W. A. D. SHORT.

ELECTRIC RAILWAY SIGNAL.

APPLICATION FILED SEPT. 6, 1907.

923,901.

Patented June 8, 1909.

5 SHEETS—SHEET 1.

FIG. 1.

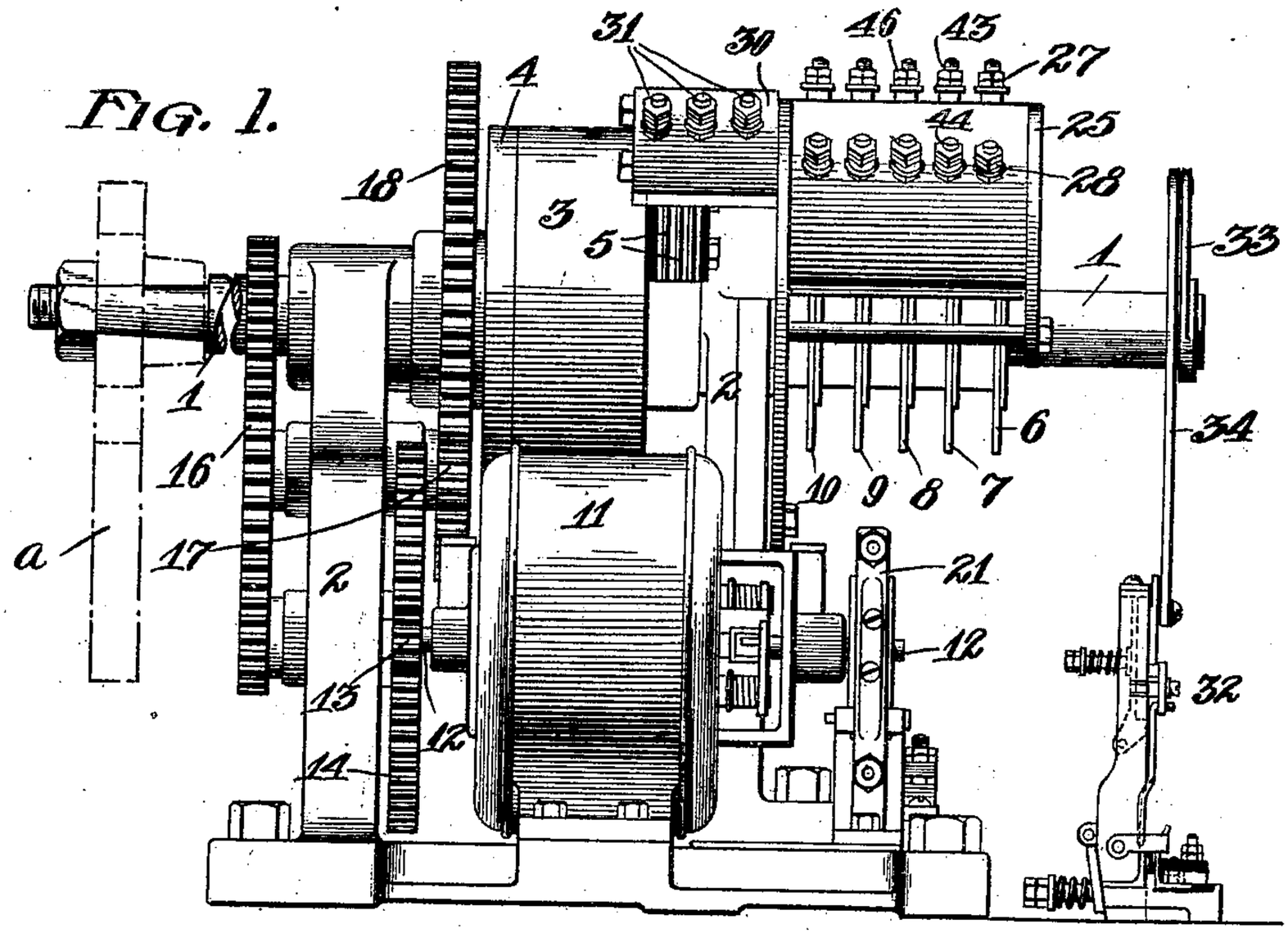
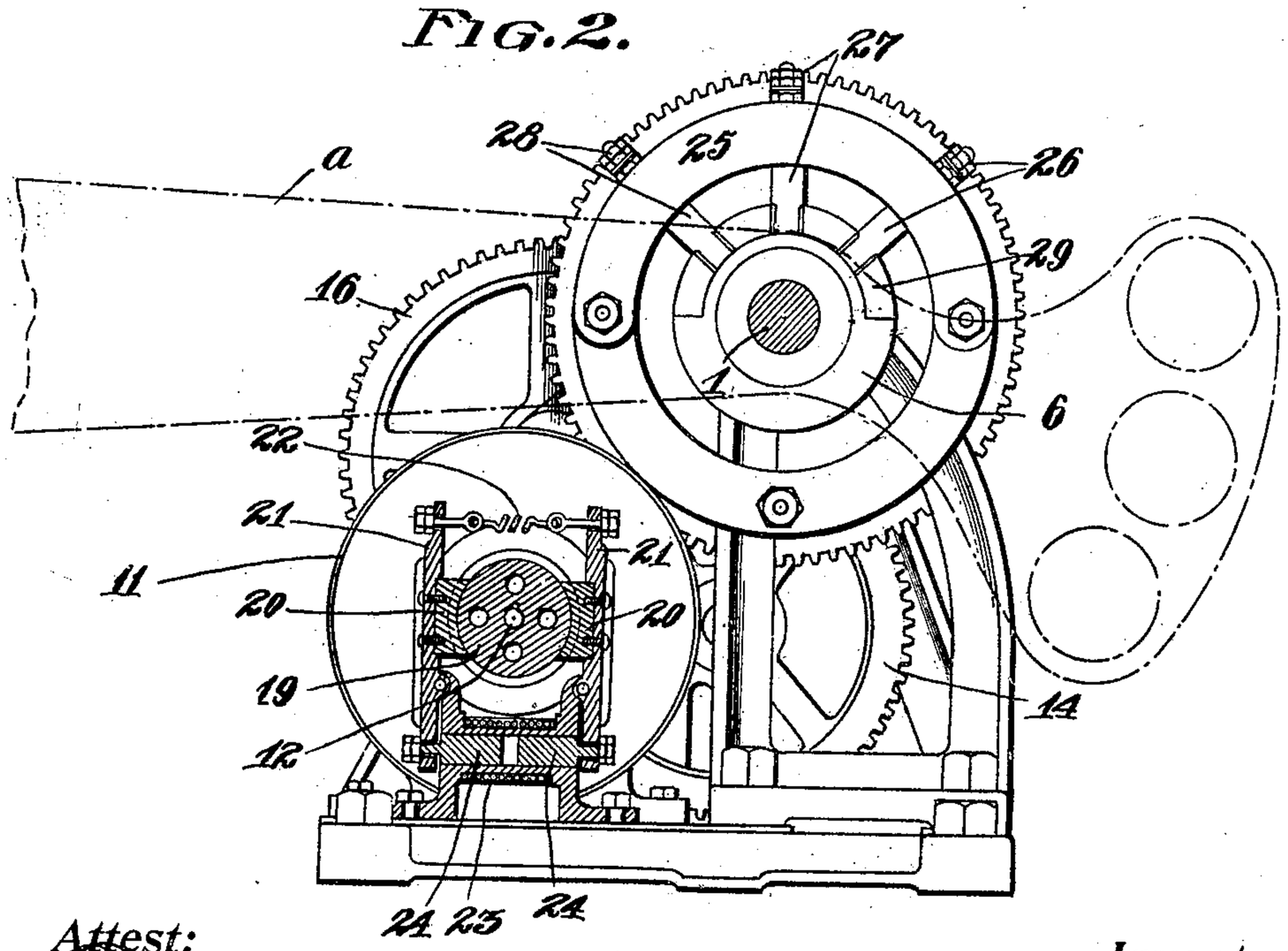


FIG. 2.



