No. 744,248. PATENTED NOV. 17, 1903.

J. SHOECRAFT.

RAILWAY SIGNALING SYSTEM.

APPLICATION FILED AUG. 30, 1902.

NO MODEL. 4 SHEETS—SHEET 1.

Fig. 6.

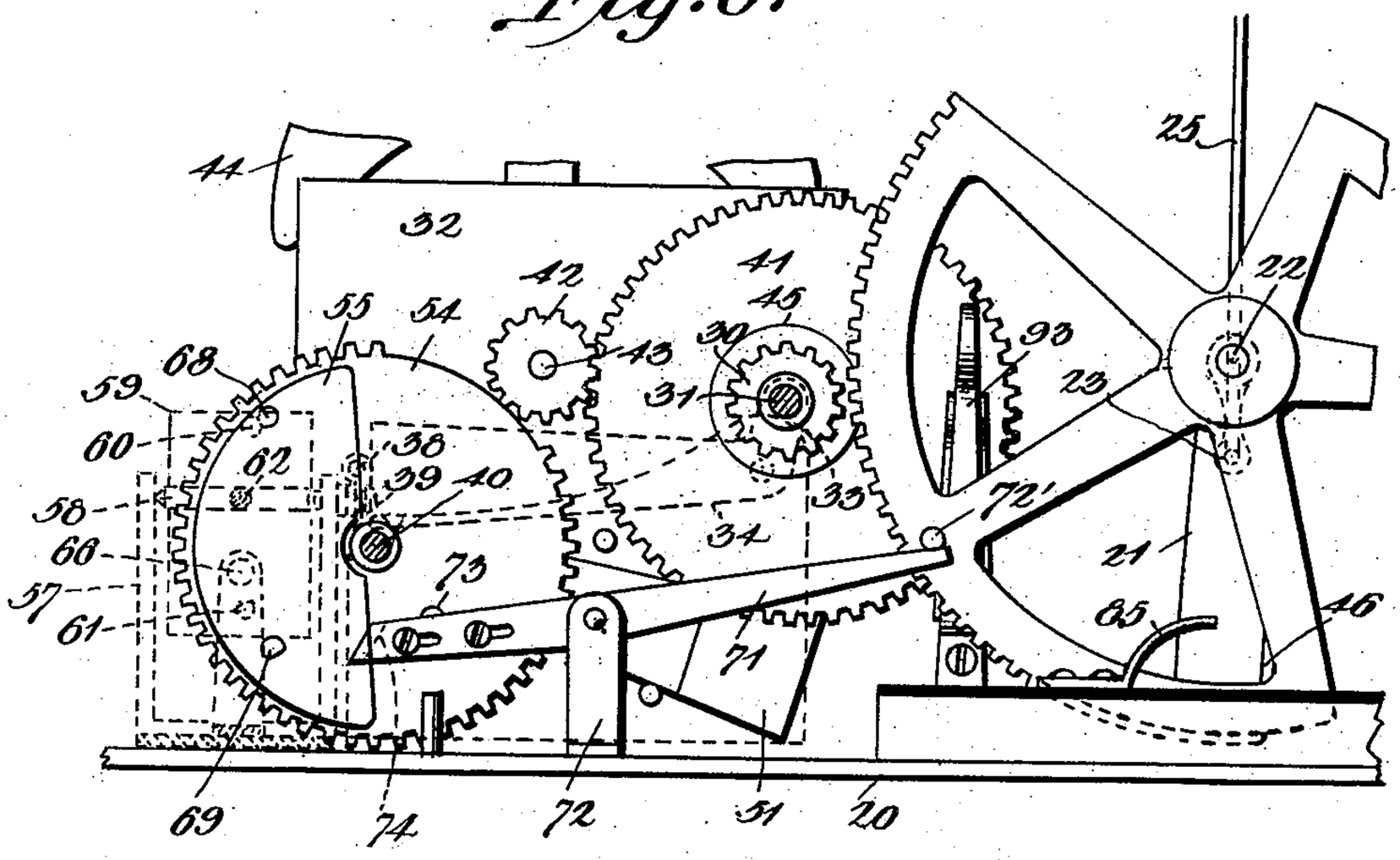
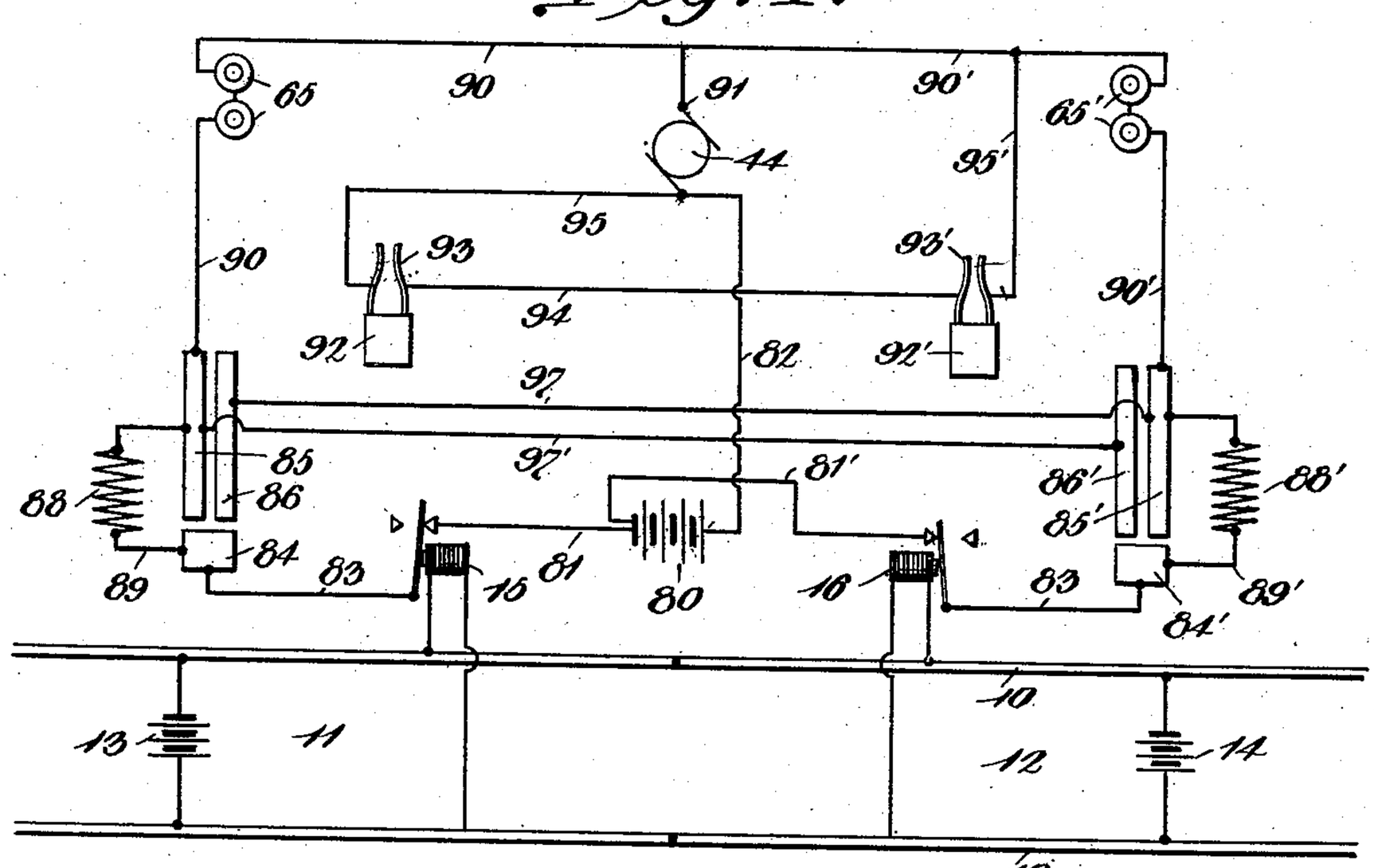


Fig. 1.



