(No Model.) 3 Sheets—Sheet 1.

S. L. POWELL.

APPARATUS FOR OPERATING SIGNALS.

No. 437,348. Patented Sept. 30, 1890.

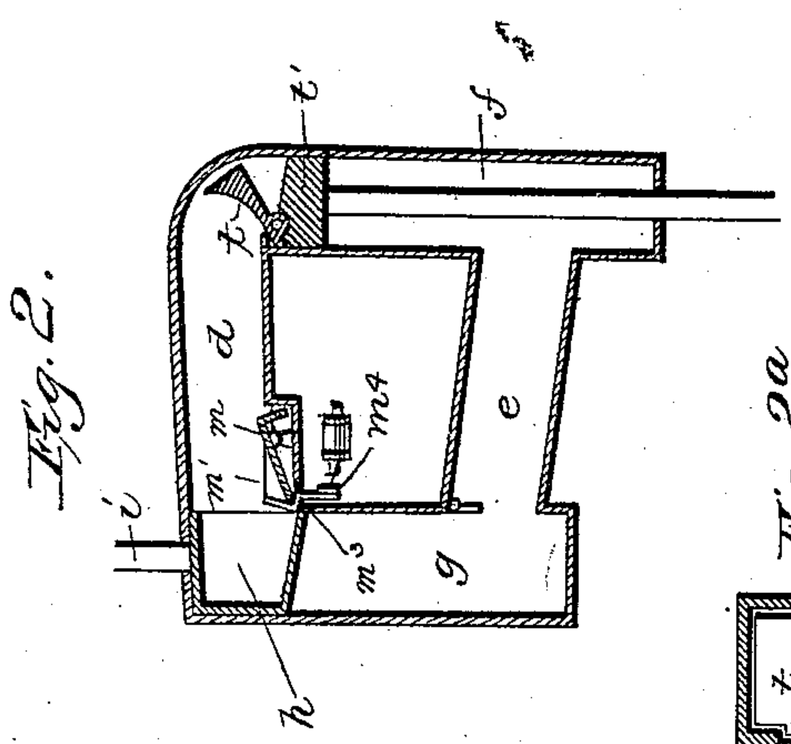

Fig. 2.

