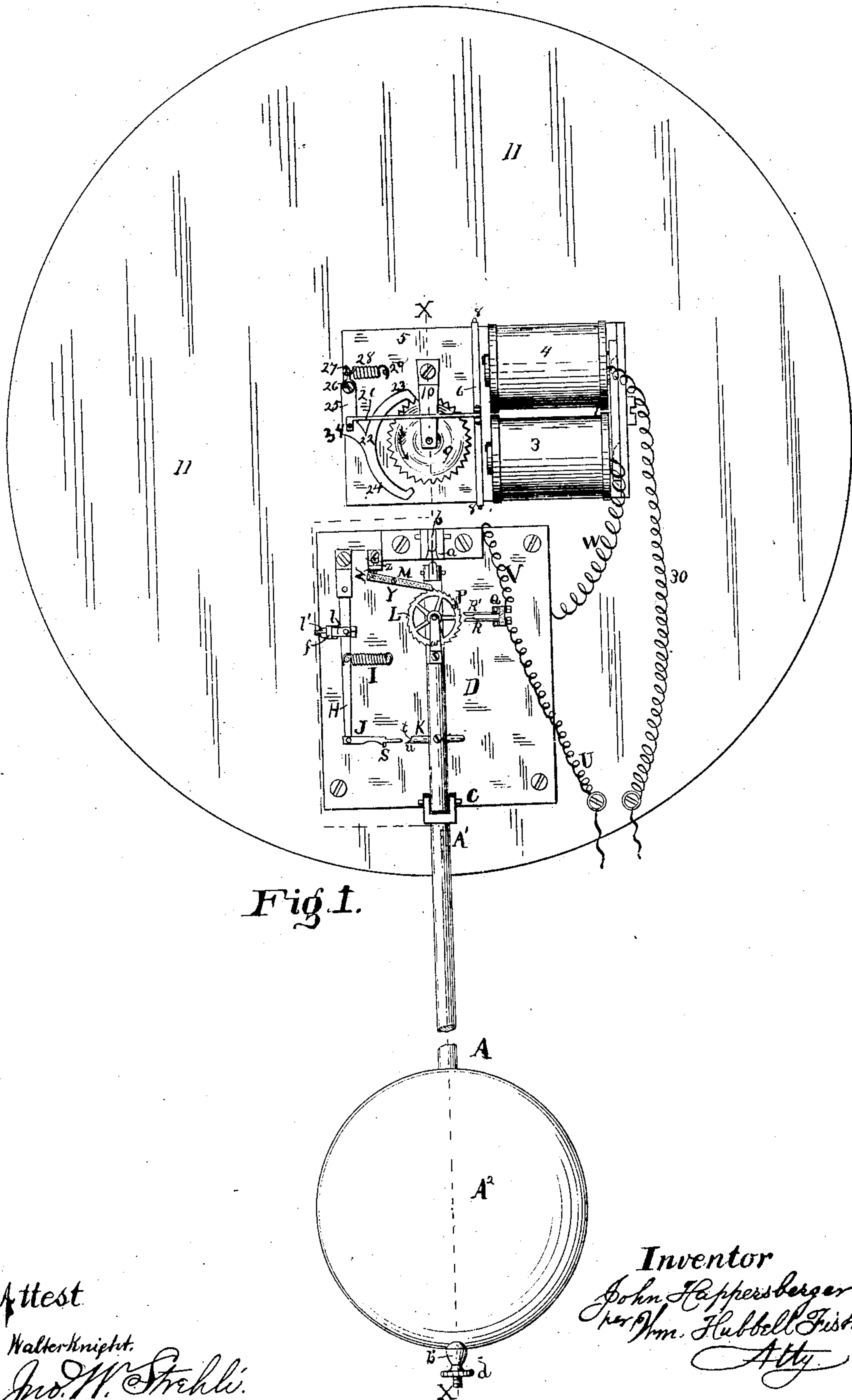


J. HAPBERSBERGER.
Electric-Clock.

No. 226,401.

Patented April 13, 1880.



Attest
Walter Knight.
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UNITED STATES PATENT OFFICE.

JOHN HAPPERSBERGER, OF CINCINNATI, OHIO.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 226,401, dated April 13, 1880.

