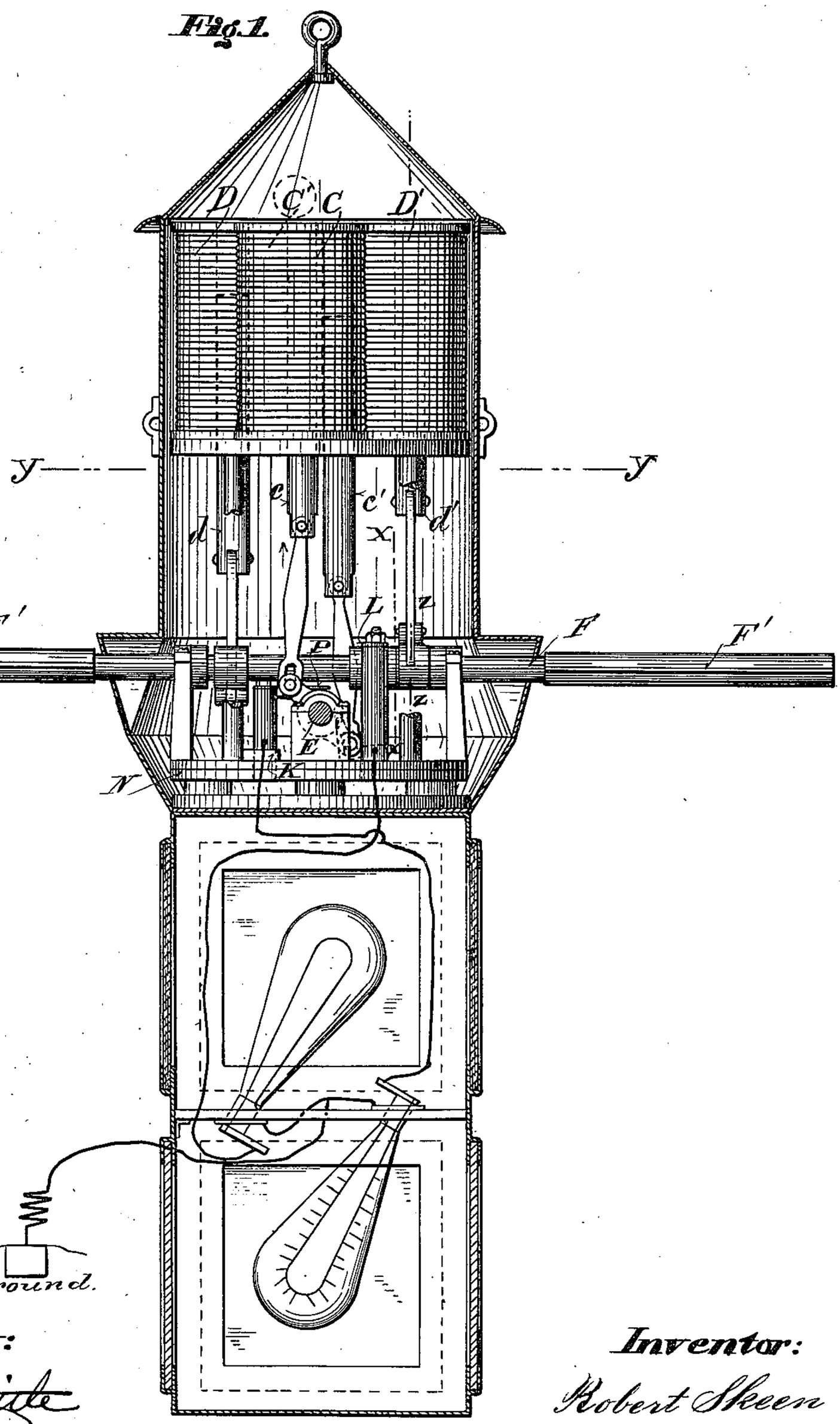
(No Model.) 4 Sheets—Sheet 1.

R. SKEEN.

ELECTRIC SIGNAL.

No. 574,954. Patented Jan. 12, 1897.

Fig. 1.



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(No Model.) 4 Sheets—Sheet 2.

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Fig. 2.

