No. 830,473.

PATENTED SEPT. 4, 1906.

P. L. CLARK.

ELECTRICALLY WOUND CLOCK.

APPLICATION FILED OCT. 13, 1902. RENEWED JAN. 8, 1906.

Fig. 1

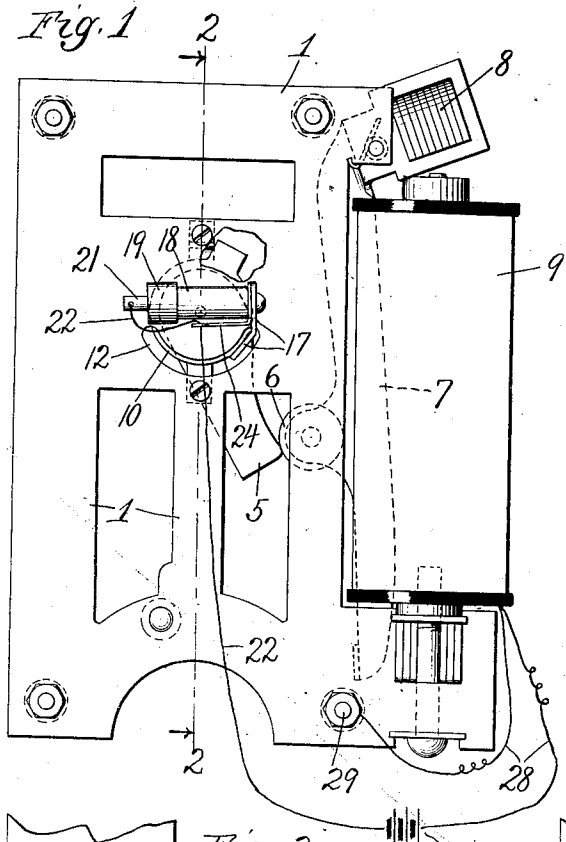


Fig. 2.

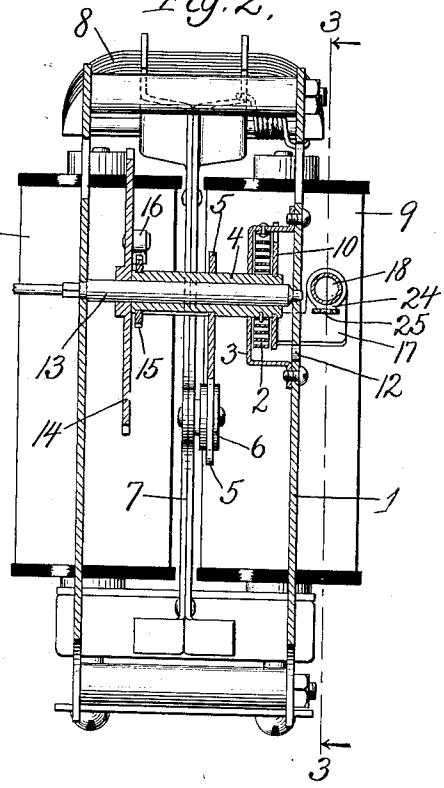
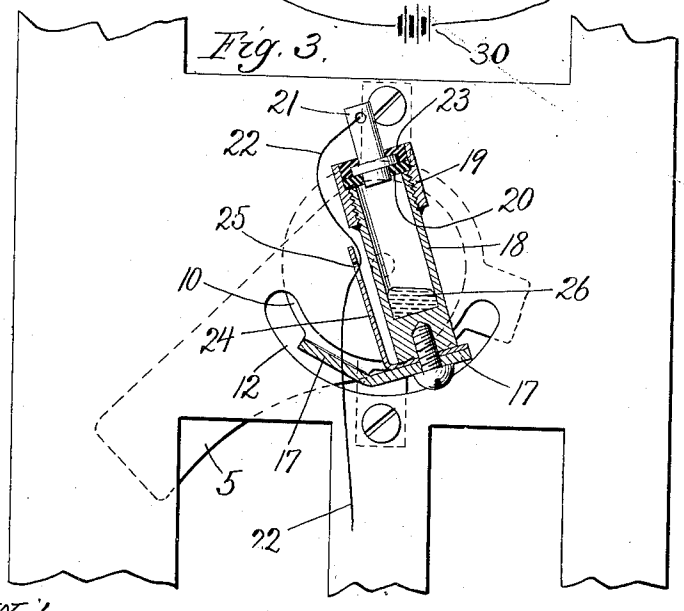


Fig. 3.



