No. 816,938. PATENTED APR. 3, 1906.

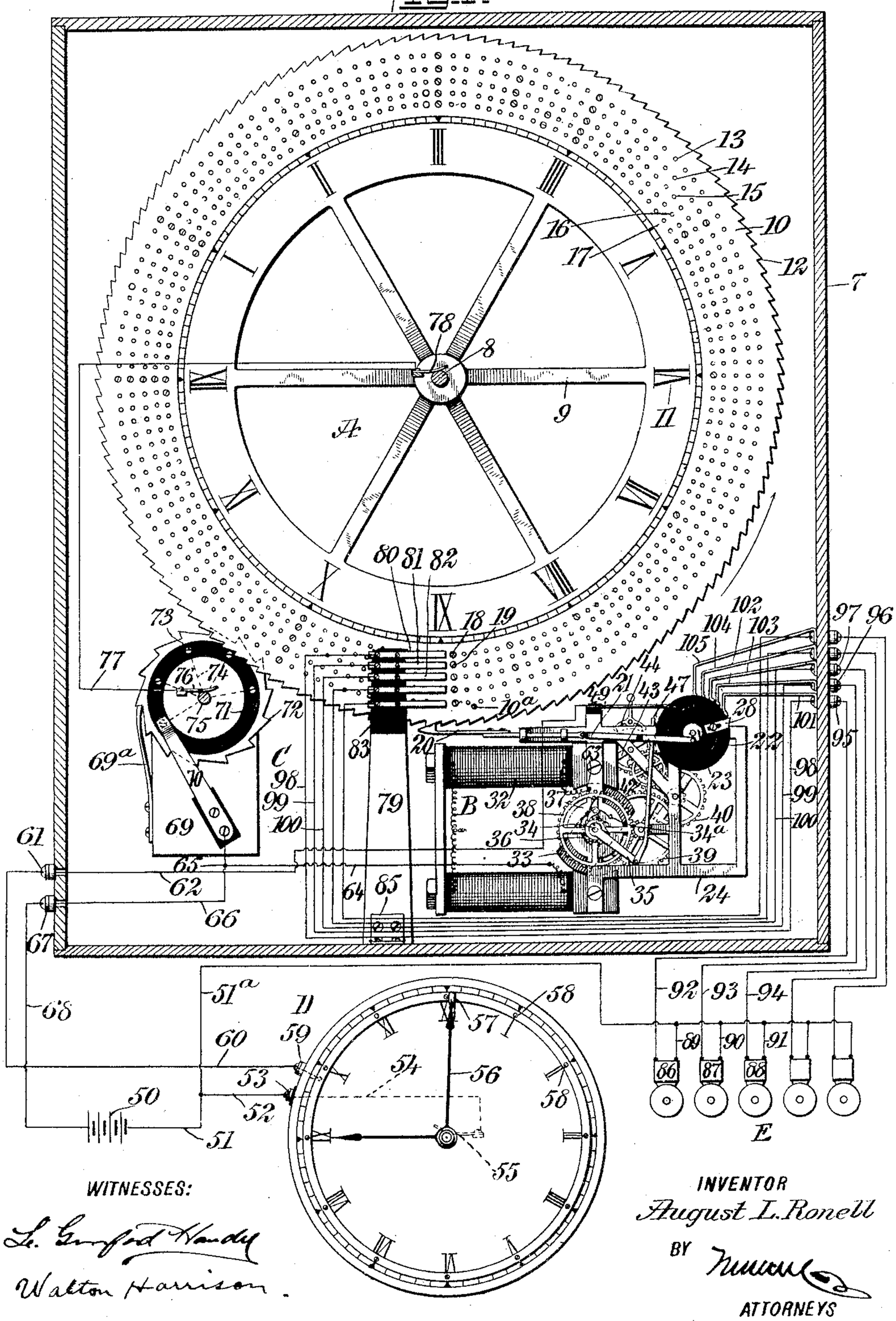
A. L. RONELL.

ELECTRIC PROGRAM CLOCK.

APPLICATION FILED MAR. 10, 1905.

3 SHEETS—SHEET 1.

FIG. 1.



WITNESSES:

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Walton Harrison.

INVENTOR

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3 SHEETS—SHEET 2.

FIG. 7.

