(No Model.) 3 Sheets—Sheet 1.

F. FRICK.

ELECTRIC PROGRAM CLOCK.

No. 551,372. Patented Dec. 17, 1895.

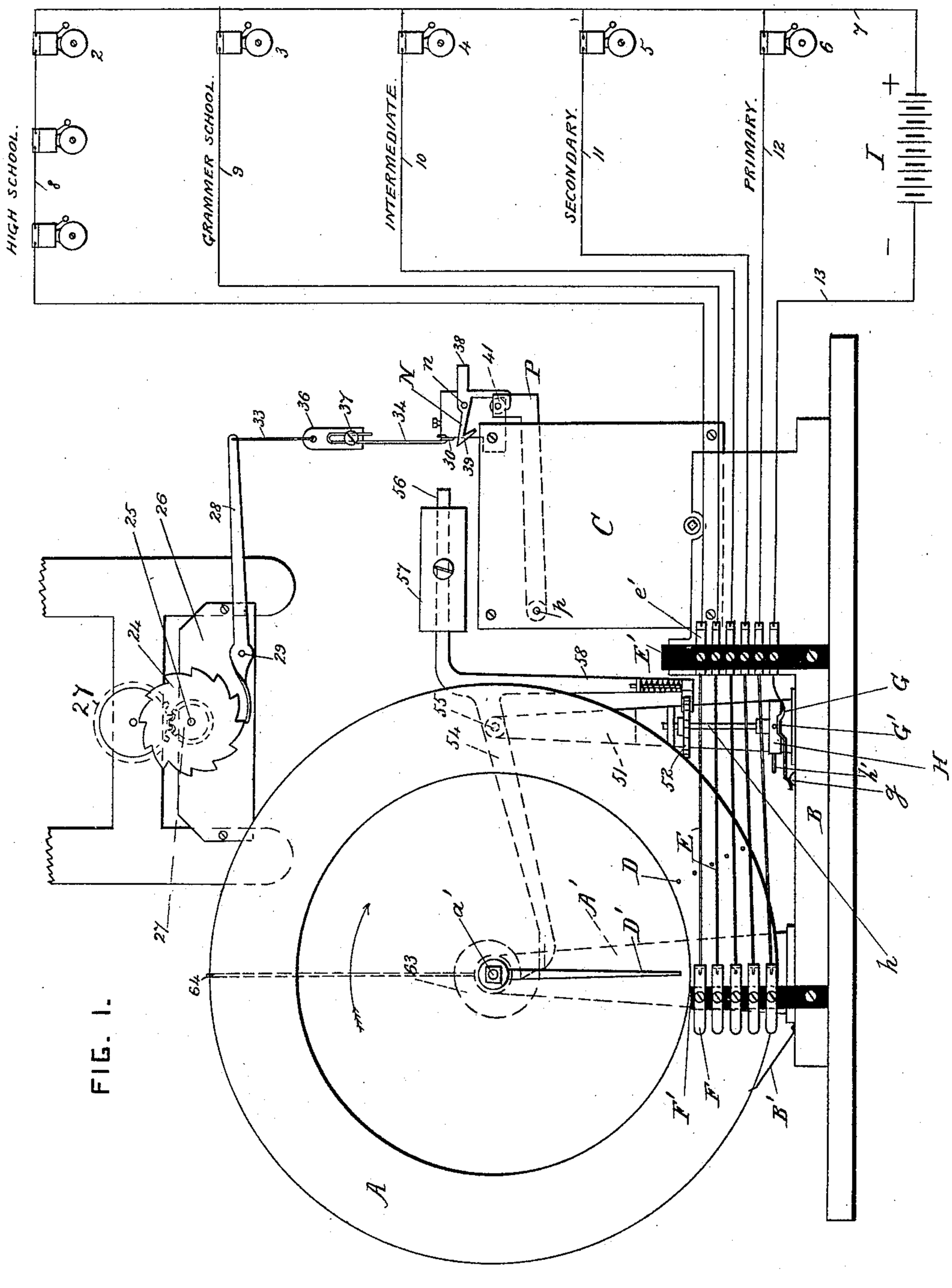

FIG. 1.

Witnesses
W. F. Heller
J. Wm. Kister

Inventor
Fred. Frick.
By Attorney Herbert W. J. Jenner.

(No Model.)

