

M. D. PORTER.  
ELECTRIC INDICATOR.

No. 424,725.

Patented Apr. 1, 1890.

Fig. 1.

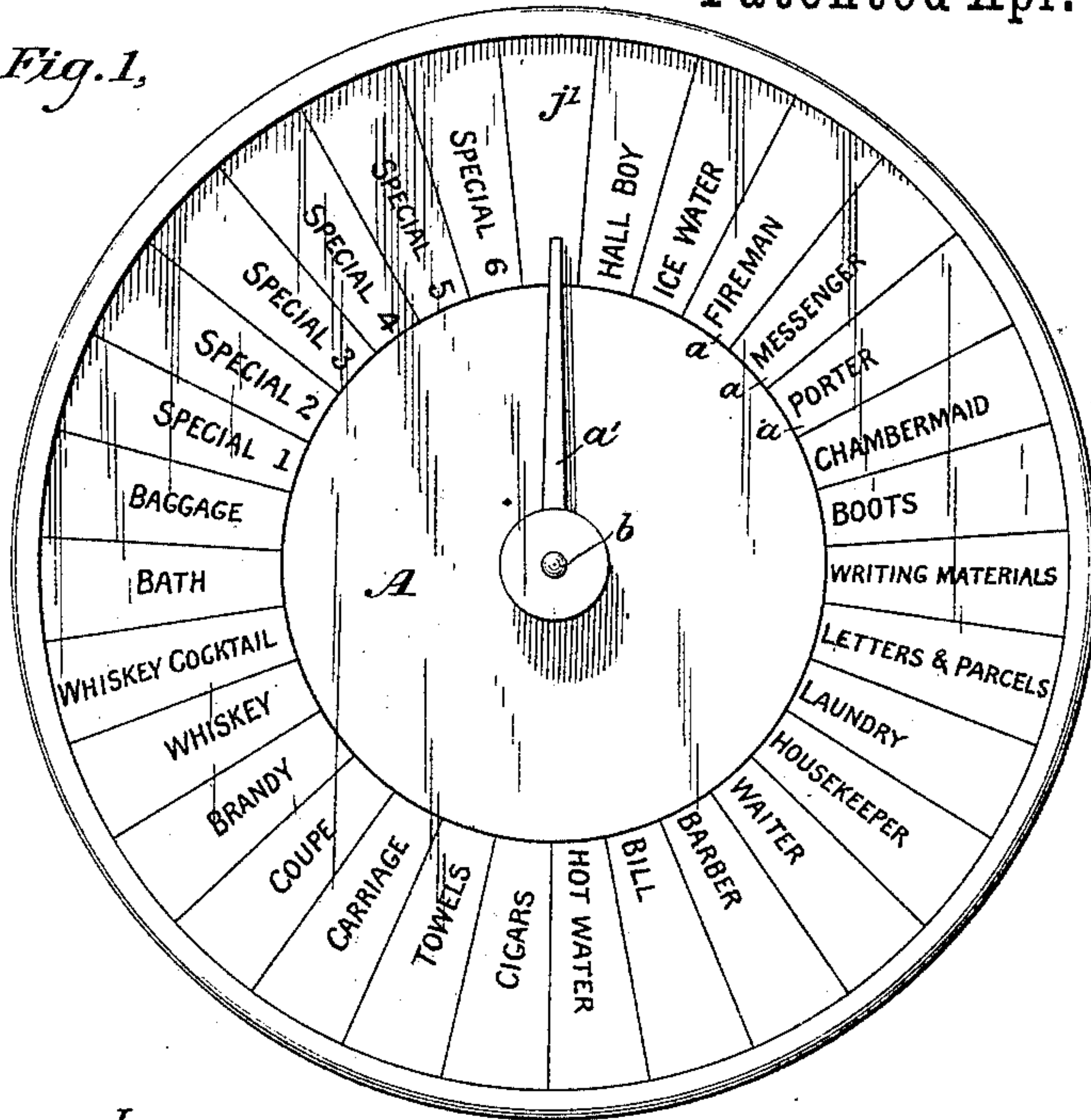


Fig. 2.

