No. 669,338. Patented Mar. 5, 1901.

S. FISCHER.

ELECTRIC CLOCK.

(Application filed June 8, 1900.)

(No Model.) 5 Sheets—Sheet 1.

FIG. 1.

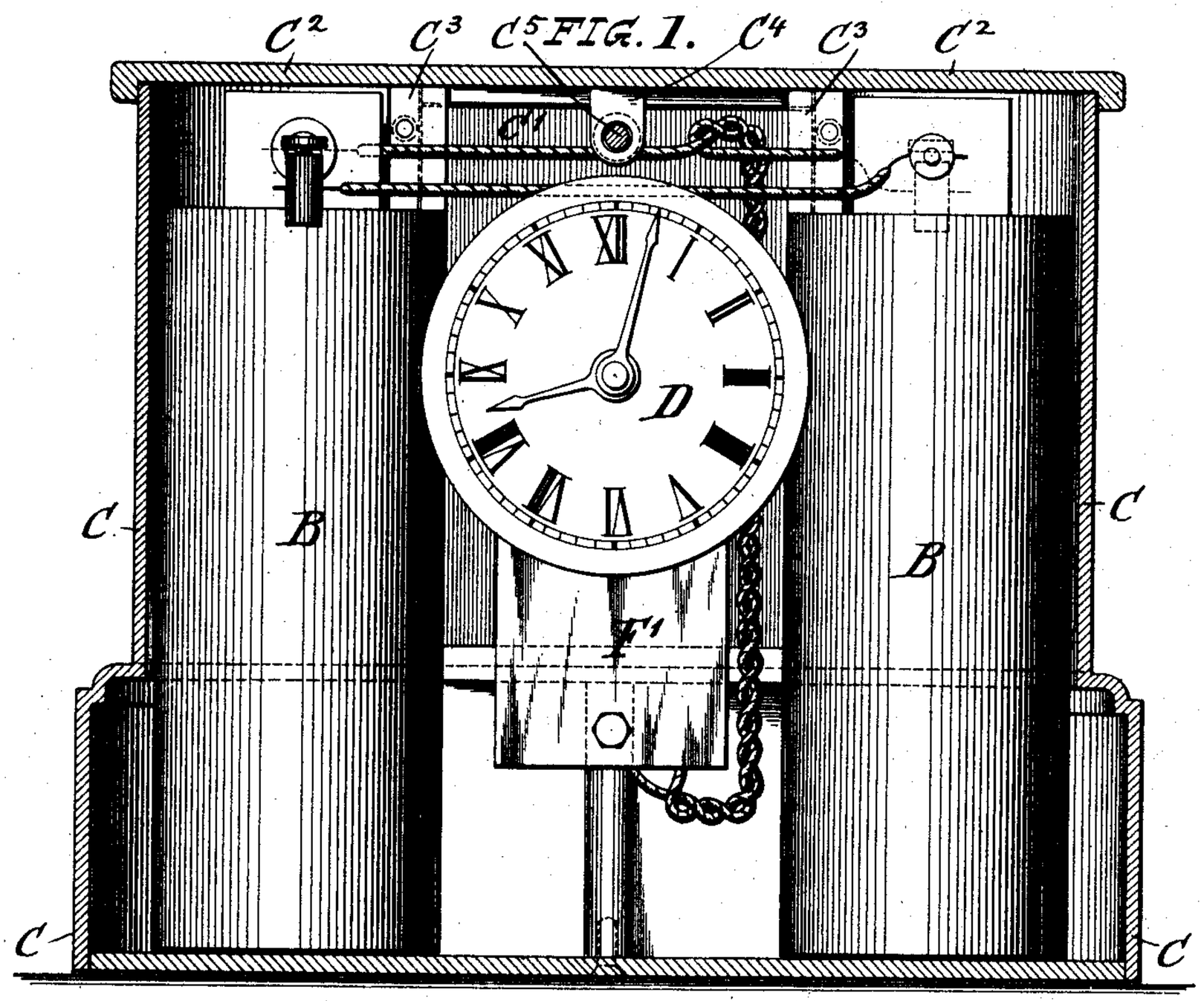
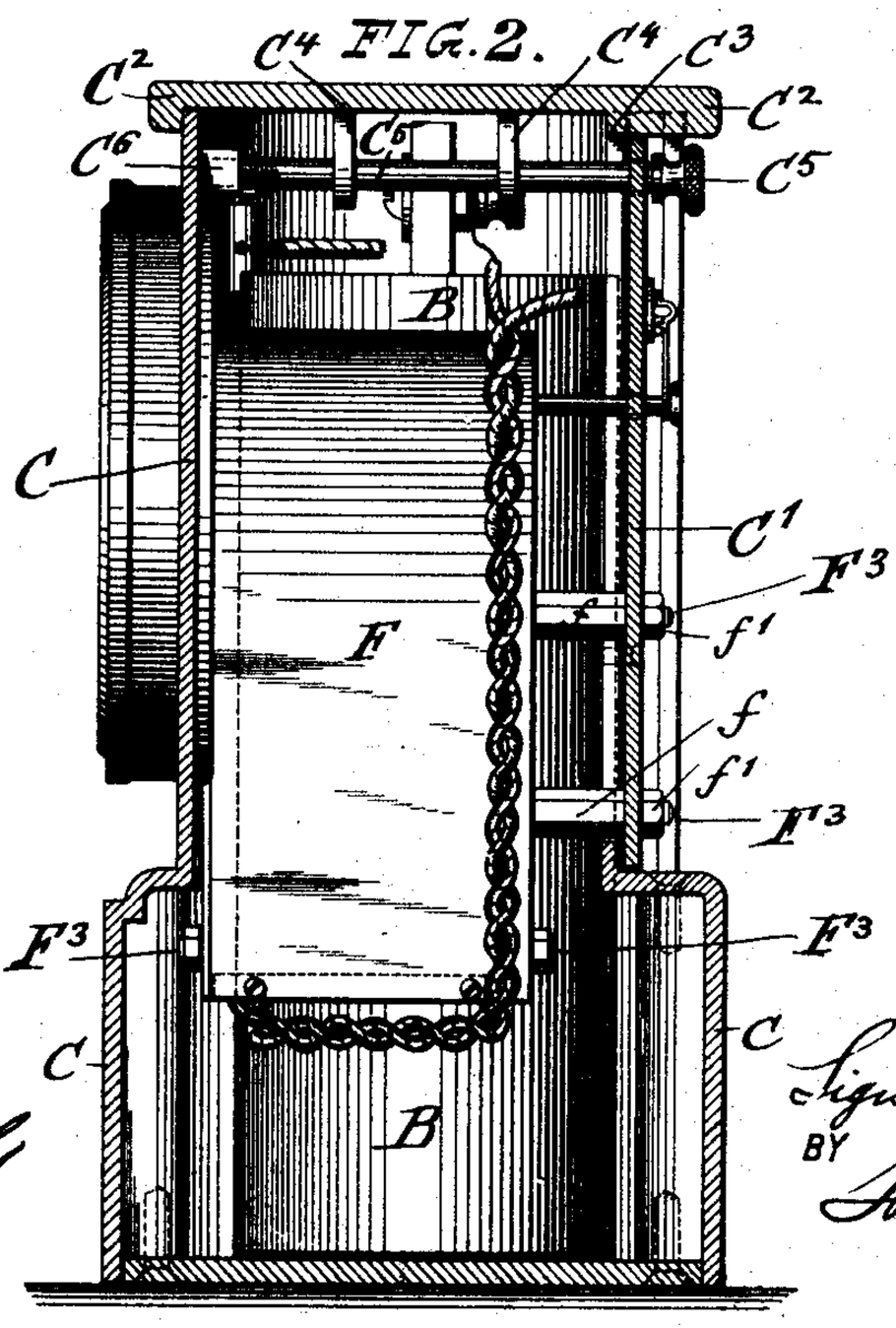


FIG. 2.



