(No Model.) 3 Sheets—Sheet 1.

G. W. BLANCHARD.

ELECTRIC WHEEL LOCKING DEVICE.

No. 472,329. Patented Apr. 5, 1892.

Fig. 1.

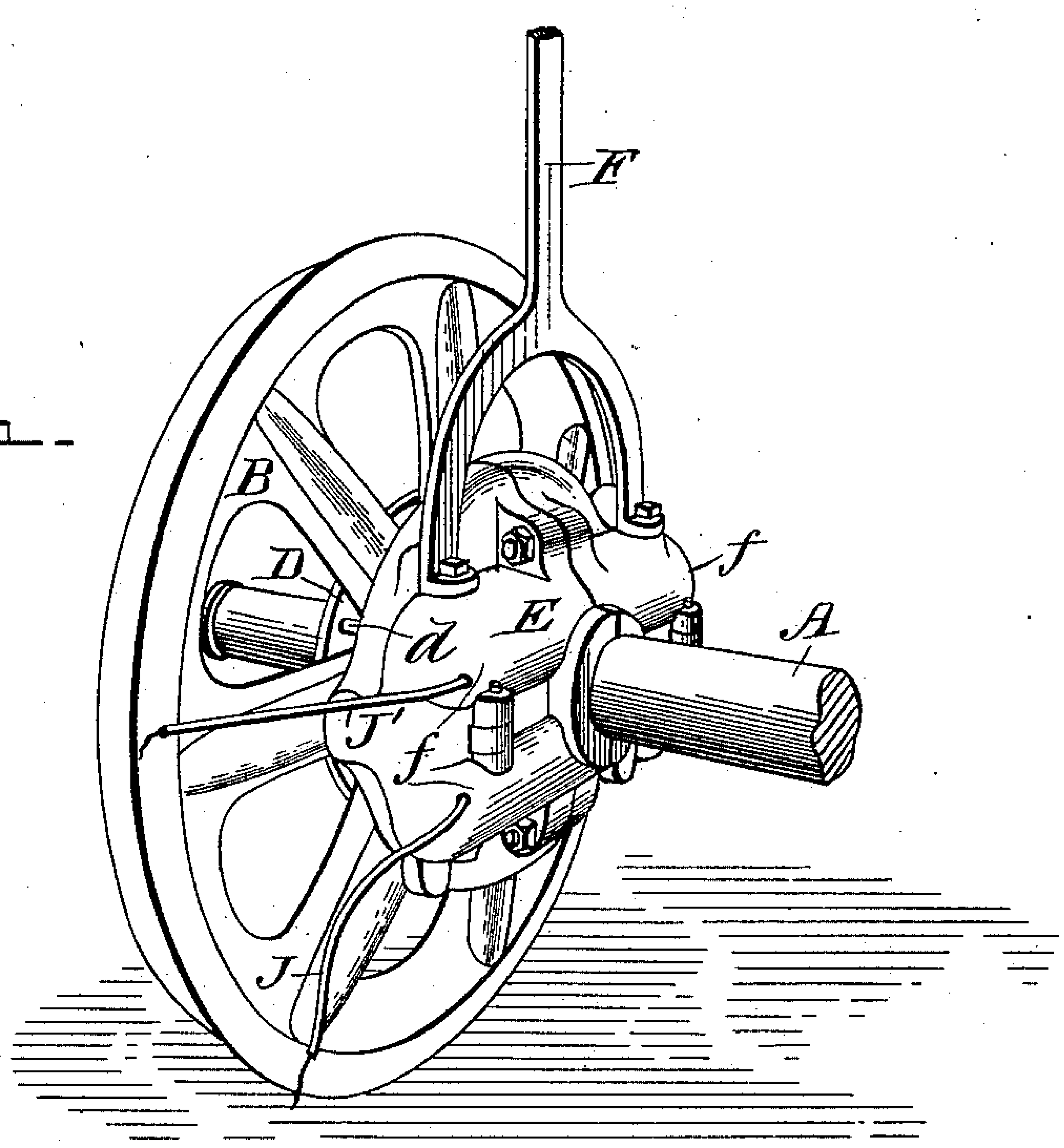


Fig. 2.

