No. 649,587. Patented May 15, 1900.

S. P. THRASHER.

ELECTRIC CLOCK.

(Application filed Mar. 5, 1897.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1

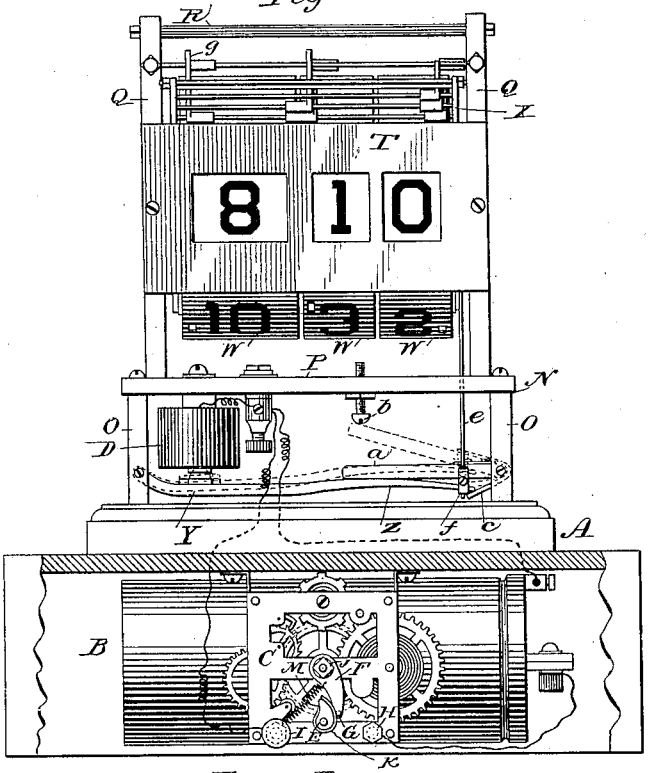


Fig. 2

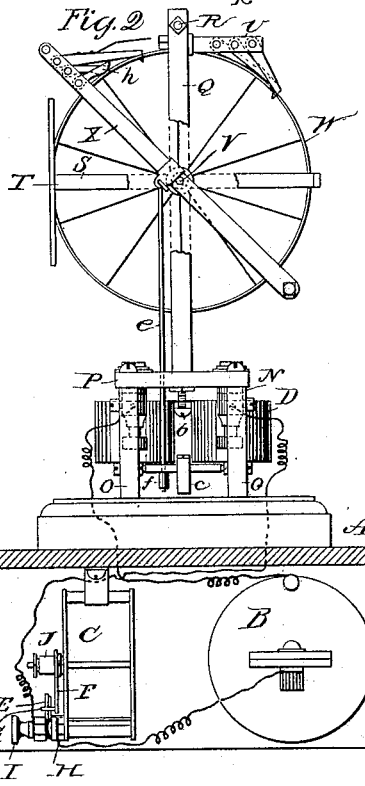


Fig. 3

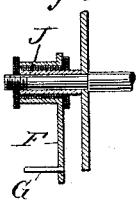


Fig. 4

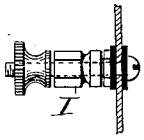


Fig. 5.

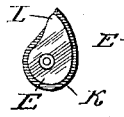
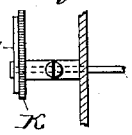


Fig. 6



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(No Model.) 2 Sheets—Sheet 2.

