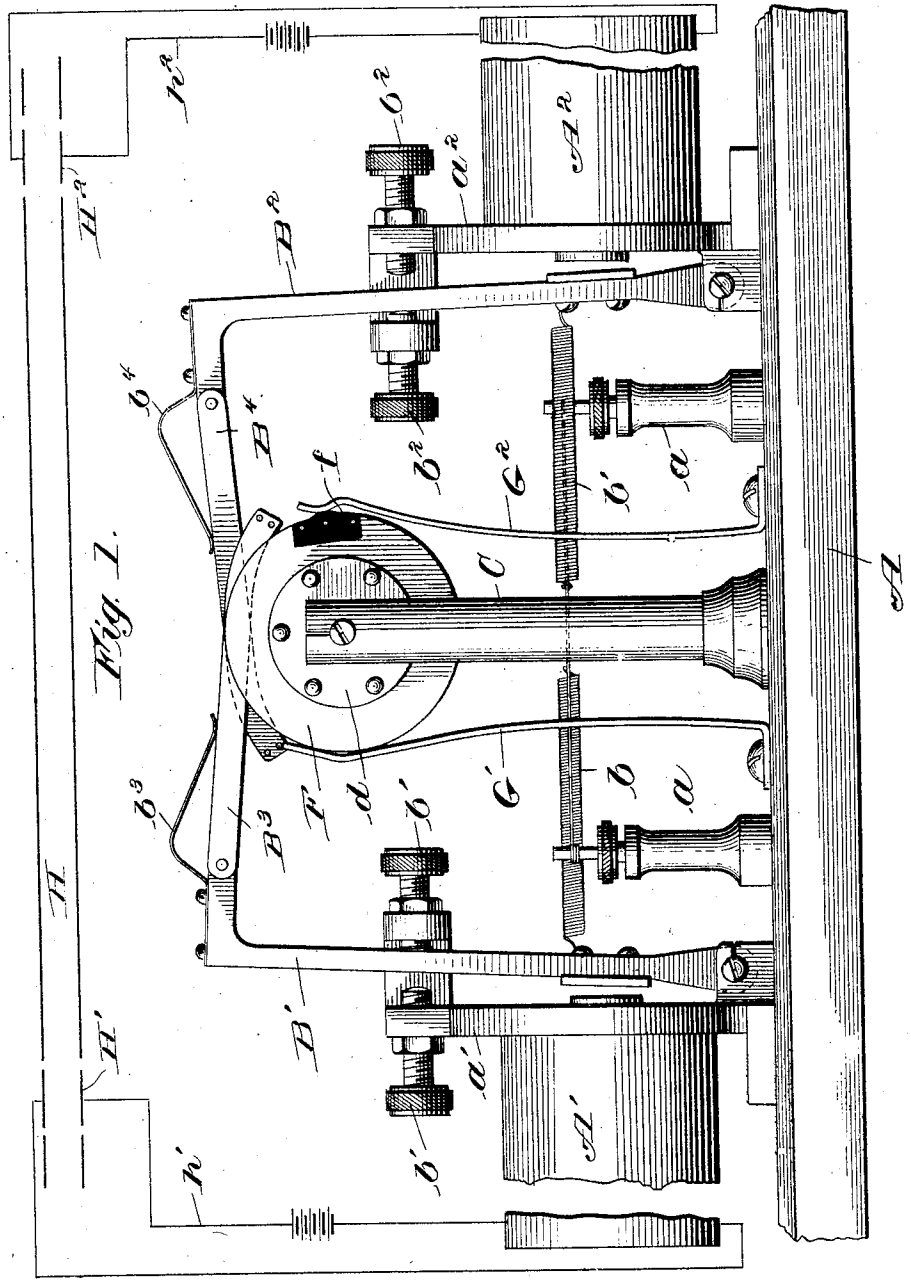
No. 775,692. PATENTED NOV. 22, 1904.

E. W. VOGEL & C. H. MORRISON.

ELECTROMAGNETIC CIRCUIT CONTROLLER.

APPLICATION FILED MAR. 21, 1902.

NO MODEL. 3 SHEETS—SHEET 1.



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NO MODEL. 3 SHEETS—SHEET 2.