3 Sheets—Sheet 2.

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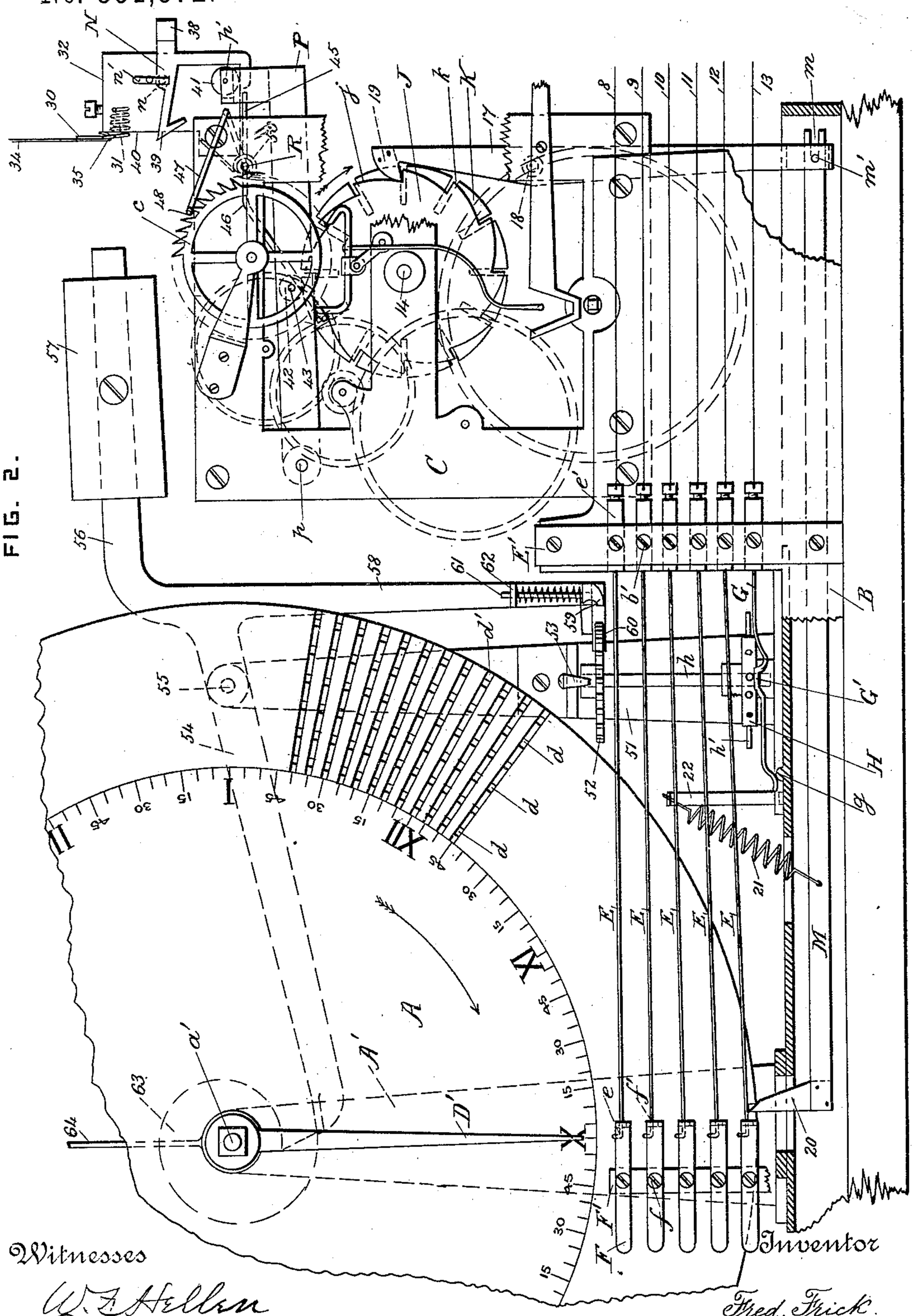
ELECTRIC PROGRAM CLOCK.

No. 551,372. Patented Dec. 17, 1895.

FIG. 2.



(No Model.) 3 Sheets—Sheet 3.

F. FRICK.

ELECTRIC PROGRAM CLOCK.

No. 551,372. Patented Dec. 17, 1895.

