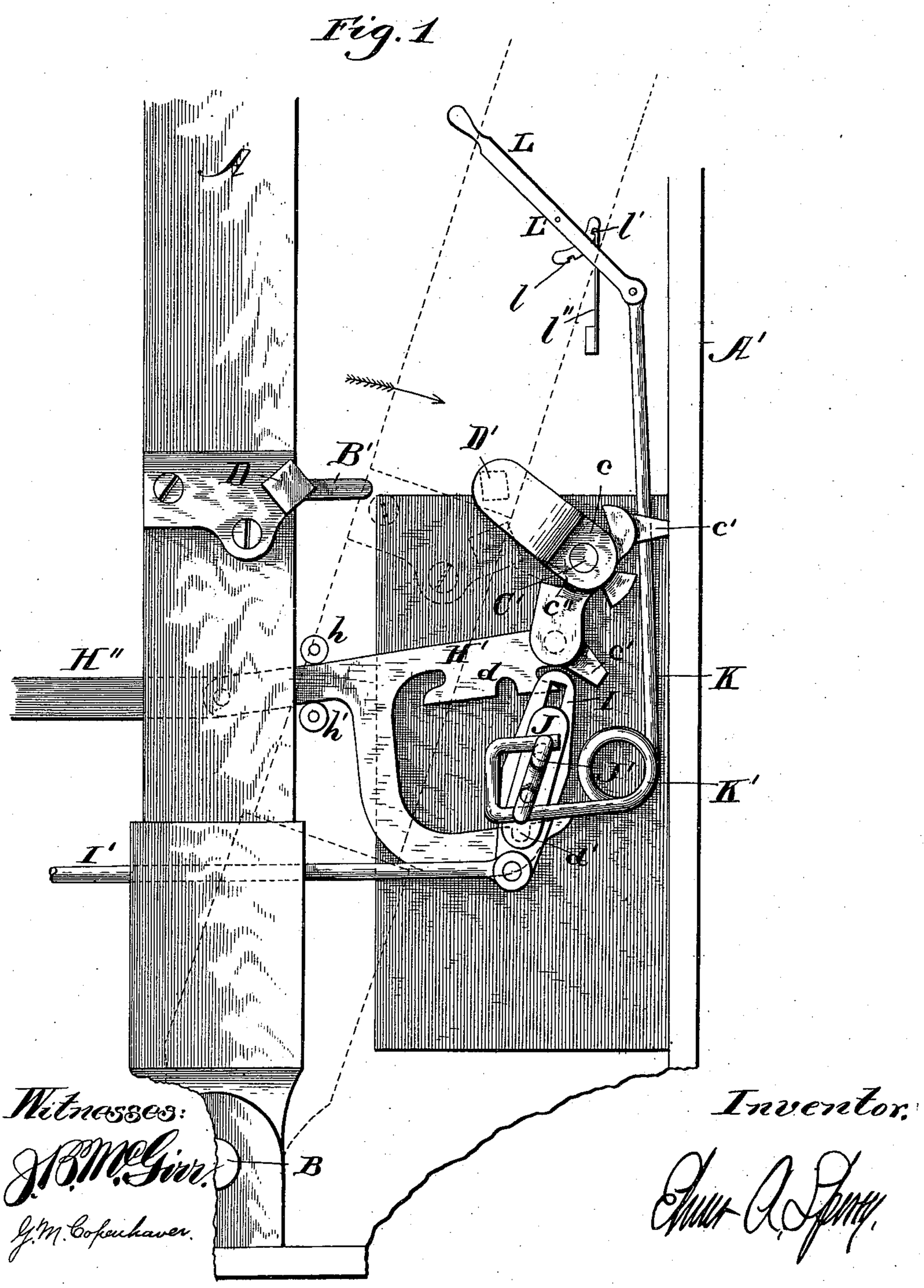
(No Model.) 4 Sheets—Sheet 1.

E. A. SPERRY.

MECHANICAL MOVEMENT.

No. 563,424. Patented July 7, 1896.

Fig. 1



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J. M. Copenhaver.

Inventor:

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(No Model.) 4 Sheets—Sheet 2.

