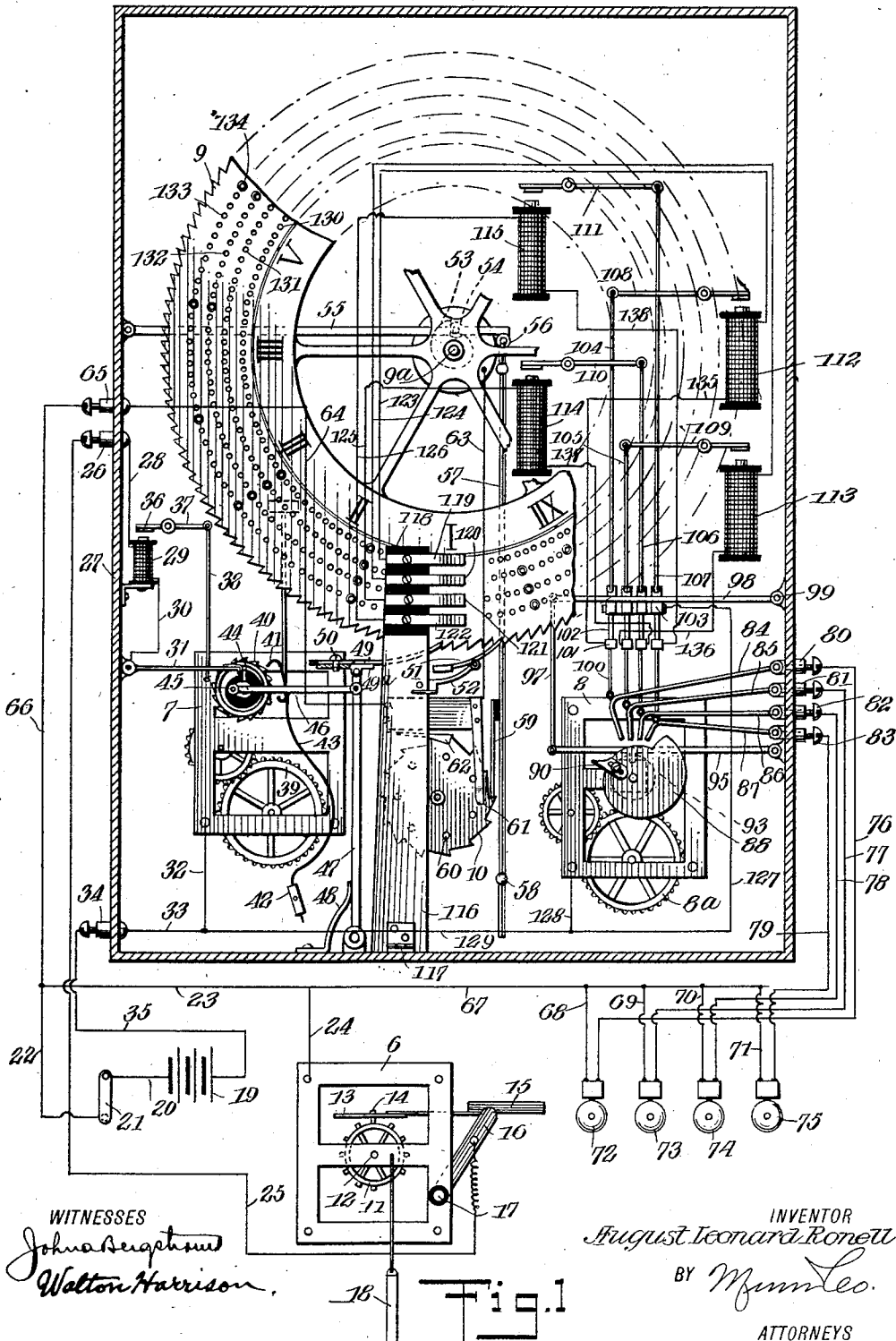


A. L. RONELL.
ELECTRIC PROGRAM CLOCK.
APPLICATION FILED MAR. 31, 1911.

1,016,852.

Patented Feb. 6, 1912.