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No. 744,248. PATENTED NOV. 17, 1903.

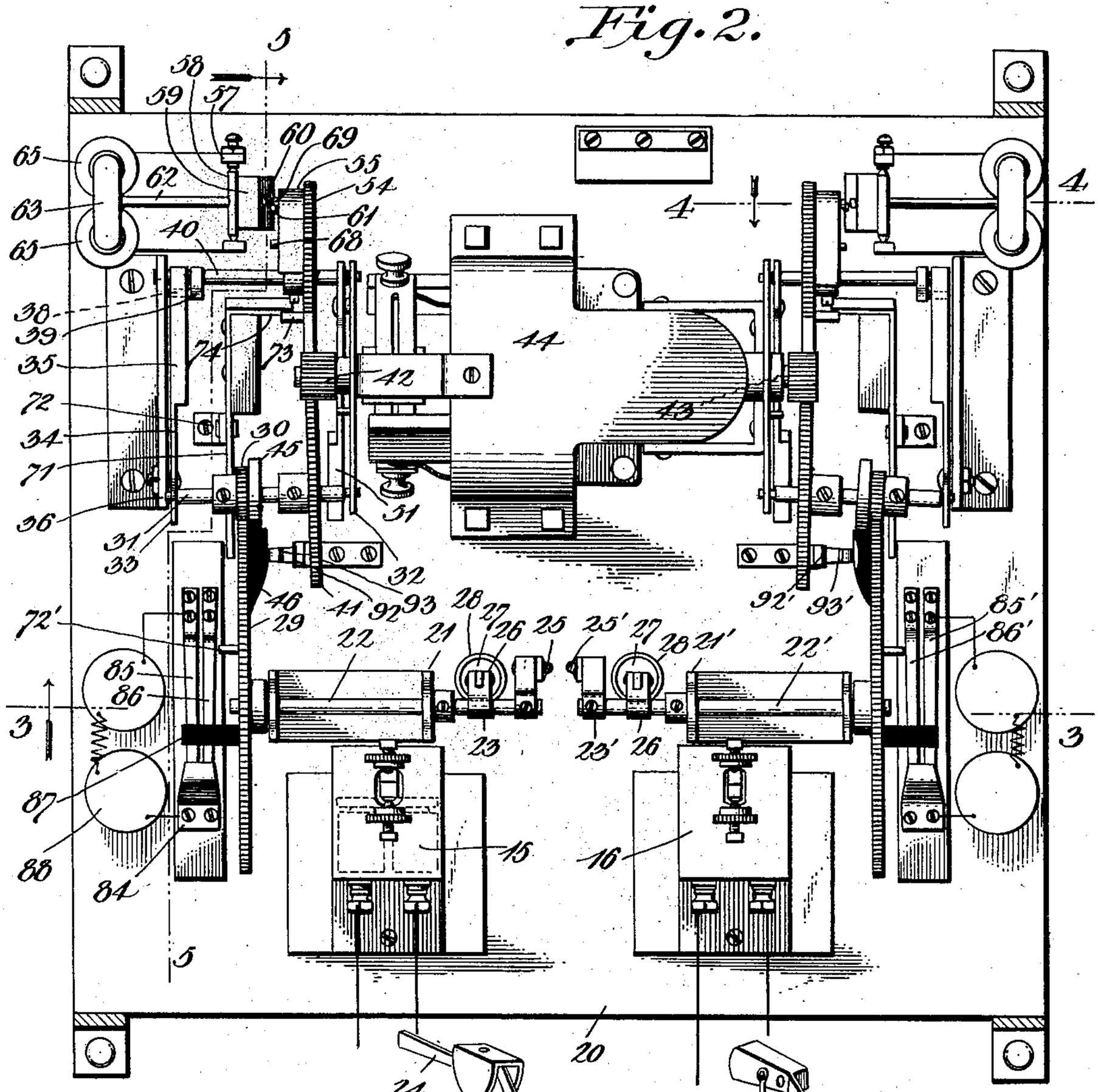
J. SHOECRAFT.

RAILWAY SIGNALING SYSTEM.

APPLICATION FILED AUG. 30, 1902.

NO MODEL. 4 SHEETS—SHEET 2.

Fig. 2.



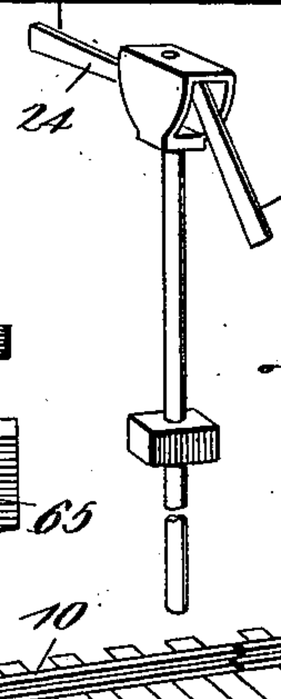


Fig. 11.

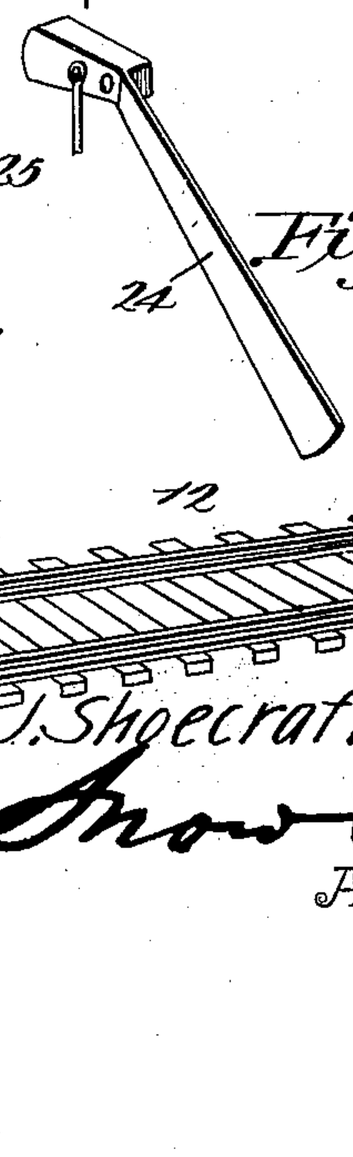


Fig. 12.

