(No Model.) 2 Sheets—Sheet 1.

C. PARTINGTON.

ELECTROMOTOR MAGNET.

No. 574,215. Patented Dec. 29, 1896.

Fig. 1.

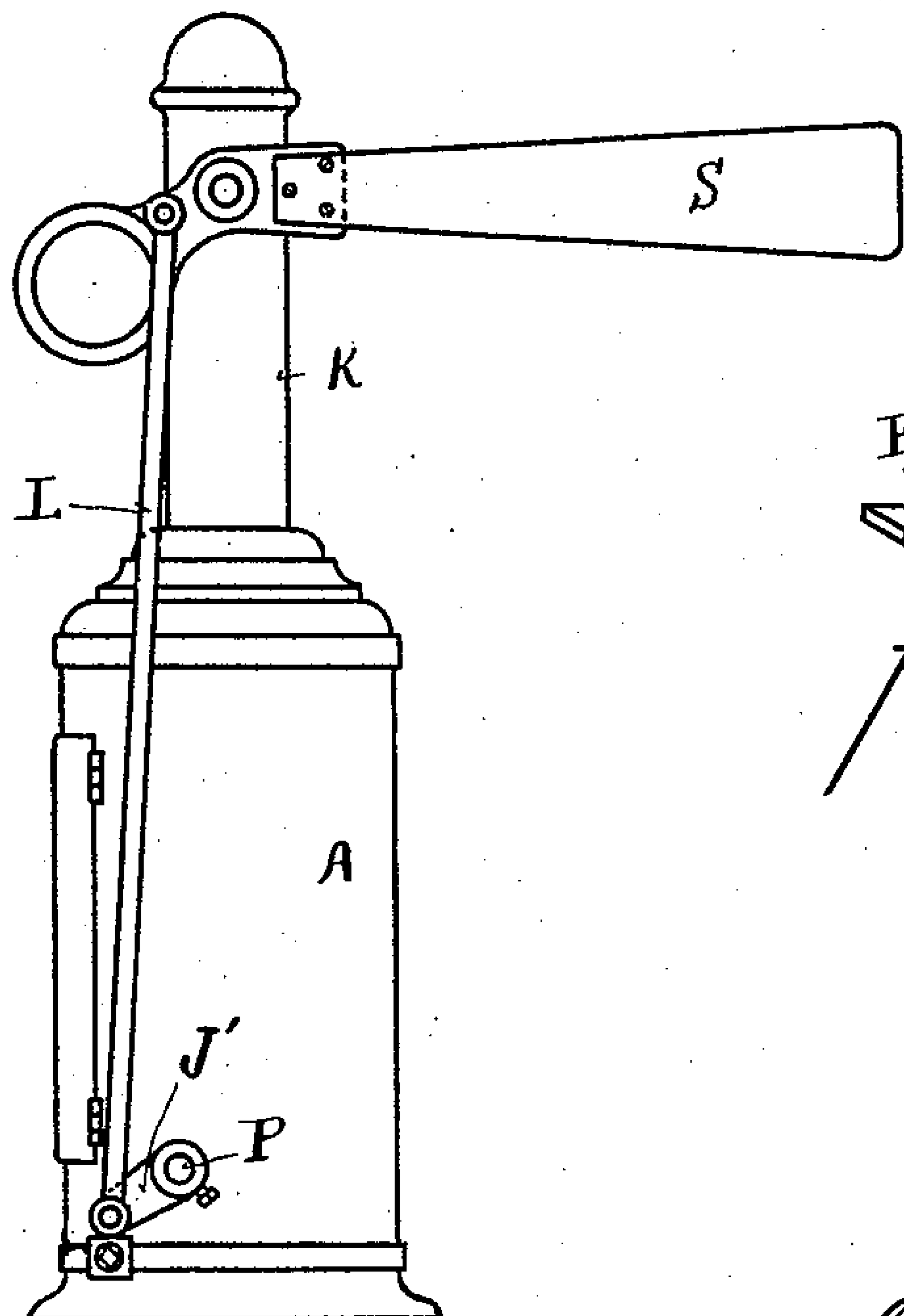


Fig. 4.

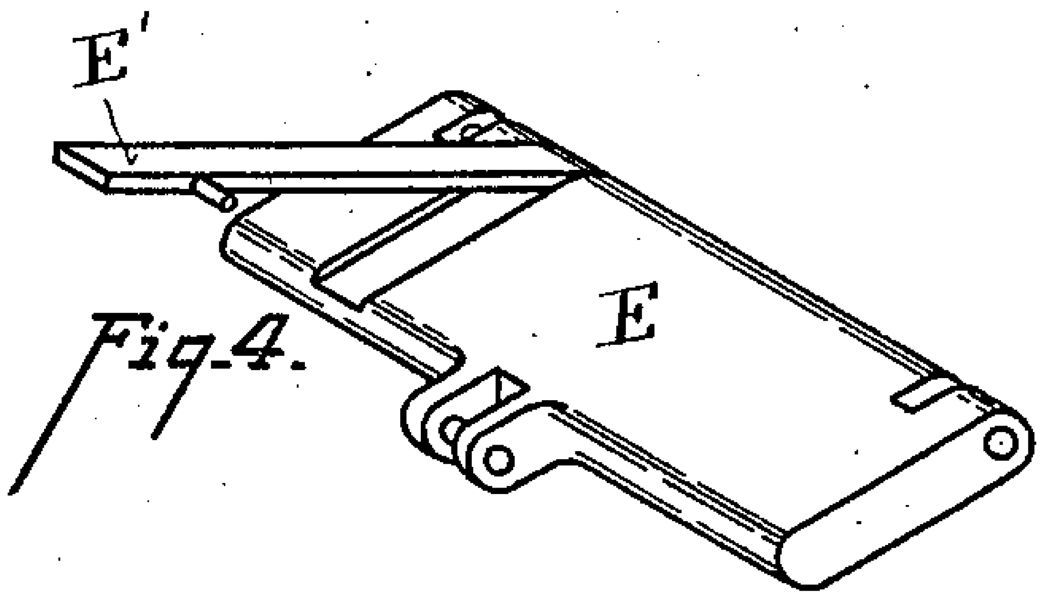


Fig. 2.

