No. 648,296. Patented Apr. 24, 1900.

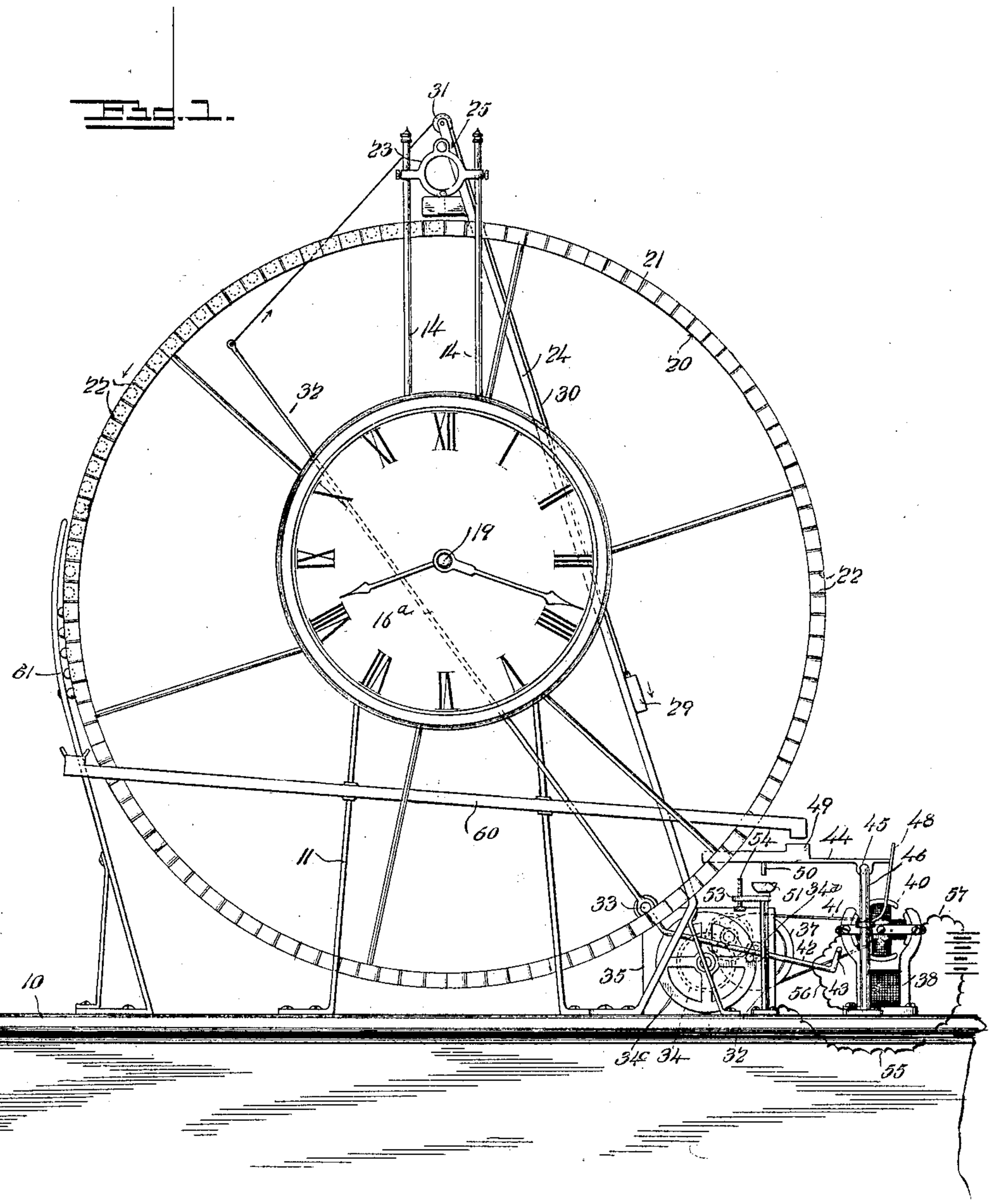
P. M. RAVENSKILDE.

ELECTRIC CLOCK.

(Application filed Apr. 7, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



Witnesses
E. F. Stewart.
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(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