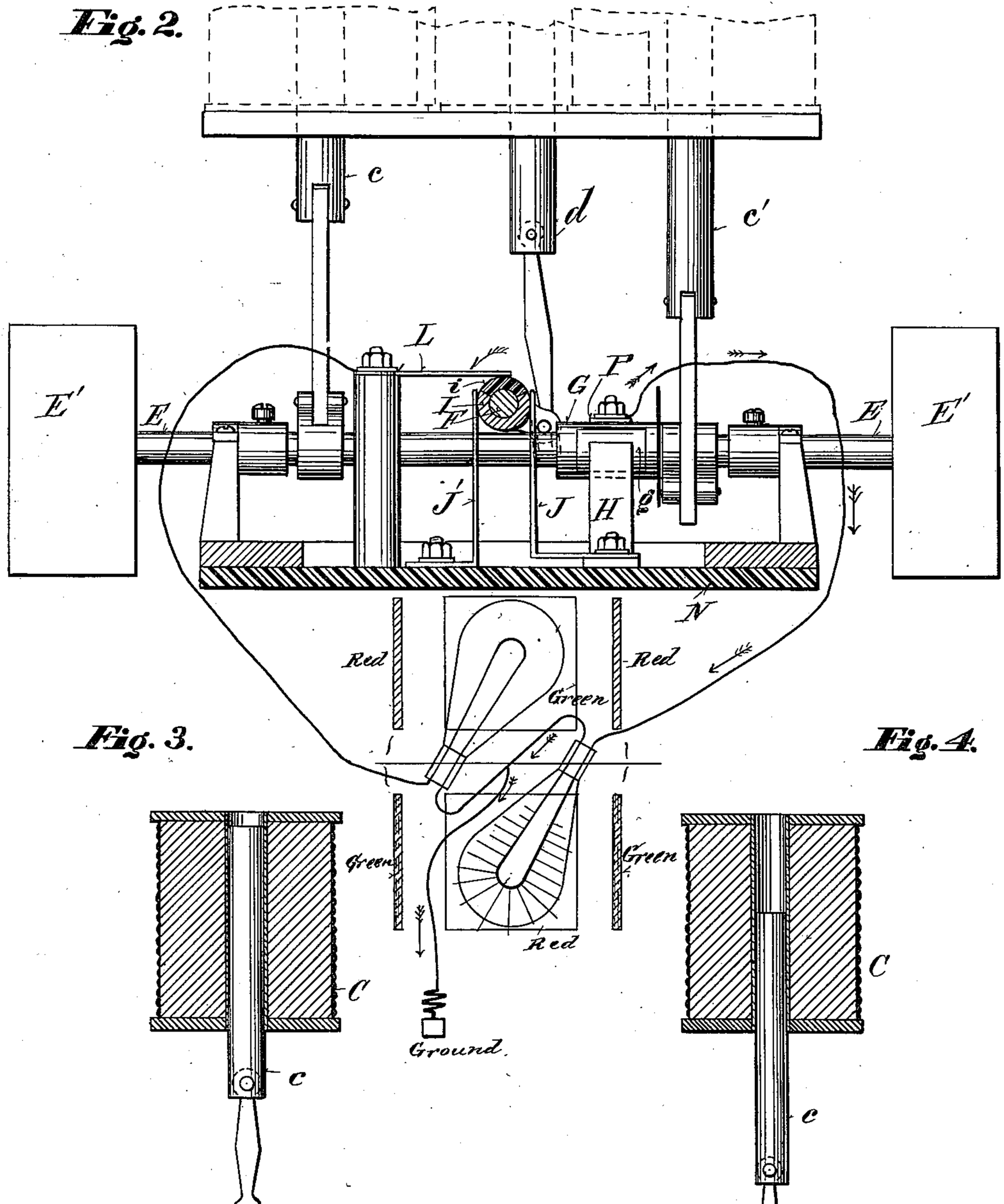

Fig. 3.

Fig. 4.

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Fig. 5.