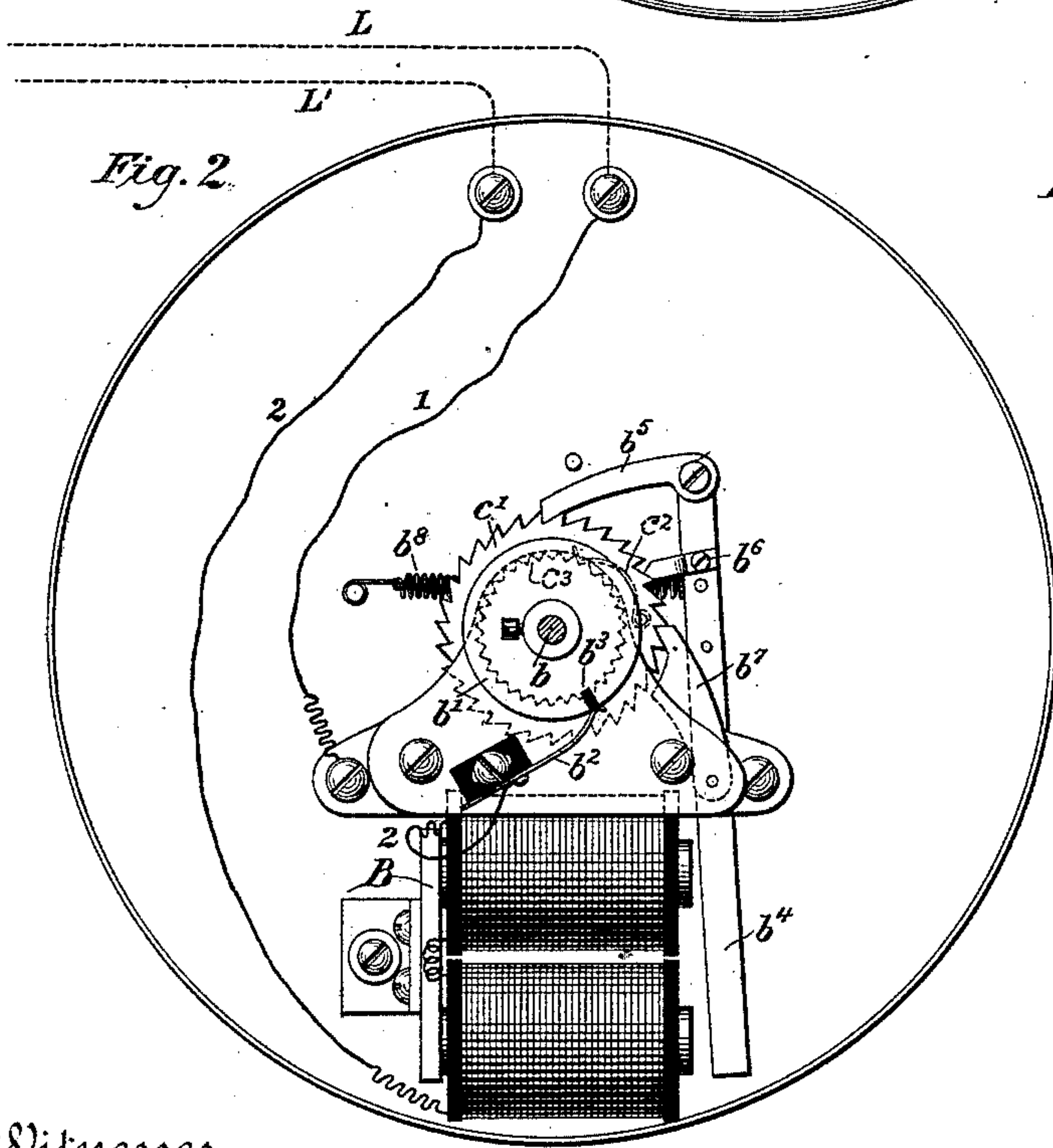
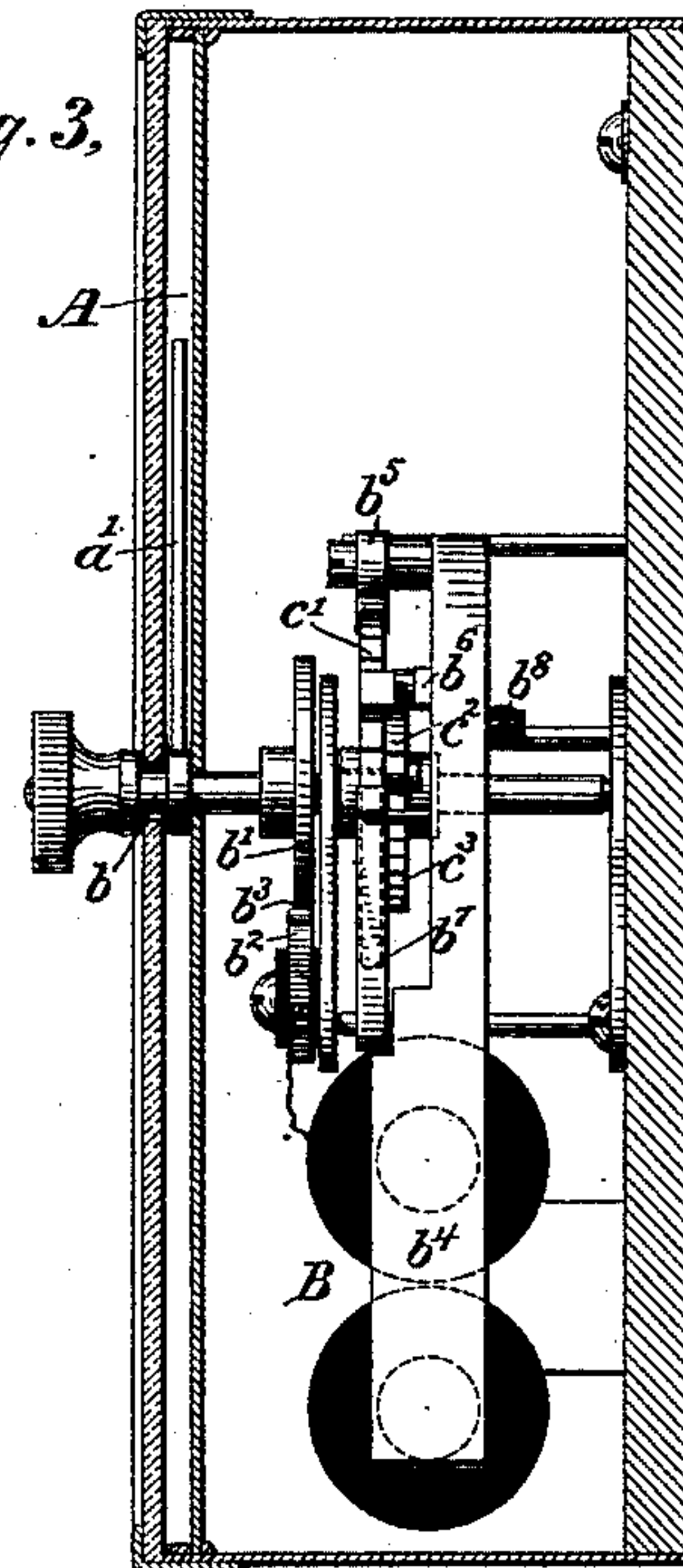


Fig. 3.



Witnesses  
Geo. W. Breck  
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By his Attorneys

Inventor  
Major D. Porter,  
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(No Model.)