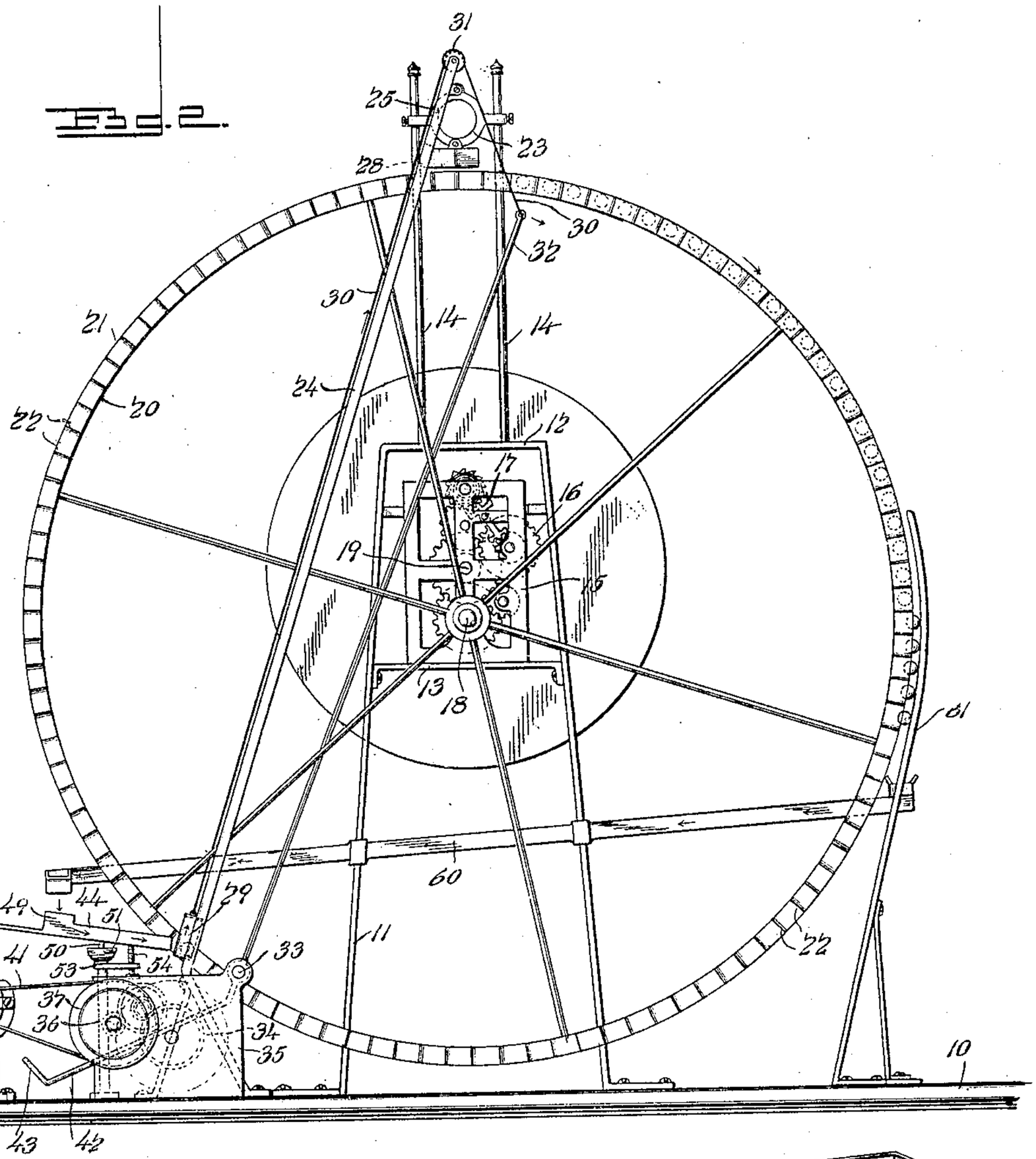

Fig. 6.

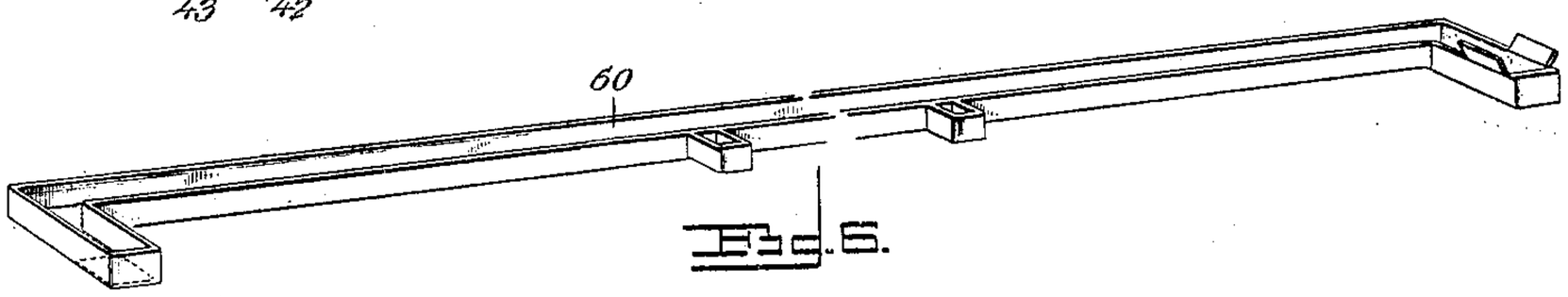

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Fig. 3.