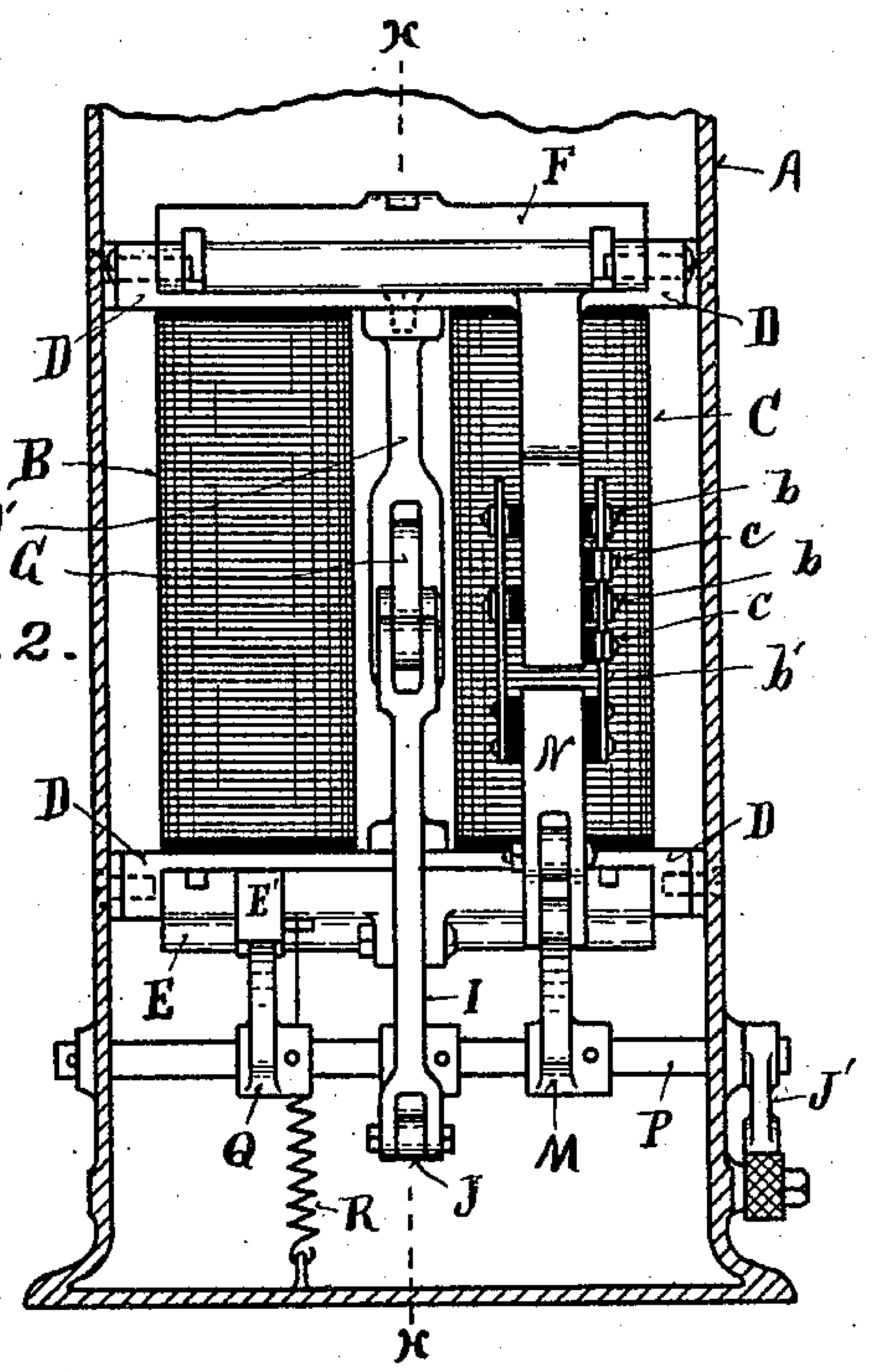
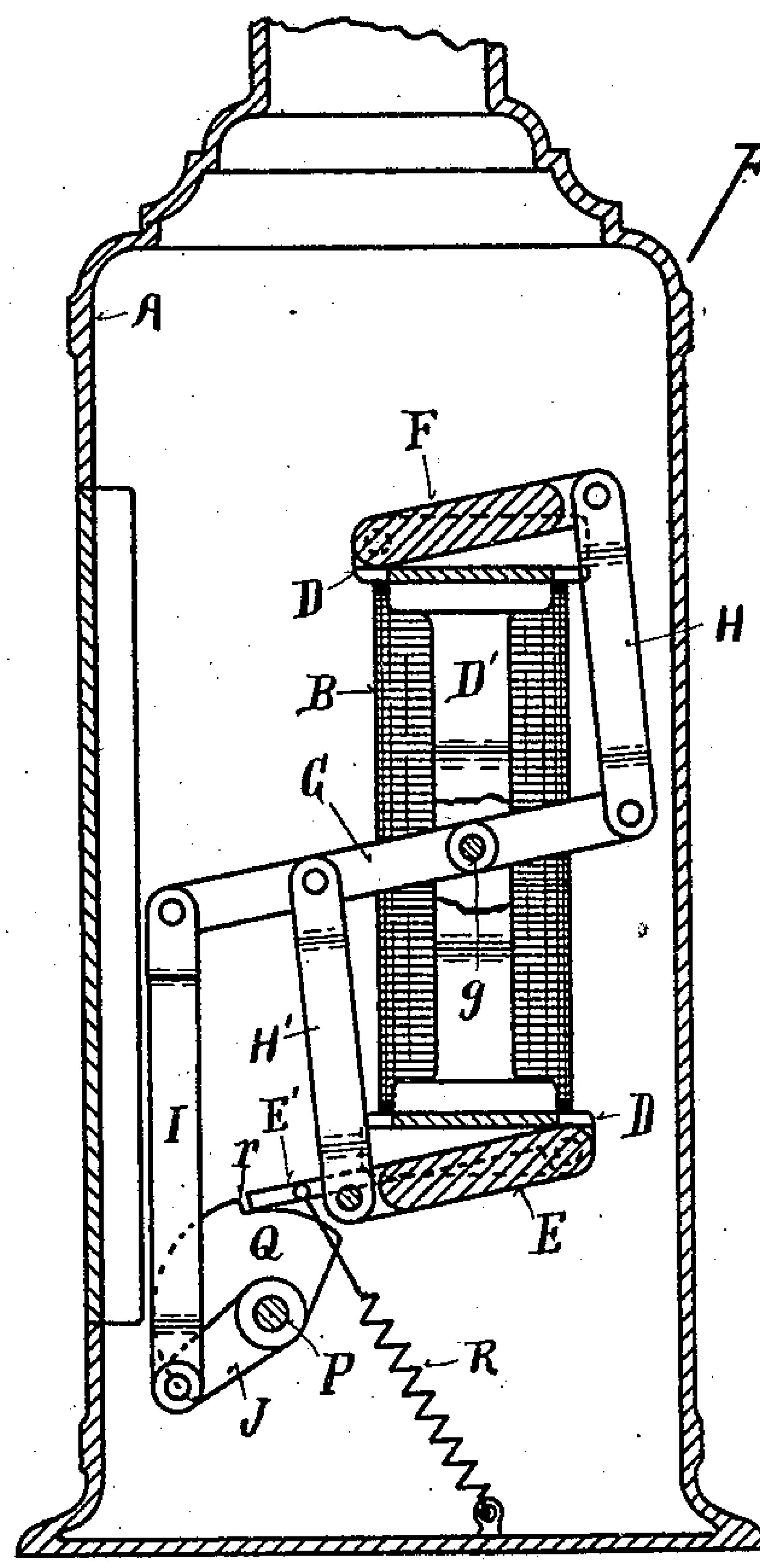