Witnesses.
Edward T. Wray.
Fred' G. Fischer

Inventor.
Percy L. Clark
by Burton & Burton
his Attys.

UNITED STATES PATENT OFFICE.

PERCY L. CLARK, OF BRISTOL, CONNECTICUT, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE NATIONAL SELF-WINDING CLOCK COMPANY, OF CHAMPAIGN, ILLINOIS, A CORPORATION OF ILLINOIS.

ELECTRICALLY-WOUND CLOCK.

No. 830,473. Specification of Letters Patent. Patented Sept. 4, 1906.

Application filed October 13, 1902. Renewed January 8, 1906. Serial No. 295,117.

To all whom it may concern:

Be it known that I, PERCY L. CLARK, a citizen of the United States, residing at Bristol, in the county of Hartford and State of Connecticut, have invented new and useful Improvements in Electrically-Wound Clocks, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

The purpose of this invention is to provide an improved means for closing the circuit for energizing the winding devices of an electrically-wound clock, in which the circuit-closing elements comprise a liquid conductor, such as mercury, which flows into and out of circuit-closing position in a suitable carrying-chamber which is tilted for the purpose of reversing its inclination to cause the flow to occur in one direction or the other.

The improvements consist in the features of construction of the device for carrying the mercury and the means for operating said mercury-carrying elements, as set out in the claims.

In the drawings, Figure 1 is a rear side elevation of a portion of a clock mechanism embodying my improvements in respect to circuit-closing devices, the parts being shown in circuit-closing position. Fig. 2 is a section at the line 2 2 on Fig. 1. Fig. 3 is a section at the line 3 3 on Fig. 2, taken axially through the liquid-contact chamber.

In the drawings only so much of the clock mechanism is shown as necessary to the understanding of the operation of the improved circuit-closing devices. These devices are represented as applied to an electrically-wound clock in which the train is driven by a spring which is wound or coiled to set it for action and which in reacting or rewinding in running the train drives the same element by which it is itself operated upon in winding, so that said element is moved one way in winding and the other way in the unwinding or running action, having thus a back-and-forth movement. The winding is effected by the encounter of an abutment on the armature-lever with a winding cam-lever which is fulcrumed concentrically with the mainspring-shaft. The mainspring is in this construction secured at the outer end to a point fixed with respect to the bearings or frame of the train and is wound by coiling from within, the inner end being attached to a drum or sleeve which is rotated or rocked on the main shaft by the movement communicated to the winding cam-lever from the armature-lever. The back-and-forth swinging movement of the cam-lever involves a back-and-forth rocking movement of the sleeve or drum. The train, it will be understood, is carried by pawl-and-ratchet connection between the sleeve of the winding-lever and an adjacent wheel of the train mounted on the same shaft. The drawings may be interpreted in view of this general description of the movement. In them there is shown the back-plate 1 of the clock-frame and the mainspring 2, having its outer end secured to the housing 3, which is rigid with the back-plate, and has its inner end connected to the sleeve 4 of the winding cam-lever 5, said lever being mounted on a shaft 13, on which the wheel 14 is also mounted, said latter wheel being driven by the engagement of a pawl 16, which is pivoted on the train-wheel with the ratchet-disk 15, which is rigid with the sleeve. On the armature-lever 7 the abutment 6 is located in position to encounter and actuate the winding cam-lever to do the winding when the armature 8 is attracted toward the poles of the magnet 9