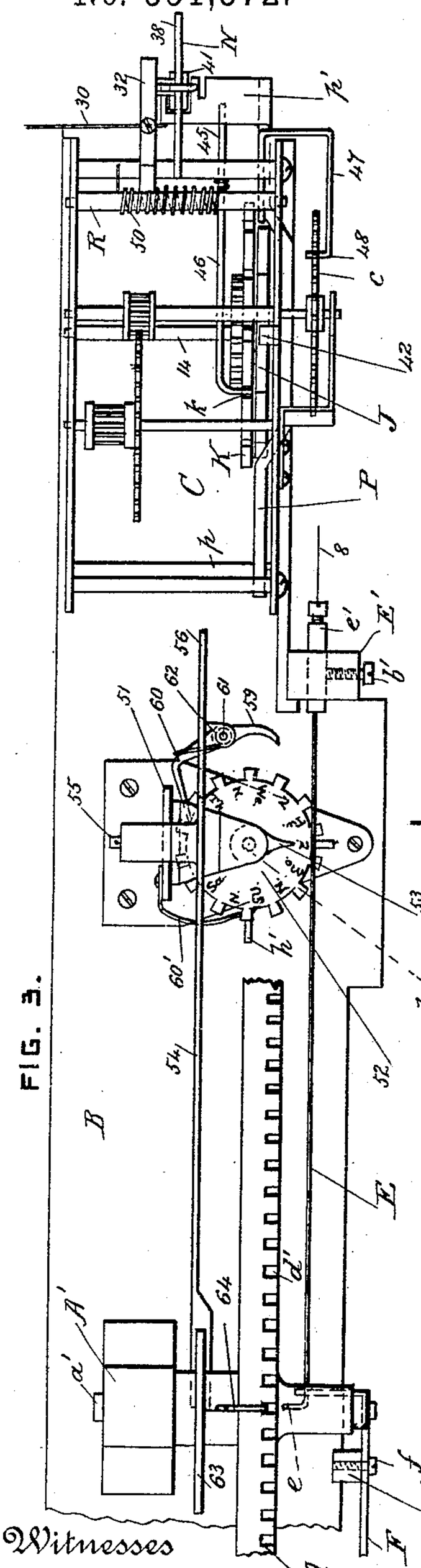


FIG. 3.