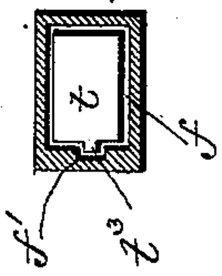

Fig. 2a

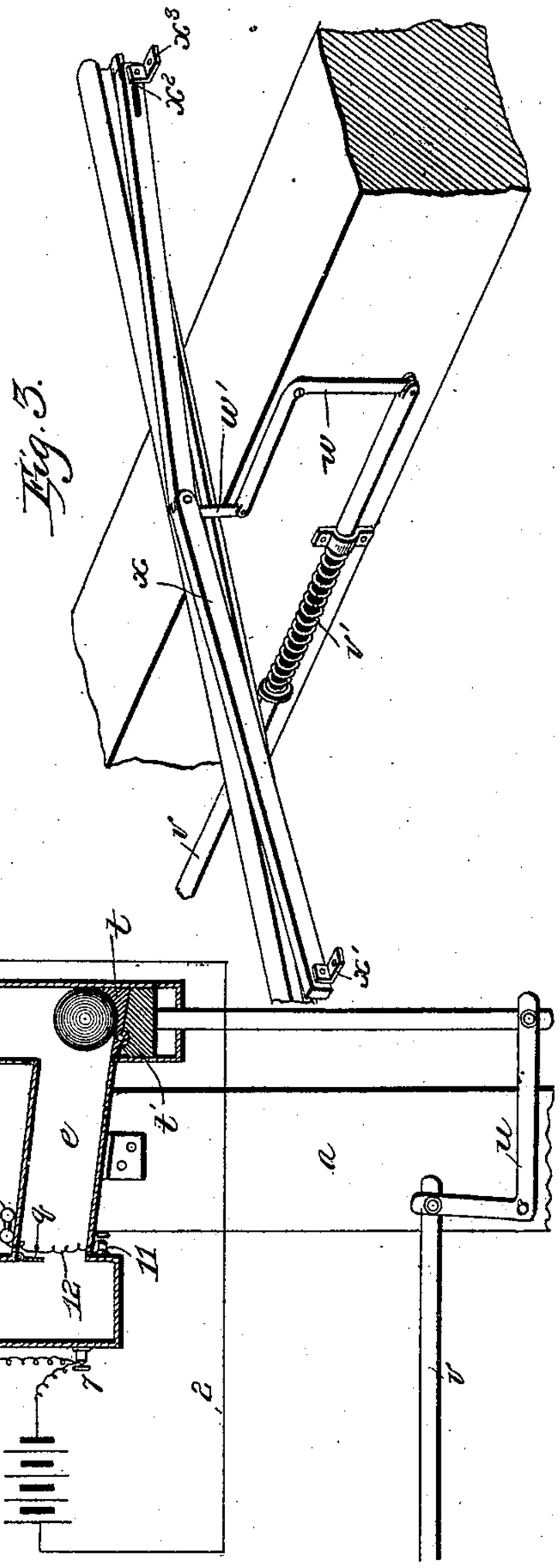

Fig. 1.

Fig. 3.

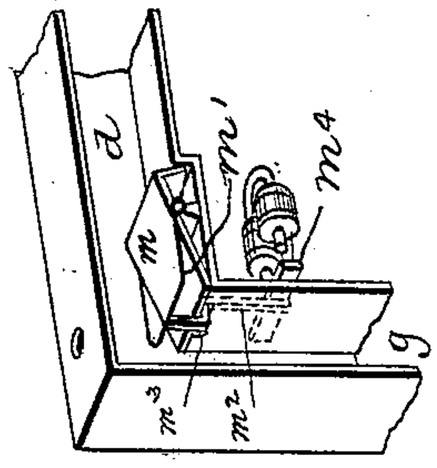

Fig. 2b

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Fig. 4.