2 SHEETS—SHEET 1.

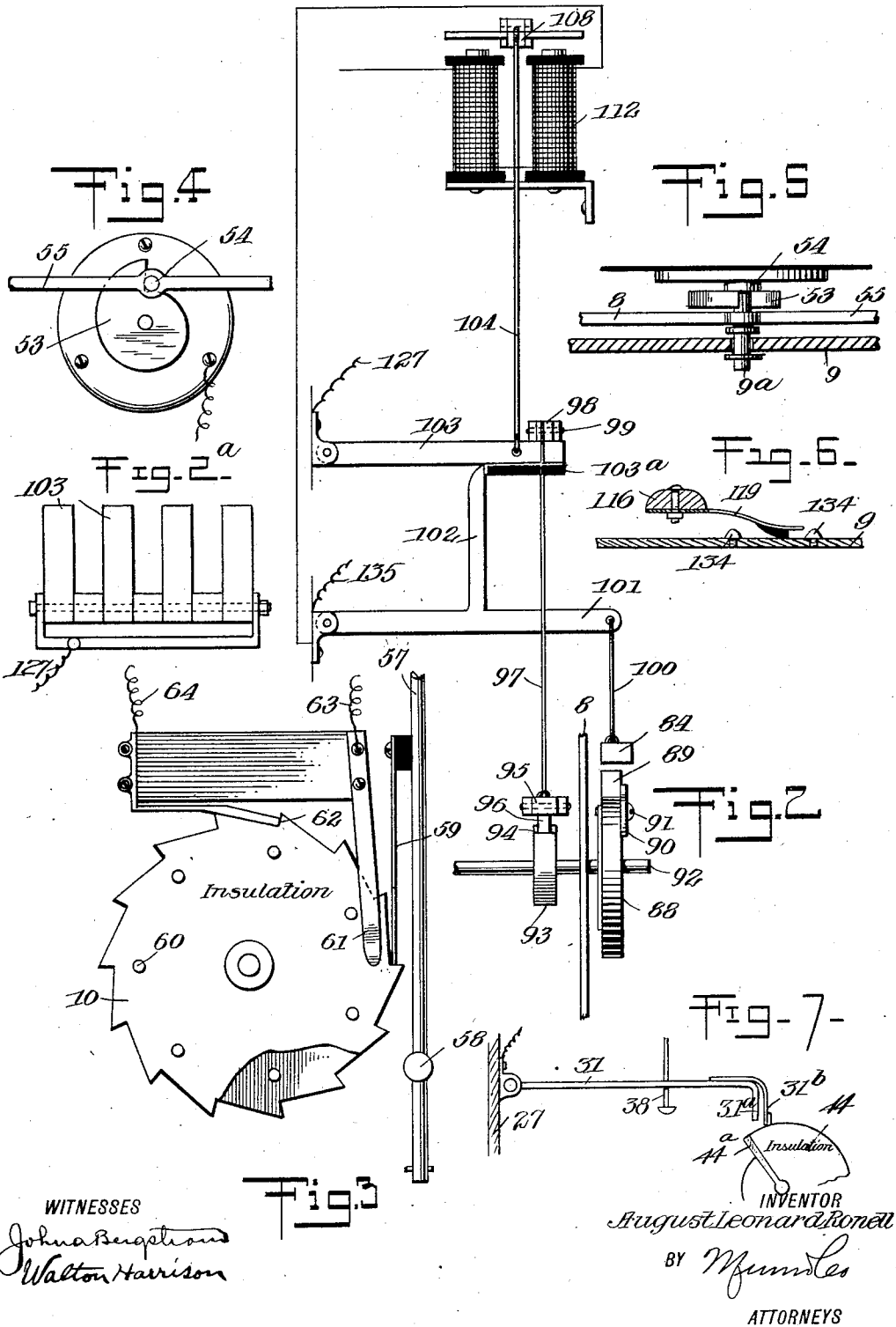


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UNITED STATES PATENT OFFICE.

AUGUST LEONARD RONELL, OF FORT DODGE, IOWA.

ELECTRIC PROGRAM-CLOCK.

1,016,852.

Specification of Letters Patent.

Patented Feb. 6, 1912.

Application filed March 31, 1911. Serial No. 618,106.