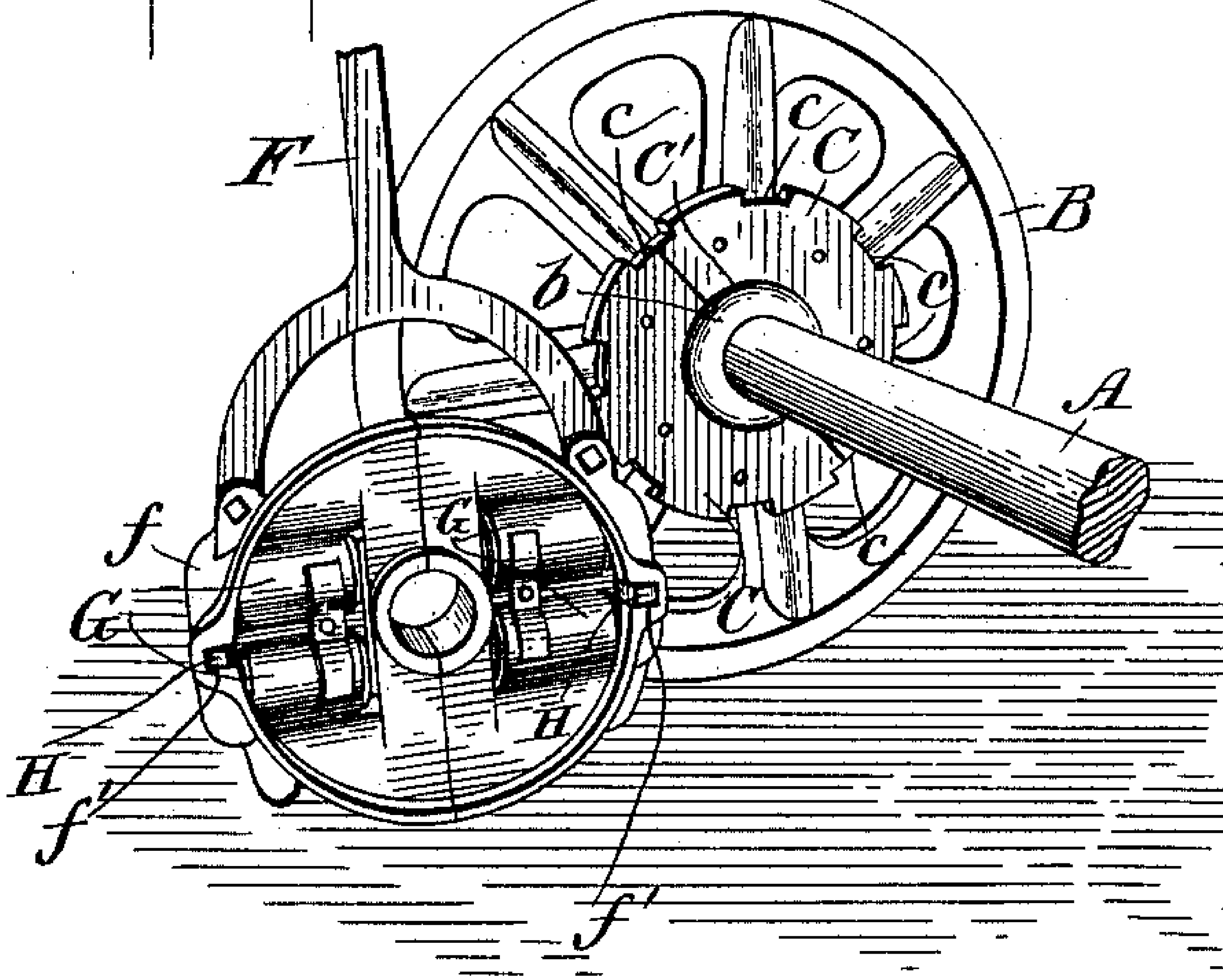
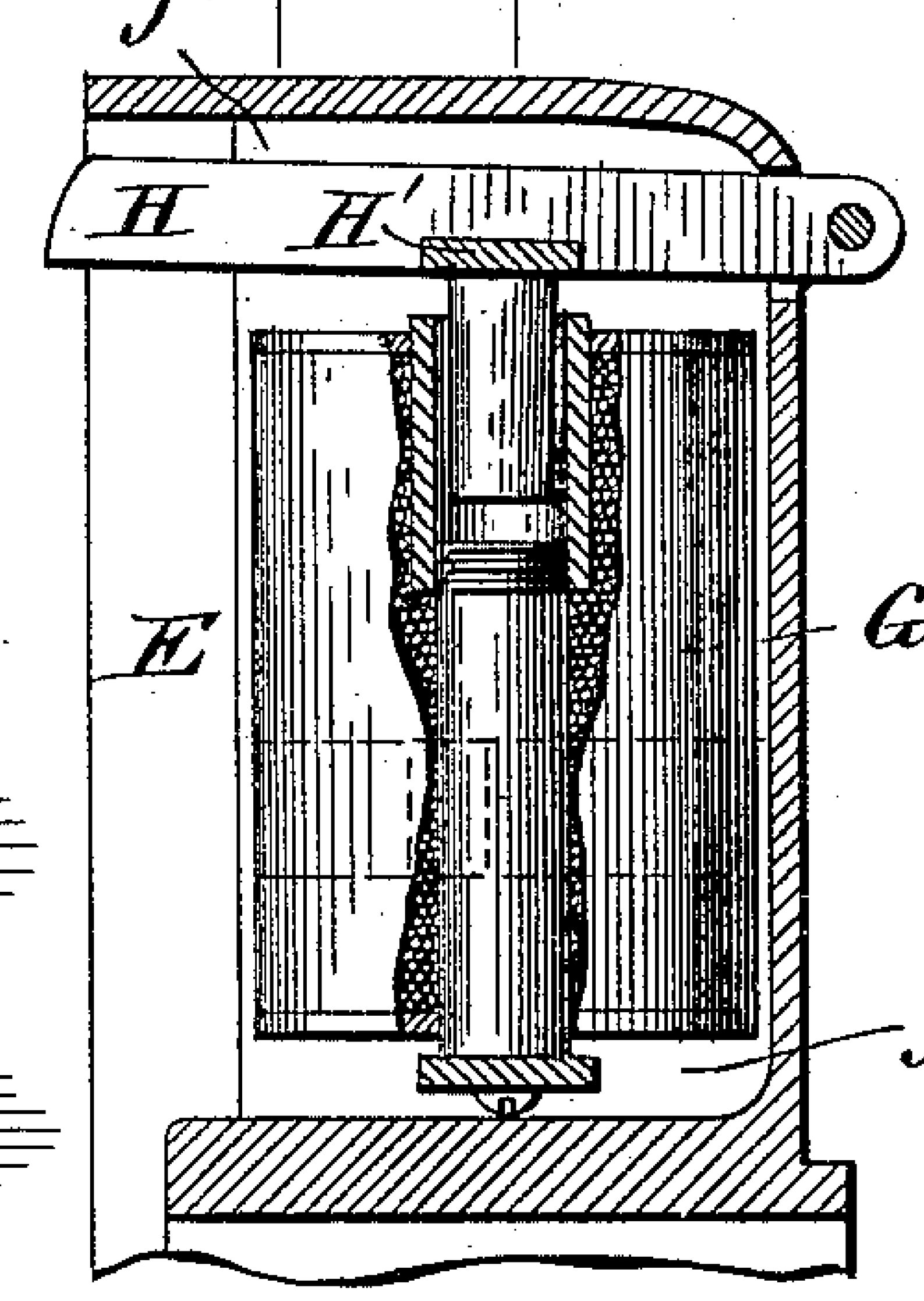


