No. 638,606. Patented Dec. 5, 1899.

H. B. TAYLOR.

ELECTRIC SIGNALING APPARATUS.

(Application filed Apr. 27, 1899.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1

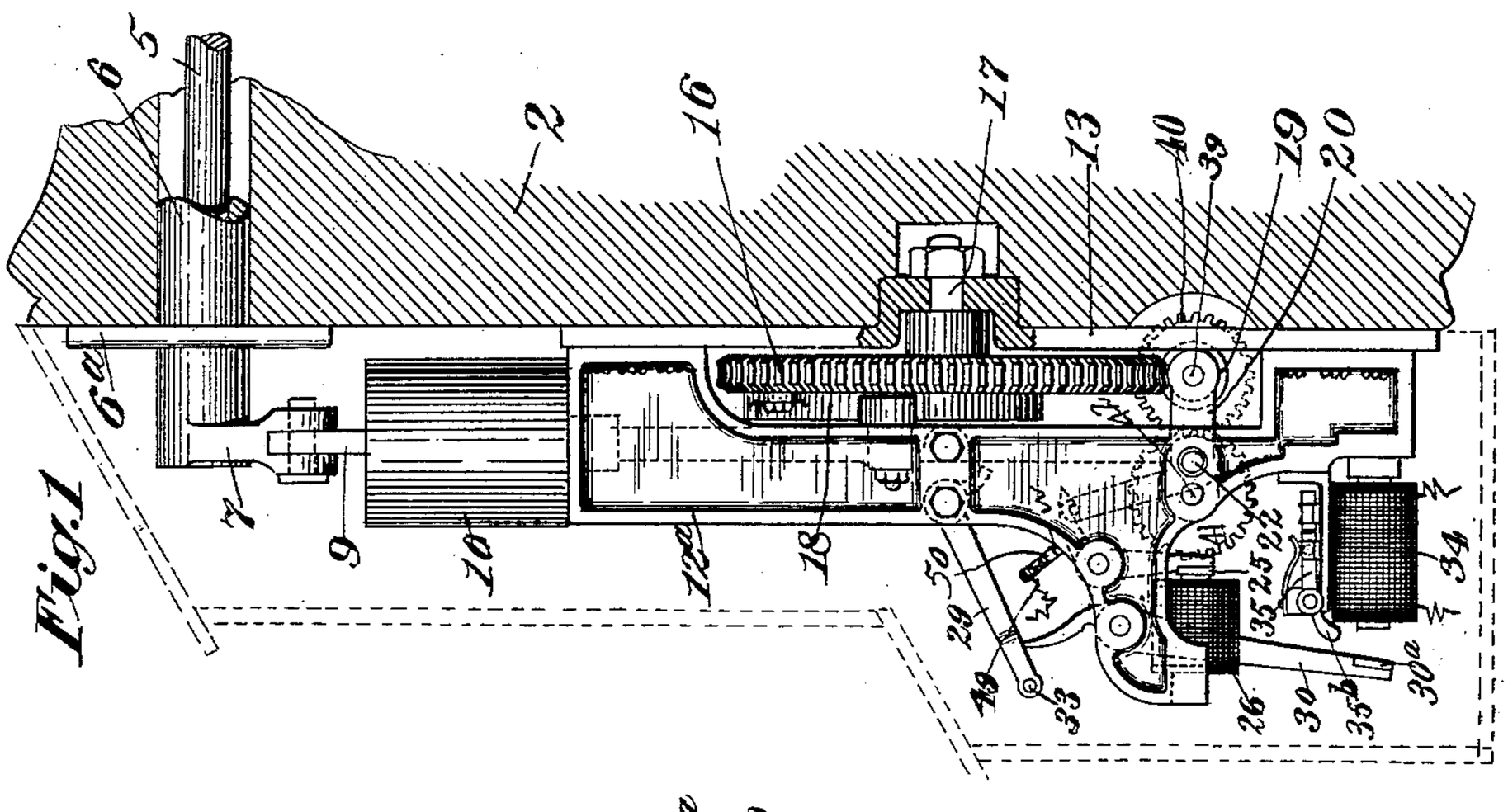

Fig. 2

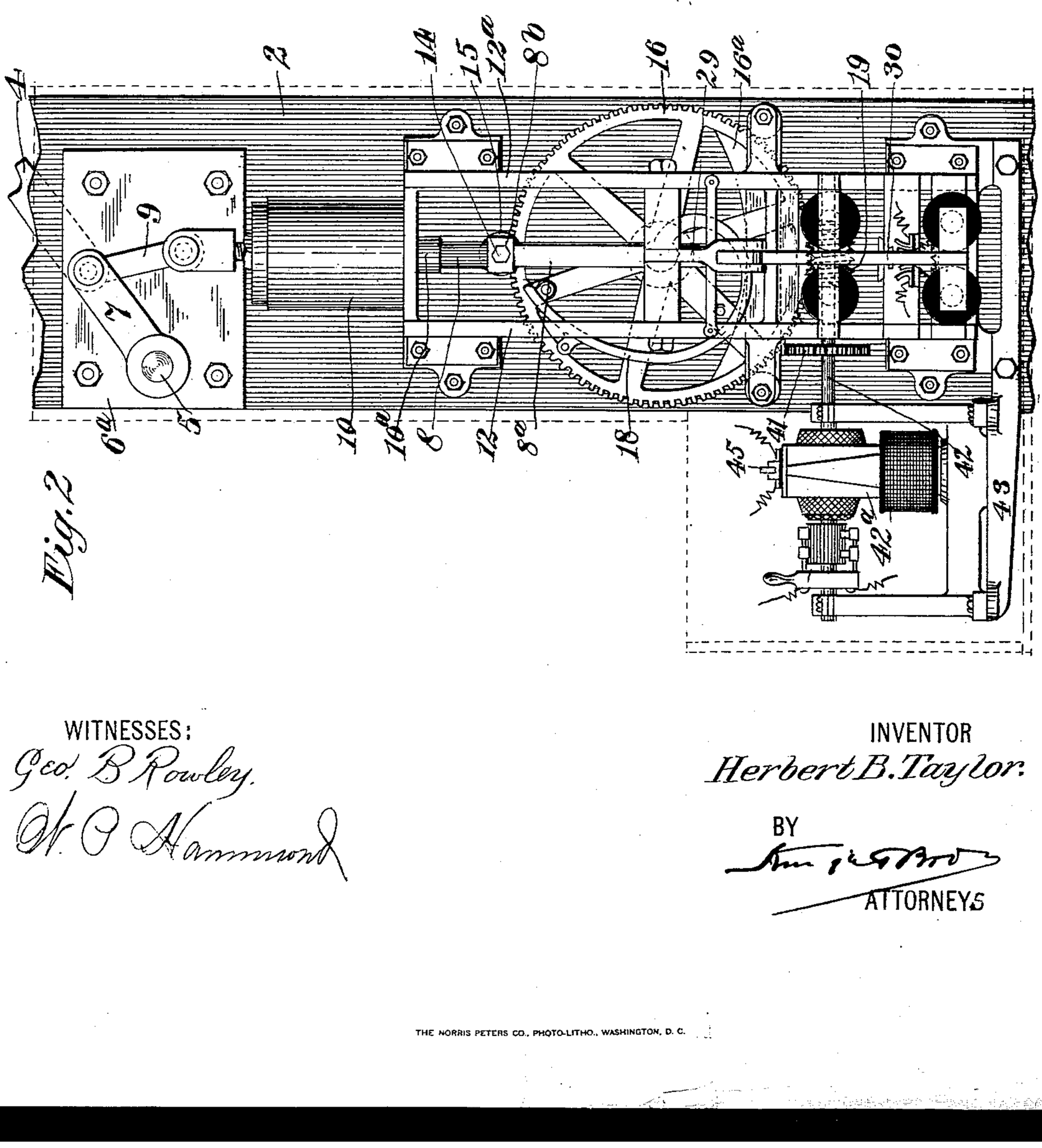

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Fig. 3

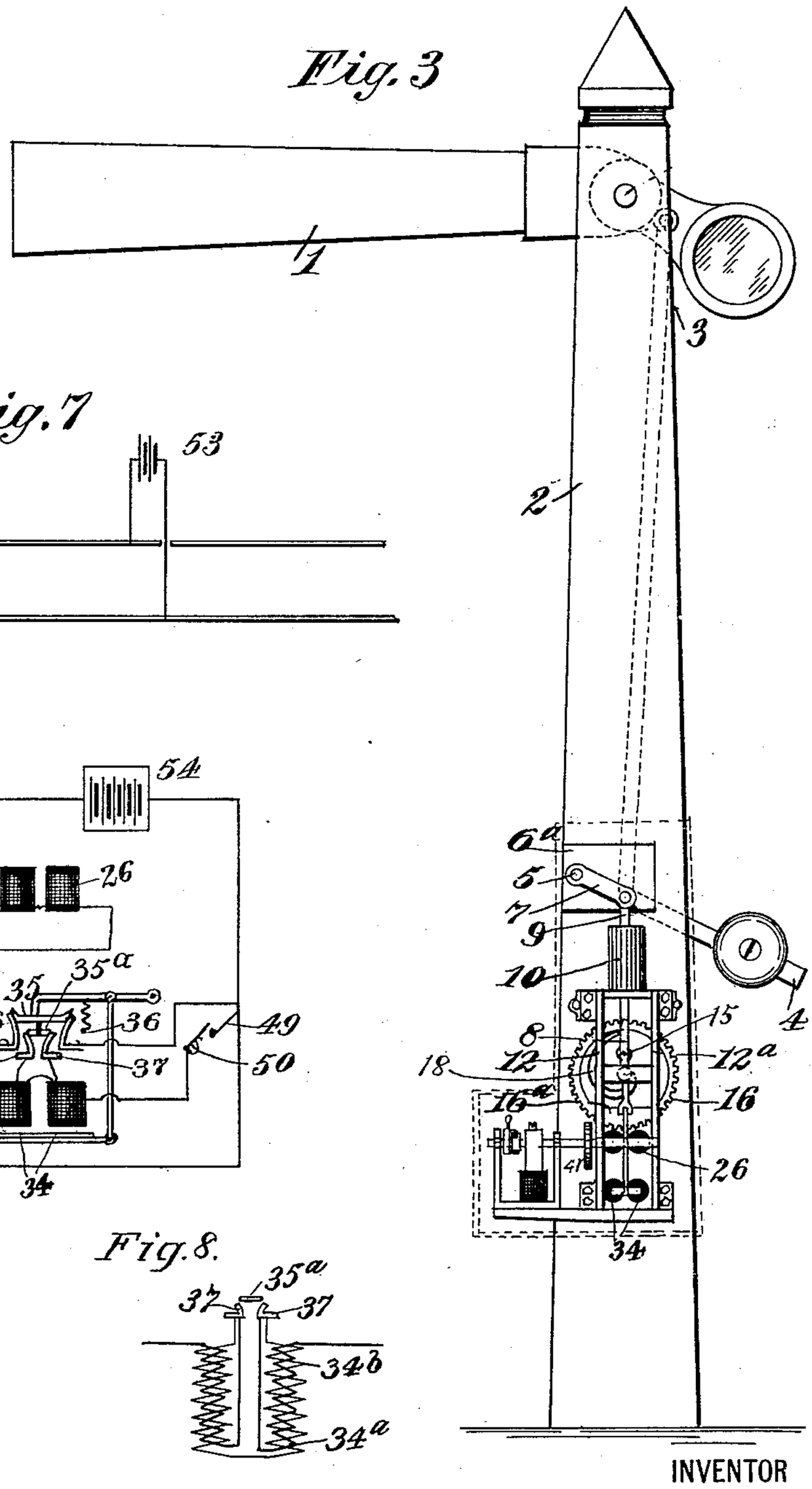

Fig. 7

Fig. 8.