Fig. 7

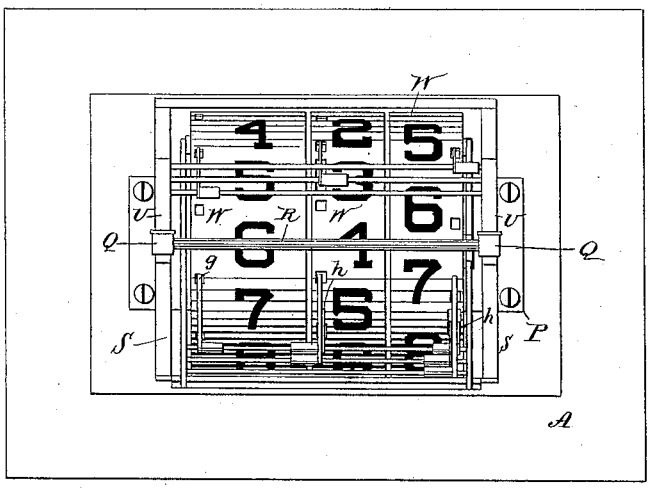


Fig. 8

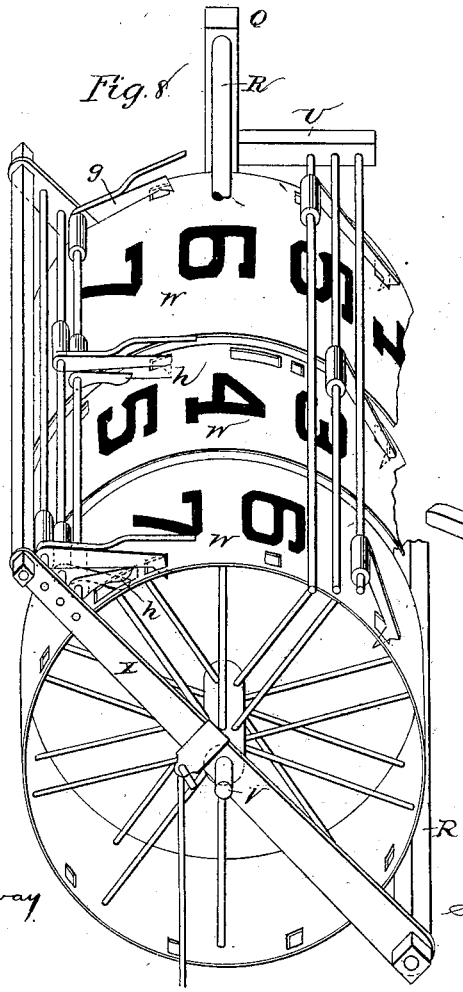


Fig. 9.

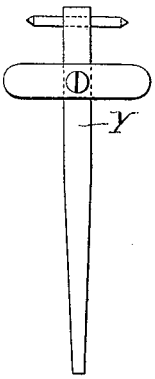
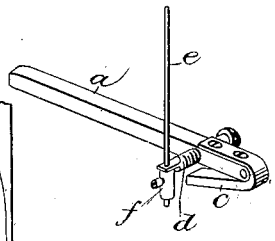


Fig. 10.



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UNITED STATES PATENT OFFICE.

SAMUEL P. THRASHER, OF NEW HAVEN, CONNECTICUT.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 649,587, dated May 15, 1900.

Application filed March 5, 1897. Serial No. 626,012. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL P. THRASHER, a citizen of the United States, and a resident of New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Time-Indicating Devices, of which the following is a specification.

My invention relates to time-indicating devices, and is especially adapted to indicate time by figures carried on spools or drums adapted to be rotated by an electromagnet; and it consists in the construction and relative arrangement of the parts as hereinafter described, and pointed out in the claims, reference being had to the accompanying drawings, in which like letters of reference indicate like parts throughout the several figures.

Figure 1 is a front view of the preferred embodiment of my device in operation, with top part of the case removed and a portion of its base broken away to show the battery and master-clock located within the same. Fig. 2 is a side view of the same with the end of the base broken away. Fig. 3 is an enlarged detailed view of a portion of the front end of the center shaft of the time movement, extending through the front plate of the movement and having mounted thereon an insulated contact-arm. Fig. 4 is an enlarged detailed view of an insulated binding-post secured to the front plate of the movement. Fig. 5 is an enlarged detailed view of the insulated cam. Fig. 6 is a side view of the same attached to the seconds-shaft. Fig. 7 is a top view of the drums bearing the figures to indicate the time of day and showing the perforations in their rims and the construction and arrangement of their engaging pawls. Fig. 8 is an enlarged perspective view of Fig. 7, showing the method of attaching the pitman to the yoke and the weighted bar at its lower end. Fig. 9 is a top detailed view of the armature of the electromagnet. Fig. 10 is an enlarged view of the lever shown in Fig. 1 in engagement with the armature of the magnet.