To the sleeve 4 at the rear side of the spring there is secured a disk 10, which, beside furnishing a guard for the spring at that side, constitutes a lever-arm of the sleeve and at a distance from the axis is deflected rearward through a slot 12 in the back-plate, and on said rearwardly-extending portion 17 there is mounted the liquid-contact chamber 18. The chamber 18 is a small cylinder which is footed at one end on and secured to the arm 17 and extends behind the back-plate and past the end of the shaft 13, with its axis approximately intersecting the axis produced of said shaft. The liquid-contact chamber 18 is provided at the end opposite that at which it is mounted on the lever-arm 17 with a cap 19, the cap being closed by an insulating-disk 20, at the center of which an electrode 21 is mounted and rigidly secured, with its inner end exposed within the chamber, its outer end arranged for attachment of a flexible conducting-wire 22. The disk is made secure in its place by means of non-conducting cement 23, which is caused to flow

and solidly in the center of the end of the cam beyond the disk. The lever-arm 17 has rigid with it a finger 24, which is most conveniently made in a separate piece and bent in L shape, one arm being bent between the end of the chamber 18 and the end of the lever-arm 17 and the other arm projecting along the chamber rearward of the same to a point substantially opposite the end of the shaft 13. At this point it has an eye 25, through which the conducting-wire 22 is passed, so that the rocking of the chamber does not drag the wire and the weight of the latter does not have to be lifted by said rocking movement of the chamber. From one pole of a suitable battery 30 a circuit-wire 28 leads to the electromagnet and thence to the frame, to which it is connected at any convenient point—as, for example, at the binding-post 26. From the eye 25 the flexible circuit-wire 22 leads to the other pole of the battery 30. The circuit is interrupted at the liquid-contact chamber except when the mercury 26 is lodged at the end of the chamber having the electrode 21, and when it is thus lodged, the circuit being complete, the magnet is energized and the armature actuated, causing the abutment 6 to operate upon the winding cam-lever 5, driving it in direction to wind the spring and rocking the liquid-contact chamber 18 away from circuit-closing position, the range of movement due to each such winding impulse varying upon the force of the winding stroke, being at the minimum more than sufficient to carry the chamber past the horizontal position in direction causing the contact end to be upward, so that the mercury will flow away from that end, breaking the circuit and interrupting the pull of the magnet upon the armature and permitting the armature-lever to return to the position of rest. As the train runs under the stress of the spring reacting upon the winding, the liquid-contact chamber gradually approaches the horizontal position, and as soon as it passes that position the mercury starts from the end at which it has up to that time been lodged and flows or rolls in a globule to the contact end and reëstablishes the circuit and the winding action is repeated. The action of the winding device is naturally abrupt, and the armature-lever acts, as by a blow of its abutment 6, on the winding cam-lever, tending to produce a very quick winding action; but nevertheless it is desirable that the current should be maintained throughout the entire winding movement and that the circuit should be broken only after the pull of the magnet has been experienced by the armature to the full extent possible and the full winding action is caused. If the mercury should flow away from contact position as soon as the chamber in the rocking movement which it derives from the winding action passed the horizontal position, the action might cease by reason of interruption of the circuit before the full stroke of the armature was made: but the contact end of the chamber being at some considerable distance from the axis of the rocking movement the first effect of that movement is to give to the mercury globule a centrifugal tendency, by which it is held at the contact end during substantially the whole rocking movement or at least until the chamber is so nearly vertical that the action of gravity overcomes the centrifugal tendency. The range of the rocking movement due to the winding action is calculated to be such as to carry the chamber 18 positively—that is, while the abutment 6 still remains in contact with the winding-lever and by direct push of said abutment against said lever—well around toward vertical position, and the slot 12 is extended so that whenever the momentum resulting from the impact of the abutment on the cam is sufficient to drive the cam ahead of the abutment the chamber 18 may tilt even past the vertical position. The practical effect is that the circuit is kept closed by the centrifugal tendency of the mercury keeping it at the contact end throughout the whole stroke of the armature—that is, until it is stopped at its nearest approach to the magnet-poles—the chamber being by that time so far around toward a vertical position that gravity overcomes the centrifugal tendency and causes the circuit to be broken by the movement of the mercury toward the depressed end of the chamber. Thus contact lasts as long as the energizing of the magnet can be operative for the purpose of giving winding action and terminates when it would no longer operate to increase the winding movement. Substantially all waste of current is thus prevented, while sufficient duration of the current to produce the maximum winding is insured.

