(No Model.) 2 Sheets—Sheet 1.

H. T. R. ZEIDLER.

ELECTRIC PROGRAM CLOCK.

No. 553,890. Patented Feb. 4, 1896.

Fig 1.

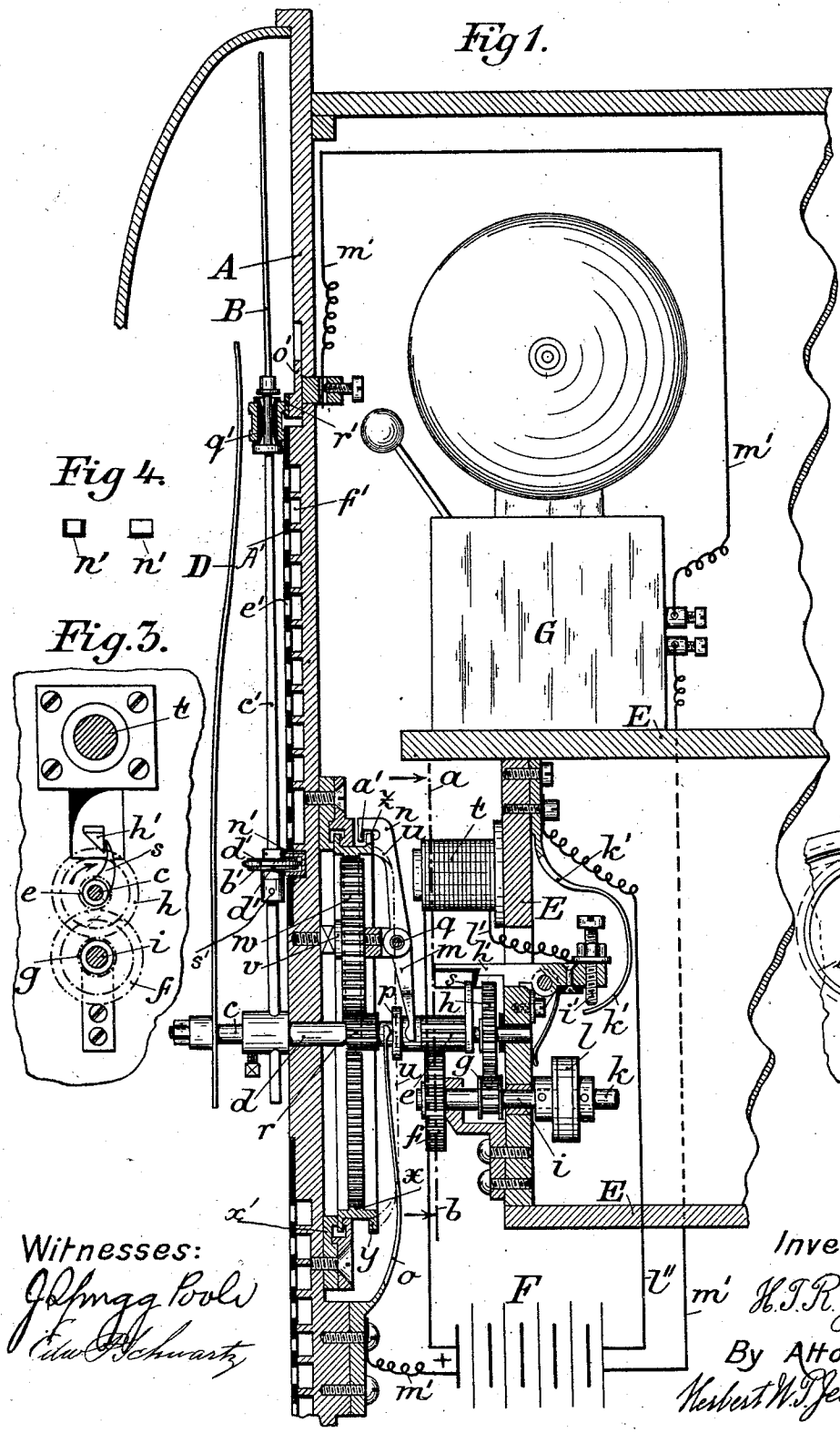
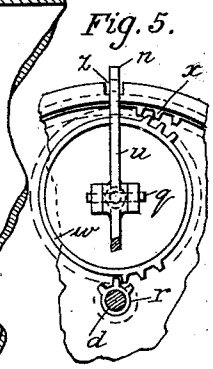


Fig 4.