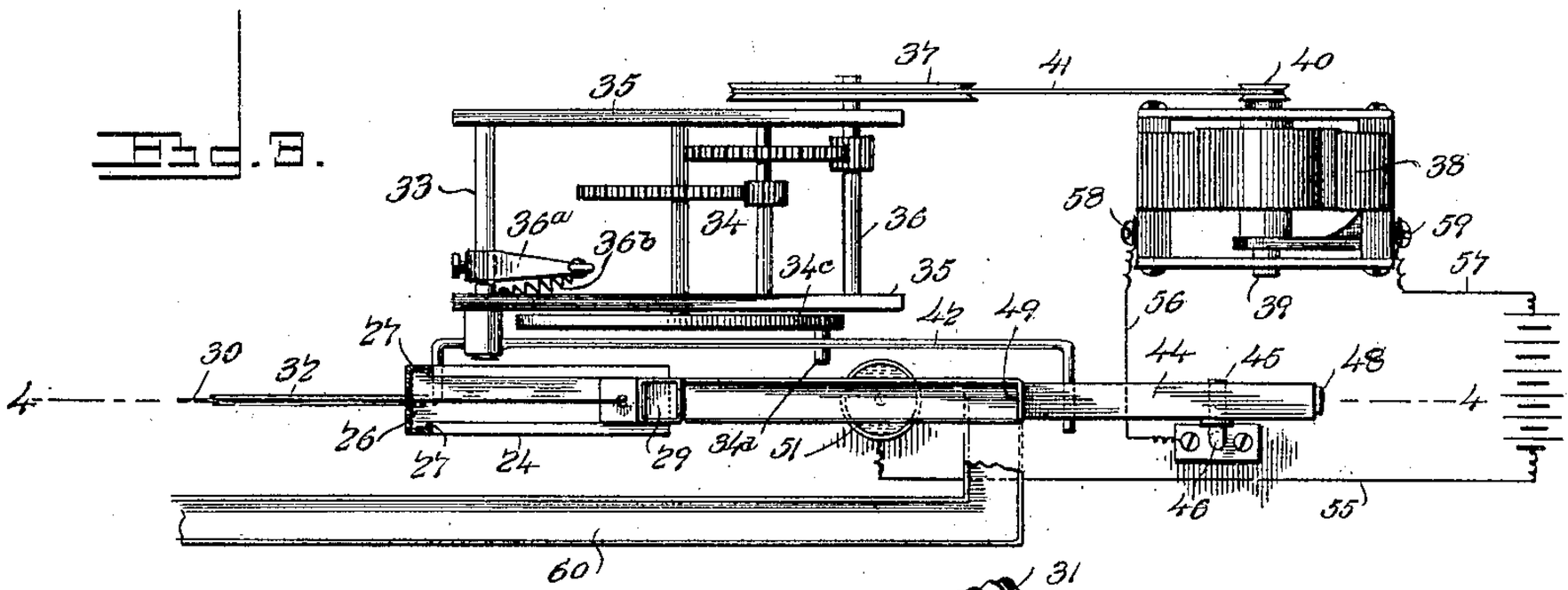

Fig. 5.

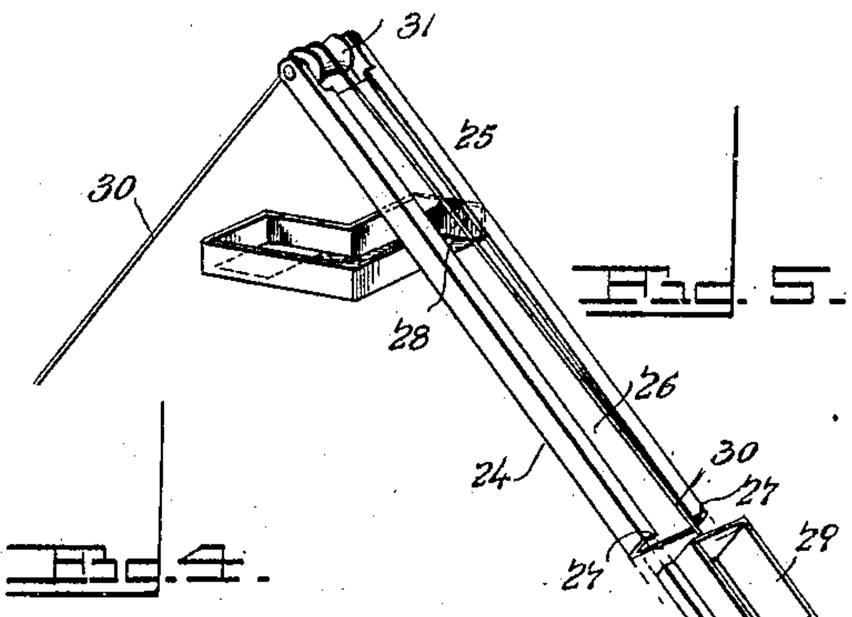

Fig. 4.

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UNITED STATES PATENT OFFICE.

PETER M. RAVENSKILDE, OF CABERY, ILLINOIS.

ELECTRIC CLOCK.

SPECIFICATION forming part of Letters Patent No. 648,296, dated April 24, 1900.

Application filed April 7, 1899. Serial No. 712,149. (No model.)

To all whom it may concern:

Be it known that I, PETER M. RAVENSKILDE, a citizen of the United States, residing at Cabery, in the county of Ford and State of Illinois, have invented a new and useful Electric Clock, of which the following is a specification.

My invention relates to improvements in automatic electric clocks; and the object in view is to provide a clock mechanism which dispenses with springs and a winding mechanism therefor, and which clock mechanism is operated automatically and continuously to drive the hands-train of gearing at uniform speed without subjecting the same to such irregularities as are due to variations in the tension of an impelling-spring.

In my clock the hands-train is propelled by gravitation of a number of weight-balls which are fitted to pockets in the periphery of a power-wheel in such relation to the axis thereof as to rotate said power-wheel continuously in one direction, and said weight-balls are discharged periodically from a lower part of the power-wheel and they are delivered in like manner to the upper part of said wheel at a point to one side of the vertical axis of the wheel. The weight-balls discharged from the lower part of the power-wheel are delivered to an inclined runway, by which they are carried to a circuit-closing delivery-chute which is included in an electrical circuit to a small electric motor. Said tiltable chute directs the weight-balls successively delivered thereto from the power-wheel into an elevator-car which is raised by an elevator-train of gearing propelled from the armature-shaft of the electric motor, and said elevator mechanism includes a vibratory arm that is connected operatively to the elevator-car and is arranged to adjust the tiltable chute so as to break the circuit when the car reaches its delivery-point, whereby the rotation of the motor is arrested and the car is permitted to stop for discharging the weight-ball therefrom to devices which deliver the weight-ball to the upper part of the power-wheel. The car is returned by its gravity and the action of a spring on the vibratory arm for receiving another weight-ball from the tiltable chute; but during the descent of the car said tiltable chute is held in its raised position by a suitable detent, such as a friction-spring, until another weight-ball shall have been delivered thereto from the runway of the power-wheel.