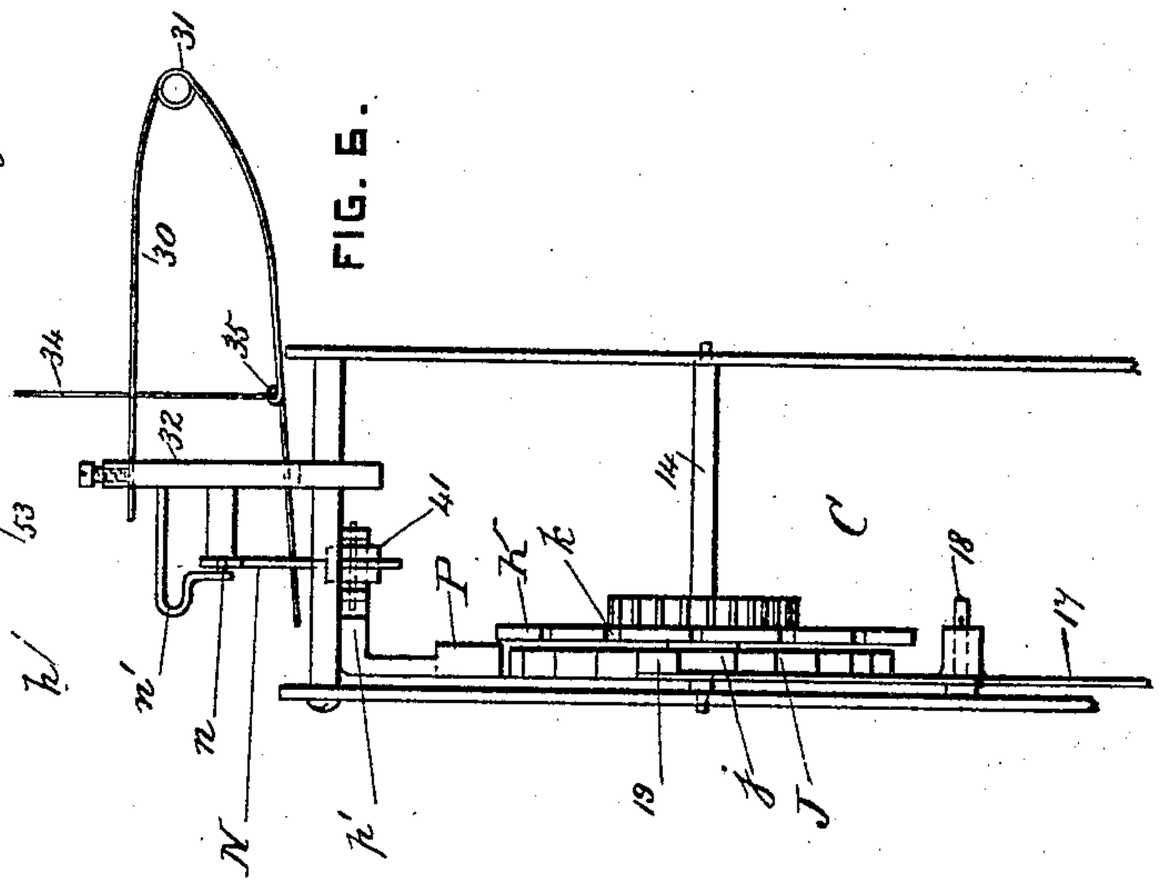


FIG. 6.

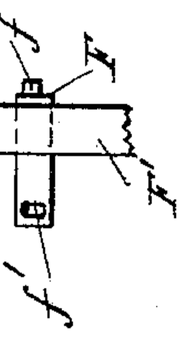


FIG. 4.

FIG. 5.

Witnesses

W. F. Hellen

J. Wm. Wister

Inventor

Fred. Frick.

By Attorney Herbert W. Jenner

UNITED STATES PATENT OFFICE.

FREDERICK FRICK, OF WAYNESBOROUGH, PENNSYLVANIA.

ELECTRIC PROGRAM-CLOCK.

SPECIFICATION forming part of Letters Patent No. 551,372, dated December 17, 1895.

Application filed April 29, 1895. Serial No. 547,550. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK FRICK, a citizen of the United States, residing at Waynesborough, in the county of Franklin and State of Pennsylvania, have invented certain new and useful Improvements in Electric Signaling Apparatus; 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 electric signaling apparatus chiefly used in schools and colleges for announcing the times for various studies, or for recreation, to the various departments or classes, according to prearranged schedules or programs.

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

In the drawings, Figure 1 is a diagram of the apparatus, showing its connection with the bells in the various departments. Fig. 2 is a front view of the program-clock with portions of the motor removed and the base shown partly in section. Fig. 3 is a plan view of the same. Fig. 4 is a detail end view of one of the contact-spring guides. Fig. 5 is a detail side view and front view of one of the contact-pins. Fig. 6 is a detail side view of the starting-spring and its connections.

A is the program-disk, which is journaled on a pin a', projecting laterally from the upright A'. B is the base under the said upright. This base supports all the parts of the program-clock and its motor.

C is a motor for driving the program-clock. This motor is preferably the driving mechanism of an eight-day clock, and is therefore not hereinafter more fully described; but it may be a motor of any other approved construction. This motor is provided with an escape-wheel c and regulating mechanism of approved construction for controlling the speed of the escape-wheel when the motor is in operation.

The disk A is provided on its front face with numerals corresponding to those on a clock-face, and with subdivisions preferably indicating five-minute intervals of time. The disk A is provided with one or more series of perforations d, arranged in circles on its face, and a series of notches d' at its periphery. D are contact-pins adapted to be thrust into any of the said perforations. Each contact-pin consists of a flat strip of metal bent double. The point of one end of the strip is inclined, and the remaining portions of the doubled strip are parallel and have an open space between them. The pins are easily inserted in the holes d because of the inclined ends of the strips, and the elasticity of the metal holds the pins secure in the holes of the disk. The disk A is revolved step by step by means of the motor and intermediate driving mechanism hereinafter fully described. At each step the disk is revolved through a space corresponding to five minutes as marked on its dial and another radial row of holes d is brought in line with the pointer D', which is secured to the front end of the pin a'.

E are contact-springs carried by the vertical post E', of insulating material, which is secured to the base B. The contact-springs have cranked ends e for the pins D to strike. Each circle of perforations d has a separate contact-spring E, and as many circles of perforations and contact-springs may be provided as is desired.

F are the contact-spring guides which are carried by the post F' of insulating material secured to the base. Each guide F consists of a bent plate pivoted and secured to the post F' by a screw or pin f, and provided with a slot f' engaging with the end of a contact-spring. The slot f' permits the pins D to press the contact-spring downward when they strike it, and it prevents the contact-spring from rising too high.

The contact-springs E have shanks e' which are slidable longitudinally in the holes in the post E', and b' are set-screws for securing the shanks in position after the positions of the contact-springs have been adjusted.