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Fig. 4

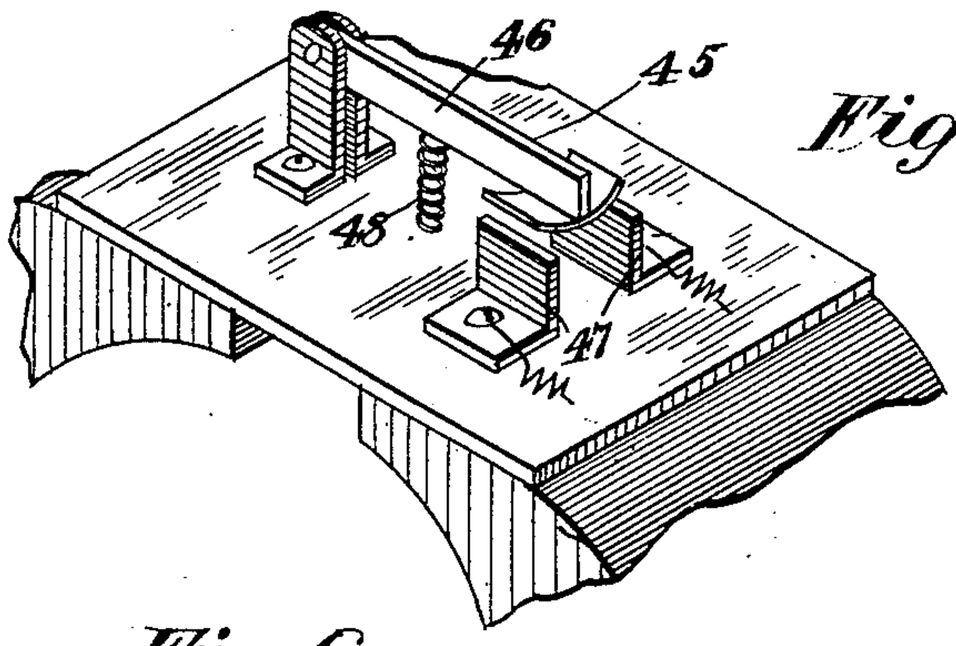