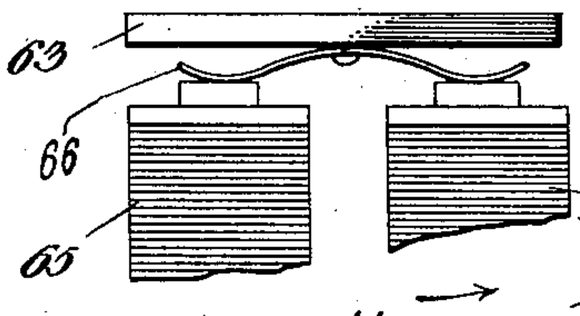
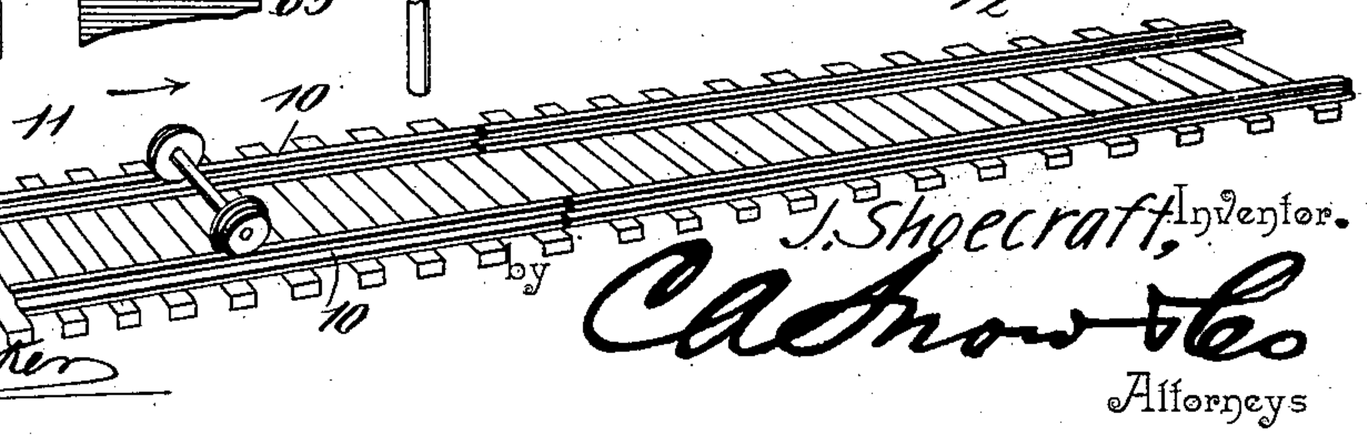


Fig. 13.



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No. 744,248. PATENTED NOV. 17, 1903.

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RAILWAY SIGNALING SYSTEM.

APPLICATION FILED AUG. 30, 1902.

NO MODEL. 4 SHEETS—SHEET 3.

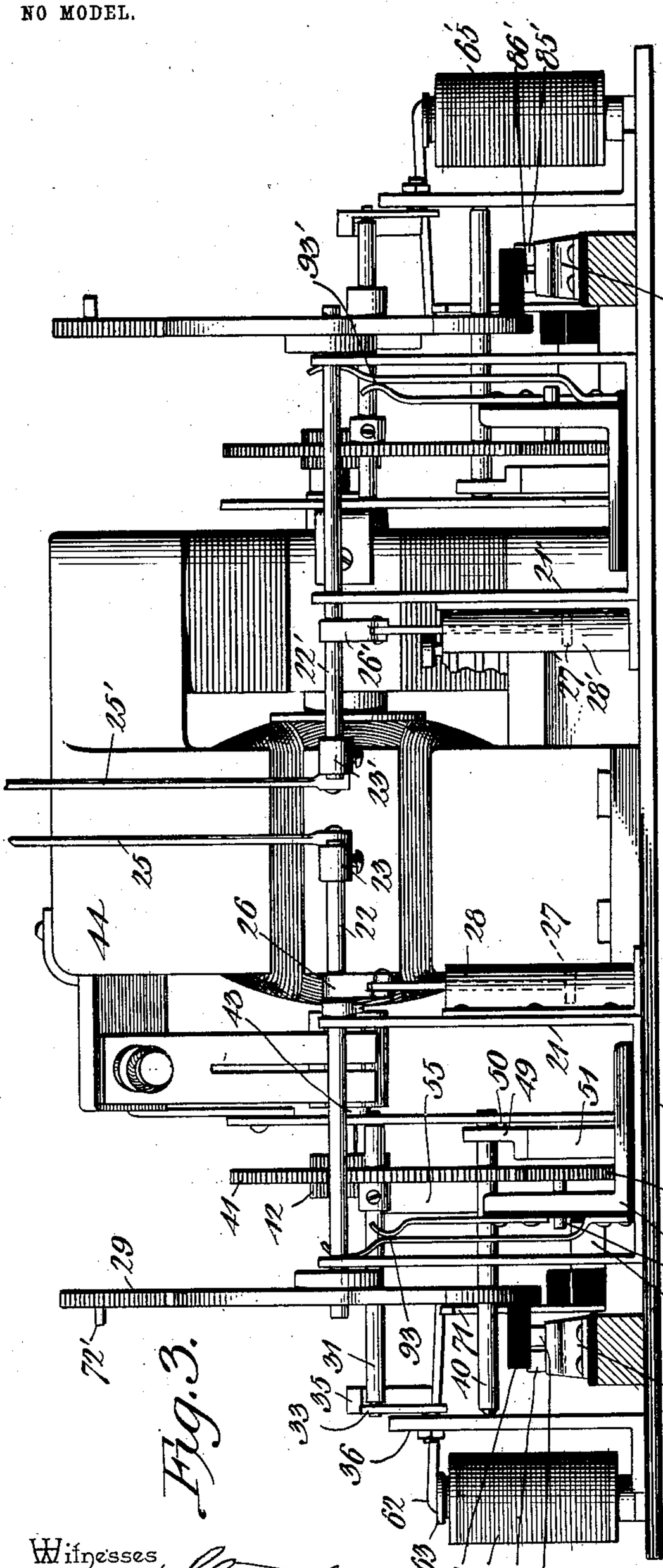

Fig. 3.

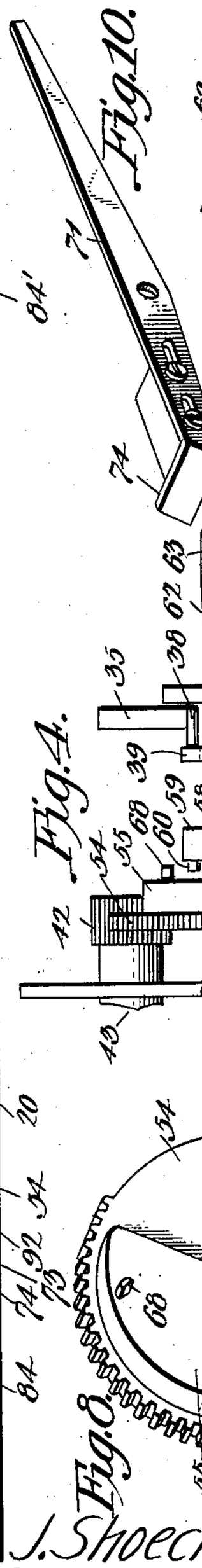

Fig. 10.

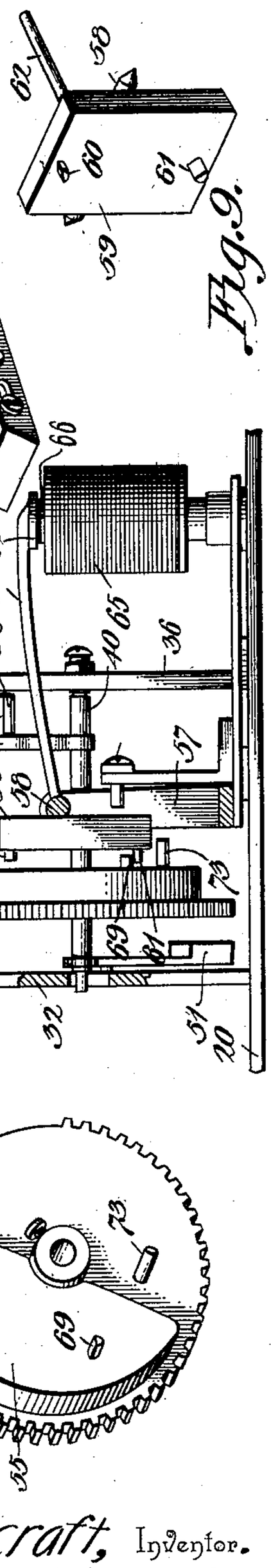

Fig. 9.