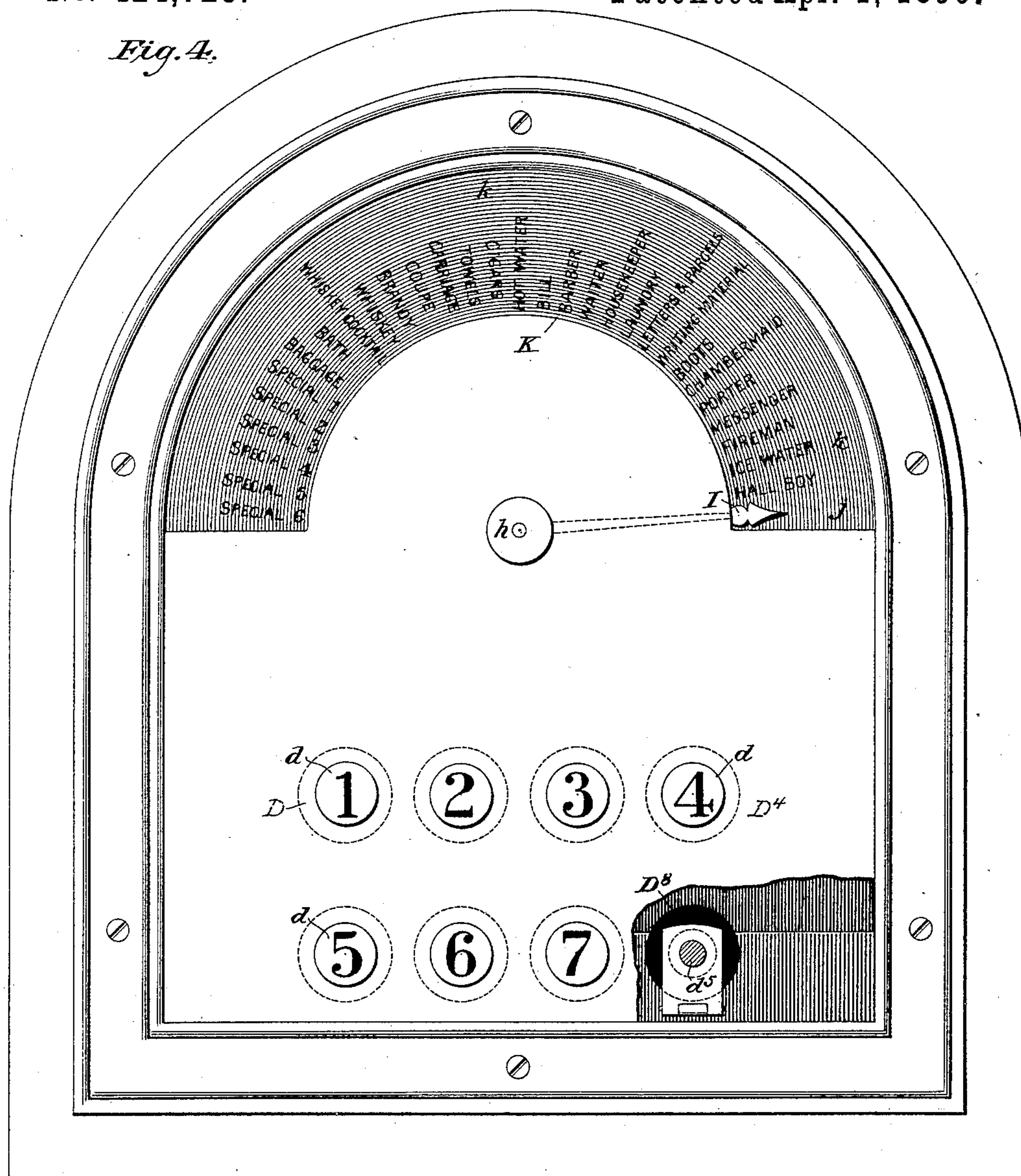
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*Fig. 4.*