Fig. 3.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 3 Sheets—Sheet 2.

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ELECTRIC WHEEL LOCKING DEVICE.

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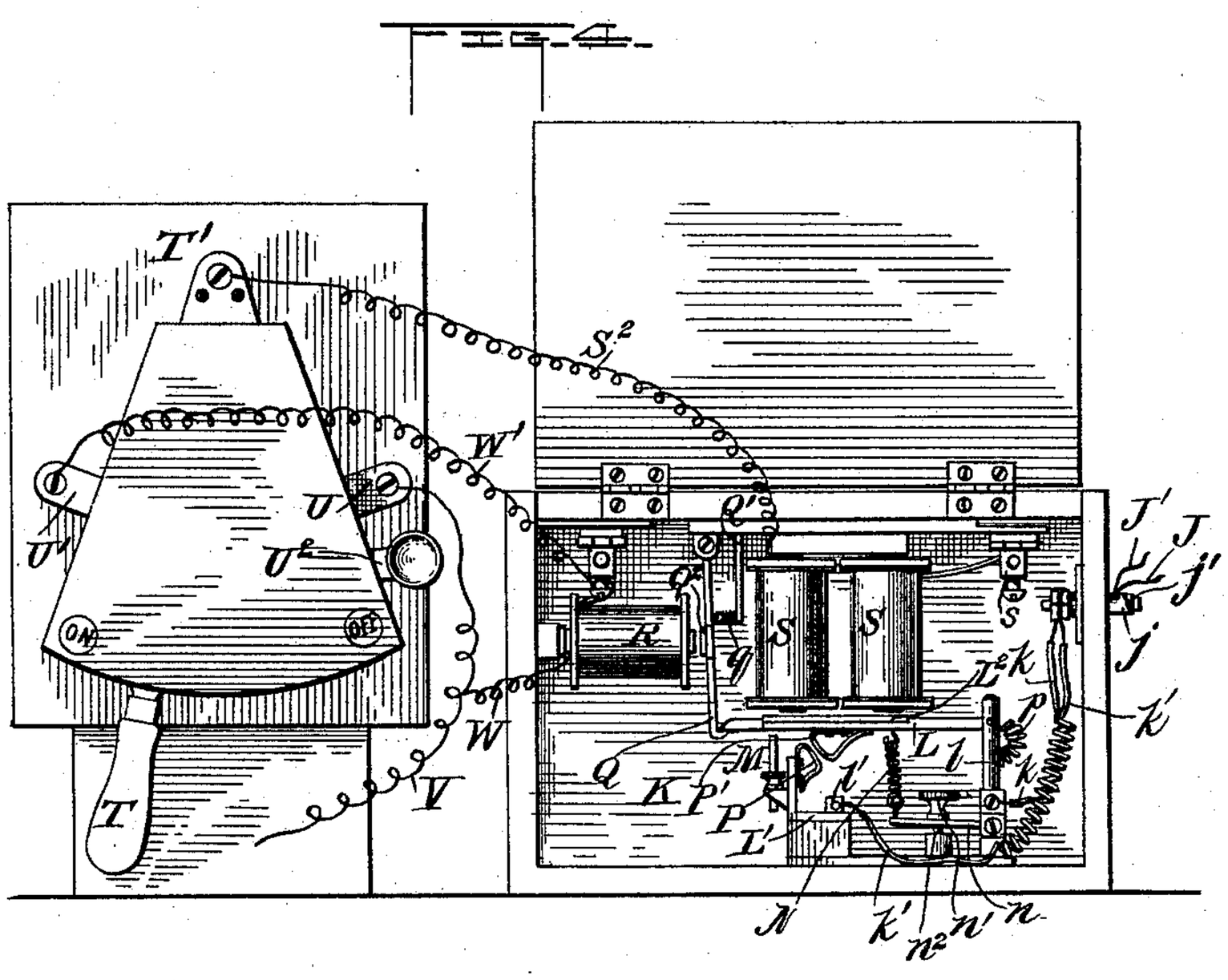