Fig. 8.

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No. 744,248. PATENTED NOV. 17, 1903.

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RAILWAY SIGNALING SYSTEM.

APPLICATION FILED AUG. 30, 1902.

NO MODEL. 4 SHEETS—SHEET 4.

Fig. 7.

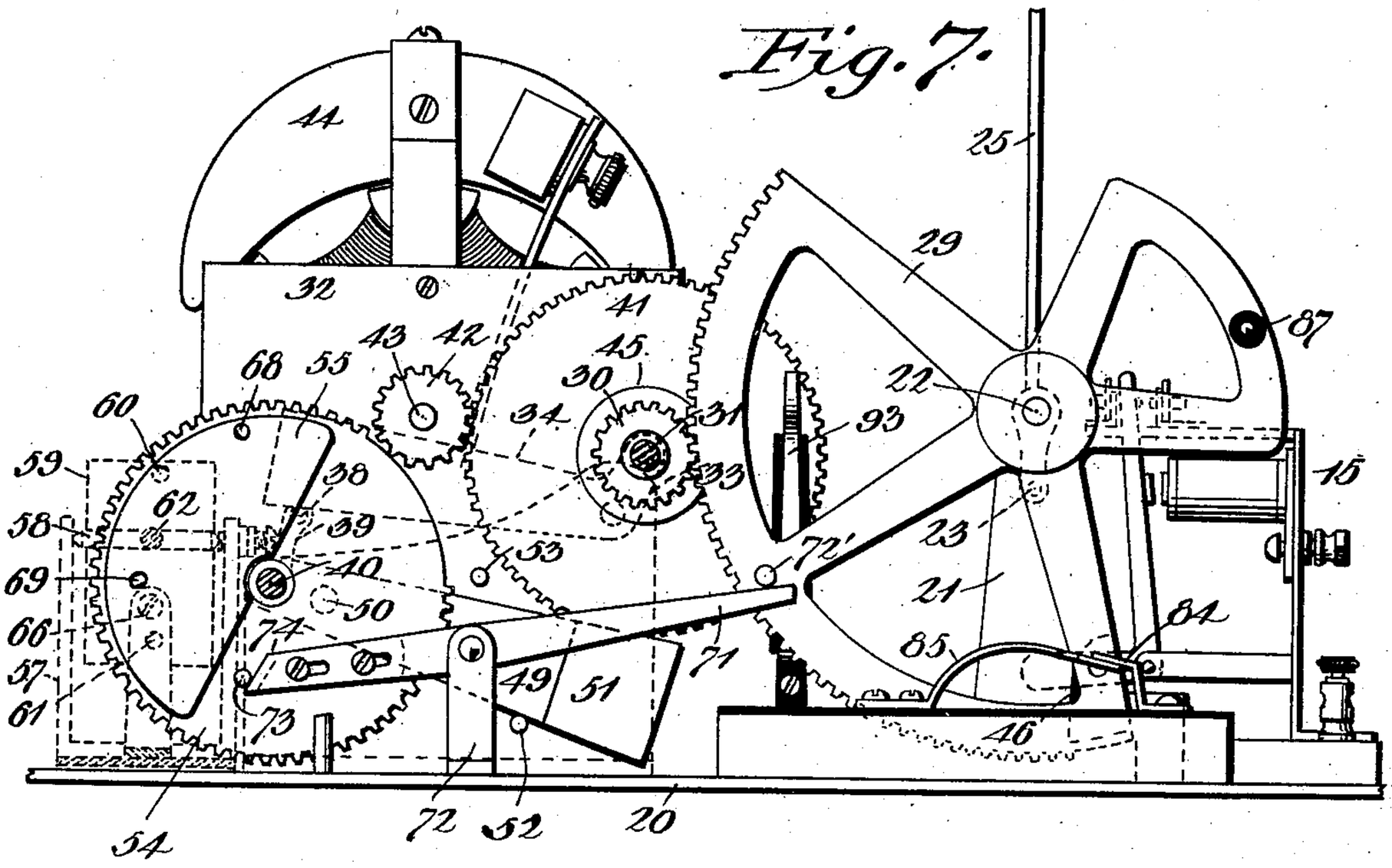
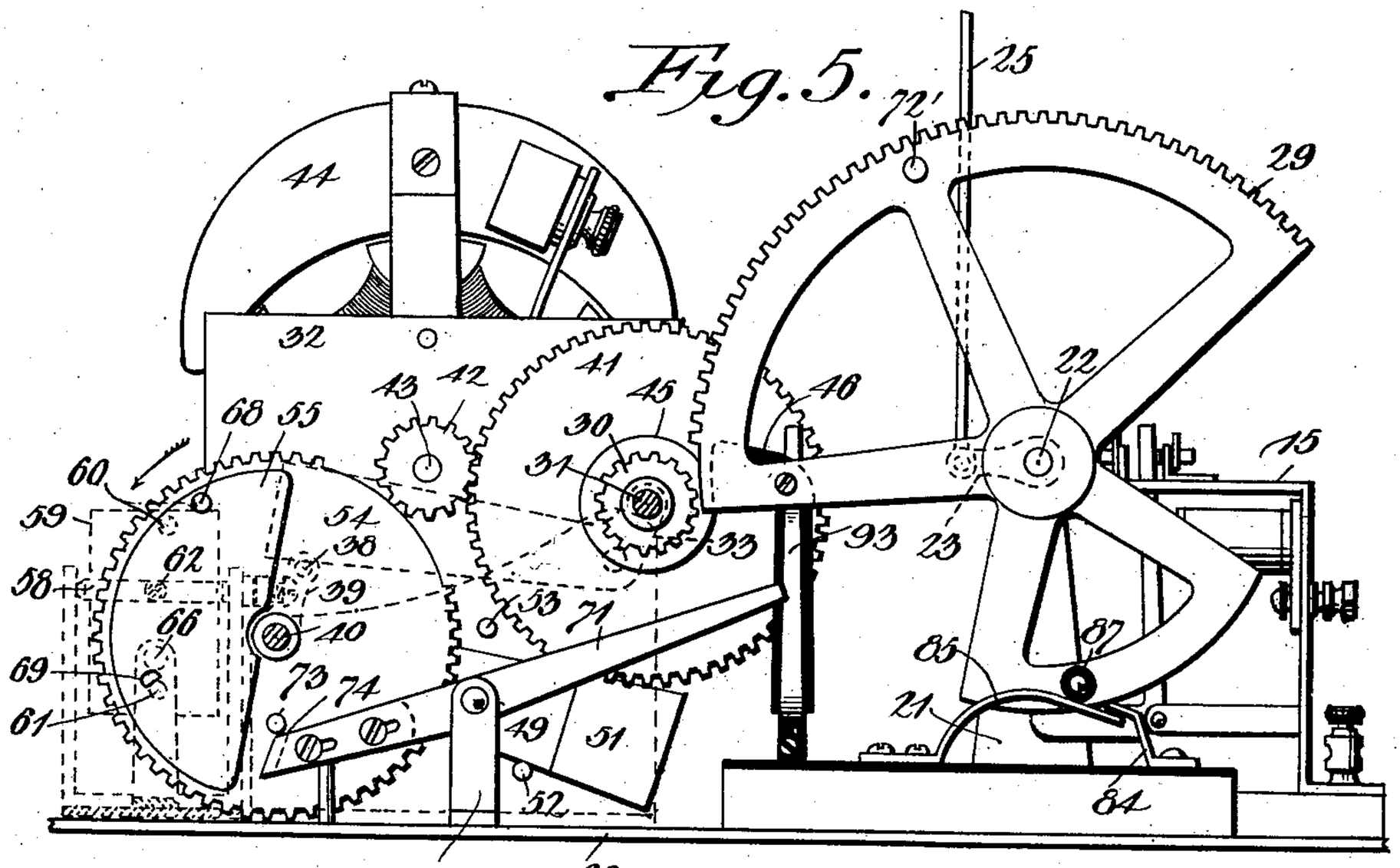


Fig. 5.