E. A. SPERRY.

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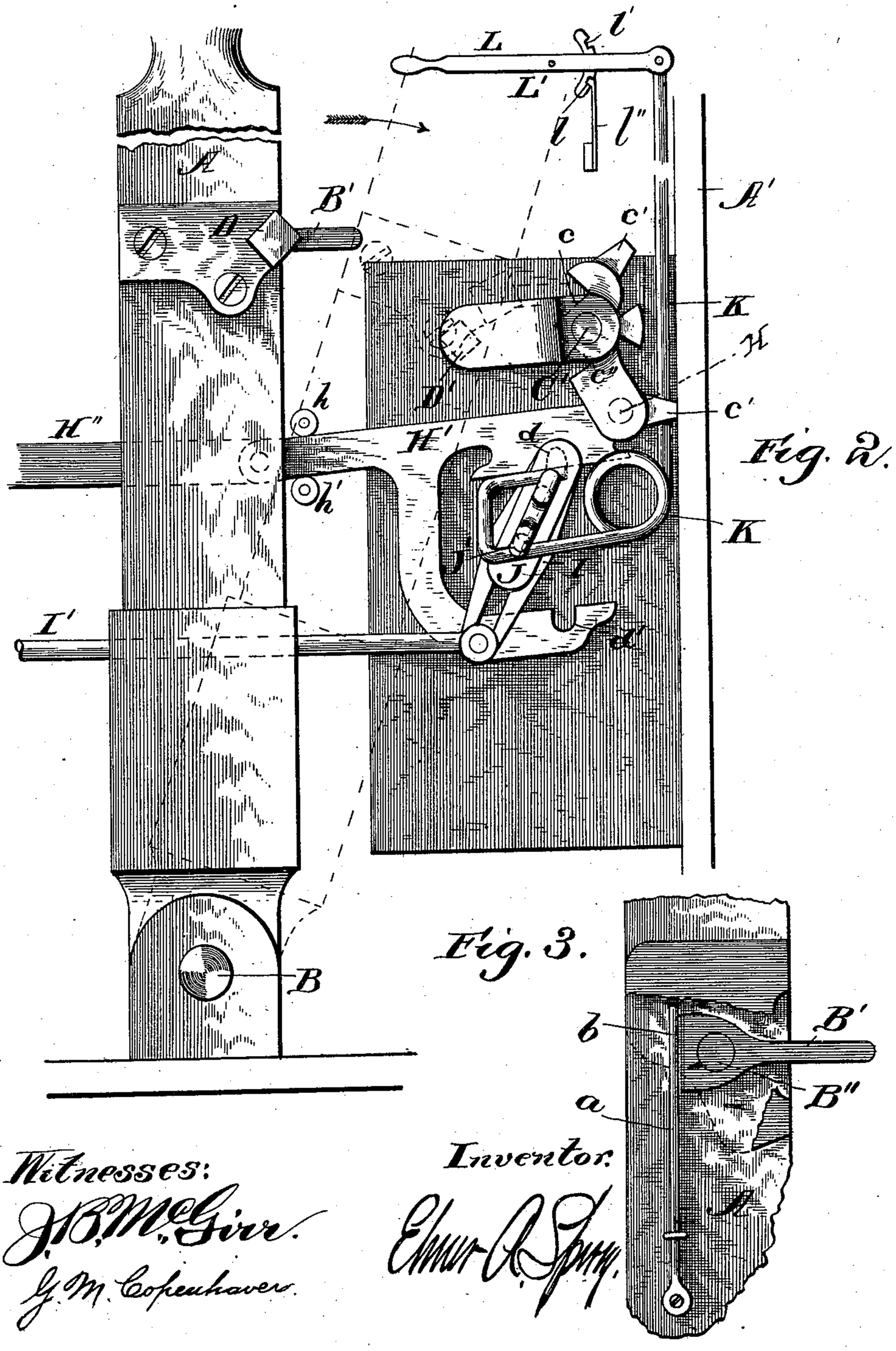

Fig. 2.

Fig. 3.

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(No Model.) 4 Sheets—Sheet 3.

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MECHANICAL MOVEMENT.

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Fig. 4.

