(No Model.) 2 Sheets—Sheet 1.

B. HABERTHÜR.

SECONDARY ELECTRIC CLOCK MOVEMENT.

No. 456,325. Patented July 21, 1891.

FIG. 1.

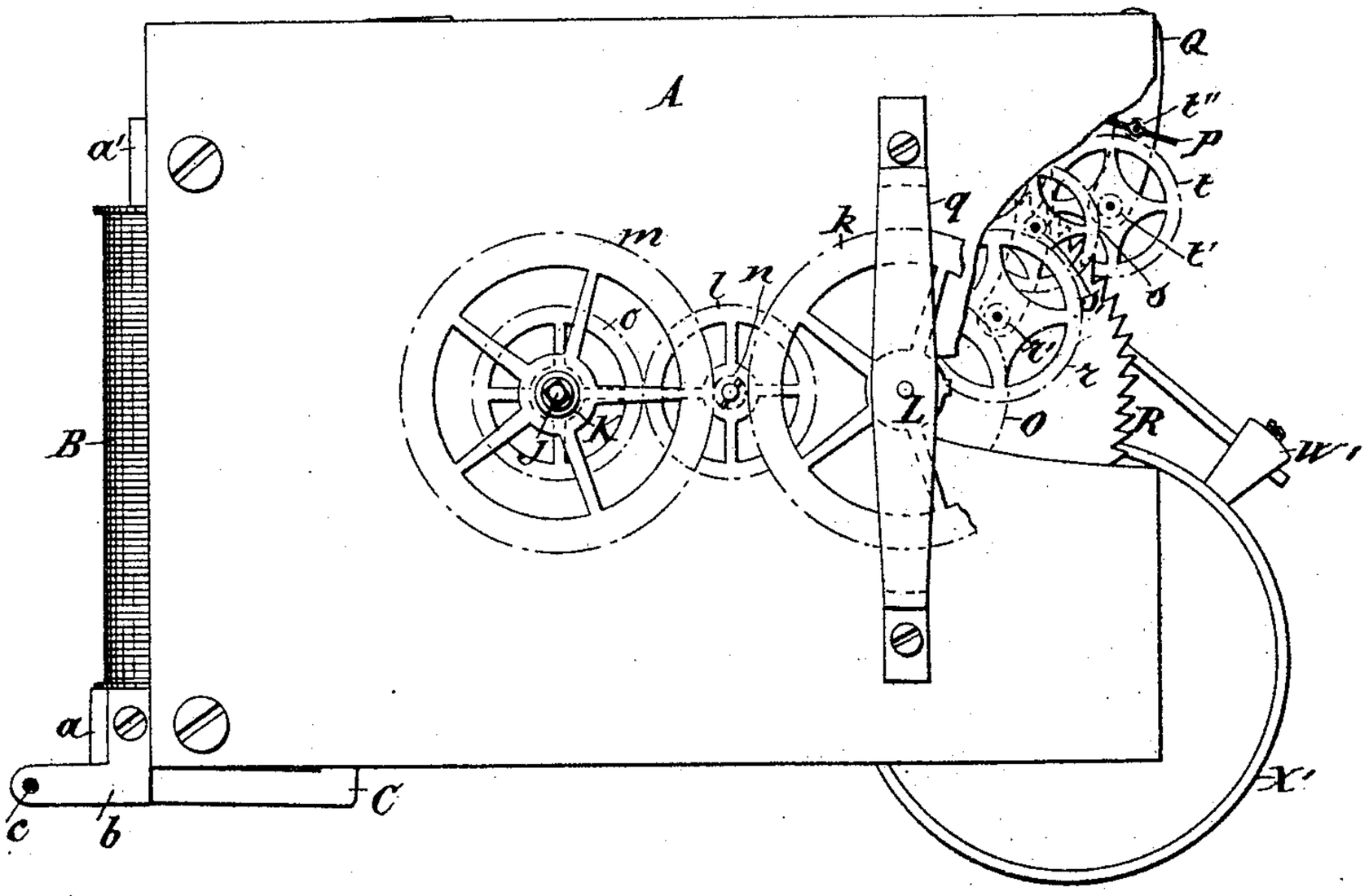
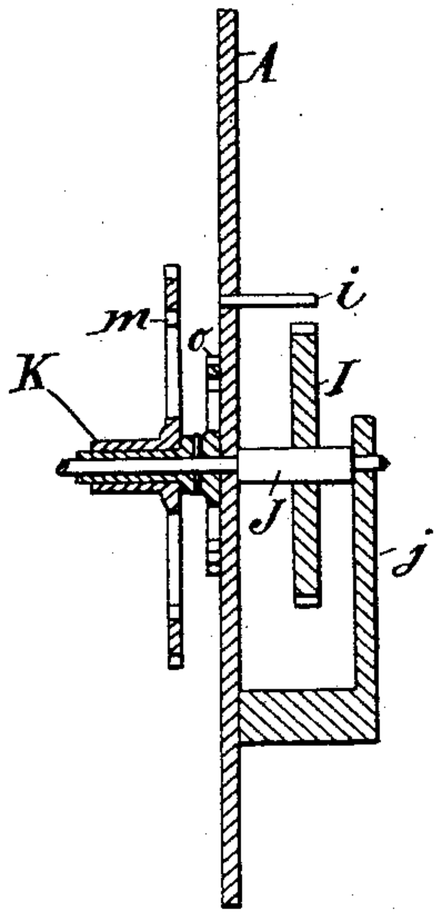