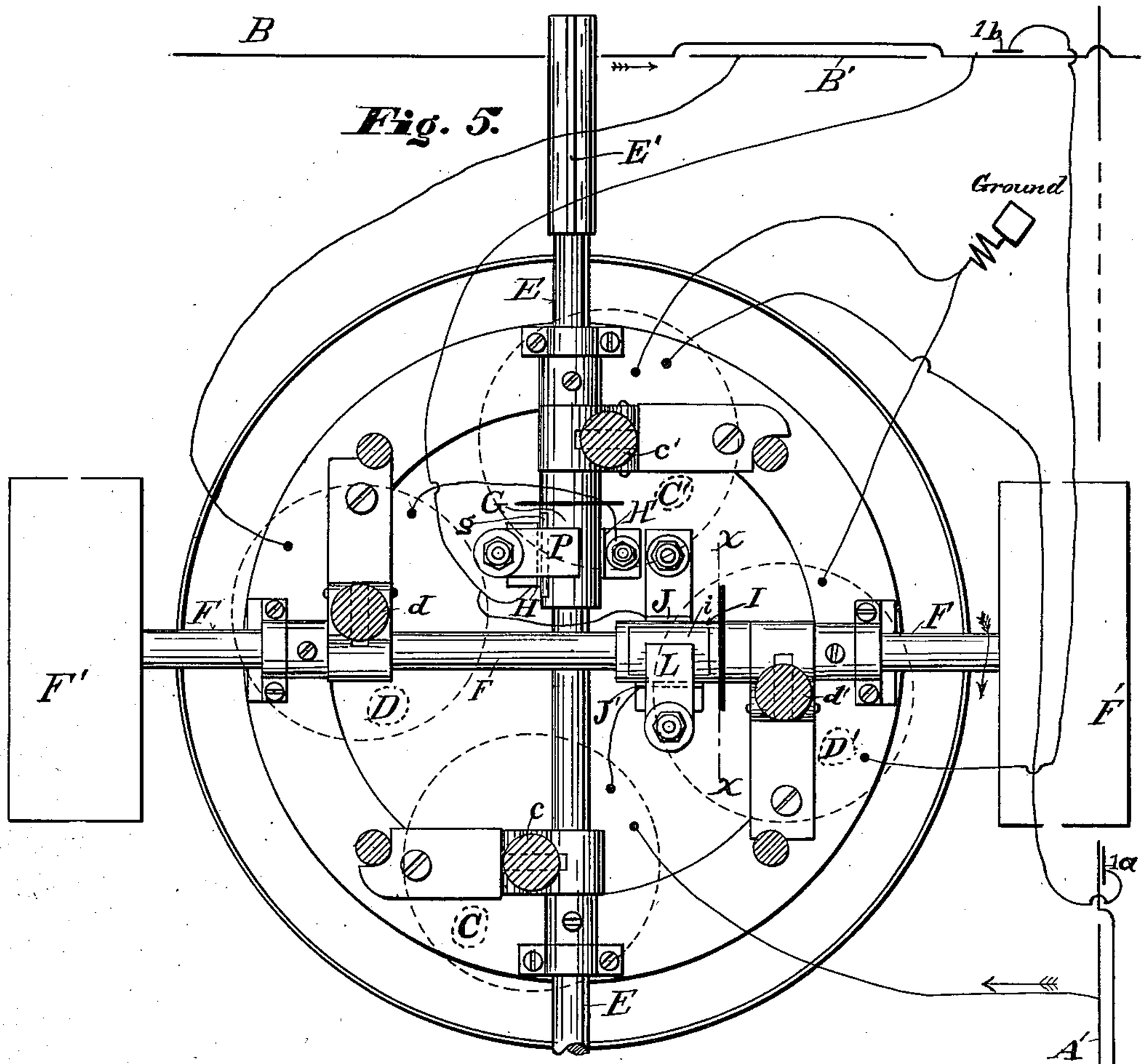
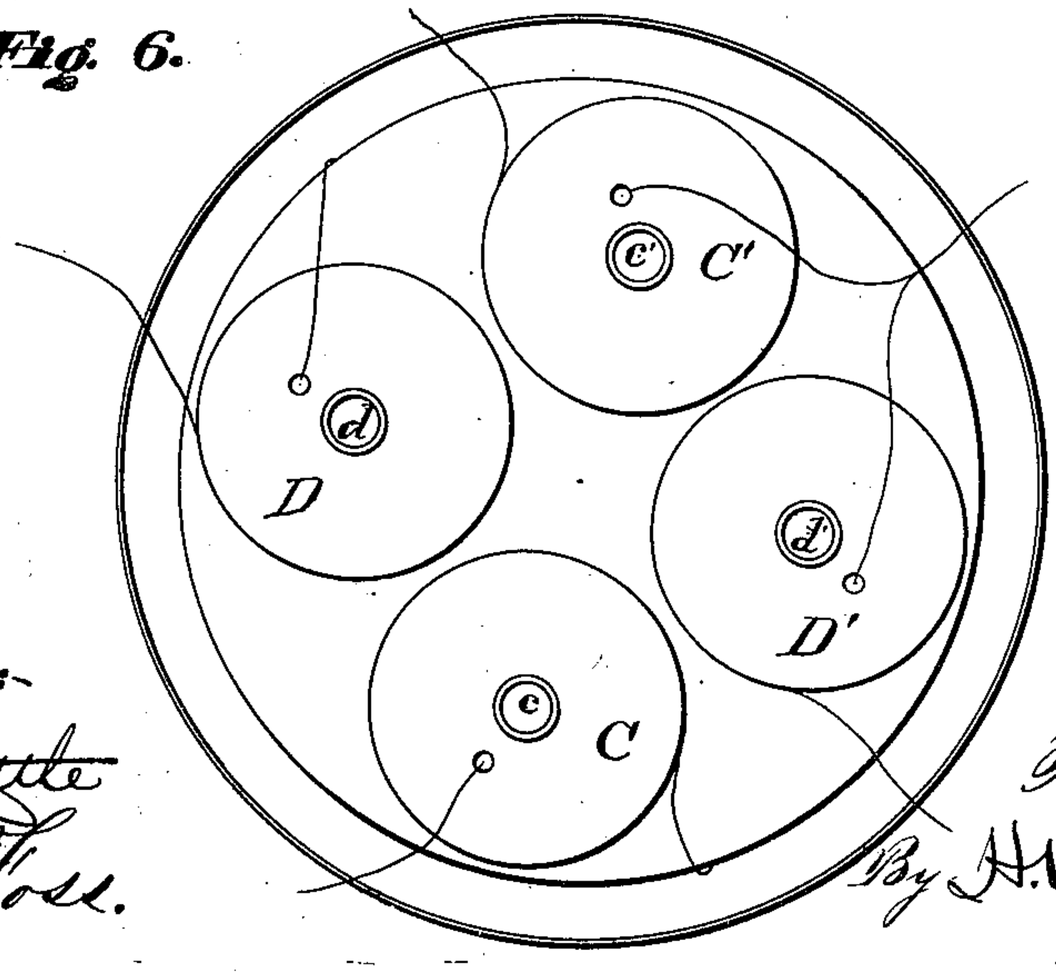


Fig. 6.



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(No Model.) 4 Sheets—Sheet 4.

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ELECTRIC SIGNAL.

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Fig. 7.