G is a short contact-spring carried by the post E', and g is a contact-piece on the bed B arranged under the end of the contact-spring G.

G' is a projection on the upper side of the contact-spring G, for operating it.

The contact-spring G is normally held clear of the contact-piece g by its own elasticity.

H is a circuit-breaker consisting of a revoluble disk mounted on a vertical shaft h,

and provided with a series of holes in its periphery. Pins h' are inserted in the said holes and are freely removable therefrom. When one of the pins h' comes over the projection G', the contact-spring G is depressed and touches the contact-piece g with a sliding or wiping contact.

Bells 2, 3, 4, 5 and 6, or other approved signals, are provided in the various departments of the school or college—in this instance called "high school," "grammar school," "intermediate," "secondary," and "primary," for the purpose of illustration. Any number of bells or signals may be used in any one or more than one department if desired. This is necessary when a department consists of several class-rooms, or a series of dormitories; but the operation is the same, whether one or more than one bell is used.

I is an electric generator, and 7 is the positive main. A series of leads 8, 9, 10, 11, and 12 connect the main 7 with the five contact-springs E, respectively, and include the respective bells 2, 3, 4, 5, and 6 in their course. The lead 8 is shown as connecting the high-school signal-bell 2 with the top contact-spring E which pertains to the contact-pins of the innermost circle of perforations of the program-disk A. A negative main 13 connects the contact-spring G with the negative pole of the battery.

As many contact-pins D as desired may be inserted into the perforations of the program-disk, and, provided the contact-spring G is in contact with the contact-piece g, the bells will be rung whenever the pins D touch the contact-springs E.

When a pin D in the innermost circle of perforations touches the contact-spring E pertaining to it, the current passes from the battery, through the main 7, bell 2, which is sounded, lead 8, upper contact-spring E, pin D, disk A, upright A', base B, contact-piece g, contact-spring G, and negative main 13 to the battery.

When five pins are inserted in a radial row in adjacent perforations of the disk A, all the bells are rung simultaneously, and the bells in the various departments can be arranged to ring upon prearranged schedules or programs independent of each other, according to the positions of the pins inserted in the respective circles of perforations in the disk A.

When the circuit-breaker is moved to permit the contact-spring G to leave the contact-piece g the circuit is broken and none of the bells will be rung until the circuit is remade.

In order to revolve the program-disk step by step at prearranged intervals of time, a driving-wheel J, provided with cam-shaped teeth j, is secured on the shaft 14 of the motor, which shaft corresponds with the minutes-arbor of a clock. This wheel has preferably twelve teeth j.

A stop-wheel K, provided with radial slots k, is secured on the shaft 14 adjacent to the wheel J. These two wheels are secured in a certain position with respect to each other, and the number of the slots k is the same as the number of teeth j.

An oscillatory propelling-arm 17 is pivoted on a pin 18, projecting from the frame of the motor, and is provided with a head 19 of hardened steel which engages with the teeth j of the driving-wheel J.

M is the propelling-rod arranged horizontally inside the base B. One end of this rod M has a slot m, which engages with a pin m', carried by the lower end of the propelling-arm 17, and the other end of the rod M is provided with a hardened-steel head 20, which projects upwardly through a slot in the base and engages with the notches d' on the periphery of the disk A.

A retracting-spring 21 is secured to the free end of the rod M and to a bracket 22, secured to the base. This spring is arranged in an inclined position and performs the double function of drawing back the rod M and holding its head 20 in engagement with the notches d'. Any mere mechanical equivalent, such as a weight, may be substituted for the spring 21.

When the motor revolves the wheel J through the space of one tooth in the direction of the arrow, the propelling arm and rod turn the disk A for the space of one notch which is equal to five minutes in time as marked on the face of the dial.

The retracting-spring 21 draws back the propelling-rod directly the tooth on the wheel J passes out of contact with the head on the propelling-arm, and the next tooth j on the driving-wheel is brought into position to commence to operate the propelling arm and rod.

B' is a spring stop-pawl for preventing the disk A from being revolved backward.

The starting of the motor is controlled by a timepiece of any approved construction and not shown in the drawings.

A trip-wheel 24, having twelve teeth or cams, is journaled on a pin 25, carried by a plate 26, which is adapted to be secured to the frame of the timepiece. A toothed driving-wheel 27 is secured to the trip-wheel and preferably gears into the intermediate toothed wheel of the dial-train of the timepiece; but it is not material how the said trip-wheel 24 is driven, provided its motion is practically synchronous and that it is revolved once an hour when provided with twelve teeth.