Fig. 6

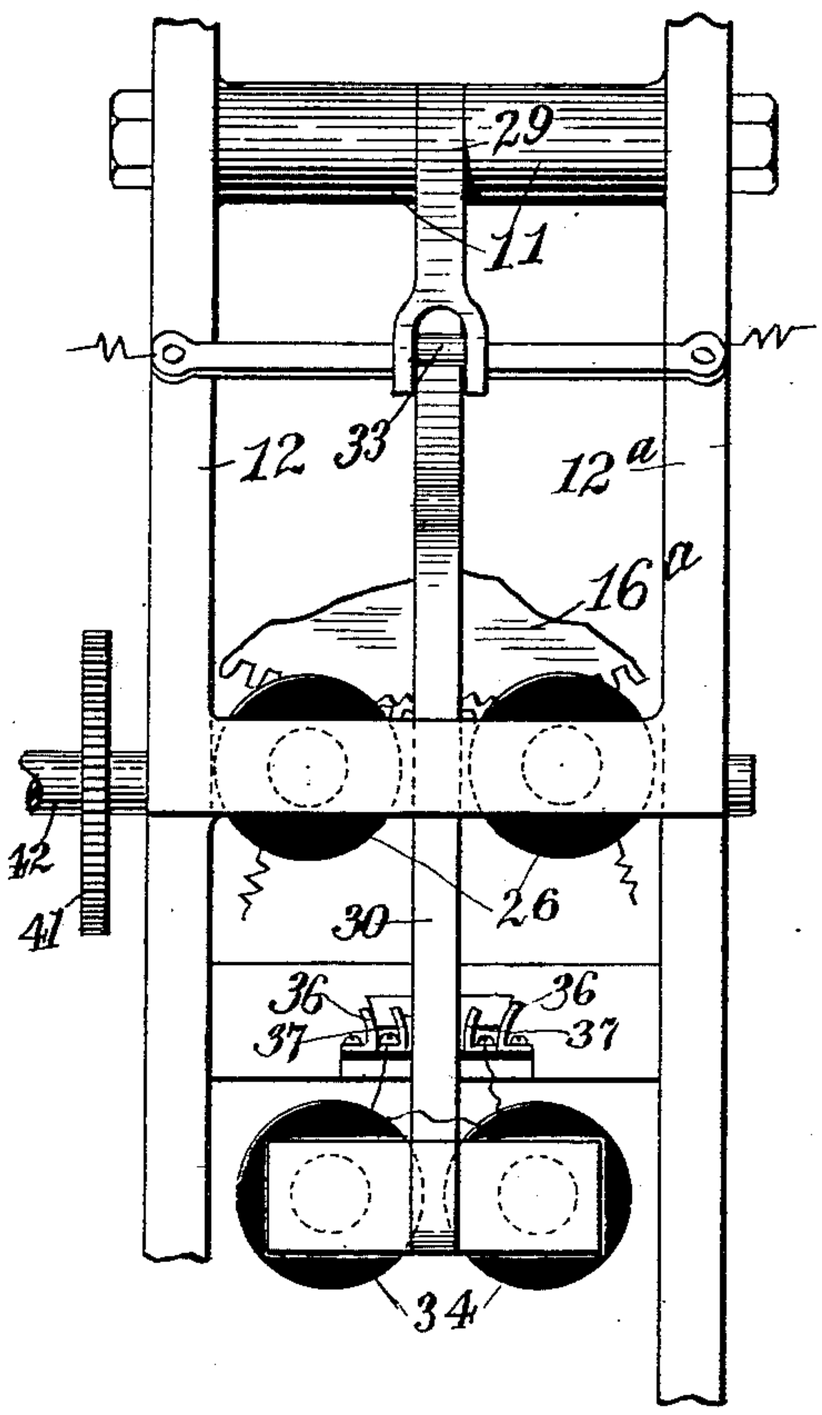
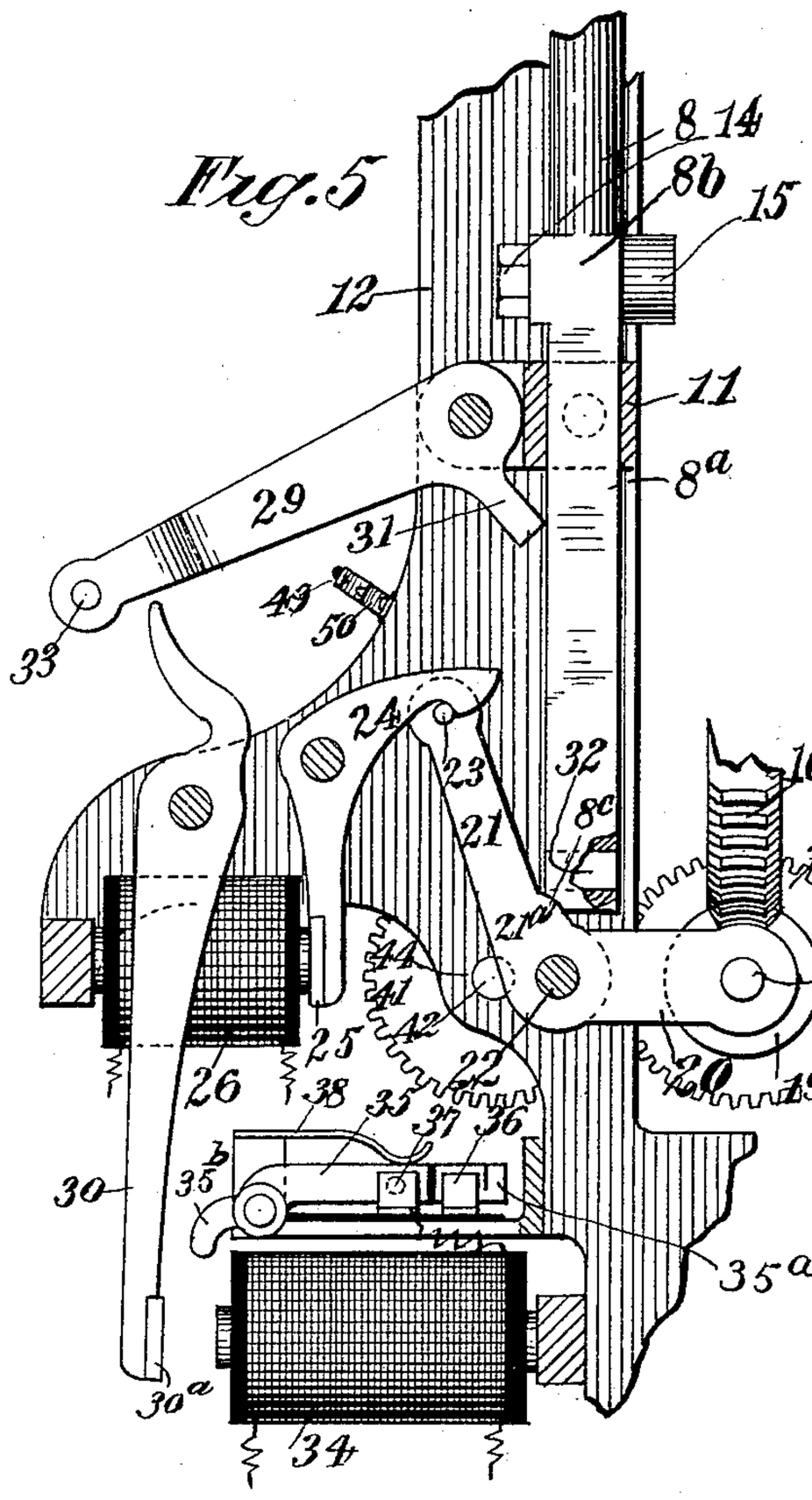