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No. 669,338. Patented Mar. 5, 1901.

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(No Model.) 5 Sheets—Sheet 2.

FIG. 3.

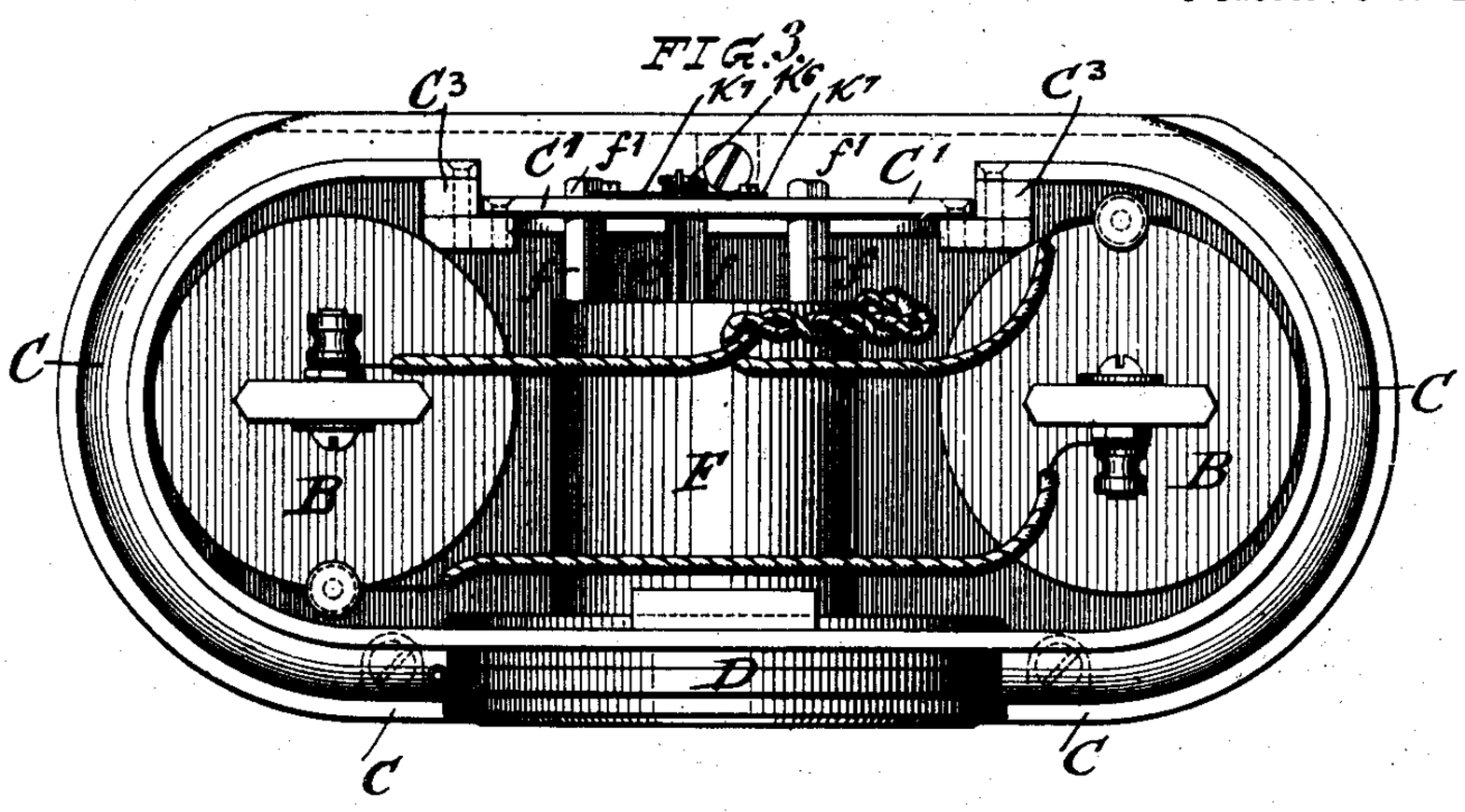
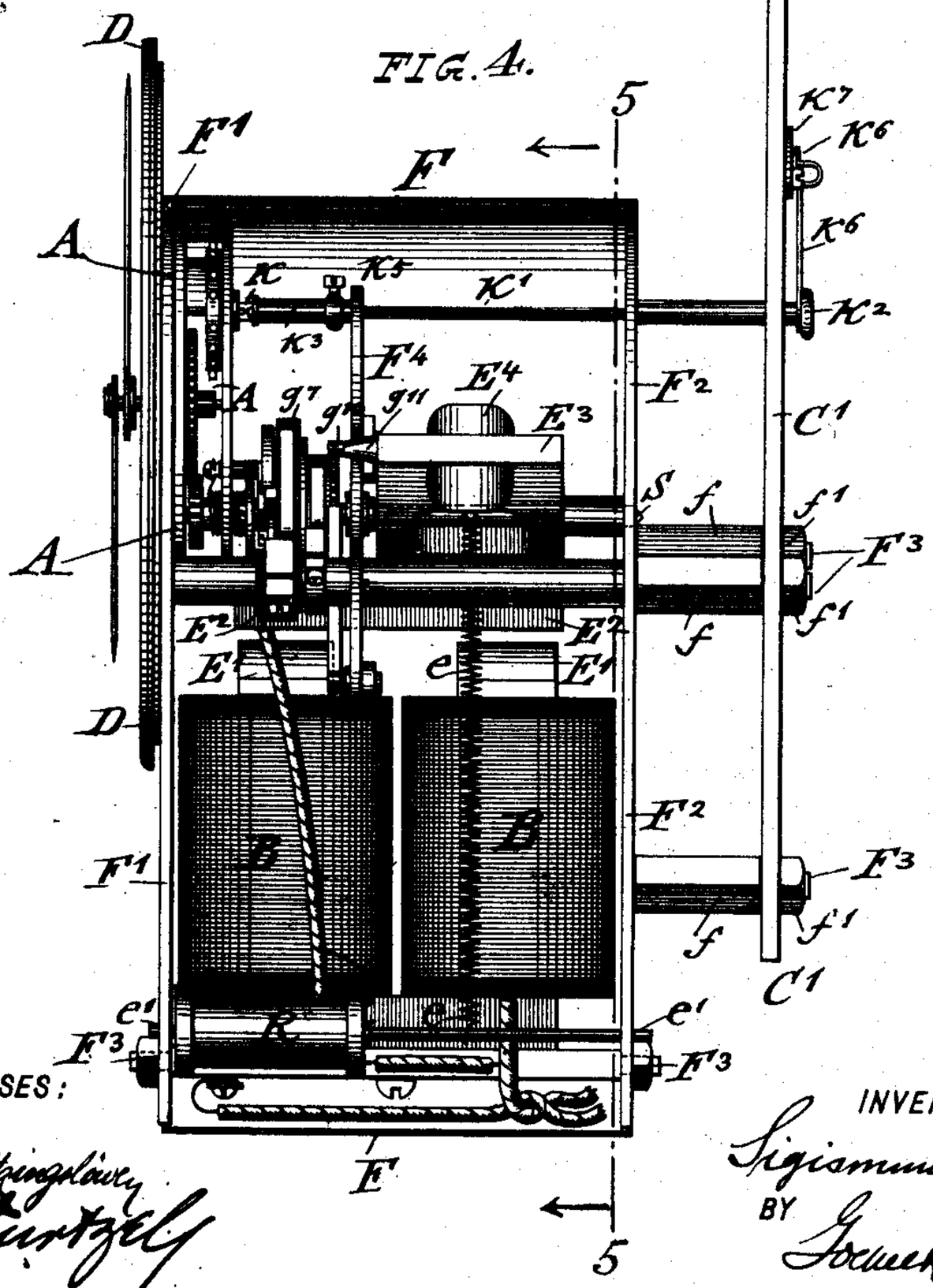


FIG. 4.