Witnesses

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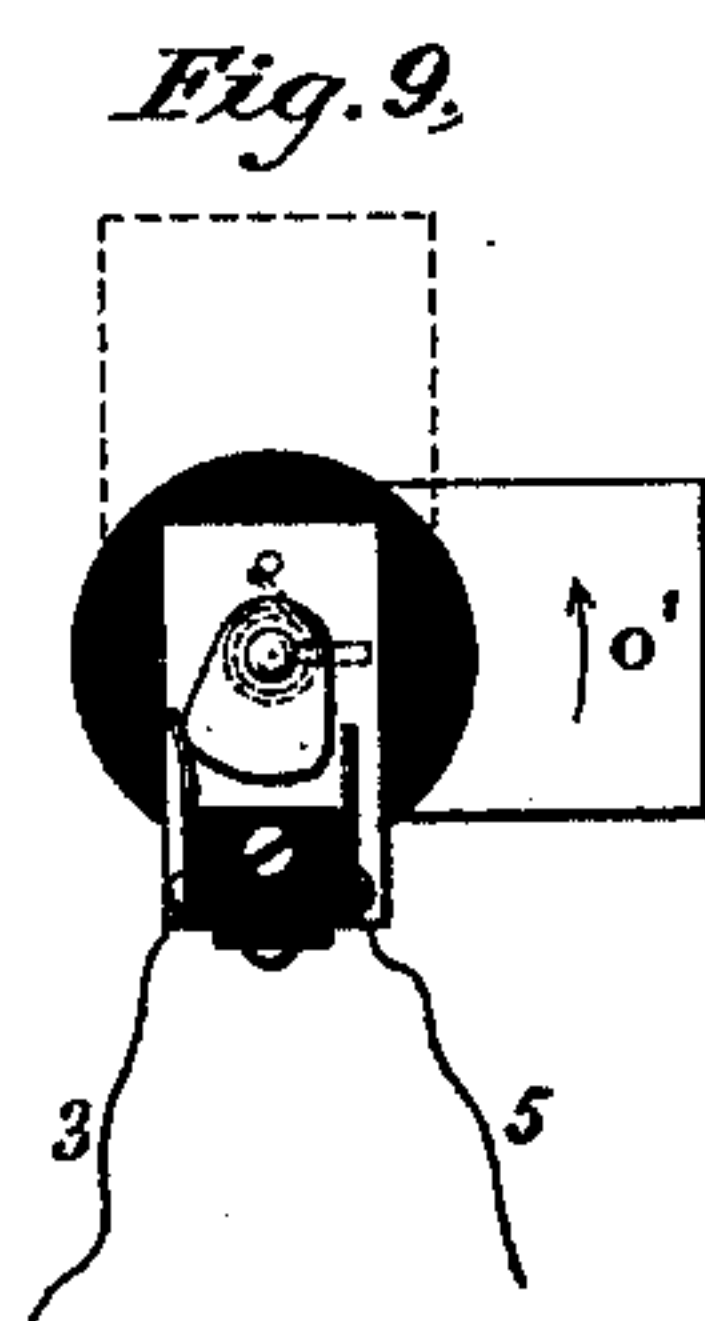
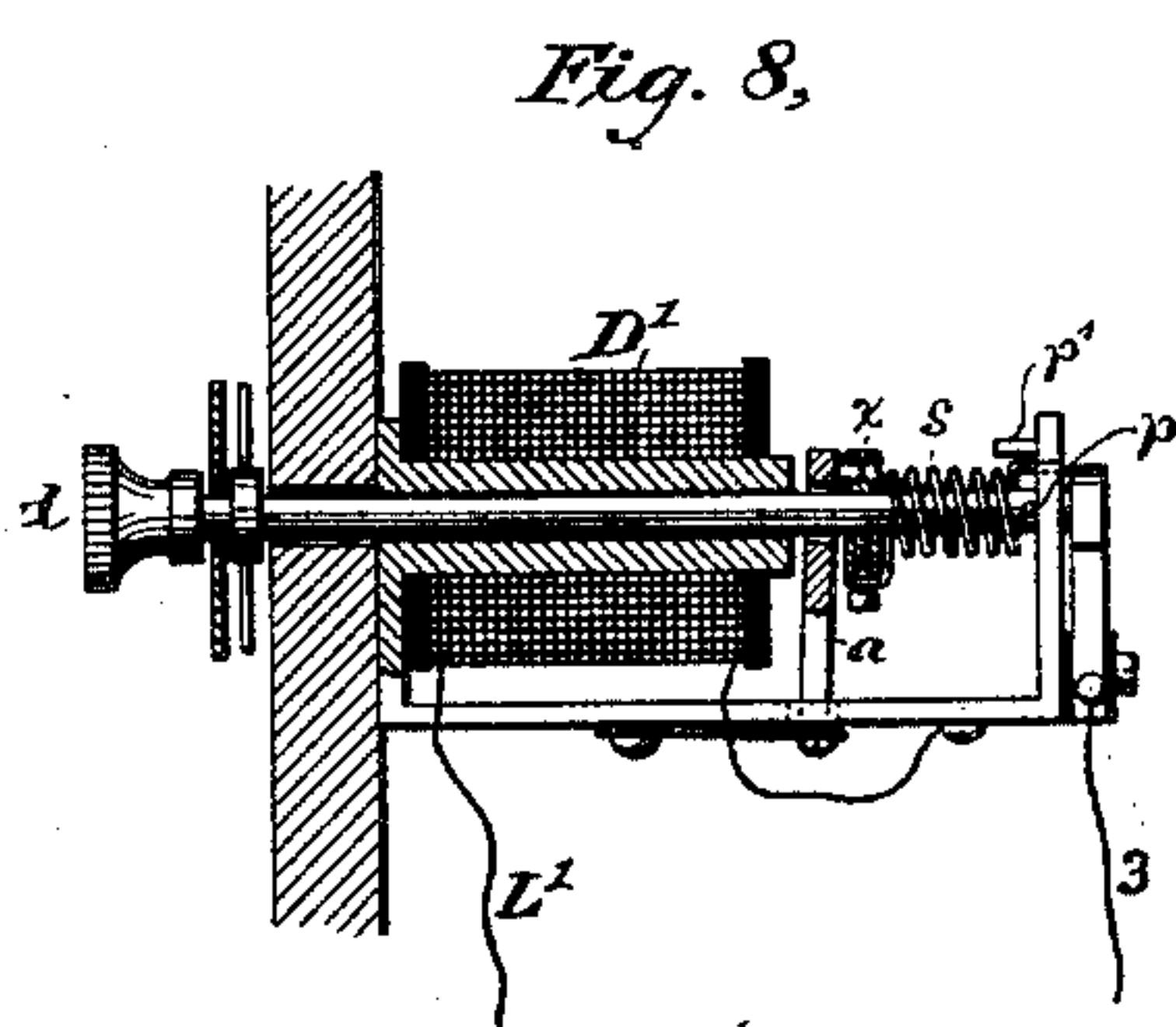
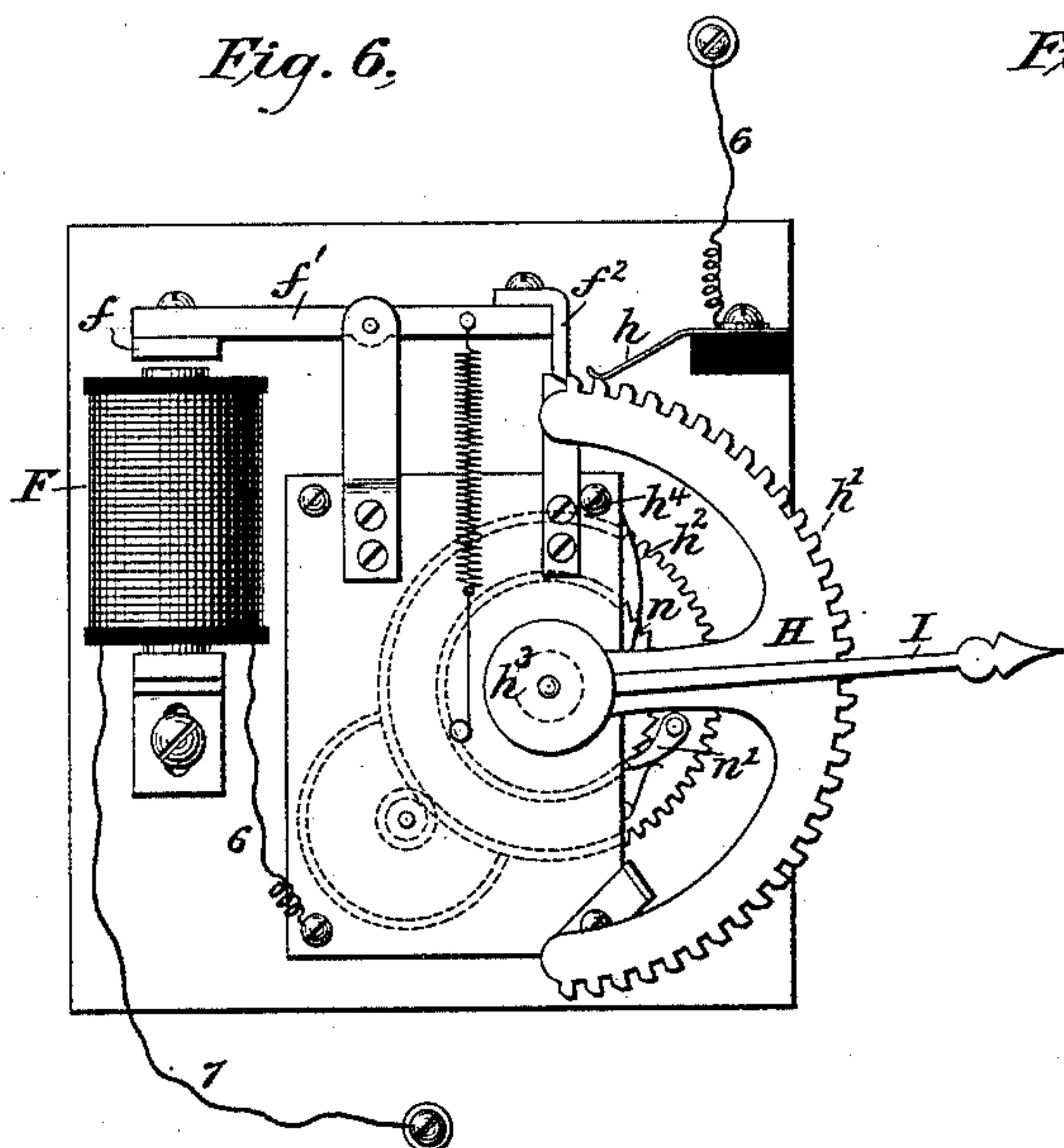