Fig. 3.



Witnesses
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(No Model.) 2 Sheets—Sheet 2.

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ELECTROMOTOR MAGNET.

No. 574,215. Patented Dec. 29, 1896.

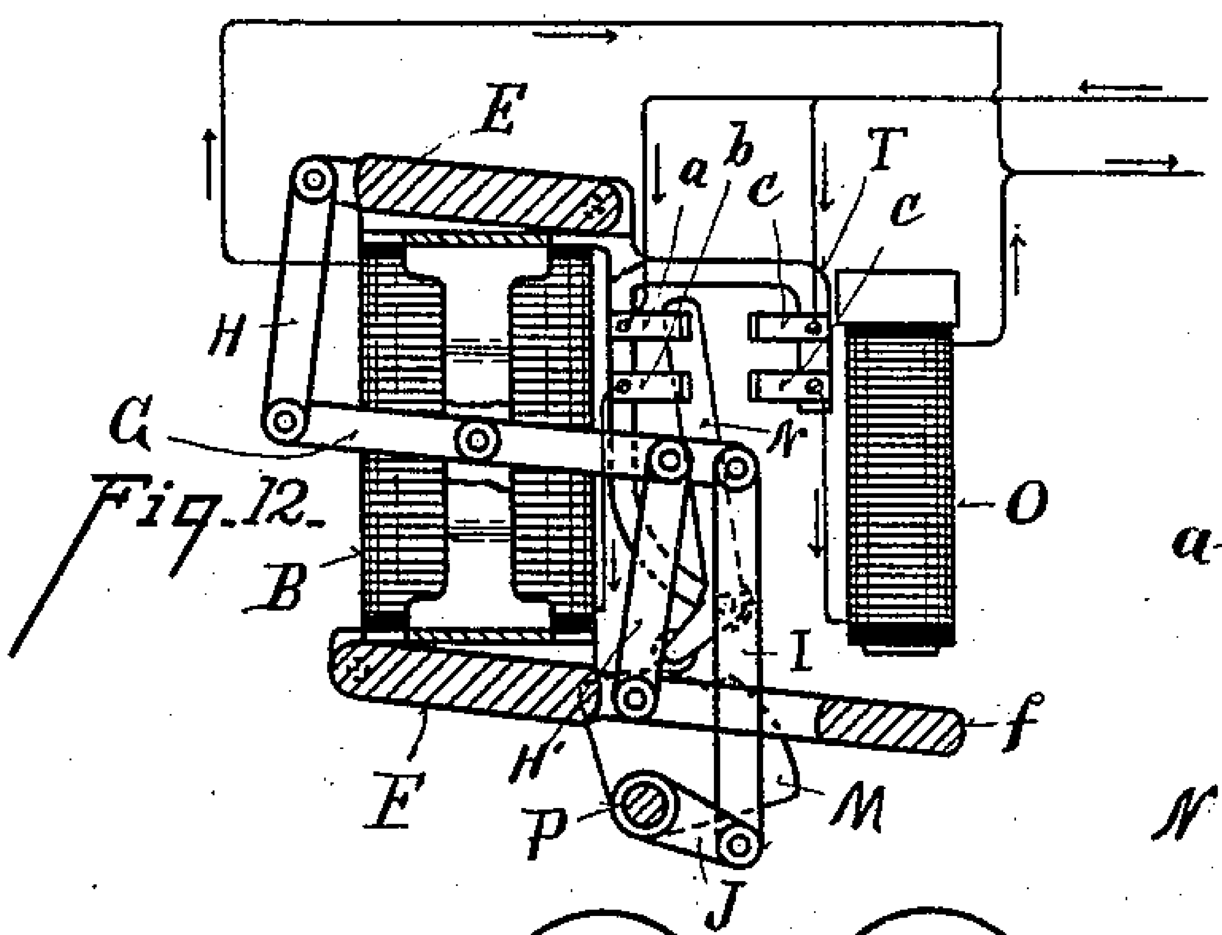

Fig. 12.