Fig. 5



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ELECTRIC SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 638,606, dated December 5, 1899.

Application filed April 27, 1899. Serial No. 714,662. (No model.)

To all whom it may concern:

Be it known that I, HERBERT B. TAYLOR, a citizen of the United States, residing at Newark, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Electric Signaling Apparatus, of which the following is a specification.

The invention herein described relates to certain improvements in electrically-operated signals for railways, and has for its object a construction of signal-actuating mechanism whereby the signal may be operated and may be detached from its operating mechanism so as to insure an instantaneous return to "danger" when released and also removing most of the friction otherwise to be overcome in the return of the signal to "danger."

Referring to the accompanying drawings, which form a part of this specification, Figure 1 is a side elevation of my improved device for operating a semaphore, showing it in its normal or danger position. Fig. 2 is a front elevation of the mechanism in abnormal or safety position, showing operating cam and motor and other electrical devices upon which the operation of the mechanism is dependent. Fig. 3 is a rear elevation of the completed signal apparatus. Fig. 4 is a detail of a sensitive circuit-breaker automatically operated by the field-magnets of the motor. Figs. 5 and 6 are side and front views of the locking and detent mechanisms. Fig. 7 is a diagram of the circuit connections. Fig. 8 is a diagrammatic detail of the lock-magnet, showing the double winding thereof.