Fig. 3.

Fig. 5.



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(No Model.) 2 Sheets—Sheet 2.

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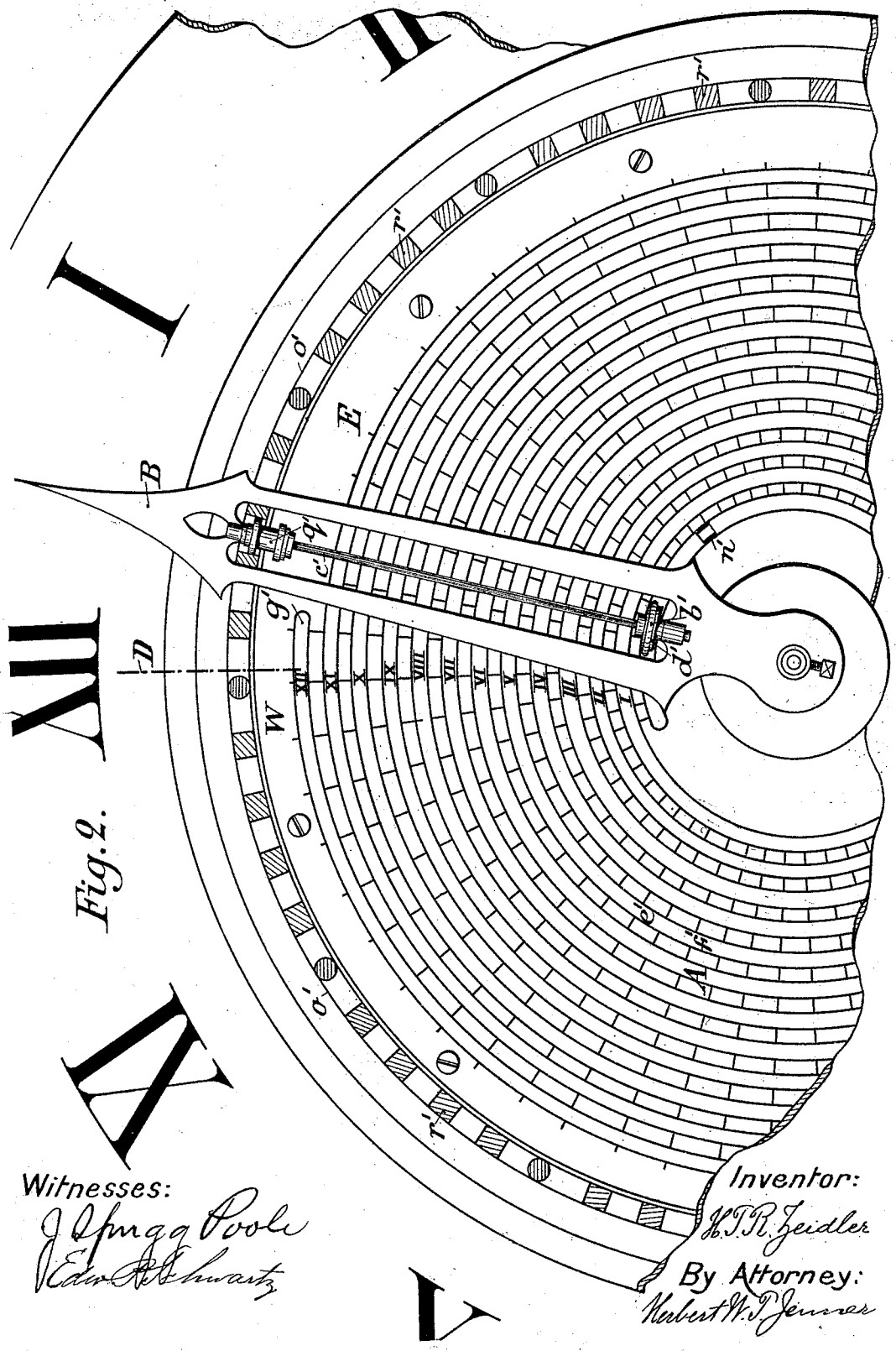

Fig. 2.