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5 SHEETS—SHEET 2.

FIG. 3.

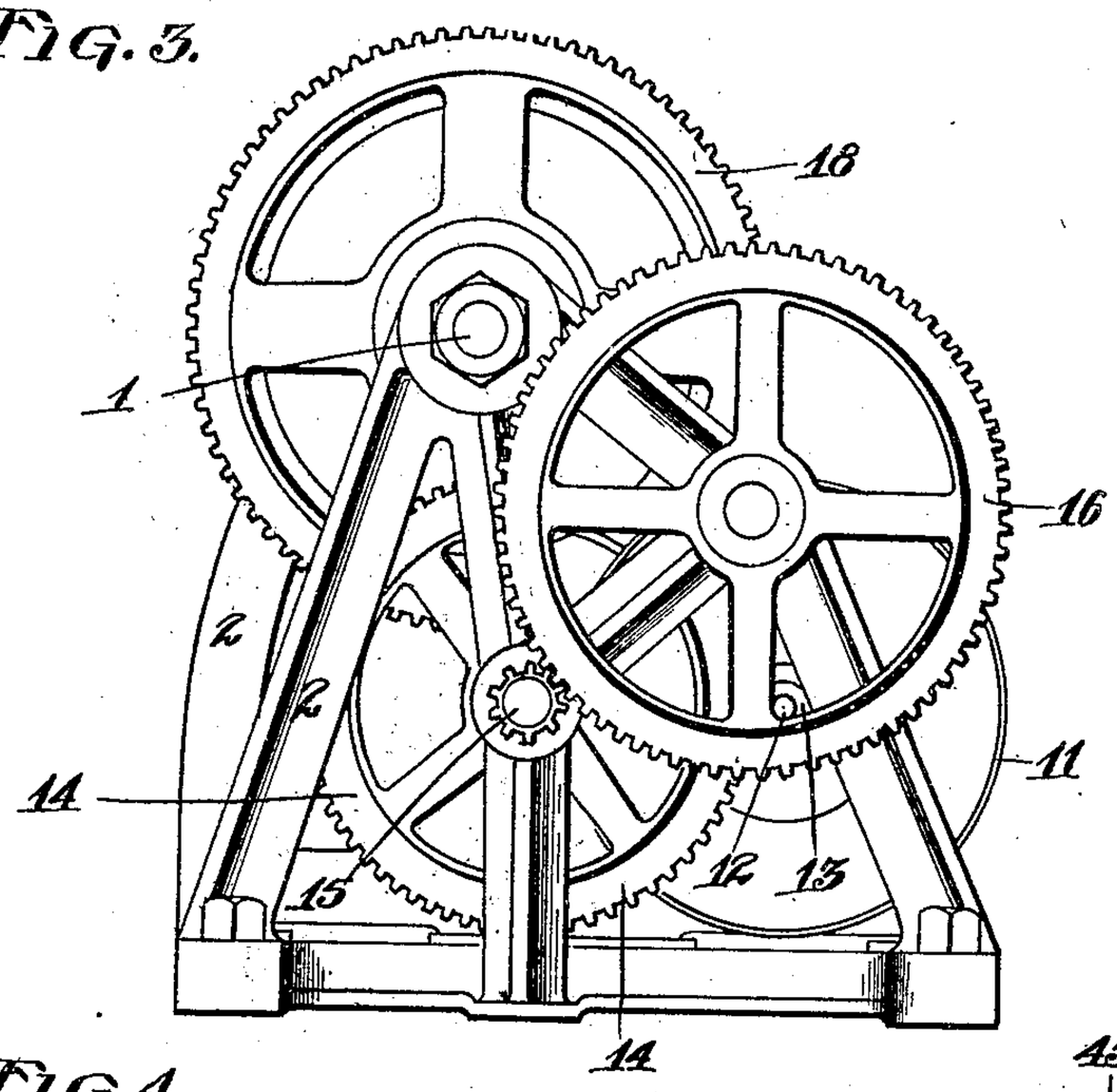
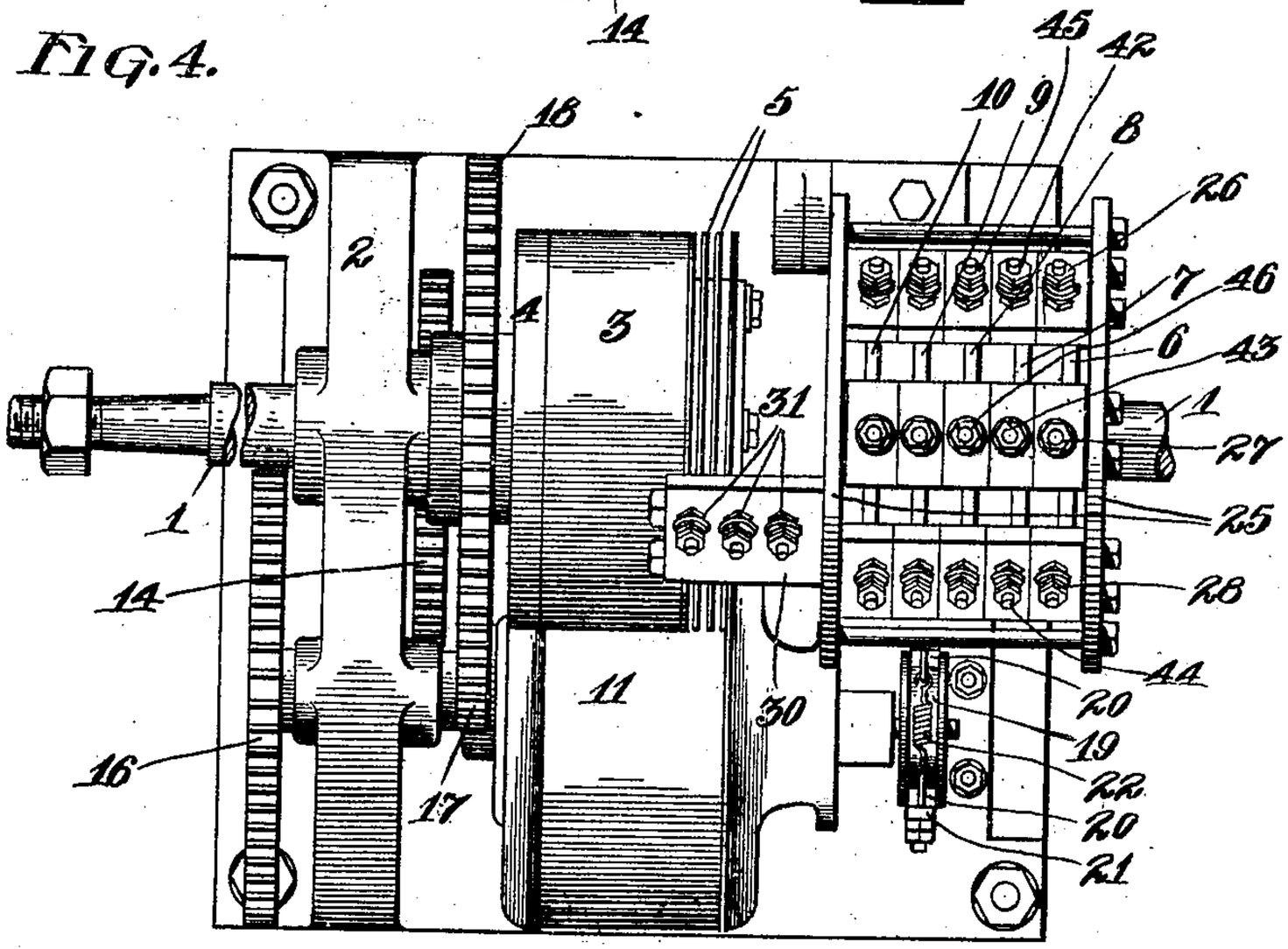


