No. 624,409. Patented May 2, 1899.

B. C. VAN EMON.

CONTROLLER FOR ELECTRICAL ELEVATORS.

(Application filed Aug. 30, 1898.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

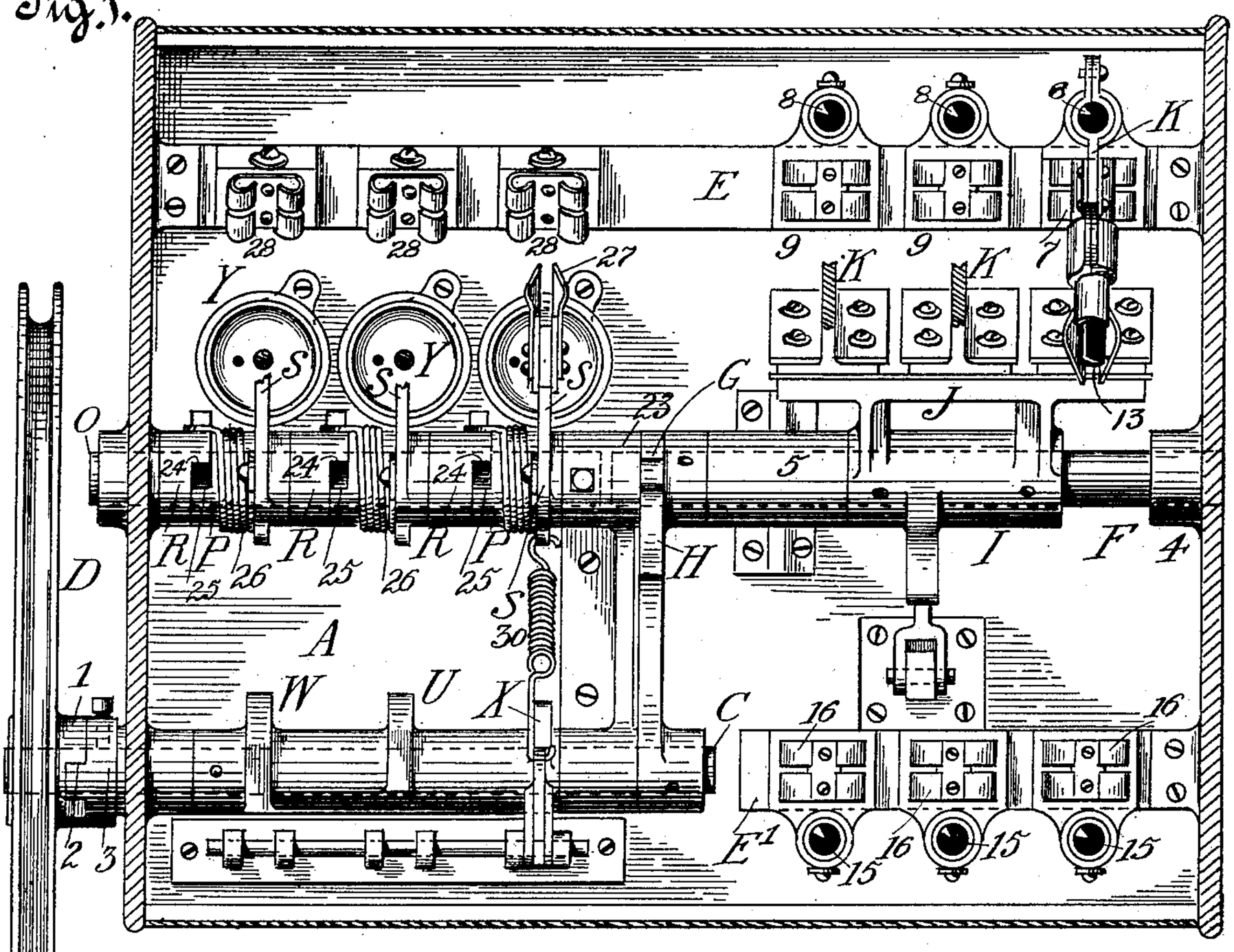
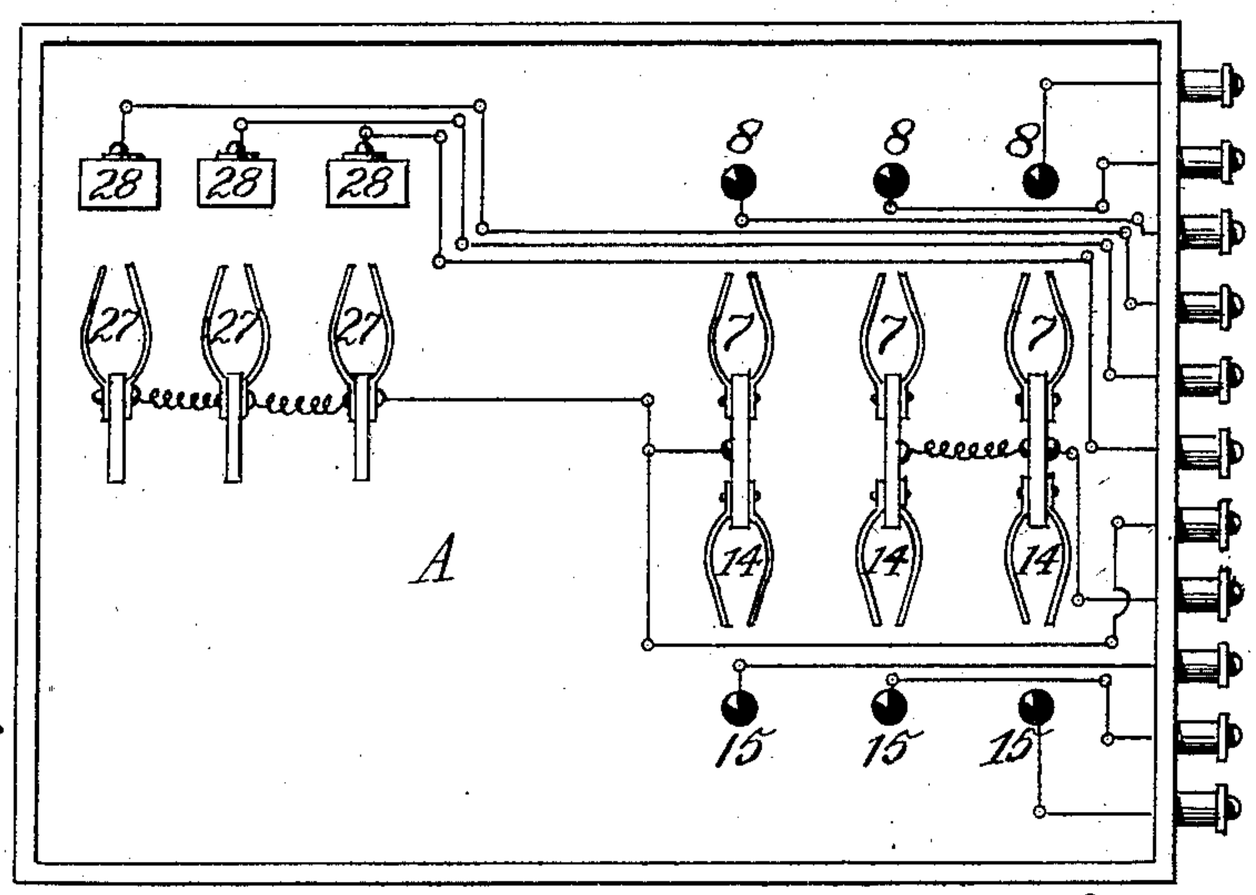


