of the arc aforesaid.

8. In combination with a mechanically impelled pendulum, an escapement lever, a tappet projecting from the pendulum across the path of oscillation of the lever, pivotally suspended weighted pendent levers mounted on the escapement lever and adapted to be successively impinged by the tappet, each pendent lever first impinged by the tappet allowing the tappet to pass uninterruptedly in its swing in one direction, and stops on the escapement for arresting the second pendent lever impinged by the tappet before the tappet has passed off the pendent lever, whereby the escapement lever is bodily oscillated with the pendulum from the point of arrest

of the pendent lever to the end of the vibration of the pendulum in the direction aforesaid.

9. In an electric-clock, an energizing coil, a contact member, a reciprocating armature normally and mechanically impelled toward the coil, a wiper in connection with the armature for closing the circuit by contact with the contact member during the initial movement of the armature toward the coil, and means for breaking the circuit subsequent to the energizing action produced by said contact.

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

RUDOLPH JAEGERMANN.

Witnesses:
EMIL STAREK,
JOS. A. MICHEL.

Correction in Letters Patent No. 959,864.

It is hereby certified that in Letters Patent No. 959,864, granted May 31, 1910, upon the application of Rudolph Jaegermann, of St. Louis, Missouri, for an improvement in "Electric Clocks," an error appears in the printed specification requiring correction as follows: Page 4, line 29, the word "coal" should read *coil;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 21st day of March, A. D., 1911.

[SEAL.]

E. B. MOORE,
Commissioner of Patents.

Correction in Letters Patent No. 959,864.

It is hereby certified that in Letters Patent No. 959,864, granted May 31, 1910, upon the application of Rudolph Jaegermann, of St. Louis, Missouri, for an improvement in "Electric Clocks," an error appears in the printed specification requiring correction as follows: Page 4, line 29, the word "coal" should read *coil;* and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

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[SEAL.]

E. B. MOORE,
Commissioner of Patents.