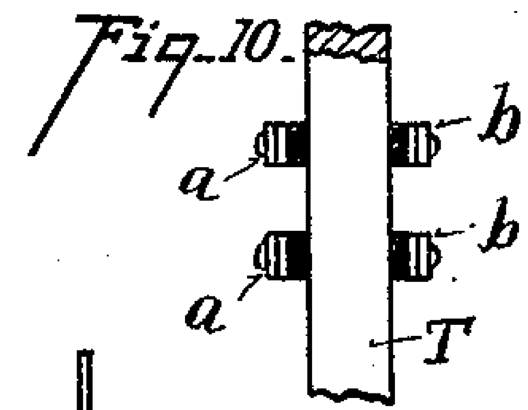

Fig. 10.

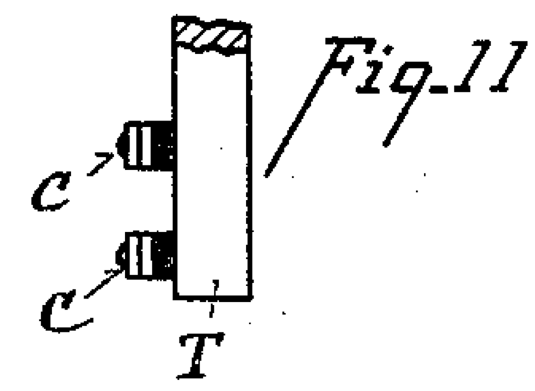

Fig. 11.

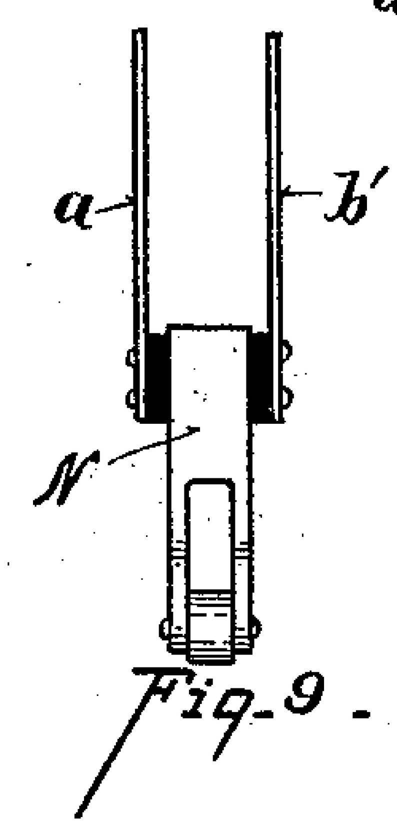

Fig. 9.

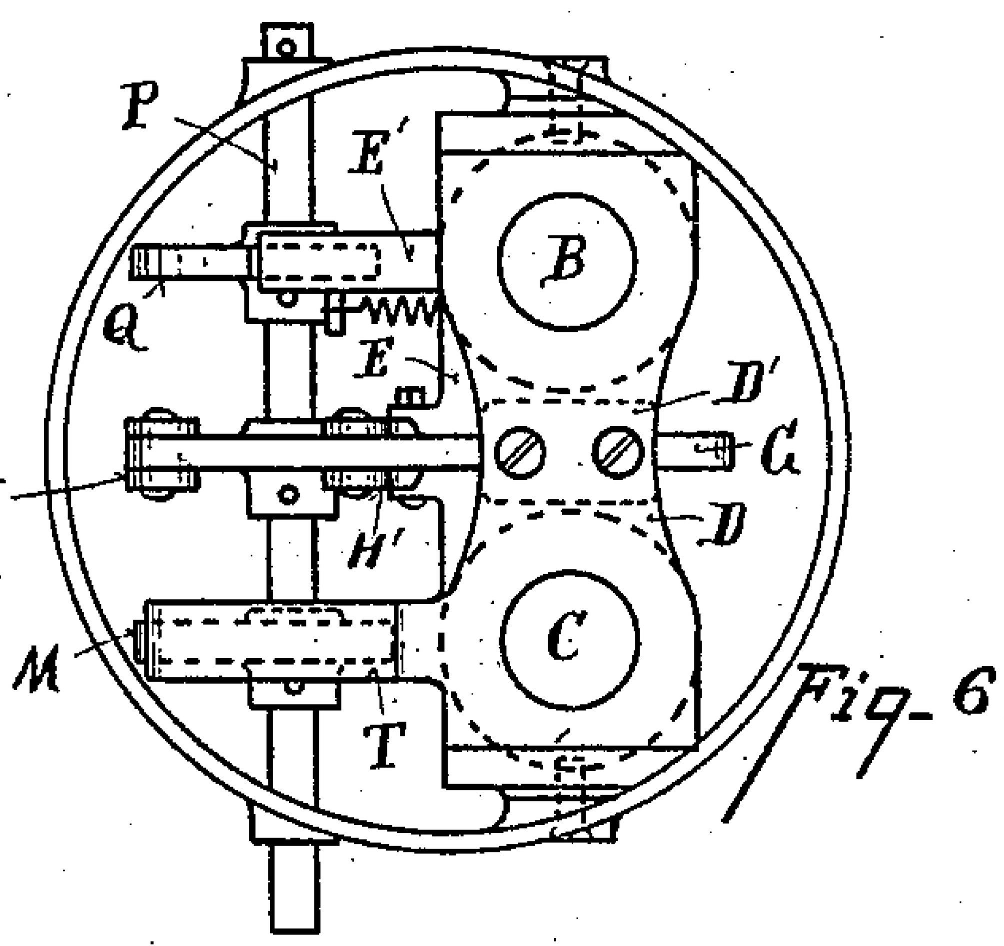

Fig. 6.