Fig. 4.



Witnesses.

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Fig. 2.

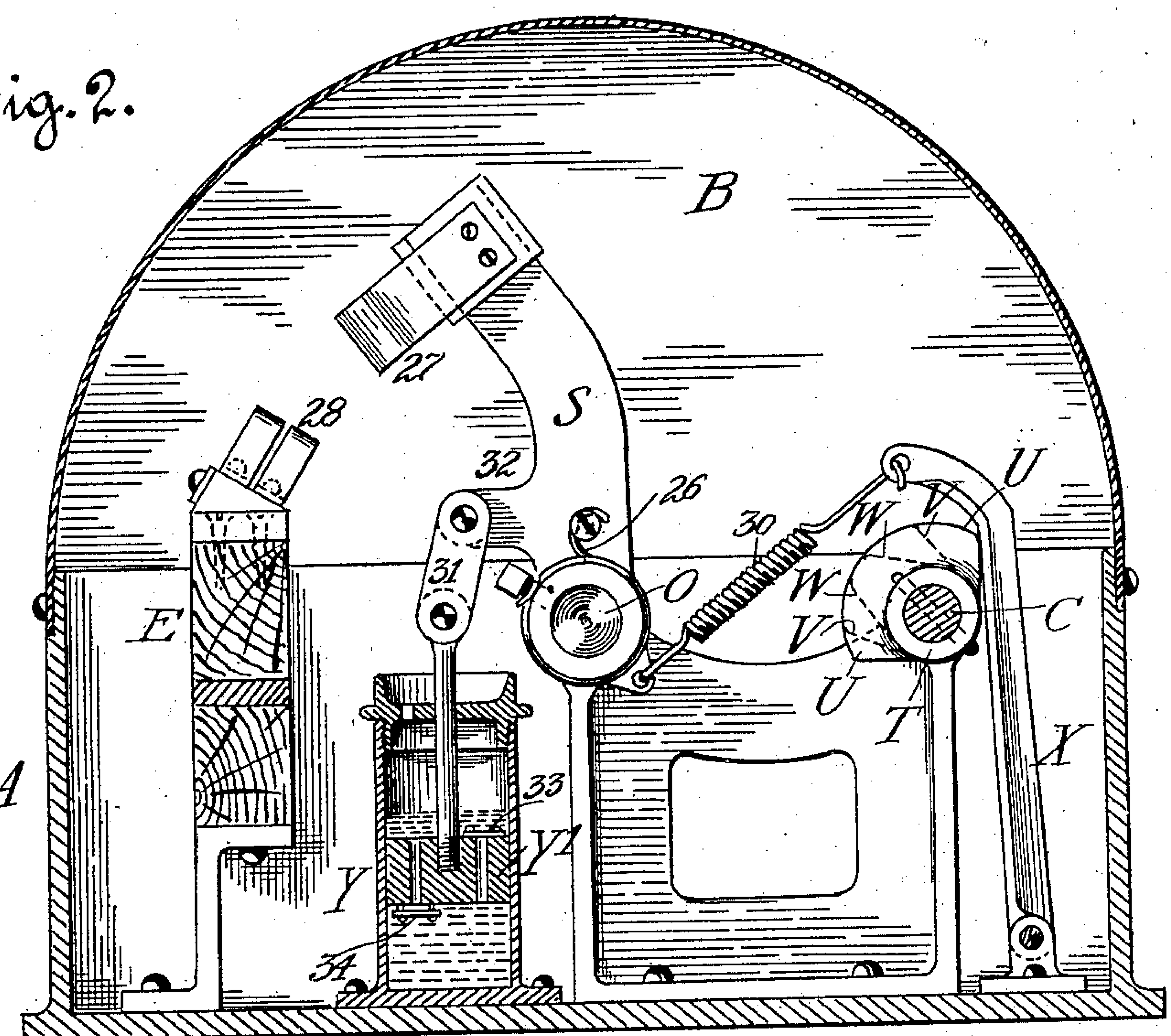
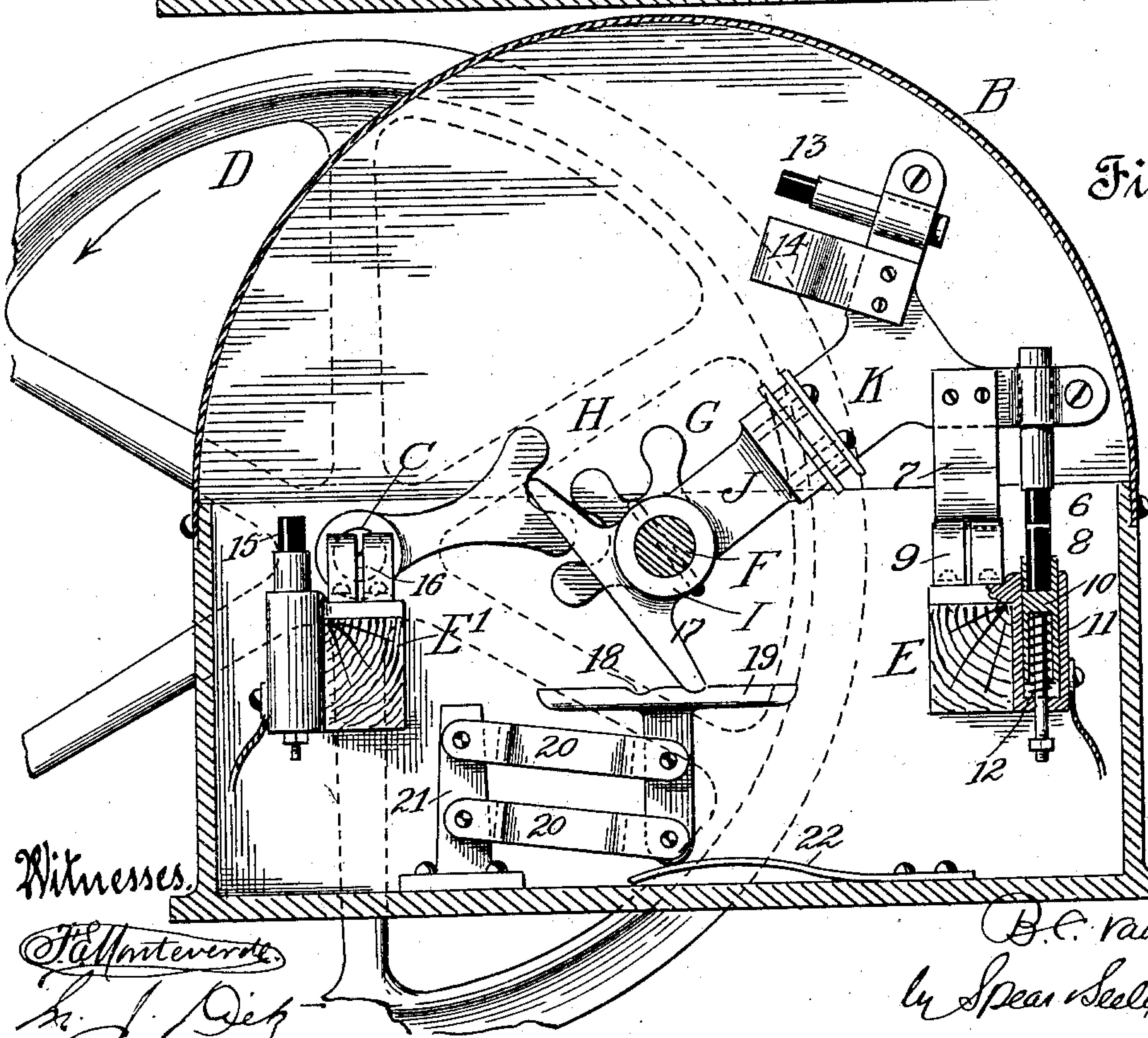