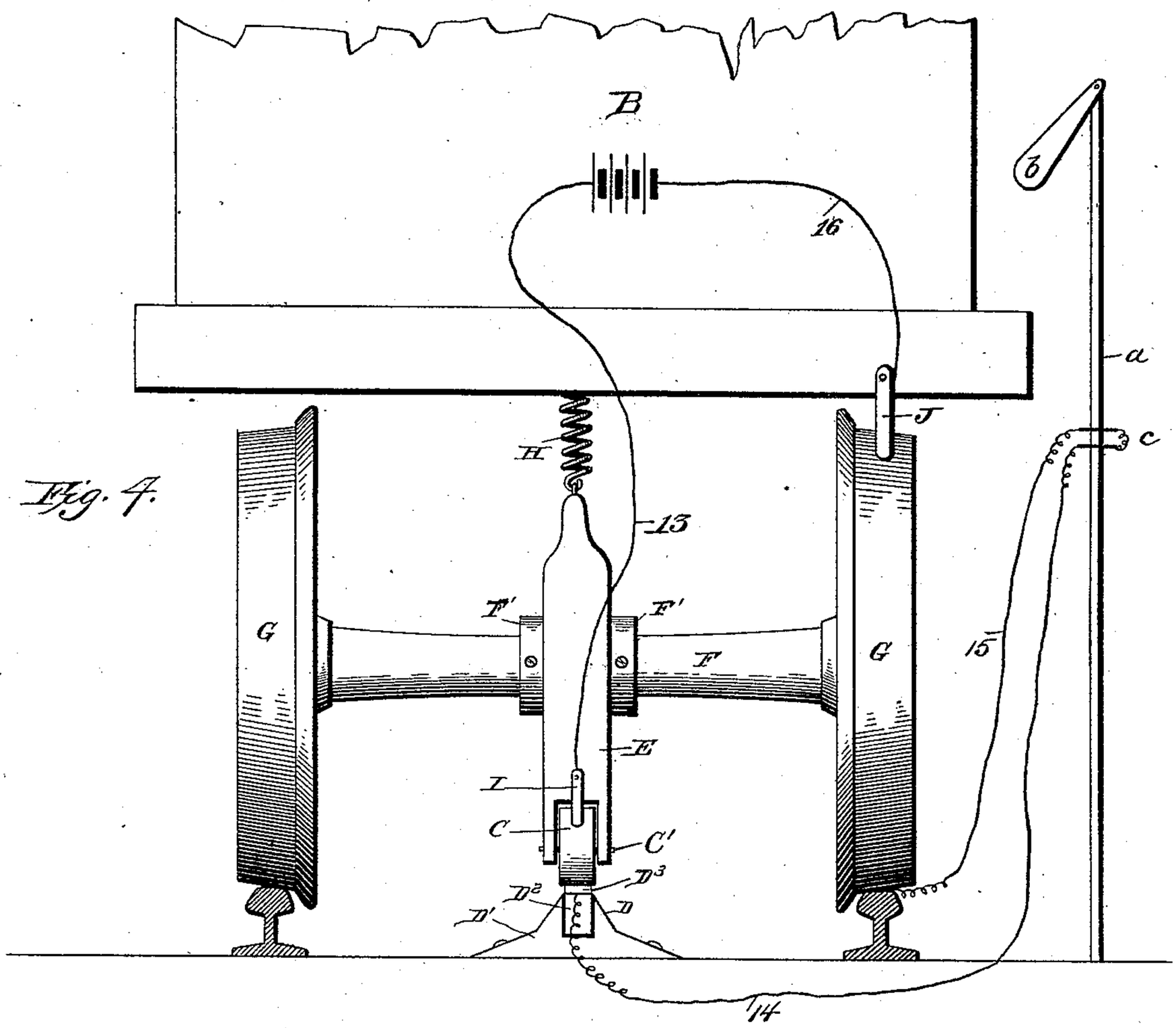

Fig. 4a.

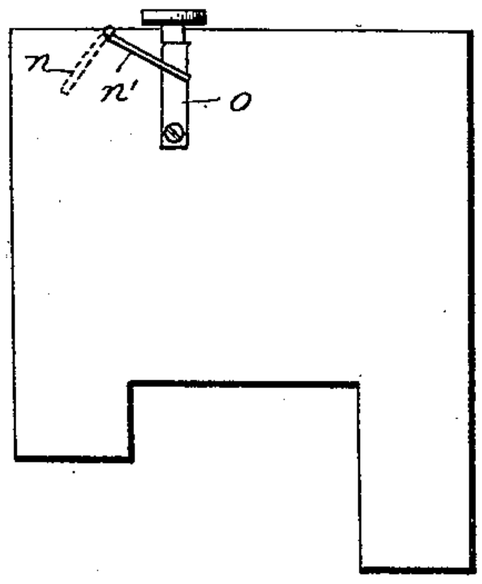

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Fig. 5.