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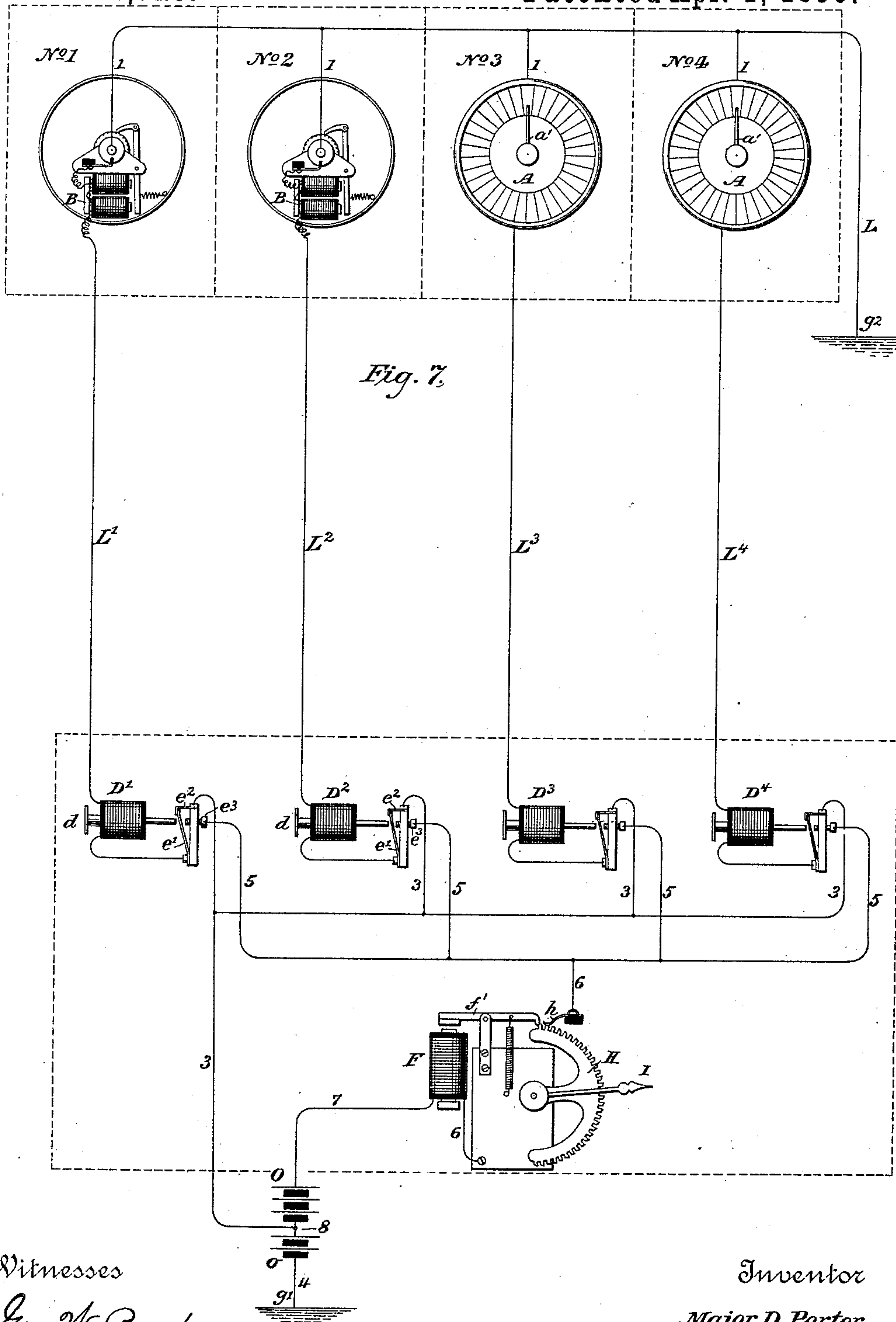
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# UNITED STATES PATENT OFFICE.