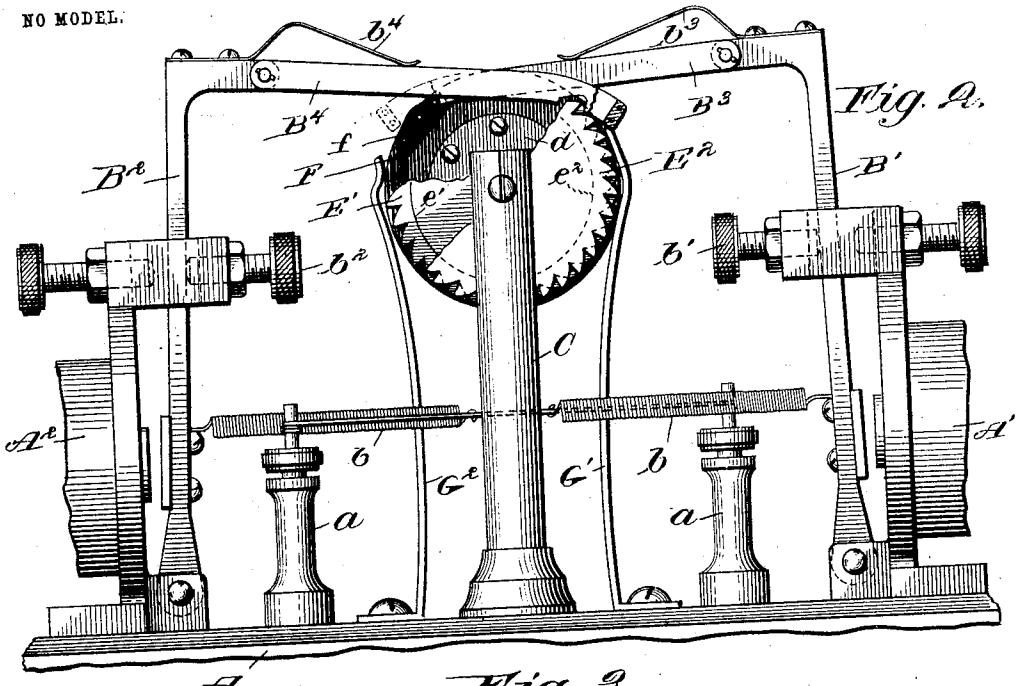


Fig. 2.

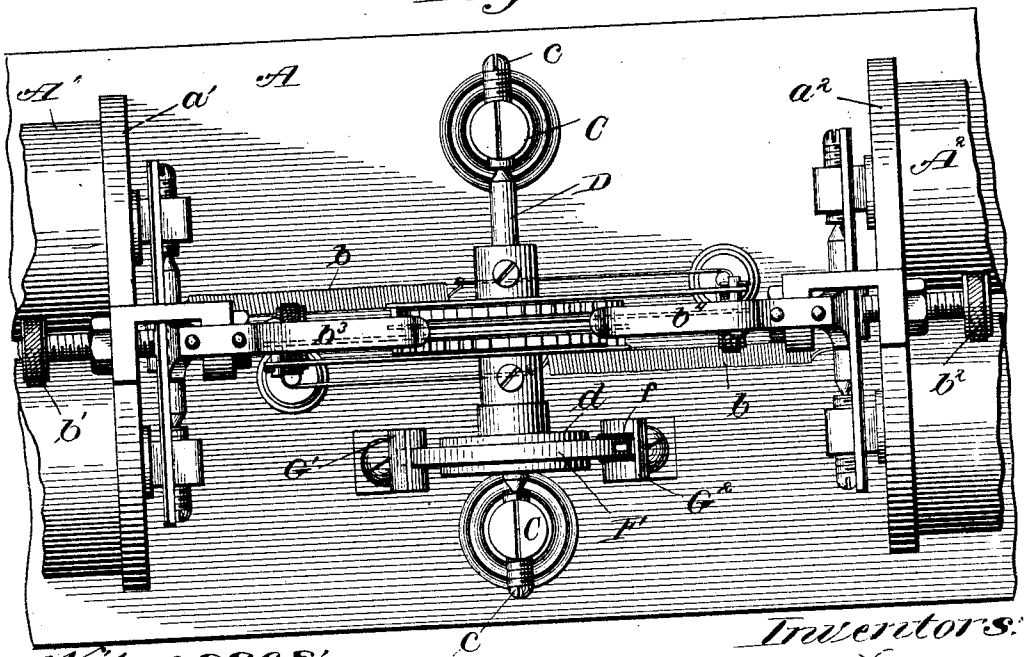


Fig. 3.