To all whom it may concern:

Be it known that I, AUGUST LEONARD RONELL, a citizen of the United States, and a resident of Fort Dodge, in the county of Webster 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 an electrically operated program clock suitable for use in schools, military headquarters, public offices, and in all situations where it may be desired to periodically actuate a number of separate alarms located some distance apart; as, for instance, in different rooms or in different parts of a building or buildings.

My invention embodies certain improvements over the invention described in my two Patents No. 737,965, dated September 1, 1903, and No. 816,938, dated April 3, 1906.

My present invention embodies quite a number of improvements for general purposes which may be summarized by saying that they render the apparatus more efficient, reliable and certain in its action and less liable to get out of order or to give trouble for any cause, and that the mechanism is somewhat simplified.

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

Figure 1 is a view partly in vertical cross section and partly diagrammatic showing the entire construction and the wiring. Fig. 2 is a detail showing practically in elevation, with parts broken away, one of the electrically operated contact levers and the means for restoring it to its normal condition after it is lowered for the purpose of completing the circuit; Fig. 2^a is a detail showing the arrangement of certain levers appearing in Fig. 2; Fig. 3 is a detail showing the calendar wheel and contact mechanism associated therewith used for the purpose of throwing the alarm mechanism out of action on certain days of the week, and at night in school work; Fig. 4 is a detail showing a part of the mechanism for actuating the calendar wheel step by step; Fig. 5 is a detail showing a fragmentary horizontal section of the mechanism appearing in Fig. 4; Fig. 6 is a detail showing the arrangement of the upper row of levers appearing

in Fig. 1; Fig. 7 is a detail showing the mechanism for stopping and starting the spring motor employed for actuating the time wheel.

The apparatus as a whole comprises a number of distinct factors to wit;—a master clock for periodically closing a circuit, a spring motor controllable by electrical mechanism energized periodically by means of said master clock, a time wheel actuated step by step by said electrically controlled spring motor, electric alarm mechanism such as a number of electric bells located in different places and adapted to be energized independently, contact mechanisms connected with the several alarms and controllable to some extent independently of each other, and contact mechanism controllable directly by movements of the time wheel and indirectly by conditions of said time wheel as changed from time to time by the operator, this contact mechanism coacting with the contact mechanisms first-mentioned for controlling the bells; and various magnets, wire connections and other parts for completing the system and causing the various factors enumerated to act in harmony.

The master clock is shown at 6.

At 7 and 8 are two electrically controlled spring motors employed for different purposes as hereinafter described.

At 9 is a time wheel which is turned step by step by aid of the spring motor 7.

At 10 is a calendar wheel, which is turned step by step by aid of the time wheel 9 and has a very slow step by step rotation, making preferably one complete revolution in a week. This calendar wheel is of metal, covered by a sheet of insulating material.

The master clock 6 may be a clock substantially of the usual construction. It is provided with a contact wheel 11 mounted directly upon the minute arbor 12 and rotatable therewith. A contact arm 13 is provided with a metallic contact button 14 which is engaged periodically by the teeth of the contact wheel 11. There are twelve of these teeth so that as the minute arbor makes one revolution during an hour the contact wheel 11 makes a direct contact once every five minutes with the contact arm 13.

At 15 is a lever which carries the contact arm 13 and which is pivotally mounted upon an arm 16, the latter being journaled upon a

stationary pin 17 and so balanced that the arm 13 just makes good contact with the wheel 11 which is insulated from metallic parts of the master clock. The arm 13 is
 5 adjusted relatively to the contact wheel 11 by shifting the arm angularly upon the pin 17 as a center. The arm fits tightly enough upon the pin for this purpose. By thus adjusting the arm 16 the engagement of the
 10 teeth of the contact wheel 11 and the contact arm 13 is controlled to a nicety. This adjustment is necessary in order to bring the contact mechanism into accord with definite positions of the hands of the master clock.
 15 At 18 is a pendulum which has the usual construction and action, and thus no essential part of my invention.