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## ELECTRIC INDICATOR.

SPECIFICATION forming part of Letters Patent No. 424,725, dated April 1, 1890.

Application filed August 10, 1885. Serial No. 173,901. (No model.)

*To all whom it may concern:*

Be it known that I, MAJOR DANE PORTER, a citizen of the United States, residing in Newton, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Electric Indicators, of which the following is a specification.

My invention relates to the class of electrical apparatus employed for indicating at a central office the different wants of various sub-stations or for transmitting different signals from the various rooms of a hotel to the clerk's office.

The object of the invention is to provide efficient means for transmitting accurately any required number of different calls without the aid of complicated apparatus and without necessitating any but the most simple manipulation of the transmitting devices.

The invention consists in organizing the apparatus in substantially the following manner: In each sub-station or in each room of a hotel, for instance, there is placed a transmitting device, which is constructed with a revolving disk carried upon a shaft, the latter also carrying a ratchet-wheel so constructed that when moved away from its point of rest it will be returned thereto by the action of an electro-magnet. When at rest, an insulating-point upon the disk is beneath a circuit-closing spring connected with a conductor leading to the central station or office through the electro-magnet, thus leaving the circuit open. When the disk is turned, the spring forms an electrical connection through the disk with a return-conductor. An indicating-arm upon the shaft moves with the disk, and when the latter is turned to any given point upon an indicating-dial the electric circuit is completed through the electro-magnet. This magnet, by being successively vitalized and demagnetized, is made to return the ratchet-wheel, and thus the disk, to its starting-point step by step. The indicator may be turned in either direction to the desired point, and a number of impulses, depending upon the position of the indicator, (and thus of the disk,) is required to return it to its starting-point, whereupon the circuit is again interrupted.

The interruptions of the circuit are occa-

sioned by the apparatus at the receiving-station or central office. At this office the make and break of the circuit is controlled by a device set in operation by the attendant, and for each interruption a receiving device or indicator, with markings corresponding to those on the dial of the sub-station or room, is advanced step by step, its movement corresponding to those of the indicator of the transmitter.

The circuit which is first completed by the transmitter releases an annunciator device at the central office, and upon returning this to its normal position in the manner of an ordinary annunciator the clerk or attendant thereby automatically completes a circuit through an electro-magnet adapted to operate the receiving-indicator. Each time, however, that the electro-magnet is vitalized the circuit is automatically interrupted, thereby releasing both the armature of the receiving electro-magnet and that of the electro-magnet employed for returning the indicator of the transmitter. A number of impulses are required for so returning the indicator, dependent upon the number of spaces upon the dial between the one selected and the zero-point or point of rest, and for each movement of the transmitting-indicator a corresponding movement of the receiving-indicator will be occasioned, so that when the former has been returned to its normal position the latter will stand at a point corresponding to that at which the transmitter was placed.

Various details in the construction of the apparatus will be described in connection with the accompanying drawings, in which—

Figure 1 is a front elevation of one of the transmitting devices, and Fig. 2 is a view of the same, the face being removed. Fig. 3 is a transverse section of the device. Fig. 4 is a front elevation of the annunciator-board or receiving device. Fig. 5 is a transverse section of the same. Fig. 6 is a detailed view of the receiving and indicating device. Fig. 7 is a diagram illustrating an organization of circuits, and Figs. 8 and 9 show a modification of the annunciator-magnet devices.

Referring to the drawings, A represents the dial of a transmitting device, upon the face



of which there are divisions  $a$ , which designate various classes of wants, such as may be desired at the rooms of hotels. An indicating-arm  $a'$  is designed to be turned until it points to the particular division which designates the want for which a call is to be sent. The indicator  $a'$  is carried upon a shaft  $b$ . To this shaft there is rigidly secured a disk  $b'$ , which is in electrical connection by means of a conductor 1 with a line  $L$ , leading to the office or to the earth. A conductor 2, connected with a conductor  $L'$ , which leads from the office, is connected through the coils of an electro-magnet  $B$  with a contact-spring  $b^2$ . In the disk  $b'$  there is placed an insulated contact-surface  $b^3$ . When the transmitter is at rest, the spring  $b^2$  rests against the point  $b^3$ , and therefore the connections between the conductors  $L$  and  $L'$  are interrupted. When, however, the indicator  $a'$  is turned in either direction, the connections through the magnet  $B$  are established. It is designed that the disk  $b'$  shall be returned step by step to its starting-point by means of a pawl  $b^5$ , carried by an armature  $b^4$ , applied to the electro-magnet. The pawl acts upon a ratchet-wheel  $c'$ , carried upon the shaft  $b$ . A suitable locking-pawl  $b^6$  enters the tooth of the ratchet-wheel  $c'$  when the pawl  $b^5$  moves forward in response to the action of a spring  $b^8$ . It is evident that the arm  $a'$  and the shaft  $b$  may be turned toward the left hand, carrying with it the wheel  $c'$ ; but it is desired that it may be turned as well in the opposite direction, and to accomplish this it is preferred to connect the ratchet-wheel  $c'$  with the shaft through a spring  $c^2$ , connected to the ratchet-wheel and resting against the tooth of a star-wheel  $c^3$ . The force of this spring is sufficient to cause the disk to revolve when the wheel  $c'$  is actuated; but at the same time it permits the shaft and the disk to be revolved in either direction independently of the wheel  $c'$ . A second locking-pawl  $b^7$  normally prevents a retrograde movement of the wheel.