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UNITED STATES PATENT OFFICE.

HERMAN THEODOR REINHOLD ZEIDLER, OF BERLIN, GERMANY.

ELECTRIC PROGRAM-CLOCK.

SPECIFICATION forming part of Letters Patent No. 553,890, dated February 4, 1896.

Application filed June 29, 1895. Serial No. 554,422. (No model.)

To all whom it may concern:

Be it known that I, HERMAN THEODOR REINHOLD ZEIDLER, a subject of the German Emperor, residing at Berlin, in the German Empire, have invented certain new and useful Improvements in Electric Signal or Time-Alarm Clocks; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to time-alarm clocks for giving electric signals at one or more places upon a prearranged program.

This invention consists in the novel construction and combination of the parts hereinafter fully described and claimed.

In the drawings, Figure 1 is a vertical section through a portion of a program-clock constructed according to this invention. Fig. 2 is a front view of the same. Fig. 3 is a detail view taken in section on the line *a b* in Fig. 1. Fig. 4 is a detail longitudinal and cross section through one of the contact-pieces. Fig. 5 is a front view of a portion of the wheel *x* and the mechanism for operating it.

A is the dial-plate of the program-clock, which is preferably provided with a glass front of approved construction.

B is the minute-hand, and D is the hour-hand.

The dial need not be provided with figures or numerals, as the device can be placed in a cellar or other dark place, and when unprovided with numerals the plate A becomes an ordinary plate or flat disk, and the minute-hand B becomes a mere rod, which projects laterally of the central driving-shaft.

A train of clock-driving mechanism (not shown in the drawings) and of any approved construction is provided, and this train is connected to the main driving-shaft *k*. A shaft *i* is journaled in a frame E inside the clock-case in line with the shaft *k*, and *l* is a coupling-plate of insulating material interposed between the ends of the said shafts and coupling them together. The frame E is of insulating material or is insulated in any approved manner.

A toothed pinion *g* and a toothed wheel *f* are secured upon the shaft *i*. The hour-hand D is secured on a shaft *c*, which also has a toothed wheel *h* secured on it and gearing into the pinion *g*.

The minute-hand B is secured on a tubular shaft *d*, which encircles the shaft *c* and is journaled in the dial-plate A. The dial-plate A is formed of insulating material or is insulated in any approved manner. The shaft *c* is journaled in the frame E and in the tubular shaft *d*.

The tubular shaft *d* is slidable longitudinally on the shaft *c*, and has secured upon it a broad-faced toothed pinion *e*, which gears into the wheel *f*. The toothed wheels and pinions are proportioned so that the minute-hand makes twelve revolutions while the hour-hand makes one revolution, the same as an ordinary clock.

An internal toothed wheel *x* is journaled in a ring *x'*, which is secured to the back of the dial A. A toothed pinion *r* is secured on the tubular shaft *d*, and *w* is an idle toothed wheel journaled on the pin *v* projecting from the back of the dial. The idle-wheel *w* gears into the teeth of the pinion *r*, and the wheel *x* is revolved once every twelve or twenty-four hours or any other prearranged period.

A collar *p* is secured on the tubular shaft *d*, and *o* is a spring which normally holds the said shaft pressed to the right, and which also serves as a contact-spring.

A disengaging-lever *m* is provided for pushing the tubular shaft *d* to the left when requisite. This lever is pivoted on the pin *q* carried by the end of the pin *v*, and its lower end bears against the said collar *p*. The upper end *n* of the lever *m* bears against a stop-flange *y* formed on the wheel *x*, and is provided with a hook *a'* which engages with the said flange. The lever *m* is provided for sliding the tubular shaft *d* to the left, and the said flange *y* is provided with a notch *z* at one point of its periphery which permits the lever *m* to be turned on its pivot when the said notch *z* comes opposite the hook *a'*. A cam or detent *s* is also secured on the tubular shaft *d* and the use of this cam will be more fully described hereinafter.