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No. 744,248. Patented November 17, 1903.

UNITED STATES PATENT OFFICE.

JUDSON SHOECRAFT, OF ESKRIDGE, KANSAS, ASSIGNOR OF ONE-HALF TO WILLIAM PETERSON, OF TOPEKA, KANSAS.

RAILWAY SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 744,248, dated November 17, 1903.

Application filed August 30, 1902. Serial No. 121,663. (No model.)

To all whom it may concern:

Be it known that I, JUDSON SHOECRAFT, a citizen of the United States, residing at Eskridge, in the county of Wabaunsee and State of Kansas, have invented a new and useful Railway Signaling System, of which the following is a specification.

This invention relates to certain improvements in railway-signals of that class in which semaphore signaling devices are electrically operated by the opening or closing of a circuit by a train on the traffic-rails.

One of the principal objects of the invention is to provide a signaling system in which a pair of oppositely-disposed semaphore-arms located at the end of a block or at a curve or other station on the road may be operated by a single electric motor energized when a train leaves a block in either direction.

A further object of the invention is to provide a double-semaphore system of this class in which either semaphore-arm may be operated without in any manner disturbing the position of the other and in which said semaphore-arms may be successively moved to the danger position and both retained in danger position while two trains are on the traffic-rails on opposite sides of the semaphore-signal or while a single train traveling in either direction is passing the signal and portions of the rolling-stock are in contact with both sections of the traffic-rails.

A further object of the invention is to arrange and connect the two semaphore-arms to the block-sections in such manner as to enable the engineer of a train approaching the semaphore-arms to determine from the position of the arms whether the signal has been set by his own train on approaching the semaphore or by a train on the other side of the signal.

A still further object of the invention is to provide an improved mechanism for connecting the armature-shaft of the motor to the semaphore-arms and to provide an electrically-operated controlling means for locking and unlocking the mechanism, and, further, to provide means for retarding or checking the movement of the mechanism after the semaphore-arm has been set to the desired position, and thus avoid breaking or straining the parts.

A still further object of the invention is to provide an improved system of wiring by which the electrical energy may be used economically during intervals between the operations of the semaphore-arms, the motor being cut out and the battery energy utilized mainly for the purpose of keeping the mechanism in locked position, provision being also made for connecting the two mechanisms in such manner that a working current may be distributed to each without regard to the position of the other.

With these and other objects in view the invention consists in the novel construction and arrangement of parts hereinafter described, illustrated in the accompanying drawings, and particularly pointed out in the appended claims, it being understood that various changes in the arrangement of the mechanism and details of construction may be made without departing from the spirit or sacrificing any of the advantages of my invention.

In the drawings, Figure 1 is a diagram of a portion of the block-section arranged in connection with an electrically-operated semaphore in accordance with my invention. Fig. 2 is a detail plan view of the semaphore-operating mechanism. Fig. 3 is a transverse sectional elevation of the same, on an enlarged scale, on the line 3 3 of Fig. 2. Fig. 4 is a transverse sectional elevation of the mechanism on the line 4 4 of Fig. 2. Fig. 5 is an elevation, partly in section, on the line 5 5 of Fig. 2, illustrating the position of the parts when the semaphore-arm is in a normal safety position. Fig. 6 is a similar view illustrating the position of the parts immediately after the locking mechanism has been released and the signal moved from safety to danger position. Fig. 7 is a further view illustrating the position assumed by the parts after the locking mechanism has been engaged by the motor. Fig. 8 is a detail perspective view of the mutilated gear and its counterweight employed for effecting the releasing movement of the semaphore-supporting device. Fig. 9 is a similar view of a

locking-block adapted to engage the mutilated gear. Fig. 10 is a detached perspective view of the lever employed for retarding the movement of the locking-wheel. Fig. 11 is a detail view of a portion of a single-track railway and a pair of semaphore-arms connected thereto in accordance with the invention. Fig. 12 is a detail perspective view of one of the semaphore-arms detached. Fig. 13 is a detail view of one of the electromagnets and its armature.

Similar numerals of reference are employed to indicate corresponding parts throughout the several figures of the drawings.

The apparatus is intended principally for use in connection with single-track roads, although the apparatus may be used without change in connection with double-track rails, and in the present case there is shown a pair of traffic-rails 10, constituting a single-track railway and divided by insulation into two sections 11 and 12, one on either side of the semaphore-station and each representing the end of a block or otherwise situated in such manner as to display a signal at a curve or other dangerous portion of the road where approaching trains do not come into sight of each other until too late to prevent collision. The traffic-rails of the section 11 of the road are connected by suitable wires, including a battery 13, and the section 12 of the tracks is provided with a similar battery 14. The block-sections are connected, respectively, to the coils of relays 15 and 16, which are normally energized by the batteries 13 and 14 when no trains are on either block. When a train enters one or other of the blocks, the battery-circuit of the said block is closed through the rolling-stock cutting out the relay and permitting the opening of the normally closed local circuit in which the semaphore-operating mechanisms are connected, the mechanism thus far described being in common use and connecting with semaphore-operating and road-crossing signal systems.

To the supporting-post of the semaphore is secured a base-plate 20, having two pairs of standards 21 and 21′, in the upper portion of which are bearings for the support of two alining shafts 22 and 22′, respectively. At the adjacent ends of the shafts 22 and 22′ are secured cranks 23 and 23′, which are connected, respectively, to the weighted ends of semaphore-arms 24 and 24′ by rods 25 and 25′. When in normal position, with the semaphore-arms dropped to safety position, the cranks are up in horizontal position, as shown in Fig. 5, and retaining each semaphore-arm depressed against the tendency of its counterbalance-weight. When the mechanism is released, the weighted ends of the semaphore-arms move the latter to the horizontal or danger position, the crank being turned to the vertical position, (shown in Fig. 6,) and this movement is further aided by the weighted portions of the operating mechanism, as hereinafter described. In order to prevent sudden downward movement of the weighted end of the semaphore and liability to breakage, each of the horizontal shafts is provided with an auxiliary crank 26, connected to a plunger 27, fitting in a dash-pot 28, carried by the base and serving in a measure to retard the movement of the arm.