When the circuit has been completed by setting the transmitting device, an electro-magnet  $D'$ , which is included in the conductor  $L'$ , becomes vitalized, and thus serves to release a push-button or annunciator device  $d$ , bearing a number or design corresponding to the particular transmitter to which it responds. The electro-magnet is provided with an armature  $d^2$ , which normally engages an extension  $d^3$  of the annunciator or push-button by entering a notch  $d^4$ . When the electro-magnet is vitalized by closing the circuit at the transmitter, the armature  $d^2$ , which is preferably pivoted near one pole of the electro-magnet and extends into proximity to the opposite pole, is raised out of the notch, and the push-button moves forward in response to the tension of a spring  $d^6$ . The button  $d$  is carried upon a non-magnetic rod  $d^5$ , extending axially through the center of the core of the electro-magnet.

When the push-button is returned by the attendant to its normal position, it is designed that the circuit shall be transferred, so as to include an electro-magnet  $F$ , which is designed to actuate the indicator of the receiving device.

Referring to the diagram, it will be seen that the circuit-connections are first through the conductor  $L'$ , for instance, leading from the transmitter in room No. 1 to an electro-magnet  $D'$ , corresponding to that room, thence to a contact-spring  $e'$ , which normally rests against a stop  $e^2$ . The stop  $e^2$  is connected by a conductor 3 with one pole of a battery  $o$ , the remaining pole of which is connected by a conductor 4 either with the earth or with a return-conductor  $L$ . A second contact-point  $e^3$  is applied to the spring  $e'$ , so that when the push-button is pushed farther in than its normal position the spring  $e'$  will be separated from the point  $e^2$  and pressed against the point  $e^3$ . The point  $e^3$  is connected by conductors 5 and 6 through the coils of the electro-magnet  $F$ , and by the conductor 7 with one pole of a battery  $O$ , the remaining pole of which is connected in series with the battery  $o$  by the conductor 8. If, therefore, the attendant pushes the button  $d$  back beyond its normal position, it will disconnect the conductor  $L'$  from the conductor 3 and place it in connection, through the magnet  $D'$ , with the point  $e^3$ , and thus, through the electro-magnet  $F$  and the circuit of the batteries  $O$  and  $o$ , will be complete through the magnet  $F$ .

In Figs. 8 and 9 a modified form of the device connected with the magnet  $D'$  is shown. Instead of operating by the action of the spiral spring pushing the button outward when the magnet  $D'$  is vitalized, the same object may be accomplished by turning upward and bringing into view a disk bearing the number of the room whence the signal comes. In the device shown in Figs. 8 and 9 the spring  $s$  is so attached to the rod carrying the annunciator-disk  $o'$  as to tend to turn it in its bearings, but is held by a pin upon the armature  $a$  of the magnet, which engages the disk  $x$  on the rod to which one end of the twisted spring is secured. When the magnet is vitalized, as already described, the armature is drawn toward the core and away from the disk  $x$ . The latter, being released, turns the rod one-quarter round until stopped by the contact of the pin  $p$  on the rod with the pin  $p'$  on the piece in which the rod is supported. This brings the disk  $o'$  into view. The attendant, when he turns the disk back to its former position by turning the button  $d$ , connects the wire  $L'$  with wire 5 instead of the wire 3, thus making the same connections as was done by pushing in the button  $d$  in the device first described in Fig. 5.

The conductor leading from the magnet  $F$ , instead of passing directly to the conductor 6, is connected with a toothed segment of a wheel  $H$ . A contact-spring  $h$ , which rests



against the teeth  $h'$  of this wheel, is connected with the conductor 6. When the wheel H is moved, the teeth  $h'$  pass beneath the spring  $h$ , and the spaces between the teeth serve to interrupt the circuit-connections, and thus demagnetize both the magnets F and D'. The electro-magnet F is provided with an armature  $f$ , carried upon a lever  $f'$ . The lever  $f'$  carries a detent  $f^2$ , which normally engages the teeth of the segment H and prevents it from moving. When, however, the electro-magnet F is vitalized, the detent  $f^2$  releases the segment, which immediately advances in response to the tension of a spring  $h^2$ , one end of which is attached to the shaft  $h^3$ , carrying the segment, and the other to a stationary post  $h^4$ . Immediately upon the movement of the segment a space between the teeth  $h'$  comes beneath the contact-spring  $h$ , and the circuit through the electro-magnet F is interrupted. The armature  $f$  thereupon falls away, and the detent  $f^2$  passes in front of the succeeding tooth. A second tooth, however, immediately comes into contact with the spring, and the circuit is again completed. In this manner the connections through the electro-magnet F will be successively made and interrupted, and the armature  $f$  will occasion a step-by-step movement of the segment H, and thus of an indicating-arm I, which is carried upon the shaft  $h^3$ . Each interruption of the circuit will also, as has already been shown, cause a corresponding movement of the armature  $b^4$  of the transmitter, and thus return the indicator  $a'$  to its starting-point. The movements of the indicator  $a'$  will thus correspond to those of the indicator I, and for each space of the dial A passed over by the latter a corresponding division  $k$  of the dial K of receiving-annunciator will be passed over by the indicator I. The spaces upon the dial K are so placed that, starting from the one extremity  $j$ , which is the normal position of the indicator, the different wants are indicated in the same manner as are represented upon the transmitting-dial, commencing at a point  $j'$  and reading toward the right hand. If, therefore, the indicator  $a'$  be placed in the third division, for instance, then when it is returned three movements of the arm I will be occasioned, and this will cause the indicator to stand at the third division and indicate the want as is represented upon the third division of the dial A.