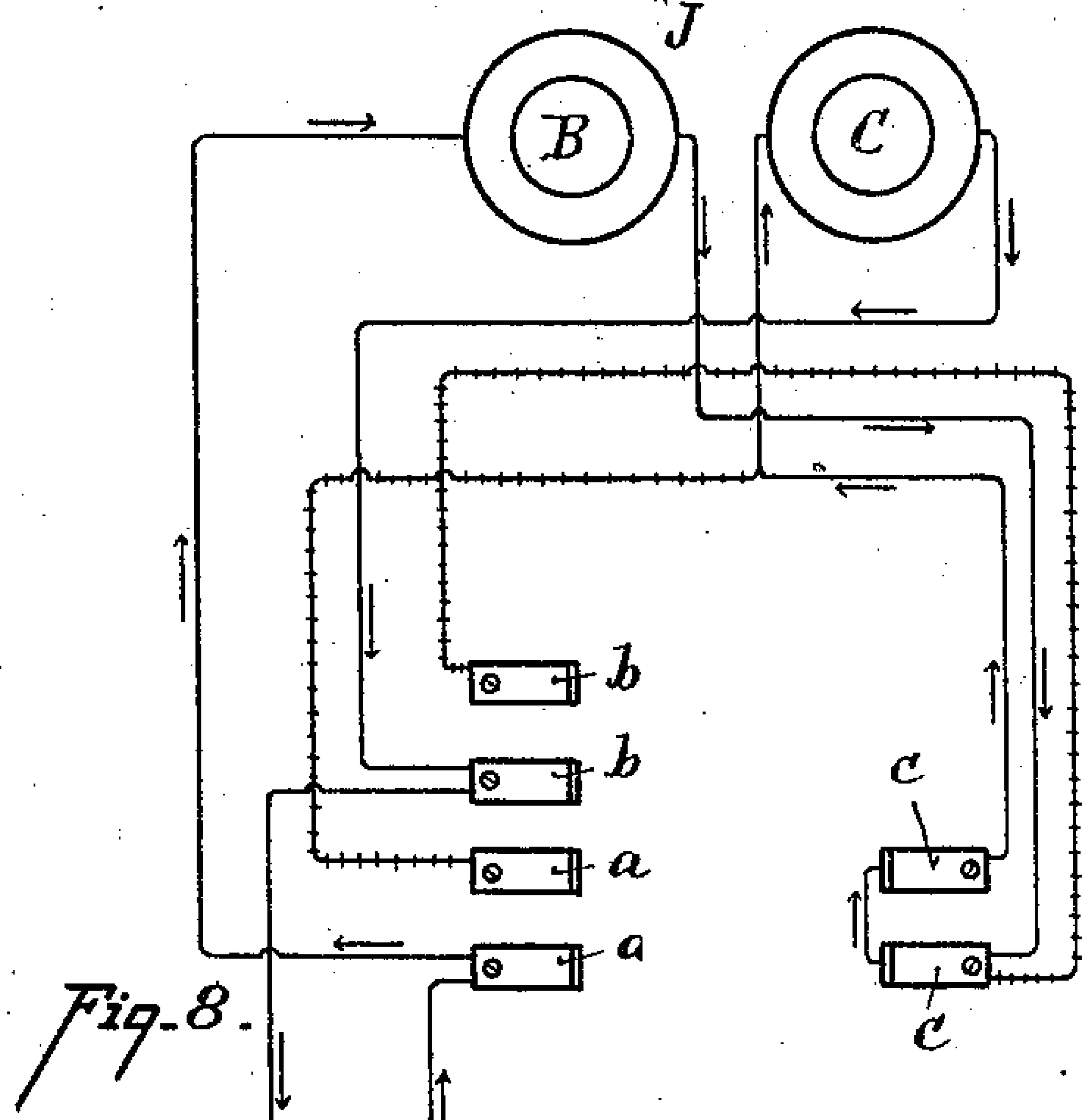

Fig. 8.