A battery is shown at 19. A wire 20 leads from this battery to a hand switch 21 and connected to the latter is a wire 22. This wire connects to a wire 23 and from the latter a wire 24 leads to the metallic frame work of the master clock. A wire 25 is connected with the arm 16 and leads to a binding post 26, which is mounted upon a casing 27, the latter being preferably insulated, although metal may be employed if suitable precaution be taken to insulate it. A wire 28 is connected with a binding post 26 and
 30 with a magnet 29. A wire 30 leads from this magnet to a metallic pawl 31. This pawl is provided at its free end with a downturned portion 31^a and also with a contact spring 31^b which is also bent downward and extends below the downturned portion 31^a
 35 as indicated more particularly in Fig. 7. A wire 32 leads downwardly from the metallic framework of the motor 7 and is connected with a wire 33 the latter leading to a binding post 34. A wire 35 leads from this binding post to the battery 19. The magnet 29 is provided with an armature 36, the latter being carried by an armature lever 37, which is mounted to rock, and connected with this
 45 lever is a rod 38 which is secured to the pawl 31 and is adapted to lift the same each time the armature 36 is attracted by the magnet 29.

The spring motor 7 contains a train of
 50 gearing 39 and a scape wheel 40. Associated with the latter are pallets 41. The scape wheel and pallets constitute an escapement. A pendulum 42 is connected with this escapement and coacts with it in the manner
 55 well known for controlling the speed of a spring motor. The pendulum is carried by a pendulum rod 43. Journaled within the motor is a cam wheel 44 of insulating material, which, like the scape wheel 40, turns in a
 60 contra-clockwise direction according to Fig. 1. The cam wheel 44 has the form of a simple spiral and is provided with a shoulder adapted to lodge against the contact spring 31^b of the pawl 31. This pawl consequently tends to prevent the rotation of

the cam wheel 44 and normally maintains the spring motor in a state of inactivity. Each time the magnet 29 is energized, however, and the armature lever 37 is rocked, the pawl 31 is lifted momentarily, the contact
 70 spring 31^b moves away from the wheel 44 and the motor 7 thus liberated starts into action and continues to run until stopped by the lodgment of the shoulder of the cam wheel 44 against the end of the pawl 31.
 75 The cam wheel 44 carries a crank pin 45 and journaled upon this crank pin is a rod 46 which is pivotally connected with a swinging lever 47. A leaf spring 48 engages this rocking lever adjacent to its lower ends. 80 The purpose of the leaf spring is to equalize the work of the spring motor. The rocking lever 47 is pivotally mounted at its lower end upon the casing 27 and at its upper end carries a pawl plate 47^a. This pawl plate
 85 carries a pawl 49 which is adjustable relatively to the plate by aid of a screw 50 extending through a slot in the pawl. The operator by loosening the screw can adjust the pawl 49 to the right or left as desired so
 90 as to turn the time wheel 9 step by step to the precise points necessary to make good electrical communication through the wheel 9 as hereinafter described. The pawl loosely
 95 engages the time wheel 9, which is provided at its outer edge with teeth. There are 144 of these teeth which in general appearance are not unlike those of a circular saw. At 51 is a pawl which is pivotally mounted upon a bracket 52. The purpose of the pawl 51
 100 is to prevent backward movement of the time wheel, whereas the pawl 49 is used to turn the time wheel step by step.

The time wheel 9 is mounted loosely upon a shaft 9^a and this shaft carries a cam wheel
 105 53 which has the form of a simple spiral as indicated more particularly in Fig. 4. A pin 54 is mounted upon a lever 55, the latter being journaled to the casing 27 and adapted to rock slightly in a vertical plane. The
 110 cam wheel 53 turns step by step with the time wheel 9, in a contra-clockwise direction according to Figs. 1 and 4. The cam wheel 53 lifts the rocking lever 55 by raising the pin 54 each time the cam wheel 53 makes a
 115 complete revolution, and each time it assumes the position indicated in Figs. 1, 4 and 5, the pin 54 slips abruptly off the highest part of the cam and drops directly downward, thus causing the lever 55 to rock into
 120 its lowermost position. At 56 is a joint by aid whereof the lever 55 is connected with a vertically disposed slide rod 57, the latter being journaled to slide in bearings 58. The slide rod 57 carries a spring pawl 59 which
 125 is insulated from it and at its free end is adapted to engage the outer edge of the calendar wheel 10, this outer edge being provided with teeth as will be understood from Fig. 1.
 130