In the above preferred embodiment, A is the base of my time-indicating device, and contains a battery B and master-clock C, fastened in their respective positions in any suitable manner, and arranged and adapted to be put in circuit each minute with the electromagnet D, which operates my device. This is effected by means of the cam E, which revolves with the seconds-shaft, and the spring-actuated lever F, loosely journaled on the front plate and riding over the periphery of the insulated cam by means of its laterally-extending pin G in the following manner: The binding-post H is directly connected with the movement, and the binding-post I is insulated therefrom and connected by means of a metallic spring to the lever F and its pin G. This lever is also insulated from the movement by means of its insulated hub J, as shown in Fig. 3. The cam E is in metallic connection with the movement and is provided with insulation K on its periphery, except at the single point L, arranged on a steep incline leading to the lowest point on the cam. When the device is in operation, the point L contacts with the pin G of the lever F and completes the circuit through the movement. Owing to the construction just described, the clock will not stop when the battery is in circuit, since at this point power is applied by tension-spring M in actuating the escapement by means of the pressure of the pin G in passing down the incline of said cam past the contact-point. In the present instance the base of my device is left open at the bottom to afford easy access to these parts. Mounted on this base is a frame N, provided with posts O O, attached to the base. This frame further consists, substantially, of the main plate P, secured to the upper ends of the posts O O and provided with two upright columns Q Q, secured to the said plate at their lower ends and rigidly connected at their upper ends by a cross-bar R. To each of the columns Q Q is a forward-extending arm S, which serves to hold in proper position the dial-mat T and rear-extending arms U U, forming supports for the idle pawl-shafts. A shaft V is supported by the columns Q Q and has journaled thereon the rotatable time-indicators carrying time-numerals thereon, in this embodiment drums W W W, provided with figures to indicate the time of day, and also an oscillating pawl-carrier X, in this embodiment provided with carrying and count pawls mounted on their respective shafts and adapted to actuate their

respective drums by ratchets thereon in indicating the time of day. By "carrying time-numerals" I do not mean that the numerals must be necessarily attached to the drums themselves, for if the drums carry the time-numerals and move them around I consider this will clearly be within my invention.

The lever *a* is provided with a step *c*, upon which the end of the armature rests when released by the magnet, and this step, in connection with the outer end of the lever bearing upon the armature, serves to limit the downward motion of both armature and lever when not actuated by the magnet. (See Fig. 1.) Secured to the lever *a* is a laterally-projecting arm *d*, having an eye in its outer end through which the pitman *e*, connected to the oscillating pawl-carrier X, passes. *f* is an adjustable collar and set-screw, by means of which it is made fast to the pitman below its bearing in the arm *d* and serves to operatively connect the pawl-carrier X with the projecting arm *d* and its lever *a*. The upper end of the yoke having at this point been drawn backward by the weight of the said lever and armature to its farthest limit of motion in this direction, the said weight of the lever and armature being greater than the weighted lower end of the pawl-carrier, but since the weight applied to the lower end of the pawl-carrier by means of its heavy cross-bar R when not overcome by the weight of the said lever and armature is sufficient to overcome the weight of the upper end of the pawl-carrier and the mechanism attached thereto and carry forward at the same time one or more of the drums, as the change of time may require, it is evident that when the weight of the lever and said armature is lifted off the collar *f* of the pitman *e* the rotation of the drums is readily effected.

The parts are shown in the figures in their normal position, the pawl-carrier being drawn back ready for forward movement to rotate the drums. When the cams E and K rotate far enough for the pin G to be released and drop down, thereby closing the circuit and energizing the magnet, the lever *a* will be raised, releasing the pawl-carrier, thus allowing the heavier lower end of the carrier to fall and rotate the carrier and drums. This heavier portion of the carrier is obviously the rod which lies across the lower part of the yoke. As this weight falls it turns with the carrier, and as the arm X rotates it will approach a vertical position the farther it moves. To overcome the inertia of the drums and start them in rotation, more force is necessary than to continue them in rotation after they have been started. When the pawl-carrier is released and the weighted lower end of the carrier starts to move, the effect of this weight will decrease as the arm X approaches the vertical. In this way I provide a construction in which a greater force is applied to start the drum, and this force automatically decreases as the drum continues to move.