Fig. 3.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

BURTON C. VAN EMON, OF SAN FRANCISCO, CALIFORNIA.

CONTROLLER FOR ELECTRICAL ELEVATORS.

SPECIFICATION forming part of Letters Patent No. 624,409, dated May 2, 1899.

Application filed August 30, 1898. Serial No. 689,868. (No model.)

To all whom it may concern:

Be it known that I, BURTON C. VAN EMON, a citizen of the United States, residing at San Francisco, in the county of San Francisco and State of California, have invented certain new and useful Improvements in Controllers for Electrical Elevators, &c., of which the following is a specification.

My invention relates to electrically-operated hoisting apparatus, and more particularly to means for controlling the application of the motor-current and the rate of speed in operating such apparatus and in starting and stopping the same.

My invention is adapted for use in connection with different kinds of hoisting and conveying devices, but I have herein described it as forming the controlling means for an electrically-operated lift or elevator.

In Letters Patent No. 578,954, granted to me March 16, 1897, I described an electrical controlling apparatus as applied to an electrically-operated passenger-elevator. In that device the main switch was carried by the elevator-cage and operated by an attendant. The contacts controlled by that switch were in electrical connection with devices for starting, stopping, and reversing the cage, such devices consisting of switches or contacts operated by means of solenoids controlled by said main switch. The main switch also controlled devices for cutting in and out series resistance for modifying the rate of speed of the motor to suit varying conditions in raising and lowering loads. The control of the elevator described in that patent was wholly electrical.

The object of my present invention is to provide instead of such electrical controlling devices mechanical controlling devices for an electrically-operated elevator and particularly for freight-elevators without regular attendants, in which it is desirable to have external control of the moving cage or platform at different floors, as well as upon the platform itself. This mechanical controller is applied to the governing of the electrical contacts for starting, stopping, and reversing the elevator and also for cutting out and in and modifying resistance in order to vary the speed of the motor. The mechanical controller is operated by a hand-rope extending through the elevator-well and connected to a rocking shaft, which is the primary operating-shaft of the controller. Such a hand-rope can be operated from the elevator or from any floor of the building.