The calendar wheel 10 is provided with a number of removable metallic pins 60 and these metallic pins are one by one brought into metallic communication with the contact spring 61 as the calendar wheel turns slowly step by step, under control of the spring pawl 59, as will be understood from Fig. 3. The contact spring 61 is at its lower end bent slightly and thus provided with a toe-like portion. The contact spring is adapted to yield slightly and the toe-like portion is engaged neatly by each pin 60 as the latter passes under it. The pins each the latter passes under it. The pins each thus make a so called floating contact with the toe-like portion of the spring. A spring pawl 26 engages the teeth of the calendar wheel 10, as will be understood from Figs. 1 and 3, and prevents retrogression of the calendar wheel. A wire 63 is connected with the contact spring 61 and leads upwardly being in metallic communication with the hub of the time wheel 9. Another wire 64 (see Figs. 1 and 3) is connected with the spring pawl 62 which is of metal. This wire 64 leads to a binding post 65. A wire 66 is connected with this binding post and also with the wires 22 and 23. A wire 67 is connected with the wires 23, 24. A number of wires 68, 69, 70 and 71 are connected with the wire 67 and also with various electric bells 72, 73, 74 and 75. As above explained, these bells may be placed in different rooms or different buildings or in different parts of a town, or otherwise located to suit the convenience of the occasion. Connected with the bells 72, 73, 74 and 75 are wires 76, 77, 78 and 79 which lead respectively to binding posts 81, 82 83. In metallic connection with these binding posts and journaled upon the inside of the casing 27 are a number of contact members 84, 85, 86 and 87, each having generally the form of a flat bar, the free end of which is bent downward as will be understood from Fig. 1.

The spring motor 8 is provided with a train of gearing 8^a, and connected with this gearing and revoluble thereby is a cam wheel 88 made of insulating material and having a simple spiral shape, as may be readily understood from Fig. 2. This cam wheel is provided with a shoulder 89 and carries a contact member 90 made of metal and having the general form indicated in Figs. 1 and 2. A screw 91 extends through a slot in the contact member 90. The operator by releasing the screw 91 may adjust the contact member 90 radially inward or outward relatively to the center of the cam wheel 88, and by so doing can practically adjust the contact surface of the contact member 90. The contact wheel 88 is mounted rigidly upon a revoluble shaft 92 and turns therewith. This shaft also carries a wheel 93 and is provided with a notch 94. Disposed

immediately above the wheel 93 is a lever 95 carrying a boss 96 which normally extends into the notch 94 and prevents rotation of the wheel 93 and consequently preventing the spring motor 8 from running. Connected with the lever 95 is a rod 97 which extends upward and is pivotally connected at its upper end with another lever 98. The latter is by aid of a pivot pin 99 journaled upon the inner face of the casing.

The various contact members 84, 85, 86 and 87 are severally connected by rods 100, journaled to them and extended upwardly from them, to as many levers 101. Each lever 101 (see Fig. 2) is provided with an arm 102 integral with it and extending upward from it. Each lever 101 is journaled upon the casing. Over each lever 101 is another lever 103, which carries a stop 103^a comprising a block of insulating material having its top and one of its edges covered with a member of platinum against which the arm 102 of the lever 101 immediately below it can lodge, as indicated in Fig. 2. Normally, therefore, each arm 102 is in metallic communication with the lever 103 just over it. A number of rods 104, 105, 106 and 107 substantially alike, but for convenience vary in length, extend upward, each from one of the levers 103, as will be understood from Fig. 1. These rods are at their upper ends pivotally connected with armature levers 108, 109, 110 and 111. Associated with these armature levers are magnets 112, 113, 114, 115 which are alike with the exception that they are for convenience located in different positions. These magnets each control the position of one of the contact members 84, 85, 86, 87.