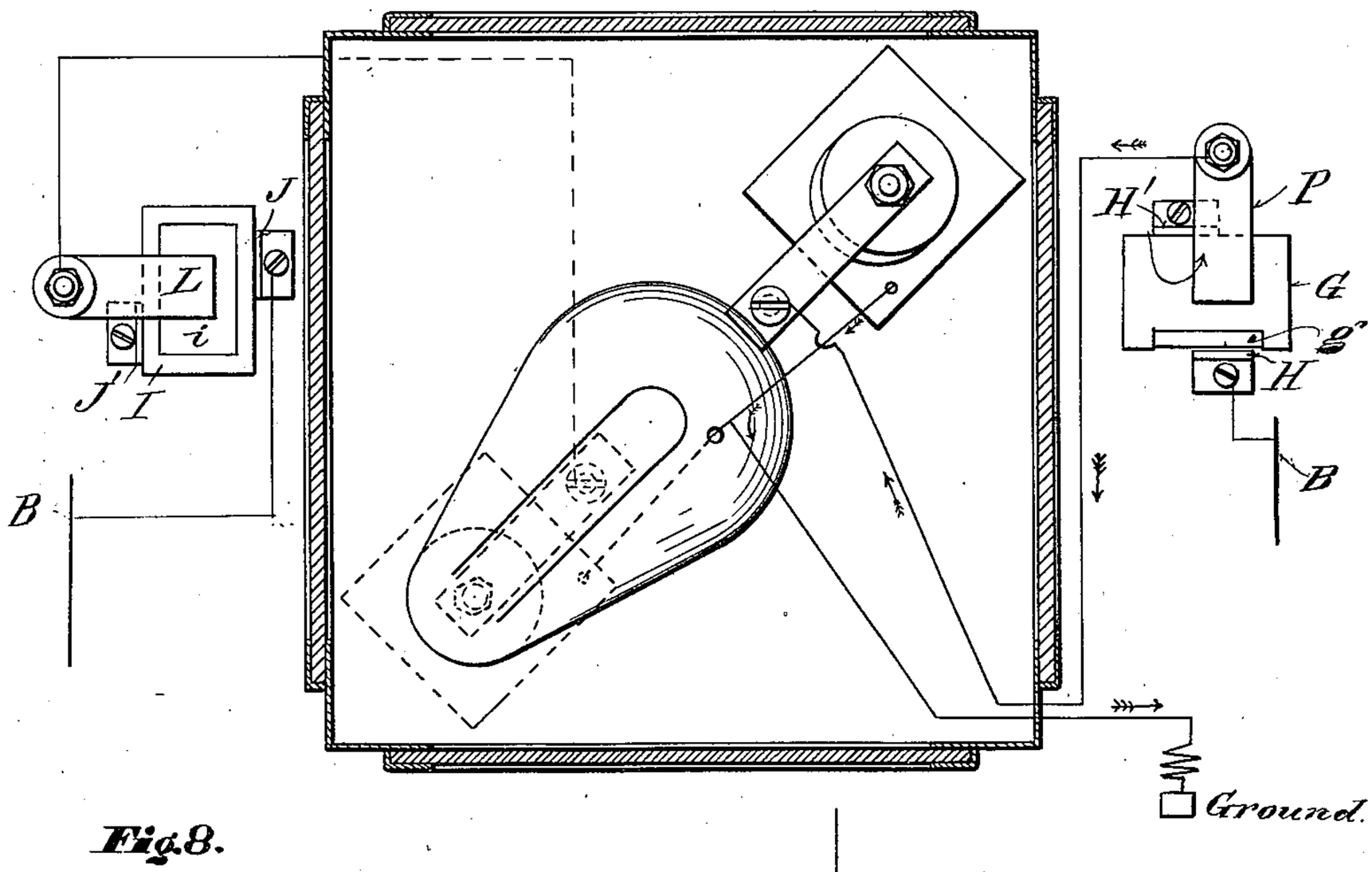


Fig. 8.

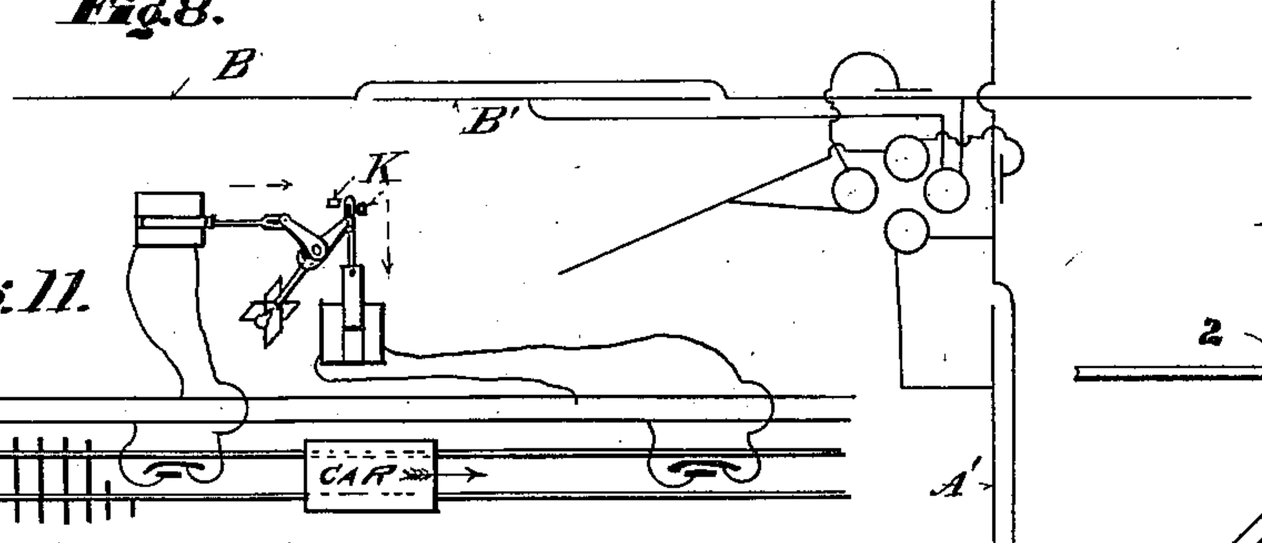


Fig. 11.

Fig. 10.