In the practical working out of my invention I preferably employ the semaphore type of signal, although other types may be used. Semaphore 1 is suitably mounted in such manner on supporting-post 2 that when detached from the operating mechanism and free to move it will assume a danger position. Rod 3, of any desired length, connects semaphore 1 with lever 4, on which is an adjustable weight. Lever 4 is permanently secured to shaft 5, which is pivotally mounted on post 2 in bearing 6, which extends through and is secured to same by bolts through flange 6^a. On opposite end of shaft 5 is secured crank 7, which is connected with operating-rod 8 8^a by link 9. Rod 8, the lower end 8^a of which is square to keep from turning, extends down through dash-pot 10, the lower end 10^a of which forms a guide for said rod into and through square guide 11, formed of lugs cast on supporting-frames 12 12^a and extending inward. Frames 12 12^a are secured to base-plate 13, which is bolted to post 2. About the center of rod 8 is a squared section 8^b, somewhat larger than the rod, to which is secured pin 14, on which turns roller 15. Worm-wheel 16 is mounted on spindle or shaft 17, the hub of wheel 16 extending into a recess in plate 13, permitting of a long bearing. To wheel 16 is secured operating-cam 18, whose function is to raise the rod 8 by means of contact with roller 15, motion being transmitted to cam by the rotating of worm-gear 16. Wheel 16 is also provided with a counterweight 16^a, sufficient to hold the wheel when free in the position shown in Fig. 2. Worm 19, which operates wheel 16, revolves in bearings on yoke 20, to which lever 21 is attached, parts 20 21 thus forming a bell-crank pivotally mounted by shaft 22 in frames 12 12^a. The upper end of lever 21 is provided with a pin 23, engaging with a hook on detent-lever 24, the tail of this detent-lever having an armature 25 secured thereto, which is normally in contact with poles of magnet 26, secured to the frame, but will be drawn away when said magnet is deënergized, owing to the greater weight of yoke 20 and worm 19, which will drop down, pulling lever 21 inward. Lever 21 is provided with a raised portion or hump 21^a, which, when the worm is not in gear, projects into the path of rod 8^a, which descends when released, striking said hump with its corner 8^c (which is rounded off) and forcing lever 21 back into position shown and worm 19 into gear with wheel 16.

Latch-lever 29 and locking-lever 30 are pivotally mounted on frames 12 and 12^a by means of long pins extending through said frames. Latch-lever 29 is provided with tail or latch 31, which normally rests against rod 8^a, but which enters into a slot or hole 32 in rod 8^a when said rod reaches the highest point in its vertical travel. When the latch enters said slot, the other end of lever 29, which is clevised and provided with a pin 33, drops down over tail of locking-lever 30, and at the same

time closes a circuit through lock-magnet 34, which is secured to the frames. Lock-lever 30, which is provided with an armature, is thus drawn toward said magnet, locking rod 8 (which is directly connected to weighted semaphore 1) in its raised position.

Knife-switch 35 is suitably mounted on, but electrically insulated from, frames 12 12ª and is provided with two sets of contacts 36 37 to receive blade portions 35 35ª of the switch, which completes the circuit-blades, portion 35ª being insulated from blade portion 35. Contacts 36 are in the main motor-circuit, as indicated in Fig. 7, and are open-circuited by the action of lever 30 in striking the tail 35ᵇ of switch-blade 35, forcing the blade out of engagement with contacts 36. The other set of contacts 37 short-circuits the high-resistance windings 34ª in magnet 34 when blade 35 is down, the high-resistance coils being in series with the low-resistance coils 34ᵇ when the blade of switch 35 is withdrawn, as shown more fully in Fig. 7. Spring 38 forces switch-blade 35 down between the contacts, which is the normal position of said blade.

Worm 19 is rotated by means of a shaft 39, to which it is secured, said shaft having also secured to it a pinion 40, which meshes with a pinion 41 on motor-shaft 42. The motor 42ª is of the series type and is secured to a bracket 43, bolted to base-plate 13 and post 2, and may be mounted on either side of operating mechanism, as desired. The end of motor-shaft 42 runs in bearing 44 on frame 12 or 12ª, according to the side on which motor is mounted. On the field-pieces of motor I mount a sensitive switch or circuit-closer 45, constructed in the following manner: On a plate of non-magnetic material (preferably fiber or rubber) I pivotally mount a blade of iron, steel, or other substance capable of being magnetically attracted, the end of blade being tipped with a metal blade of good current-conducting qualities. Also on said plate I secure a pair of contacts 47 to receive end of blade. Current enters one contact, passes through blade to other contact, and thence through wires to magnet 26 and back to the source of energy. The switch 45 will be held normally open by spring 48, but will be closed the instant the current enters the motor-windings on account of the magnetic attraction of the fields or poles for the iron or steel in the switch-lever and will be as quickly released when the motor-circuit is broken.

Contacts 49 50, normally open, are included in circuit leading to lock-magnet 34 and are secured to frames in such manner that lever 29 in its downward course will close the contacts 49 50, completing circuit through lock-magnet 34.

Dash-pot 10 is secured to frames 12 12ª by means of bolts, its function being to relieve the shock of the falling semaphore-weight. It is made in the usual manner with a leather-cupped piston which is carried on rod 8. When rod 8 is released, the weight which is attached to it forces piston into the cylinder against an air-cushion, the cylinder being vented to suit the speed required for the fall.