FIG. 4.



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5 SHEETS—SHEET 3.

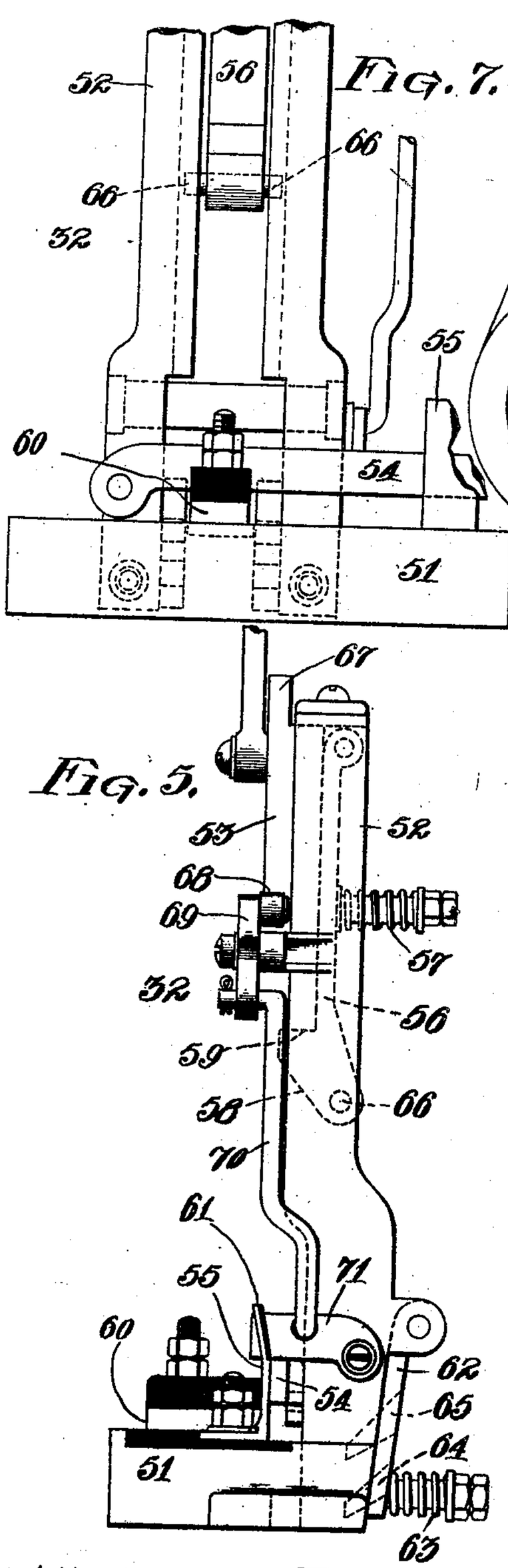

Fig. 7.