The invention consists in the novel combination of mechanisms and in the construction and arrangement of parts, which will be hereinafter fully described and claimed.

To enable others to understand the invention, I have illustrated the preferred embodiment thereof in the accompanying drawings, forming a part of this specification, and in which—

Figure 1 is a front elevation of an automatic electric clock embodying my invention. Fig. 2 is another elevation looking at the rear side of the clock. Fig. 3 is an enlarged plan view of the motor-driven elevator mechanism in active relation to the elevator-arm and the tiltable circuit-closer chute, showing the electric-motor circuit. Fig. 4 is a longitudinal sectional elevation through a part of the mechanisms represented by Fig. 3 and on the plane indicated by the dotted line 4 4 of said Fig. 3. Fig. 5 is a detail view of the elevator-car and a part of its guideway. Fig. 6 is a detail perspective view of the inclined runway by which the ball-weights are conveyed from the power-wheel to the circuit-closure chute.

The same numerals of reference are used to indicate like and corresponding parts in each of the several figures of the drawings.

10 designates a base of any suitable character, to which is firmly secured an upright frame 11, which supports the hands-train of gearing, the face or dial of the clock, and the power-wheel. This upright frame is provided at its upper extremity with a head 12, and at a point intermediate its length the sides of the frame are joined together by a bridge-bar 13. Projecting upwardly from the head of the frame 11 are the standards 14, which support the supply devices adapted to receive the weight-balls successively from the elevator mechanism and to deliver said weight-balls back to the pockets in the power-wheel.

The train of clock-gearing 16 by which the hands are driven is carried by a small frame 15 of any suitable construction, and this clock-train and its framework are disposed be-

tween the sides of the upright frame 11 and also between the head 12 and bridge-bar 13 of said upright frame. This frame 15 is fastened firmly in place in any suitable way to the parts of the upright frame, and said frame 11 also has the dial or face 16ª of the clock secured in any suitable way to one side thereof. The train of clock-gearing 16 is equipped with an escapement mechanism 17 of any suitable type, and said gear-train 16 has a primary driving-shaft 18 and the hands-arbor 19. The primary driving-shaft of the clock-train is journaled in firm bearings of the frame 15 to support the weight of the power-wheel, which is fixed directly to said shaft, and between the shaft 18 and the arbor 19 are disposed the gear elements of the train 16 for the purpose of rotating the hands-arbor at the proper rate of speed.

The power-wheel 20 is fast with the shaft 18 to rotate the latter. As shown by the drawings, this power-wheel is of skeleton construction to reduce the weight thereof and enable a wheel of comparatively large diameter to be used in the construction of the apparatus. The spoked wheel has a rim 21 secured to the spokes thereof, and this rim is equipped with a large number of cups which form the plurality of peripheral pockets 22, adapted to receive the weight-balls, which by their gravitation propel the power-wheel continuously in one direction. It will be understood that the power-wheel is not equipped throughout its entire periphery with a series of weight-balls that are fitted or secured permanently thereto, but a sufficient number of weight-balls are employed to fill the pockets for one-third of the circumference of the power-wheel. The weight-balls contained within the pockets of the power-wheel are disposed at one side of the plane of the vertical axis of said power-wheel, and the balls in the pockets of the lower part of the power-wheel are discharged successively into a runway, which returns the weight-balls to an elevator mechanism adapted to carry the weight-balls from the lower part of the power-wheel back again to the upper part of the power-wheel.

The means by which the weight-balls when delivered from the elevator mechanism are returned to the power-wheel are situated above the upper edge of the wheel 20, and this return or supply means for the weight-balls contemplates the employment of a head-piece 23, which is equipped firmly to the standards 14, that are extended above the frame 11. The head-piece 23 supports a supply-chute 24, which is arranged to have its delivery end 25 overhang the pocketed rim of the power-wheel, and as the latter is rotated with a step-by-step motion to present its pockets successively below the overhanging delivery end of the chute 24 the weight-balls, which are supplied to said chute by the elevator mechanism, are dropped one after the other into the successively-presented pockets of said power-wheel.

The elevator mechanism for returning the weight-balls from the lower part of the power-wheel to the chute 24 includes an elevator-car, which is fitted to travel in an inclined guideway 26, which is formed by a standard having the flanges 27. This inclined standard, which constitutes the elevator-guideway, is fixed in any suitable way to the base or to a frame which supports the train of motor-driven gearing, and the standard or guideway 26 is provided at its upper end with an opening 28, which is disposed in a plane over the chute 24. The elevator-car 29 is fitted slidably against the standard or guideway 26 and within the flanges 27 thereof, and with this car are combined devices which are actuated by the motor-driven train of gearing for positively raising the car to a position where it will discharge the weight-ball from the standard or guideway 26 to the chute 24. In one construction of this car I employ a skeleton or bottomless frame, which is arranged to travel directly against the guideway or standard 26, so that the standard will serve to confine a weight-ball within the car, and this car is adapted to be raised by the elevator mechanism to a position over the opening 28 in the guideway or standard 26, whereby the weight-ball which is contained within the car will fall or drop by gravity through the opening 28 and pass to the chute, which returns the weight-ball to the pocket in the rim of the power-wheel.