In the accompanying drawings, Figure 1 is a top plan of the entire box containing the controlling apparatus, its cover being removed. Fig. 2 is a rear end elevation. Fig. 3 is a front end elevation. Fig. 4 is a diagrammatic view illustrating the wiring in the controller.

The controlling mechanism as a complete apparatus is contained by a box A, the open top of which is ordinarily protected by a cover or hood B, Fig. 3. This box may be supposed to be located at the bottom of an elevator-shaft in convenient proximity to the electrical motor which operates the cage. It is not considered necessary to illustrate the motor nor the elevator itself, as these constitute no part of the present invention.

A shaft C is journaled in bearings within the box A and extends outside of the same, Fig. 1. Upon its end is mounted the loose sheave D for the hand-rope of the elevator, which rope extends up through the cage and elevator-well. The hub of the sheave is provided with a projection 1, which by bearing upon a corresponding projection 2 of the tight collar 3 rocks the shaft in either direction, according to the direction of motion desired, such motion being transmitted to the sheave by pulling upon one side or the other of the hand-rope. The rocking of shaft C starts the cage slowly either up or down, according to the direction of motion, by throwing in a set of contacts the fixed members of which are carried by the supports E E′, secured in the box, and the movable members by a shaft F, which oscillates in suitable bearings, as 4 and 5. The movement of shaft F is derived from that of shaft C by two partial gears G H, the gear G being secured to shaft F, Fig. 3, and the gear H to shaft C, the said gears intermeshing at proper times, as shown, and their relation being such as to swing the contacts carried by shaft F in both directions and then to disengage. A sleeve I is fixed upon shaft F, which carries a bracket J. From this bracket project the forked arms K, which carry the movable contacts. Each branch of

the fork carries a carbon contact 6 and a metallic contact 7, while on the support E are corresponding carbon and metallic contacts 8 and 9. The lower carbon rods are held in tubes 10, sliding within the holders 11 and having pressure-springs 12 to keep them forced upwardly. This series of contacts is made simultaneously as the first result of pulling the hand-rope and turning its sheave in the direction of the arrow in Fig. 3, the shaft F and sleeve I being rocked by the gears in the manner illustrated in that figure. The current is thereby applied to start the motor and cage slowly. If the hand-rope had been pulled so as to move the sheave in the other direction, a similar set of contacts 13 14 on the other arm of the fork would have engaged with contacts 15 16 on the support E′ on the other side of shaft F to start the cage slowly in the opposite direction. Of course the number of contacts in these series is not arbitrarily fixed, and I have simply shown three of them on each side of the shaft for the purpose of illustration. Partial gears G and H are employed to operate these first or reversing contacts, because it is necessary that they be disengaged as soon as the contact has been made in order to permit the shaft C to operate another series of contacts without affecting those already made. Taking the parts as illustrated in Fig. 3 the double contacts 6 7 and 8 9 have been established. Now if the pull on the rope-sheave be continued in the direction of the arrow the gears will be disengaged, and the shaft C will continue its movement in order to operate the contacts yet to be described; but this disengagement of the gears would leave the contacts at 6 7 and 8 9 depending upon their own gravity for maintenance. I have therefore provided means for locking these contacts and for automatically disengaging the lock. These means are also intended to positively and quickly break the contacts, so that the formation of arcs between the carbons is prevented. The device which I prefer to use and which is shown in Fig. 3 comprises an arm 17, forming part of the sleeve I and having a flat bearing-face and curved extremities. Beneath the arm is a plate 19, having locking-recesses 18 and which is supported by parallel links 20 from the standard 21, so as to have a vertical motion. A spring 22 tends to force this plate upwardly, but permits it to yield downwardly. When the contacts on either side have been established, one end of the arm 17 engages the appropriate locking-recess and positively maintains the contacts. If the rope-sheave be moved still further, the teeth of the gears will disengage and whatever other operations are to be performed by the shaft C will take place without affecting the contacts already established. If the rope-sheave had been moved in the opposite direction, the same result would have occurred in the locking of the contacts 13 14 and 15 16.