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NO MODEL. 3 SHEETS—SHEET 3.

Fig. 4.

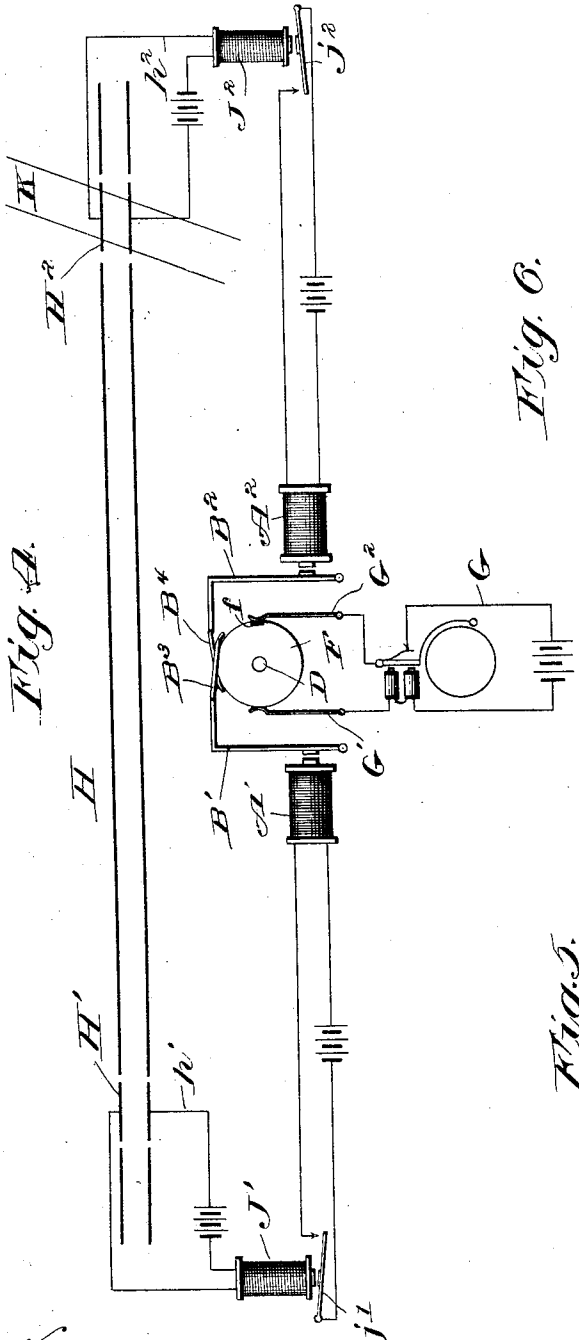


Fig. 6.

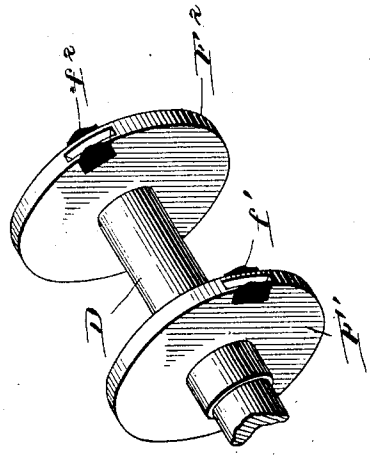


Fig. 7.

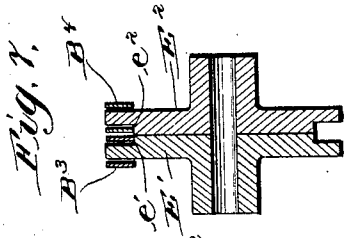
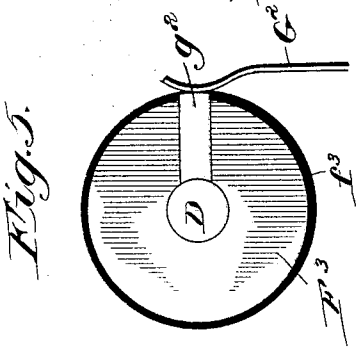


Fig. 5.