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ELECTRIC CLOCK.

(Application filed June 8, 1900.)

(No Model.) 5 Sheets—Sheet 3.

FIG. 5.

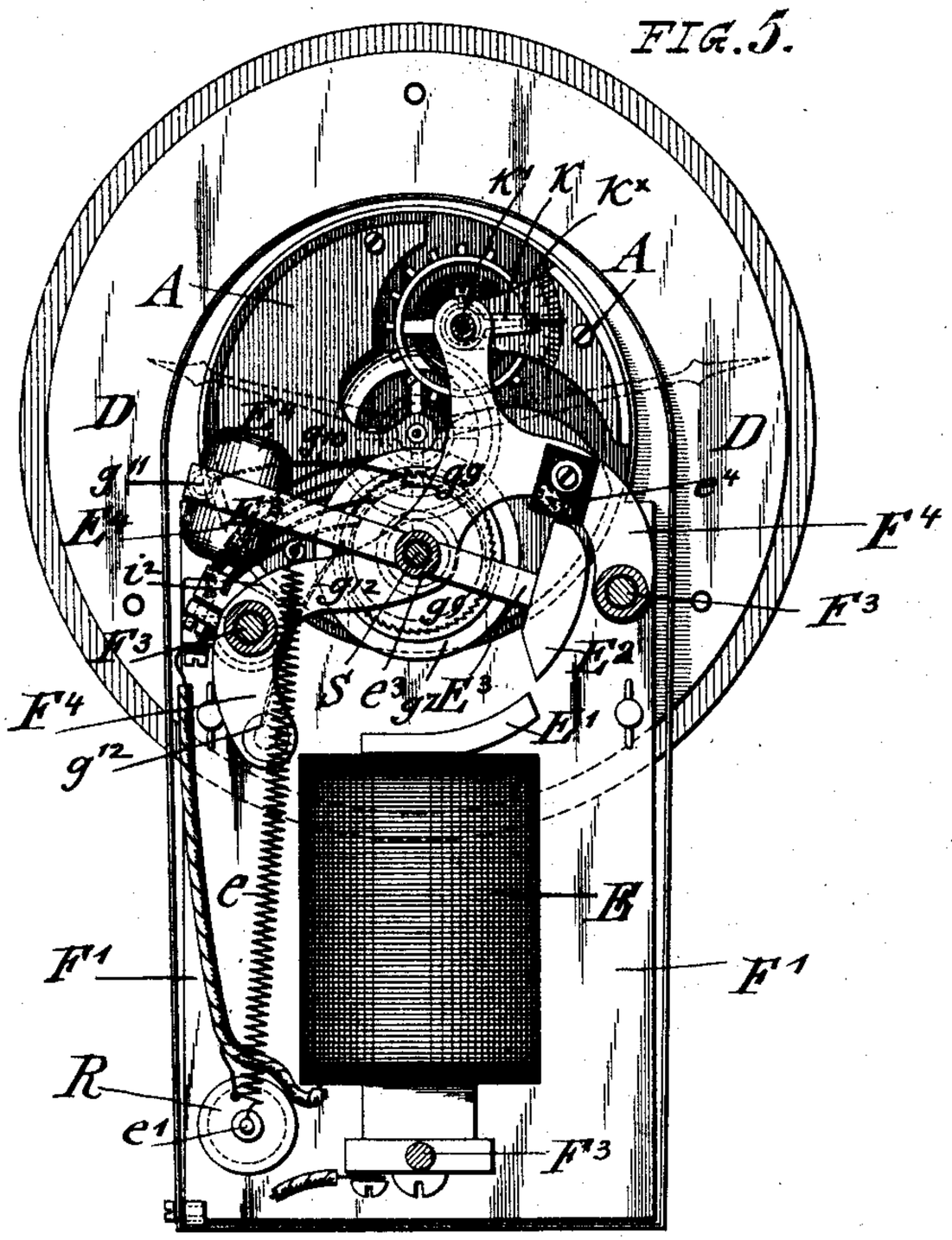
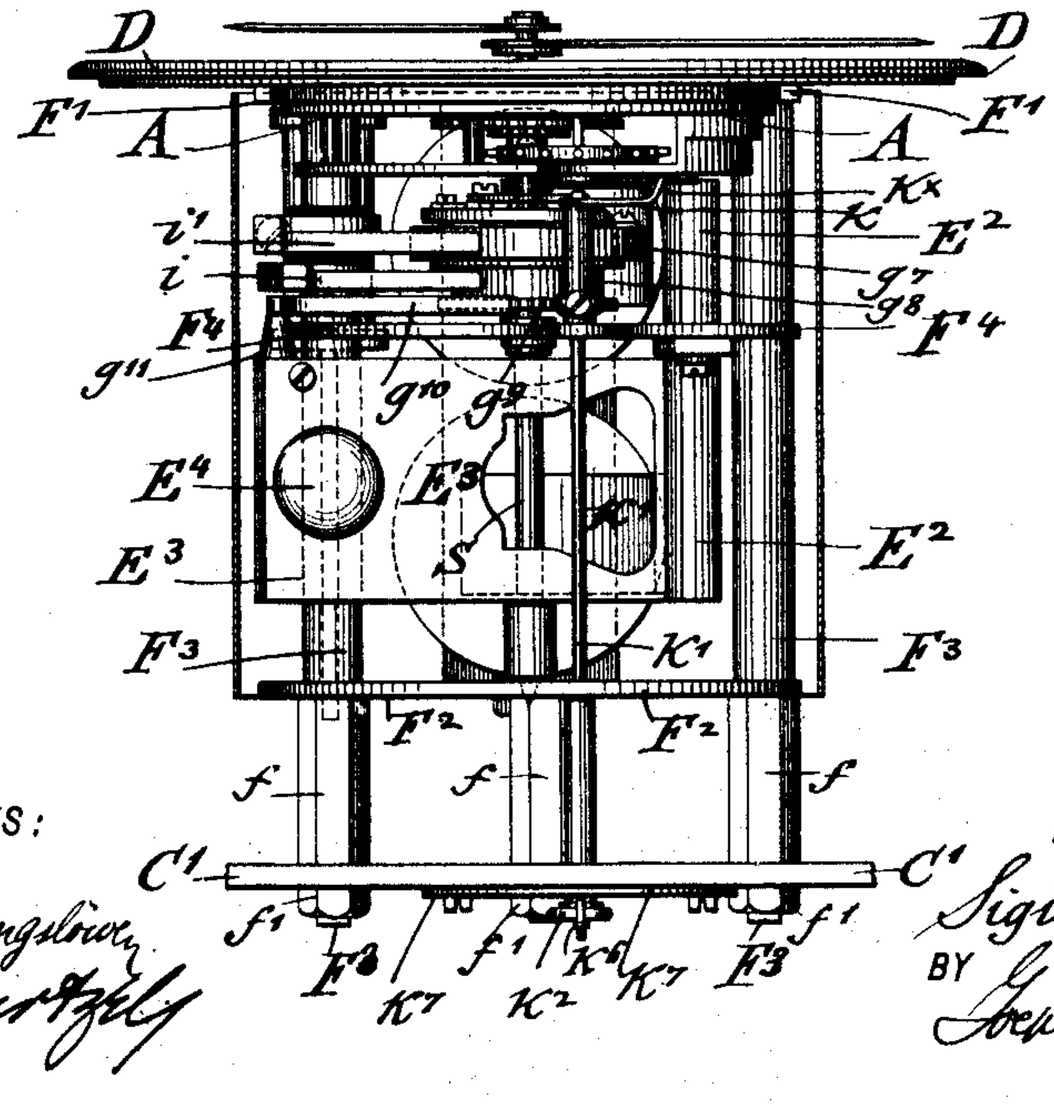


FIG. 6.