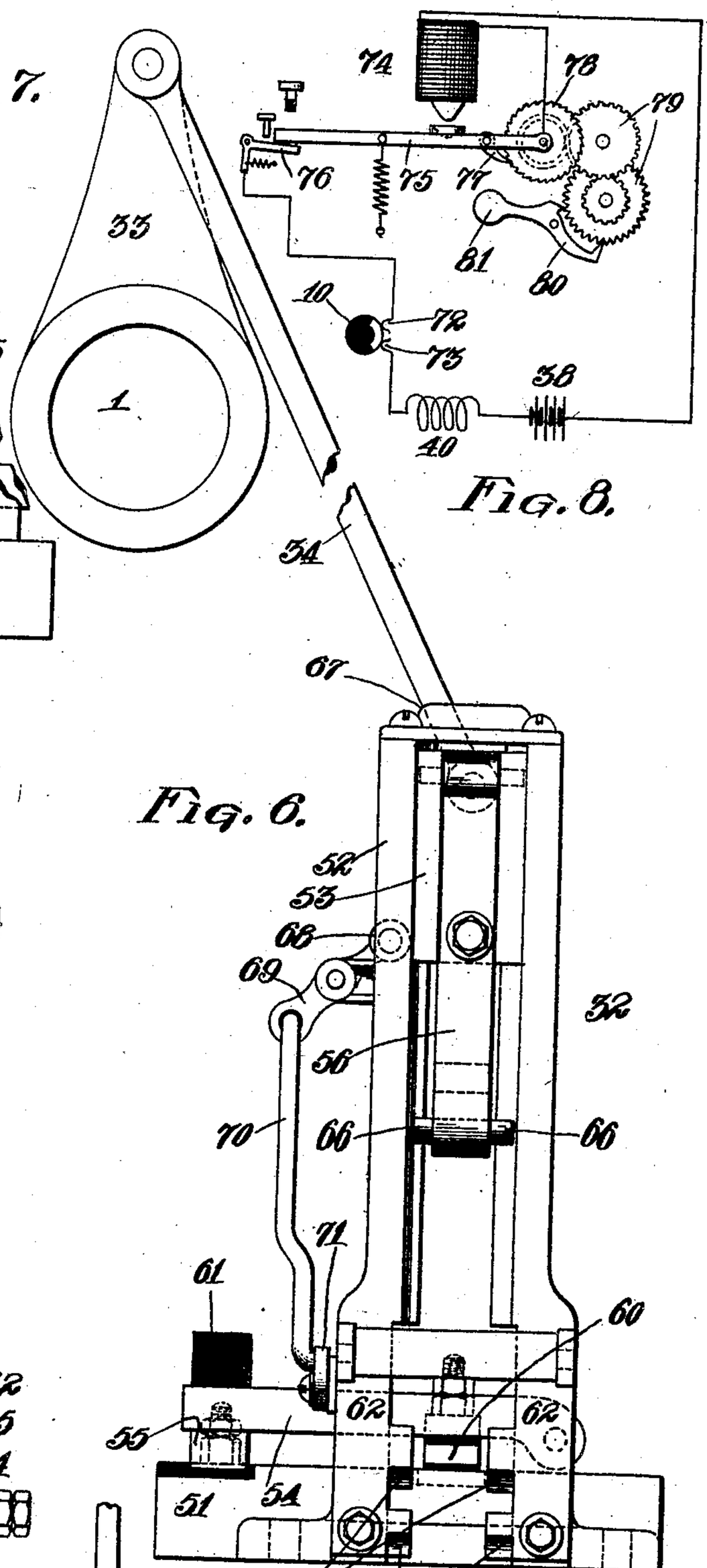

Fig. 8.

Fig. 5.

Fig. 6.

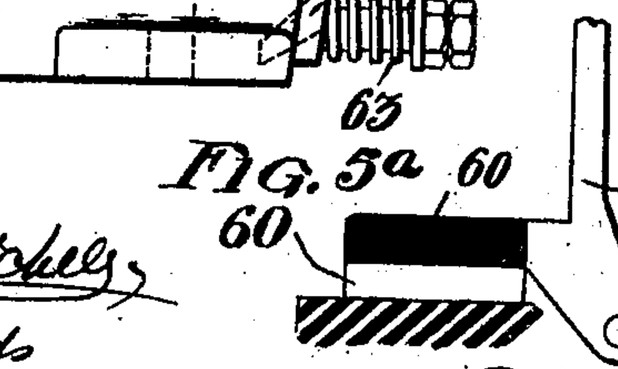

Fig. 5a

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APPLICATION FILED SEPT. 6, 1907.

923,901. Patented June 8, 1909.

5 SHEETS—SHEET 4.

FIG. 9.

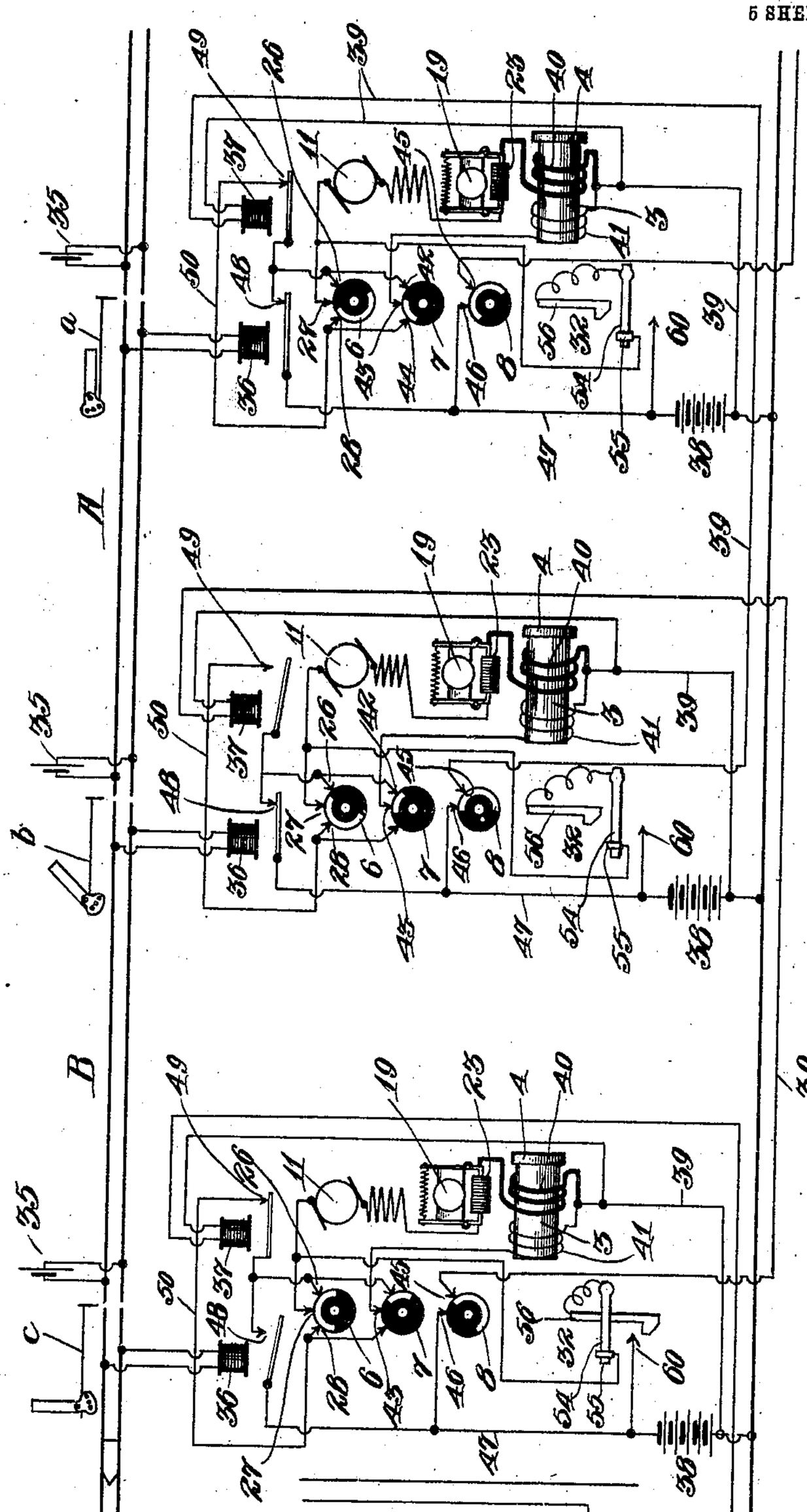
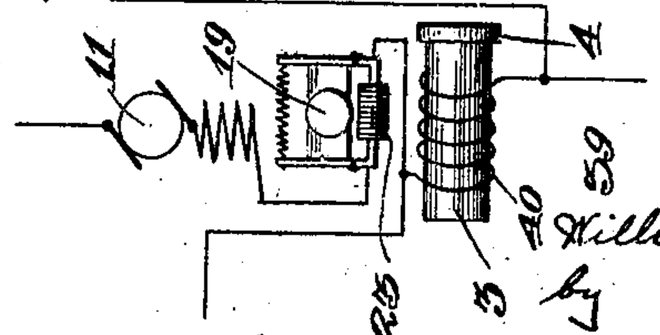


FIG. 10.



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APPLICATION FILED SEPT. 6, 1907.

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5 SHEETS—SHEET 5.

FIG. 11.