FIG. 4.



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(No Model.) 2 Sheets—Sheet 2.

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No. 456,325. Patented July 21, 1891.

FIG. 2.

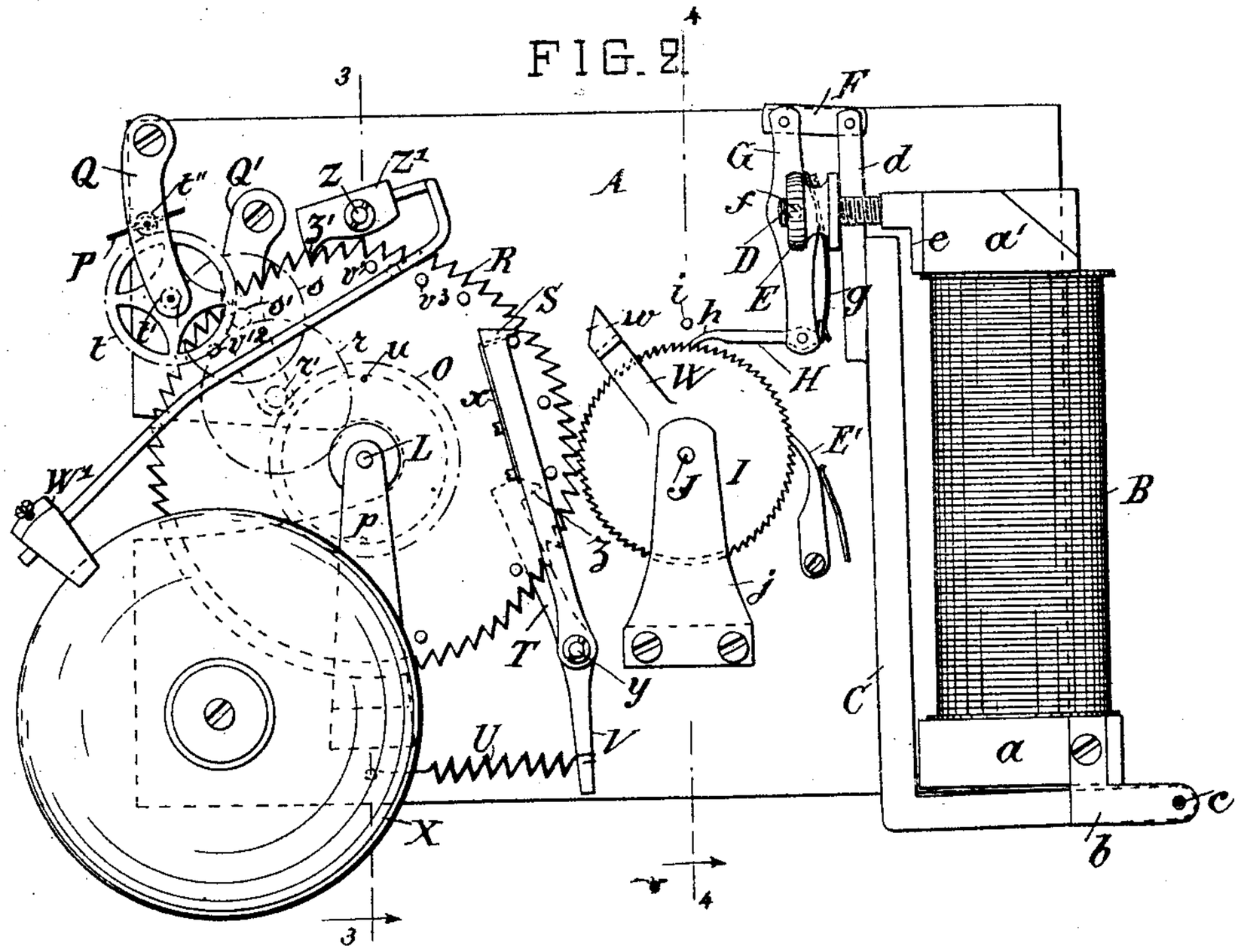
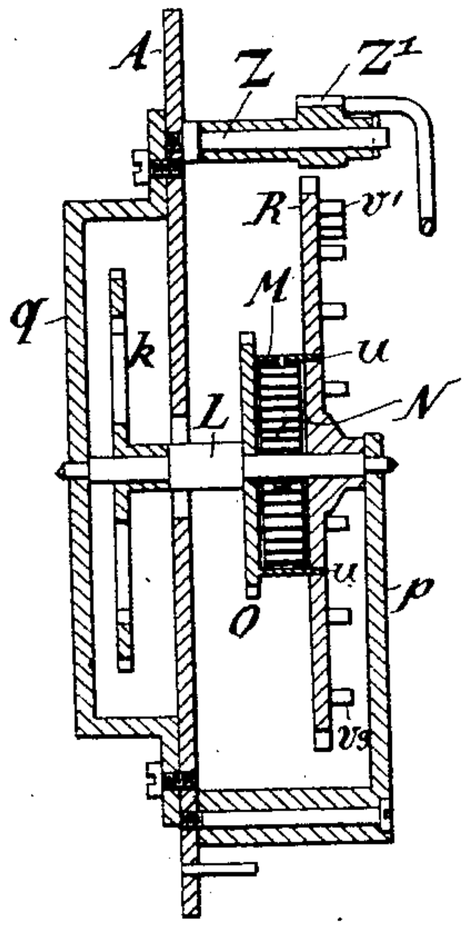


FIG. 3.



INVENTOR:

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UNITED STATES PATENT OFFICE.

BENEDIKT HABERTHÜR, OF BREITENBACH, SWITZERLAND, ASSIGNOR OF ONE-HALF TO PIUS SANER, OF SAME PLACE.

SECONDARY ELECTRIC-CLOCK MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 456,325, dated July 21, 1891.

Application filed November 8, 1890. Serial No. 370,763. (No model.)

To all whom it may concern:

Be it known that I, BENEDIKT HABERTHÜR, a citizen of the Swiss Republic, residing at Breitenbach, Canton of Soleure, Switzerland, have invented certain new and useful Improvements in Electrical Secondary Clock-Works, of which the following is a specification.

This invention relates to secondary electric clocks with a striking mechanism.

Figure 1 of the accompanying drawings is a front elevation of the mechanism partly broken away. Fig. 2 is a rear elevation thereof. Fig. 3 is a vertical transverse section on the line 3 3 in Fig. 2. Fig. 4 is a vertical transverse section on the line 4 4 in Fig. 2.