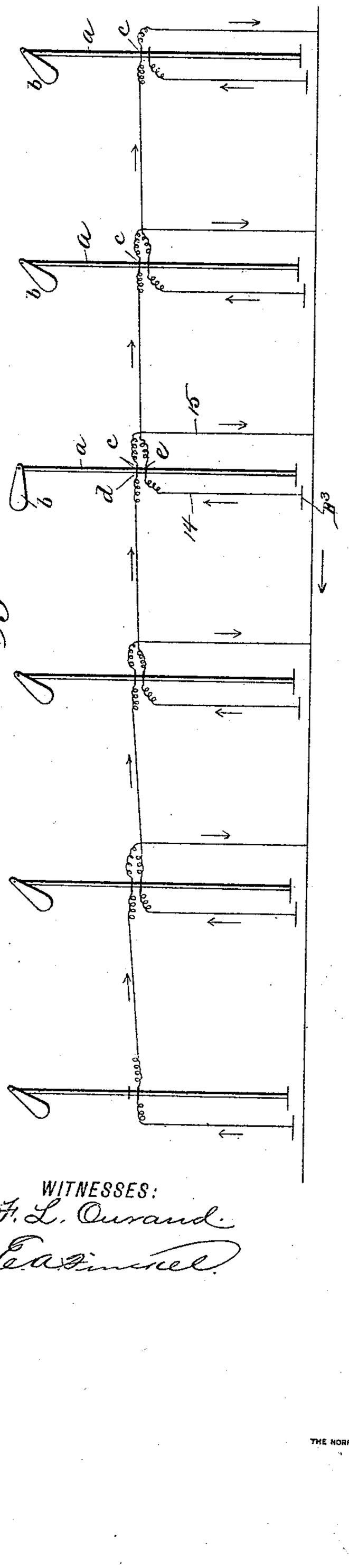
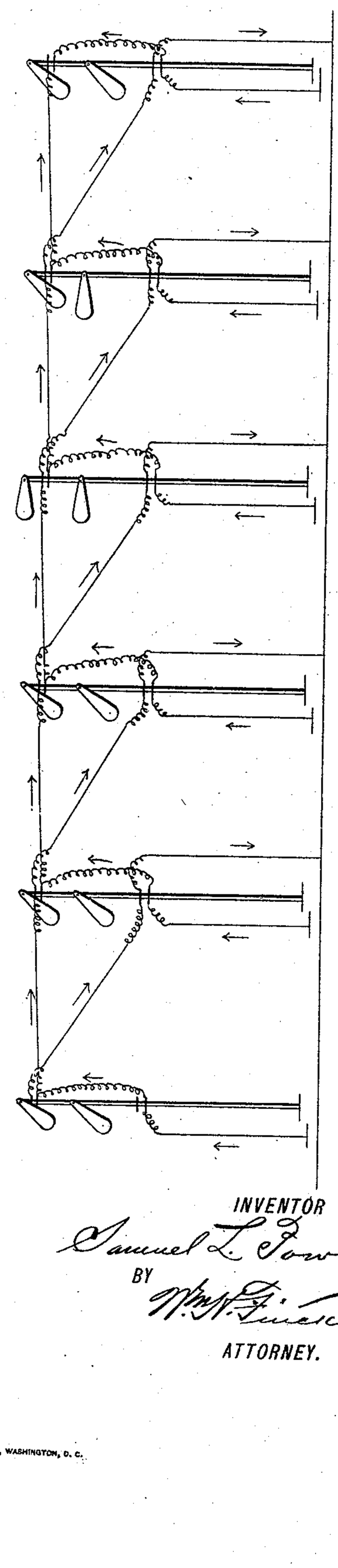


Fig. 6.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR OPERATING SIGNALS.

SPECIFICATION forming part of Letters Patent No. 437,348, dated September 30, 1890.

Application filed June 20, 1890. Serial No. 356,051. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL L. POWELL, a citizen of the United States, residing at Lewistown, in the county of Frederick and State of Maryland, have invented a certain new and useful Improvement in Apparatus for Operating Signals, of which the following is a full, clear, and exact description.

The object of this invention is to provide mechanism for operating signals, semaphores, or other superstructures arranged for visually or audibly indicating desired information at a distance.

For the sake of conciseness I have shown and will describe my invention as applied to the operation of semaphores used in railway signaling, and for the same reason will show my invention as employing electricity for the actuating device or means; but I wish it to be understood at the outset that I do not limit my invention to this single purpose mentioned and the single motive force described.

The nature of the invention will be understood fully from the description following, taken in connection with the accompanying drawings and the claims, in and by which I particularly point out and claim my invention.