As the elevator-car is slidably fitted to the guideway or standard 26 it is adapted to travel in an inclined rectilinear path, and to the upper end of this car is connected one end of a hauling cord or wire 30, which passes over a guide-sheave 31, journaled in the upper extremity of the standard or guideway 26. The other end of this hauling cord or wire is attached to a vibratory arm 32, adapted to turn on a horizontal axis and move in the vertical plane relatively to the guideway or standard 26 for the purpose of drawing the car 29 toward the upper end of the guideway when said arm 32 is lowered by the action of the motor-driven train of gearing. This vibratory arm 32 is fast with a horizontal shaft 33, journaled in the frame 35, supporting the train of gearing 34, which constitutes a part of the elevator mechanism. This train of gears has the shafts thereof journaled in said frame 35, and one shaft 36 of this train of gears is equipped with a pulley 37. The frame 35 for the gear-train is fastened firmly to the base 10, and it is located adjacent to an electric motor 38, the framework of which is also fastened to the base. The armature-shaft 39 of the electric motor is equipped with a pulley 40, disposed in alinement with the pulley 37 of the train of gears, and these two pulleys are connected operatively by a belt 41, which transmits the motion of the motor-armature to the shaft 36 for positively driving the train of gears, so as to rock or turn the shaft 33 through the medium of the wheel 34ᶜ and the

stud 34[d], hereinafter described, and thereby depress the vibratory arm 32 to raise the elevator-car 29.

The electric motor is not driven continuously, because its circuit is broken or interrupted at intervals during the return movement of the elevator-car, and I will now proceed to describe the means by which the circuit is interrupted and the weight-balls are delivered to this elevator-car. The vibratory arm 32 is provided with a lifting-finger 42, which extends from the opposite side of the shaft 33, and this finger 42 is bent in an upward and outward direction, as at 43, to fit below the circuit-closer chute 44. This chute is arranged in a position for its delivery end to lie contiguous to the lower end of the standard or guideway 26 for the purpose of returning the weight-ball to the elevator-car, and said chute occupies a substantially horizontal or inclined position, and it is mounted or hung pivotally for vibration in a vertical plane. The chute 44 is hung, as at 45, on a fixed standard 46, attached to the base 10, and the heel of said vibratory chute is arranged to ride against a friction-spring 48, that is attached to the standard 46. This spring exerts sufficient tension on the heel of the chute to sustain the latter in the position to which it may be raised by the finger of the vibratory arm 32; but the tension of the spring is not sufficient to hold the chute in the horizontal raised position when the weight-ball is deposited therein previous to the return of the weight-ball to the elevator-car. This chute 44 is provided at a point intermediate its length with an inclined abutment 49, adapted to prevent the weight-balls from traveling through the chute in a direction toward the heel thereof, and this abutment occupies such relation to the runway that the weight-balls when delivered from the latter will be directed by the abutment toward the delivery end of the chute for return to the elevator-car. Said pivoted chute is furthermore provided with a contact-point 50, which depends from the lower side of the chute and is adapted to be immersed in the mercury contained in the cup 51, which is fixed to the upper end of the post 52, fastened on the base 10 adjacent to the standard 46. The post 52 is furthermore provided with a laterally-extended arm 53, which supports a stop-screw 54, that lies in the path of the pivoted chute, and this stop-screw may be raised or lowered in its supporting-arm 53 for regulating the travel of the pivoted chute 44.

The electric circuit includes the motor 38, the post 52, and the mercury-cup 51 thereon, and it also includes the post 46 and the pivoted chute 44, which is hung on said post so as to be in electrical contact therewith. It will thus be seen that the mercury-cup 51 constitutes one terminal of the electric circuit, while the other terminal of the circuit is formed by the contact-point 50, which is in electrical connection with the pivoted chute 44, whereby the chute is adapted to serve as the means for making and breaking the motor-circuit. This chute is actuated mechanically in both directions, and it is raised positively by the finger 42 of the vibratory arm on the elevation of the car, for the purpose of interrupting the motor-circuit when the car reaches the limit of its upward travel; but this circuit-closer chute is depressed by gravity of a weight-ball, which is deposited upon the chute so as to overcome the tension of the friction-spring and make the contact-point 50 of the chute enter the mercury within the cup forming the fixed terminal of the motor-circuit, whereby the circuit is closed for the current to energize the motor which drives the train of elevator-gearing. As shown more clearly by Fig. 3 of the drawings, the motor-circuit has a conductor 55 leading from one pole of the battery or other source of electrical energy to the post 52, that supports the mercury-cup 51, and between the standard 46 and one binding-post 58 of the motor is a conductor 56, which thus electrically connects the standard 46, on which the circuit-closer chute 44 is hung, directly to one terminal of the motor-field. The other binding-post 59 of the electric motor has an electrical conductor 57 connected electrically thereto, and this conductor forms the return connection to the battery or other source of electrical energy.

From the foregoing description it will be understood that the circuit is closed by a weight-ball dropping into the pivoted chute 44 to depress the latter for its contact-point 50 to enter the mercury-cup 51, and the circuit is thus completed from the conductor 55, the post 52, the mercury-cup 51, the contact-point 50, the pivoted chute 44, the post 46, the conductor 56, to the motor-field, through said field to the conductor 57, and thence back to the battery.