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No. 775,692. Patented November 22, 1904.

UNITED STATES PATENT OFFICE.

EUGENE W. VOGEL AND CHARLES H. MORRISON, OF CHICAGO, ILLINOIS, ASSIGNORS TO THE RAILROAD SUPPLY COMPANY, A CORPORATION OF ILLINOIS.

ELECTROMAGNETIC CIRCUIT-CONTROLLER.

SPECIFICATION forming part of Letters Patent No. 775,692, dated November 22, 1904.

Application filed March 21, 1902. Serial No. 99,264. (No model.)

To all whom it may concern:

Be it known that we, EUGENE W. VOGEL and CHARLES H. MORRISON, citizens of the United States, residing at Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Electromagnetic Circuit-Controllers; and we declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

Our invention relates in general to electromagnetic circuit-controllers, and more particularly to a step-by-step controller.

It is frequently desirable that the repetition of the operation of a circuit-controller by which a circuit is changed from its open to a closed condition should prevent the restoration of the circuit to its initial condition until an equal number of repetitions of the reversed operation of the controller have occurred. In the art of railroad-signaling, for instance, a signal-circuit is controlled to operate a signal upon the arrival of a train at a predetermined distance from a given point and to discontinue the operation of the signal when the train reaches the given point, and it often occurs that several successive trains pass the distant point and all approach the given point, which renders it necessary that the signal should not be discontinued by the arrival of the first train at the given point, but should continue until the last train has reached such point.

The object of our invention is to provide an electromagnetic circuit-controller for changing the condition of a circuit when moved in either direction from a normal position one or more steps and for restoring the circuit to its original condition only when returned to its normal position by one or more steps equal in number to the steps by which it was moved from its normal position.

A further object of our invention is to provide a controller for a railroad signal-circuit actuated to operate the signal or to continue the operation thereof by each train reaching a point at a predetermined distance from the signal and actuated by each train reaching the signal, but only controlling the signal-circuit to discontinue the signal when the last train has reached the signal and no succeeding train has arrived at the predetermined distant point.

A still further object of our invention is to provide a circuit-controller of the character described which will be simple in construction and reliable in operation.

Our invention, generally stated, consists in an electromagnetic circuit-controller movable step by step in either direction from a normal position to change the condition of the circuit and adapted to restore the circuit to its original condition when moved back step by step to its normal position.

Our invention will be more fully described hereinafter by reference to the accompanying drawings, in which the same is illustrated as embodied in a convenient and practical form, and in which—

Figure 1 is a side elevation of our improved circuit-controller looking upwardly from the bottom of Fig. 3; Fig. 2, a side elevational view looking downwardly from the top of Fig. 3 and showing parts broken away; Fig. 3, a plan view; Fig. 4, a diagrammatic view illustrating the application of our improved circuit-controller to a railroad-crossing signal system; Fig. 5, a detail view illustrating a modification; Fig. 6, a detail view illustrating still another modification, and Fig. 7 a vertical sectional view through the ratchet-wheels.

Similar reference characters are used to indicate similar parts in the several figures of the drawings.

Reference-letter A indicates a base or support upon which the circuit-controller is mounted. Reference characters A' and A^2 indicate pairs of magnets supported upon the base A by any suitable means.

B' and B^2 indicate armatures pivotally supported upon the base A, adjacent to the poles of the pairs of magnets A' and A^2. Yokes a' and a^2 surround the ends of the pairs of magnets adjacent to the armatures and are pro-