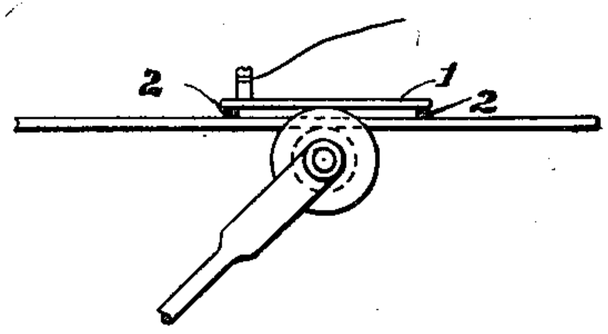
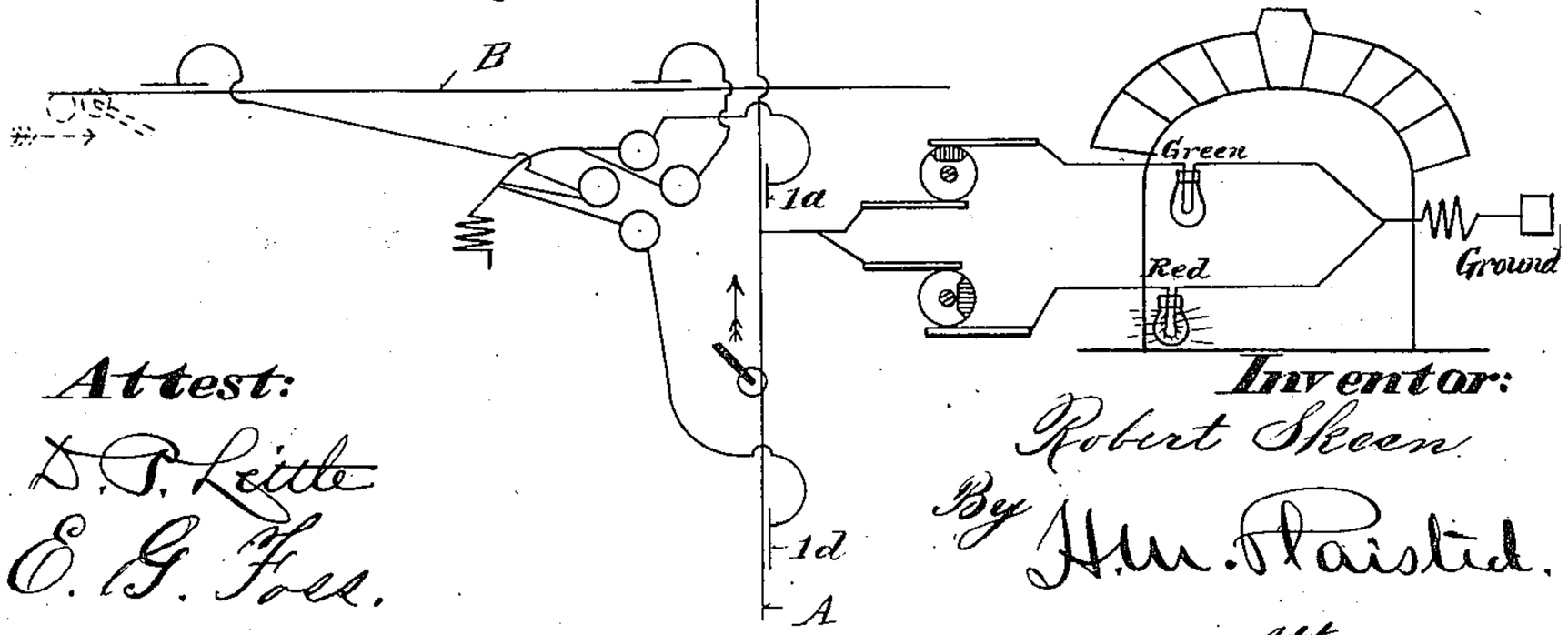


Fig. 9.



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By Hm. Paisted.

Attorney.

UNITED STATES PATENT OFFICE.

ROBERT SKEEN, OF MADISON, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO THE SKEEN ELECTRIC SWITCH AND SIGNAL COMPANY, OF ST. LOUIS, MISSOURI.

ELECTRIC SIGNAL.

SPECIFICATION forming part of Letters Patent No. 574,954, dated January 12, 1897.

Application filed May 11, 1895. Serial No. 548,984. (No model.)

To all whom it may concern:

Be it known that I, ROBERT SKEEN, a citizen of the United States, residing at Madison, in the county of Madison and State of Illinois, have invented certain new and useful Improvements in Electric Signals, of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to certain new and useful improvements in electric signals.

The main object of my improvements is to provide self-locking means automatically operated by electrical connections whereby the signal will be locked, and also the switch mechanism controlling said signal, in both the normal and the danger positions of the signal.

With this object in view my improvements have reference to a rotatable crank-shaft, an electromagnet, and a slotted connection between the electromagnet and crank-pin on said shaft, whereby said connection will engage with a lug or stop and lock the shaft against any movement till said connection be first moved to unlock the same.

Other peculiarities of construction and arrangement will be hereinafter fully described in this specification and pointed out in the claims.

In the accompanying drawings, on which like reference-characters indicate corresponding parts, Figure 1 represents a side view of the switch device and a section through the inclosing hood and the case of the lamps; Fig. 2, a partial side view, the section taken on the line *x x* of Fig. 1, looking to the left; Fig. 3, a central vertical section through an electromagnet and the crank-shaft with the armature raised; Fig. 4, a similar view with the armature down and the parts in locking position; Fig. 5, a plan view on line *y y* of Fig. 1 with the solenoids and wiring indicated in diagram; Fig. 6, a plan of the solenoids themselves; Fig. 7, a plan of the lamp-chamber and diagram of connections; Fig. 8, a diagram of crossing trolley-lines having insulated sections and my switch device wired thereto; Fig. 9, a similar diagram to Fig. 8, showing a temporary contact device, the switch and lamp-signal exemplified; Fig. 10, a detail of a double contact device used in Fig. 9, and Fig. 11 another diagram view.

My invention relates to a switch device operated by a car on an electric or other road for cutting off the current from a portion of a crossing line, to a self-locking feature in the switch to prevent change in the switch and the signals connected thereto, and to an unlocking arrangement operated by the car to restore the switch and signals to normal position after the passage of the car from the danger position.

In the construction shown by the drawings exemplifying my improvements my invention is illustrated in connection with two electric lines crossing each other, and the switch-operated signal is shown at or near the crossing, as indicated in Fig. 5 and diagram Fig. 8.

Let the letter A designate the trolley-line running in one direction, and the letter B the crossing trolley-line. In each line is an insulated section A′ B′, respectively, extending from at or near the crossing to a point a suitable distance away (say two hundred feet). The car on either line that first arrives at its insulated section will cut off the current from the other insulated section, expose a danger-signal to the latter line, and lock the signal till the first car has passed the crossing, when the signal will be automatically returned to "safety," and the switch device may then be operated by the car on the crossing line.