The weight-balls are discharged from the pockets in the periphery of the power-wheel successively as said power-wheel is rotated with a step-by-step feed, and these weight-balls are received into an inclined runway 60, which has its receiving end disposed contiguous to the pocketed periphery of the power-wheel. The delivery end of the runway is bent or deflected to overhang the tiltable chute 44, and the balls are thus caused to traverse the runway from the power-wheel to the tiltable chute. To prevent the balls from dropping out of the pockets of the power-wheel when the pockets assume the downwardly-inclined positions in the rotation of said wheel, I employ a curved guide 61, which is fixed to the base and conforms for a part of its length to the contour of the pocketed rim, and the curved or segmental portion of this guide lies contiguous to the path of the pockets on the periphery of the power-wheel, so that certain of the balls may travel against the arm previous to discharging the weight-balls from the wheel-pockets into the receiving end of the runway 60.

The shaft 33, which supports the vibratory arm 32, is provided with an upwardly-extending finger 36[a], to which is attached a spring 36[b], having its other end fastened to the frame 35, and this spring assists in returning the elevator-car to its lower position when the motor-circuit is broken and the elevator-train comes to a period of rest.

This being the construction of my electric clock, the operation may be described as follows: A sufficient number of the weight-balls are supplied to the pockets of the power-wheel to fill the pockets for one-third the length, more or less, of said wheel, and these weight-balls are disposed on the rim of said wheel at one side of the plane of the shaft 18, to which the power-wheel is fixed. The weight or gravity of the series of balls acts constantly on the power-wheel to impel the latter continuously in one direction, and this power-wheel is permitted, by the escapement of the clock-train, to rotate with a step-by-step feed. It is calculated that a weight-ball is to be discharged from the power-wheel at intervals of every minute and a half, but the period of discharge of the weight-balls may be varied as desired. At each step in the rotation of the power-wheel a weight-ball is discharged from the pocket to the inclined runway 60, which serves to return said weight-ball to the tiltable chute, the chute being held in its raised position normally by the friction-spring 48 to break or interrupt the motor-circuit. As the weight-ball is deposited in the chute 44 the latter is depressed for its contact-point to enter the cup, and the depression of the chute thereby serves to simultaneously close the circuit and deliver the weight-ball to the elevator-car. The fields of the motor are thus energized to effect the rotation of the armature which drives the shaft 36, and thus the train of elevator-gearing is set in motion to rock the shaft 33 in the manner hereinafter explained. The movement of the shaft 33 operates to depress the vibratory arm 32 for the purpose of elevating the car 29 along the inclined guideway or standard 26, and when the car reaches the opening 28 in the guideway the weight-ball is delivered to the chute 24. Simultaneously with the delivery of the weight-ball the finger 22 impinges against the chute for the purpose of positively lifting the latter to withdraw the contact-point 50 from the mercury-cup. The motor-circuit is thus broken and the motor is thrown out of service to allow the elevator-gear to stop, and the chute 44 is held in its raised position by the frictional engagement of the spring 48 with the heel of the chute. The elevated supply-chute 24 delivers the weight-ball to a pocket in the rim of the wheel, and on the next rotation of the power-wheel, which is controlled by the escapement of the clock mechanism, another weight-ball is discharged from a pocket at the lower side of said wheel, and the operation heretofore described is repeated.

From the foregoing description it will be observed that the clock-train is propelled continuously in one direction by the weighted power-wheel and that the weight-balls are discharged from the power-wheel and returned automatically thereto in a manner to continuously rotate said wheel in the proper direction. The motor serves to positively and automatically drive the elevator-car for transferring the weight-ball from the lowest point to the highest point of the power-wheel for redelivery to the latter, and this motor is controlled by the electric circuit and the circuit-closer to periodically propel the elevator train of gears for the operation of the elevator-car. This car is returned to its lowered loaded position by gravity or weight of the car itself assisted by the coiled spring 36[b], which is connected to the shaft that serves as the axis of vibration of the arm 32, which lifts the elevator-car.

My clock mechanism requires no spring for driving the hands-train, and hence the clock-train is driven continuously under the influence of a weight, which remains constant or uniform throughout the entire period of operation of the clock. It is not necessary to wind the clock at intervals, because the parts are wholly and entirely automatic in their operation. The battery to energize the motor should receive attention at proper periods to insure the necessary supply of electric energy for the operation of the motor; but other than this attention the clock mechanism will remain in service for a long time.

It will be noted that the electric motor propels the elevator train of gears and that said train of gears are interposed between the rock-shaft which actuates the vibratory arm and the motor, whereby the train of gears reduce the speed given to the rock-shaft for the elevator of the car, which returns the weight-ball to the power-wheel.

My clock embraces as one important element thereof a power-wheel which constantly carries a number of weight-balls, which have a tendency to normally propel the power-wheel at a uniform constant speed, and this power-wheel is of large diameter to multiply the gravity of the balls by the leverage of the wheel for the propulsion of the hands-train at a constant and practically-unvarying rate of speed. The energy developed by the power-wheel is utilized solely for the propulsion of the hands-train, and the weights are returned to the power-wheel by an elevator mechanism, which has a motor as a source of energy entirely independent of the power-wheel; but the operation of the elevator mechanism and its motor is controlled by devices actuated by the weight-balls, which are discharged from and returned periodically to the power-wheel.