To one end of each of the horizontal shafts is secured a gear-segment 29, with which may intermesh a pinion 30, carried by a shaft 31, which at one end finds a bearing in a plate 32, carried by the base-plate, the opposite end of said shaft being adapted to a bearing in the shorter arm 33 of a bell-crank lever 34, the opposite arm of which is provided with a counterweight 35. The bell-crank lever is pivoted to a plate 36, rising from the base, and its weighted end 35 is normally held in elevated position by a crank-pin 38, projecting from a crank 39, secured to a shaft 40, said crank being turned from engagement with the bell-crank lever as soon as a train enters on the block, permitting a downward movement of said bell-crank lever to the position shown in Fig. 6 and moving the pinion 30 and its carrying-shaft away from the gear-segment, so that as the latter is turned to the position shown in Fig. 6 by its own weight and by the weight of the semaphore there will be no danger of the teeth of the gear and pinion coming into contact. On the shaft 31 is secured a gear-wheel 41, constantly in mesh with a pinion 42 on the armature-shaft 43 of an electric motor 44, or the pinion may be on a counter-shaft suitably geared to the motor-shaft when it is desired to alter the speed of rotation of the pinion. The shaft 31 also carries a friction-disk 45, which is adapted to engage a curved surface of a friction-block 46, secured to the inner face of the gear-segment and extending from the end of the toothed portion to the extreme end of the segment, the parts being so rotated that when the pinion 30 engages with the teeth of the segment and turns the latter from the position shown in Fig. 6 to that shown in Fig. 5 the friction-disk 45 will engage the friction-block 46 as the last tooth of the segment disengages from the pinion, the frictional contact between the disk and block assisting the further movement of the segment and maintaining the same in the position shown in Fig. 5 with the semaphore-arm set at "safety" and the parts remaining in this position until the crank-pin 38 is moved from under the counterweighted arm 35 of the bell-crank lever and the shaft 31 is moved to such position that the friction-disk releases the block 46 and permits the segment and semaphore-arm to move by gravity until the latter assumes the danger position and the segment assumes the position shown in Fig. 6.

The frictional contact between the disk 45 and the block 46 serves as a positive means for raising the segment to the position shown in Fig. 5 or until the periphery of the disk is in contact with the lower outer edge of said

block. This contact alone is sufficient to support the weight of the semaphore-arm and in practice is all that is really necessary under normal conditions. By thus disposing the disk 45 in contact with the friction-block 46 the armature-shaft of the motor may revolve at any time without altering the position of the segment, and, as the connections with the opposite semaphore-arm are precisely the same as those above described, it will be seen that either segment may be allowed to descend or may be elevated without altering the position of the opposite segment and the semaphore to which it is connected.

The shaft 40 has a bearing at one end in the plate 36 and at its opposite end finds a bearing in an arm 49, pivoted at 50 to the supporting-plate 32 and provided with a counterweight 51, which normally tends to hold the end of the shaft 40 in elevated position, but is free to yield in the event of downward pressure on said shaft. The limits of movement of the arm are fixed by suitable stop-pins 52 and 53, projecting laterally from the outer face of the plate 32.

In addition to the crank 39 the shaft 40 carries a mutilated gear 54, adapted to intermesh with a pinion 42 on the shaft of the motor, and on one side of the center of said gear is a heavy counterweight 55, normally tending to revolve the gear in the direction of the arrow, Fig. 5, and when the mutilated gear is released from its normally locked position the movement imparted by the weight to the gear and its shaft is sufficient to move the crank-pin 38 from under the bell-crank lever 34 and release the gear-segment and semaphore-arm, this being the first movement which occurs after the entrance of a train in a block to which the mechanism is connected.

Rising vertically on the base-plate are standards 57, between which is pivoted a spindle 58, carrying a block 59, from which project two stop-pins 60 and 61, disposed, respectively, above and below the pivot-point of the block and at different radial positions with respect to the axis of the shaft 40. The spindle 58 is provided with a rearwardly-projecting arm 62, carrying an armature 63 within the field of force of a pair of electromagnets 65, which are normally energized and hold the armature attracted while the gear-segment is elevated and the semaphore-arm is in safety position, a suitable spring or similar stop 66 being placed on the under side of the armature, so to prevent the latter clinging to the poles of the magnet from the effect of residual magnetism. On the outer face of the counterweight 55 are two projecting pins 68 and 69, adapted to coact, respectively, with the pins 60 and 61 of the block 59, but separated from each other for a distance somewhat greater than the distance between said pins 60 and 61. When the parts are in the position illustrated in Fig. 5, the friction-disk 45 is in contact with the friction-block 46 and the gear-segment is held in elevated position. The bell-crank lever 34 is held in proper position by the crank 38, and the crank-pin 39 and shaft 40 are maintained in the position shown by the engagement of the pin 69 of the weighted gear 54 with the lower pin 61 of the pivoted block 59, and at this time the mutilated portion of the gear 54 is opposite the motor-actuated pinion 42. The parts are maintained in position until a train enters the block. This results in cutting off the current through the magnets 65, the latter being deënergized and the weighted block 59 moving the armature from contact with the poles of the magnet. This movement of the block releases the pin 69 from engagement with the pin 61, and the weight 55 then turns the mutilated gear-wheel and shaft 40 until the crank-pin 38 passes from beneath the counterweighted arm of the bell-crank lever 34 and permits the downward movement of the gear-segment of the semaphore-arm in the manner previously described. The movement of the weighted block 59 projects the pin 60 of said block into the path of movement of the pin 68 of the weight 55, the two pins coming into contact and the mutilated gear stopped before its toothed portion can engage with the motor-actuated pinion 42. The rotative movement of the mutilated gear is, however, sufficient to accomplish the desired result, the bell-crank lever being released and the gear-segment and semaphore-arm moved until the latter assumes the danger position and said semaphore-arm being retained in this position during all the time a train is on the block and short-circuiting the current of the track battery or batteries.

The motor is connected in series with the electromagnets 65, so that when the latter are deënergized no current passes through the motor. When the train leaves the block-section, the local circuit is again established by the relay, and both the electromagnets 65 and the motor are connected to the battery. The motor is immediately operated and turns the gear 41, the shaft 31, and the segment-actuating pinion 30; but as the bell-crank lever 34 has moved the pinion 30 out of mesh with the gear-segment the latter will not be operated. Simultaneously with the actuation of the motor the armature 63 is attracted, and the lower pin 61 of the block 59 is projected to engaging position, while the upper pin 60 is withdrawn from engagement with the pin 68, carried by the weight 55 of the mutilated gear. The first effect of this movement is to slightly rotate the mutilated gear 54 by the counterweight 55 until the toothed portion of the gear intermeshes with the motor-actuated pinion 42, and said mutilated gear is rapidly rotated in the direction of the arrow, Fig. 5, until its connected crank-pin 38 again comes in engagement with the counterweighted portion of the bell-crank lever, elevating the latter and moving the pinion 30 into mesh with the gear-segment and said gear-segment being turned from the position

shown in Fig. 6 to that shown in Fig. 5, the semaphore-arm being restored to safety position. The rotative movement of the mutilated gear is finally stopped in the initial position shown in Fig. 5 by the engagement of the pin 68 with the pin 61, carried by the block to which the armature 63 is secured; but previous to the final stoppage of the movement of the gear its momentum has been retarded and checked in order to avoid danger of breaking the pins.