At 116 is a standard which is by aid of a hinge 117 connected with the bottom of the casing and is adapted to swing downward into horizontal position in order to permit accessibility to the time wheel. Mounted upon this plate are contact brushes 119, 120, 121, 122. It is immaterial, however, whether or not the standard be constructed as above described or be made entirely of wood or other insulating material. These brushes are severally connected by wires 123, 124, 125 and 126 with the respective magnets 112, 113, 114, 115. A wire 127 is connected with the levers 103 and is also connected to a wire 128 which leads to the metallic framework of the spring motor 8. A wire 129 is connected with the wires 127, 128 and also to the wires 32, 33. When a circuit is completed by the engagement of a brush 119, 120 121 or 122 with one of the screws 134 such circuit is immediately afterward broken by the dropping of the corresponding lever 101 and the consequent disengagement of its arm 102 from the lever 103 immediately over it. By this method of quickly breaking the circuit, the battery is saved

and moreover by causing the circuit to break by the disengagement of the arms 102 from the stops 103 all sparking is brought to the metallic members forming parts of these stops and consequently the sparking can do little or no harm. Moreover, the platinum member of each strap 103^a is scraped smooth by aid of the arm 102 associated with it each time such arm makes a movement to disengage the strap.

The time wheel 9 is of metal and is provided with a large number of holes 130, 131, 132, these holes being threaded. At 134 are screw plugs which may conveniently be made of number two brass screws. These screw plugs are all exactly alike and in any number desired may at the will of the operator be inserted in any of the holes 130, 131, 132 and 133. The number of these holes is related to the number of teeth carried by the time wheel 9 and consequently is associated with the time of day. The operator by employing as many screw plugs as desired and placing them directly in the various holes 130, 131, 132, 133 at any desired point or points, may very readily predetermine the engagement of some one or more of them, some one or more of the contact brushes 119, 120, 121, 122. The inner portion of the time wheel 9 is provided with ordinals 111, 113, etc., indicating the hours of the day.

The operation is as follows:—The master clock 6 closes an electric circuit once in every five minutes. This circuit may be traced as follows:—battery 19, wire 20, hand switch 21, wires 22, 23, 24, framework of master clock 6, shaft 12, contact wheel 11, contact button 14, floating contact arm 13, arm 16, wire 25, binding post 26, wire 28, magnet 29, wire 30, pawl 31, metallic parts of spring motor 7, wire 32, wire 33, binding post 34, wire 35, back to battery 19. This energizes the magnet 29 and that too, by aid of a circuit containing very few movable parts and independent of other circuits to this extent that the opening or closing of any other circuit cannot prevent the master clock from periodically completing this circuit through the magnet 29. Each time the magnet 29 is thus energized the armature 36 is attracted and causes the armature lever 37 to lift the rod 38, which is thus raised and lifts the pawl 31 out of engagement with the cam wheel 44. This liberates the gearing of the spring motor 7 and the motor (which of course has previously been wound) can now run. The electric circuit above traced does not remain closed but an instant, however, for the reason that said circuit is broken instantly by the pawl 31 which is raised by the magnet 29 so that the contact spring 31^a disengages the metallic face of the cam wheel 44 lodged against it as above explained. If the duration of me-

tallic communication through the metallic clock continues so for five seconds the current flows for a much shorter interval than this. The duration of the actual flow of the current, however, is a very small fraction of a second and therefore negligible in practice. The instant the circuit is opened and the magnet 29 is consequently deenergized the rod 38 and pawl 31 tend to drop downward. The pawl 31 is unable to make a complete descent however for the reason that the contact spring 31^a carried by it lodges upon the body portion of the cam 44 which as above explained is of insulating material. Consequently, the pawl has no tendency for the moment to prevent retardation of the motor 7 and this motor therefore starts into action. As soon as the cam wheel makes one complete revolution so that this shoulder lodges against the adjacent end of the pawl, the cam wheel 44 is brought to a stop and consequently the motor 7 ceases for the time being to run. The limited amount of action of the motor 7 due to this one complete revolution of the shaft carrying the cam wheel 44, causes the crank pin 45 to revolve in its orbit at one time, the result being that the rocking lever 47 makes one swing to the right and returns to its normal position, the pawl 49 thus being caused to turn the time wheel 9 to an extent represented by the length of one tooth. The pawl 51 prevents retrogression of the time wheel. The time wheel makes one complete revolution in twelve hours, so that the ordinals I, II, III, etc., carried by the time wheel in successively passing a given point, indicate the progress of the hours. Suppose now that any number, say four of the contact pins 134 should engage the brushes 119, 120, 121 and 122 respectively associated with the contact pins, a number of circuits equal to the number of contact brushes are thus completed. As these circuits are substantially alike, I will trace only one of them, which is as follows:—battery 19, wire 20, hand switch 21, wires 22, 66 binding post 65, wire 64, pawl 62 (see Fig. 3), calendar wheel 10, a pin 60, contact spring 61, wire 63, time wheel 9, contact pin 134, contact brush 119, wire 123, magnet 112, wire 135 to the corresponding one of the levers 101, wires 127, 129, 33, binding post 34 and wire 35, back to battery 19. This energizes the magnet 112. The magnets 113, 114 and 115 are each energized in substantially the same way as the magnet 112, the circuits being in all respects analogous except that they include the contact brushes 120, 121, 122. I will now follow further the action associated with the magnet 112. When this magnet is energized, it attracts its armature causing the armature lever 108 to rock. This lifts the rod 104 (see Fig. 2) and consequently lifts the lever 103. In doing this