By reference to Figs. 1 and 4 it will be noted that the train of elevator-gearing includes as one element thereof a wheel 34[c], which is disposed outside of the framework 35, and said wheel has a pin or stud 34[d], arranged to ride

against the finger 43 of the vibratory arm, whereby said wheel and pin cause the rock-shaft 33 of the elevator-train to turn in a direction for lowering said vibratory arm, and thereby raise the elevator-car. It will be understood that the pin or stud 34[d] rides at intervals on the finger and during a fragment of the period of rotation of the wheel 34[c]. Hence the finger and arm are free at other times from the stud, so as to be returned by the spring and the gravity of the car to normal position.

Changes in the size, shape, proportion, and minor details of construction may be resorted to without departing from the spirit or sacrificing any of the advantages of the invention.

What I claim is—

1. In a clock, the combination with a hands-train, of a power-wheel connected operatively thereto, a plurality of weights coöperating with the power-wheel and adapted to be discharged successively therefrom in the periods of its rotation, an elevator for returning the weights to the power-wheel, and a device, set in activity by a discharged weight, for starting the elevating action of said elevator, substantially as set forth.

2. In a clock, the combination with a hands-train, of a power-wheel operatively connected therewith, a plurality of weights coöperating with the power-wheel, and adapted to be discharged successively therefrom, an elevator for the discharged weights, and a device, set in activity by a weight during its travel to the elevator, for starting the elevating action of the latter, substantially as set forth.

3. In a clock, the combination with a hands-train, of a power-wheel operatively connected therewith, a plurality of weights coöperating with the power-wheel and adapted to be discharged successively therefrom, an elevator for the discharged weights, a device, set in activity by a discharged weight, for starting the elevating action of said elevator, and means for automatically throwing said device out of action when the elevator delivers its weight, substantially as set forth.

4. In a clock, the combination with a hands-train, of a power-wheel operatively connected therewith, a plurality of weights coöperating with the power-wheel and adapted to be discharged therefrom, an elevator for returning the discharged weights to the power-wheel, a motor connected operatively with the elevator, a controlling device for automatically starting and stopping the motor, said controlling device being thrown into activity by a discharged weight, and a separate device operating in unison with the elevator and arranged to throw said controlling device out of action when the elevator delivers its weight, substantially as set forth.

5. In a clock, the combination of a power-wheel connected operatively to an escapement-controlled hands-train, a series of weights fitted removably to said power-wheel and adapted to be discharged successively therefrom, an elevator mechanism including a traveling carriage which is guided to return the weights to the power-wheel at an elevated point at one side of the axis of said wheel, a motor connected operatively to the elevator mechanism, and a circuit-closer lying in the path of travel of the weights from the power-wheel to the elevator mechanism, said circuit-closer adapted to be operated by the weight for energizing the motor and also arranged to form a guide for directing the weight to the elevator mechanism, substantially as described.

6. In a clock, the combination with a power-wheel carrying a series of weights arranged to be discharged successively therefrom, of an elevator mechanism including a movable car, and means for actuating said car to positively raise the latter for delivering a weight back to the power-wheel, an electric circuit including a motor which is connected operatively with the elevator mechanism, and a circuit-closer forming a part of the electric circuit and having one of its members disposed in the path of a weight to form a chute for guiding the weight in its travel from the power-wheel back to the elevator mechanism, substantially as described.

7. In a clock, the combination of a power-wheel carrying a series of removable weights adapted to be discharged successively therefrom, an elevator mechanism, a motor geared to said elevator mechanism, a carriage connected operatively to the elevator mechanism to be raised positively thereby, and a chute lying in the path of the weights as they are discharged from the power-wheel, said chute being operatively connected with the motor for automatically starting and stopping the same, substantially as described.

8. In a clock, the combination with an escapement-controlled hands-train, of a power-wheel connected operatively thereto for rotation progressively with a step-by-step motion, a series of weights fitted removably to the power-wheel for continuously propelling the latter in one direction and adapted to be discharged successively therefrom, mechanism arranged to receive the weights subsequent to their discharge from the power-wheel and adapted to return said weights to said power-wheel at an elevated point situated at one side of the vertical axis of said wheel, an electric motor wholly independent of the power-wheel and connected operatively to the weight-returning mechanism for positively driving the latter, and a circuit-closing device associated with the motor and automatically set into action by the weights, substantially as and for the purposes described.

9. In a clock, the combination with an escapement-controlled hands-train, of a power-wheel connected operatively thereto for rotation with a step-by-step motion, a series of weights fitted removably to said wheel for continuously propelling the latter in one direction, an elevator mechanism situated in

active relation to the power-wheel and adapted to return the weights thereto, an electric circuit including the motor which is operatively connected to the elevator mechanism, and a circuit-closing chute forming a part of the electric-motor circuit and situated between the power-wheel and the elevator mechanism to be operated automatically by the weights as they are discharged from the power-wheel, substantially as described.

10. In a clock, the combination of a power-wheel connected actively with an escapement-controlled hands-train for rotation progressively in one direction, a series of weights fitted removably to said power-wheel, an elevator mechanism having a vibratory arm, a car arranged to travel in a rectilinear path and connected with said arm, means for positively propelling the elevator mechanism independently of the power-wheel, and a controlling device actuated by the weights for throwing the motor mechanism into service said controlling device being also actuated by said vibratory arm to throw the motor out of service, substantially as described.

11. In a clock, the combination of a power-wheel carrying a series of weights which are adapted to be discharged successively therefrom, an elevator mechanism including a traveling car, an electric motor geared to the elevator mechanism, a circuit-closer interposed in the path of the weights as they travel from the power-wheel to the elevator mechanism, and moved into position by the weights for closing the circuit, and means operating in unison with the elevator mechanism to automatically move the circuit-closer into position for opening the motor-circuit, substantially as described.