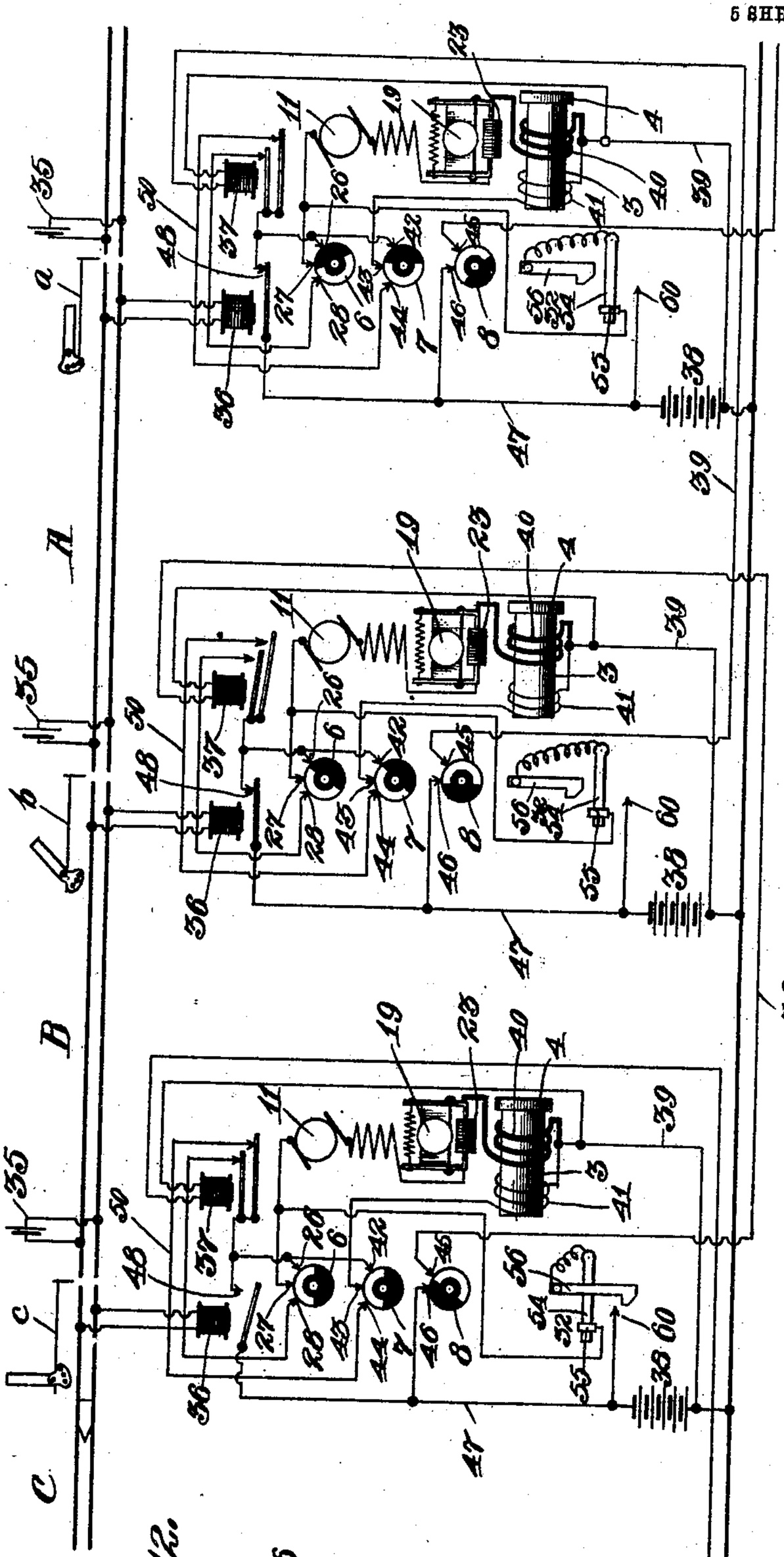
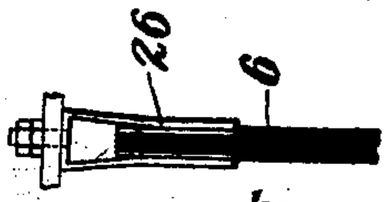


FIG. 12.



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UNITED STATES PATENT OFFICE.

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ELECTRIC RAILWAY-SIGNAL.

No. 923,901. Specification of Letters Patent. Patented June 8, 1909.

Application filed September 6, 1907. Serial No. 391,747.

To all whom it may concern:

Be it known that I, WILLIAM A. D. SHORT, a citizen of the United States, residing in Chicago, Cook county, Illinois, have invented certain new and useful Improvements in Electric Railway-Signals, of which the following is a specification.

This invention relates to improvements in electric railway signals, and particularly to improvements in the operating mechanism of such signals, and more especially signals of the semaphore type. In such signals the semaphore arm proper is usually overbalanced by the "spectacle" casting or equivalent counter-weight, so that although the arm is vertical (hanging downward) in its clear position, the arm as a whole (considering the counterweight as a part of the arm) falls from the clear position to the horizontal or danger position. For returning the signal arm to the clear position, or moving it from danger to an intermediate or caution position and thence to clear, power-operated mechanism of one sort or another, adapted for control by an electric circuit or circuits, are commonly used. According to my present invention, the mechanism for so returning the signal arm comprises a motor, an electric clutch interposed between the motor and the signal arm and which when deënergized permits the signal arm to fall, and circuit controlling means of an improved type in direct connection with the shaft driven through the clutch, and controlling circuits of the motor, clutch, and other parts of the mechanism and, if desired, auxiliary mechanism. I further provide a brake, controlled by said circuit controller, for holding the signal arm stationary in the clear and caution positions; an improved arrangement of circuits and clutch-coils whereby a minimum of current is used when the signal arm is being held; improved means for checking the fall of the signal arm; and other features of invention hereinafter described and set forth in the appended claims.

The objects of my invention are to improve the construction of signal-operating mechanism of the class referred to, to reduce the consumption of current, to make the apparatus simple, compact, reliable, durable, and easily understood, inspected, adjusted, and cared for, to provide simple and reliable circuit controlling means, to check in an improved manner the fall of the signal arm, and generally to produce a superior type of signal-operating mechanism.

I will now proceed to describe my invention with reference to the accompanying drawings, in which one form of apparatus embodying my invention is illustrated, and will then point out the novel features in claims.

In the said drawings: Figure 1 shows a side elevation of my said signal-operating mechanism; Fig. 2 shows a front elevation and partial section thereof, with the shock absorber contact device removed; Fig. 3 shows a rear elevation of such mechanism; and Fig. 4 a top view of such mechanism. Fig. 5 shows a side view of the shock absorber or checking contact device on a larger scale; Fig. 5[a] a detail of a part thereof; Fig. 6 a rear view of such device; and Fig. 7 a detail front view thereof. Fig. 8 is a diagram illustrating an alternative device for checking the descent of the signal arm. Fig. 9 is a diagram illustrating one arrangement of block-signal circuits which may be used with my signal-operating mechanism; Fig. 10 is a fragmentary diagram illustrating an alternative arrangement of a part thereof; Fig. 11 is a diagram similar to Fig. 9, illustrating an alternative arrangement of signal circuits; and Fig. 12 is a detail view of one of the contact brushes and one of the contact disks.