it disengages the lever 101 as the latter is no longer supported by aid of the limiting stop 103^a. The rod 100 is thus lowered, and the contact member 84 now rests upon the cam wheel 88 at a point adjacent to the shoulder 89. This however is not all that occurs. When the magnet 112 is energized as above stated and lifts the corresponding lever 103, the rod 97 lifts the lever 95 as will be understood from Fig. 2 and causes the boss 96 to travel upwardly and outwardly from the notch 94. This releases the wheel 93 and causes the spring motor 8 to start into action. The rotation of the cam wheel 88 causes the contact member 90 to come successively into engagement with the outer or free ends of the various contact members 84, 85, 86, 87. The contact member 90 having been adjusted by the operator as above explained, the duration of the various contacts thus formed is governed to some extent by the position in which the contact member 90 has been set. The lever 101 is restored to normal position by rotation of the cam 88. It is sometimes desirable that in one of the bell circuits the bell or bells employed in that circuit shall be sounded for a longer period than the bells in other circuits. Four circuits are thus completed provided there are four contact pins 134 in engagement with the contact brushes 119. If there be only one, two or three of the contact pins 134 in engagement with the corresponding brush or brushes, the other circuits completed will be the same in number as the number of contact pins 134 in engagement with the brush or brushes. The circuits being substantially alike, I will trace only one of them, to wit the one associated with the magnet 112. It is as follows: battery 19, wire 20, hand switch 21, wires 22, 23, 67 and 68, bell 72, wire 76, binding post 80, contact member 84, contact member 90, metallic part of the contact wheel 88, metallic framework of spring motor 8, wires 128, 129, 33, binding post 34 and wire 35 back to battery 19. As the circuit thus traced includes the bell 72, this bell is energized and consequently an alarm is sounded. The three other circuits analogous to the first traced cause the three other bells 73, 74, 75 to ring. Each time the contact wheel 88 makes one complete revolution it raises each and all of the contact members 84, 85, 86, 87. In doing this it lifts the various levers 101 so that each lever by aid of its arm 102, is restored to its normal position as indicated in Fig. 2, the arm 102 now resting against the limiting stop 103^a. Each time a magnet 112, 113, 114, 115 is energized it lifts the corresponding rod 104, 105, 106 or 107 as above described, so that the action is repeated as often as the magnets are energized. The bells are not energized at exactly the same instant, but rather in rapid succession. This enables a small

battery to do the work, as the voltage of the battery need be no greater than necessary to ring one bell or so many bells as may happen to be included in the respective bell circuits. The hand switch 21 is left open whenever the apparatus is to be laid aside for a long time, as for instance, during a school vacation. It is not generally desirable, however, where the apparatus is used in a school during term time, that the time wheel shall be stopped merely on account of the intervals of time lost on Saturdays and Sundays. It is here that the office of the calendar wheel 10 comes in. Each complete rotation of the time wheel 9 (requiring twelve hours) causes the calendar wheel 10 to turn to an extent representing the distance from one of its teeth to its next succeeding tooth, as above explained. Two complete revolutions of the time wheel (representing the whole day and night) therefore cause the calendar wheel to turn to an extent representing the space occupied by two of these teeth, and as it has fourteen teeth this space represents an interval of one day and night. If, however, one of the contact pins 60 be taken out by the operator, there can be no engagement between the calendar wheel and the contact wheel 61 for a period of one day and night. To allow for the time lost on Saturdays and Sundays therefore, the operator merely removes two of the pins 60. This being done, when the calendar wheel 10 arrives in such position that the contact spring 61 is over either of the vacant holes caused by the removal of the two pins 60 as just described, there is for a time being no metallic communication between the calendar wheel 10 and the contact spring 61. Consequently no circuit can be completed through any of the bells on Saturdays or Sundays. The battery energy is thus conserved, the time wheel is kept running, and the wear and tear due to unnecessary ringing of the bells is avoided.