A trip-lever 28 is pivoted on the pin 29, which projects from the plate 26. This trip-lever engages with the trip-wheel 24, and its free end is raised slowly and is allowed to drop suddenly by gravity at the end of every five minutes, when the points of the teeth of the trip-wheel release it.

The starting-spring 30 consists of two arms connected by a coil 31. One of these arms is secured to the bracket 32, which is carried by the frame of the motor, and the other arm is operatively connected with the free end of the

trip-lever 28. A connecting-rod 33 is made in two sections, of which the lower section 34 is provided with a hook which engages with an eye 35 on the free arm of the starting-spring. The upper section is pivoted to the trip-lever and has a plate 36 attached to its lower end. The upper part of the lower section is hooked and engages with a screw 37 in the plate 36. The connecting-rod 33 is readily adjusted to correct length by sliding the hooked upper end of the section 34 under the head of the screw and tightening the screw, so as to clamp the said hooked end when the parts are in the desired position.

N is a hooked catch pivoted on the pin *n*, projecting from the bracket 32, and retained thereon by the keeper *n'*. The catch N has a weight 38 on one side and a beak 39 on the other side which projects into the path of the free arm of the starting-spring. The vertical side 40 of the said bracket forms a guide for the said arm and causes it to strike the beak 39 when it descends.

P is a drop-arm pivoted at one end on the pin *p*, projecting from the frame of the motor, and provided with a lateral projection *p'* at its other end. An antifriction-roller 41 is carried by the projection *p'* and is normally supported by the said hooked catch N.

A roller 42 is pivoted on the pin 43, projecting laterally from about the middle of the drop-arm, and this roller, or its equivalent, a lug, is arranged over the teeth of the driving-wheel J, hereinbefore described, and is adapted to be raised by them.

R is a shaft journaled in the motor-frame between the drop-arm P and the bracket 32. Three arms are carried by this shaft. The starting-arm 45 is straight and projects laterally under the projection *p'* on the end of the drop-arm P. The sustaining-arm 46 is hooked and engages with the slots *k* of the stop-wheel K, hereinbefore described. The stop-arm 47 is cranked to permit it to pass around the front frame of the motor and is provided with a hooked end 48, which engages with the teeth of the escape-wheel.

The escape-wheel is normally held stationary by the said stop-arm, and the end of the sustaining-arm is then dropped into one of the slots of the stop-wheel.

When the timepiece permits the free arm of the starting-spring 30 to descend, which occurs at the end of every five minutes, the said spring strikes the beak of the hooked catch, turns it on its pivot and releases the drop-lever, the antifriction-roller permitting the hooked catch to be removed from under it with the least possible friction. The drop-lever falls by gravity and turns the shaft R by depressing the starting-arm. This motion of the shaft R raises the arms 46 and 47 out of engagement with their respective wheels, and permits the motor to revolve the driving-wheel J in the direction of the arrow. The wheel J then causes the program-disk to be revolved by means of the propelling arm and rod as hereinbefore described.

A spring 50 is arranged to cause the sustaining-arm to bear hard upon the periphery of the stop-wheel K between its slots, and the said sustaining-arm holds the stop-arm 47 out of engagement with the escape-wheel and permits the motor to operate until the next slot of the stop-wheel comes under the end of the sustaining-arm.

The driving and stop wheels revolve together, and while one tooth of the driving-wheel is operating the propelling-arm another similar tooth is raising the drop-arm P. The drop-arm P is raised to its full height, and the hooked catch N swings in under its roller 41 and supports it just before the propelling-rod completes its forward travel. As soon as the propelling-rod completes its forward travel it is retracted by its spring 21, and the end of the supporting-arm 46 then drops into another slot of the stop-wheel K and permits the stop-arm 47 to re-engage with the teeth of the escape-wheel and stop the motor.

The spring 50 operates to cause the arms 46 and 47 to move quickly when a slot in the stop-wheel comes under the hooked end of the sustaining-arm. This action is repeated every five minutes and the program-disk is revolved step by step through the five-minute spaces as indicated on its dial at the end of every five minutes. The time during which the program-disk is revolving is less than five minutes and is determined by the speed of the motor, which is adjusted by means of its regulator so as to cause the bells to ring for any convenient length of time.

The program-disk makes a complete revolution once every twelve hours and each circle on its face has one hundred and forty-four perforations. The pins placed in these perforations cause the bells to sound at prearranged intervals during the day or period of twelve hours.