Referring to Figs. 5 and 6, the switch device consists of two electromagnets C C′ for the trolley-line A in the form of solenoids provided with movable cores *c c′*, which have a locking connection with a crank-shaft E, adapted to expose a visible signal to the crossing line B. Similarly the trolley-line B is provided with a pair of electromagnets D D′ in the form of solenoids having similar cores *d d′*, with link connection to a transverse shaft F for signaling the line A.

The first solenoid in each set is for setting the signal at "danger," and the second solenoid, (C′ and D′) in each set, is for restoring the respective signals to their normal "safety" position.

On the shaft E is a commutator G, having an insulated portion *g*, Fig. 2, and a pair of

brushes II II′ operating with the commutator to complete or break the electric circuit for the line B. Thus the brush H is connected to the live wire B, and the brush II′ is wired through the electromagnet D to the insulated section B′. Similarly the shaft F has a commutator I, having an insulated portion *i* and matching brushes J J′. The brush J is fed from the same source of electricity as the brush H; that is, it is shown as wired in multiple with the brush H from the live wire B. It may have a separate source of current, if desired. The brush J′ is wired through the electromagnet C to the insulated section A′ and corresponds with the brush II′ on the other commutator.

The normal position of the switch is with the commutators connecting their respective brushes and forming a circuit from the feed-wire or source of electricity to both insulated sections A′ and B′. There is, however, no ground connection until a car arrives on one of these sections. The circuit is then completed, and the switch is operated to cut out the other insulated section till the first car has passed the danger-point. For example, if the car on the line A reaches the insulated section A′ first it will complete the circuit through the electromagnet C and the brushes J and J′ to the source of electricity. The current through C will energize the coil and act strongly on the core *c* to pull it upward and rotate the commutator, say, ninety degrees, thus breaking the connection between the brushes II II′, as the commutator will be turned to contact the brush II with the insulated portion *g*, as shown in Fig. 2. This will make a second break in the circuit for the line B, and now any car arriving on the insulated section B′ will be unable to obtain current till the first car on the line A has passed the danger-point. This effects a perfectly safe cut-out for the crossing, as only one car at a time can pass the danger-point.

In order to restore the shaft E to its normal position, in which both brushes II II′ are electrically connected through the commutator G, I provide the second solenoid C′, connected to the shaft E on the opposite side from the coil C. At or near the crossing of the two lines is a double contact device, such as is shown in Fig. 10, consisting of a pan 1, mounted above the trolley-line on insulated connections 2 and wired to the said coil C′, as shown in Fig. 5. A shunt-circuit is completed to the ground through this coil C′ when the trolley-wheel makes electrical contact between the trolley-wire *a* and the pan 1^a. This momentary energizing of the coil C′ will rotate the shaft E back to its normal position and span the brushes again. Fig. 5 shows the shaft E rotated ninety degrees from its normal position by the car on the line A, so as to cut out the current from the insulated section B′ of the line B. At the same time it exposes a vane or vanes E′ on the shaft E as a danger-signal to the motorman on the line B to indicate why he is without current should he arrive on the section B′.

The shaft F will remain in its normal position (shown in Fig. 5 with the edge of the vanes F′ exposed to any car approaching on the line A) until a car on the line B shall reach the insulated section B′, energize the solenoid D, and rotate the shaft F ninety degrees, thus breaking connection between the brushes J J′ and cutting out the insulated section A′. When the car on B passes the pan 1^b, wired to the coil D′, the latter coil is momentarily energized and returns the shaft F to its normal position and completes the connection between the brushes J J′.

A locking feature for the switch device is herein shown, by which means the signal will be locked against any accidental change in both the safety and danger positions. Thus the wind beating on the vanes could not change them and falsify the signal. This locking is secured by providing a slotted link connection between the core and the crank-shaft bearing the commutators.

Figs. 3 and 4 show the action of such locking device. Under the influence of the current passing through the solenoid-magnet C, for instance, the core in Fig. 3 is drawn upward and the shaft E rotated to the position shown. This is the position indicated in Fig. 1, in which the locking device on the other end of the shaft E is shown down to maintain the shaft in this position. Now when the latter device is freed, as will be presently described, the shaft will rotate in the opposite direction under the influence of the core *c*′, attracted by its armature C′, and the inert core *c* will descend and slide alongside a stop or projection K, so as to slip by the same, like a bolt, on account of the slotted connection of the link with the crank-pin, whereby the link continues to descend after the crank has rotated to its lower position. Any tendency of the wind to turn the shaft is resisted in one direction by the link's engagement with the crank-hub and in the other direction by the stop K, as indicated by the dotted arrow, Fig. 4. It will be seen, however, that the core and link are in their best position to be drawn upward when the solenoid-magnet is energized. The first effect of the upward movement will be to free the link end from the stop K. The bottom of the slot then acts on the crank-pin to rotate the shaft, and the link will swing out in an arc, as shown by the arrow in full lines. The upward action of the core *c*′ at one end of the shaft E will throw down the core and link at the other end or part of the same shaft, so that while one link is raised to rotate the shaft the other link is lowered to lock the shaft. This feature is applied in duplicate to each shaft, so that whichever position the vanes may be in or whichever cut-out is to be locked the result will be positive. Thus the coil connecting with an insulated section A′, for instance, will positively lock the switch device to cut out the section

B′ on the other line or show a visible signal to the other line, or both, which switch and signal, or either, cannot be changed till the contact of the trolley with the pan 1^a sends a release-current through the unlocking-magnet, C′ in this instance, and thus restores the shaft to normal position again.