As may be seen from the foregoing description my improved apparatus differs in various respects from the two kinds of apparatus described in my former patents. I now employ two spring motors instead of one. The motors may be key wound instead of self winding. The wiring of various circuits has been changed considerably.

The time wheel 9 is not included in the alarm circuits. On this account the motor circuit is practically independent of all other circuits which might otherwise interfere with its action.

I find that with the apparatus arranged as described, the step by step movement does not need to be altogether accurate for the reason that it is not strictly essential that the contact pins 134, in their engagements with the contact brushes 119, 120, 121 and 122 must stop in any precise position under

these brushes; but that every purpose is served if the contact pins engage the brushes. Indeed it is rather desirable that the contact pins shall merely pass under the brushes making a momentary wiping contact with them. Again, in the arrangement above described, as the time wheel 9 only moves and stops once in each period of five minutes, the time wheel can be made of small diameter, say twelve inches.

In my apparatus as now constructed there is no danger of any of the movable parts stopping in such position as to leave the circuits open accidentally.

I do not limit myself to any particular use to be made of my apparatus nor to any prices of materials to be employed in the construction of the various parts.

As will be noted from the foregoing description, all of the circuits employed except the bell circuits after being completed are broken instantly. This conserves the battery energy so that very little battery energy is required except that necessary for ringing the bells. The action of the apparatus is thus rendered very economical. While of course a loss of energy incidental to the ringing of the bells is inevitable in many systems of this general character there are in addition great losses involved in operating various movable parts in addition to the bells. The losses in question are by my apparatus almost entirely eliminated.

Having thus described the invention, what I claim is—

1. A device of the character described comprising a time wheel provided with teeth, a pawl for engaging said teeth and turning said time wheel step by step, a rocking lever carrying said pawl, a spring motor provided with a revoluble member, a connection from said revoluble member to said rocking lever, a cam wheel mounted upon said revoluble member and provided with a shoulder, a pawl provided with a portion for engaging said shoulder of said cam wheel in order to prevent said spring motor from running electrically operated mechanism for moving said pawl out of engagement with said cam wheel, said elec-

trically operated mechanism including a circuit, and a master clock provided with contact mechanism, said contact mechanism being included in said circuit for controlling said electrically operated mechanism.

2. The combination of a spring motor provided with gearing, a spiral cam connected with said gearing and actuated thereby, a contact member carried by said cam, a second contact member disposed partially within the path of travel of said first-mentioned contact and said cam carried thereby, an alarm circuit connected with said contact members and controllable by them, time controlled mechanism for starting said motor into action and for bringing said second mentioned contact member into engagement with said cam, and means for normally supporting said second mentioned contact member in a position into which it is moved by said cam.

3. A device of the character described comprising a spring motor, a cam wheel connected with said motor and driven thereby, a contact member carried by said cam wheel, a normally stationary contact member disposed adjacent to the path of travel of said cam wheel, a lever for normally supporting the second mentioned contact member, a mechanism including an electric circuit and controllable thereby for causing said lever to drop in order that the first-mentioned contact member may, by the revolution of said contact wheel, be brought into engagement with said second-mentioned contact member, means controllable by said electric circuit for starting said spring motor into action, mechanism including a time wheel for energizing said electric circuit, and an alarm circuit including the first-mentioned contact member and the second-mentioned contact member.

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

AUGUST LEONARD RONELL.

Witnesses:

A. C. HEATH,
C. H. HEATH.