Referring first to Figs. 1 to 4 inclusive, 1 designates a shaft upon which a semaphore arm, or driving means for a semaphore arm, may be mounted. This shaft extends horizontally through the mechanism from front to rear, and is mounted in suitable bearings in the frame 2 of the apparatus and carries the magnet 3 of an electric clutch and the armature 4 of such clutch, said armature being free of the shaft except when the clutch magnet is energized. Said shaft also carries disks 5 employed for connecting the coils of the magnet 3 with external circuit conductors, and also carries disks 6, 7, 8, 9 and 10 of a circuit controller the function of which will be shown presently. A motor 11 is provided for rotating shaft 1 against the influence of gravity acting on a semaphore arm driven by said shaft; motion being transmitted from the motor to said shaft by the following gearing; a pinion 13 on shaft 12, meshing with gear 14; a pinion 15 connected with gear 14 and meshing with gear 16; and a pinion 17 connected with gear 16 and mesh-

ing with gear 18 on shaft 1 and drivingly connected with the clutch armature 4. It will be seen that when the circuit of the clutch 3—4 is closed and motor 11 operates, shaft 1 will be driven through the gearing mentioned and clutch 3—4.

Upon the armature shaft of the motor there is a brake for holding the semaphore arm stationary in the caution or clear positions, the said brake comprising a brake drum 19 on said armature shaft 12, brake shoes 20 mounted upon pivoted arms 21 provided with a spring 22 tending to draw them together and so to press said shoes against the drum, and a solenoid magnet 23 having cores 24 connected to said pivoted arms 21 and arranged, when the coil of said solenoid is energized, to retract said brake shoes.

The circuit controller on shaft 1 comprises, besides the disks 6, 7, 8, 9 and 10, a frame 25 supporting brushes 26, 27, 28, etc., insulated from each other and arranged to make contact with their respective disks; there being, in the arrangement shown, three such brushes for each disk, though this number will be varied, as will the number of the disks, according to the requirements of the circuits with which the signal is to be used. Each of said disks comprises a base of insulation material, upon which is mounted a conductive segment 29 of such angular length as required by the circuit conditions. In the circuits shown herein, none of these segments 29 need be longer than about 180°, and some of them may be shorter; and I require only three of the disks, 6, 7 and 8, the others, 9 and 10, being provided for purposes not herein specially illustrated, such as the operation of indicator or annunciator circuits, crossing bells, etc. The frame of the circuit controller also carries a support 30 for terminals 31 of brushes like 26, 27 and 28, which make contact with the disks 5 of the clutch 3—4, and serve to convey current to and from the coils of said clutch.

In some cases I employ, in connection with the mechanism already described, shock-absorbing contact mechanism 32, illustrated in greater detail in Figs. 5, 6 and 7, or the alternative apparatus illustrated in Fig. 8, comprising means whereby, when the semaphore arm has fallen nearly to the horizontal position, the circuit of the clutch 3—4 is closed momentarily, with or without closing momentarily and then opening again the circuit of the motor, so converting the clutch, gearing, and, if desired, the motor also, into means for checking the fall of the signal arm. In the construction illustrated in Figs. 5, 6 and 7, the shock-absorbing contact mechanism is operated from shaft 1 through a crank arm 33 on said shaft and a pitman 34. The construction of this contact mechanism will be described hereafter.

Referring now to the circuit diagrams, and at first to Fig. 9, I have shown in this figure three insulated block sections, A, B and C, with like circuits and apparatus for each. *a*, *b*, and *c* are the signals for these three blocks. Each block section has its customary track battery 35 connected across the rails, as shown; the battery for each block being connected to the rails at the end of the block, and the signal for that block being located at or near the entrance to the block. For each block there is a relay 36 connected across the track, as shown, also another relay 37 controlled by a circuit from the block ahead as hereinafter described.

In Fig. 9 I have shown the apparatus of block A in the condition corresponding to the "clear" position of the signal; the apparatus of block B in the condition corresponding to the "caution" position of the signal; and the apparatus of block C in the condition corresponding to the "danger" position of the signal. At each block there is a signal battery 38.

The circuits of each block are as follows: A conductor 39 extends from one pole of battery 38 to the coils of clutch magnet 3 (in Fig. 9 I have indicated said clutch magnet as provided with two coils, 40 and 41) thence through coil 40 and the brake solenoid 23 and the field and armature of the signal motor 11, to the contact brush 27 of disk 6 of the circuit controller. The circuit of conductor 39 also passes through clutch coil 41 to the contact brush 43 of the circuit controller disk 7; also through the magnet of relay 37 through the signal conductor 39 to the signal apparatus of the block next in advance and to the brush 45 of disk 8 thereof. Another circuit conductor 47 extends from the opposite pole of battery 38 to the circuit controller brush 46 of the home signal mechanism, also to the armature of the home signal relay 36, and thence, if the contact of that relay be closed, to the armature of the other relay, 37, and if the armature contact of that relay be closed, to brushes 28 and 44; also from the contact of relay 36 to brushes 26 and 42; also from conductor 47 to the home shock-absorbing contact device 32. Normally, that is to say, with the parts as shown at block A, the circuit through clutch coil 41 is completed through brush 43, disk 7, brush 44, conductor 50 to the contact 49 of relay 37, and the contact of relay 36 and conductor 47 back to battery; said clutch being energized, therefore, so that the signal arm is held in its clear position by said clutch and by the brake, the solenoid 23 of the brake being deënergized and the motor at rest since brush 27 is not in contact with the conductive portion of its disk 6.

Supposing a train to enter the block, the track circuit theretofore passing through the coils of relay 36 will be short-circuited, and the armature of that relay will drop, breaking

the circuit through the clutch coil 41 and so releasing the signal arm and causing it to fall to the danger position. The circuit controller disks rotate with the signal arm in such movement, through about 90°. The parts are then in the positions and condition indicated in Fig. 9 at block C. As will be seen by examining the circuits for that block, when the signal of a block is at danger the circuit from battery 38 of that block through brushes 46 and 45 and conductor 39 to the magnet of the relay 37 of the block next in rear is broken at brush 46, and when the train has passed completely out of the block in rear into that block the signal of which has just gone to danger, the relay 36 of such block is again energized, and completes a circuit from its battery 38 through conductor 47, the armature of said relay, and the contact stop 48 thereof, to the brush 26 and thence through disk 6 (still in the danger position) to brush 27, the armature and field of signal motor 11, brake solenoid 23, and clutch coil 40 back to battery. The motor so energized moves the signal arm to the caution position (approximately 45°); and when such position is reached disk 6 has rotated far enough to break at brush 26 the circuit through the motor and brake solenoid and clutch coil 40, and disk 7 has rotated far enough to complete circuit through clutch coil 41; so that the signal arm is arrested in the caution position, and held there by clutch coil 41 and the brake on the shaft of the motor. The parts are then in the condition indicated at block B, Fig. 9. As soon as the circuit controller disks reach the caution position shown at block B, disk 8 completes a circuit from battery 38 through brushes 46 and 45 and conductor 39 to the relay 73 of the block behind, (block A), energizing that relay; whereupon a circuit is completed from battery 38 of that block through relays 36 and 37 and brushes 28 and 27 and disk 6, and through the signal motor 11, solenoid 23, and clutch coil 40, back to battery, thus releasing the brake and energizing the motor and causing the latter to move the signal arm to the clear position; and as soon as such position is reached disk 6 will break the circuit through the motor, solenoid, and coil 40 at brush 27, and disk 7 completes the circuit of clutch coil 41 through brushes 44 and 43, so that the signal arm is held in the clear position. The parts are then in the condition indicated for block A, in Fig. 9.