In order to make it clear how the spring-plate 19 acts to break the contacts and prevent arcs and burning of carbons at the break, I will suppose that the rope-sheave is about to be turned in opposition to the arrow in Fig. 3. The first effect of the gears is to release the arm 17 from the locking-recesses, whereupon the spring 22 immediately forces the plate 19 upwardly against the inclined arm 17 and throws the sleeve I and contact-arm K sharply toward the center, breaking the contacts without arcing. This motion is permitted by the fact, before explained, that the rope-sheave is loose on the shaft C and works with a certain amount of lost motion against a collar 3 on said shaft, Fig. 1. Thus the spring 22 can throw the contact-arm toward the center independently of the rope-sheave, since its force is transmitted only to the gears and the shaft C, which oscillates freely in the sheave. In such central position the flat abutting faces of arm 17 and plate 19 hold the contact-arm until the gears positively move it in order to make a contact. Without some such device to act quickly the breaking of the contacts would depend entirely upon the gears, and the slow movement resulting might cause arcing and burning of carbons.

The full effect of the current for giving the maximum speed to the cage in either direction is obtained by continuing the pull of the hand-rope, such increase of power and speed being applied not immediately, but gradually by the successive cutting out of resistances through the action of a third set of contacts, the members of which are successively thrown in no matter in which direction the sheave has been moved, provided the hand-rope has been pulled a sufficient distance. For the operation of these contacts I refer to Figs. 1 and 2. A stationary shaft O is supported in a bearing 23 and the wall of the box and preferably in line with the shaft F, as shown. Upon this shaft are mounted rocking sleeves P, which are spaced apart by fixed sleeves R. Shoulders 24 25 on the adjacent fixed and movable sleeves limit the motion of the latter, and such motion is against the tension of coil-springs 26, whose ends are secured to the respective fixed and movable parts. Each movable sleeve carries an arm S, having at its end the contact 27, which is adapted to engage a contact 28, mounted upon the support E. Three of these movable sleeves, arms, and contacts are shown; but any number of them can be used, as in the case of the other contacts before described. These contacts are employed, as in my patent before referred to, for successively short-circuiting sections of series resistance, so that the full power of the motor is applied gradually. This resistance may be mounted on the field-frame of the motor, as in that patent, or otherwise disposed; but as the electrical connections form no part of the present invention I have considered it unnecessary to illustrate them further than to show the wiring in the controller-box, as represented in Fig. 4.

The sleeves P are rocked to make the series

of contacts last described by either motion of the controlling-sheave and always in the same direction. To accomplish this result, I prefer to use the mechanism shown in Fig. 2. Secured upon the shaft C and preferably to a sleeve T, fixed thereon, is a series of cams corresponding in number and opposite in position to the contact-arm S. Each of these cams U V W is adapted to bear against and move one of a similar number of levers X, pivoted to the bottom of the box. The free end of each lever is connected (preferably by a spring 30) to an offset on the lower part of the opposite sleeve P. These cams are so shaped (dotted lines, Fig. 2) as to properly time them in bearing successively against the levers X, resulting in a successive making of the separate contacts 27 28 and a gradual increase in the power applied up to the maximum. This result takes place when the controlling-sheave is turned in either direction, the cams in one case bearing upon the levers X above the shaft C and in the other case below it. Each contact-arm of this series is operated against the resistance of a dash-pot Y, the piston Y′ of which is connected by a link 31 to an offset 32 on the contact-arm. The piston is provided with suitable valves 33 34 for the passage of fluid, and these valves are so adjusted as to make unequal resistance to the several pistons, whereby a successive action of the contact-arms is assured no matter how quickly the sheave may be turned and the cams operated. When the sheave is in its normal position, the springs 30 hold the levers X back in place to be acted upon by the cams. The contact-arms are quickly returned to their normal position by the torsion-springs 26 when the cams are released.

I do not wish to confine myself to the specific embodiment of my invention herein described nor to the details of construction shown. I desire to have the benefit of such modifications and equivalents as are properly within the spirit of my invention as expressed in the following claims.

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

1. In a mechanical controller for electrical elevators and the like, the combination with a rocking shaft, of reversing-contacts operated by connections from said shaft in either direction of its movement, an independent series of contacts and yielding connections between said rocking shaft and second set of contacts whereby they are brought gradually into action on the continuation of the motion of said rocking shaft, substantially as described.