Application filed February 5, 1880.

To all whom it may concern:

Be it known that I, JOHN HAPPERSBERGER, of the city of Cincinnati, in the county of Hamilton and State of Ohio, have invented certain new and useful Improvements in Electric Clocks, of which the following is a specification.

One portion of my invention relates to that class of time-pieces which are provided with a pendulum, and enables me to dispense with the ordinary actuating spring or weights usually employed to operate the clock mechanism, and to operate the clock by the aid of an electro-magnet in an exceedingly simple, effective, and economical manner.

Another portion of my invention relates to the actuating of the hands of a clock-face by means of the electro-magnet in a simple and efficacious manner; and this portion of my invention enables me to cause one time-piece to operate by one battery the hands of a large number of clock-dials located in various places, as desired, and more or less remote from one another.

In the accompanying drawings, Figure 1 is a rear elevation of mechanism illustrating my invention. Fig. 2 is a vertical transverse section taken at the line X X of Fig. 1. Fig. 3 is a view, in perspective, of the detent and armature for communicating an impulse to the pendulum.

A indicates a pendulum, provided at its upper end with its usual spring *a*, the latter being connected to and suspended from the frame-work at *b* in the usual manner. The upper end of the lower half of the pendulum-rod *A'* hooks over a cross-piece, *c*, in the lower end of the upper half of the rod, in the usual manner, where heavy pendulum-weights are employed.

*A*² indicates the weight, resting in the ordinary manner upon a sleeve, resting in turn on a thumb-screw, *d*, engaging a screw-thread on the lower end of the pendulum-rod. Turning this screw in one or the other direction elevates or depresses the pendulum and quickens or retards the beat of the latter.

At the rear of the supporting-plate *D* are a couple of electro-magnets, (coiled magnets,) *E* and *E'*, and opposite the ends thereof is an armature, *e*, provided with an arm, *f*, fixed in the usual manner to an arbor, *g*, each end of which

turns in a recess in the end of an adjacent pin, *h*, secured by screw-thread or other suitable manner in an arm, *i*, projecting from plate *D*.

Arm *f* projects through the front side of the plate, and is connected to a lever, *H*, fulcrumed on a pivot, *j*, journaled at one end in the supporting-plate *D* and at the other in a vertically-depending end of arm *k*. A rod, *l*, pivoted to the lever *H*, passes through the outer end of lever *f*, and on that side of the latter opposite where the lever *H* is receives a nut, *l'*, which screws thereon, and controls the amount of movement in a direction from the pendulum which the armatures shall communicate to the lever *H*. The amount of movement of the lever *H* toward the pendulum is regulated by the set-screw *m* in stud *n* of the plate *D*. The lever *f* impinges against this set-screw, and according as the latter projects more or less the movement of the lever *f* toward the pendulum will be greater or less. A spring, *I*, (see Fig. 1,) strained between the lever and stud *p*, continually tends to draw lever *H* toward the pendulum.

The detent of the lever *H* is indicated by *J*, and is pivoted at one end to the lower end of lever *H*, the other end, *q*, (see Fig. 3,) being wide horizontally from front to rear, but very thin vertically. The middle of the under side thereof is concaved at *r*, which concavity terminates on the end next the pendulum in a catch or stop, *2*, inclined downward from the concavity and terminating abruptly in a vertical step, the vertical side being toward the pendulum. A post or stud, *S*, for supporting the detent *J* projects horizontally from the plate, and is vertically flat on the side farthest from the pendulum and rounded on the side next to the latter.

There is fixed in the pendulum immediately opposite the detent *J* a cross-piece, *K*, having a concavely-inclined end, *t*, longest at bottom and cut away toward the top, as shown. This piece *K* is so located with reference to the detent that when the detent is drawn back and the step rests against the left-hand side of the post *S* (see Fig. 1) the lower projecting lip, *u*, of the cross-piece will pass below, but in proximity to the end of the detent. The distance which the piece *K* shall project beyond the pendulum is regulated by the set-screw *v*.

On the pendulum-rod and near its upper

end is located a ratchet-wheel, L, one end of whose axis is journaled in a bearing in the pendulum-rod, and the other end is an arm, *w*, secured, as shown, to the pendulum-rod.

