June 12, 1923. 1,458,509

W. ARTHUR

REGISTERING MECHANISM

Filed March 27, 1920 3 Sheets-Sheet 1

Fig. 1.

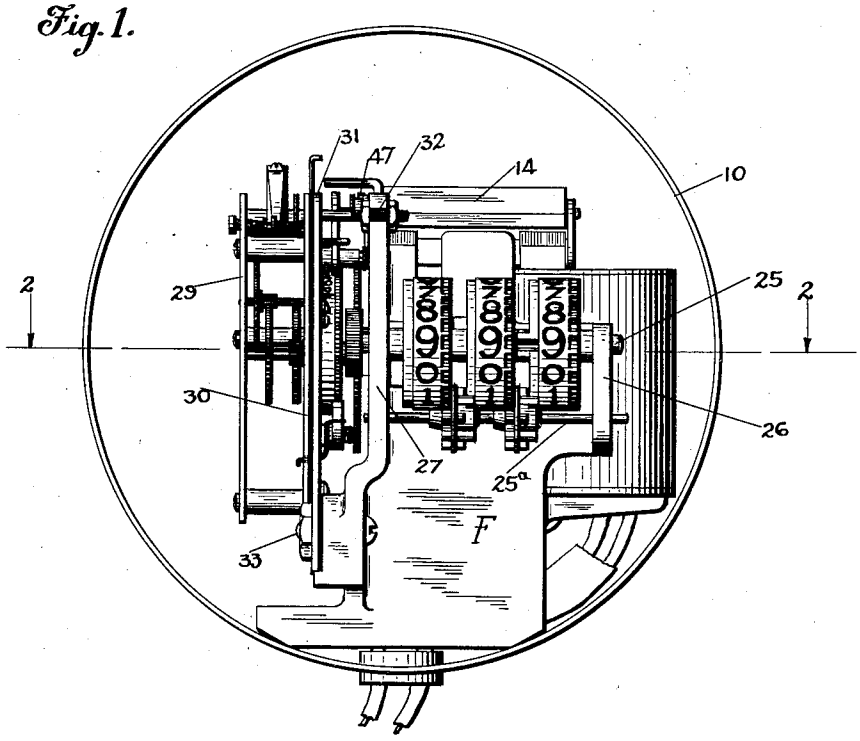
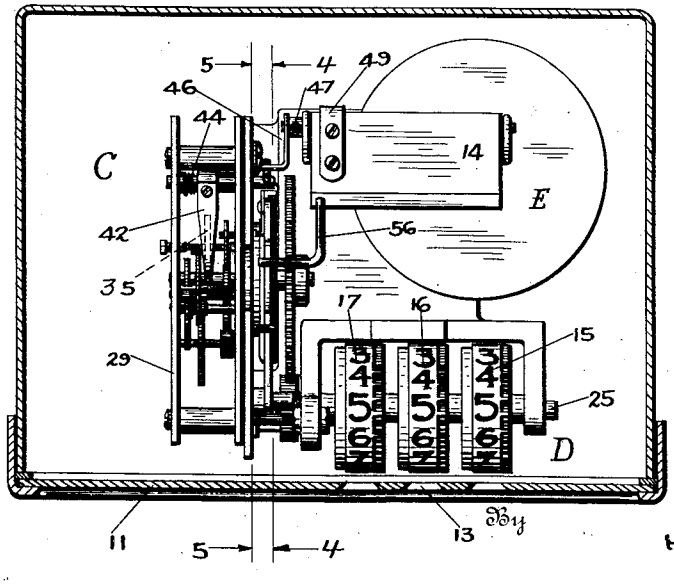


Fig. 2.



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REGISTERING MECHANISM

Filed March 27, 1920 3 Sheets-Sheet 2

Fig. 2A.