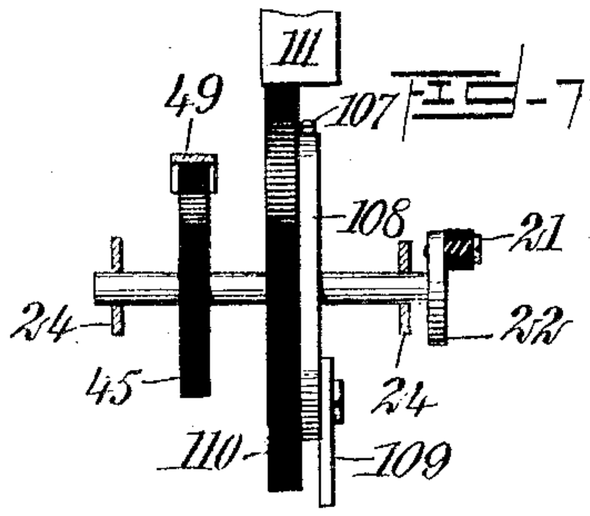


FIG. 2.

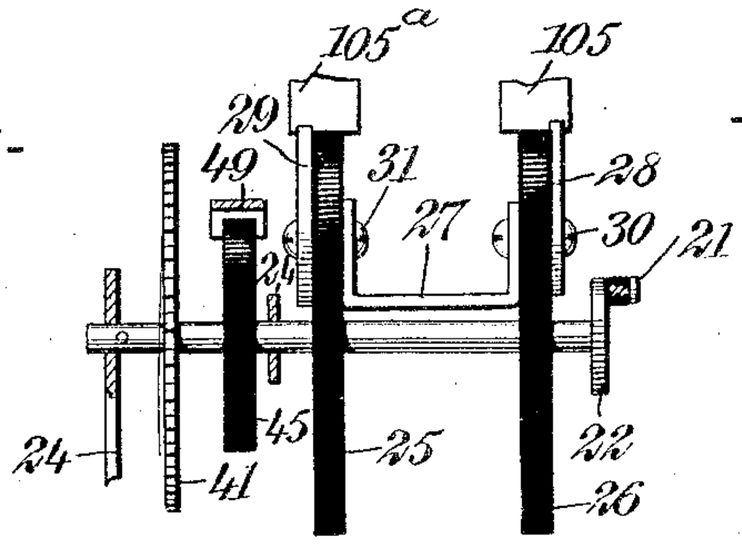


FIG. 6.