5 The teeth on this wheel are graduated, so that through the combined agency of a click, M, and of the oscillation of the pendulum the wheel shall rotate once a minute.

A flat spring located between the pendulum-rod and wheel L is attached to said rod, and presses against the end of the axis or arbor of wheel L, thereby causing it to slightly resist any attempt to rotate it, and causing it to remain stationary during each movement of the pendulum A to the right. The click M, made preferably of ivory, in order that it may not oxidize, is pivoted at *x* on an arm, *y*, supported by plate D in such a manner that that end of the click which is over the wheel L continually tends downward. The amount of fall of this end of this click is regulated by a set-screw, Z, in arm N, located over the other end of the click and supported by plate D. A platinum pin, P, projects from the front side of the wheel L and at right angles to the face of the latter.

To the right of wheel L is a stud, Q, of non-conducting material, projecting from the plate D, and provided with two elastic rods, R R', each provided near and at their left-hand ends with an inward projection, T. Neither the rods nor these projections touch one another. The inner edges of the left-hand ends of the rods are beveled away, so as the better to receive the pin P, which once during every revolution of wheel L comes opposite them, and is forced between them by the oscillation of the pendulum.

Rod R is connected to wire U and rod R' to wire V in any suitable manner—in the present instance by a metallic screw, 31.

I will now describe the mode in which this feature of my invention operates, viz: Wire U is connected to one pole of a battery and wire V is connected to the other pole of the battery. The detent J is supposed to be latched back, as shown in Fig. 1. Pendulum A is set in motion, and upon its first oscillation to the left the lip *u* of cross-piece K passes under part *q* of the detent, and the latter being forced up the bevel *t* of the cross-piece the detent is lifted high enough to raise catch 2 from engagement with stud S, and the spring I then comes into action, drawing lever H and detent J toward the pendulum and pressing the end *q* of the detent against the end of cross-piece K, by which means an impulse is communicated to the pendulum. The pendulum thus receives an increase of motion which will suffice to cause it to oscillate properly for one minute, during which time the concavity of the detent will rest upon stud S and its end *q* hang so low as to be below the point where cross-piece K in its right-and-left movement could engage it. During said minute the wheel, by the action of the click, has been rotated, tooth by tooth, an entire revolution, and at the expira-

tion of the minute, as the pendulum is swinging from left to right, the pin P is brought directly opposite the opening between the rods R and R', and is forced between the latter by the onward movement of the pendulum. As pin P is thicker than the opening between the rods R R', it touches both of the latter, and thus establishes a perfect electric circuit between both poles of the battery, the current passing through wire U, rod R, pin P, rod R', wire V, magnetic coils E and E', and thence through wire W, either directly or through other magnets and wires, to the battery. In this way the magnetic coils E and E' are magnetized, and the armature *e* is instantly attracted to them, thereby moving lever *f*, which overcomes the resistance of spring I and moves lever H to the left and draws detent J back till catch 2 comes to the left of and falls behind stop S. The detent is thus latched. The oscillation of the pendulum to the left, following that one to the right, whereby the pin P was forced between rods R R', withdraws said pin from between said rods, breaks the electric circuit, deprives the coils E E' of magnetic attraction for armature *e*, and drives piece K against the detent J, unlocks the latter, as before described, and the spring I again communicates an impulse to the pendulum.

The above operations are continually repeated.

At the expiration of each minute the circuit is closed and the detent latched, the circuit immediately broken and the detent unlatched, and a new impulse given to the pendulum. In this manner the proper and necessary vibrations of the pendulum are maintained with great regularity.

The number of times of closing and opening the electric circuit and of latching and unlatching the detent per a given number of minutes may be diminished by increasing the number of teeth in wheel L or by adding to the pendulum another toothed wheel of proper size worked by wheel L through the mediation of a pinion on the axis of the second toothed wheel, bearing pin P. There are many obvious methods of accomplishing said result.