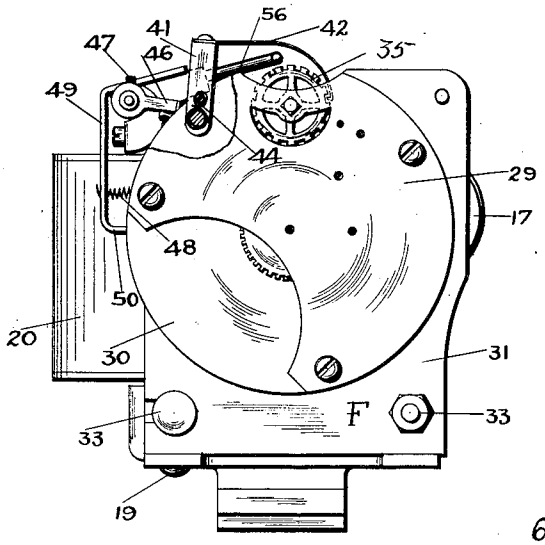


Fig. 9.

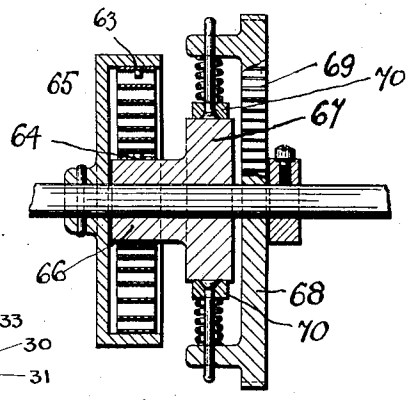
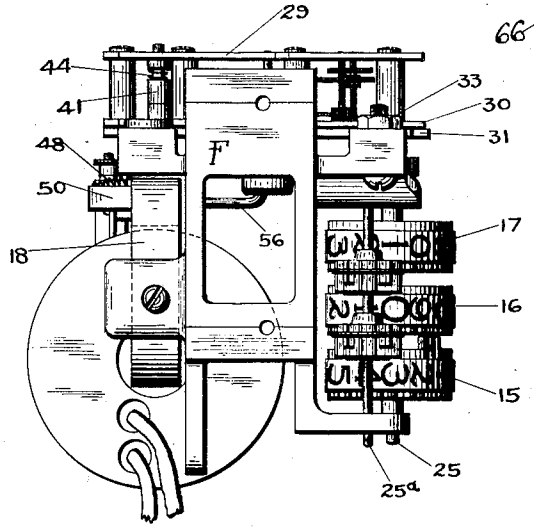


Fig. 2B



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REGISTERING MECHANISM

Filed March 27, 1920 3 Sheets-Sheet 3

Fig. 3.

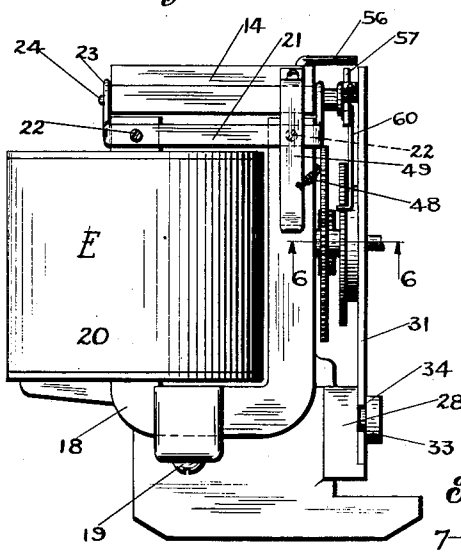


Fig. 4.

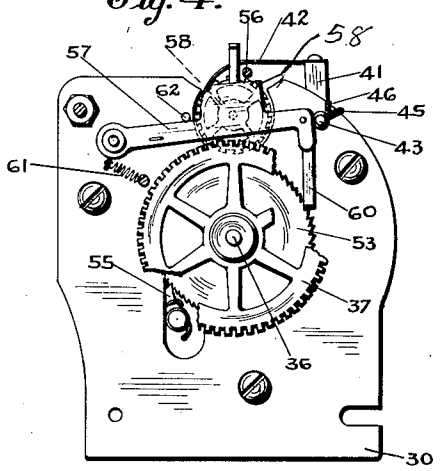


Fig. 6.

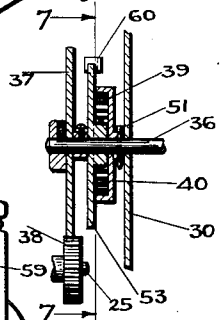


Fig. 7.