Clutch coil 41, the purpose of which is to maintain magnetism in the clutch sufficient to hold the signal arm stationary, need not energize said clutch as strongly as coil 40, the coil which is in circuit when the motor is operating; therefore I commonly make coil 41 of relatively high resistance, and coil 40 of relatively low resistance, as indicated in Fig. 9 by the relative weight of the lines indicating said coils. By employing two coils, one of high resistance and the other of low resistance, and by operating them in the manner above described, I reduce very greatly the consumption of current while the signal arm is being held in the clear or caution position. Obviously, however, I may employ a single clutch coil in circuit at all times when the signal arm is not at or moving to the danger position, the coil being then located between battery 38 and the point where the circuit branches to the brake solenoid and to the controller disk 7; and the fragmentary diagram, Fig. 10, shows such an arrangement. Or, I may have both clutch coils in circuit simultaneously when the motor is operating. Fig. 11 indicates this latter arrangement, the circuits being the same as in Fig. 9 except that the relay 37 of each block has a second armature controlling the circuit to brush 44 and thence through disk 7 and brush 43 to the coil 41 of the clutch, this circuit not being controlled by that armature of relay 37 which controls the circuit to brush 28 and thence through disk 6 and brush 27 to the motor.

As will clearly appear from Fig. 11, when the train passes from block B to block C and the relay 36 of block B is energized and the circuit controller of block B moved to the position shown, not only is there a circuit completed, as described with reference to Fig. 9, from battery 38 through the armature of relay 36, disk 6, motor 11, brake solenoid 23, and clutch coil 40, but a circuit is also completed from battery 38 through the armature of relay 36 to brush 42, disk 7 and brush 43 and clutch coil 41; so that in this way both clutch coils are energized. Likewise, when the circuit controller disks at block B have been moved to the caution position, and relay 37 at block A is energized, circuits are completed from battery 38, through the armature of relay 36 and through one armature of relay 37 to brush 28, disk 6, brush 27, the motor, the brake solenoid, and coil 40; and also from the armature of relay 36 through the other armature of relay 37, brush 44, disk 7, brush 43, and coil 41. Thus it will be seen that while only coil 41 is energized when the signal arm is stationary at caution or clear position, both coils are energized when the motor is moving the signal arm.

The contact device 32 for closing circuit to check the descent of the signal arm, comprises a base 51 and upright 52, the latter provided with guides for a cross-head 53 to which the pitman 34 is pivoted; said pitman connecting said cross-head to the crank-arm 33 on shaft 1, as above stated, so that as the shaft rotates (its maximum movement is through an arc of about 90°) the cross-head is raised and lowered alternately. Across the front of the upright 52 is the pivoted arm

54 of a switch, said arm adapted to make contact with a contact spring 55. The cross-head carries a contact hook 56, pivoted to the cross-head, and normally pressed toward the front by a spring 57. This hook is adapted to slip in under the switch arm 54, when the cross-head has nearly reached the lower limit of its movement, said hook being provided with an inclined cam-surface 58 which, when it encounters the upper edge of the arm 54, causes the hook to move back until the shoulder 59 of the hook passes below said arm 54, whereupon said hook again springs forward, making contact as it does so with an insulated contact piece 60. The effect of the closing of contact between 56 and 60 in this manner is, as will be explained presently, to close circuit through the clutch magnet and also through the field and armature of the motor; whereupon the motor, being energized, raises the signal arm slightly, the hook 56 moving up with it, and in so doing carrying up the switch arm 54 and breaking contact between said arm and contact piece 55, thereby (as will be shown presently) breaking the circuit through the motor and clutch magnet and permitting the signal arm to descend again, carrying with it the cross-head 53 and hook 56; but arm 54 and contact 56 being no longer in contact, (the upper portion 61 of 55 being of insulation material as shown) the circuit through the motor and clutch is not again closed, and the signal arm is permitted to fall clear to the danger position and to remain there until the relay 36 is energized, as previously described. The upright 52 is provided, near its lower end, with a pivoted gate 62, normally pressed forward by springs 63, and provided with guide ribs 64, 64, and 65, 65, adapted to engage lugs 66 projecting from the sides of the hook 56, as shown. As the cross-head 53 descends to the lower limit of its travel, these lugs 66 engage the upper surfaces of the guide ribs 65 and 64, and press the gate 62 backward; the hook being thereby permitted to descend to the lower limit of its travel. When the cross-head moves up again, the lugs 66 engage the lower surfaces of the guide ribs 64, and thereby the hook is pulled back as it moves up, so that it does not engage contact piece 60 or switch arm 54. The signal arm and the cross-head 53 may therefore return to clear position without further operation of the contact pieces. Guides 65 are provided to force the hook back in the same manner in case for any reason the signal arm is caused to go to caution or clear before it has reached its full danger position and before the cross-head and hook have descended to the limit of their travel. They act in the same manner as guides 64.

By reference to Fig. 9 or Fig. 11, in which the parts of this contact device are indicated diagrammatically, the manner of operation will be seen. When hook 56 makes contact with contact piece 60, since it is in electrical connection with switch arm 54 through the upright 52, it completes a circuit from battery 38, through 60, 56 and 54 to contact piece 55, thence to the field and armature of the motor, the brake solenoid, and clutch coil 40 back to battery. The motor being energized, raises the signal arm through a few degrees (but not far enough to make a perceptible change in the signal indication), in so doing causing hook 56 to lift arm 54 and break contact between said arm and contact 55, so again breaking the motor circuit. The signal arm then falls to the full extent of its travel, and hook 56 likewise descends to the full limit. As the cross-head 53 nears the lower limit of its travel it encounters arm 54 and presses it down into contact with contact piece 55. Should the signal blade drop and should contact not be closed between parts 54 and 55 while the blade is in the danger position, said parts 54 and 55 will remain out of contact until a lug 67 on the cross-head 53 engages with a friction wheel 68 on a lever 69 connected by a rod 70 to a lever 71 adapted, when so actuated, to depress the switch arm 54 into engagement with contact 55.