The number of times of opening and closing the electric circuit and of latching and unlatching the detent per minute may be increased by diminishing the number of teeth of wheel L or increasing the number of pins, such as P, on the wheel L. In case it is desired to give an impulse to the pendulum at every vibration, the wheel L may be dispensed with and the pin P be fixed on a permanent arm projecting from the latter in such a position as to be forced between rods R and R'.

The second feature of my invention is as follows: Magnetic coils 3 and 4 are fixed to a supporting-plate, 5. Armature 6 is pivoted in any convenient manner so as to oscillate away from and up to the ends of the magnetic coils. In the present instance a flange, 7, (see Fig. 2,) at each end of the armature receives a journal, 8, from the supporting-frame and

turns thereon. A toothed wheel, 9, (each tooth of which is of a triangular shape, as shown, both sides of each tooth being equal,) to the left of the magnetic coils, has its axis 13 journaled at one end in the supporting-bearing 10 supported by the plate 5. The axis passes through the plate 5 and into a hollow sleeve, 33, which is continued through and beyond the dial-plate 11 of the clock, and the said projecting end of said sleeve 33 carries the minute-hand 12, arranged in the usual manner. The object of this sleeve 33 is to permit the hour and minute hands to be turned forward or backward without injury to the machinery.

The usual device for operating the hour-hand by the axis 13 of the minute-hand is present here, and is as follows: The axis 13, as before stated, passes into the sleeve 33, and by friction causes said sleeve to turn when the wheel 9 turns. To the inner end of the sleeve 33 is fixed the cog-wheel 14, which engages a minute-wheel, 15, on axis 16, and on the latter is also fixed a pinion, 17, which engages an hour-wheel, 18, fixed on an axial sleeve, 19, encircling axis 13 and turning thereon and extending beyond dial-plate 11. That end of the sleeve which projects beyond the face of the dial-plate carries the hour-hand 20.

A rod, 21, is pivoted at one end to the armature and at the other to an escapement-lever, 22, at 34. The latter is provided with two bent arms, 23 24, arranged to alternately engage the teeth of wheel 9, and has a supporting end or arm, 25, the upper end of which latter is pivoted to the plate 5 by a suitable journal or pivot, 26. A hooked extension, 27, of the arm 25, above the pivot, receives one end of a spring, 28, strained between said point and stud 29 of the supporting-plate.

Wire W connects (either directly or through other wires and coils) the coils 3 and 4 to one pole of the battery, and wire 30, in like manner, connects these coils to the other pole of the battery. The operation of this feature of my invention is as follows, viz: While the circuit is broken the spring 28 forces the end of arm 23 of lever 22 between the teeth of the wheel 9. When the circuit is closed the armature 6 is attracted to the coils 3 and 4, and overcomes the resistance of spring 28 and draws the lever 22 toward the coils, thereby withdrawing arm 23 from the wheel 9 and forcing the end of arm 24 between the teeth of the wheel 9. When the circuit is broken the spring 28 again returns lever 22 to its former position. The subsequent alternate closing and opening of the circuit repeats the above operation, and this oscillation of escapement-lever 22 rotates the wheel 9. For illustration, when the point of arm 24 enters between the teeth of wheel 9 the wheel is thereby rotated in the direction of the arrow one-half a tooth, and when the circuit is broken and the point of arm 23 is forced between the

teeth of wheel 9 the latter is again rotated one-half tooth forward in the same direction. In the present illustration the wheel 9 has sixty cogs, and, as it moves one cog per minute, the hand is correspondingly moved a minute space over the dial-plate, and the hour-hand moved one-sixtieth of the space between the hour designations.

It will be apparent that the two features of my invention work admirably together, and are intimately connected with one another. For example, wire W may be connected to wire V. The opening and closing of the electric circuit by the oscillation of the pendulum and the devices shown under the first feature of my invention contribute at the same time to keep the pendulum in operation and to propel forward the hands of the time-piece.

Where the pendulum operates to open and close the circuit oftener or less than once a minute the number of teeth of wheel 9 may be correspondingly increased or diminished, or proper and easily arranged gearing (which any mechanic skilled in watch and clock making can prepare) to accomplish the same purpose may be interposed between wheel 9 and the clock-hands.