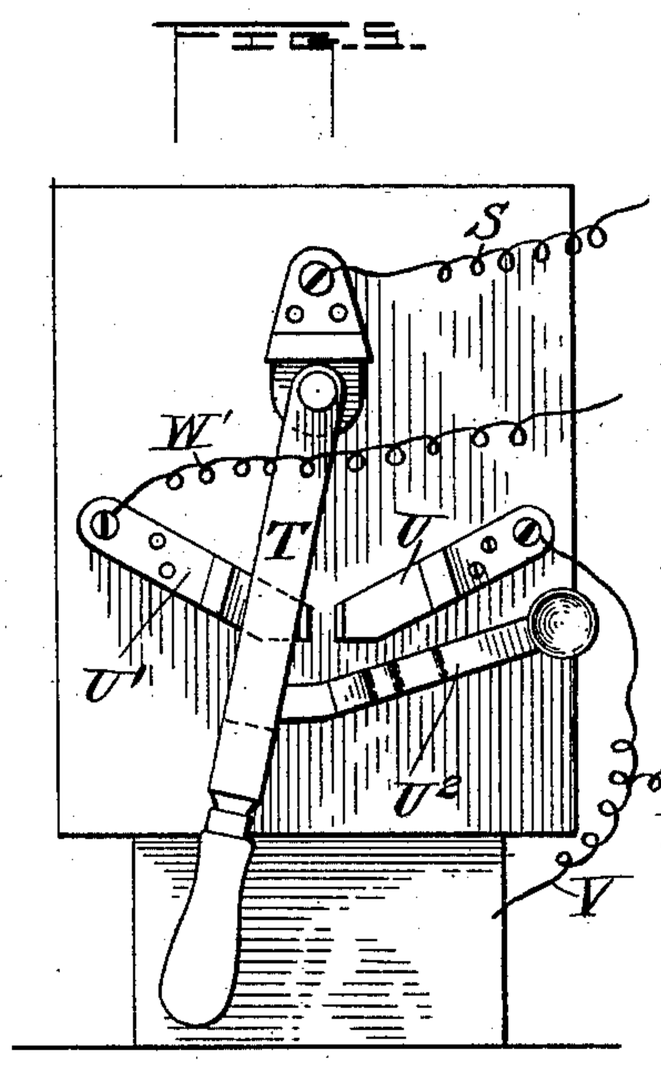

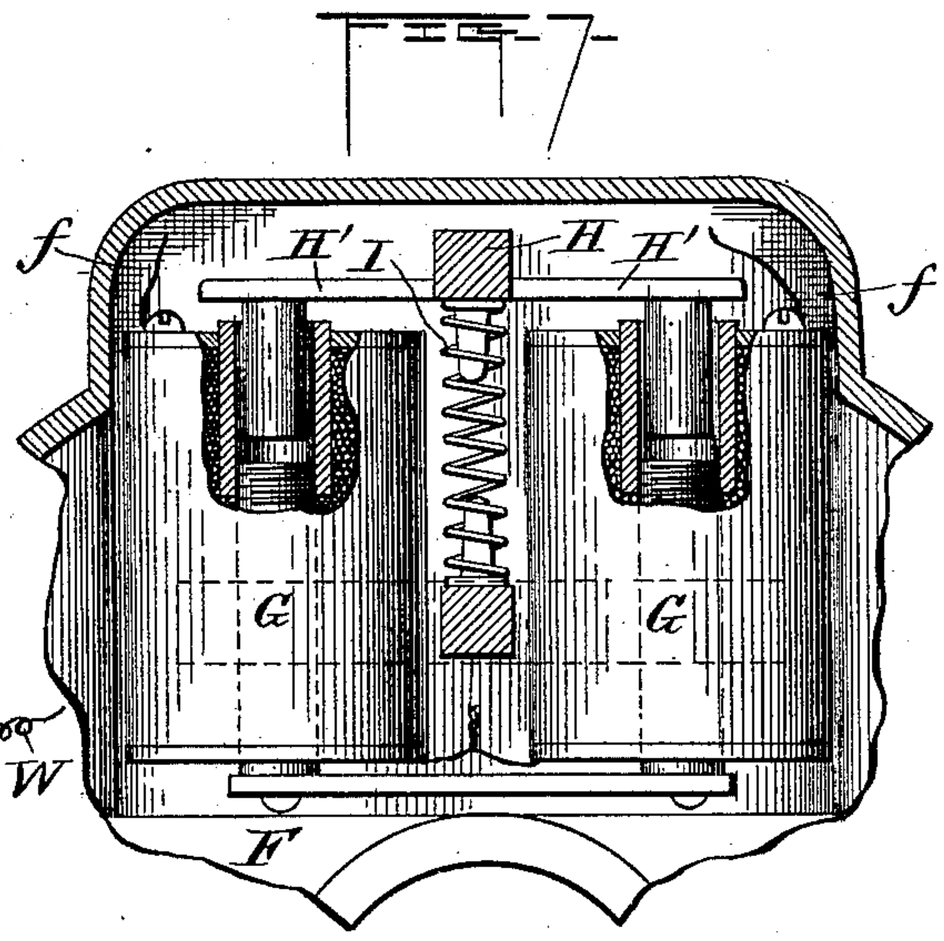

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ELECTRIC WHEEL LOCKING DEVICE.