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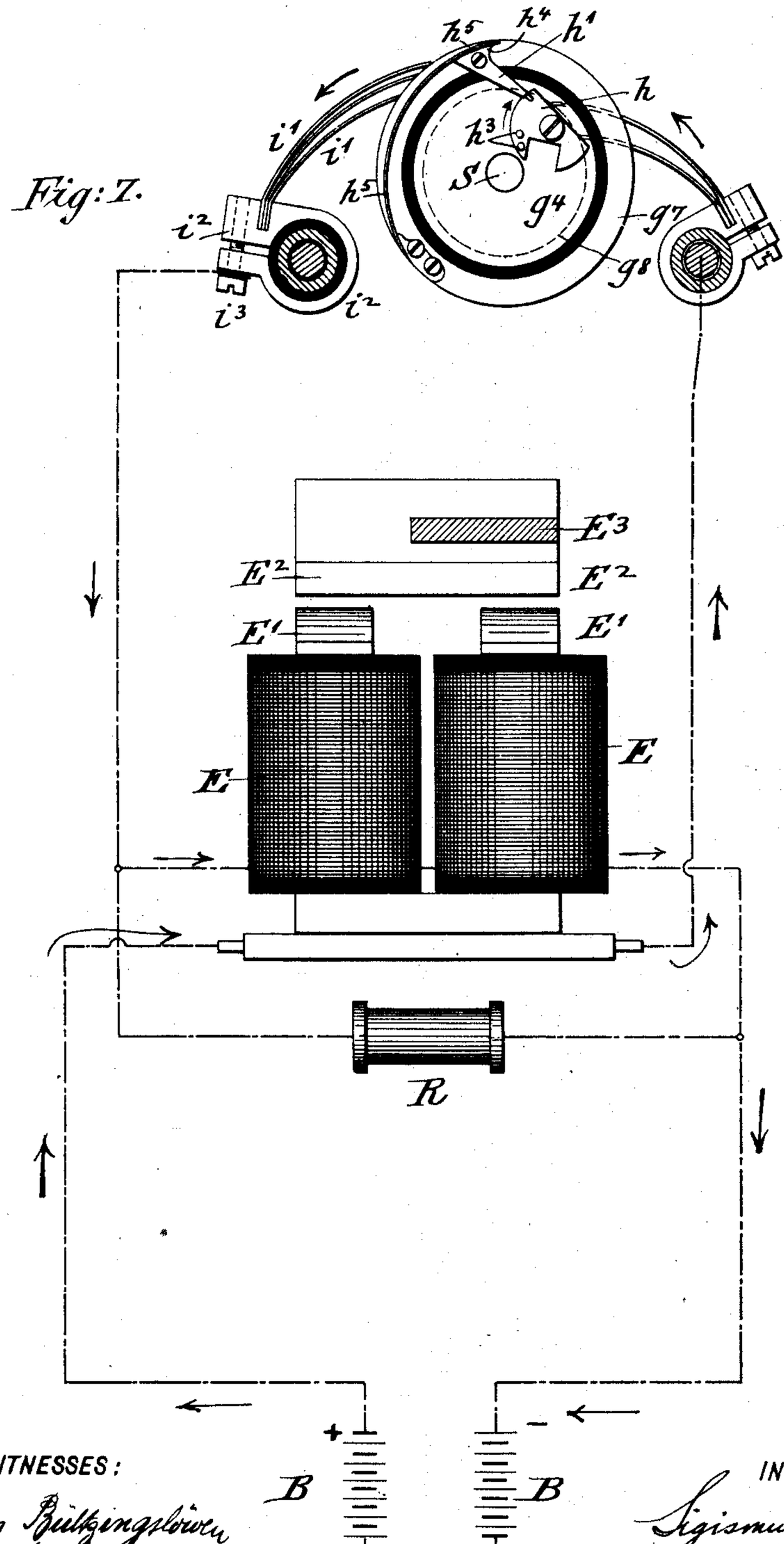
S. FISCHER.

ELECTRIC CLOCK.

(Application filed June 8, 1900.)

(No Model.) 5 Sheets—Sheet 4.

Fig: 7.



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No. 669,338. Patented Mar. 5, 1901.

S. FISCHER.

ELECTRIC CLOCK.

(Application filed June 8, 1900.)

(No Model.) 5 Sheets—Sheet 5.

FIG. 8.