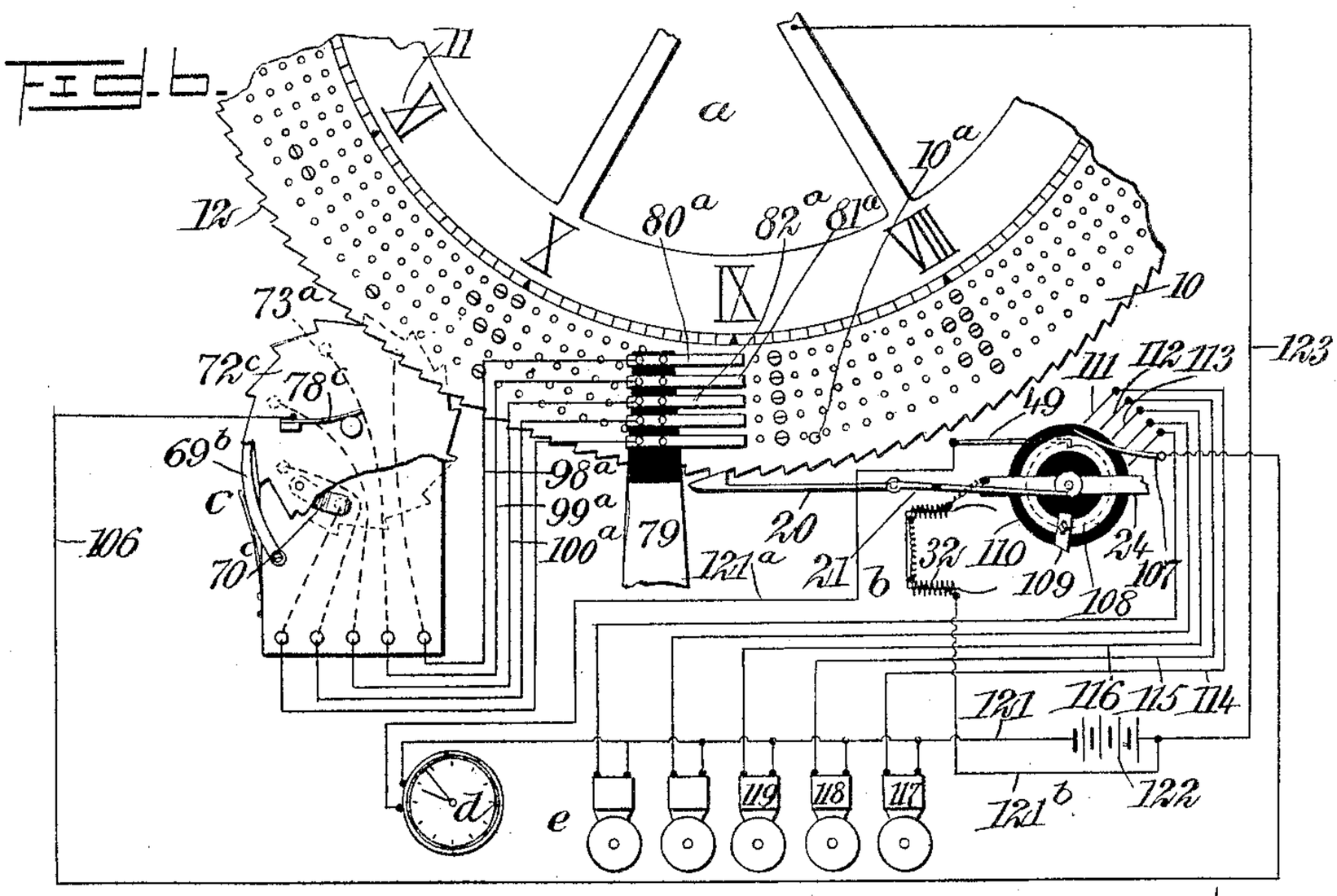


FIG. 3.

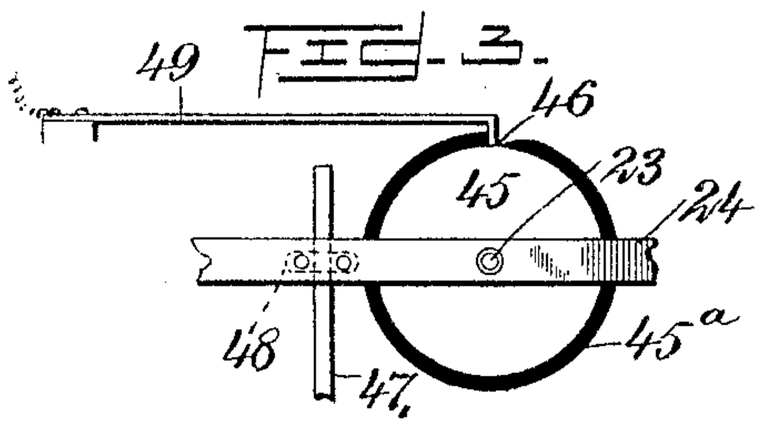


FIG. 4.

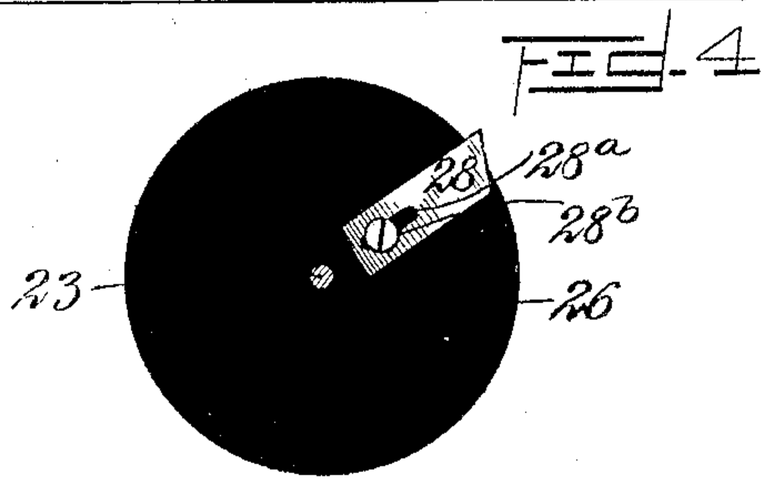
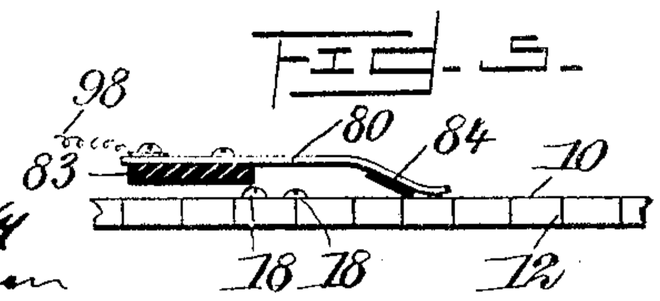


FIG. 5.