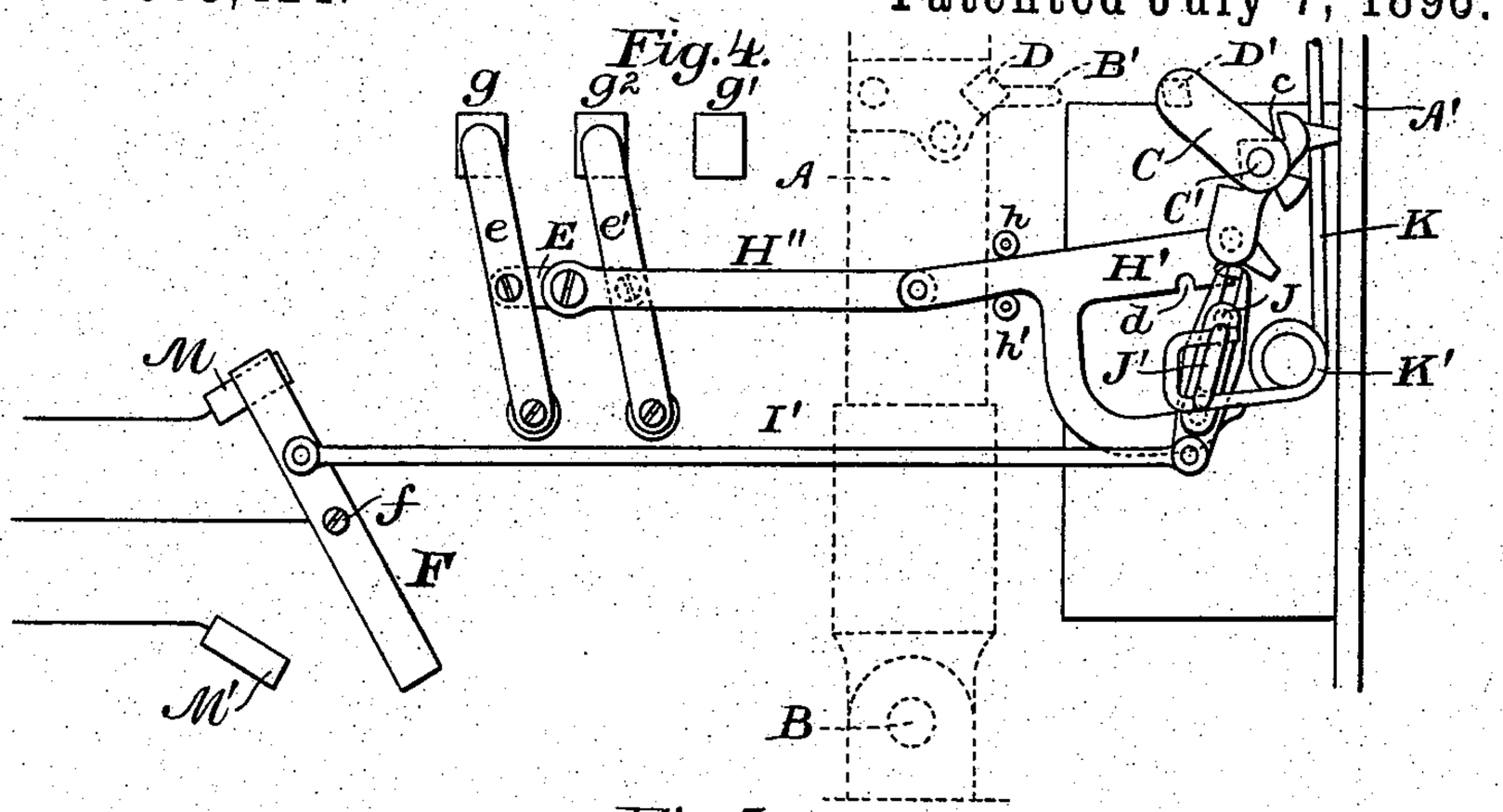


Fig. 5.