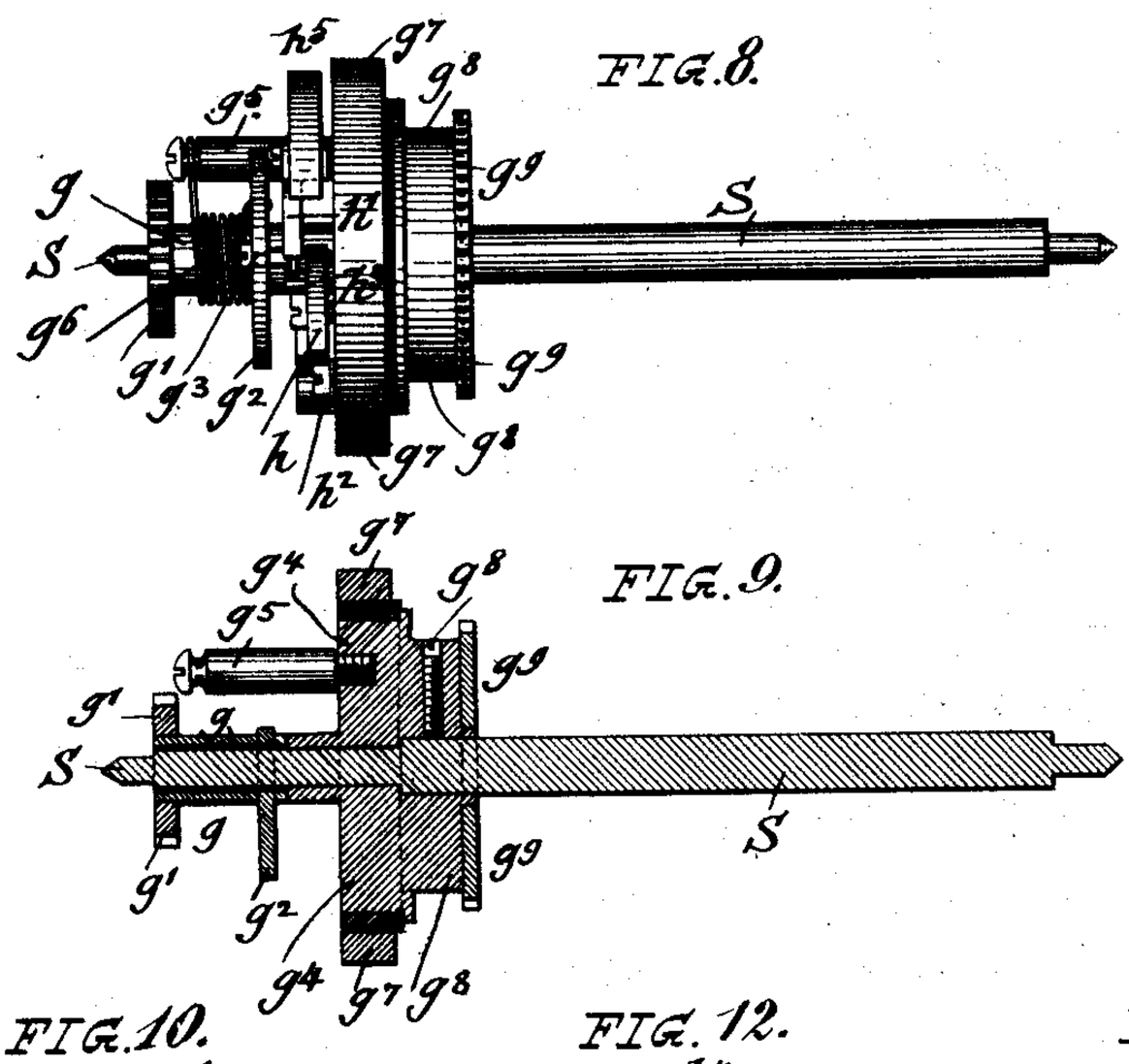


FIG. 9.

FIG. 10.

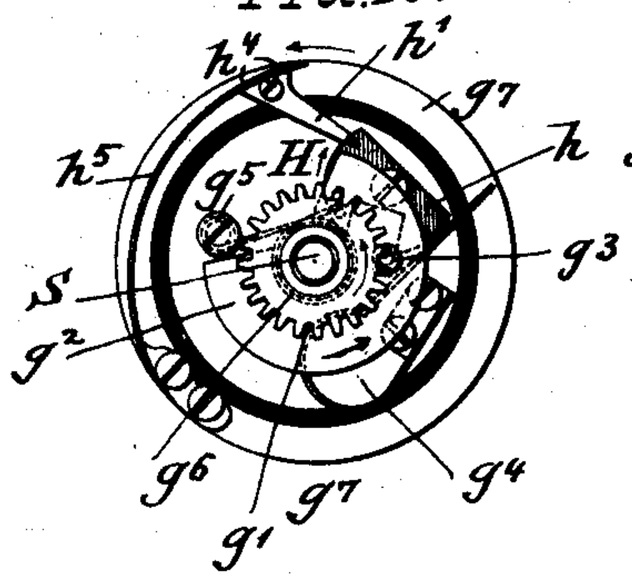


FIG. 12.

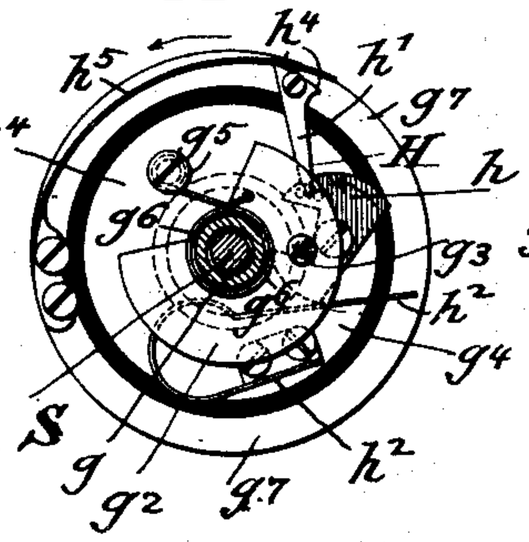


FIG. 11.

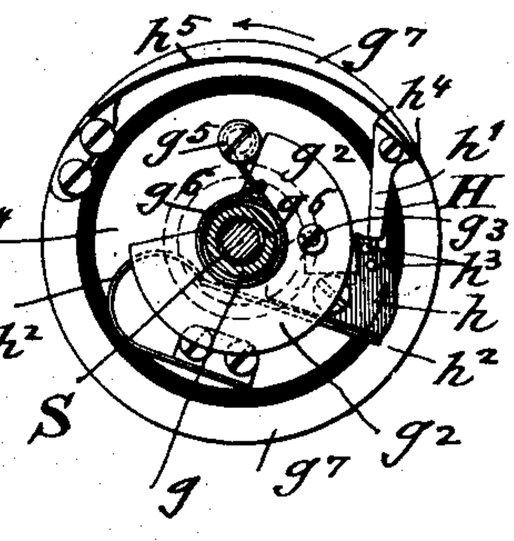


FIG. 13.

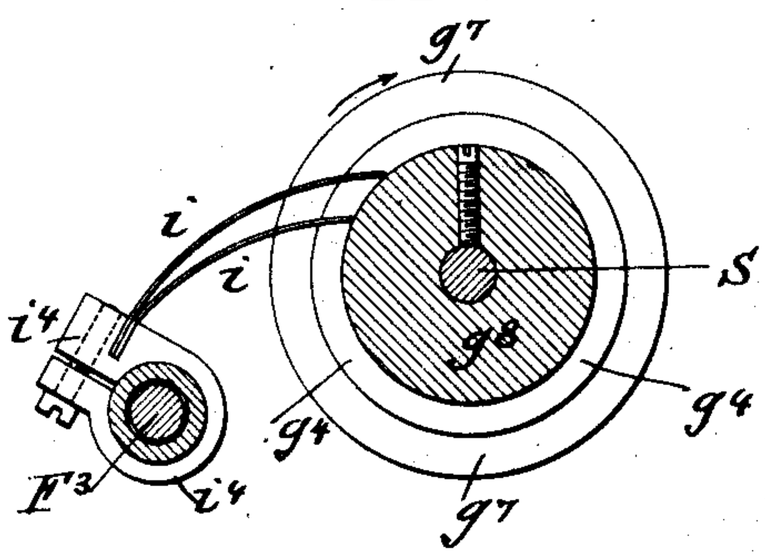
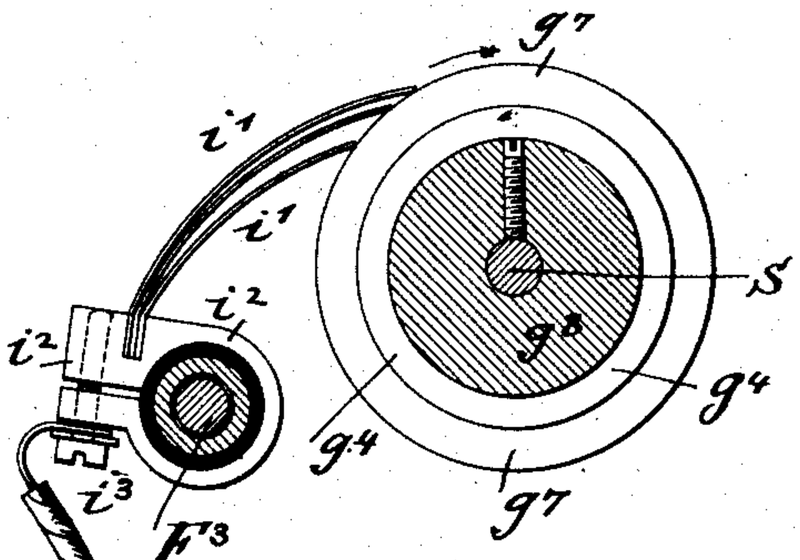


FIG. 14.



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UNITED STATES PATENT OFFICE.

SIGISMUND FISCHER, OF NEW YORK, N. Y.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 669,338, dated March 5, 1901.