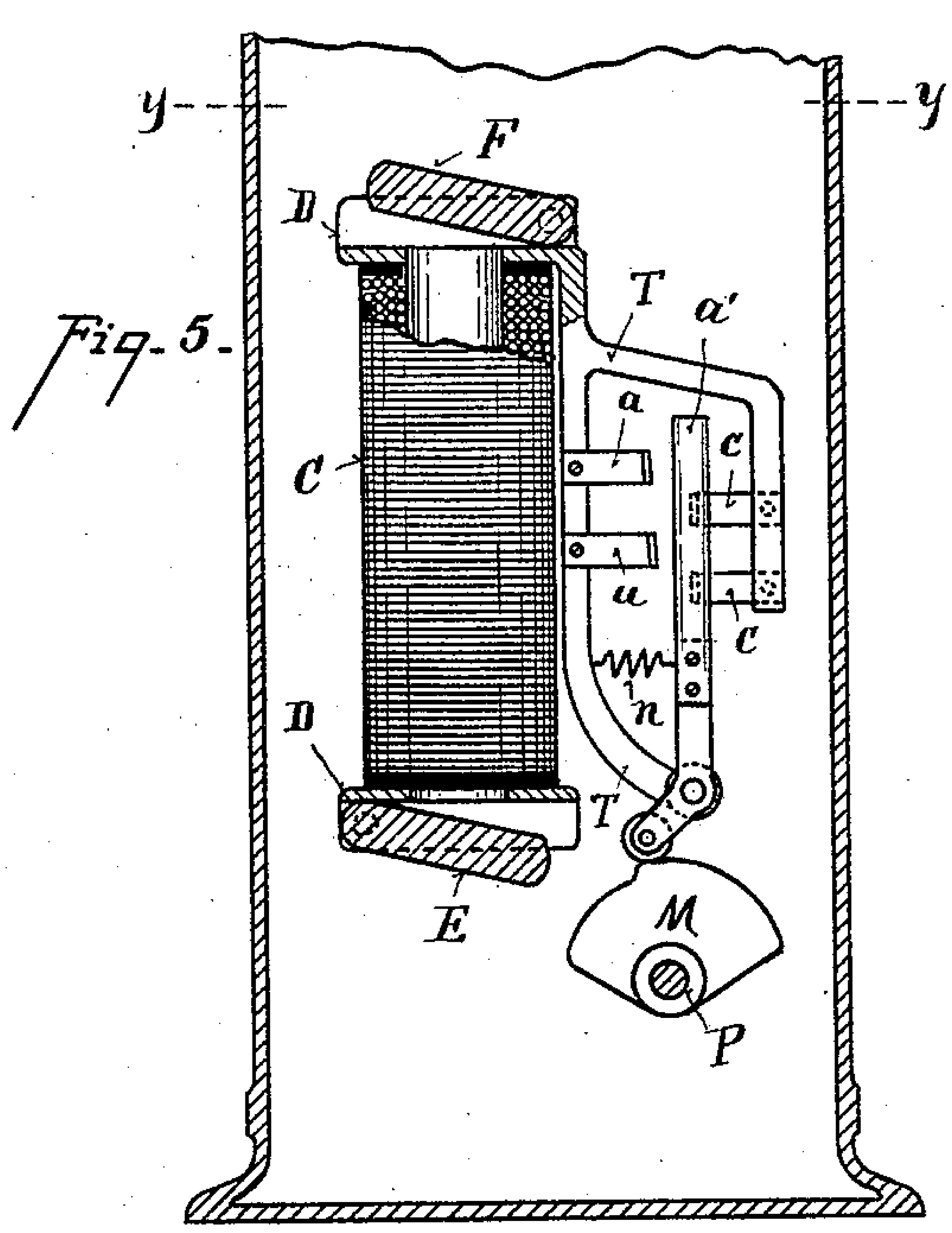

Fig. 5.

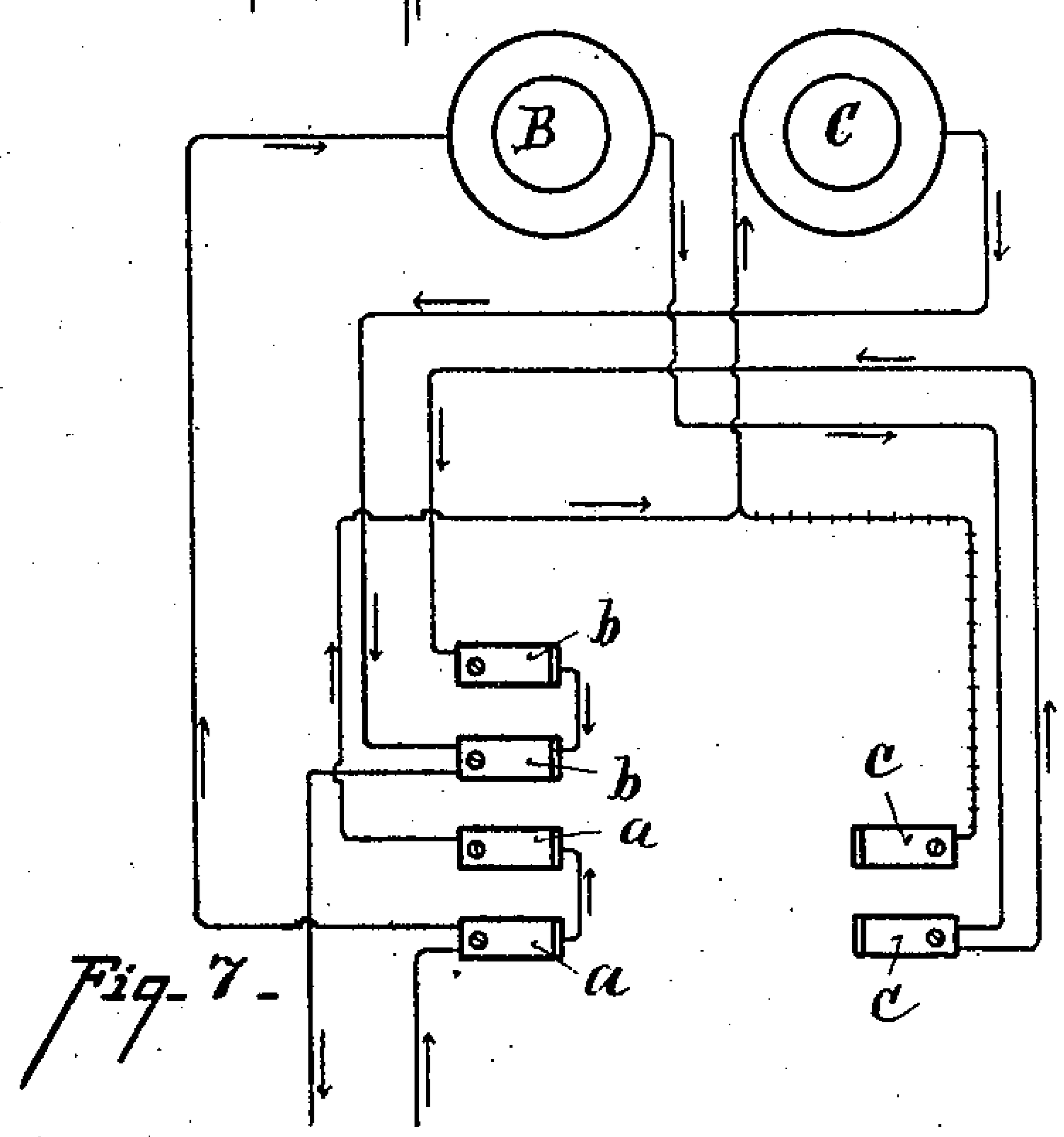

Fig. 7.