The pin G remains long enough upon the end L of the cam E to allow the drums to rotate, and when it passes off from this contact-point the circuit is broken and the lever *a* and armature *y* immediately fall back, the pin *d* contacting with pin *f* and drawing back the pawl-carrier and pawls to the position shown in Figs. 1, 2, and 8. It will be obvious that when the magnet is energized the influence of the magnet upon the armature will increase the nearer the armature approaches the poles thereof and that when the armature starts to move from its position shown in full lines in Fig. 1 the influence of the magnet thereon will increase. I have therefore provided a connection between the armature and the lever, which connection in this embodiment is the long lever attached to the armature; but this armature and connection may obviously be formed in many ways, although it is preferable to have a comparatively-long arm attached to the armature. This connection rests against the lever *a*, and one of these two parts, in the present embodiment the connection itself, carries a cam-face Z, which contacts with the lever at a distance from the pivot of the lever, as shown. When the magnet is energized, the leverage on *a* is comparatively great; but as the influence of the magnet over the armature increases and the lever *a* is raised the cam-face on Z will shift the point of contact between it and the lever along toward the pivot of the lever, thereby decreasing the leverage as the influence of the magnet on the armature increases. I do not mean that there is any ratio necessary between the increase of power in the magnet and decrease in leverage.

The operation of the drums and the mechanism engaging the same being for the most part similar to the operation of the drums and their mechanism as shown and described by me in my former application for a patent under date of October 19, 1896, Serial No. 609,293, I need only refer in the present instance to the improvements on the same embodied herein.

To provide drums for carrying figures of light practicable form, I have here shown thin rims, preferably of thin sheet metal, and provided with perforations to receive the various pawls and count-dogs. This arrangement affords cheapness of construction and admits of the use of thin and light-weight pawls and dogs arranged edgewise, thereby lessening friction, particularly when gliding over the face of the drums when not in operative engagement with the same. A further advantage of this construction consists in being able to accurately form the rims with punch and dies before they are bent in proper shape to attach to the spokes. Another improvement consists in providing the carrying-pawl *g* of the hour-drum with two count-

pawls *h h*, said count-pawls being preferably secured rigidly to the shaft of the said carrying-pawl and adapted to move in common therewith and also arranged and adapted to engage the count-notches on the units of minutes and the ten-minutes drums, respectively. By this means the carrying-pawl *g* will at all times be prevented from engagement with the perforations in the hour-drum, except when each of the said count-pawls shall fall into the count-perforations in their respective drums, at which time the change of the hour takes place.

It is evident that various changes in the construction and relative arrangement of the parts herein shown and described might be made and yet be within the spirit and scope of my invention, and I do not wish to be understood as in any way limiting myself to the exact construction and arrangement of the several parts hereinbefore described and set forth; but,

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

1. In a time-indicating device, a magnet, an armature having a lever *y*, lever *a* provided with step *c*, secured thereto, and arranged and adapted to oscillate therewith and to be engaged by the end of the lever *y*, when released by the magnet, substantially as and for the purposes described.

2. In a time-indicating device, in combination with armature Y, lever *a*, step *c* and stop *b*, substantially as and for the purposes described.

3. In a time-indicating device in combination, a rotatable time-indicating drum, a rotatable insulated cam, an electric circuit, a movable switch resting against said cam and moved thereby said cam being cut away to release said switch at a certain point and allow it to have a quick return movement, said electric circuit being closed by said switch in its said return movement, an electromagnet in said circuit, a weight to move said drum in one direction, an overweight to move said drum and weight in the opposite direction, and means operated by the armature of said electromagnet to release said overweight and allow said first weight to move said drum.

4. In a time-indicating device in combination, a movable time-indicator, a movable lever connected therewith to actuate the same and having a step thereon, a second lever contacting with said first lever to move the same and adapted to lie against said step when at rest.

5. In a time-indicating device in combination, an electric circuit, a switch and an electromagnet in said circuit, a movable armature for said magnet, a pivoted lever, a connection from said armature contacting with said lever at a distance from its pivot, one of said contacting parts having a cam-face, means to automatically close said switch and circuit and energize said magnet, thereby moving said armature, connection and lever and shifting the point of contact with said lever toward the pivot thereof as the influence of said magnet on said armature increases, a rotating time-indicator carrying time-numerals thereon, a ratchet connected with the same, a reciprocating pawl-carrier, a pawl carried thereby and adapted to engage said ratchet, means to reciprocate said carrier and a connection between said carrier and lever, whereby said shifting of the point of contact on said lever decreases the effect which said magnet has on said lever.