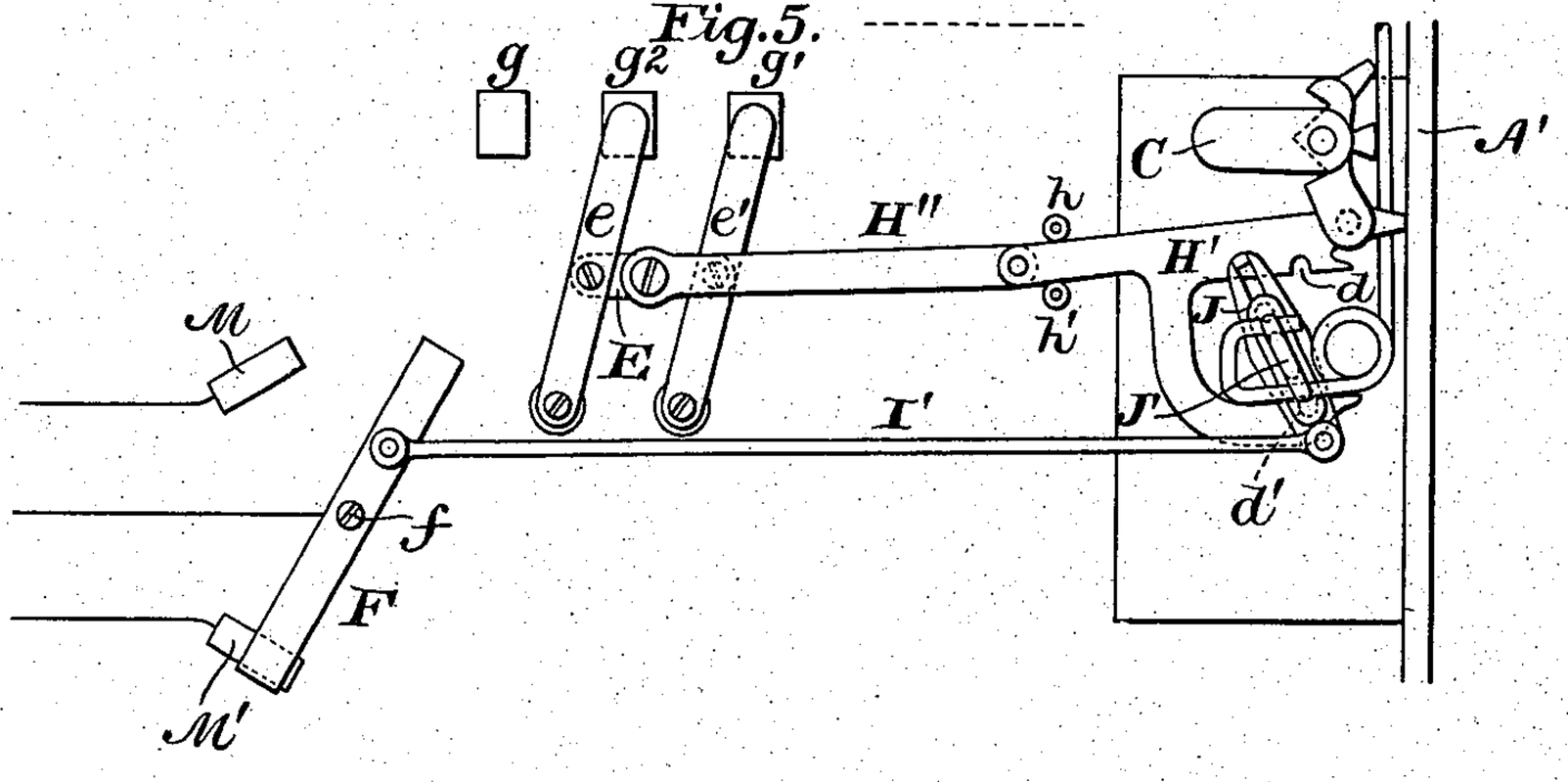
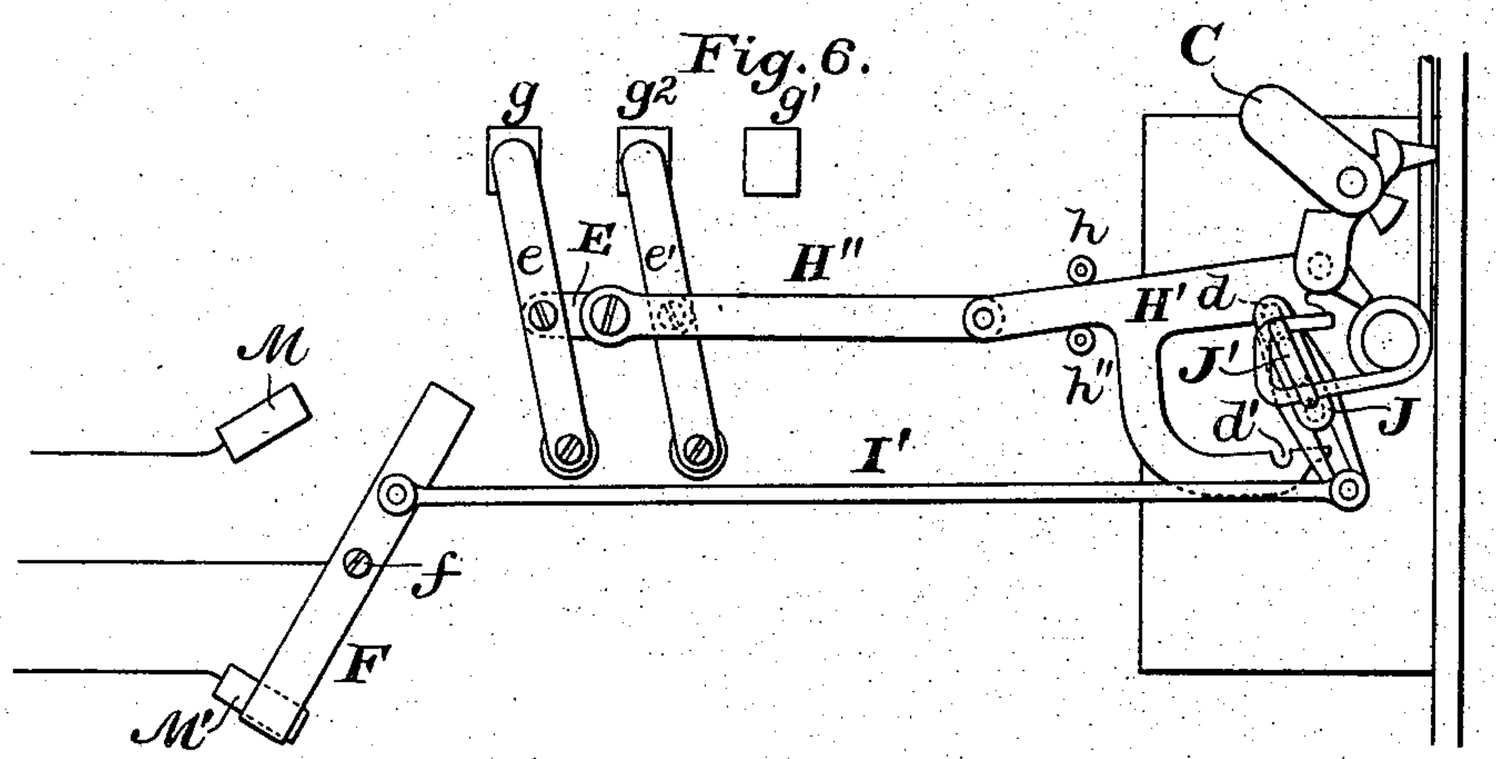