vided with adjustable stops b' b' b^2 b^2 for limiting the forward and backward movement of the armatures. The armatures normally swing away from the poles of the magnets when the latter are deënergized, such movement of the armatures being insured by springs b, each of which is secured at one end to an armature and at its other end to an adjustable device a, secured to the base A, whereby the tension of each spring may be regulated. To the upper ends of the armatures, which preferably extend horizonally away from the magnets, are pivoted arms B^3 and B^4, respectively, each of which is hollow, preferably consisting of parallel side portions united at the end thereof opposite to their pivotal connection with the armatures. Springs b^3 and b^4 are preferably provided for forcing the arms B^3 and B^4 downwardly, such springs being shown as secured to the horizontal portions of the armatures and engaging the upper surfaces of the arms B^3 and B^4. Intermediate of the pairs of magnets A′ and A^2 are mounted uprights C C, between which is rotatably supported a shaft D, the opposite ends of such shaft being adjustably mounted within screw-bearings c c. Fixed upon the shaft D are ratchet-wheels E′ and E^2, the peripheral teeth of which extend in opposite directions. The ratchet-wheels E′ and E^2 are preferably located as shown in Fig. 7 and are provided with concentric shoulders c' and c^2, respectively. The arms of the pair B^3 are located on each side of the teeth on the ratchet-wheel E′, while the arms of the pair B^4 are located on each side of the teeth on the ratchet-wheel E^2. The adjacent arms of each pair B^3 and B^4 rest upon the concentric shoulders on the ratchet-wheels E′ and E^2, as shown in Fig. 7. The normal positions (see Fig. 2) of the pairs of arms B^3 and B^4, which constitute through their closed ends pawls for engaging the teeth on the ratchet-wheels, are such that the ratchet-wheels are free to rotate in either direction without engaging the ends of the pairs of arms. When, however, either of the pairs of magnets is energized, the corresponding armature is attracted, which moves the pair of arms secured thereto a distance sufficient to engage one of the teeth of the corresponding ratchet-wheel, and thereby rotate the shaft D a distance equal to the angular space between the adjacent ratchet-teeth.

Secured to the shaft D is a disk F, the surface of which is provided with segmental contacts, preferably consisting in conducting and non-conducting material. The surface of the disk may comprise a small segmental non-conducting portion f, as indicated in Figs. 1 and 2, while the remaining portion of the surface constitutes an extended conducting segmental contact, or a small conducting segmental contact may be provided, as indicated at g^2 in Fig. 5, while the remaining portion of the surface of the disk F^2 is provided with an extended non-conducting segmental contact f^3. A plurality of disks may be secured to the shaft D, as indicated in Fig. 6, each of which may control a circuit by means of segmental contacts—such, for instance, as the non-conducting segments f' and f^2 and the extended conducting segments on the periphery of the disks F′ and F^2. The segmental contacts on the several disks are preferably staggered, so that as the shaft D rotates step by step the several circuits controlled by the disks will be changed in their conditions at different points in the revolution of the shaft. The disk F may be secured upon the shaft D by means of disks d d, surrounding the shaft, as indicated in Figs. 1, 2, and 3.

While our improved step-by-step circuit-controller is well adapted for a variety of uses, we have in Fig. 4 shown it applied to a railroad-crossing signal in which H indicates a track which is crossed by a highway K, and at such point, consequently, it is desirable that a signal should be located. H′ indicates a short insulated portion of the track at a predetermined distance from the highway K or other point at which it is desirable to locate a signal. h' indicates a track-circuit connected to the rails of the insulated track-section H′, such track-circuit including a relay J′, the armature j' of which controls a circuit for energizing the pair of magnets A′ of the circuit-controller. At the point K is provided a short insulated section of track H^2, the rails of which are connected to a track-circuit h^2 for energizing a relay J^2. The armature j^2 of the relay J^2 controls a circuit for energizing the other pair of magnets, A^2, of the step-by-step circuit-controller. G indicates a signal circuit which is controlled to operate a signal by the step-by-step circuit-controller upon the arrival of a train at the track-section H′.

The operation of the application of our invention illustrated in Fig. 4 is as follows: When the front truck of a train reaches the insulated section H′, the track-circuit h' is closed, which energizes the relay J′, thereby closing the circuit which includes the pair of magnets A′. The energization of the magnets A′ causes them to attract the armature B′, which causes the pawl B^3 to engage a tooth upon the ratchet-wheel E′ and rotate the shaft D a distance determined by the number of teeth upon the ratchet-wheel. The rotation of the shaft D rotates the disk F, so that the fixed contact G^2 is disengaged from the insulated segmental contact f, thereby closing the signal-circuit G through the disk F, which in the form described is composed of conducting material. If a second train reaches the insulated section H′ before the first train arrives at the insulated section H^2, the pair of magnets A′ is again energized and the controller-disk F is moved a distance corresponding to another tooth on the ratchet-wheel engaged by the pawl B^3. Each succeeding train that ar-