G is an electric bell, signal or annunciator, of any approved construction. This bell is sounded at prearranged intervals of time by

the program-clock. The bell G is shown arranged inside the clock-case, but it is obvious that it can be arranged at a distance from the clock and that a number of bells G can be included in series in the wire m' through which the electricity is supplied to actuate the bell.

The dial-plate A has a spiral groove f' formed in it, and on the front of the said dial-plate a program or contact plate A′ is secured. The program-plate A′ is formed of conducting material, and when the dial-plate is not formed of non-conducting material the plate A′ is insulated from it in any approved manner. The contact-plate A′ has a spiral guide, preferably consisting of a spiral groove e' corresponding with the spiral groove f', and this groove e' preferably consists of twelve or twenty-four convolutions. Each convolution represents one hour, and each convolution is marked off by radius-lines into sixty minute spaces, as shown in Fig. 2.

The wire m' is operatively connected with the contact-plate A′. This may be accomplished by securing the wire m' direct to the plate, in which case the connection is constant. In order to obtain an intermittent connection between the wire m' and the plate A′, and thereby compel the bell to ring for the same length of time at different intervals during the day, as will be hereinafter more fully explained, a contact-ring o' is secured to the dial-plate concentric with and at a little distance from the contact-plate A′. The contact-ring o' is provided with a series of plates of non-conducting material r' arranged equidistant from each other, or grooves may be used instead of the said plates. A series of contact-surfaces is thereby formed between the plates r'. This series of contact-surfaces may be formed on the plate A′ instead of on the ring o', if desired.

The minute-hand B is provided with an insulated roller q', or any other approved form of contact-piece. This roller runs between collars on the rod c' which forms a part of the minute-hand, and this roller completes the circuit between the ring o' and the plate A′ as long as it is in contact with the contact-surfaces of the said ring between the plates r'. The wire m' is connected to the ring o' by an ordinary binding-screw.

A contact-roller b', or any other approved form of contact-piece, is slidable on the rod c' of the minute-hand and runs in the spiral guide or groove e' of the contact-plate A. Plates of insulating material d' are interposed between the roller b' and the plate A′, but the said roller is always in circuit with the rod c'.

Contact-pieces n' are provided for making the circuit between the roller b' and the plate A′ at prearranged intervals. These contact-pieces n' are channel-shaped in cross-section and have sufficient elasticity to retain their places when pressed into the groove e' at any point.

F is a battery or electricity generator of any approved construction. One pole of the battery is connected with the minute-hand by the sleeve d and spring o, and the other pole is connected with the ring o' including the bell G in the circuit.

The contact-roller b' is moved outwardly along the rod by the convolutions of the spiral groove e' with which it engages as the minute-hand is revolved.

Suppose that it is desired to ring the bell at eight minutes past twelve. A contact-piece n' is pressed into the first convolution upon the eighth section corresponding radially in position with the eighth minute-space after the hour. When the contact-roller b' touches the bottom of the channel-shaped contact-piece n', the circuit is established from the battery F through the spring o, tubular shaft d, rod c', roller b', contact-piece n', contact-plate A′, roller q', contact-ring o' to the bell, and from the bell to the negative pole of the battery. The bell continues to sound as long as the contact-roller b' remains in contact with the contact-piece n'.

It is obvious that any desired number of contact-pieces n' may be inserted in the spiral groove e', so that the bell may be sounded on any prearranged program or schedule.

The function of the contact-ring o' is to equalize the periods during which the bell sounds. The insulating plates r', or grooves, are arranged on the radial minute-lines of the clock and of the contact-plate A′, and the bell only sounds while the contact-roller q' is in contact with the ring o'. By this means all the contact-pieces n' can be of equal size, and each time the bell is sounded it will continue to ring for the same length of time, whether the contact-piece n', which completes the circuit, is in the first or twelfth convolution of the spiral groove e'.