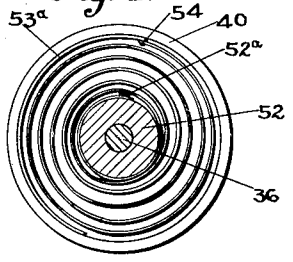


Fig. 5.

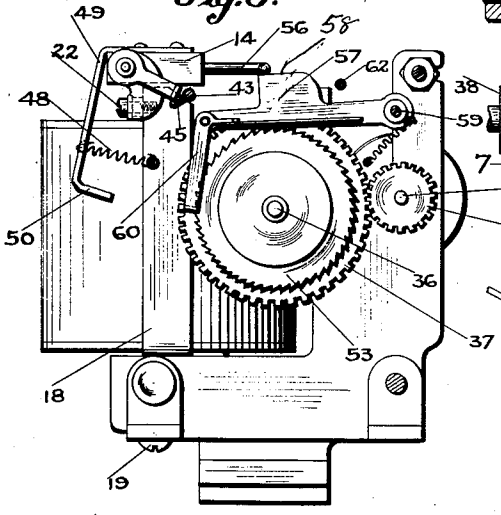


Fig. 8.



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Patented June 12, 1923. 1,458,509

UNITED STATES PATENT OFFICE.

WILLIAM ARTHUR, OF NEW HAVEN, CONNECTICUT.

REGISTERING MECHANISM.

Application filed March 27, 1920. Serial No. 369,226.

To all whom it may concern:

Be it known that I, WILLIAM ARTHUR, a citizen of the United States, residing in New Haven, county of New Haven, State of Connecticut, have invented certain new and useful Improvements in Registering Mechanism, of which the following is a full, clear, and exact description.

This invention relates to certain new and useful improvements in registering mechanism of the general type disclosed in my Patent No. 1,319,453 of October 21, 1919.

The term registering mechanism is used in a generic sense and is intended to cover a mechanism which will register time. My improvements are particularly applicable to a device for determining the efficiency of motormen of trolley and like cars by the registration of the number of minutes that power is applied to the car during a certain run, for example, or while it is being operated by a particular motorman. The invention is not limited, however, to this particular application.

One of the primary objects of the invention is to furnish improved mechanism for registering the length of time during which power is applied.

Another object of the invention is to provide improved means for winding automatically the clock mechanism employed in a power-on register, or in a similar register or device.

Another object is to provide a clock mechanism with means for rewinding it and with means for preventing overwinding, both of such means being of simple and efficient character and construction.

Still another purpose which I have in view is the provision of an improved power register for trolley cars and the like, where the operation of time registering mechanism is simply and efficiently controlled from the power circuit, and where the rewinding mechanism associated with the time registering mechanism is also controlled automatically from the power circuit in a simple, reliable manner.

The invention also has in view the general improvement in construction and operation of devices of the class to which the invention relates.

To these and other ends, the invention consists in the novel features and combinations of parts to be hereinafter described and claimed.

In the accompanying drawings:

Fig. 1 is a front elevation of a registering mechanism embodying my improvements, with the face plate removed from the casing.

Fig. 2 is a section on line 2—2 of Fig. 1, with the face plate in position.

Fig. 2^A is a side view of the mechanism contained within the casing looking from the left of Fig. 1.

Fig. 2^B is a bottom plan view of the interior mechanism.

Fig. 3 is a rear elevation of the electromagnet structure, with part of the clock mechanism omitted.

Fig. 4 is a fragmentary section on line 4—4 of Fig. 2.

Fig. 5 is a section on line 5—5 of Fig. 2.

Fig. 6 is a section on line 6—6 of Fig. 3; and

Figs. 7 and 8 are details of the main spring of the clock.

Fig. 9 is a sectional view, showing a modified form of device for preventing overwinding of the spring.

The device shown in the drawing consists of a time register automatically controlled from the power circuit of the electric car in such a manner as to register the number of minutes the power has been applied, or the lapsed power time. The registering mechanism includes a plurality of number wheels adapted to register minutes and preferably adapted to register a total of, say, 999 minutes, such wheels being driven from a clock-work which operates only during the time that the power is turned on. The number of wheels are visible through one or more sight openings in the face plate of a casing in which the registering mechanism is enclosed. In the embodiment illustrated, a clock-work is controlled by an electromagnet which is controlled by the motor controller of the electric car in such a manner that when the controller is in the off position, the clock and the register operated thereby are inactive, while on the other hand, the clock is started and operates the register, i. e., the number wheels, when and so long as the controller is in a position to operate the motor or motors.