Should the electric current be too weak to operate the first and second features of my invention at the same instant of time, the device shown in Fig. 5 may be employed, viz: The wire U connects one pole of the battery to rod R and the wire V connects the coils E E' to rod R'. Wire W connects the electric coils E E' to the second pole of the battery. Wire 32 connects the rod R² to the coils 3 and 4, and the rod 30 connects the latter to the second pole of the battery. The pin P, after passing between rods R and R' and closing in the circuit so as to latch the detent, will be withdrawn, and at the next movement of the pendulum from left to right the pin P will be forced between rods R and R² and close the circuit and operate armature 6.

I purpose operating, when occasion demands, clock-hands upon various dial-plates provided with the second feature of my invention and located at various desired localities by one and the same mechanical movement of any desired kind, opening and closing the circuit, made by conducting-wires connecting the coils of each with one another. Thus one battery or one source of electric fluid, whatever that source may be, will operate at a trifling expense a large number of time-pieces and enable the latter to keep the same time.

The device for compressing the spring and for unlatching the detent and communicating the impulse of the spring to the pendulum may be advantageously employed with devices other than those I have described for closing and breaking the circuit.

What I claim as new and of my invention, and desire to secure by Letters Patent, is—

1. The combination of the pendulum and the pin P, and rods R R', and electro-magnets E and

E', and wires U V, and wire W, substantially as and for the purposes specified.

2. The pendulum provided with piece K, in combination with the detent J, stop S, lever H, and spring I, substantially as and for the purposes specified.

3. The combination of the pendulum provided with the pin P and piece K and rods R R', electro-magnets E and E', and wires U V, and wire W, armature e, levers f and H, spring I, detent J, and stop S, substantially as and for the purposes specified.

4. The pendulum provided with wheel L, having one or more pins, P, in combination with a device for rotating the wheel and a device for enabling the pin P, by the oscillation of the pendulum, to close and break the circuit, substantially as and for the purposes specified.

5. The pendulum provided with wheel L, having one or more pins, P, in combination with click Y and pins R' R, wire U, wire V, electro-magnet, and wire W, substantially as and for the purposes specified.

6. The combination of click M, pivoted at X, and set-screw Z, and wheel L, having pin P, and located on the pendulum, and rods R R', substantially as and for the purposes specified.

7. The combination of the electro-magnet, armature e, lever f, lever H, hinged rod l, having nut l', lever H, and detent J, and piece K on the pendulum, substantially as and for the purposes specified.

8. The combination of detent J, lever H, lever f, and set-screw m, and spring I, and piece K, substantially as and for the purposes specified.

9. The combination of electro-magnet, armature e, lever f, screw m, connecting-rod l, screw l', lever H, and detent J, provided with concavity r and stop 2, and end q, substantially as and for the purposes specified.

10. The combination of the electro-magnet, armature e, detent J, connecting and operating mechanism, and piece K, pendulum, and devices for closing and breaking the circuit, substantially as and for the purposes specified.

11. The combination of the electro-magnet, armature e, detent, connecting and operating devices, piece K, pendulum, wheel L, click M, pin P, rods R R', and wires U, V, and W, substantially as and for the purposes specified.

12. The combination of electro-magnet 3 4, armature 6, rod 21, lever 22, consisting of arms 23 and 24 and supporting-arm 25, and suspended from pivot 26 at the upper end of piece 25, spring 28, and wheel 9, wires W and 30, and a device for closing and breaking the circuit, substantially as and for the purposes specified.

13. The combination of electro-magnet 3 4, armature 6, rod 21, lever 22, pivoted at 26, and one end being provided with a spring, 28, wheel 9, axis or arbor 13, minute-hand 12, sleeve 33, and minute-wheel 14, wheel 15, pinion 17, hour-wheel 18, sleeve 19, hour-hand 20, and dial-plate 11, and a suitable device for closing and breaking the circuit, substantially as and for the purposes specified.

14. The combination of the electro-magnet E E', armature e, detent J, connecting and operating mechanism, pendulum, piece K, pin P, rods R R', wires U V W, electro-magnet 3 4, armature 6, lever 22, connecting mechanism, wheel 9, and arbor 13, and hands 12 and 20, and suitable connecting and operating mechanism, substantially as and for the purposes specified.

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Witnesses:

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