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M. FISCHER.

ELECTRIC SYMPATHETIC OR SECONDARY CLOCK FOR INDUCTION CURRENTS

APPLICATION FILED JULY 24, 1901.

Fig. 1.

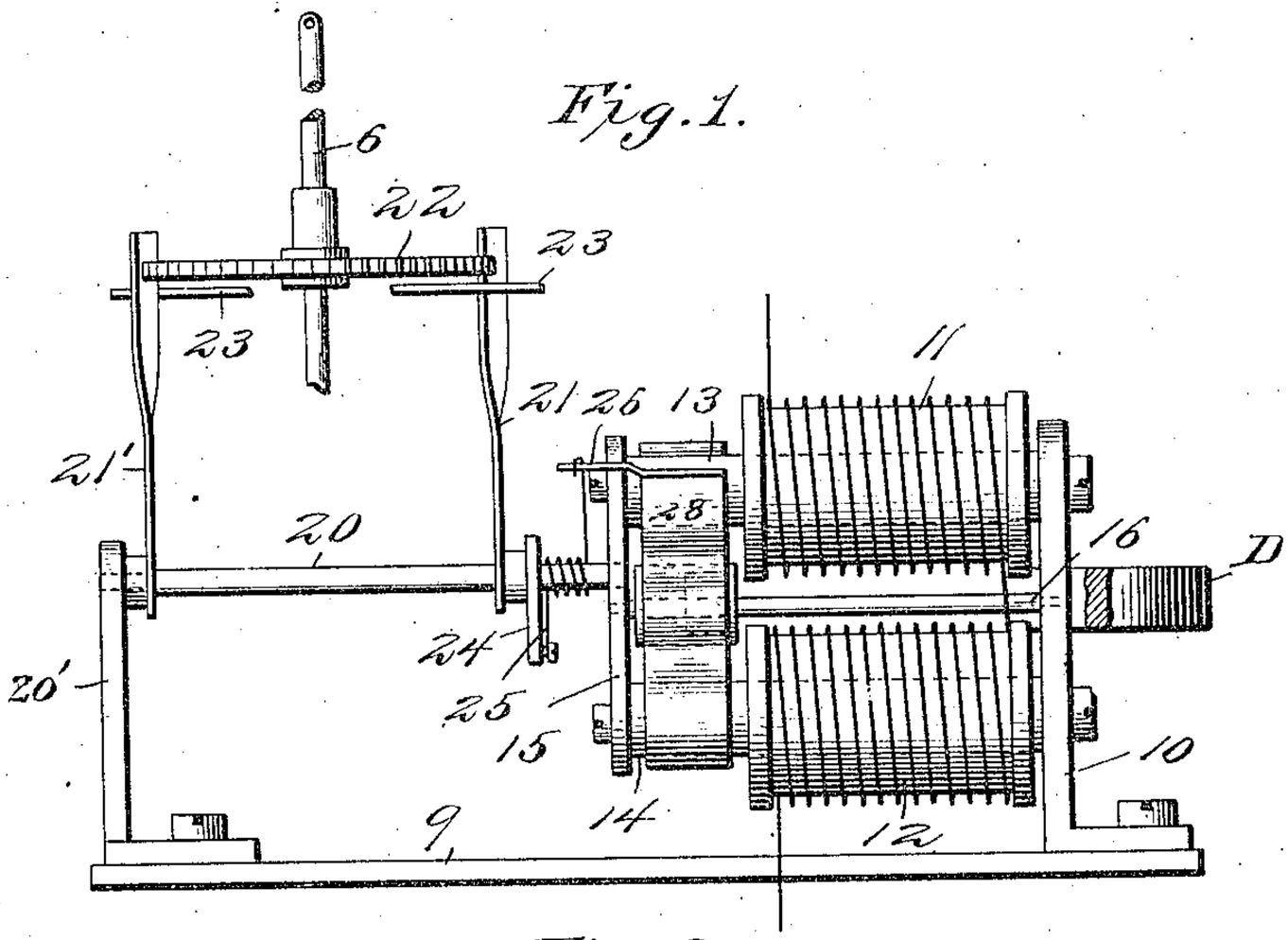


Fig. 2.