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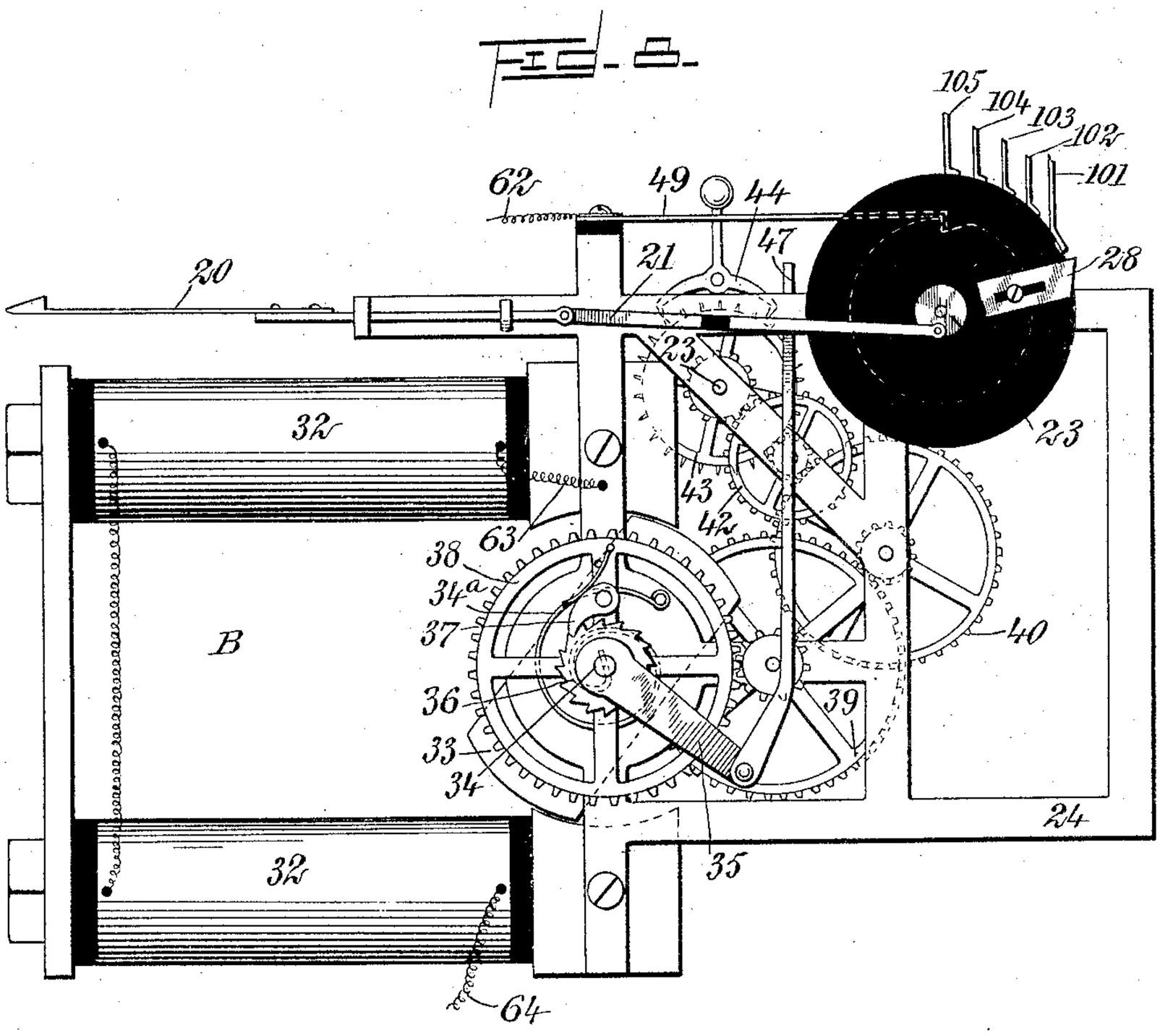
3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

AUGUST LEONARD RONELL, OF FOREST CITY, IOWA.

ELECTRIC PROGRAM-CLOCK.

No. 816,938. Specification of Letters Patent. Patented April 3, 1906.

Application filed March 10, 1905. Serial No. 249,389.

To all whom it may concern:

Be it known that I, AUGUST LEONARD RONELL, a citizen of the United States, and a resident of Forest City, in the county of Winnebago and State of Iowa, have invented a new and Improved Electric Program-Clock, of which the following is a full, clear, and exact description.

My invention relates to electric program-clocks suitable for use in institutions of learning, factories, public offices, and in all relations where it may be desired to periodically actuate a number of alarms located in different parts of a building or buildings.

The present invention constitutes an addition to another invention described in my Letters Patent No. 737,965, dated September 1, 1903, for a time-controlled electric alarm.