When the contact-roller b' arrives at the end g' of the twelfth convolution of the spiral groove e', it is automatically restored to its original position in the first convolution by automatic disengaging mechanism, which slides the minute-hand B away from the dial-plate. As soon as the roller b' clears the groove e', it slides down the rod c' by gravity, the end g' of the twelfth convolution being arranged to come at the upper part of the dial-plate. When the end g' of the groove comes in any other position, a spring or counter-weight of approved construction can be used to slide the roller along the rod automatically.

The position of the hour-hand D is indicated by a dotted line in Fig. 2 for the sake of clearness.

An electromagnet t is provided for operating the disengaging-lever m and thereby sliding the minute-hand away from the dial-plate. This electromagnet is energized periodically. A lever h' is pivoted to the frame E and projects through a hole in the same into the path of the cam s. This lever h' carries a contact-screw i', which is connected to the electromagnet by the wire l'. A spring k' is secured

to the frame E in the path of the contact-screw i', and this spring is connected to the battery F by the wire l''. The other pole of the battery is provided with a wire also leading to the electromagnet. When the cam s tips up the lever h', it makes the circuit, and the electromagnet is energized by the battery. This occurs once every hour, but the lever m is not operated until the notch z comes in front of the hook a' and releases it. When the lever m is released it slides the tubular shaft d longitudinally and moves the contact-roller b' clear of the spiral groove e'. A stop-collar s' is provided on the rod c' to prevent the roller b' from sliding too far down it. The spring o restores the tubular shaft d to its original position, and causes the contact-roller to re-engage with the groove e', as soon as the cam s releases the lever h'. The lever h' resumes its original position by gravity and may be assisted by a spring, if desired.

Various other means for automatically sliding the shaft d longitudinally may be used. For instance, a tappet u may be formed on the wheel x, as indicated by the dotted line in Fig. 1, and this tappet may be arranged to push back the upper part of the lever m, when the hook a' is opposite the notch z of the flange y, and the electromagnet may be dispensed with.

This program-clock is used for giving simultaneous signals at different places—as, for instance, in the departments of a factory or school or in hotels for awakening all the guests at a certain hour—and it is also used with a single bell for giving signals upon a prearranged program.

What I claim is—

1. The combination, with a program-plate provided with a spiral guide, of a longitudinally-slidable central shaft provided with a laterally-projecting rod, a contact-piece slidable on the said rod and movable laterally therewith into and out of engagement with the said spiral guide, and a spring normally holding the said contact-piece in engagement with the guide, substantially as set forth.

2. The combination, with a program-plate, and a contact-ring insulated from and surrounding the said plate, one of the said parts being provided with a series of contact-surfaces on its face, of a central shaft provided with a laterally-projecting rod carrying a contact-piece, overlapping the adjacent edges of the said plate and ring and operating to establish a series of connections between the said plate and ring, substantially as set forth.

3. The combination, with a plate of non-conducting material provided with a spiral groove, and a contact-plate provided with a similar spiral groove, of a central shaft provided with a laterally-projecting rod, a contact-piece slidable on the said rod, a stationary contact-piece engaging with the said grooves and arranged in the path of the aforesaid contact-piece, a ring insulated from the said contact-plate and provided with a series of contact-surfaces, and a contact-piece carried by the said rod and completing the circuit periodically between the said plate and ring, substantially as set forth.

4. The combination, with a program-plate provided with a spiral guide, and a slidable contact-piece engaging with the guide, of driving mechanism for supporting the contact-piece and moving it along the guide, means—such as a spring—for holding the contact-piece in the guide, and automatic disengaging mechanism operating to slide the contact-piece out of the guide when it arrives at the outer end thereof, substantially as set forth.

5. The combination, with the minute-hand of a clock and its supporting-shaft, of a program-plate provided with a spiral guide, a contact-piece carried by the said hand, a spring pressing the said shaft in one direction and normally holding the said contact-piece in the guide, and disengaging mechanism controlled by the motion of the clock and operating automatically to slide the said shaft in the opposite direction and move the said contact-piece clear of the guide at prearranged intervals, substantially as set forth.