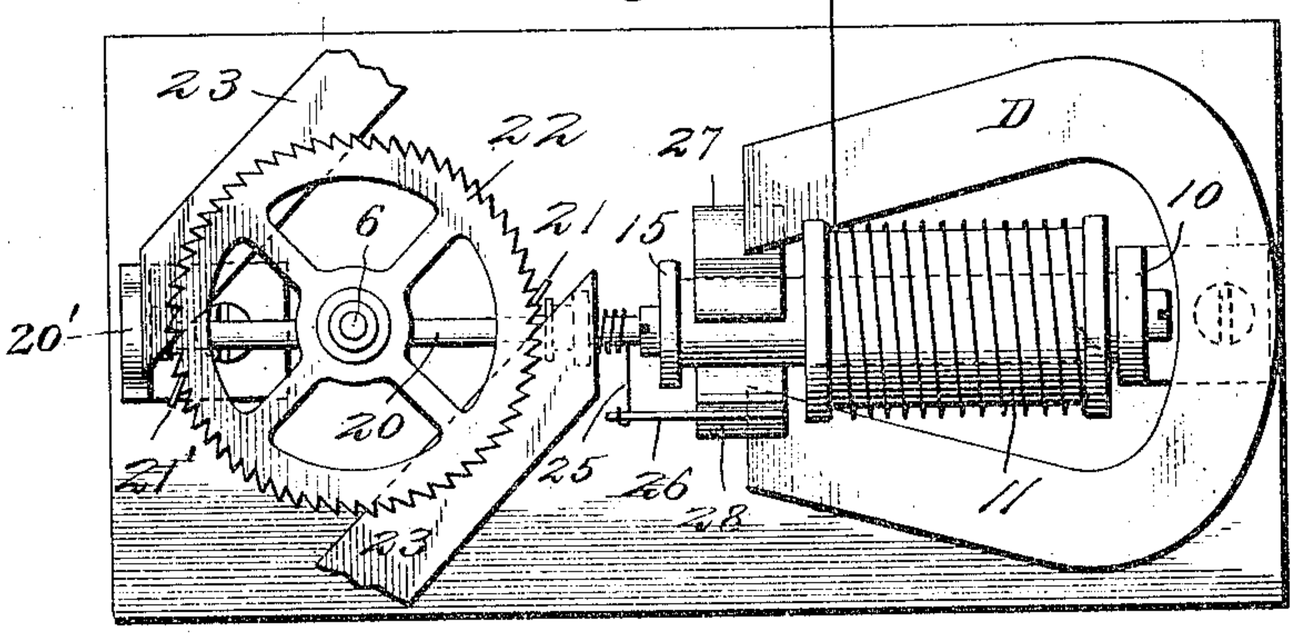
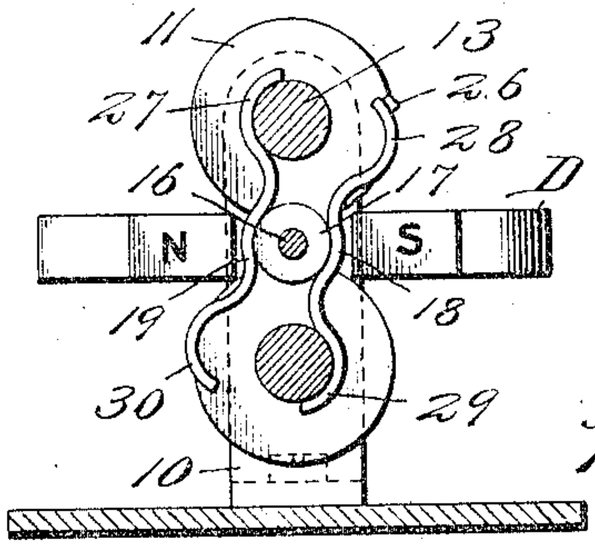


Fig. 3.



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UNITED STATES PATENT OFFICE.