The operation of the device is as follows: Supposing the parts to be in normal position, as shown in Fig. 1, track-relay 51, which is fed by batteries 53, (see Fig. 7,) is energized, holding contacts 52 of the local circuit open. Neither of the magnets 26 or 34 is now energized. Switch 45 on the motor is also open, contacts 49 and 50 are open, but switch 35 is closed, partially completing circuit through the motor and the lock-magnet 34. We will now suppose a train enters section A. (See Fig. 7.) Track-relay 51 is deënergized by short-circuiting of battery 53, and contacts 52 in the local circuit controlled by track-relay 51 are closed, completing the circuit from local batteries 54 through operating-motor and causing its armature to revolve, which through the medium of the pinions, worm, and cam lifts rod 8 with its attached weight. At the same instant that current is admitted to the motor switch 45 over motor is closed, completing the circuit through detent-magnet 26, which holds armature 25 of detent-catch 24 against its poles, thereby keeping lever 21 in position shown in Fig. 5 and worm 19 in gear with wheel 16. As the cam forces rod 8 upward the tail 31 of latch-lever 29 drops into slot 32 in rod 8ª. At the same time the clevised end or pin 33 of lever 29 will fall over and engage with hook on lever 30 and also close contacts 49 50 in the circuit of locking-magnet 34. At this instant the armature 30ª of lever 30 is pulled toward the poles of magnet 34 with great force, owing to the large amount of current passing through its low-resistance windings. As lever 30 is drawn thus forward it hooks and locks lever 29 in its down position, and at the same time strikes the tail of switch-blade 35, forcing it out of its jaws, opening the main motor-circuit and putting in series with the low-resistance coils of magnet 34 other coils of very high resistance, which are wound on the same magnet, thereby reducing the consumption of current in magnet 34 to the lowest possible point that will retain parts in locked position. As soon as the circuit through motor is broken switch 45 on motor is automatically opened, for the reason that there is now no magnetism sufficient to keep it shut against the pressure of the spring tending to open it. The opening of this switch cuts off the current which energizes detent-magnet 26, which releases lever 21, allowing yoke 20, supporting worm 19, to drop out of gear with wheel 16. Wheel 16 now being free from all friction will assume a position in which the cam 18 will be clear of rod 8 and roller 15. This wheel will have been driven by the worm 19 to about just such a position, and as the counterweight 16ª will be so fixed as to be at the lowest point on the wheel at the time it is released the wheel

will probably not move at all after being released. All parts of the apparatus are now in such position as to insure the immediate return to the normal position the instant the circuit in locking-magnet 34 is broken. Suppose now that the train vacates the section A. The circuit through track-relay 51 will be reëstablished and the contacts in the local circuit will be opened, cutting off all current whatsoever from local circuit. In this case lock-magnet 34 becomes deënergized, allowing armature 30ª of lock-lever 30 to be forced away from its poles, thus releasing lever 29 from engagement with hook of lever 30. Semaphore 1, with its attached weight, will now fall, forcing rod 8 downward, throwing tail 31 of lever 29 out of slot 32 and away from lever 30 and also allowing contacts 49 50 to separate. The rounded corner 8ᶜ of rod 8ª as it moves downward will strike the hump or projection 21ª on lever 21, which projects in the path of the rod, and will force lever 21 to the left, so as to cause the pin 23 thereof to be engaged with catch of detent-lever 24. This movement also throws worm 19 in gear with wheel 16, the teeth on wheel and threads on worm being preferably pointed, so as to positively insure their meshing. Rod 8ª will now keep these parts in this position until the circuit is again completed through magnet 26, when said magnet will effect the detaining as the rod begins to lift. It will be seen the function of this magnet 26 is only to hold the bell-crank formed of lever 21 and yoke 20 in its normal position. The forcing into this position is done mechanically by the rod 8. Now suppose that before the signal had been operated to the full required distance—that is, before the cam had cleared the roller 15—the motor-circuit should become disarranged or broken, stopping the motor. In this case the sensitive switch 47, attached to motor, will immediately open, breaking the circuit through detent-magnet 26, which would release lever 21 and drop worm 19 out of gear with wheel 16. This wheel would then be free to move and would be turned back to its normal position by the action of the weight tending to slide down the cam and by the counterweight 16ª. The parts would again be in normal position and would so stay until motor-circuit was again restored.

The whole mechanism, including operating-motor, will be housed in a suitable water-tight case, (indicated in dotted lines at 55,) extending above crank 7, thus covering all the parts liable to be injured by exposure to the elements.

It will be seen that this signal apparatus has a continual bias or tendency to the danger position, and in case any defect occurs in the electric circuits the semaphore will remain in or return to the danger position. When the signal is in normal or danger position, it is disconnected from its primary actuating mechanism—that is, the operating worm or screw and the motor and cam operated thereby—the signal-operating rod in all positions thereof being out of engagement with said cam when the latter is in normal position.