In the accompanying drawings, illustrating my invention, in the several figures of which like parts are similarly designated, Figure 1 is a sectional elevation. Fig. 2 is a sectional elevation showing a preferred form of box with the piston in its uppermost position; Figs. 2^a and 2^b, details to be referred to. Fig. 3 is a perspective view showing mechanical apparatus for connection with the track for operating the device from and by a passing train. Fig. 4 is an end elevation and diagram showing the electro-mechanical arrangement on the train. Fig. 4^a is a plan of the face-plate and gate-catch. Fig. 5 is a diagram showing one form of the system of signaling, and Fig. 6 is a diagram showing another form of the system of signaling in accordance with my invention.

The pole *a* and the semaphore *b* attached thereto may be of usual construction. Upon the pole I have suitably mounted a box *c*, having an inclined way *d*, a reversely-inclined way *e*, and a vertical way *f*, connecting the ways *d* and *e*, and a second vertical way *g*, also connecting the ways *d* and *e* at the opposite side. In the way *g* is a cage *h*, the bottom of which is inclined toward the ways *d* and *e* and the face of which is open next to the said ways *d* and *e*. This cage is secured to a rod *i*, which may be run through an eye or bracket *j* made fast to the pole *a*, and extends up to and is joined to the semaphore *b*. This rod *i* is jointed at *i'*, in order to compensate for the curvilinear path of movement it would receive incident to the up and down movements of the semaphore.

On the short end of the semaphore *b* is suspended a weight *k*, which counterbalances the weight of the long arm of the semaphore and the rod and cage suspended therefrom, so that the said counterbalancing-weight *k* normally elevates the semaphore into the position of "danger" and thus compensates for any accidental failure of the apparatus to work.

Within the box *c* is arranged a suitable number of spheres, disks, or other rotary bodies *l* of sufficient weight to overbalance the counterbalancing-weight *k* and cause the semaphore to descend and indicate "safety." This operation of the rotary bodies is effected when they are permitted to pass into the cage *h*, and when passed into the cage *h* they cause said cage to descend, and thus carry down the semaphore.

Within the way *d* is arranged a tilting table *m*, and above this tilting table is arranged a gate *n*, which is normally locked in position to keep the rotary bodies *l* within the way *d*. The gate *n* is provided with an arm *n'*, and this arm is normally engaged by a spring-catch *o*, one end of which serves as an armature for the magnet *p*. When this magnet is energized, the armature is attracted, arm *n'* released, and then the gate *n* is free to be swung outwardly toward the cage by the ball, and the ball so released rolls over the table *m*, tilts it as it passes its fulcrum or hinge, and so drops into the cage *h* and causes the said cage to descend. When the cage has reached the limit of its descent, it then stands opposite the way *e*. This way is similarly

equipped with a gate *q*, which has an arm likewise engaged by a spring-catch, which also serves as an armature for the magnet *s*, which magnet *s* when energized withdraws the catch from the arm and permits the gate *q* to swing inwardly, and so allows the rotary body to escape from the inclined bottom of the cage and roll into the way *e* and onto a piston *t*. As the rotary body escapes from the cage into the way *e* the counterbalancing device *k* restores the semaphore to its original position.

In order to elevate the rotary body into the way *d*, to be again used in depressing the semaphore, the piston *t* is connected to a bell-crank lever *u*, pivoted to the post *a*, and the other end of this bell-crank lever is connected by a rod *v*, arranged in suitable bearings upon a sleeper or tie of the railway-track and connected to a bell-crank lever *w* on such tie, the other end of which bell-crank lever *w* is connected by a link *w'* with a toggle *x*, arranged alongside of the track and adapted to be acted upon by the flange of a passing car-wheel to depress the link *w'* and consequently oscillate the bell-crank lever *w* and move the rod *v* longitudinally and oscillate the bell-crank *u*, and so elevate the piston *t* and carry the rotary body *p* up into the said way *d*, ready for the repeated use mentioned. In order to throw the rotary body *p* into the way *d*, the head of the piston is pivoted at *t'*, and its short end comes in contact with a projection t^2 at the upper end of the way *f*, as shown in Fig. 2.