In the drawing, the main part of the case is shown at 10, and the face plate is indi-

cated at 11. The mechanism within the case includes an electro-magnet generally indicated at E, a clock-work or clock movement generally designated by reference character C, and a registering counter D. The counter D is actuated from the clock C and comprises a plurality of number wheels visible through sight openings 13 in the face plate of the casing. The clock-work is controlled from the electromagnet E, which is located in the power circuit in substantially the same manner described in my patent previously mentioned or in any other convenient manner. The clock C is normally locked against operation, but is released when the electromagnet is energized by the passage of a current through the motor circuit, such release being effected by the movement of the armature 14 of the electromagnet. The clock is geared to the counter, the number wheels of which are all located on one shaft, which in the present case is arranged horizontally, in front of the magnet structure. The counter selected for illustration has a unit wheel 15, a ten's wheel 16, and a hundred's wheel 17. The electromagnet, the clock and the counter are all preferably mounted on a suitable frame F in the example illustrated, such frame being adapted for attachment to the cylindrical wall of the case by suitable screws (not shown).

Referring now to the details of the device, it will be observed that the electromagnet E has a U-shaped core 18. The middle part of the U-shaped core is detachably secured to the frame F at the back of the latter by a screw 19, the legs or pole pieces of the U being directed upwardly. A coil 20 which is adapted to be placed in circuit with the motor or motors is suitably located on the core. In the present case it embraces that leg of the core which is located at the right of Fig. 1, but this is merely a matter of convenience. The armature 14, previously mentioned, cooperates with both poles of the magnet and is preferably pivoted so as to have a swinging movement, as shown. In the present case, the upper ends of the core legs are connected at the rear above the coil 20 by a U-shaped clip 21, the body of which is secured to the respective legs by screws 22. The clip has cheeks 23 at the respective ends projecting above the magnet poles and having perforations therein for the reception of trunnions 24 on the armature plate 14. The trunnions 24 are located adjacent the rear edge of the armature plate and the arrangement is such that when the electromagnet is energized, the armature is swung about a horizontal pivot from a position wherein it is tilted somewhat in a forward and upward direction to a position in which it is approximately horizontal with its under surface in approximate contact with the upper surface of the magnet poles.

Referring now to the clock C, which is controlled from the electromagnet, it will be observed that a clock movement is detachably applied to the frame at the left thereof (Fig. 1), with the general plane of the clock movement substantially at right angles to the plane of the magnet core. The counter shaft 25 of the counter D is located in a plane parallel to that of the magnet core and in front of the coil or winding 20. The main shaft 25 of the counter is journalled between cheeks 26, 27, extending vertically at the front of the frame F, and the clock movement is detachably secured to the cheek 27 at the top and bottom thereof, and is also detachably secured to a lug 28 at the base of the frame.

The clock movement may be of any appropriate character. In the present instance, it comprises the usual parallel movement plates 29, 30 spaced apart by the usual distance pins. The movement plate 30, which is innermost, is in turn detachably secured in any appropriate manner which I need not describe, to an attaching or supporting plate 31. This plate 31 carries the clock movement and is suitably connected with the frame F. In the drawing, I have shown the plate 31 secured to the cheek 27 at the top and bottom by bolts 32 and 33 respectively, the lower rear corner of plate 31 being secured to lug 28 by a stud 33 engaging a slot 34 in the plate.

It will not be necessary to refer to all parts of the clock movement in detail. It will be observed, however, that it has the usual balance wheel 35, which in this case is located at the top of the movement in a vertical plane. The escapement is of the usual or any preferred construction. The main shaft or arbor of the clock movement is indicated at 36. It is journalled between the movement plates 29, 30 in the customary manner and extends through a fairly large opening in the attaching plate 31. On the end of the arbor 36 at a point between the attaching plate 31 and the cheek 27 is fixed a master gear 37, which meshes with a pinion 38 on the end of the main shaft 25 of the counter D. The main spring of the clock is shown at 39 in Fig. 6, and it will be observed that it is contained within a barrel 40 keyed or pinned to the main shaft or arbor 36. The arrangement is such that when the clock is in operation, the time is properly registered by the counter D through the connection of the counter shaft 25 with the main clock arbor, as described. The counter D may be of any well-known kind, and it is, therefore, unnecessary to describe its construction in greater detail, although it may be remarked that in the form shown the auxiliary shaft 25a on which

the well-known carrier pinions are located is journalled between the frame cheeks 26, 27 beneath the number wheels.