The retarding device is in the form of a lever 71, pivoted on a standard 72 at a point adjacent to the mutilated gear. One arm of the lever extends along one side of the gear-segment in the path of a laterally-projecting pin 72′, which when the segment is moved to the position shown in Fig. 6 comes into contact with said arm and elevates the opposite arm of the lever into the path of movement of a pin 73, projecting from the face of the mutilated gear 54. The pin-engaging end of the lever is counterweighted and provided with a laterally-projecting inclined finger 74, against which the pin 73 strikes, the momentum of the mutilated gear being gradually checked by the resistance offered by the movement of the pin over the inclined finger. Immediately after passing this finger the interlocking pins 68 and 61 are again engaged to retain the mutilated gear in proper position for the next operation. The movement of the parts is timed in such manner that as the crank-pin 39 is moved under the bell-crank lever 34 to engage the pinion 30 with the gear-segment the pin 73 is approaching the inclined finger 74, and the latter is being maintained in position by the pin 72′, carried by the gear-segment. As soon as the pinion 30 intermeshes with the segment the latter starts to rotate, and as the pin 72′ is moved away from the end of the lever 71 the finger-carrying end of the lever is gradually lowered while in contact with the pin 73 and continues to lower as the segment continues to rise until the finger is free from the pin, and the latter moves with the mutilated gear until the locking-pins 69 and 61 are engaged with each other.

During the time the gear-segment is in the normal or elevated position and during the time the segment is lowered and the magnet 65 deënergized the mutilated portion of the gear 54 is in alinement with the armature-actuated gear 42, and the latter may rotate freely to accomplish the setting of the mechanism on the opposite side without rotating the mutilated gear, and when the parts are both in safety position the pinion 42 may freely rotate without altering the position of any of the parts, although to prevent this continual operation of the motor and waste of energy the motor is cut out during all the time the gear-segments are held elevated.

As the armature and pinion 42 may have commenced to rotate before the teeth of the mutilated gear engage therewith, there is some danger of stripping the gear-teeth or otherwise injuring the mechanism, and to avoid this the weighted lever 51 is employed. Should the teeth of the mutilated gear fail to properly intermesh with the teeth of the pinion, the weighted lever will permit downward movement of the shaft and mutilated gear, this yielding contact with the teeth permitting the mutilated gear to move to the proper position to engage the pinion.

Referring now to Fig. 1 of the drawings, the relays 15 and 16 are connected in closed circuits with the two block-sections 11 and 12 of the track, and when a train enters either block the track-battery is short-circuited and the relays are deënergized.

80 designates a local battery arranged in any suitable position and connected by current-conducting wires 81 and 81′ to the relay-armatures, both wires being connected to the positive pole of the battery and the negative pole of the battery being connected by a conducting-wire 82 to one of the binding-posts of the motor 44. From the relay-stops extend wires 83 and 83′ to contact-plates 84 and 84′, respectively, these plates being arranged adjacent to contact-strips 85 86 and 85′ 86′, arranged in pairs at the opposite sides of the base-plate at points adjacent to the gear-segments. These spring-contacts are each engaged by a pin 87, of insulating material, when the gear-segments are in the elevated position, as shown in Fig. 5, and are held out of contact with the plate 84, so that no current may pass directly from the plate to the spring. At a suitable point on the base-plate are resistance-coils 88 and 88′, connected in wires 89 89′, leading, respectively, from the plates 84 and 83′ to the contact-springs 85 and 85′, and from these contact-springs extend wires 90 and 90′ to the electromagnets 65 and 65′ and from thence leading to the second binding-post 91 of the motor 44.

At a suitable point near the inner face of the gear-segments are standards 92 and 92′, formed of non-conducting material and provided, respectively, with spring-contacts 93 and 93′, arranged in pairs, the inner contacts of both pairs being connected by a conducting-wire 94 and the outer contacts being connected one by a wire 95 to the return-wire 82 at one side of the motor and the other by a wire 95 to the wire 90′ at the opposite side of the motor, the whole forming a shunt for the motor when the pairs of contacts are engaged with each other. These contacts are held in engagement while the gear-segments are elevated by means of the friction-blocks 46, which for this purpose are formed of non-conducting material or otherwise insulated from the gear-segments, and the closing of the contacts forming a shunt around the motor for the passage of the current which energizes the locking-magnet 65. The parts being in normal position, the circuit may be traced from the positive pole of the local battery through wire 81, the relay-contact, wire 83,

contact-plate 84, wire 89, resistance-coils 88, contact-spring 85, line-wire 90, magnet 65, wire 95′, spring-contacts 93′, wire 94, spring-contacts 93, wire 95, and wire 82 to the negative side of the battery. On the other side of the apparatus the current flows from the positive pole of the battery to wire 81′, the relay-contacts, wire 83′, plate 84′, wire 89′, resistance-coils 88′, contact-spring 85′, conducting-wire 90′, locking-magnets 65′, wire 90′, wire 95′, contacts 93′, wire 94, contacts 93, and wires 95 and 82 to the negative side of the battery.

When either side of the apparatus is deenergized by the short-circuiting of the relay-current, the circuit of the other side is the same as that described with the exception that the current is returned through the wire 91 and the motor to the negative wire 82. The side cut-out remains deënergized until the train passes out of the block and permits the track-battery to again energize the relay, and taking, for instance, the left-hand side as an example it will be seen that the contact-springs 85 and 86 are allowed to move into contact with the contact-plate 84 when the gear-segment is down, the pin 87 being then removed from engagement with said contact, and in similar manner the friction-block 46 has been moved from engagement with the spring-contacts 93 and permitting the separation of the same. The relay 15 being energized, the current goes through wires 81 and 83 to plate 84, and a portion of the current passes through the spring-contact 85 and wire 90 to the locking-coil 65 to reënergize the same and alter the position of the block 59. The current thence passes through wire 90 and the motor 44 to the return-wire 82 and battery, the shunt being broken by the separation of the contacts 93. At the same time a portion of the current will traverse through the contact 86 to a wire 97, leading to the spring-contact 85′, and from thence to the wire 90′ and electromagnet 65′ and from thence to motor and return-wire 82, the current being sufficiently strong to hold the magnet 65′ energized and passing directly thereto without passing through the resistance-coils 88′, a portion of the current also passing through said resistance-coils 88′ through the connecting-wire 89′ in the manner previously described. For operation in the reverse direction a wire 97′ extends from the contact-spring 86′ on one side of the machine to the contact-spring 85 on the opposite side, so that a portion of the current can always pass from one side of the apparatus to the other without passing through the resistance-coils, this being essential in low-tension currents, where the resistance of the coil will prevent the energizing of the magnets on that side of the machine opposite to the released gear-segment.

The mechanism, as described, is adapted especially for use in connection with a single-track railway in which the semaphore-arms are set successively at danger position by a train passing from one block to another or both semaphores are set at danger position simultaneously by the entrance of approaching trains on the two blocks, one semaphore-arm being operable by the short-circuiting of the relay-battery of one block and the other by the short-circuiting of the relay-battery of the second block.

On reference to Fig. 11 it will be seen that an approaching train traveling in the direction of the arrow has set the left-hand semaphore-arm at the danger position, the arm being set in this position as soon as the train enters the block and serving as a warning to the engineer of a train traveling in the opposite direction on the adjacent block. When the train which has set the semaphore-arm approaches the station, the engineer immediately sees that the proper semaphore-arm has been set by his own train, and he is notified by the position of the right-hand semaphore-arm whether or not there is a train in the block ahead. In devices of this class of ordinary construction a single semaphore-arm is employed, and this arm is set by the entrance of a train into a block from either direction and long before the engineer approaches within seeing distance of the semaphore-arm, so that when he finally arrives at the signal he is unable to determine whether the signal set at "danger" has been actuated by his own train or by a train traveling in either direction on the block ahead. The present invention overcomes this difficulty and enables the engineer to determine the location of the train by the position of the signal-arm. This arrangement of arms is also of considerable value in that while approaching the signal-station the left-hand semaphore will be set, notifying the engineer of the approaching train in the block ahead of the presence in said block of the train setting the signal, and after passing the signal the train enters the next block, the left-hand semaphore-arm being restored to safety position while the opposite semaphore will be set at "danger" and act as a rear-end signal to notify the engineer of the following train of the presence of the first train in the block ahead.