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FIG. 6.

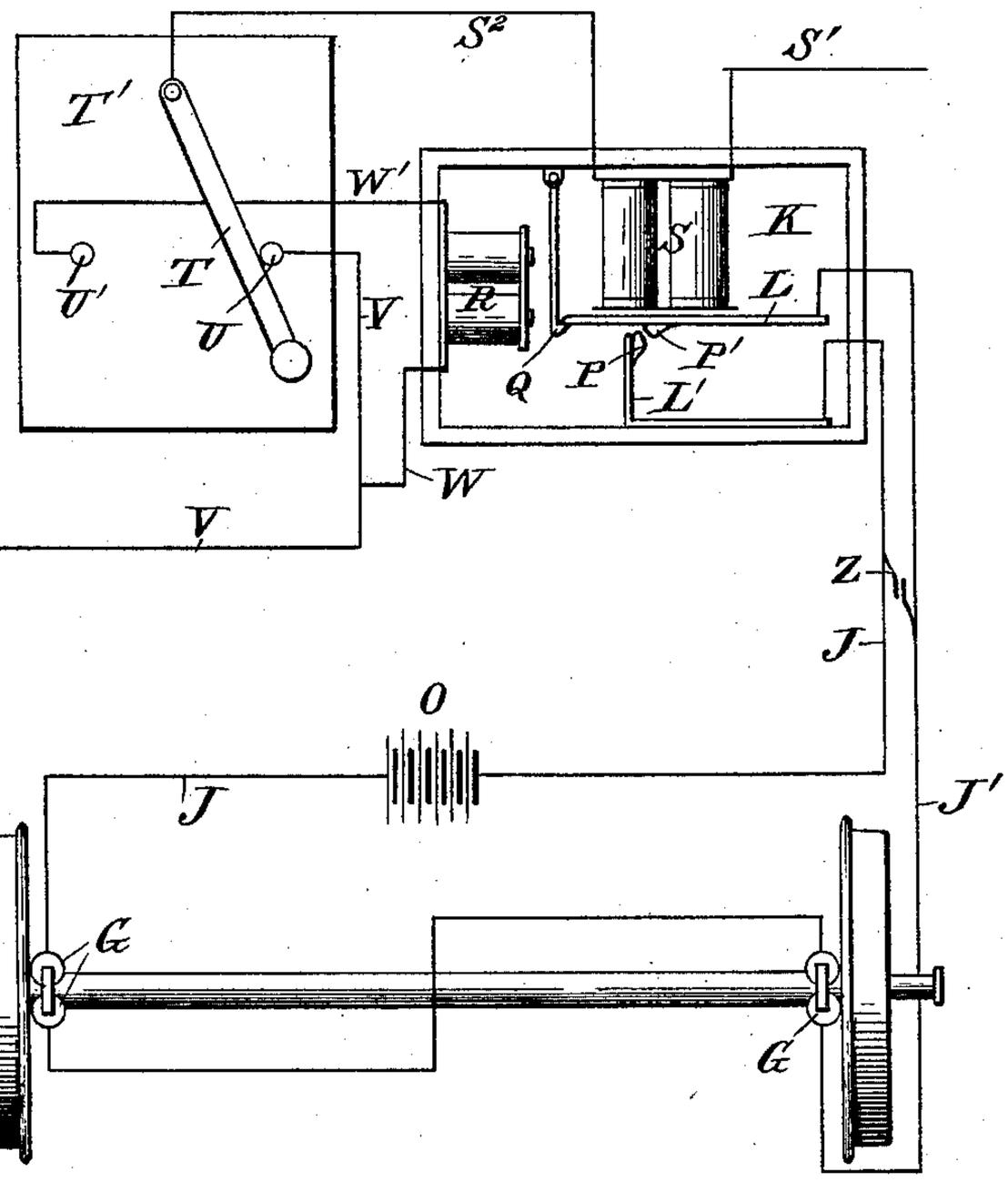


FIG. 7.