The clock shown is adapted to be actuated by an electric impulse sent over a circuit at intervals of one minute or other suitable intervals.

In addition to the usual electro-magnetic mechanism for imparting motion to the hands, the improved clock has a striking mechanism which continually rewinds itself through the action of the electro-magnetically-driven clock mechanism. The electro-magnet B is fastened by its pole ends *a a'* to the base-plate A. The coil of the electro-magnet is in an electric circuit which is closed every minute by an electric standard clock. On the lower pole end *a* two angular supports *b b* are screwed, and in the latter turn the pivots *c c* of an angular armature-lever C, which is connected at the top with an arm *d*. The movement of this arm *d*, and therefore of the armature-lever C, is limited on the one hand by a shoulder *e* of the upper pole end *a'*, and on the other hand by the face of a regulating-nut E on the screw D. The upper end of the arm *d* is connected by a connecting-rod F with one end of a lever G of the first class, which can turn on a pivot *f* on the plate A, and which lever carries at its other arm a pawl H, operating on a ratchet-wheel I. A spring *g* presses the nose *h* of the pawl H continually against the teeth of the ratchet-wheel I, and by means of a stop-pin *i* the motion of the pawl H is limited to the extent of one tooth of the ratchet-wheel I at a time. A stop-pawl E', opposite the pawl H, prevents the backward motion of the ratchet-wheel I. The latter is designed to be actuated from the standard clock once each minute, and has therefore sixty teeth. It is fixed on the minute-arbor J, which has bearings in the bridge *j* of the base-plate. The minute-arbor J carries a wheel *o*, whose rotation is transmitted through the wheel *l*, pinion *n*, and wheel *m* to the hour-arbor K, as in any ordinary hand-operating mechanism. The pinion *n* meshes also with the wheel *k*, which is fastened on the arbor L of the spring-barrel of the striking mechanism and transmits the motion of the hand-operating mechanism to the last-mentioned arbor L. The arbor L, Fig. 3, has bearings at opposite ends in the bridges *p q*, and the spring-barrel M turns loosely on this arbor. One end of the spiral spring N is fastened to the arbor L, while the other end is fastened to a projection of the spring-barrel M. The rotation of the spring-barrel M is transmitted by means of the wheel O and the intermediate wheels and pinions *r r'*, *s s'*, and *t t' t''* to the fly or regulator P, Figs. 1 and 2, so that the rotation of the spring-barrel is regulated by the latter. The arbors of the wheels and pinions *r r'*, *s s'*, and *t t' t''* have bearings at one end in the base-plate A and at the other end in the bridges Q and Q'. Two or more stop-pins *u* connect the spring-barrel M with the striking-wheel R, which is provided with seventy-eight teeth, and carries on its rear surface twelve stop-pins v' to v^{12}. The intervals or successive distances of these stop-pins correspond with the successive numerals 1 to 12, the first two v' and v^2 being separated the width of one of the teeth of the wheel, the second two v^2 and v^3 the width of two teeth, &c. A stop-hook S on an arm pivoted on a stud *y* engages any of the stop-pins v' to v^{12}, and its arm is connected by means of a sleeve with a lever-arm T, having a tooth *z*. The other lever-arm V is connected with a spring U in such a manner that the hook S and the lever-arms T V can turn around the stud *y* on the base-plate. The lever carries a spring *x*, the end of which is bent down close to the hook S, serving to reduce the shock of this hook when it strikes the pins v' to v^{12}.

On the stud Z, which is fastened to the plate

A, is pivoted a movable block Z′, having a nose *z′*. This block Z′ carries the hammer W′, which can strike against a gong X. The nose *z′* is kept in mesh with the teeth of the wheel R by means of its own weight or of a spring.