The clock is normally locked against operation by means controlled from the armature 14 of the electromagnet, such means preferably comprising a pivoted arm. In the form shown, the locking arm consists of a main portion 41 and a somewhat curved spring portion 42. The main portion 41 of the arm is fixed to a rock shaft 43 journalled in the plates 29, 30, 31. The arm portion 41 is acted upon by a coiled spring 44, which normally holds the rock shaft 43 and the arm portions 41, 42, in such a position that the spring portion 42 of the arm engages the balance wheel 35, to hold the clock inactive. The arm portion 41 extends preferably in an upward direction and the arm portion 42 extends forwardly therefrom and has a downwardly curved front end adapted to engage between the teeth of the balance wheel. The inner end of the rock shaft 43, which extends inwardly beyond the plate 31, is provided with a lateral pin 45 adapted to be engaged by a crank 46 rigid with the armature 14. Preferably the crank 46 has a sleeve portion secured by a screw 47 on the left hand trunnion (Fig. 2) of the armature. As the armature is attracted by the magnet poles, on the energizing of the magnet E, the crank 46 presses down on pin 45 in such a manner as to rock the shaft 43 and swing the spring arm 42 upwardly and rearwardly, so that it disengages the balance wheel 35. In this manner the clock is set in operation. Upon the shutting off of the current in the motor circuit, however, the armature moves back to the initial position and the coil spring 44 is therefore permitted to shift the spring 42 into its locking position, with respect to the balance wheel. When the magnet is deenergized the armature is immediately carried back to the elevated position by a small coiled spring 48, connected with an arm 49 secured to the armature. The arm 49 may be conveniently made of a piece of sheet metal, bent over and screwed to the top of the armature and having a depending extension to which one end of the spring 48 is connected, the other end of said spring being connected to the adjacent leg of the magnet core. At the lower end of the arm 49, the same is provided with an inwardly extending lug or projection 50, best shown in Fig. 5, which is adapted to abut said leg of the magnet core and thereby limit the upward swing of the armature away from the poles.

Referring now to the means for driving the clock, it will be observed that the spring barrel 40, previously mentioned, is provided with a hub suitably fixed to the arbor 36, as by means of a pin 51, (Fig. 6). The spring 39, which is, generally speaking, of the usual form, is secured at the inner end of the spiral by a suitable fastener 52^a, to a hub 52, located within the barrel and forming part of a ratchet 53. Preferably the hub 52 is integral with the ratchet and the diameter of the ratchet is greater than that of the barrel, as shown, the spring being confined between the opposing inner surfaces of the barrel and ratchet. The outer end of the spiral spring, instead of being fixed to the spring barrel, has a frictional driving connection therewith, which may be formed in any of a number of different ways, for example, by providing the outer end of the spring with a relatively stiff end portion 53^a, adapted for frictional engagement with the inner surface of the flange or cylindrical wall at the periphery of the barrel 40, as shown in Fig. 7. In the example shown, the portion 53^a of the clock spring is thicker and stiffer than the main part of the spring and is riveted to such main part by a small rivet 54, as shown in Fig. 8. At any rate, the arrangement is such that, the spring being wound to a suitable degree and the ratchet being suitably fixed against rotation, a turning movement will be imparted to the barrel 40 by the frictional engagement therewith of the free end portion of the spring. The rotation of the barrel causes the shaft or arbor 36 to be rotated, which operates the clock in the usual manner. The means for preventing an unwinding movement of the ratchet 53 comprises a pivoted spring pressed pawl 55 (Fig. 4) mounted on the inner face of the plate 31.