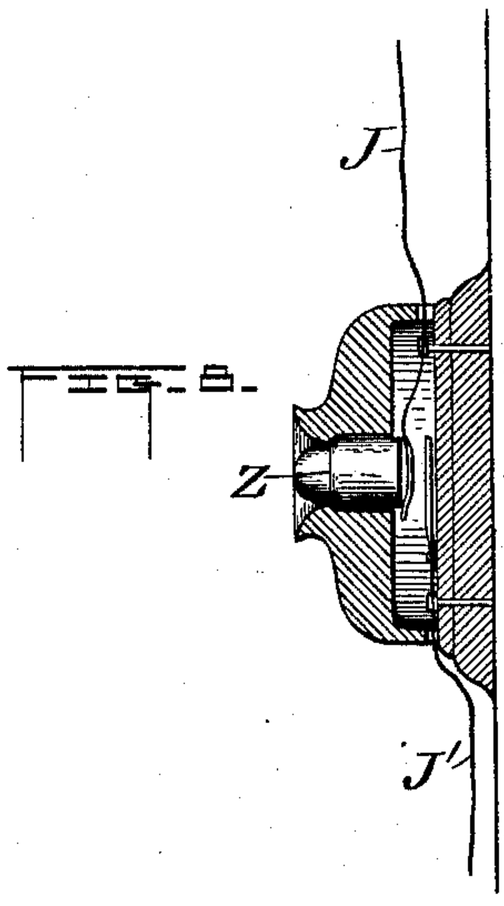
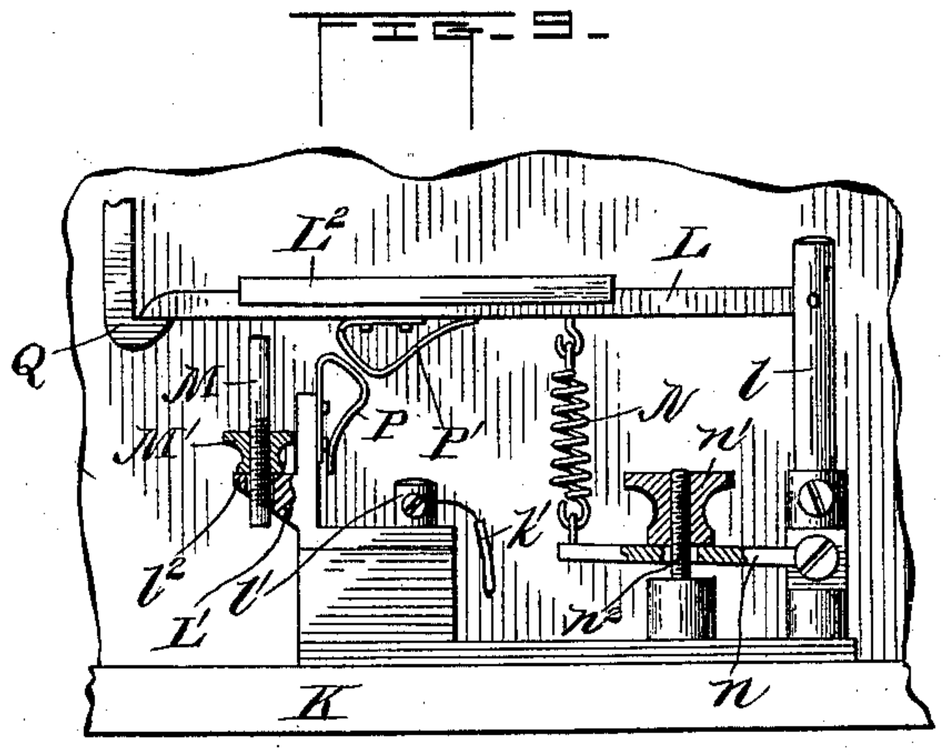


FIG. 8.



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UNITED STATES PATENT OFFICE.

GEORGE W. BLANCHARD, OF WATERVILLE, MAINE.

ELECTRIC WHEEL-LOCKING DEVICE.

SPECIFICATION forming part of Letters Patent No. 472,329, dated April 5, 1892.

Application filed August 10, 1891. Serial No. 402,281. (No model.)

To all whom it may concern:

Be it known that I, GEORGE W. BLANCHARD, a citizen of the United States, residing at Waterville, in the county of Kennebec and State of Maine, have invented certain new and useful Improvements in Electric Wheel-Locking Devices; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention is an improvement on Letters Patent No. 449,843, heretofore granted to me, and, like the subject-matter of the said patent, is chiefly intended to lock an electric car against slipping back in ascending steep hillsides on failure of the motor-actuating current, although it is applicable also to other machinery in which such locking is needed.

To this end the said invention consists in the construction and combination of devices hereinafter more particularly set forth and claimed.

In the accompanying drawings, Figure 1 represents a perspective external view of a car-wheel and a part of its axle having the locking devices applied thereto and covered by a suitable casing. Fig. 2 represents a similar view of the said wheel, its shaft, and the recessed disk, also in reversed position and separated from said shaft and disk, the said casing with the locking devices contained therein, and its supporting arm or bar. Fig. 3 represents a detail view of one of the locking-dogs and the magnet acting thereon. Fig. 4 represents a view in front elevation of the devices for controlling the locking mechanism, the front of the magnet-case being open and the switch-lever and switch-board being covered. Fig. 5 represents a similar view of the switch-board and switch-lever, the cover or front of the said switch being detached. Fig. 6 represents in the form of a diagram the various parts of the mechanism employed by me embodying this invention and the electrical connections thereof. Figs. 7, 8, and 9 are detail views.

In the said drawings, A designates one of the axles of a railway-car such as is commonly in use on electric railways, and B designates one of the wheels on the said axle. A disk C, which is made in two sections for convenience of removal and provided with a central opening C′, fits on the hub or nave *b* of the said wheel. This disk is bolted to a flat plate D on the front of the wheel by means of bolts *d*, which pass through the openings of the said wheel. The wheel, disk, plate, and axle all turn together. At regular intervals the periphery of the said disk is provided with notches or recesses *c*.