I have described a signal suitable for day service. It remains to show the connections and constructions for a night signal.

Referring to Figs. 2 and 5, the letter L indicates a brush contacting with the commutator I. In the figures it is shown in contact with the insulated portion *i* and wired to a lamp M. An insulated table N supports and electrically separates the brushes and other devices mounted thereon, as shown in the figures. Thus no current can pass to the lamp through the brush L till the commutator be turned to one side and allows the lamp-brush to rest on the conducting portion of the commutator and so electrically connected with the brush J, wired to the trolley-wire. This rotation of the shaft and commutator to this position occurs when a car on the line B arrives at the section B′ and cuts out the insulated section A′, at the same time rotating the vanes F′ to vertical in the direction of the arrow, Figs. 2 and 5. The lighting of the lamp would then show red through the glass in the same direction, the grounding of the lamp-circuit being indicated in Fig. 2. Another lamp O is located in a separate chamber from the lamp M and wired in multiple therewith and to the lamp-brush P that contacts with the commutator G. The sides of the two lamp-chambers are closed by reversely-colored glass, as indicated, or the globes inclosing the lamp-filaments may be of different-colored glass. The main point is that the chamber supporting the lamps does not necessarily rotate in this construction, but that one of the two lamps will show a danger-signal to the opposite line at the same time such line is cut out as to its insulated section. The figures will show this wiring of the lamps clearly and the arrows show the lower lamp as burning to show red to the car approaching on the line B. The vanes E′ are similarly opposed and answer the same purpose in the daytime. Whether said signals are shown or not, however, the main point is that the locking-switch has cut out one of two lines temporarily to give the right of way to the other line, and that this right of way is absolute in that the crossing line cannot obtain its current till the former line returns the locked switch to normal position once more. In the form illustrated the lamp-chamber has sides which are formed by oppositely-placed red and green glass, respectively, the upper chamber having the lines of exposure for the red and green lights at right angles to the green and red shown below. Thus the lamp in one chamber will be dead, while the lamp in the other chamber will be burning to show red and green in directions at right angles to each other. In other words, the one lamp always shows red to one line and green to the other, while the other lamp always shows green to the first line and red to the crossing line. Figs. 1 and 7 also indicate the wiring of the lamps, and in the latter figure the position of the brushes and commutators with their connections is shown in diagram.

In some cases it may be required to separate the lights a greater or less distance, such as at the ends of tunnels, to indicate the distance between one train and another following.

Fig. 9 shows in diagram a red and green light connected to a switch, as previously described. In this case, however, the pan previously described is in duplicate and takes the place of the insulated section of the trolley-line. The passage of the trolley over the pan 1^d, for instance, has lighted the red lamp by sending a current through the switch previously described, has thus lighted the red lamp and locked it in its position, so it will continue burning till the trolley passes over the second pan 1^a, as before. The latter sends the release-current through the switch device and cuts out the red light and cuts in the green. The same arrangement of red and green lamps may also be employed for crossing lines, as indicated at the left of this figure by the trolley-lines A and B.

The locking of the switch prevents change of signals either by accident or design, and also makes positive the supply of current to one car, while it just as positively cuts off the motive current from the other car in two crossing lines.

While I have described, for simplicity and better showing of the invention, the cut-out and locking feature as applied to one electric line and another electric line crossing the former, it will be understood that one of the crossing lines only may be electric and that the signal may be relied on to give warning to the crossing line of the approach of a car to the danger-point. The locking feature is therefore claimed, broadly, whether there be one or more electromagnets and switch cut-outs.

Referring to Fig. 11, the locking-signal is shown in diagram as used in connection with a road having an electric conductor or live wire, preferably double, as shown, extending alongside the road. At one point on the road is located a circuit-closer of any well-known kind, which is wired to the operative electromagnet and then to the feed-wire on one side. On the other side of the circuit-closer the wire runs to the return-wire of the electric conductor or may run to the ground, as desired. At another point in the road is a similar electric circuit-closer similarly wired to the unlocking electromagnet for the same signal. A car therefore passing over the first circuit-closer will operate the signal, lock it in the position to which it is moved, and maintain it in this position till it is unlocked by the

passage of a car past the second point, thereby operating the unlocking device and returning the signal to its normal position.

The latter device does not depend upon an electric road for its success, but may be used on steam or cable roads, and the signal may be placed either on the road or some other point where it is desired to signal.

The signal may be for day or night observation, by sight or other sense, as it is evident that a light, a semaphore, a gong, or other device can be connected to the operating means and be actuated by said means, maintain such actuated condition during the period in which the car passes from one circuit-closer to the other, and be released or returned to the normal position when the car passes the second circuit-closer.

In this connection it may be observed that the locking and unlocking device previously described and the operative means for the switch will operate equally well from whichever side of the signal the car approaches. That is to say, while I have just described the signal as being operated by a car passing from one circuit-closer to the other in one direction, yet I wish to be understood that by my construction and arrangement the signal will be equally well operated by a car passing in the reverse direction on the same or other adjacent track by means of suitable connection.

Thus it will be understood that by suitable connections with the traffic-road the signal may be used as a block-signal and signal either in the rear or in front of a moving train, or both. Thus when one train runs up and for any reason stops on a certain block another train will be properly signaled, according to the connections of the signal, as may be desired.

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

1. The combination with the crossing tracks and an electric conductor extending along one track for supplying electricity as a motive power, of means under the control of a train moving along the other track for temporarily cutting the electricity off from a portion of said conductor along the first-named track, and a locking device to lock said means throughout the duration of said temporary cut-out.