In the present embodiment, the automatic winding of the spring is effected by the armature 14. In the form shown, the spring is given a winding movement each time the armature is attracted to the magnet poles, by a suitable mechanical connection between the armature and the ratchet member 53, to whose hub 52 the inner end of the main spring is connected. For this purpose the armature 14 is provided with a forwardly and laterally directed arm 56, adapted to actuate a re-winding lever 57. Preferably the arm 56 consists of a small rod screwed into a socket in the forward edge of the armature flap near the left hand edge thereof (Fig. 2) and having a laterally extending bent end overlying and adapted to engage an upwardly projecting enlargement 58 on the lever 57. This lever is pivoted to the plate 31 at its forward end by a pin 59 and at its rear end it carries a spring pressed actuating arm 60, having a laterally bent lower end yieldingly held in engagement with a tooth of the ratchet member 53. Normally the lever 57 occupies the position shown in Fig. 4, under the influence of a spring 61. The spring 61 holds the lever against a stop pin 62, which limits the upward movement of said lever. When, however, the current is

turned on and the armature attracted, the lever 57 is pressed down by the arm 56, thereby giving the ratchet member 53 a winding movement of more or less amplitude. In the form shown, the ratchet member is turned a distance approximating the width of two of the teeth on the periphery of the ratchet member. When the ratchet reaches the advanced position it is, of course, held in that position by the check pawl 55, as will be understood.

It will be observed from the foregoing description that when the magnet is energized the clock is rendered active by the swinging movement of the armature communicated to the swinging stop arm associated with the balance wheel, whereby the clock work is set in operation in a very simple and efficient manner. As the spring arm 42 is raised, its curved forward end gives the balance wheel a slight upward throw so that there is no tendency for said wheel to stick. At the same time that the clock is set in operation an automatic winding of the clock spring takes place. This is also effected through the armature, which carries a re-winding arm as well as a releasing arm. The armature preferably swings in a vertical plane, as shown, and the devices operated thereby, that is to say, the clock releasing arm and the rewinding arm, also swing in vertical planes, or in other words, in planes parallel to the armature movement. This makes for simplicity and reliability.

The over-winding of the clock spring may be readily prevented by the use of the mechanism shown in Figs. 6 and 7, or an equivalent mechanism. It will be readily understood that where the power is applied frequently, as in city traffic, there might ordinarily be an over-winding of the spring, but this is prevented in the present case by the frictional connection between the spring and one of the elements, such element being in this case the spring barrel. It will be obvious that as the spring is wound up to a considerable degree, the diameter of the spiral is decreased and the stiff free end portion of the spring is therefore permitted to slip on the inside of the barrel. By this arrangement of parts, therefore, the barrel, and the clock mechanism driven thereby, are not in fixed connection with the spring, so that further winding of the latter is not harmful. The re-winding of the spring does not, however, interfere in any way with the continued operation of the clock so long as the locking arm is released from the balance wheel.

By my improvements the winding of the clock mechanism is taken care of automatically in a very efficient manner, as the parts may be so arranged that the actuations of the motor controller, and therefore of the magnet armature, will be sufficient to store up enough energy in the spring to operate the clock at all times when the power is on. On the other hand, the over-winding of the clock spring is prevented in the manner described. Of course, the design of the mechanism may be changed as required to meet the different conditions of service. The design of the rewinding mechanism may naturally be somewhat different when the register is used on interurban cars than in the case where it is primarily intended for urban service, owing to the fact that in one case the power is applied a comparatively few times for long periods, whereas in the other case the power is frequently applied, but for short periods.

By providing the register with a rewinding mechanism, controlled automatically from the power circuit, re-winding is effected with a negligible consumption of power. The re-winding mechanism is however, very simple. Only a few simple parts are added to the register, but on the other hand, there is no necessity for providing the clock with mechanism for winding it by a key, nor of providing the casing with a key opening. The device requires much less attention than the prior hand-wound registers and yet the increase in cost is very slight.

In the modification shown in Fig. 9, there is a somewhat different construction of the means for preventing over-winding. In this case, the spring is fixedly attached at 63 and 64 respectively to a barrel 65 and the hub 66 of a disk 67. The disk 67, however, has a frictional or slip connection with a member 68 adapted to be rotated by the rewinding arm or lever. In the case illustrated, the member 68 is in the form of a ratchet, having teeth 69, and adapted to cooperate with a pivoted operating lever, and a check pawl in substantially the manner hereinbefore described. The frictional connection between the members 67, 68 may be produced by spring-pressed shoes 70, carried by member 68 and pressing against the periphery of member 67. When the main spring has been wound to a certain extent, the shoes 70 will slip on the member 67, as will be obvious.