E designates a relatively fixed casing or frame which surrounds the axle in proximity to the said wheel, and, like the said disk, is made in two sections, so that it may be removed easily. It is suspended by a rigid bifurcated arm or bar F from any fixed part of the car-frame or the motor. This case is circular in outline and has cylindrical enlargements *f*, forming chambers for electro-magnets G; and also smaller recesses *f′* for the locking-pawls H, operated by the said magnets. The outer face of the said frame or casing in proximity to the said disk is open and the said pawls are allowed to extend out through it, so that their free ends may be drawn into the notches *c* of the said disk. To effect this, the said pawls are pivoted to the said frame at one end, and each has an armature H′ attached to it, the frame itself being non-magnetic. The magnet in each instance when energized attracts the armature, pulling down the pawl, and thereby introduces the operative end of the said pawl into the notch for locking the disk. When the current is cut off from the magnet, a spring I for each pawl restores it to its former inoperative position. Both wheels of the car-axle B are provided with these locking devices, and all the car-wheels may be thus provided. Only one set of them is shown, except in the diagram, as each set is a duplicate of the others. When the circuit through the magnets G is closed, all of the locking-pawls H simultaneously protrude and enter the recesses *c* of the disks C, effectually locking the axle and wheels. The form of the locking-pawls may of course be varied, since any locking-block dog or other device arranged and actuated substantially as described with respect to the disk would be within my invention.

From the magnets G wires J J′ extend to binding-posts *j j′* in the side of a casing K, which incloses two pairs of magnets, herein-

after described. From binding-post *j* a wire *k* extends to an electrically-conducting post or standard *l*, to which one end of an electrically-conducting circuit-closing bar L is pivoted. A wire *k'* extends from the said post *j'* to a binding-post *l'* on an electrically-conducting bracket L', having a vertically-adjustable regulating-post M attached to it under the movable end of the circuit-closing bar or arm L. A spring N is attached at one end to said bar or arm L and at the other to an adjustable bar *n*, which is pivotally attached to post *l* and held down by a milled thumb-nut *n'*, turning on a fixed screw n^2, that passes up through an opening in the said bar *n*. The tension of the said spring may be increased by screwing the said nut farther down, and it may be lessened by the reverse proceeding. Its tendency is to draw down the circuit-closing arm or bar L, so that the yielding contact P' thereon will press against the similar contact P on the said bracket, thereby closing the electric circuit through the electro-magnets G, above mentioned, and a battery O, which has two sections of wire J attached to its respective poles, although the said battery or an equivalent generator may be introduced into any other part of the circuit.

The vertical adjustment of the regulating-post M is by means of a nut M', turning on screw-threads of the said regulating-post and against a shoulder l^2 of bracket L', through an opening in which the said post is free to be thus adjusted. The contacts or contact-making pieces P P' are preferably of spring metal and have inclined faces, making a sliding contact, which avoids any jar and is very certain.

To insure the passage of the electrical current, a short wire *p* passes from the body of the post *l*, before mentioned, to the proximate end of the said circuit-closing bar L. It is therefore not necessary to rely on the pivot of the said bar for such transmission. Two different sets of devices are used for holding the said circuit-closing bar L against the attraction of the said spring N, and thus keeping the circuit open. Both of these must be removed from contact with the said bar before the secondary circuit, hereinbefore described, can be closed. One of these sets of devices consists of a catch Q, suspended pivotally from the roof of the casing and taking under the tip of said circuit-closing bar. It is normally held in this position by a spring *q*, attached to a fixed rod Q'. An armature Q^2 is fastened on or formed with the said catch. An electro-magnet R is arranged to attract this armature when energized, so as to withdraw the said catch. The circuit-closing bar L is also provided with an armature L^2, attracted normally by an electro-magnet S, fixed to the said box and arranged to hold the said circuit-closing bar away from its contact-post aforesaid. The said electro-magnet S and armature L^2, with the connections making an electric circuit, constitute the second series or set of devices above referred to. One end of the wire forming the helices of the said magnet extends to a binding-post *s* and is connected thereby to a wire S', which extends to the motors of the car, bringing the electro-magnet S into the main circuit of the latter. From the other terminus of the helices of said magnet a wire S^2 extends to a switch-lever T, pivoted on a switch-board T', on which are fastened two contact springs or plates U U', having an interval between them and arranged to be respectively in contact with the said switch-lever, according to the position, right or left, which the said lever has been moved into. From the right-hand contact spring or plate U the main-circuit wire V extends to the motor and source of electricity. (Not shown.) A branch wire W extends from one terminus of the helix-wire of electro-magnet R to the said wire V, while from the other terminus of the helix-wire of said magnet a wire W' extends to the left-hand contact plate or spring U'.

When the switch-lever T is in contact with the plate U, the main electric circuit of the car is through the source of electricity and the motor, (not shown,) the wire S', the magnet S, the wire S^2, the switch-lever T, the contact-plate U, and the wire V, omitting the magnet R. The circuit-closing bar L of the secondary circuit is then held up out of contact both by the catch Q and the magnet S. When the switch-lever is moved to the other contact-post U', the main circuit is, as before, to and through the magnet S, thence through the contact-plate U' and the wire W' to the magnet R, and thence through the said magnet and the wires W and V to the point of beginning. The magnet R, being energized by the current thus directed, withdraws the catch Q and leaves the circuit-closing bar L of the secondary circuit suspended by the magnet S.