My present invention has quite a number of separate objects, among which are the following: first, to economize battery power; second, to provide a system in which any desired timing-clock may be employed by making in it comparatively trivial changes; third, to readily prevent certain alarms from being actuated temporarily without interfering with other alarms, and, fourth, to provide certain constructional details hereinafter described and tending to promote efficiency, simplicity, and reliability in the action of the alarm.

Reference is to be had to the accompanying drawings, forming a part of this specification, in which similar characters of reference indicate corresponding parts in all the figures.

Figure 1 is a vertical section through the casing, showing most of the working parts and also showing diagrammatically the wiring of the system. Fig. 2 is an enlarged sectional detail showing the bridge connection for certain contact members and which is hereinafter more particularly described. Fig. 3 is a side elevation of the contact-commutator 45 and its accompanying parts. Fig. 4 is a side elevation of the cam-wheel 26, carrying one or more contact-cams 28. Fig. 5 is a fragmentary side elevation of one of the contact-brushes for the time-wheel 10. Fig. 6 is a fragmentary front elevation of a general form of apparatus differing from that shown in Fig. 1; and Fig. 7 is an enlarged sectional detail showing a contact-disk of the kind used in connection with the circuits shown in Fig. 6, this contact differing from that shown in Fig. 2. Fig. 8 is an enlarged front elevation of the motor mechanism B shown in the lower right-hand portion of Fig. 1.

In the system shown in Fig. 1 it is the intention to operate several distinct programs at the same time, while in that shown in Fig. 6 it is intended to operate automatically a different program each day in the school week. In other words, in Fig. 1 any one, two, three, or more alarms may be sounded, the others remaining silent, while in Fig. 6 all of the alarms are sounded in rapid succession in accordance with a single uniform time-table differing upon different days of the week. While in both Fig. 1 and Fig. 6 I show single bells, I do not limit myself to this arrangement, for obviously any number of bells may be substituted for any single bell shown in either figure.

Briefly summarized, the system comprises a time-wheel A *a*, motor mechanism B *b* for making and breaking contact and for moving said time-wheel step by step, auxiliary switches C *c* for throwing the alarm mechanism out of action upon certain days of the week, a timing-clock D *d* for automatically exercising supervisory control over the entire system, and the alarms E *e*, consisting, preferably, of bells located in different parts of a building.

Mounted centrally within a casing 7 is a revoluble shaft 8, upon which is mounted a spider 9, bounded by an annular disk 10, the spider and disk together constituting a member which I term a "time-wheel." This member is provided with ordinals 11, representing the twelve hours of the day, and is further provided with ratchet-teeth 12, whereby it may be rotated. The time-wheel is further provided with a pin 10^a, projecting slightly below its under surface, and with a plurality of separate circles 13, 14, 15, 16, and 17, made up of holes, the holes in each circle being spaced apart a distance commensurate with the distance between two consecutive teeth 12. A number of contact-screws 18 19 may be secured to the time-wheel, being inserted within appropriate holes in the circles mentioned. A slidably-mounted pawl 20 is pivotally connected with a pitman 21, actuated by a pitman-wheel 22, which is rigidly mounted upon a revoluble shaft 23. This shaft is journaled in framework 24, and mounted rigidly upon it are cam-disks 25 26, connected together by a metallic bridge 27. Each cam-disk 25 26 carries one or more con-

tact-cams 28 29, each cam being provided with a slot 28[a], through which passes an adjustable screw 28[b], for enabling the cam to be adjusted toward or from the shaft 23, as will be understood from Fig. 4. By virtue of this adjustment the outer end of the cam can be made to project a greater or lesser distance beyond the circumference of the cam-disk. The cams 28 29 are in metallic communication with the metallic bridge 27, being connected thereto by metallic screws 30 31.

An electromagnet 32 is provided with a bipolar armature 33, mounted rigidly upon a rocking shaft 34. A crank 35 is likewise rigidly mounted upon this shaft and is free to move angularly when the latter is rocked. A ratchet-wheel 36 is disposed adjacent to the crank 35 and is mounted rigidly upon the shaft 34 in such position as to engage a pawl 37, carried by a gear-wheel 38. This gear-wheel 38 is loose upon the shaft 34. When the shaft 34 is rocked, the ratchet-wheel 36 is also rocked, and at each forward movement—that is, each movement in a clockwise direction, as seen in Fig. 1—the ratchet-wheel 36 carries the pawl 37 around a slight distance. The pawl 37 therefore moves step by step around the rocking shaft 34 considered as a center, and the wheel 38 therefore rotates step by step. It occupies this position when at rest. When the armature is attracted by the magnet 32, it rocks in a vertical position and merely winds the spring 34[a] without directly affecting any part of the gearing. When, however, the magnet is deënergized, it releases the armature, and consequently releases the shaft 34, and the latter being actuated by the spring 34[a] transmits motion from the wheel 38 through a train of gearing including wheels 39, 40, 41, (the latter wheel being shown in Fig. 2,) and 42 to a scape-wheel 43 and thence to an escapement 44. Therefore the wheel 43 when turned communicates rotation to the shaft 23, upon which it is rigidly mounted. A revoluble contact-wheel 45 of metal (see Fig. 3) is provided with a circumferential sleeve 45[a] of insulating material, the latter being cut away at 46, so as to form a notch at which the outer surface of the metallic wheel is exposed. A thrust-rod 47 is pivoted upon the outer end of the crank-arm 35 and loosely engages a guide 48 on the frame 24. The periodical rocking of the crank-arm 35 causes the thrust-rod 47 to move upwardly and engage a contact-hook 49, so as to raise the same out of the notch 46, as will be understood by reference to Fig. 3.