6. The combination, with the minute-hand of a clock and its supporting-shaft, of a program-plate provided with a spiral guide, a contact-piece carried by the said hand and automatically slidable toward the said shaft when clear of the said guide, and a stop carried by the said hand and operating to arrest the said contact-piece opposite the inner end of the guide, substantially as set forth.

7. The combination, with a dial-plate, a spiral guide in front of the dial-plate, and a slidable shaft having secured thereon a toothed pinion and a hand carrying a contact-piece engaging with the said guide; of an internal toothed wheel journaled behind the dial-plate and provided with a notched flange, a toothed idle-wheel operatively connecting the said pinion and wheel, and a pivoted lever provided with a hooked end engaging with the said flange and operating to slide the said shaft and move the contact-piece clear of the guide when the said hooked end is drawn back through the notch in the said flange, substantially as set forth.

8. The combination, with a slidable shaft, a wheel provided with a notched flange and revolved from the said shaft, and a lever for sliding the shaft, said lever being provided with a hooked end engaging with the said flange; of automatic retracting devices operatively connected with the said shaft and arranged to operate the said lever when the notch in the said flange comes opposite its hooked end, substantially as set forth.

9. The combination, with a slidable shaft, a wheel provided with a notched flange and revolved from the said shaft, and a lever for sliding the said shaft, said lever being provided with a hooked end engaging with the said flange; of an electromagnet arranged be-

hind the said lever and operating to retract its hooked end through the notch in the flange, substantially as set forth.

10. The combination, with a program-clock operating to give signals upon a recurrent program, said clock being provided with a contact-piece slidable longitudinally on one of its hands, and a stationary spiral guide carrying contact-pieces and controlling the movement of the aforesaid contact-piece; of an electromagnet, intermittent operating devices causing the said electromagnet to be energized automatically at the end of each program, and disengaging devices actuated by the said electromagnet and operating to restore the said slidable contact-piece to the position occupied by it at the beginning of the program, substantially as set forth.

11. The combination, with a program-clock operating to give signals upon a recurrent program, said clock being provided with a contact-piece slidable longitudinally on one of its hands, and a stationary spiral guide carrying contact-pieces and controlling the movement of the aforesaid contact-piece, of an electromagnet, a cam driven by the said clock, a pivoted lever arranged in the path of the said cam and operating when actuated thereby to switch an electric current into the said electromagnet, and disengaging mechanism actuated by the said electromagnet and operating to restore the said slidable contact-piece to the position occupied by it at the beginning of the program, substantially as set forth.

12. The combination, with an insulated contact-plate provided with a spiral-guide groove, of an insulated minute-hand provided with appropriate driving mechanism and a slidable contact-piece controlled by the said guide-groove, a trough-shaped contact-piece sprung into the said groove and permitting the said slidable contact-piece to pass through it in its passage along the said guide-groove, an electric signal, an electricity-generator, and wires connecting the said generator with the said hand and plate respectively and including the said signal in the circuit, whereby the said signal is operated while the two said contact-pieces are together, substantially as set forth.

13. The combination, with an insulated contact-plate provided with a spiral guide, and an insulated contact-ring surrounding the said plate, one of the said parts being provided with a series of equidistant and equal contact-surfaces; of an insulated minute-hand provided with appropriate driving mechanism, a slidable contact-piece b' controlled by the said guide, and an insulated contact-piece q' operating to establish a circuit periodically between the said plate and ring; a stationary contact-piece n' carried by the said plate and arranged in the path of the said slidable contact-piece, an electric signal, an electricity-generator, and wires connecting the said generator with the said hand and ring respectively and including the said signal in the circuit, whereby the said signal is operated for the same length of time while the two contact-pieces b' and n' are together irrespective of the convolution in which the contact-piece n' is placed, substantially as set forth.

In testimony whereof I have affixed my signature in presence of two witnesses.

HERMAN THEODOR REINHOLD ZEIDLER.

Witnesses:

EMIL KOLLINER,

MAX WAGNER.