Having thus described and ascertained the nature of my said invention, what I claim as new therein, and desire to secure by Letters Patent, is—

1. In a signal-locking device, the combination with the signal mechanism provided with means tending to move it to danger position, of an electromagnet and two pivotally-mounted levers, one of which carries an armature for said electromagnet and is adapted to engage by a hook connections with one end of the other lever, the other end of said lever being adapted to engage with the signal mechanism to hold same in safety position, so that the two levers form a compound lever-lock for the signal mechanism.

2. In a railway signaling device, the combination of signal mechanism provided with means tending to move it to danger position, a signal-operating motor, a cam or eccentric driven thereby and adapted to engage the signal mechanism to move the same to safety position, and a locking device for retaining the signal in safety position comprising an electromagnet and two pivotally-mounted levers, one of which carries an armature for the electromagnet and the other is adapted to engage with the signal mechanism to hold same in safety position, the said two levers engaging with another by a hook connection to form a compound lever-lock for the signal.

3. In a railway signal apparatus, the combination of a signal mechanism provided with means tending to move it to danger position, a cam for moving said signal mechanism to safety position, and adapted to run clear of said signal mechanism when the latter is raised to safety position, signal-locking means for holding the signal mechanism in safety position, means for operating the cam, and means for bringing the cam to rest after it has lifted the signal to safety position and has run clear of same.

4. In a railway signal apparatus, the combination of a signal mechanism provided with means tending to move it to danger position, a cam for moving said signal mechanism to safety position, and adapted to run clear of said signal mechanism when the latter is raised to safety position, electromagnetically-controlled signal-locking means for holding the signal mechanism in safety position, means for operating the cam, and means for bringing the cam to rest after it has lifted the signal to safety position and has run clear of same.

5. In a railway signal apparatus, the combination with the signal, its operating-motor and a releasable connection between them, of a detent-magnet controlling said releasable

connection, and a magnetic switch situated near the poles of the motor and responding magnetically to the energization of the motor-field magnet to close a circuit through the detent-magnet.

6. In a railway signaling apparatus, the combination with the signal, its operating-motor, and the motor-circuit, of locking apparatus for the signal, an electromagnet in a circuit parallel to the motor-circuit, having an armature controlling said locking apparatus, a circuit-breaker in the motor-circuit, engaged by said armature and operated directly by the attraction thereof to break the motor-circuit, and a circuit-closer for the circuit of the said electromagnet, controlled by the movement of the signal to safety.

7. In a railway-signal, the combination of a signal with a bias to danger, a rod connected thereto, a cam engaging with said rod to move the signal, a worm-gear attached to said cam, a worm detachably engaging with said worm-gear and tending to move it out of such engagement, means for locking the worm in engagement with the worm-gear, an electric motor operating said worm, and a locking device for retaining the rod in the position to which it is moved by the cam.

8. The combination with a signal having a bias to danger, a rod connected to, and adapted to shift said signal, a cam adapted to engage with, move and clear said rod, a locking device for holding the rod in the position to which it is moved, a worm-gear attached to aforesaid cam, a worm driving said worm-gear, a shaft carrying a gear and said worm-gear and pivotally mounted to carry the worm in and out of engagement with the worm-wheel, an electric motor carrying a gear on its shaft, and engaging the gear on the worm-shaft, the latter shaft being so pivotally mounted that such engagement is maintained during the movements of the worm toward and away from the worm-gear, means for breaking the circuit of the electric motor on completion of operation of the cam, and means responsive to the energization of the motor, for controlling the engagement of the worm with the worm-gear.

9. In a railway signaling device, the combination of a signal with a bias to danger, a cam attached to a worm-gear for shifting said signal and a worm connected to and driven by a motor for turning said gear, and adapted to fall out of gear by gravity, means actuated by the movement of the signal to danger to throw the worm into gear mechanically and means for retaining said worm in gear after it has been so placed.

10. A railway signal system consisting of a signal with a bias to danger, a cam adapted to operate the signal, a motor for operating said cam, an electric circuit for said motor with source of energy in said circuit, a locking device for holding signal in its changed position, a circuit for the locking device parallel to the motor-circuit using same source of energy, a detent-magnet for holding parts in gear, a circuit for said magnet also parallel to motor-circuit using the same source of energy, a circuit-breaker in the last-named circuit controlled by presence of current in the motor-circuit, and a main-circuit breaker for all three circuits actuated by a track-relay connected with a source of energy to the track and adapted to be operated by the short-circuiting of the track.

11. In a railway signal apparatus, the combination with the signal and the signal-operating motor, for changing the position of the signal, and locking mechanism for holding the signal in its changed position, of a locking-magnet having high and low resistance windings and having an armature controlling said locking mechanism, a switch operated by said armature and controlling the circuit of the signal-operating motor and a short circuit for the high-resistance winding of the locking-magnet, also controlled by said switch.

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