The operation of bringing the indicator I into position to designate the want also serves to restore the transmitting-indicator  $a'$  to its normal position and to give notice that the call is received. When the indicator  $a'$  is returned to its normal position, the circuit through the conductor L' is interrupted, and therefore the electro-magnet F will not be again actuated, and the indicator I will stand at the want desired.

It is designed that the spring  $h^2$  shall be wound by the action of returning the indicator I to its normal position after a want has been indicated. For this purpose a ratchet-

wheel  $n$  is loosely mounted upon the shaft  $h^3$ , and this is provided with a retaining-pawl  $n'$ , serving to hold it in position in a manner well understood. One end of the spring is attached, through the ratchet-wheel and pawl, to the shaft of the arm or indicator, and the other end to the post  $h^4$ .

In the diagram four transmitting devices are represented as being placed in four rooms, (indicated by dotted lines.) The conductor L' L<sup>2</sup>, &c., leads from the respective transmitters through the corresponding electro-magnets D' D<sup>2</sup> D<sup>3</sup> to the conductor 3 in the manner described, and the return-conductor may be either direct or through the earth with which the conductors 4 and L are connected, as shown at  $g'$  and  $g^2$ ; or it is evident a metallic return may be made, if desired. It will be noticed that the person calling has only to move the hand  $a'$  in either direction to the point upon the dial indicating the want and leave it. The clerk or attendant will thus be notified that a call is to be received from the particular room or sub-station, and upon pressing in the push-button the want is automatically indicated and the transmitter replaced without further care upon the part of the person calling. A signal-bell may of course be placed in circuit, if desired. It will be noticed, also, that no confusion is caused by signals from several rooms or stations being sent at the same time by this system. The wants of each can be ascertained successively as rapidly as desired.

By mechanically connecting the indicator I and the rheotome H of the receiving apparatus reliability of indication is secured, inasmuch as the same relations are always sustained between the said parts, whereas where the connection between the indicator and rheotome is not mechanical and fixed it is difficult to preserve their right relations, and confusion of indication must often occur.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, at one station, of an indicator capable of being set in any of several positions to transmit a desired signal and an electro-magnet for returning it step by step to its normal position, a second indicator and an electro-magnet for moving it step by step into different positions at another station, an electric circuit including said electro-magnets, a circuit-controller at the last-named station operated by the second magnet for temporarily interrupting the circuit at each movement of its indicator, and a circuit-controller operated by the first-named magnet to interrupt the circuit when its indicator is returned to its normal position.

2. A multiple-signal apparatus consisting of a transmitter capable of being placed in position to send any of a number of different signals, a circuit-closing device for completing a circuit at the transmitter when it is set, an indicating device at a receiving-station operated by the completion of this circuit, a



signal-receiving device at the receiving-station, an electro-magnet for controlling it, means at the receiving-station for placing said magnet in said circuit, and an automatically-operating rheotome at the receiving-station for successively completing and interrupting the circuit, and thereby returning the said circuit-closing device to its normal position and simultaneously placing the signal-receiving device in position corresponding to that in which the transmitting device was placed.

3. The combination, substantially as hereinbefore set forth, at a central station, with an indicating-arm, a circuit-closer, and an electro-magnet for operating the indicating-arm, of an annunciator, an electro-magnet for operating the same, an electric circuit including both magnets, the connections of which may be completed by said circuit-closer, a second indicating-arm located at a distant point, an electro-magnet for moving the same step by step, a circuit-closer at said distant point normally interrupting the circuit, but placing the last-named electro-magnet in circuit when a signal is set, and a rheotome at the central station for causing the connections of said circuit to be made and interrupted, thereby moving both of said indicating-arms.

4. The combination, with a variable signal-transmitter having an indicator, an electro-magnet for returning the same to its position of rest, and a circuit-controller, of a signal-indicator located at a receiving-station for reproducing any signal to which the transmitter may be set, an electro-magnet also located at the receiving-station, an electric circuit controlling such magnet, a detent constantly impelled to stop the signal-indicator and thereto released by the said circuit as soon as the signal has been reproduced, and an automatic rheotome located in the said circuit and interrupting the same, whereby the magnet of the transmitter operates to return the indicator thereof to its position of rest and to break the circuit, substantially as set forth.

5. The combination, with a variable signal-transmitter having an indicator, an electro-magnet, and a circuit-controller, of an indicator situated at a receiving-station to locate the transmitter, a signal-indicator also located at the receiving-station and adapted to reproduce any signal to which the transmitter may be set, an electro-magnet located at the receiving-station, an electric circuit including the said magnets, a detent constantly impelled to stop the signal-indicator and thereto released by the said circuit when the signal has been reproduced, and an automatic rheotome mechanically connected with the signal-indicator and located in the said circuit and interrupting the same, whereby the magnet of the transmitter operates to return the indicator thereof to its position of rest and to break the circuit, substantially as set forth.

6. The combination, with a variable signal-transmitter having an indicator, an electro-magnet, and a circuit-controller, of an indicator situated at a receiving-station to locate the transmitter, a signal-indicator also located at the receiving-station and adapted to reproduce any signal to which the transmitter may be set, an electro-magnet located at the receiving-station, an electric circuit including the said magnets, a detent controlled by the said circuit for stopping the signal-indicator when it has reproduced a signal, and an automatic rheotome mounted on the same shaft with the signal-indicator and interrupting the said circuit, whereby the magnet of the transmitter operates to return the indicator thereof to its position of rest and to break the circuit, substantially as set forth.

In testimony whereof I have hereunto subscribed my name this 7th day of August, A. D. 1885.

MAJOR DANE PORTER.

Witnesses:

DANL. W. EDGECOMB,  
CARRIE E. DAVIDSON.