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ELECTRIC SYMPATHETIC OR SECONDARY CLOCK FOR INDUCTION-CURRENTS.

No. 844,009. Specification of Letters Patent. Patented Feb. 12, 1907.

Application filed July 24, 1901. Serial No. 69,607.

To all whom it may concern:

Be it known that I, MARTIN FISCHER, a resident and citizen of Zürich, Republic of Switzerland, have invented a certain new and useful Improvement in Electric Sympathetic or Secondary Clocks for Induction-Currents, of which the following is a specification.

This invention has relation to electrically-operated clocks, and more particularly to the receiving instruments for the secondary clocks operated by electric impulses, the periodical transmission of which is controlled by a central or master clock.

In my copending application for patent, filed July 5, 1900, Serial No. 22,582, of which the present application is a division, I have shown and described a master-clock combined with a current-generator of peculiar construction whereby the contacts usually required either for taking off current or for opening and closing the secondary clock-circuit are dispensed with.

One of the great disadvantages inherent to the receiving instruments wherein the armature of the electromagnet is directly connected to the ratchet-wheel that operates the minute-hand lies in the liability of said ratchet-wheel having imparted thereto angular movements of greater amplitude than contemplated, by the rapid movements of the armature, and although means are provided for limiting the throw of the pawls in the direction of rotation of the ratchet-wheel, or, in other words, to limit the positive movements of the pawls, yet these have been found unreliable, resulting in irregularities in the movements of the hands. On the other hand, the sudden angular movement imparted to the ratchet-wheel on the minute-hand arbor and the corresponding sudden movement of the minute-hand frequently causes the latter to rebound before the ratchet-wheel is stopped or when suddenly stopped. These disadvantages become the more pronounced when the electromagnet is energized by very short yet quite powerful induction-currents, such as generated by the magneto-conductor described in my copending application, the duration of said currents being but one-tenth the duration of battery-currents of equal strength.

My invention has for its object the provision of means whereby the disadvantages above referred to are obviated, and this I attain by the interposition of a power-accumulator between the armature and indicator element operated thereby, the effect of which is to temporarily store the sudden energy of the moving armature and apply it gradually and resiliently to the actuating-pawl, which latter thus moves at a different rate of speed from the armature and advances the ratchet-wheel with which it engages with accuracy and precision.

Reference is made to the accompanying one sheet of drawings, in which—

Figure 1 is a side elevation of the actuating mechanism of a secondary clock, part of the permanent magnet being broken off; Fig. 2, a top plan view of the same with parts broken away, and Fig. 3 a vertical section of Fig. 1 through the pole-pieces of the electromagnet-armatures.

In Fig. 1 the numerals 13 and 14 indicate the two soft-iron cores of an electromagnet secured at one end to a standard 10, of magnetic material, the opposite ends of said cores projecting some distance from the bobbins of their coil-conductors 11 and 12 and being connected by a bridge 15 of non-magnetic material. The bridge 15 and standard 10 are provided with bearings for the ends of a spindle 16, parallel with the axis of and between the bobbins of the electromagnet, said spindle carrying at its outer end and in the field of force of the cores 13 and 14 a disk or sleeve 17, of non-magnetic material, to which are secured two thin soft-iron plates 18 and 19, which constitute the armature of the electromagnet, said plates having their outer ends bent to fit the cores of said electromagnet, and to the bent portion at one end of one of the elements of the bipartite armature—as, for instance, to the bent end 28 of the element 18—is secured a pin 26, the armature being arranged in the magnetic field of a permanent magnet D, supported in any suitable manner, the purpose of the latter being to polarize the armatures 18 and 19.

The pawl-carrier or rock-shaft 20 is mounted to oscillate in bearings formed in a standard 20′ and in the bridge 15, and said shaft carries two elastic or flexible pawls 21 and 21′, which act alternately as feed and retaining pawls, according to the direction of movement of the rock-shaft, for the ratchet-wheel 22, secured to the minute-hand arbor 6 of the

clock, the flexible pawls being limited in their play by the stop-plates 23 and 23′, which may be mounted on any convenient portion of the framework. (Not shown in the drawings.)