On the ratchet-wheel I is provided a disconnecting-arm W, having a projection *w* at its rear end, and at the end of each rotation of the wheel I—that is, at the beginning of each hour—the arm W strikes the end tooth *z* of the lever-arm T, by means of which the hook S is shoved aside, so that the striking-wheel R is freed, whereupon this wheel turns, under the tension of spring N, until the next stop-pin is engaged by the hook S, which arrests it.

The operation of my electric secondary clock is as follows: At the end of every minute the armature C is attracted by the electro-magnet B, and its motion transmitted by means of the connecting-rod F to the lever G, the pawl H, the ratchet-wheel I, and then to the hand-operating mechanism, so that the minute-hand moves the distance representing one minute. This motion of the hand-operating mechanism is transmitted to the wheel O on the arbor of the spring-barrel M, and thereby the spring N is wound up partly after every minute. On the expiration of every hour the disconnecting-arm W of the wheel I strikes the lever-arm T, and thereby the hook S is displaced to one side, so that it is moved out of the way of the stop-pins *v′* to v^{12}, so that the striking-wheel R is free and turns by means of the tension of spring N. By this turning motion the teeth of the striking-wheel R operate on the nose *z′* of the movable block Z′, so that the hammer strikes the hour on the gong X. As on the one hand the spring-barrel makes a complete turn in twelve hours, and on the other hand, in consequence of the operation of the hand-operating mechanism on the spring-barrel arbor L, the latter also makes a complete revolution in twelve hours, it is obvious that the tension of the spring N is always the same at a certain hour of the day. Instead of the bridges Q Q′, fastened on the rear part of the plate A, a second plate may be provided.

I claim as my invention the following defined novel features, substantially as hereinbefore specified, namely:

1. In an electric clock, the combination, with a hand-propelling mechanism and electro-magnetic means for driving it, of a striking mechanism, a motor-spring therefor, and mechanical means in connection with said hand-propelling mechanism for rewinding said spring.

2. In an electric clock, the combination of hand-propelling mechanism, comprising a minute-arbor, electro-magnetic means for driving said mechanism, a striking mechanism, a motor-spring for driving it, mechanism for rewinding said spring automatically, and a projecting arm carried by the minute-arbor and adapted to release the striking mechanism once to each revolution of said arbor.

3. In a secondary electric clock, the combination of a hand-propelling mechanism comprising a minute-arbor, a ratchet and pawl, an electro-magnet for operating the pawl, a striking mechanism, the motor-spring thereof, the arbor of said spring geared to the hand-propelling mechanism, whereby said spring is rewound by said latter mechanism, and a projection carried by the minute-arbor adapted to release the striking mechanism.

4. In a secondary electric clock, the combination of an actuating-magnet, a pawl and ratchet, a minute-arbor carrying a projection, a striking mechanism comprising a striking-wheel having stop-pins, a stop-lever having a hook engaging said pins, and a tooth adapted when engaged by said projection to release said hook, a motor-spring for said striking mechanism connected thereto at one end and to a motor at the other, and gearing connecting said arbor with the minute-arbor, whereby said spring is periodically rewound.

5. In a secondary electric clock, the combination of an electro-magnet B, its pivoted armature C, opposite stationary stops *e* and E for limiting the vibration of said armature, lever G of the first class connected at one end to the armature-lever, a pawl H, connected to its other end, and a ratchet-wheel I, adapted to be advanced by said pawl during the attractile stroke of the armature.

6. In a secondary electric clock, the combination, with a hand-propelling mechanism comprising a minute-arbor carrying a projection *w*, of a striking mechanism comprising a striking-wheel having stop-pins, a stop-lever having a hook S for engaging said pins, a spring *x*, carried by said lever, bent down close to the hook, so that it shall reduce the shock when the hook strikes the stop-pins, a spring U for imparting a tension to said lever, and a tooth *z*, carried by said lever and engaged by said projection *w*, for displacing the lever to disengage said hook.

In witness whereof I have hereunto signed my name in the presence of subscribing witnesses.

BENEDIKT HABERTHÜR.

Witnesses:
AMAND RITTEZ,
GEORGE GIFFORD,
CHS. A. RICHTER.