In order to avoid sounding the bells during the night or having to remove the pins from the disk at the end of each day, the circuit-breaker H, hereinbefore described, is operatively connected with the revoluble time-disk A in the following manner: The shaft *h* of the circuit-breaker is journaled in a bracket 51, secured to the base B, and has a toothed wheel 52 secured to it. The wheel 52 has fourteen teeth and the spaces between the teeth are marked to represent the days and nights of a week. A pointer 53 is secured to the bracket 51 to guide in setting the wheel 52 and the pins in the circuit-breaker under it. The wheel 52 and the circuit-breaker are caused to make a complete revolution once every week. A bell-crank lever 54 is pivoted by a pin 55 to the top of the bracket 51, and 56 is an arm projecting from the bell-crank lever and carrying an adjustable weight 57. The vertical arm 58 of the bell-crank

lever has a laterally-projecting check-pawl 59 adapted to engage with the teeth of the wheel 52. A spring-actuated pawl 60 is pivoted by the pin 61 in the stop-pawl 59 and in the lug 62 projecting laterally from the arm 58, and is also adapted to engage with the teeth of the wheel 52. A spring-pawl 60′ prevents the reverse movement of the wheel 52. An adjustable cam-wheel 63 is operatively connected with the program-disk by means of the spring-catch and indicator 64, and the horizontal arm of the bell-crank lever 54 passes under the said cam-wheel and is held in contact with it by the weight 57. The cam-wheel 63 slowly turns the bell-crank lever and draws back its pawls as the program-wheel is revolved. At the end of each day or twelve-hour period the cam-wheel releases the bell-crank lever, and the weight swings the pawls into engagement with the toothed wheel 52. The spring-actuated pawl 60 strikes the wheel first and revolves it suddenly for the space of one tooth, and the check-pawl 59 then engages with the said wheel and prevents it from being carried too far around by its own momentum.

The pins are placed in each alternate hole of the circuit-breaker to cause the bells to ring during each day of the week and not to ring during each night, and an additional pin is removed if the bells are not required to ring during the day on Sunday.

The program-clock can be made to operate for other intervals of time than those hereinbefore mentioned. For instance, the circuit-breaker can be made to operate at six-hour periods instead of twelve, by making the cam-wheel 63 with two teeth and by having twenty-eight holes for pins in the circuit-breaker. The program-dial can have any desired number of holes in its face and be driven at any desired intervals, so that the bells may be rung at other intervals of time besides five-minute intervals.

What I claim is—

1. The combination, with electrically-operated signals, an electricity generator, and leads connecting the said signals in parallel with the generator, each lead being provided with a separate contact spring; of contact pins arranged in separate series, one series to each contact spring; driving devices for moving the said pins and causing the signals to be operated either separately or simultaneously upon prearranged programs; and a separate contact spring G arranged in the main and operating to cut out all the signals simultaneously, substantially as set forth.

2. The combination, with electrically-operated signals, an electricity generator, and leads connecting the said signals in parallel with the generator, each lead being provided with a separate contact spring; of contact pins arranged in separate series, one series to each contact spring; driving devices for moving the contact pins and causing the signals to be operated either separately or simultaneously upon prearranged programs; a separate contact spring G operating to cut out all the said signals simultaneously; and intermediate actuating devices operatively connecting the spring G with the said driving devices, whereby the circuit is made and broken automatically and at prearranged intervals, substantially as set forth.

3. The combination, with an electrically-operated signal, an electricity generator, and a contact spring, all included in same circuit; of contact pins, and driving devices for causing the circuit to be completed at intervals upon a prearranged recurrent program; a separate contact spring G included in the circuit; and intermediate actuating devices operatively connecting the spring G with the said driving devices, whereby the circuit is broken at prearranged intervals and the signal is prevented from operating for prearranged periods without disturbing the arrangement of the said contact pins, substantially as set forth.

4. The combination, with a program disk provided with perforations, of a spring contact pin adapted to engage with the said perforations and consisting of a metallic strip bent double, one end of the said strip being inclined, substantially as described and shown.

5. The combination, with a notched program disk, a motor provided with a driving wheel having cam-shaped teeth, and a base supporting the said disk and motor; of a propelling arm pivotally supported by the motor and operated by its said driving wheel, a propelling rod M engaging with the said disk and pivoted to the lower end of the said propelling arm, and a single supporting and retracting device—such as the spring 21—arranged in an inclined position between the said disk and motor, and operatively connected with the said base and propelling rod, whereby the said rod is held in driving contact with the disk and is moved longitudinally into engagement with its successive notches, substantially as set forth.