Instead of providing the projection t^2 for tripping the piston-head, I may provide the said piston-head with a tongue t^3, as shown in Fig. 2^a, which travels in a groove *f'* in the way *f*, and is arrested and the piston tilted by the intersecting wall of the way *d* at the upper end of the way *f*.

As shown in Fig. 3, the toggle *x* is composed of two bars jointed at their meeting ends and one of the bars pivoted at *x'* to any suitable support, and the other bar having a pin-and-slot connection x^2 with a bracket x^3, suitably supported to permit the proper up-and-down motion of the said toggle.

A spring *v'* on the rod *v* abuts against one of the bearings of the said rod at one end and against a collar on the rod at the other, and so effects the return movement of the toggle and the piston—that is to say, resets these parts for a repetition of the operation just before described.

As shown in Fig. 1, the electrical apparatus for controlling the magnets *p* and *s* comprises an office-battery A, with a wire 2 extending from one pole of the battery to a binding-post 3 on the semaphore-post *a*, where the said wire is divided and one branch 4 passes to the magnet *p* and the other branch 5 passes to the magnet *s*. The circuit is completed by making the basket *h* a conductor to move in contact with the contact-pieces in the posts 6 and 7, which are connected by the wire 8, so that when the basket is in the position shown in Fig. 1 the circuit will be completed through 7, 8, 6, *h*, post 9, and wire 10; and so, also, when the basket is in the lower position the circuit will be completed through post 7, basket *h*, post 11, and wire 12.

The apparatus, however, may be operated from a train, and for this purpose the train may be equipped with a battery B and a trolley C, which trolley is adapted to co-operate with the track-contacts D, and the details of construction and arrangement may be as follows: The trolley C is arranged upon an insulated axle C', supported in a hanger E, which hanger E is secured to the axle F of the car-wheel G, and this hanger is retained in position upon the said axle by means of collars F' F' or other suitable means, and its upper end is secured to the car-frame or other support through the intervention of a spring H, which permits the said hanger to yield to pass obstructions, but at the same time insures rolling contact of the trolley with the contact D. A brush I, secured to the hanger and bearing upon the trolley, has a conductor 13 connected with the battery B. The contact D is composed of brackets D', having an insulated block D^2 therein and provided with a conducting-strip D^3. From this conducting-strip D^3 a wire 14 leads to one of the magnets of the box, as indicated by the diagram at the right-hand side of Fig. 4. The return-circuit is effected through the wire 15, leading from the box to a wire of the track, and thence through the car-wheel, a brush J in contact with said car-wheel, and a wire 16.

I have shown in Fig. 1, heretofore described, one form of the arrangement of magnets and gates for controlling the escape of the rotary bodies *p*, and I will proceed now to describe the preferred form, as shown in Fig. 2. The tilting table *m* is retained, and in connection with this table there is a gate in the form of a wire bail *m'*, which takes the place of the gate *n*. This gate *m'* is provided with a depending catch m^2, having an offset or shoulder m^3, adapted to engage the edge of an opening in the bottom of the way in which it is applied, and the said catch terminates in an armature m^4 for the magnet, which in this case is arranged inside of the box and on the under side of the way *d*. Normally the rotary body rolls onto the table and tilts said table, as shown in Fig. 2^b, and is supported upon the table and arrested in its further movement by the gate *m'*, and as soon as the gate support or catch is released by the attraction of the magnet then the ball is discharged into the cage. The gate is made shorter than the table, so as to be raised by such table as the table automatically resumes the normal horizontal position after discharging a ball. The tilting of the table serves to arrest the rearmost ball, or, in other words, serves to insure the discharge of only one ball at a time.