The term "liquid-contact chamber" as used in this specification is employed to denote, generically, the chamber with its electrodes, liquid-contact element, and circuit connections, the end toward which the liquid is made to flow for closing the circuit being denoted the "contact" end, and the invention is not to be understood as limited to the specific construction in which the chamber, being metallic and being in uninsulated connection with the frame, constitutes one of the electrodes, although specifically this construction is regarded as desirable. Neither is the invention to be understood as limited to having the liquid-contact chamber carried rigidly with the element which moves back and forth in the winding and running processes, respectively, but this is regarded, nevertheless, as specifically the most simple and for many situations the most effective form of the device.

I claim—

1. In an electrically-wound mechanism in combination with a shaft, a motor; an electromagnet and its armature; an element actuated by the armature when the magnet is energized; mechanical means by which such actuation sets the motor for operating said shaft comprising an element which has a back-and-forth rocking movement about such shaft, performed respectively in the winding and running actions; a liquid-contact chamber in the magnet-energizing circuit carried by said element in its rocking movement and thereby rocked about the axis of said movement, its position with respect to said axis being such that it is tilted to circuit-closing position by the running action and to circuit-breaking position by the winding action.

2. In an electrically-wound mechanism in combination with a shaft, an element in the mechanism which has a back-and-forth rocking movement performed respectively in the winding and running actions; a liquid-contact chamber rigid with said rocking element and thereby participating in said rocking movement, said chamber being mounted with respect to the axis of said movement so that it is rocked or tilted to circuit-closing position by the running action and to circuit-breaking position by the winding action.

3. An electrically-wound mechanism comprising a shaft and a sleeve mounted thereon; connections by which the sleeve is rocked back and forth in the winding and running movements respectively of the mechanism; a lever-arm extended from such sleeve past the bearing of the shaft at one end; a liquid-contact chamber which is carried rigidly by said arm beyond said bearing, and thereby partakes of the rocking movement of the sleeve, said chamber being mounted relatively to the axis of said rocking movement so that it is rocked or tilted to circuit-closing position by the running action, and to circuit-breaking position by the winding action.

4. An electrically-wound mechanism comprising a shaft and a sleeve mounted thereon between the journal-bearings of the shaft; connections by which such sleeve is rocked back and forth in the winding and running processes respectively of the mechanism; an arm extending from the sleeve longitudinally with respect to the shaft past one bearing thereof, and a liquid-contact chamber carried rigidly by said arm and supported thereby in position extending past the end of the shaft beyond said bearing, whereby said chamber partakes of the rocking movement of the sleeve and is traversed by the axis of said movement, said chamber being so mounted with respect to said axis as to be rocked to circuit-closing position by the running action, and to circuit-breaking position by the winding action.

5. An electrically-wound mechanism comprising a rocking element journaled between the bearing-plates, and connections by which it is rocked back and forth in the winding and running processes respectively, said element having a lever-arm extended through one bearing-plate; a liquid-contact chamber mounted rigidly at one end of such lever-arm beyond the plate, in position traversed by the axis produced of its rocking movement, said chamber being mounted with respect to said axis in position such that the range of its rocking movement thereby is from a position at which said chamber trends from horizontal position slightly downward toward the contact end to a position at which it is vertical with the contact end upward.

6. An electrically-wound mechanism comprising an element which has back-and-forth rocking movements performed respectively in the winding and running processes; a liquid-contact chamber supported by and carried rigidly with said rocking element in its rocking movements, said element having an arm which extends past its bearing at one end and carries an eye located substantially in line with the axis of said rocking movement, the magnet-energizing circuit comprising a circuit-wire running from the contact end of the liquid-contact chamber out through said eye.

In testimony whereof I have hereunto set my hand, in the presence of two witnesses, at Bristol, Connecticut, this 6th day of October, A. D. 1902.

PERCY L. CLARK.

In presence of—

CHAS. R. HARE,

ALVIN R. LAMB.