12. In a clock, the combination with a power-wheel carrying a series of weights adapted to be discharged successively therefrom, an elevator mechanism having a vibratory arm, a motor geared to the elevator mechanism, a circuit-closer lying in the path of return of the weights as they travel from the power-wheel to the elevator mechanism, and said closer adapted to be moved in one position by the gravity of said weights, a finger operated by the vibratory arm to return the circuit-closer to its normal position, an elevator-car connected with the vibratory arm to be raised positively thereby and arranged to receive the weights successively from the power-wheel and to deliver said weights back to the power-wheel, at a point on one side of the vertical axis thereof, substantially as described.

13. In a clock, the combination of a power-wheel having a series of weights adapted to be discharged successively therefrom, a motor, a tiltable chute arranged in the path of the weights as they are delivered from the power-wheel and adapted to automatically close the motor-circuit, an elevator mechanism actuated by the motor and having a vibratory arm arranged to restore the circuit-closer to its normal position for interrupting the motor-circuit, and a car connected operatively with the vibratory arm and adapted to receive the weights from the tiltable chute, substantially as described.

14. In a clock, the combination with a power-wheel carrying a series of weights adapted to be discharged successively therefrom, an elevator-train, a motor geared to said elevator-train for positively driving the latter, a tiltable chute included in the motor-circuit and lying in the path of return of the weights from the power-wheel to the elevator mechanism to be actuated by gravity of said weight for closing the motor-circuit, an elevator-car, and a vibratory arm actuated by the elevator-train and connected with the elevator-car, said vibratory arm arranged to operate the tiltable chute for returning the latter to its normal position, substantially as described.

15. In a clock, the combination with a power-wheel carrying a series of weights adapted to be discharged successively therefrom, of an elevator mechanism including a vibratory arm and a traveling car, a motor geared to the elevator mechanism for positively driving the latter independently of the rotation of the power-wheel, a tiltable chute forming a part of the motor-circuit and lying in the path of the vibratory arm and also arranged to intercept the weights as they are discharged from the power-wheel, and means for maintaining the tiltable chute in position to normally open the motor-circuit, substantially as described.

16. In a clock, the combination of an elevator-train having a vibratory arm and a circuit-closing finger, an electric circuit having one terminal formed by a mercury-cup, a pivoted chute forming the other terminal of the circuit and adapted to make electrical connection with said mercury-cup, a motor included in said circuit and geared to the elevator mechanism, a power-wheel wholly independent of the motor and carrying a series of weights adapted to be discharged successively therefrom, and means for returning the weights discharged from the power-wheel to the tiltable chute which serves to direct the weights successively into the elevator mechanism, substantially as described.

17. In a clock, the combination of an elevator mechanism having a rock-shaft, an arm fixed to said shaft and provided with a finger, a car connected with said arm to be raised positively thereby on the rotation of the power mechanism, a motor-circuit including a tiltable chute which is disposed in the path of the said finger, means for normally maintaining the chute free from contact with the finger and opening the motor-circuit, a motor included in said circuit and connected with the elevator mechanism, a power-wheel having a series of weights adapted to be discharged successively therefrom, and means for directing the weights to the tiltable chute,

for the purpose described, substantially as set forth.

18. In a clock, the combination of an escapement-controlled hands-train, a power-wheel connected operatively thereto for rotation with a step-by-step motion, a series of weights fitted removably to said power-wheel for discharge successively therefrom, a guideway adjacent to the power-wheel and having a point of discharge at one side of the vertical axis of said power-wheel, an elevator-car fitted to said guideway, an elevator mechanism connected operatively with said car, a motor-circuit having a motor geared to the elevator mechanism and adapted to operate the latter positively and independently of the rotation of the power-wheel, a tiltable chute included in the motor-circuit and controlled mechanically by the elevator mechanism to normally open the motor-circuit, and means between the power-wheel and the tiltable chute for returning the weights as they are delivered from the power-wheel to the chute which returns said weights to the elevator mechanism, substantially as described.

19. In a clock, the combination with an escapement-controlled hands-train, of a power-wheel connected actively thereto for rotation with a step-by-step motion and provided with a series of peripheral pockets, a series of ball-weights fitted removably in said pockets for discharge successively from the power-wheel, an elevator mechanism having a movable car, a motor geared to the elevator mechanism, a motor-circuit, a tiltable chute included in said motor-circuit and arranged to deliver the weights to the elevator mechanism, and a return-chute extending from the power-wheel to the tiltable chute, substantially as described.

20. In a clock, the combination of a train of elevator-gears including a rock-shaft, a vibratory arm fast with said shaft to be rocked thereby, a spring arranged to restore the arm to an elevated position, an inclined guideway adjacent to the arm, a car fitted to the guideway and connected operatively to the arm to be raised positively thereby and adapted to be lowered by gravity and the action of the spring, a motor-circuit including a motor geared to the elevator-train for positively rotating the latter, a circuit-closer also included in the motor-circuit and arranged to deliver weights to the elevator-car, a power-wheel equipped with a series of weight-balls which are adapted to be discharged successively therefrom, and a chute between the power-wheel and the circuit-closer, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

PETER M. RAVENSKILDE.

Witnesses:
JAMES OGILVIE,
GEORGE E. WRIGHT.