6. In a time-indicating device in combination, an electric circuit, a switch and an electromagnet in said circuit, a movable armature for said magnet, a pivoted lever, a connection from said armature contacting with said lever at a distance from its pivot, one of said contacting parts having a cam-face, means to automatically close said switch and circuit and energize said magnet, thereby moving said armature, connection and lever and shifting the point of contact with said lever toward the pivot thereof as the influence of said magnet on said armature increases, a rotating time-indicator carrying time-numerals thereon, a ratchet connected with the same, a reciprocating pawl-carrier, a pawl carried thereby and adapted to engage said ratchet, means to reciprocate said carrier and a connection between said carrier and lever, said lever adapted to normally retain said pawl-carrier and pawl in its retracted position and release the same when said lever is moved by said cam, and a weight to move said carrier and time-indicator when so released.

7. In a time-indicating device in combination, an electric circuit, a switch and an electromagnet in said circuit, a movable armature for said magnet, a rotatable time-indicator having time-numerals thereon, a ratchet connected with said time-indicator, a pawl to engage said ratchet, a reciprocating carrier for said pawl, a weight to move said carrier and pawl in one direction, a connection between said armature and weight to raise said weight, thereby removing the effect of said weight upon said pawl-carrier and releasing said pawl-carrier, and another weight to then move said pawl-carrier and drum in the opposite direction.

8. In a time-indicating device in combination, a rotatable time-indicator carrying time-numerals, a ratchet connected with the same, a pawl engaging said ratchet, a reciprocating carrier for said pawl, a weight connected with said carrier and adapted to move said carrier and time-indicator in one direction, a pivoted lever connected with said carrier and by its weight adapted to move said carrier and weight in an opposite direction, an electric circuit, an electromagnet in said circuit, an armature for said magnet, a connection from said armature contacting with said lever at a distance from its pivot, one of said contact-

ing parts having a cam-face, means to automatically close said switch and circuit and energize said magnet thereby moving said armature, connection and lever and shifting the point of contact with said lever toward the pivot thereof as the influence of said magnet on said armature increases whereby the effect of said lever on said carrier decreases.

9. In a time-indicating device in combination a rotatable time-indicator, a ratchet connected with the same, a pawl engaging said ratchet, a reciprocating carrier for said pawl, a weight to move said carrier in one direction, an overweight to move said first weight and said carrier in the opposite direction, and automatic means embracing a clock-movement adapted to release said overweight from connection with said carrier and allow said first weight to move said carrier.

10. In a time-indicating device in combination, a movable time-indicator, a ratchet connected with the same, a pawl to engage said ratchet, automatic means to move said pawl in one direction until it engages with said ratchet, and automatic means embracing a weight connected with said carrier and adapted to fall and move said carrier in the opposite direction and gradually decrease the power applied to move the same after the inertia of the same has been overcome.

11. In a time-indicating device in combination, a movable time-indicator, a ratchet connected with the same, a pawl to engage said ratchet, automatic means to move said pawl in one direction until it engages with said ratchet, and automatic means embracing a weight on a pivoted arm adapted to fall and move around its pivot toward a vertical position to move said time-indicator and gradually decrease the power applied to move the same after the inertia of the same has been overcome.

12. In a time-indicating device in combination, a movable time-indicator, a ratchet connected with the same, a pivoted pawl-carrier, a pawl on said carrier to engage said ratchet, a clock-movement and a connection between said clock-movement and carrier to move said carrier in one direction until said pawl engages with said ratchet, a weight on said pawl-carrier adapted to fall and move said carrier in the opposite direction and gradually decrease the power applied to move said time-indicator after the inertia of the same has been overcome.

13. In a time-indicating device in combination, a rotatable time-indicator, a ratchet connected with the same, a pawl engaging said ratchet and a reciprocating carrier for said pawl, a weight to move said carrier in one direction, an overweight to move said first weight and said carrier in the opposite direction, and automatic means embracing a clock-movement adapted to release said overweight and allow said first weight to move said carrier.

Signed at New Haven, in the county of New Haven and State of Connecticut, this 3d day of March, A. D. 1897.

SAMUEL P. THRASHER.

Witnesses:
E. LEDYARD,
W. S. TUCKER.