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

E. A. SPERRY.

MECHANICAL MOVEMENT.

No. 563,424. Patented July 7, 1896.

Fig. 7.

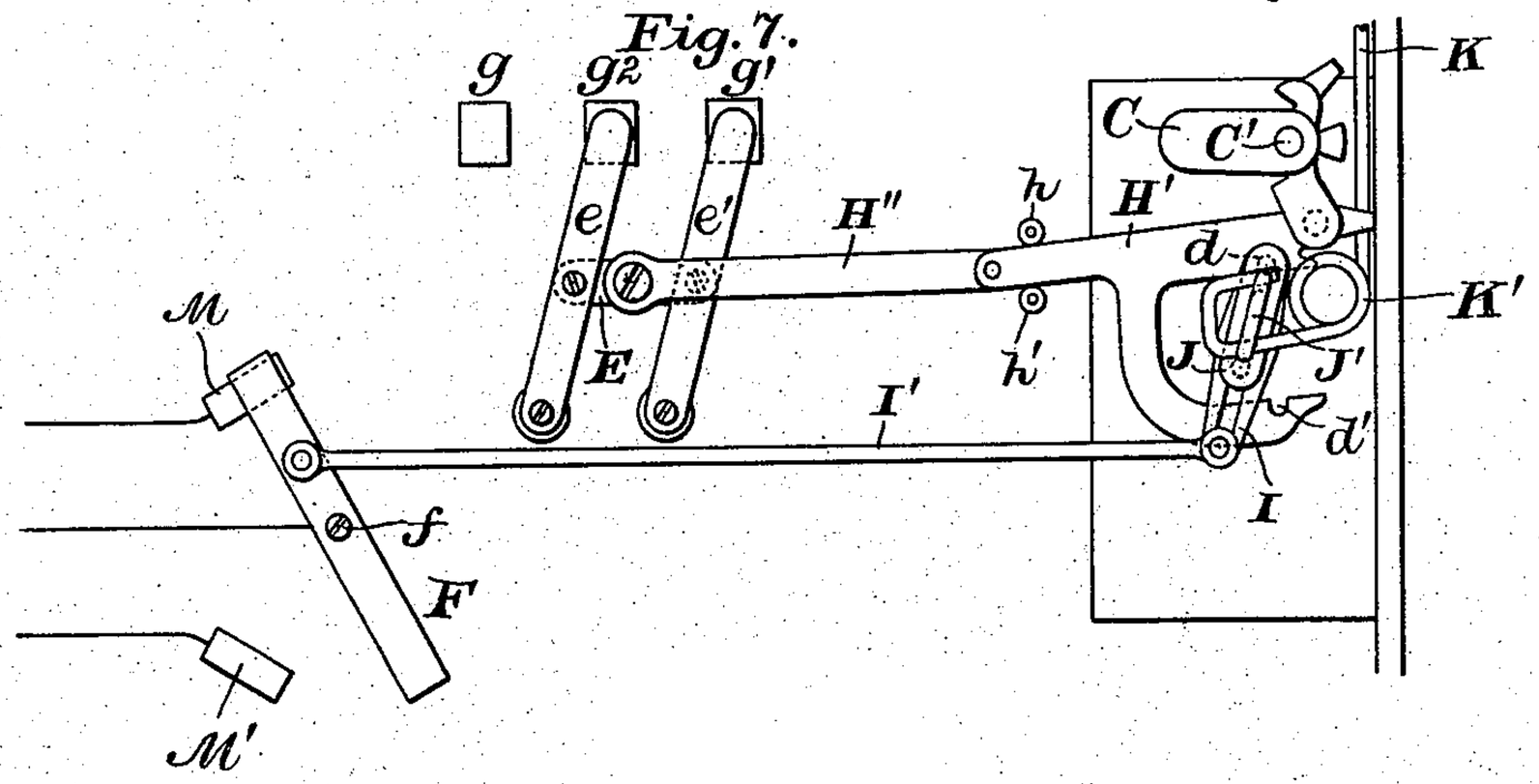


Fig. 8.

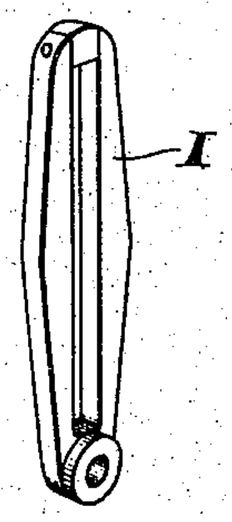


Fig. 9.

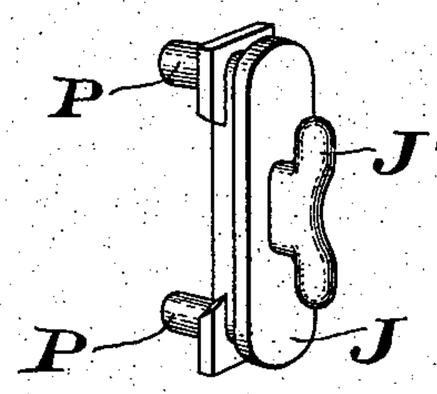
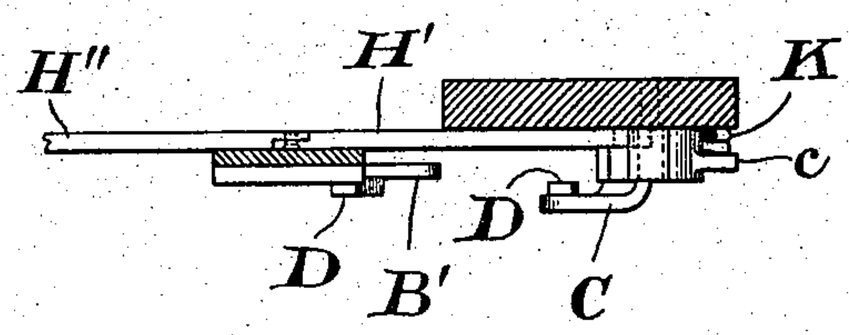


Fig. 10.



Witnesses.

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Elmer A. Sperry,

By Geo. R. Beodgett

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UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CLEVELAND, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE GENERAL ELECTRIC COMPANY, OF NEW YORK.

MECHANICAL MOVEMENT.

SPECIFICATION forming part of Letters Patent No. 563,424, dated July 7, 1896.

Application filed November 11, 1893. Serial No. 490,697. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Cleveland, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Mechanical Movements, of which the following is a full, clear, and exact description.

My invention relates to electrical controllers for use in connection with electric motors; and it consists in a novel arrangement of mechanical elements by means of which a single lever operates to control the motor, and also, when thrown to an extreme position, to alter the motor connections, so that it works as a generator and acts as a brake. In connection with this there is a device for changing the relative positions of the parts whereby the first extreme movement of the lever after such change will reverse the motor and cause the car to be run in the opposite direction, subsequent movements of the lever serving to control the motor or cause it to have a braking action just as when running in the other direction.