Various changes may be made in the details of the construction without departing from the scope of my invention. For example, in so far as certain aspects of the invention are concerned, the provision of number wheels operatively connected with the clock is unnecessary, and other alterations or modifications will suggest themselves to those skilled in the art.

What I claim is:

1. A registering mechanism for determining the efficiency of motormen, comprising a

clock mechanism having a balance wheel, an electromagnet in circuit with the motor controller, so as to be energized whenever the power is applied, a pivoted armature cooperating with said electromagnet, and a swinging arm mounted independently of the armature but engaged directly by a part thereof, for engaging the balance wheel of the clock to start and stop the clock at the beginning and end respectively of the power period.

2. A registering mechanism, such as described, comprising a clock having a toothed balance wheel, an electromagnet, a pivoted armature for said magnet, and means, comprising a pivoted arm having a spring end portion to engage the teeth of the balance wheel, for starting and stopping the clock, and means on said armature directly engaging and operating said arm.

3. A device such as described, comprising a clock, an electromagnet in circuit with the motor controller so as to be energized whenever the power is applied, having a substantially U-shaped core, a pivoted armature cooperating with the magnet poles, an arm pivoted independently of the armature, for starting and stopping the clock at the beginning and end respectively of the power period, means secured to said armature and engaging said arm for operating said arm from the armature, and means to normally urge said pivoted arm to clock-stopping position.

4. In a device such as described, a clock mechanism, comprising a pair of movement plates, said clock mechanism having a balance wheel mounted between said plates, a rock shaft journalled in said plates, a swinging arm on said rock shaft for starting and stopping the clock by co-operation with the balance wheel, an electromagnet having a substantially U-shaped core, an armature cooperating with and bridging the ends of the magnet core, a pivotal mounting for the armature, and means, on the armature, for rocking said shaft to control the operation of the starting and stopping arm of the clock.

5. A power-on register for electric cars including a clock mechanism having relatively fixed and movable members with a spring therebetween, means cooperating with one of said members for rewinding the clock mechanism, said means comprising an electromagnet in circuit with the controller so as to be actuated when the power is applied, and means for preventing overwinding of the spring, comprising a slip connection between a part of the spring and one of said members, said part of the spring being less resilient than the main portion thereof.

6. An attachment for electrically operated vehicles comprising a frame, a clockwork mounted on the frame, an electromagnet mounted on the frame and adapted to be placed in circuit with the vehicle motor, registering devices operated by the clock mechanism, and means carried by the frame and actuated by the magnet to rewind and to positively start said clock mechanism.

7. A power-on register for electrically operated vehicles comprising a frame, a clock mechanism having a balance wheel and an electromagnet mounted on the frame, said magnet being in circuit with the controller so as to be energized when the power is applied, a swinging arm mounted on the clock mechanism, having one end thereof in engagement with the balance wheel to impart an impetus to the same when the arm is moved, and an armature controlled by the magnet and having a part adapted to actuate said arm, to start the clock mechanism.

8. A power-on register comprising a frame, a clock mechanism having a balance wheel and an electromagnet mounted on the frame, said magnet being in circuit with the controller so as to be energized when the power is applied, a rock shaft mounted on the clock mechanism, a swinging arm secured to the rock shaft and having an end thereof normally in engagement with the balance wheel, an armature swingably mounted on trunnions adjacent the poles of the magnet, and an arm secured to one of the armature trunnions and adapted to rock said rock shaft when the magnet is energized to move said swinging arm out of engagement with the balance wheel.

9. A power-on register comprising a frame, a clock mechanism and an electromagnet supported on the frame, said clock mechanism including a balance wheel, a spring actuated shaft and a ratchet wheel to which one end of the spring is connected, arms swingably mounted on the clock mechanism to engage the balance wheel and ratchet wheel respectively, the electromagnet being in circuit with the controller so as to be energized when the power is applied, and having an armature provided with means to engage both of said arms to start and rewind the clock.

In witness whereof, I have hereunto set my hand on the 23rd day of March, 1920.

WILLIAM ARTHUR.