A battery 50 is common to the entire system. From this battery a wire 51 connects with a wire 52, and the latter leads to a binding-post 53 upon the timing-clock D. From this binding-post a wire 54 leads to a brush 55, which is in electrical communication with the minute-hand 56 of the clock. This minute-hand carries a sliding contact-brush 57, the latter being adapted to make periodical engagement with a number of contact members 58, spaced apart at intervals representing five minutes each, as will be understood from the lower portion of Fig. 1. The contact members 58 are in electrical communication with each other and with a binding-post 59. The latter is connected by a wire 60 with a binding-post 61 upon the casing 7. From the binding-post last mentioned a wire 62 leads to the contact-hook 49.

The framework 24 of the motor mechanism B is connected by a wire 63 with the electromagnet 32, the latter being connected by a wire 64 with a junction 65 from the wire 66, which leads to a binding-post 67. From this binding-post a wire 68 leads to the battery 50. An auxiliary switch 69, provided with a spring-pawl 69[a], is mounted at a point adjacent to the rim of the timing-wheel and is provided with a brush 70, connected with the wire 66 and properly insulated. An annulus 71 of insulating material is mounted upon a toothed wheel 72 and is provided with removable screws 73, which are in communication by means of wires 74 with a shaft 75, this shaft and the toothed wheel 72 being rigidly connected together and being revoluble. A brush 76 engages the shaft 75 and is connected by a wire 77 with another brush 78, which engages the revoluble shaft 8, carrying the time-wheel 10. A standard 79 is provided at its upper end with a series of contact-brushes 80, 81, and 82, any number being employed. These brushes are insulated from each other and from the standard 79 by means of a plate 83 of insulating material. The under side of each brush is provided with a plate 84 of insulating material, as indicated in Fig. 5. The standard 79 is movably connected with the casing 7 by means of a hinge 85, whereby the standard 79 can be inclined, or, in other words, its top may be moved away from the time-wheel, so as to prevent the possibility of electrical communication with it. This arrangement also permits ready accessibility to different parts of the time-wheel, and this is necessary, as, for instance, when it is desirable to place one or more contact-screws 18 19 in the lower part of the time-wheel and for removing them from the frame.

A number of alarms are shown at E and preferably consist of bells 86, 87, and 88, any number of which may be employed. It will be understood, of course, that while the drawing is shown diagrammatically these alarms may be distributed over different parts of a building or even located in different buildings. It will also be understood that while I preferably use bells I am not limited thereto, as I may employ any equivalent devices for attracting attention. The several alarms are connected in parallel with each