In Fig. 4^a I have shown an outside view of the cover or face plate for the box with the

catch for the first form of gate in position and showing the gate in releasing position.

In Fig. 5 I have shown a very simple block-signal system embodying my invention when used in connection with an electrical apparatus on the train. There are supposed to be five blocks in this diagram, and let it be supposed that a train is at contact B^3. Then the current will pass through wire 14, release the rotary body held in the way *e*, and cause the semaphore at that station to rise and indicate "danger." At the same time the current will pass from the magnet in the way *e* rearwardly to the signal at the beginning of the block just affected and energize the magnet controlling the gate of the way *d* at the box C of that station, and admit the ball into the cage and cause the cage to descend and so actuate the semaphore to indicate "safety."

In the diagram, Fig. 6, I have shown a double-track system, where each post bears two semaphores and two boxes with their appropriate connections; and in this connection I desire to say that where such a system is employed the only change in the box necessary is to fork the piston-rod and have one member enter the lower box and the other member enter the upper box, and thus both boxes may be operated by one and the same mechanism. In this system, should a train be at the arrow and going in the direction indicated by the arrow, then the two signals at that station would be set for "danger," while the upper signal of the station in the rear would be set for "safety" and the lower one allowed to stand at "danger" to serve as a caution-signal. Every time, however, that a positive contact is made at a given station both of the signals at that station will be set alike.

In both of the systems indicated in Figs. 5 and 6 it is assumed that the circuit is completed through the track and the train, as before described in Fig. 4, and with this explanation and the marking of the arrows on the wires in these two figures, together with the designating characters, it is assumed that the operation of these systems will be understood by those skilled in this art, and hence it is assumed that further description is unnecessary.

For convenience I will refer in the claims to part *l* as a "ponderous body."

What I claim is—

1. The combination, with a movable body, such as a semaphore, of a cage, a box in which it is arranged, a way, means in such way for delivering a ponderous body into such cage to cause it to descend, another way communicating with said cage at the limit of its descent, means to permit the ponderous body to escape from the cage into said last-named way, and means to return the ponderous body to the first-named way for a repetition of the operation, substantially as described.

2. The combination, with a movable body, such as a semaphore, of a cage pendent therefrom and by its descent serving to operate such movable body, a box in which the cage moves, a way communicating with such cage at one end of the box and containing a ponderous body, a second way communicating with said cage at the other end of the box, and electro-mechanical gates arranged in said ways to control the ingress and egress of the ponderous body relatively to the cage, substantially as described.

3. A movable body, such as a semaphore, a cage depending therefrom, a box in which it is arranged, ponderous bodies in said box and adapted to be let into and discharged from such cage, and electro-mechanical gates for controlling such ingress and egress of the ponderous bodies, combined with a source of electrical energy, and conductors arranged to form a circuit including a battery and the said gates, substantially as described.

4. A movable body, such as a semaphore, a depending cage, a box in which it is arranged and containing ponderous bodies, gates for controlling the ingress and egress of such bodies relatively to the cage, and a piston for returning the ponderous bodies from the egress to the ingress, combined with a system of rods and levers actuated from and by a passing train, substantially as described.

5. A movable body, such as a semaphore, a depending cage, a box in which said cage is arranged, ways in said box for the passage into and out of the cage of a rotary or ponderous body, and a tilting table arranged in the ingress-way, substantially as and for the purpose described.

6. A movable body, such as a semaphore, a depending cage, a box in which said cage is arranged, ways in said box for the passage into and out of the cage of a rotary or ponderous body, a tilting table arranged in the ingress-way and provided with a gate made as a bail, a catch by which it is supported, an armature on said catch, and an electro-magnet for releasing the catch to permit the discharge of the ponderous bodies from the table, substantially as described.

In testimony whereof I have hereunto set my hand this 19th day of June, A. D. 1890.

SAMUEL L. POWELL.

Witnesses:
F. D. MORRISON,
WM. H. FINCKEL.