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UNITED STATES PATENT OFFICE.

CHARLES PARTINGTON, OF NEWPORT, KENTUCKY, ASSIGNOR TO THE WEIR FROG COMPANY, OF CINCINNATI, OHIO.

ELECTROMOTOR-MAGNET.

SPECIFICATION forming part of Letters Patent No. 574,215, dated December 29, 1896.

Application filed March 6, 1896. Serial No. 582,111. (No model.)

To all whom it may concern:

Be it known that I, CHARLES PARTINGTON, residing at Newport, in the county of Campbell and State of Kentucky, have invented certain new and useful Improvements in Electromotor-Magnets, of which the following is a specification.

My invention relates to the construction of a magnet primarily adapted to operate a signal-blade or other like devices which are required to be moved back and forth short distances, such as switches, shipping-levers, &c.

For convenience of illustration I have shown the magnet and connections applied to a signal-blade.

In moving objects from a state of rest a maximum amount of power is required in overcoming the inertia. Where an armature is employed, the armature being farther away from the core at the initial point of movement as ordinarily constructed, furnishes less power than at the latter part of the movement. I therefore provide an electromagnet and pivot the heel of an armature-plate close to the core of the magnet and employ a current and develop magnetic force of sufficient power to overcome the inertia, and then as soon as the movement has commenced I provide means for cutting out a large portion of the electric current and cutting in or retaining a small amount thereof sufficient to complete the movement. In cases where the object moved is to be held in position this lesser current can be utilized to lock the same in position. By this means I am enabled to employ for the initial movement a current of higher amperage than the magnet will sustain for a continued period without overheating, the lessening of the current being sufficient to prevent the heating of the coils.

The features of my invention are more fully set forth in the description of the accompanying drawings, making a part of this specification, in which—

Figure 1 is a side elevation of the signal-blade with the casing containing the magnet and sustaining the operative parts. Fig. 2 is a central vertical section showing the magnet in elevation. Fig. 3 is a section on line *x x*, Fig. 2. Fig. 4 is a perspective view of one of the armatures provided with a locking mechanism. Fig. 5 is a side elevation of the right-hand magnet shown in Fig. 2 with the cutting-out mechanism. Fig. 6 is a section on line *y y*, Fig. 5, with the upper armature removed. Fig. 7 is a diagram of the magnet and circuit with the magnets in parallel circuits. Fig. 8 is a diagram of the circuits and magnets connected in series. Fig. 9 is an elevation of the switch-lever. Fig. 10 is a detailed view of the switch-terminals for parallel connection. Fig. 11 is a detailed view of the terminals for serial connection. Fig. 12 is a modification showing a lesser magnet employed for holding the armature in position when it is desired to lock the same.

When the magnet is to be employed for moving a signal-blade, it is preferably mounted in the casing A, as shown.

B C represent a pair of magnet-coils. These magnets are mounted upon a non-magnetic frame D, which is secured to the casing.

E represents an armature pivoted to the frame D.

F represents a similar armature pivoted to the frame at the opposite end of the coil.

G represents the transmitting-lever, pivoted to a stud-shaft *g*, supported by the frame-piece D'.

H H' represent connecting-rods, one end of each of which is pivoted to a projecting portion of its respective armature, and the other end of each of said levers is pivoted to the transmitting-lever G on opposite sides and equidistant from its center *g*. I represents a pitman pivoted to lever G at one end and the other end to the crank J. P represents a rock-shaft operated by the said armatures through their connecting rods and levers.

In Fig. 1 I have shown a signal-blade connected to a post K, projected above the box and operated by a pitman L, connected to a crank J' and to the signal-blade, as shown in Fig. 1, but the signal-blade might be mounted directly on the shaft P.

In Fig. 7 I have shown a diagram of the magnet-coils B C connected in parallel circuits, as shown by the full lined, but when the switch-lever is thrown over so that lever *b'* is in contact with the terminals *c* then the magnets are in serial circuit, as shown by the full lines in Fig. 8. These circuits are established alternately and automatically through the operation of the magnet-armature, and I prefer to operate the automatic mechanism from shaft P. M represents a cam mounted on said shaft, which operates the stem of the switch-lever N. The lever N is pivoted to a bracket T, secured to the frame D. The switch-terminals *a a b b c c* are also secured to bracket T. When the shaft P and its cam are rocked in one direction, the switch N is moved, say, from the terminals *a b* to the terminals *c*, thus establishing a serial circuit through the magnet. When the shaft P is moved in the opposite direction, the lever and its cam are rocked in the opposite direction and the switch-lever N is moved from the terminals *c* to contact with the terminals *a b*, and the parallel-circuit connection of the magnet is established. As constructed, the cam M only moves the switch-lever in one direction and the spring *n* pulls it in the opposite direction as soon as the shaft is rocked far enough to allow the movement to take place.

If a positive movement in both directions is desired, a closed cam could be employed to accomplish this. In the modification shown in Fig. 12 instead of establishing a parallel and serial circuit operated through one pair of magnets I provide a second magnet O of lesser strength, which is brought in by the terminals *c*, when the larger magnet is cut out, by breaking the contact at terminals *a b*. The armature F has a projecting armature *f*, which is attracted by said lesser magnet for completing the movement and locking the parts or holding the armature in contact with the core.