2. In a controller for elevators, and in combination a primary rock-shaft, carrying a hand-rope sheave, a second rock-shaft geared thereto and carrying two series of contacts coöperating with two series of fixed contacts, a third series of contacts independently movable and adapted to coöperate with a third series of fixed contacts, and connections operated by the primary rock-shaft for moving said third series of contacts successively.

3. In a controller for elevators, a rock-shaft in combination with a series of dissimilar cams mounted on said shaft, a series of independently-movable contact-arms, a lever pivoted in proximity to each cam, and connected to one of said contact-arms, fixed contacts coöperating with said contact-arms, springs for breaking said contacts when permitted by said cams, electrical connections, and a hand-rope sheave on said rock-shaft, whereby the rocking of said shaft in either direction will make said contacts successively.

4. In a controller for the described purpose, a series of contact-arms independently movable, a series of fixed contacts coöperating therewith, means for moving said contact-arms so as to make successive contacts, springs for returning said arms and a fluid resistance connected to each arm.

5. In a controller for the described purpose, a series of fixed contacts, a series of independently-pivoted contacts adapted to coöperate therewith, means for closing said contacts successively, and a dash-pot having a piston, connected to each pivoted contact.

6. In a controller for the described purpose, the combination with a rocking shaft C having a gear H and a series of dissimilar cams, of a rocking shaft F having a gear G, carrying contacts adapted to engage fixed contacts on both sides of said shaft F, a stationary shaft O, a series of contacts independently pivoted thereon, a series of fixed contacts at one side of said shaft O and connections operated successively by said cams for moving said independently-pivoted contacts.

7. In a controller for elevators and in combination, a swinging contact-arm coöperating with a fixed contact, means for swinging said arm into contact, means for locking said arm in contact, means for releasing the lock, and a spring for breaking the contact after the release of the lock independently of the means for making it.

8. In a controller for elevators, and in combination, a swinging contact-arm carrying oppositely-placed contacts, coöperating with separate fixed contacts; means for swinging said arm in either direction, to establish said contacts; said contacts; means for locking said arm in either contact, means for releasing the lock, and a spring for breaking either contact after the release of the lock and for throwing the swinging contact-arm toward its normal intermediate position independently of the means for making said contact.

9. In a controller for elevators, the combination with an arm carrying a contact and adapted to swing such contact into engagement with another, a yielding plate having a locking-recess, a bar on said arm adapted to engage said recess and lock the contacts, and

means for swinging the said arm to make and break the contact and to engage and disengage said lock.

10. In a controller for elevators, the combination with an arm carrying oppositely-set contacts, and with means for swinging said arm in opposite directions, of a yielding plate having locking-recesses, and a bar carried by said arm; one end of said bar engaging with one of said recesses when said arm is swung in either direction.

11. In a controller for elevators, a swinging contact coöperating with a fixed contact, partial gears for communicating said swinging motion, rocking shafts carrying said partial gears, a rope-sheave loose on one of said shafts for operating said gears to establish the contact, a lock for maintaining said contacts, and a spring, adapted upon the release of said lock, to break said contacts independently of the rope-sheave.

12. In a controller for elevators and in combination, a rock-shaft carrying a rope-sheave, a second rock-shaft carrying a swinging contact, partial gears connecting said shaft and operated so as to swing said contact and then to disengage, an automatic lock for maintaining said contact after the disengagement of said partial gears, and means operated by the reëngagement of said gears for releasing the lock.

13. In a controller for the described purposes and in combination, a rocking driving-shaft; a rocking driven shaft detachably connected thereto; reversing-contacts operated by the driven shaft when geared to the driving-shaft; another series of contacts operated by the driving-shaft through intermediate connections and after the detachment of the said two shafts; and a primary actuator for the driving-shaft, such as a hand-rope sheave, mounted thereon.

14. In a controller for the described purpose and in combination, a driving rock-shaft and a driven rock-shaft detachably connected together; reversing-contacts carried by the driven shaft and operated when the shafts are connected; a hand-rope sheave loosely mounted on the driving-shaft; an automatic lock for maintaining the reversing-contacts after the disconnection of the two shafts; means operated by the reconnection of said shafts for releasing the lock; and a spring acting on the release of the lock for breaking the contacts by bodily rocking said shafts independently of the hand-rope sheave.

In testimony whereof I have affixed my signature, in presence of two witnesses, this 19th day of August, 1898.

BURTON C. VAN EMON.

Witnesses:
L. W. SEELY,
H. J. LANG.