rives at the point H′ actuates the circuit-controller and causes the same to move farther away from the normal position in which the signal-circuit is broken by the non-conducting segmental contact *f* engaging the fixed contact G^2. As each train reaches the insulated track-section H^2 the track-circuit h^2 is closed and the relay J^2 energized, which in turn, through the attraction of its armature f^2, closes the circuit which energizes the pair of magnets A^2. The attraction of the armature B^2 by the pair of magnets A^2 causes the pawl B^4 to move a distance sufficient to engage one of the teeth on the ratchet-wheel E^2, and thereby rotates the shaft D in a reverse direction and causes the controller-disk F to move a step toward its normal position. It is evident that each succeeding train as it reaches the insulated section H^2 effects a movement of the disk F a step toward its normal position, and it is consequently evident that the disk F will only be returned to its normal position, in which the signal-circuit is broken and the signal discontinued, when all of the trains have passed the point K and no train occupies the track between the points H′ and H^2.

While we have shown in Fig. 4 track-circuits for energizing the pairs of magnets for actuating the circuit-controller, it is obvious that such track-relays may be omitted and the track-circuits extended so as to include the pairs of magnets of the circuit-controlling mechanism, as indicated in Fig. 1. It is also obvious that any suitable means may be provided for controlling the circuits including the magnets of the circuit-controlling mechanism other than track-circuits, the arrangement of track-circuits being merely shown as one means for energizing and deënergizing the magnets of the circuit-controlling mechanism upon the arrival of each train at the points H′ and H^2.

While we have shown a fixed contact G′ for electrically engaging the controller-disk, it is obvious that the circuit might be completed to the disk by connecting one of the standards C with a lead from the circuit to be controlled, in which case the fixed contact G′ would be dispensed with or could be used merely for the purpose of retarding the free rotation of the shaft D through its frictional engagement with the periphery of the controller-disk F.

We have shown our invention in Fig. 4 in connection with a railway-crossing signal, as it is desirable that the signal at a crossing should sound continuously during the approach thereto of a train, and hence it is necessary that the passing of one train should not discontinue the signal when a second train is following the first and located upon the insulated track-section extending to the crossing. It is evident, however, that our invention is adapted for use in connection with a block system.

While we have described more or less precisely the details of construction, we do not wish to be understood as limiting ourselves thereto, as we contemplate changes in form, the proportion of parts, and the substitution of equivalents as circumstances may suggest or render expedient without departing from the spirit of our invention.

Having now fully described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. In a circuit-controller, the combination with a rotary shaft, of a ratchet-wheel fixed upon said shaft, a laterally-projecting shoulder on said ratchet-wheel concentrically located between the teeth on the ratchet-wheel and said shaft, an electromagnet, an armature adapted to be actuated by said magnet, a pawl operatively connected to said armature and comprising parallel arms extending on opposite sides of the teeth on the ratchet-wheel, one of said arms normally resting upon said shoulder, said pawl adapted to engage a tooth on the ratchet-wheel when the magnet is energized and thereby rotate said shaft, and contacts operated by said shaft for controlling the circuit.

2. In a circuit-controller, the combination with a rotary shaft, ratchet-wheels fixed upon said shaft and having oppositely-directed teeth and concentric shoulders between the teeth and said shaft, a disk also fixed upon said shaft the surface of which is provided with conducting and non-conducting portions, a contact engaging said surface, means for electrically connecting said shaft with a source of electricity, pawls normally engaging said shoulders and adapted when actuated to engage the teeth on said ratchet-wheels, and means for actuating said pawls and thereby rotating said shaft, substantially as described.

3. In a circuit-controller, the combination with a rotary shaft, ratchet-wheels fixed upon said shaft and having oppositely-directed teeth and concentric shoulders between the teeth and said shaft, a disk also fixed upon said shaft the surface of which is provided with conducting and non-conducting portions, a contact engaging said surface, means for electrically connecting said shaft with a source of electricity, pawls normally engaging said shoulders and adapted when actuated to engage the teeth on said ratchet-wheels, electromagnets the armatures of which are pivotally connected to said pawls, and means for energizing said electromagnets, substantially as described.

In testimony whereof we sign this specification in the presence of two witnesses.

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CHARLES H. MORRISON.

Witnesses:
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CLARA C. CUNNINGHAM.