It will be seen that by throwing the clutch and motor in, when the signal blade is nearly in the danger position, the signal mechanism itself is caused to check the fall of the signal blade, which it can easily do without strain. In many cases it will be sufficient merely to close the circuit of the clutch without energizing the motor, the inertia of the signal blade being absorbed in the gearing of the mechanism. Fig. 8 illustrates diagrammatically simple means for doing this. One of the disks of the circuit controller (disk 10, for example) is arranged to complete circuit between two brushes, 72 and 73, when the signal blade has nearly reached danger position; and these brushes are in a local circuit including battery 38, the clutch coil 40, the magnet of a relay 74, and the armature 75 of that relay and a continuity-preserving contact point 76 of that relay. As soon as such local circuit is closed the clutch is energized, and the movement of the signal blade is transmitted to the mechanism, the inertia of which will absorb the inertia of the signal blade, bringing the latter to rest easily. The relay 74 being also energized, breaks the local circuit by breaking contact between its armature and contact point 76; but the local circuit has been energized long enough for the purpose before such contact is broken; residual magnetism in the clutch magnet being sufficient to prolong the retardation somewhat after the local circuit is broken. As soon as the local circuit is broken, the armature of the relay of course moves back again; but movement in the backward direc-

tion is retarded and regulated by engagement of a pawl 77 with a ratchet wheel 78 driving a clock train 79 regulated by an escapement 80 having a pendulum 81, or any other suitable retarding device.

It will be obvious that a great variety of devices for retarding the return of the relay armature may be devised, and I do not limit myself to the use of any particular device for the purpose.

What I claim is:—

1. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electro-magnetic friction clutch, having both high resistance and low resistance coils, and a rotary circuit controller in driving connection with said shaft and comprising contact means controlling said clutch and driving means, said contact means including means for throwing the low-resistance clutch coil into circuit when the signal is to be operated by the motor, and for throwing the high-resistance clutch coil into circuit when the signal is to be held.

2. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electrically-controlled motor and an electro-magnetic friction clutch, having both high resistance and low resistance coils, and a rotary circuit controller in driving connection with said shaft and comprising contact means controlling said clutch and motor, said contact means including means for throwing the low-resistance clutch coil into circuit when the signal is to be operated by the motor, and for throwing the high-resistance clutch coil into circuit when the signal is to be held.

3. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electro-magnetic friction clutch mounted on said shaft, having both high resistance and low resistance coils, and a circuit controller comprising contact means likewise mounted on said shaft, said contact means including means for throwing the low-resistance clutch coil into circuit when the signal is to be operated by the motor, and for throwing the high-resistance clutch coil into circuit when the signal is to be held.

4. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor, and a circuit controller including a plurality of rotary contact members mounted on said shaft, a stationary segmental frame spanning said contact members, and brushes for said contact members carried by said frame.

5. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electrically-controlled clutch, an electrically-controlled brake, and a circuit controller operating in synchronism with said shaft and controlling said clutch and brake.

6. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electrically-controlled clutch, an electrically-controlled brake, and a circuit controller comprising contact means on said shaft and contact means controlling said clutch and brake.

7. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electrically-controlled clutch, and a driving motor, a brake having a controlling magnet in circuit with said motor, and a circuit controller operated in synchronism with said shaft and comprising contact means controlling said clutch and contact means controlling said motor and brake.

8. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including a driving motor, an electrically-controlled brake, and a circuit controller operated in synchronism with said shaft and comprising contact means controlling said motor and brake.

9. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including a driving motor, a brake having a controlling magnet in circuit with said motor, the brake arranged to be set when the magnet is deënergized, and a circuit controller operated in synchronism with said shaft and comprising contact means arranged to complete and break circuit through said motor and brake magnet.

10. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electric motor, an electric clutch on said shaft, and gearing connecting said motor and clutch, a brake comprising a brake-drum on the shaft of said motor and a controlling magnet, and means controlling said clutch, motor, and brake-magnet.

11. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electric motor, an electric clutch, and gearing, a brake comprising a controlling magnet, and a circuit controller drivingly connected to said signal-operating shaft and comprising contact means controlling said clutch, motor, and brake-magnet.

12. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electric motor, an electric clutch, and gearing, a brake comprising a controlling magnet, and a circuit controller drivingly connected to said signal-operating shaft and comprising a motor-controlling disk and a clutch-controlling disk and brushes adapted to make contact with said disks.

13. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electric motor and an electric clutch, and a brake for said shaft comprising a controlling magnet, and a circuit controller drivingly connected to said signal-operating shaft and comprising a motor-controlling disk and a clutch-controlling disk and brushes adapted to make contact with said disks.

14. A railway signal mechanism comprising in combination a signal-operating shaft, driving means therefor including an electric motor and an electric clutch, an electrically-controlled brake, and a circuit controller drivingly connected to said signal-operating shaft and comprising a motor-controlling disk, a brake-controlling disk, and a clutch-controlling disk and brushes adapted to make contact with said disks.

15. A railway signal mechanism comprising in combination a signal-operating member, driving means therefor including an electric motor, a brake having a controlling magnet, and an electric clutch, said motor and brake acting through said clutch, said clutch comprising low-resistance and high-resistance coils, and circuit controlling means comprising contact means adapted to energize the low-resistance coil when the motor is operating and to energize the high-resistance coil when the brake is operating, and comprising also contact means controlling said motor and brake.

16. A railway signal mechanism comprising in combination a signal-operating shaft, a motor for driving the same, a brake-drum, means for placing said drum in connection with said shaft, brake-shoes for said drum and a spring tending to hold said shoes against said drum, and a magnet and armatures therefor arranged to retract said shoes when the magnet is energized.

17. A railway signal mechanism comprising in combination a signal-operating member, driving means therefor, means for connecting said driving means to and disconnecting it from said member, and checking means arranged to operate said connecting means to connect said member and driving means to check the motion of said member.

18. A railway signal mechanism comprising in combination a signal-operating member, driving means therefor comprising a motor and clutch, and checking means arranged to operate said clutch to connect the motor to said member to check the motion of the latter.

19. A railway signal mechanism comprising in combination a signal-operating member, driving means therefor comprising a motor and clutch, and checking means arranged to operate said clutch to connect the motor to said member and comprising also means for operating said motor simultaneously with such operation of the clutch.

20. A railway signal mechanism comprising in combination a signal-operating member, driving means therefor comprising an electric motor and an electrically-controlled clutch, and checking means comprising contact means in circuit with said motor and clutch and adapted to energize the clutch and the motor, and comprising also means for breaking the circuit through said clutch and motor after momentary energization thereof.

21. A railway signal mechanism comprising in combination a signal-operating member, driving means therefor comprising a motor and an electrically-controlled clutch, and checking means comprising contact means operated in synchronism with said signal-operating member and arranged to close said clutch momentarily and then to open the same.

22. A railway signal mechanism comprising in combination a signal-operating member, driving means therefor comprising a motor and an electrically-controlled clutch, and checking means comprising a reciprocating member driven from said signal-operating member, a switch through which the circuit to said clutch and motor passes, and a hook carried by said reciprocating member and arranged to close circuit through said switch and to engage same and open it as the motor begins to operate.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

WILLIAM A. D. SHORT.

Witnesses:
THEODORE STENSLAND,
OSCAR AMUNDSEN.