6. The combination, with a revoluble program disk, a motor provided with an escape wheel and a driving wheel having cam-shaped teeth, and intermediate driving mechanism connecting the said driving wheel with the program disk; of a stop wheel provided with slots and secured concentric with the said driving wheel, a pivoted sustaining arm bearing on the periphery of the said stop wheel, and a stop arm connected to the said sustaining arm and operating to engage with the said escape wheel and stop the motor when the stop wheel has moved far enough to permit the sustaining arm to drop into one of its slots, substantially as set forth.

7. The combination, with the motor provided with an escapement wheel and operating to revolve the program disk, and a pivoted starting arm, and a stop arm connected

to the said starting arm and engaging with the said escapement wheel, thereby holding the motor stationary; of an isochronously revoluble trip wheel, a trip lever actuated thereby, a starting spring, a connecting rod arranged between the said trip lever and spring, a pivoted catch arranged in the path of the said spring, and a pivoted drop arm normally supported by the said catch and operating to depress the said starting arm when released from the said catch by the action of the starting spring, whereby the motor is free to operate, substantially as set forth.

8. The combination, with the pivoted trip lever 28, of the starting spring provided with two arms, a stationary bracket having one of the said arms secured to it, and a connecting rod formed in two sections, the lower section being attached to the free arm of the spring and provided at its upper end with a long hook, and the upper section being attached to the said trip lever and provided at its lower end with a plate, and a screw for clamping the said long hook after the length of the connecting rod has been adjusted, substantially as set forth.

9. The combination, with the stationary supporting bracket 32, and the starting spring carried thereby; of the pivoted hooked catch provided with a beak projecting into the path of the said spring; and the pivoted drop arm provided with an anti-friction roller and normally supported by the said catch, substantially as set forth.

10. The combination, with the pivoted drop arm, and a pivoted catch for supporting the free end of the said drop arm; of the motor provided with a driving wheel having cam-shaped teeth, and a roller carried by the said drop arm and bearing on the said teeth, whereby the drop arm is raised into engagement with the said catch by the action of the motor, substantially as set forth.

11. The combination, with the motor provided with a driving wheel having cam-shaped teeth, and an escape wheel; of a stop wheel secured concentric with the said driving wheel and provided with slots, a pivoted drop arm provided with a roller arranged over the said driving wheel, a catch for supporting the free end of the drop arm; and the sustaining arm, the starting arm, and the stop arm all pivotally connected together, the said starting arm being arranged in the path of the drop arm and operating, when depressed, to raise the sustaining arm out of a slot in the stop wheel and to raise the stop arm out of engagement with the escape wheel, and the said sustaining arm operating to hold the stop arm in its raised position while the said drop arm is being raised into engagement with the said catch, and thereafter dropping into the next slot in the stop wheel, thereby permitting the stop arm to re-engage with the escape wheel and stop the motor, substantially as set forth.

12. The combination, with the contact spring provided with a projection, and the stationary contact piece projecting from the base of the machine and arranged under the free end of the said spring, of a circuit breaker consisting of a disk provided with radial holes and removable pins for depressing the said contact spring, and driving mechanism operating to revolve the said circuit breaker step by step, substantially as set forth.

13. The combination, with the revoluble circuit breaker and the toothed wheel secured concentric therewith; of the pivoted bell-crank lever provided with a horizontally arranged check pawl and a lug on the lower end of its vertical arm, a cam wheel for oscillating the said bell-crank lever and check pawl periodically, and a spring-actuated pawl arranged horizontally under the said check pawl and provided with a pin journaled in the said check pawl and lug and operating to revolve the said toothed wheel and circuit breaker step by step, substantially as set forth.

14. The combination, with the program disk provided with contact pins, a motor, and intermediate driving mechanism operating to revolve the said disk step by step isochronously; of insulated contact springs arranged in the path of the said contact pins; a revoluble cam wheel carried by the said disk; a separate contact spring for completing the circuit through the aforesaid contact springs and pins; a revoluble circuit breaker for operating the said contact spring; and intermediate actuating devices arranged between the said cam wheel and circuit breaker, whereby the circuit is broken by the action of the program disk at a certain point of its revolution without disturbing the arrangement of its said contact pins, substantially as set forth.

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

FRED. FRICK.

Witnesses:
A. H. ROWE,
T. S. CUNNINGHAM.