This invention is an improvement in the mechanical details of such a controller as is shown in my Patent No. 535,511, dated March 12, 1895.

In the drawings, Figure 1 is an elevation of the device. Fig. 2 shows the parts in a reverse position. Fig. 3 is a detail. Figs. 4, 5, 6, and 7 show the four positions into which the parts can be thrown. Figs. 8 and 9 are details. Fig. 10 is a top plan view.

An arm or lever A, pivoted at B, carries a finger or actuator B′, pivoted at B″ and held yieldingly in the position shown by means of a leaf-spring *a*, fastened to the lever A and having its free end resting against the square abutment *b* of the finger. Upon a stationary support, such as the wall of the controller-case A′, is mounted a shifter C, pivoted at C′ and comprising an offset arm and upper and lower wings, one containing a V-shaped notch *c*, and the other a V-shaped notch *c*″. On each wing is a lug or stop *c*′, adapted to abut against the wall of the controller-case, and thus limit the movement of the shifter. The offset arm of the shifter carries a square or diamond-shaped lug D′ on its inner face to coöperate with a similar lug D on the lever A, adjacent to the finger B, the relation being such that when the shifter stands in its extreme position its diamond is out of the path of the diamond on the lever, but in any of the intermediate positions their paths intersect, for a purpose explained hereinafter.