other by means of wires 89, 90, and 91 and with a wire 51[a], which connects with a wire 51, leading to the battery 50. The several alarms are also connected by wires—such as 92, 93, and 94—with a series of binding-posts—such as 95, 96, and 97—mounted upon the exterior of the casing 7. A series of wires 98, 99, and 100 are connected with brushes—such as 101, 102, 103, 104, and 105—which are provided for the cam-disk 26, these brushes being duplicated for the cam-disk 25, the several duplicate brushes, such as 105[a], being connected, respectively, with the binding-posts 95, 96, and 97. Each brush engaging the cam 26 thus coacts with a similar brush engaging the cam-disk 25. The manner of doing this is indicated in Fig. 2, where is shown the connection between the top brushes 105 and 105[a], the parts being adapted to communicate with each other through the contact members 28 29 and the bridge 27. As above explained, the armature 33 normally occupies a position slightly displaced from the vertical, in which position it is held by the spring 34[a], so that when the shaft 34 is rocked in a contra-clockwise direction, according to the view shown in Fig. 1, the spring is slightly wound and the armature becomes vertical, yet the instant the armature is free it rocks back into position indicated, carrying with it in its rotation the shaft 34. The parts being in position as indicated in Fig. 1 and the timing-clock D being in motion, the minute-hand 56 of course turns in the usual manner. The contact-brush 57 therefore periodically touches the respective contact members 58, and each time it touches one of these contact members a motor-circuit is completed, as follows: battery 50, wire 51, wire 52, binding-post 53, wire 54, brush 55, minute-hand 56, contact members 57 58, binding-post 59, wire 60, binding-post 61, wire 62, hook 49, contact-disk 45, (see Fig. 3,) shaft 23, framework 24, wire 63, (see Fig. 1,) electromagnet 32, wire 64, junction 65, wire 66, binding-post 67, and wire 68 back to battery 50. This circuit momentarily energizes the electromagnet 32 and causes the armature 33 to assume its vertical position, as above described. In doing this it causes the shaft 34 to rock and raise the crank-arm 35, thus causing the thrust-rod 47 to lift the hook 49 out of the notch 46. This lifting of the hook 49 opens the circuit above traced and leaves the shaft 34 and spring 34[a] free to move the armature 33 back into its normal position, so that the ratchet-wheel 36 by engaging the pawl 37 carries the wheel 38 a step forward in its revolution. The wheel 38 being thus turned in a clockwise direction to an extent representing a small fraction of a revolution communicates rotation to the train of gear-wheels 39, 40, 41, 42, and 43, thus causing the shaft 23 to make a complete revolution, which is stopped by the brush 49, thereby engaging the notch 46. A complete revolution of the shaft 23, therefore, represents the angular displacement of the armature 33 necessary to restore the latter to its normal position. The rotation of the shaft 23 leaves the brush 49 in the notch 46, thus restoring this part of the circuit; but in the meanwhile the hand 56 has moved in such position that the contact member 57 no longer engages one of the contact members 58 in the timing-clock. The motor-circuit is therefore normally open and is closed at five minute intervals, and each time it is closed the shaft 23 makes one complete turn. Each of these turns causes the pawl 20 to be drawn to the right, as seen in Fig. 1, and as the pawl successively engages the teeth 12 of the time-wheel the latter is at the expiration of each successive period of five minutes moved a step in the direction indicated by the arrow in Fig. 1—that is, a distance representing the distance apart of any two consecutive teeth 12.

When one of the contact-brushes 80, 81, and 82 is engaged by one of the contact members 18 19, electric communication is made between the time-wheel 10 and the particular brush affected. The insulating-plates 84 (shown more particularly in Fig. 5) prevent premature and accidental connection between the brush and the time-wheel, as will be understood from Fig. 5.

The frame of the auxiliary switch (shown at C in Fig. 1) is for the purpose of leaving the circuits open upon certain days of the week—for instance, on Saturdays and Sundays. This is done by regulating the number of contact-screws 73 with which the annulus 71 is provided. The rotation of the time-wheel causes the pin 10[a] to engage one of the teeth 72 of the auxiliary switch, so as to move one of the contact-screws 73 a distance representing one-fourteenth of a revolution. By this means if seven of the contact-screws 73 are employed and spaced equidistant the wire 77 will always be in metallic communication with the brush 70 during the day-time, but not at night. If, however, one or more of the contact-screws 73 are removed—as, for instance, those representing Saturday and Sunday—it is obvious that the annulus 71 is, so far as those days are concerned, a mere blank and that upon those particular days there is no electrical communication between the brush 70 and the wire 77, so that upon the days of the week thus affected the brushes 80, 81, and 82 in engaging their appropriate contact members, such as 18 19, are unable to sound any of the alarms E. Suppose now that the brush 70 engages one of the contact-screws 73, as indicated at the left in Fig. 1, and that the timing-clock D has just closed the motor-circuit above traced, causing the time-wheel to be rotated a distance representing the width of one of

the teeth 12, and that one of the contact-brushes 80, 81, and 82—say, for instance, the one numbered 80—is engaged electrically by contact member 18. The following circuit is thereupon completed: battery 50, wire 68, binding-post 67, wire 66, brush 70, one of the removable contact-screws 73, shaft 75, brush 76, wire 77, brush 78, shaft 8, time-wheel 10, one or more of the contact members 18 19, one or more of the brushes 80, 81, and 82, wires 98, 99, and 100, one or more of the brushes 101, 102, and 103, thence through the bridge 27 to the corresponding brushes upon the opposite side thereof, thence through wires 92, 93, and 94 to the bells 86, 87, and 88, and thence by wire 51[a] back to the battery. It will be understood, however, that this circuit is only completed while the cam-disks 25 26 are in motion, and when the cams 28 29 are in actual engagement with the brushes 101, 102, 103, 104, and 105 each set of these brushes as have circuits otherwise complete the circuit by virtue of the engagement of the contact members 18 19 with the proper brushes 80 81 82, &c. While the bells 86, 87, and 88 are sounded at practically the same instant, they are in reality sounded in a particular consecutive order and are hence energized one at a time, provided there be only one in each circuit. This being so, the battery power may be just sufficient to ring a single bell. By adjusting the cam 28 toward or from the shaft 23 the operation of the ringing of the bells is apportioned at will.