2. A system comprising a trolley-wire which supplies a working current for a car, said trolley-wire having an insulated section in proximity to a crossing or other danger-point, there being a branch wire connecting the insulated section to the adjoining portion of the trolley-wire, and an automatically-locking switch in the branch wire for positively controlling the electrical condition of the insulated section.

3. A system comprising an electrical road, an intersecting road, an insulated section of working conductor on the electrical road, a cut-out therefor, a train-stopping device on the intersecting road operatively connected with said cut-out to block traffic on one road when the right of way is given to the other road, and an automatic device for locking the cut-out and the signal controlled thereby in the safety and danger positions thereof, respectively.

4. The combination with two electric roads in proximity to a crossing or other danger-point, each provided with an insulated section near said crossing, and also a secondary section of electric conductor forming a contact device beyond its respective insulated section in the direction of travel, a switch electrically connected to the insulated sections of both lines to cut out one or the other section respectively, operative means for said switch and wired to the insulated section on each line that first contacts with the car, and a self-unlocking operative device between said switch and the second contact device on each line respectively, to return said switch to normal position.

5. An electric cut-out comprising a rotatable or oscillating piece having a crank, operative means, a connection of variable length between said crank and operative means, and a stop adapted to engage laterally with the said connection in an extreme position of the same.

6. An electric signal comprising a commutator having a crank, an electromagnet, an armature therefor provided with a slotted extension operatively connecting it to said crank, and a stop adapted to act laterally on said slotted connection near its crank end, substantially as described.

7. An electric cut-out comprising a commutator, brushes therefor with their connections, a crank shaft and pin for said commutator, an operative link having a slotted engagement with said crank-pin and limited in its forward movement, and a stop obstructing its backward movement in a circular direction till it be first moved longitudinally to pass such stop.

8. An electric signal comprising a commutator-switch, brushes and their respective connections adapted to be cut in or cut out according to the position of said commutator, a lamp-signal, a brush contacting with said commutator and wired to said lamp-signal and normally resting on an insulated portion of said commutator, but fed from one of said brushes when the current is cut off from the other brush by the rotation of the commutator, and operative means for said commutator.

9. An electric signal comprising a plurality of signal-lamps wired in multiple and properly grounded, a plurality of commutators having each an insulated portion, a pair of brushes for each commutator and wired to their several connections, and a brush for each commutator normally resting on the insulated portion thereof and fed from one of

said pair of brushes when the commutator is rotated to cut out the other brush on the same commutator, whereby a current is sent to the lamp wired to the said lamp-brush in circuit.

10. An electric signal comprising a pair of stationary lamps adapted to show one color or another color from the same point of view according to which lamp is lighted, said lamps being wired in multiple and grounded in common, a commutator-switch for each lamp, brushes respectively wired to their connections, a lamp-brush for each commutator wired to its respective lamp, operative means for each commutator and a self-locking device with its electrical connections to lock and release said commutator at predetermined periods.

11. An electric signal for a pair of crossing roads, comprising a pair of semaphore-bearing shafts mounted transversely to each other and adapted to be rotated ninety degrees to expose the edge or the face of the semaphore to its respective road, an automatic self-locking device for each shaft at each limit of its rotation, and means under control of each road for operating the signal on the other road respectively.

12. An electric signal for a pair of crossing roads, comprising a pair of axles mounted transversely to each other, a pair of cranks oppositely arranged on each axle, a pair of solenoid-electromagnets for each shaft, cores therefor connected to the corresponding pair of cranks, each pair of magnets being under control of one line, a pair of contact devices on each line wired to the corresponding pair of magnets, and a locking device for each limit of motion of said cranks, whereby the car passing on either line will expose a danger-signal to the crossing line and lock it in said position at the beginning of a predetermined period, and unlock it at the end of said period of travel between a pair of contact devices.

13. An electric signal comprising a crank-shaft, a solenoid-electromagnet and adjunctive electrical connections, a core for said magnet, a link pivoted to the core at one end and having a slotted connection with the crank-pin at the other end to rotate the latter till the link engages with the crank-hub, and a stop adapted to act laterally on the crank end of said link at or near this limit of rotation of the crank, to lock the crank against return movement till the link be first operated longitudinally to pass the stop.

14. An electric signal comprising a rotatable shaft, a signal controlled thereby, a pair of cranks oppositely disposed on said shaft, a pair of electromagnets operatively connected to said cranks and adapted to be energized alternately, a locking device for each limit of rotation of said shaft, and electrical connections for said pair of magnets, whereby one magnet will lock the shaft in one rotated position, and the other magnet will unlock the shaft, rotate it and lock it in the other position.

15. The combination with a traffic-road, and an electric conductor extending along said road, of a signal, an electromagnet for operating said signal, a circuit-closer located at one point in said road, a branch wire connecting said electromagnet and circuit-closer with the electric conductor, another circuit-closer located at another point in said road, another branch wire and electromagnet to return said signal to its former position, whereby the passage of a car will operate the signal at the said first point in the road, and return the signal to its original position when the car passes the said second point in the road.

16. The combination with a traffic-road, of an electric conductor along said road, a signal, an electromagnet operatively connected to said signal, a locking device in connection with said electromagnet, a circuit-closer located at one point in said road adapted to be operated by the passage of a car, a branch wire connecting said circuit-closer with said electromagnet and electric conductor, a second circuit-closer located at another point in said road, and operated by the passage of a car, an unlocking device connected to said signal, a branch wire through said unlocking device, the circuit-closer and source of electricity, whereby the signal will be operated by the passage of a car past the first circuit-closer, be locked for a predetermined period, and be unlocked at the end of said period by a car passing the second circuit-closer.

In testimony whereof I affix my signature in presence of two witnesses.

ROBERT SKEEN.

Witnesses:
H. M. PLAISTED,
D. P. LITTLE.