A moving element or forked yoke H′ is pivotally connected with the shifter by a pin H, preferably by means of the lower wing, as shown. The yoke has a tailpiece guided by rollers *h h*′, and is connected by a link H″ with the reversing-switch, which has two arms *e e*′, pivoted at their lower ends and connected by a block E, to which the link H″ is pivoted. The switch-arms coöperate with the contacts *g g*′ *g*², as described in my patent aforesaid. From this instruction it is evident that the movement of the shifter on the pin C′ will actuate the reversing-switch.

The movement of the shifter is effected by the finger B′, which, when the lever A is thrown over to its extreme position, strikes one or the other of the notches *c c*″ and tilts the shifter either up or down accordingly. During the movement the diamond D′ swings in a vertical arc and the diamond D in a nearly horizontal arc, but without colliding. Should, however, the movement of the lever A and finger B′ to the right be incomplete, then, upon attempting to move the lever back to the left again, the diamond D will strike the diamond D′, and by reason of their inclined faces will force the latter up or down, as the case may be, until the diamond D can pass by the diamond D′, at which point the shifter will have been forced to an extreme position. The two diamonds therefore constitute an automatic correcting device which in no instance allows the lever A to be moved back to the left after the finger has engaged with the shifter without forcing the shifter to one or the other of the extreme positions, no matter how slight may have been the first movement of the shifter by the finger. This relieves the device of all uncertainty of action.

At F is shown a double-armed switch-lever, fulcrumed at *f* and adapted to close against the contacts M M′ alternately. When the arm is in contact with the plate M, the motor is in connection with the line. When the arm

is in contact with the plate M′, the connection with the line is broken and a local circuit is closed through the motor, whereby it will operate as a brake.

In order to actuate the switch-arm F by means of the lever A, I connect with it a rod I′, which is pivotally attached to an oscillating guide or floating upright lever I, arranged adjacent to the yoke H′. This guide is preferably a slotted link, as shown in Fig. 8, pivoted at its lower end to the rod I′. The slot is straight and serves as a guide for a block J, which has on its rear side two projecting pins P, one near the top and the other near the bottom of the block. The pins extend through and beyond the slot in the guide and are adapted to engage with notches *d d′*, the former in the upper arm of the yoke and the latter in the lower arm thereof.

As a means for shifting the block from one end of the guide to the other, and thus throwing one of the pins P out of one notch and the other pin into the other notch, I provide the outer face of the block with a T-headed lug J′, with which engages the parallel-faced hooked end of an upright rod K, in which there is a spring-coil K′ near said hook. The rod is pivoted to a lever L, fulcrumed at L′, and carrying a small quadrant containing notches *l l′*, coöperating with a spring *l″*, for the purpose of retaining the lever and rod in either of its extreme positions. The space between the faces of the hook bears such relation to the travel of the block in the guide that in either position of the block the center, about which it turns, is practically coincident with one face of the hook, the T-headed lug J′ being a little loose in the hook. Moreover, the vertical movement of the rod K is somewhat greater than the travel of the block J, so that the pins P will be kept pressed into their notches with a yielding pressure, due to the spring-coil K′.

When the block J is in its lowermost position, the pin P engages with the notch *d′* between the rod I′ and the center about which the guide I oscillates. In such case, the rod I′ and the link H″ both move in the same direction. When the upper pin P is in engagement with the notch *d*, the rod I′ moves in the opposite direction to the link H″. In using this device, let the parts be as shown in Figs. 2 and 7, which correspond with the position in which they are shown in my patent aforesaid. The motor is supposed to be running ahead. Upon throwing the lever A to the right, the yielding pin B′ will strike on the lower side of the upper notch *c* and ride down into it, tilting the shifter upward and pulling the yoke to the left and the rod I′ to the right, thereby shifting the reversing-switch *e e′* and the switch-arm F to the position shown in Fig. 6. This breaks the line-circuit and brings the braking action into service. A second throw of the lever A will simply restore the parts to the positions shown in Fig. 7, thereby releasing the brake and starting up the motor again; but if, while the parts stand as shown in Fig. 7, the rod K is lowered and the pin P withdrawn from the notch *d* then the block is left disconnected from the yoke, because in this position the lower pin will not enter the notch *d′*. A throw of the lever A will then result merely in shifting the reversing-switch *e e′* and reversing the direction of the car, the rod I′ remaining at rest in the position shown in Fig. 7; but at the end of the movement of the yoke the notch *d′* is brought into line with the lower end of the guide I, and the pin P snaps into it, as shown in Fig. 4, so that at the next throw of the lever the switch-arm F will be actuated simultaneously with the switch, and the parts will be brought into the position shown in Fig. 5, in order to apply the brakes. Similarly, with the parts as shown in Fig. 4, if the block J′ is raised, the upper pin will not engage its notch, and the rod I′ will remain at rest until the yoke has been moved to the right, and the parts resume the position shown in Fig. 7. The object, therefore, of moving the block J′ up or down is to change the relative direction of movement of the yoke H′ and rod I′, according to the direction in which the car may be moving. The devices permit the car to be reversed in its direction without disturbing the switch-arm F, but at the same time they are put into a condition to respond at once to the next throw of the lever A for putting on the brakes. The control of the car is thus reduced to similar movements of a single lever, one starting the car and the next stopping it, and so on alternately, irrespective of the direction in which the car may be running.