The power-accumulater consists of a resilient operating connection between the oscillating member which carries the pawls and the electromagnet-armature and may conveniently take the form of a coil-spring 25, surrounding the shaft with one end engaged by the crank-arm 24 and the other by the aforesaid pin 26 on the armature, so that movement of the armature will be imparted directly to the pawls through the coils of the spring and the rock-shaft.

The operation is as follows, it being presumed that currents alternating in direction energize the electromagnet-coils. Supposing the armature elements 18 and 19 and the actuating-pawls 21 and 21′ to be in the positions relatively indicated in Figs. 2 and 3, the N wing of the armature element 19 being in contact with electromagnet-core 13, and the S wing 29 of armature element 18 in contact with electromagnet-core 14, as shown in Fig. 3. If now the electromagnet-coils are energized by a current of such direction that core 13 will be an N pole and core 14 an S pole, the wing 28 of armature element 18 will be attracted by core 13 and its wing 29 repulsed by core 14. Inversely, the wing 27 of armature element 19 will be repulsed by core 13 and its wing 30 attracted by core 14. This vibration places spring 25 under tension, and said spring imparts a partial rotary movement to spindle 20 in such a direction as to cause pawl 21′ to ride over one tooth of the ratchet-wheel 22 while pawl 21 turns said ratchet-wheel a distance of one tooth. These movements of the pawls being reversed at the next change of polarity of the cores 13 and 14, pawl 21 will then make its negative movement and pawl 21′ its positive movement, the spindle 20 being oscillated in an opposite direction under the tension of spring 25. If desired, direct contact of the armature-wings with the electromagnet-cores can be prevented by mounting a non-magnetic sleeve on each of said cores.

From what has been said it will readily be understood that at each reversal of the polarity of the electromagnet-cores and the movements of the armature the spring 25 is brought under tension through the medium of the pin 26 and is maintained under tension in that the armature is held stationary until the next change of polarity, the spring acting on crank-arm 24 to oscillate the spindle 20, the stop-plates 7 preventing the pawls 21 21′ imparting to the ratchet-wheel 22 an angular movement greater than contemplated. By using spring or resilient pawls to drive the armature the instantaneous or sudden action of the pawls on the ratchet-wheel is further counteracted.

Having thus described my invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. The combination with the driving-wheel of an electric clock of a shaft, spring driving and retaining pawls on the shaft to operate the wheel, an electromagnet and its armature, and a spring secured at one end to the shaft and at the other end to the armature, whereby the armature is yieldingly connected to the shaft.

2. The combination with a driving-wheel of an electric clock of a shaft parallel with the plane of the wheel, a spring driving and retaining pawl secured to the shaft one on each side of the center of the wheel and projecting from the shaft substantially normal to the wheel, an electromagnet, an oscillating armature therefor and a spring connecting the armature and shaft, substantially as described.

3. A secondary electric clock, comprising an electromagnet and an armature therefor; in combination with a toothed wheel, feed and retaining pawls engaging the same, a rock-shaft to which said pawls are secured, a crank on said shaft and a spring connecting said crank to the armature, for the purpose set forth.

4. In a secondary electric clock, a toothed wheel, an oscillating member, feed and retaining pawls secured thereto and engaging said wheel and an electromagnet-armature; in combination with a coil-spring located between the armature and oscillating member and through which the latter is oscillated by said armature.

5. In electrically-operated clocks, a receiving instrument comprising an electromagnet, a permanent magnet and a bipartite armature 18 19 in the field of force of said permanent magnet and of the cores of the electromagnet; in combination with a toothed wheel, two pawls engaging the same, a rock-shaft to which said pawls are secured, a crank on said shaft and a spring coiled on the latter and having its ends connected to said crank and to one of the parts of the aforesaid armature, for the purpose set forth.

6. The combination with a driving-wheel of an electric clock of a shaft, spring driving and retaining pawls secured to the shaft at different points of its length and engaging the wheel, an electromagnet having projecting poles, a forked armature actuated by the magnet the forks of which engage the poles and limit its movement and a coil-spring connecting the armature and shaft.

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