In the respect last mentioned my present invention does not differ materially from that disclosed in my patent to which reference is made above. Of course inasmuch as the rotation of the disks 25 26 is stopped mechanically by the hook 49 the disks 25 26 need not revolve during the entire period of five minutes, and their movement can be shortened by properly proportioning the length of the pendulum in the motor mechanism.

In the form shown in Fig. 6 the time-wheel and its connections are shown at *a*, an auxiliary switch of a form differing from that designated C is shown at *c*, and a slightly-different form of motor mechanism at *d*. In the auxiliary switch *c* a toothed disk 72[c] is revolubly mounted and held against reverse rotation by a pawl 69[b]. Said disk is provided with a brush 70[c], which periodically engages a number of contact members 73[a]. The disk 72[c] is turned by being engaged by the pin 10[a]. The several contact members 73[a] are connected by as many wires 98[a], 99[a], and 100[a] with appropriate contact-brushes 80[a], 81[a], and 82[a], and these contact-brushes are energized as above described. The contact-brush 78[c] is connected by a wire 106 with a brush 107, which engages a metallic ring 108, which is provided with an adjustable cam 109 and is mounted upon a revoluble disk 110 of insulating material. This disk corresponds to the disks 25 26, (shown in Fig. 2,) the rest of the motor mechanism remaining unchanged. The cam 109 successively engages a number of brushes 111, 112, and 113, connected, respectively, with a series of wires such as 114, 115, and 116, leading in turn to a series *e* of bells 117, 118, and 119. The bells are connected in parallel with each other with respect to the wire 121, which runs from the timing-clock *d*, preferably of the construction above described, to the battery 122. A wire 123 is connected with the time-wheel 10, as above described and as indicated diagrammatically in Fig. 6. A wire 121[a] connects the timing-clock *d* with the contact-hook 49, and another wire 121[b] connects the battery 122 with the motor-magnet 32. The motor-circuit in Fig. 6 being completed by the timing-clock *d* is as follows: battery 122, wire 121[b], magnet 32, framework 24, contact-hook 49, wire 121[a], timing-clock *d*, back to battery 122. This starts up the motor mechanism, as above described, and causes the cam 109 to successively engage all of the brushes 111, 112, and 113 and complete any alarm-circuit represented by one of these brushes, as may be otherwise complete—for instance, battery 122, wire 123, time-wheel 10, brush 80[a], wire 98[a], switch *c*, wire 106, brush 107, ring 108, cam 109, all of the brushes 111 112 113, all of the wires 114 115 116 in rapid succession, bells 117 118 119, and wire 121, back to battery 122.

One of the peculiar advantages of the system shown in Fig. 6 is that no greater battery voltage is necessary for several bells than for a single bell, and consequently a single battery of suitable power may operate quite a number of bells. The battery power is conserved by the fact that the switch C, being tripped periodically by the tripping-pin 10[a], leaves the circuit alternately open and closed at intervals of twelve hours. The switch not only conserves the battery power by periodically opening the circuit, but also prevents the alarms from being sounded when they are not wanted and also the operation is entirely automatic.

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

1. The combination of time-controlled mechanism, contacts to be opened and closed thereby, electric motor mechanism to be energized and deënergized by the opening and closing of said contacts, said motor mechanism being provided with a revoluble shaft, disks of insulating material mounted upon said shaft and revoluble therewith, contact members mounted upon said disks, a metallic bridge connecting a contact member of one disk with a contact member of another disk so as to establish electrical connection between

the contact members of said disks, separate brushes to be engaged by said contact members thus brought into electrical communication with each other, and separate alarm mechanisms respectively connected with said brushes.

2. The combination of electric motor mechanism provided with an armature having, when at rest, a certain normal position, a spring for bringing said armature into such position of rest, gearing connected with said armature and provided with a revoluble member having contacts, separate alarms connected with said contacts and adapted to be energized thereby when said revoluble member is rotated, means for temporarily restraining said revoluble member, mechanism connected with said armature for effecting the release of said revoluble member at predetermined intervals, and time-controlled electric mechanism for actuating said motor mechanism at said predetermined intervals.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

AUGUST LEONARD RONELL.

Witnesses:
I. O. LEE,
GEO. R. PETERSON.