It will be readily understood that alterations and modifications may be made in the details of construction without departing from the spirit of my invention.

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

1. A pivoted shifter, notches thereon located on each side of its pivot, a finger-like actuator for said shifter, coöperating with said notches, the actuator having a forward-and-back movement, in combination with means whereby the insufficient movement of said shifter by the actuator in its said forward movement is corrected upon its backward movement.

2. A pivoted shifter having two extreme positions, notches thereon located on each side of its pivot, a finger-like actuator for said shifter, coöperating with said notches, the actuator having a forward-and-back movement, in combination with means whereby a failure on the part of the actuator to bring the shifter to one of said extreme positions on its forward movement is rectified in its backward movement.

3. A pivoted shifter having two extreme positions, notches thereon located on each side of its pivot, a finger-like actuator for said

shifter, coöperating with said notches, the actuator having a forward-and-back movement, and two stops or abutments for said shifter, in combination with means whereby a failure on the part of the actuator to bring the shifter to one of said extreme positions on its forward movement is rectified in its backward movement.

4. A pivoted shifter, notches thereon located on each side of its pivot, a finger-like actuator for said shifter, coöperating with said notches, the actuator having a forward-and-back movement, in combination with oblique-sided coöperating projections, one moving with said shifter and the other moving with said actuator, whereby the insufficient movement of said shifter by the actuator in its said forward movement is corrected upon its backward movement.

5. A pivoted shifter, notches thereon located on each side of its pivot, a finger-like actuator for said shifter, coöperating with said notches, the actuator having a forward-and-back movement, in combination with oblique-sided coöperating projections having two active or engaging faces, one above and the other below the line of movement of the actuator, whereby the insufficient movement of said shifter by the actuator in its said forward movement is corrected upon its backward movement.

6. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and projections connected with the oscillator for the notches, the arrangement being such that the oscillator is operated by the said vibrating element through the engagement of one of its notches only.

7. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and projections connected with the oscillator for the notches, the arrangement being such that the oscillator is operated by the said vibrating element through the engagement of one of its notches only, and means providing for a relative movement between the projections and the notches whereby their relation may be reversed.

8. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and projections connected with the oscillator for the notches, the arrangement being such that the oscillator is operated by the said vibrating element through the engagement of one of its notches only, and means whereby the projections may be shifted with reference to the notches.

9. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and two projections for the notches, and means whereby the projections may be shifted with reference to the notches in such a manner that while being withdrawn from one of the notches the other projection is made to engage the opposite notch, substantially for the purpose specified.

10. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and projections connected with the oscillator for the notches, the arrangement being such that the oscillator is operated by the said vibrating element through the engagement of one of its notches only, and means whereby the projections may be shifted with reference to the oscillator.

11. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and projections connected with the oscillator for the notches, the arrangement being such that the oscillator is operated by the said vibrating element through the engagement of one of its notches only, and means whereby the projections may be shifted with reference to the notches, an operating element for the projections, in combination with an elastic medium located between the said element and projections.

12. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and projections connected with the oscillator for the notches, independent means connecting said projections for controlling movement of the same, an actuator for the said independent element for moving and holding the said projections located over the said pivot.

13. A shifter, a vibrating element moving therewith and provided with notches opening opposite each other, a pivoted oscillator, the pivot being located between the notches and projections connected with the oscillator for the notches, independent means connecting said projections for controlling movement of the same presenting two faces to an actuator, being separated from each other by practically the distance of said movement, an actuator for the said independent element for moving and holding the said projections, located over the said pivot.

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Witnesses:
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J. B. MCGIRR.