Application filed June 8, 1900. Serial No. 19,519. (No model.)

To all whom it may concern:

Be it known that I, SIGISMUND FISCHER, a citizen of the United States, residing in New York, in the borough of Manhattan and State of New York, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification.

This invention relates to improvements in electric clocks, and more especially to electric clocks which are to be used as mantel-clocks or as marine clocks on board ship and in which the pendulum is dispensed with and an ordinary watch-movement used for transmitting the power from the actuating-electromagnet to the hands, said power being intermittently restored by the winding up of a motor-spring of the movement by the intermittent closing of an electric circuit and the actuation of the armature of an electromagnet in said circuit. The batteries by which the current is supplied are located in the casing of the clock, so that each clock is complete and will continue to run in any position as long as the batteries supply a current of sufficient strength.

For this purpose the invention consists of an electric clock which comprises a watch-movement, an electromagnet, an oscillating armature actuated thereby, a sleeve mounted loosely on the armature-shaft and carrying the driving-pinion of the movement, a motor-spring mounted on said sleeve and connected therewith and with the armature-shaft, and means for intermittently closing the circuit of the electromagnet. The invention consists, further, in certain details of construction and combinations of parts, which will be fully described, and finally pointed out in the claims.

In the accompanying drawings, Figure 1 is a front elevation of my improved clock, partly in section, through the case. Fig. 2 is a side elevation, the case being also in section. Fig. 3 is a plan view of the clock with the top plate of the case removed. Fig. 4 is a side elevation of the clock shown as removed from the case. Fig. 5 is a vertical transverse section on line 5 5, Fig. 4, in the direction of the arrow in Fig. 4. Fig. 6 is a plan view of Fig. 5. Fig. 7 is a diagram showing the electric circuit of the clock. Figs. 8 and 9 are respectively a detail side elevation and a vertical longitudinal section of the circuit-closing device. Figs. 10, 11, and 12 are end elevations of the circuit-closing device, showing the parts in different successive positions; and Figs. 13 and 14 show the arrangement of the contact-springs by which the current is transmitted from the rotary parts to the stationary parts of the circuit of the electric clock.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, A represents an ordinary watch-movement from which the motor-spring, its barrel, and the winding devices have been removed. This watch-movement is attached to the front plate of the supporting-frame F of the clock, a dial D of any suitable size being attached to the front plate of the clock. The hands are applied to the center arbor of the watch-movement in the usual manner. The supporting-frame F of the clock consists of a front plate F′, a rear plate F^2, and transverse pillars F^3, which connect the front and rear plates, some of the pillars being extended in backward direction and attached to the rear wall C′ of the case C by means of long hollow posts *f*, interposed between the rear plate F^2 and the rear wall C′ and screw-nuts *f′*, that are applied to the threaded rear ends of the pillars. Intermediately between the front and rear plates of the supporting-frame F is arranged a bracket-plate F^4, which is clearly shown in Fig. 5 and which is provided with openings for the passage of the connecting-pillars, and a central opening for the passage of a shaft S, that extends parallel with the pillars from the front to the rear plate and that is supported by its reduced ends in holes of the front and rear plates, while an upwardly-extending arm of the intermediate bracket F^4 serves as a support for the rod by which the balance-spring of the watch-movement is regulated. The bracket-plate F^4 is rigidly retained in position by means of sleeves that are applied to the pillars and interposed between it and the front and rear plates of the supporting-frame. The bracket-plate F^4 also serves as a support for the armature-shaft S in addition to the bearings supporting said shaft at its ends. The actuating-electromagnet E is located below the shaft and supported at its base by the lowermost pillar of the supporting-frame F. The cores of the electromagnet E are provided with arc-shaped pole-shoes E′, which correspond in length with the armature E^2, that swings over the same, the shanks E^3 of

the armature being provided with a center sleeve or hub e^3, that turns loosely on the armature-shaft S. The shank E^3 is extended diametrically beyond the shaft and provided at its opposite end with a counterbalancing-weight E^4. A helical spring e connects the extension of the armature-shank E^3 with a transverse pin e' at the lower part of the supporting-frame, said pin serving also for the support of a spark-preventing coil R of the ordinary construction. To the bracket-plate F^4 is attached, above the end of the armature, an elastic stop e^4, that serves for arresting the upward motion of the armature under the influence of its spring and for retaining it in a normal fixed position of rest in proximity to the ends of the pole-shoes, as shown in Fig. 5. The shank of the armature E^2 is located in the space between the bracket-plate F^4 and the rear plate F^2, while the armature itself is extended in forward direction to a sufficient length so as to be attracted by both pole-shoes of the electromagnet, as shown in Fig. 4. The coils of the electromagnet E are connected by suitable conducting-wires with two batteries B B, of any approved construction, which are located one at each side of the electromagnet in the case of the clock, as shown in Fig. 1. The clock-case C is made of any suitable material, size, and shape, plain or ornamental, as desired. The rear wall C′ is fitted against lugs C^3 on the recessed rear portion of the case C, said lugs being made of angular shape, so as to project inwardly sufficiently for retaining the batteries in position and prevent their shifting and pressing against the mechanism of the clock after they are placed in position. The top plate C^2 is provided with downwardly-projecting perforated lugs C^4, through which a locking-bolt C^5 is passed, the threaded front end of which is secured in a socket C^6 of the front wall of the case. The shank of the locking-bolt C^5 passes through an opening in the rear plate C′ and is provided with a milled head or button at its outer end for taking hold of the bolt and establishing its connection with the front wall of the casing or unscrewing it when the top plate is to be detached for removing the batteries and clock-movement for renewal or repairs. After the clock is placed in position in the case and the top plate locked in position thereon the rear wall of the case is secured in position by means of suitable fastening-screws.

To the front end of the armature-shaft S is loosely applied a sleeve g, which carries a driving-pinion g' at its front end and a segment g^2 at its rear end, said segment being provided with a headed screw-pin g^3, that projects beyond the segment. Adjacent to the segment g^2 is keyed to the shaft S a disk g^4, which carries a post g^5, said post extending in forward direction and being located within the circumference of the segment g^2. A helical spring g^6 is placed on the sleeve g of the driving-pinion g', one end of the spring being attached to the segment g^2, while its opposite end is attached to the grooved end of the post g^5, as shown clearly in Fig. 8. The spring g^6 is an ordinary coiled steel spring and serves as the motor-spring of the watch-movement, it transmitting its power to the driving-pinion g' and from the same to the watch-movement A, so as to keep the same going when wound up from six to eight minutes. The disk g^4 is surrounded by an insulated ring g^7, which forms, together with the disk, the support for the circuit-closing device H, by which the circuit of the electromagnet is intermittently closed, so as to energize its cores, attract the armature E′, and impart an oscillating motion thereto. The disk g^4 is provided with a shouldered rear portion g^8, of smaller diameter than the disk g^4, to which is attached a ratchet-wheel g^9. This ratchet-wheel g^9 is located adjacent to the bracket-plate F^4 and engaged by a spring-pawl g^{10}, that is attached to a laterally-extending stud g^{11} on the armature-shank E^3, said pawl g^{10} engaging the teeth of the ratchet-wheel and imparting rotary motion to the shaft and the disk g^4 g^8 at each oscillation of the armature. A check-pawl g^{12} is attached to the lowermost end of the bracket-plate F^4, so as to prevent the turning of the ratchet-wheel g^9 in a direction opposite to that imparted to it by the spring-pawl g^{10}.