When the current weakens in ascending a steep grade or is found inadequate, the switch-lever T is shifted into this latter position, or such shifting may be used as a precautionary measure before beginning the ascent. As soon thereafter as the current through the magnet S becomes unable to sustain the circuit-closing lever or bar L the latter will fall, closing the secondary circuit and applying the locking devices, as before described. Any absolute break in the main circuit will effect the same result. Less magnetic force is required to hold the vertically-hanging catch Q against the resistance of its light spring out of engagement with the circuit-closing bar L than to keep the latter in raised position against the action of its stronger spring and the attraction of gravity. Consequently the catch Q in case of any weakening of the main current will remain out of engagement after the said closing-bar has begun to descend, and even when a breaking of the current releases both of these parts simultaneously the catch cannot return to its position of engagement in time to intercept

the tip of the said closing-bar L. By shifting the switch-lever to contact-plate U and thereby leaving the magnet R out of circuit the said catch is left in position with no means of automatic withdrawal to hold up the said circuit-closing lever, and the said lever is thus held by a shouldered spring-latch U^2. Under such circumstances both sets of sustaining devices must become inoperative before the circuit-closing bar can fall. No accidental nor intentional dislodgment of the catch Q can then cause the closing of the secondary circuit and the locking of the car, while magnet S retains its power, nor will any interruption or weakening of the main current have this effect so long as the said catch is in such engagement. This position of the switch-lever is commonly taken while the car runs on a level or moderately-undulating surface.

To provide for locking the wheels at any time when necessity arises, I make use of a push-button Z, preferably attached to the roof or side of a car, which button is connected to wire J, and on being pressed makes contact with wire J′, closing the secondary circuit at a point below the closing-bar L. The said circuit will then be from the battery O through one section of wire J and push-button Z to wire J′, the electro-magnets G and the other section of wire J ending in the other pole of the said battery. When two or more sets of magnets G are employed as in the diagram, one set for each wheel, as is usual, the connecting wire or wires between such sets of course will be included in the circuit, the said push-button constituting a hand-operated circuit-closing device for the secondary circuit, in addition to the automatic circuit-closing device already described, and enables the conductor, lever-man, or other employé to close the said circuit and lock the wheels of the car at any time.

The tips of circuit-closing bar L and catch Q are rounded on the sides which come into contact when the said circuit-closing bar rises, in order that they may slip easily past each other into engaging position when the magnet S attracts the armature and raises the said bar to break the secondary circuit.

Of course the aforesaid devices for controlling automatically and by hand the locking of a wheel may be used with any kind of rotating mechanism; but I have preferred to show the most important application of it—that to electric cars.

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

1. In combination with a rotating wheel, a disk turning therewith, dogs or locking devices engaging the said disk, and electrically-actuated means for drawing them into such engagement, for the purpose set forth.

2. A rotating shaft or axle and a notched disk carried thereby, in combination with dogs arranged to enter the notches of the said disk, and electrically-actuated means for governing such engagement, for the purpose set forth.

3. A rotating axle and wheel and a notched disk turning therewith, in combination with a relatively-fixed frame, a set of dogs pivoted in the said frame in position to enter the said notches, electro-magnets in the said frame for actuating the said dogs, and the conductors and circuit-closing devices of an electric circuit of which the said electro-magnets form a part, substantially as set forth.

4. In combination with a wheel and a disk turning therewith, dogs engaging the said disk, electro-magnets actuating said dogs, the generator and conductors of an electric circuit through said magnets, a bar arranged to automatically close the said circuit when released, and a movable catch for supporting said bar out of such engagement until such release, substantially as set forth.

5. In combination with a rotating wheel and locking devices therefor, an electro-magnet for actuating the said locking devices and the electric generating and conducting devices of its circuit, an automatic circuit-closing bar, devices for normally holding it out of contact, and a hand-operated circuit-closing device for the said circuit, substantially as set forth.

6. In combination with an electric car-wheel and locking devices therefor, an electro-magnet for actuating the said locking devices and the generator and conductors of its circuit for operating the said locking devices, a circuit-closing bar for said circuit provided with an armature, and an electro-magnet in the main circuit of the car arranged to withdraw the said bar from contact until the main current is broken or weakened, substantially as set forth.

7. In combination with an electric car-wheel and locking devices therefor, an electro-magnet for actuating the said locking devices and the conductors and electric generator of its circuit for actuating the said locking devices, a movable bar for automatically closing the said circuit, an electro-magnet in the main circuit which normally holds the said bar out of circuit-closing contact, a catch for supporting the said bar, an electro-magnet for withdrawing the said catch therefrom, and a switch-lever and conductors and contact-plates whereby the last-mentioned electro-magnet may be introduced into the main circuit or left out of it at will, substantially as set forth.

8. In combination with an electric car-wheel and a secondary electric circuit and wheel-locking devices and their actuating-magnet operated by said circuit, an automatic circuit-closer, an electro-magnet in the main circuit operating to hold the said circuit-closer open, supplemental devices, including a catch and electrically-energized means for withdrawing the same for this latter purpose, and a switch-lever and connections for mak-

ing these latter devices effective or ineffective at will, substantially as set forth.

9. In combination with an electric car-wheel, locking devices therefor, and a magnet for actuating the said locking devices, the generator-conductors and antomatic circuit-closing bar, a secondary circuit controlling these locking devices, a catch which holds said bar out of circuit-closing contact, an electro-magnet operating to withdraw the said catch, and a switch-lever and conductors for introducing this magnet into the main circuit at will or eliminating it therefrom, substantially as set forth.

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

GEORGE W. BLANCHARD.

Witnesses:

W. W. MERRILL,

HOMER PERCIVAL.