I do not wish to limit myself to the precise method of cutting out a portion of the current employed, as this may be done in various ways automatically. The preferred form, however, is shown in Figs. 7 and 8. I also provide means for locking the shaft P against movement when there is no current through the magnets.

The cam Q is mounted on shaft P and provided with a notch *r*, into which the projecting end of armature E′ enters when the armature is in its normal position away from the magnet. Armature E′ is loosely pivoted at its rear end to armature E. R represents a spring of sufficient power to retract the armature when the current is cut out. Thus as soon as the current is established through the magnet-coils armature E′ is attracted and the cam Q unlocked before the armature E begins to move.

When this device is employed to move a signal in the construction shown, the signal-blade S is locked in the "danger" or horizontal position shown in Fig. 1, and it cannot be moved to the "safety" position until the current is established by connection with the magnet-circuit. This locking device is effective and desirable when said magnet is employed to operate switches, shipping-levers, and other like mechanisms.

Several advantages are obtained by the construction herein shown and described. First, a stronger current can be utilized to overcome the inertia than the coils of the magnet will sustain for any considerable period without heating, as the excessive current is continued but for a short time, the change of circuit being made during the armature movement. Second, as it is desired to utilize the electromagnet to hold the signal to "danger," a small amount of current is only required for this purpose, and hence a waste of energy is prevented by using the lesser amount of current. Again, by employing the duplex-armature form a greater amount of power is utilized for a given size of magnet. Hence a smaller space is required and a less costly magnet. Again, by combining the duplex armature with the two-circuit system operated automatically by the armature movement a very much greater initial moving force is obtained with a comparatively small magnet. This is very important where a magnet is employed to do work in which the initial movement requires a much greater power than that required to complete the movement.

I claim—

1. The combination of an electromotor-magnet having operative circuits of greater and lesser resistance, independent terminals for each circuit for changing the circuits through the same helices, an armature pivoted within the magnetic field, lever mechanism actuated by the armature, a cam actuated by said lever mechanism, and a switch operated by said cam to change the currents during the armature movements, substantially as specified.

2. The combination with an electromotor-magnet having two or more limbs, wire-terminals for each limb, and a switch adapted to change the electric current through the wire-terminals of the magnet from parallel circuits to serial circuits, of a rock-shaft having a cam to control said switch, an armature pivoted within the magnetic field, and lever mechanism for connecting said armature and rock-shaft, substantially as specified.

3. The combination of an electromotor-magnet having the wire-terminals of its separate limbs arranged opposite each other, a switch adapted to be moved from one set of terminals to the other for changing the current through the terminals of the magnet from parallel circuits to serial circuits and vice versa, an armature, and a cam controlled from said armature to actuate the switch, substantially as specified.

4. The combination of an electromotor-magnet having the wire-terminals of its separate limbs arranged opposite each other, an armature pivoted within the magnetic field, a cam-actuated switch automatically controlled from said armature to make and break the circuits through the magnet-terminals, thereby establishing parallel circuits or serial

circuits according to the direction in which the said switch is moved, and means for locking the armature, substantially as specified.

5. The combination with the coils of an electromotor-magnet, and two sets of magnet-terminals, of a switch adapted to be moved from one set of said terminals to the other set and thereby establish parallel circuits for the magnet-coils when the said switch is moved in one direction and a serial circuit through the coils when the switch is moved in the opposite direction, an armature pivoted within the magnetic field, and a rock-shaft controlled from said armature and carrying a cam to actuate the switch and change the circuits during the armature movement, substantially as specified.

6. The combination of an electromotor-magnet having operative circuits of greater and lesser resistance and two sets of wire-terminals arranged opposite to each other, an armature pivoted within the magnetic field at each end of the magnet, lever mechanism connected with and operated by the two armatures, and a switch actuated through said lever mechanism and adapted to be moved from one set of terminals to the other set and thereby establish parallel circuits for the magnet-coils when the switch is in one position and a serial circuit through said coils when the switch is in another position, substantially as described.

7. An electromotor-magnet having an armature pivoted within the magnetic field at each end of the coils, each of which armatures controls an operating-lever connected to a common transmitting-lever and adapted to exert force in the same direction upon the same transmitting-lever, substantially as specified.

8. The combination of an electromotor-magnet with an armature at each end of the coil, each connected to a device which is moved by the two armatures simultaneously and conjunctively, substantially as specified.

9. In an electromotor-magnet having a movable armature at each end and located within the magnetic field, a lever connected to and operated by each armature which are in turn pivoted to a common transmitting-lever at equidistant points from its center, and connecting mechanism for transmitting motion from said transmitting-lever to the point of work, substantially as specified.

10. The combination with an electromotor-magnet, of an armature pivoted within the magnetic field at one extremity of the magnet and having an independently-movable arm extended beyond said field, and a rock-shaft adapted to be actuated from the armature and carrying a locking-cam adapted to engage and be locked by the said independently-movable armature-arm, substantially as specified.

11. The combination of an electromotor-magnet having two sets of terminals for operative circuits of greater and lesser resistance, respectively, armatures pivoted in the magnetic field at opposite ends of the magnet, lever mechanism connected with and operated by the two armatures, simultaneously, a switch-lever actuated through said lever mechanism to change the circuits during the armature movements, and means for transmitting power from the armature-actuated lever mechanism to the point of work, substantially as specified.

12. An electric-motor magnet composed of two or more parallel bars provided with energizing-coils, an armature pivoted at each end of the said magnet and within the magnetic field, in combination with lever-moving mechanism actuated conjointly by both armatures, substantially as specified.

13. An electromotor-magnet composed of one or more bars provided with energizing-coils, in combination with an armature pivoted at each end of said magnet and within the magnetic field, said armatures being jointly connected to the same power-transmitting mechanism, substantially as specified.

In testimony whereof I have hereunto set my hand.

CHARLES PARTINGTON.

Witnesses:

W. R. Wood,

N. O. Goldsmith.