The circuit-closing device H consists of two parts—a centrally-fulcrumed cam h and a tongue h'. The cam h is carried by the disk g^4 and the tongue h' by the insulated ring g^7. The cam h is flat at one edge and provided with a recess in its circumference, it being acted upon by a flat spring h^2, which serves to quickly turn the cam when the spring h^2 is placed in contact with the flat edge of the cam. The pin g^3 on the segment g^2 extends into the recessed portion of the cam h, so as to actuate the same during the rotary motion that is imparted to the segment by the unwinding or winding up of the motor-spring g^6. The cam h carries near its recess two closely-arranged platinum pins h^3, which are gradually moved by the rotation of the segment g^2, under the influence of the spring g^6, into close proximity with the platinum-pointed end of the circuit-closing tongue h'. The tongue h' is pivoted to the insulated ring g^7, it being provided near the pivot with a flat face, forming two heels h^4, that are acted upon by the free end of a flat spring h^5, which is attached at its opposite end to the insulated ring g^7, as shown in Figs. 10, 11, and 12. By the turning of the cam h on its fulcrum under the influence of the pin g^3 on the segment g^2 the platinum pins on the cam h are gradually brought closer to the end of the tongue, and at the same time the heel of the cam h passes over the cam-spring h^2 until the latter turns the cam quickly on its fulcrum and forms contact with the flat side of the cam, as shown in Fig. 11. The platinum pins are thereby quickly placed in successive

contact with the end of the tongue, so as to close the circuit, excite the electromagnet, and attract the armature, imparting an oscillating motion to the same. The tongue h' slides from the first pin h^3 quickly onto the second pin h^3 and has a brief dwell on the latter, so as to close the circuit and start the armature in its motion over the pole-shoes. The oscillation of the armature E^2 imparts, by the spring-pawl g^{10}, a quick rotary motion to the ratchet-wheel g^9, and thereby to the shaft S and the disk g^4 g^8. The disk g^4 g^8 carries the recessed cam h along, so that the pin g^3 reëngages the recessed portion of the cam and produces the quick turning of the same in a direction opposite to its former motion against the tension of the cam-spring, as shown in Fig. 12, and the quick sliding of the tongue h' from the second platinum pin h^3 over the first platinum pin h^3 until the tongue is released and the cam and tongue are returned into the starting positions. (Shown in Fig. 10.) By the contact of the platinum point of the tongue h' during the return motion of the cam h the circuit is retained in closed condition, so that the armature is pulled completely over the pole-shoes of the electromagnet, so as to make an oscillation of the full length necessary for the proper and uniform winding up of the motor-spring. As soon as the first platinum pin passes beyond the point of the tongue the circuit is interrupted and the armature returned to its normal position, as shown in Fig. 5. The recess in the cam h is of such a size that the sudden turning of the cam first by its spring and then by the turning of the disk g^4 is not checked, but first one edge of the recess and then the other edge brought close to the actuating-pin g^3 of the cam h. The tongue h' is during the motion of the cam h returned by its spring into its normal position shown in Fig. 10, said spring having exerted its tension during the quick motion of the cam h in one direction on one heel and during its slow return motion on the opposite heel of the tongue, as shown, respectively, in Figs. 11 and 12. When the parts are thereby returned into the position shown in Fig. 10, they are ready to be moved gradually again under the influence of the motor-spring until the next closing of the circuit and rewinding of the motor-spring is produced. The rewinding of the motor-spring is repeated at intervals of from six to eight minutes, and thereby the watch-movement subjected to a uniform degree of spring-power and kept in continuous motion by the successive winding up of the motor-spring.

The circuit of the electric batteries is established by means of contact-springs i i', two groups of which are arranged, the free ends of the contact-springs i' being placed in contact with the circumference of the insulated ring g^7, while the free ends of the contact-springs i are placed in contact with the shouldered disk portion g^8. The opposite ends of the contact-springs i' are supported in a clamping-sleeve i^2, that is attached to one of the pillars F^3 of the clock-frame and insulated therefrom, as shown in Fig. 14. The clamping-sleeve i^2 is connected by a binding-post i^3 and conducting-wire with one pole of the battery, the spark-preventing coil R being located in a shunt-circuit, as shown in Fig. 7, said coil serving to prevent sparking at the platinum contact-points of the circuit-closing device. The contact-springs i are likewise supported by a clamping-sleeve i^4 on the same pillar adjacent to the clamping-sleeve i^2, said clamping-sleeve i^4 being not insulated, but electrically connected with the supporting-frame of the clock and the opposite pole of the batteries.

The battery-circuit is clearly shown in Fig. 7. Whenever the circuit is closed by the contact of the platinum pin on the cam h with the platinum pointed end of the circuit-closing tongue h', the current passes from the positive pole of the battery to the bottom pillar, through the supporting-frame to the uninsulated contact-springs i, over the shouldered disk and cam-spring to the cam on the same, over the platinum pins on the cam to the tongue, over tongue-spring to the insulated ring, and from the same over the contact-springs i' and insulated clamping-sleeve to the coils of the electromagnet and through the same to the negative pole of the battery.

A plurality of contact-springs is preferably used between the disk g^4 g^8 and the insulated ring g^7, so as to insure the reliable contact of the parts and keep the circumference of the disk and ring clear of any deposits produced by corrosion.

The regulation of the watch-movement A is accomplished by the regulating-lever of the balance-spring by means of a forked end of a crank-arm K, which is applied to the end of a rod K′, that is supported in the upper arm of the bracket F^4 and passed through the rear plate of the clock-frame and the rear wall C′ of the clock-case to the outside of the latter, said rod being provided at its outer end with a milled button K^2, as shown in Fig. 4. The fork $K^\times$ of the crank-arm K engages the regulating-lever of the balance-wheel, as shown in Figs. 5 and 6, and moves the same in either direction over the scale on the balance-bridge. The crank K is connected with the regulating-rod K′ by a sleeve K^3, which is secured thereto by means of a clamping-screw K^5, as shown in Fig. 4. To the rear end of the crank-rod K′ is attached a pointer K^6, which moves over a graduated segment K^7 on the rear wall of the clock-case, so as to permit the convenient adjustment of the regulating mechanism of the balance-spring by turning the pointer in one or the opposite direction over the graduated segment until the proper adjustment of the regulating device for the accurate running of the clock is produced.

My improved electric clock is operated as follows: After the proper connection of the

battery is made with the operative parts of the clock the hands are first set to proper time on the dial. The motor-spring is then set to tension by means of one oscillation of the armature, so as to impart motion to the watch-movement. The motion of the driving-pinion under the influence of the motor-spring also imparts rotary motion to the segment by which the circuit-closing device is intermittently actuated—*i. e.*, before the power of the motor-spring is exhausted. By the special construction of the circuit-closing device the circuit is kept closed for a sufficient length of time to produce a full oscillation of the armature over the pole-shoes of the electromagnet and the full rewinding of the motor-spring, so that the movement can be kept going for about six to eight minutes until the battery-circuit is closed again and another oscillation of the armature and another winding of the spring is produced, and so on. As the oscillation motion of the armature is kept up intermittently, and thus the motor-spring wound up at certain fixed intervals of time, the clock continues to move until the power of the batteries is exhausted. The regulation of the clock is accomplished by the regulating device of the balance-spring in the manner described, so that a reliable and correct electric time-keeper is obtained. Whenever for any reason the circuit is interrupted, the motor-spring spends its power and moves one end of the segment g^2 against the post g^5 until it is retained in position by the same. As soon as the circuit is restored and the clock is to be started again all the parts are therefore in proper position, so that by the manual actuation of the armature the movement is again set in motion. During the running of the clock the post g^5 on the disk g^4 never abuts against the ends of the segment, for the reason that the rewinding of the spring is produced always before its full power is exhausted. When the clock is to be stopped, the motor-spring unwinds until one end of the segment abuts against the post, so as to retain the segment and the parts actuated thereby in position for restarting the clock when the repairs are made or new batteries supplied. The operating devices of my improved electric clock can be used also in electric pendulum-clocks, as they are not confined to clocks with a balance-spring regulator. The circuit-closing device can also be used for various other purposes, as I do not desire to confine it to electric clocks merely.

The advantages of my improved electric clock are, first, that it can be kept running without requiring hand-winding and keeps accurate time until the batteries are entirely exhausted; secondly, that by the employment of a comparatively small and inexpensive motor-spring the clock is wound up at definite and comparatively long intervals of time, so that the power of the batteries is distributed over a considerable length of time before they are used up; thirdly, that the closing of the circuit and winding up of the motor-spring is accomplished in a very quick and effective manner, so as to consume but little power of the batteries; fourthly, that the clock will continue its movement whatever be the position in which it be placed, whether in vertical, horizontal, or other position, so that it is adapted for marine purposes as well as for use on mantles or other supports; fifthly, that by the use of a short spring and frequent rewinding of the same almost uniform power is imparted to the watch-movement, and thereby accurate time obtained; sixthly, that as the watch-movement can be of a very cheap kind and as the clock mechanism is of comparatively simple construction the electric clock can be made at so low a price as to be within the reach of any who desire a reliable electric clock; seventhly, that by the arrangement of two platinum pins and a platinum-pointed spring-tongue in the circuit-closing device the contact-points are made to slide over each other in such a manner as to be self-cleaning, which is of importance for the proper running of the clock for long periods of time, and, lastly, that the batteries can be easily removed and the operative parts repaired or examined by first removing the top plate and the clock mechanism, with the rear wall, from the case.

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

1. In an electric clock, the combination, with a watch-movement, of a motor-spring for driving the same, an electromagnet, means for intermittently closing the circuit of said electromagnet, an oscillating armature actuated by said electromagnet, and mounted loosely on its shaft, a ratchet-wheel fixed on the armature-shaft, a pawl on the armature engaging said ratchet-wheel, disks fixed upon the armature-shaft, a pin on one of said disks connected with one end of the motor-spring, and means actuated by the armature for breaking the circuit of the electromagnet when the motor-spring is wound up, substantially as set forth.

2. In an electric clock, the combination of a watch-movement, an electromagnet, an armature-shaft, an oscillating balanced armature actuated by said electromagnet and mounted rotatably on said shaft, a sleeve mounted loosely on said shaft and carrying the driving-pinion of the movement, a segment on said sleeve, a pin on said segment, disks on the armature-shaft, one of said disks carrying a cam engaged by the segment-pin, a motor-spring mounted on said sleeve and connected therewith and with the armature-shaft, and a pawl-and-ratchet mechanism between said armature and disks, substantially as set forth.

3. In an electric clock, the combination of a watch-movement, an electromagnet, an armature-shaft, an oscillating balanced armature actuated by said electromagnet and

mounted rotatably on said shaft, a sleeve mounted loosely on said shaft and carrying the driving-pinion of the movement, a segment on said sleeve, a pin on said segment, disks on the armature-shaft, one of said disks carrying a cam engaged by the segment-pin, a motor-spring mounted on said sleeve and connected therewith and with the armature-shaft, a pawl-and-ratchet mechanism between said armature and disks, and means on one of said disks for making electrical connection with said cam, substantially as set forth.

4. In an electric clock, the combination, with a watch-movement, of a motor-spring for driving the same, an electromagnet, a balanced oscillating armature, means winding up the motor-spring actuated by said armature, and mechanism for intermittently closing the circuit of the electromagnet, said mechanism consisting of a driving-pinion, a segment on the sleeve of said driving-pinion, a carrier-disk, a spring-actuated cam provided with platinum contact-points fulcrumed to said disk, an insulated ring, and a spring-actuated tongue having a platinum-pointed end pivoted to said insulated ring, substantially as set forth.

5. In an electric clock, the combination of a watch-movement, a motor-spring for driving said movement, said motor-spring being located on a hub-sleeve of the driving-pinion, a segment on said sleeve connected to one end of the motor-spring, a post connected to the opposite end of said spring, an electromagnet oscillating and counterbalanced armature actuated by the electromagnet, a carrier-disk on the arbor of the armature, an insulated ring on said disk, a circuit-closing device actuated by the segment under the influence of the motor-spring, and contact-springs between the carrier-disk and insulated ring, substantially as set forth.

6. In an electric clock, the combination of a watch-movement, a motor-spring for the same, an electromagnet, an electric circuit for the electromagnet, an oscillating and counterbalanced armature, means between said armature and the motor-spring for intermittently winding up the same by the actuation of the armature, a circuit-closing device actuated by the unwinding of the motor-spring, said circuit-closing device consisting of a spring-actuated cam provided with platinum contact-pins, a spring-actuated tongue having a platinum contact-point, a carrier-disk for said cam, an insulated ring on said disk carrying the tongue, and contact-springs for the disk and ring for producing the reliable closing of the circuit, substantially as set forth.

7. In an electric clock, the combination, with a watch-movement, a motor-spring for the same, an electromagnet, and an armature connected with said motor-spring, of a circuit-closing device operated by the motor-spring of the movement and consisting of a segment connected with one end of the motor-spring, a pin on said segment, a carrier-disk, a recessed and spring-actuated cam fulcrumed to said disk, platinum pins on said cam, a post on said disk connected to the opposite end of the motor-spring, an insulated ring on said disk, and a spring-actuated circuit-closing tongue pivoted to said ring and provided with a platinum point adapted to be engaged by the platinum pins of the cam, substantially as set forth.

8. In an electric clock, the combination, with a watch-movement, a motor-spring for the same, an electromagnet, and an armature connected with said motor-spring, of a circuit-closing device, consisting of a carrier-disk, a recessed cam fulcrumed to said disk and provided with a flat side, a flat spring acting on said cam, platinum pins on said cam, an insulated ring on said disk, and a spring-actuated circuit-closing tongue pivoted to said ring and provided with heels near its pivot and with a platinum point at its end adapted to be engaged by the platinum pins of the cam, substantially as set forth.

9. In an electric clock, the combination, with a watch-movement, a motor-spring for the same, an electromagnet, and an armature connected with said motor-spring, of a circuit-closing device, consisting of a carrier-disk, a recessed cam fulcrumed to said disk and provided with a flat side, a flat spring actuating on said cam, platinum pins on said cam, an insulated ring on said disk, a spring-actuated circuit-closing tongue pivoted to said ring and provided with a platinum point, and means for moving the cam in the opposite direction to that imparted by its spring, so that a protracted contact of the platinum points of the cam with the platinum point of the tongue is produced, substantially as set forth.

10. In an electric clock, the combination, with a segment located on the sleeve of the motion-transmitting pinion, a carrier-disk, a post on said carrier-disk, a motor-spring located on the sleeve of the segment and attached at its ends respectively to the segment and the post, said segment abutting against the post when the motor-spring has spent its force so as to be in position for rewinding, substantially as set forth.

11. In an electric clock, the combination, with a clock-case, provided with a recessed rear wall having angular inwardly-projecting lugs, of an electric clock located in the center of the case, a rear plate connected with the frame of said clock and closing the rear wall of the case, and batteries located at each side of said clock, and retained in position by said angular lugs, substantially as set forth.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

SIGISMUND FISCHER.

Witnesses:
PAUL GOEPEL,
M. H. WURTZEL.