The device may also be employed in connection with double-track railways for use as a rear-end signal for both tracks without any change whatever in the local wiring. When used on a double-track road, one relay is connected in circuit with one of the tracks and the other relay with the second set of tracks, the arms being operable by the closing of the circuits through trains on different tracks.

Having thus described my invention, what I claim is—

1. In a semaphore system, a pair of semaphore-arms, gear-segments operatively connected to said arms, pinions intermeshing with said segments for restoring the arms to initial position, an electric motor having an operative connection with both pinions where-

by both are simultaneously driven each time the motor is operated, and an independent mechanism for moving each pinion into and out of engagement with the segment to effect the raising or lowering of either.

2. In a semaphore system, a pair of semaphore-arms, gear-segments operatively connected thereto, friction-blocks carried by the segments, a motor, a pair of revoluble shafts operatively connected to the motor, a pinion and a friction-disk disposed on each shaft and adapted to engage respectively with the teeth of the segment and the friction-block carried thereby, and an independent means for moving each shaft and its pinion and disk toward and from the gear-segments.

3. A semaphore system comprising a pair of semaphore-arms, a gear-segment having an operative connection with each of said arms, a motor, a shaft operatively connected to the motor, pinions carried by the shaft and adapted to intermesh one with each gear-segment and raise the same until the teeth of the segment are out of mesh with the pinion, means for holding each segment in elevated position independent of its pinion and permitting free rotation of said pinion without further movement of the segment, and an electromechanical means for releasing the segments and permitting the semaphore-arms to move by gravity to danger position.

4. In a semaphore system, a semaphore-arm, a gear-segment connected thereto, a revoluble pinion adapted to engage said gear-segment, a shaft carrying said pinion, a lever carrying the shaft, a crank-shaft, means for revolving the same, means for locking the crank-shaft, an electromechanically-operated means for releasing said crank-shaft, a crank and crank-pin carried by the crank-shaft and engaging and holding the lever in normal position, the release of the crank-shaft effecting the disengagement of the pinion and segment and the movement of the semaphore-arm by gravity.

5. In a semaphore system, a semaphore-arm, a motor, gearing connecting the motor and arm, a movable pinion forming a part of the gearing, a bell-crank lever connected to the pinion and adapted to move the same to operative and inoperative positions, a mutilated gear adapted to intermesh with one of the motor-actuated gears, a counterweight for imparting initial rotative movement to the mutilated gear, a shaft carrying said mutilated gear, a crank and crank-pin carried by the crank-shaft and engaging the pinion-carrying lever, an electromagnet, means for energizing the same, a pivoted block carried by the armature portion of the magnet and movable therewith, and interengaging pins carried by the mutilated gear and block and serving to normally lock said mutilated gear in position.

6. In a semaphore system, a semaphore-arm, a motor, gearing connecting the motor and arm, a movable pinion forming a part of the gearing, a bell-crank lever connected to the pinion and adapted to move the same to operative and inoperative positions, a mutilated gear adapted to intermesh with one of the motor-actuated gears, a counterweight for imparting initial rotative movement to the mutilated gear, a shaft carried by said mutilated gear, a crank and crank-pin carried by the shaft and engaging the pinion-carrying lever, an electromagnet, a pivoted armature disposed within the field of force of the magnet, a pivoted block carried by the armature-lever and provided with a plurality of projecting lugs or pins, and lugs or pins carried by the mutilated gear and adapted to interlock consecutively with the pins or lugs carried by the block to first release the mutilated gear and then lock the same after the partial rotative movement.

7. In a device of the class specified, a locking and releasing mechanism comprising a mutilated gear-wheel, a motor-actuated pinion with which said gear may intermesh, a counterweight carried by the gear and serving to impart initial rotative movement thereto, projecting locking-pins disposed at different radial distances on the gear, a pivoted block having a pair of lugs or pins disposed in different planes and adapted to engage the pins or lugs of the gear, and an electromagnet for imparting a rocking movement to said block.

8. In a device of the class specified, a locking and releasing mechanism comprising a revoluble member having a counterweight adapted to impart an initial rotative movement thereto, pins or lugs projecting from one face of the revoluble member and located at different radial distances from the axis thereof, a pivotally-mounted block having lugs or pins disposed respectively at points on opposite sides of its pivot and adapted for successive engagement with the lugs or pins of the revoluble member, and an electromagnet for moving said block to first release the same and then to engage and lock the revoluble member after a partial rotative movement.

9. In a device of the class specified, a semaphore-arm, an electric motor adapted to move said arm to safety position, an electromechanically-operated locking means for holding the semaphore-arm in safety position and including a revoluble gear adapted to be engaged and revolved by the electric motor, a pin projecting from said gear, and an inclined finger movable to pin-engaging position and adapted to check the momentum of the gear in advance of the movement of the latter to its initial locked position.

10. In a device of the class specified, a semaphore-arm, a gear-segment connected thereto, an electric motor having a gearing connection with the segment, a mutilated gear adapted to engage and to be rotated by the motor-gear, locking and releasing devices for engagement with the mutilated gear, a pin or lug carried

by said mutilated gear, a pivoted arm having at one end an inclined finger for engagement with said pin or lug, and means carried by the gear-segment for engaging the lever and moving said finger to pin-engaging position.

11. In a device of the class specified, a semaphore-arm, a gear-segment connected thereto, an electric motor having a gearing connection with the segment, a mutilated gear adapted to engage and to be revolved by the motor-gear, locking and releasing devices for engagement with said mutilated gear, a pin or lug carried by said mutilated gear, a pivoted arm having at one end counterweight, a finger disposed at the weighted end of the arm and adapted to engage with and retard the movement of the pin, and a pin or lug carried by the gear-segment and adapted to move the finger into pin-engaging position and thence on the return movement of the segment to permit the gradual disengagement of the finger from the pin.

12. In a device of the class specified, a pair of semaphore-arms, gearing operatively connecting both of said arms to a single motor, an electric motor for driving the gearing, a pair of frictional holding devices associated with the gearing and revoluble with the driving member thereof, said frictional holding devices serving to maintain the semaphore-arms in safety position and each permitting revoluble movement of the mating gearing without affecting the position of the semaphore-arm with which it is associated.

13. In a device of the class specified, a pair of semaphore-arms, an electric motor having a gearing connection with both arms, means including a mutilated gear-wheel disposed at each end of the motor and movable to engage the motor-actuated gears, the mutilated portion of each gear being normally in alinement with the motor-actuated gear.

14. In a device of the class specified, a pair of semaphore-arms, an electric motor having a gearing connection with both arms, a mutilated gear-wheel disposed at each end of the motor and having its mutilated portion normally in alinement with a motor-actuated gear, a counterweight carried by each of the mutilated gears and adapted to impart initial rotative movement thereto, a pair of locking-pins projecting from the face of each mutilated gear, a pivoted block disposed adjacent to each gear and provided with pins adapted to successively interlock with those of the mutilated gears, electromagnets controlling the movements of said blocks to first release the gear and its partial rotative movement and then engage and lock said gear before the toothed portion thereof comes into mesh with the motor-actuated gears.

15. In a device of the class specified, a semaphore-arm, an electric motor, a pinion revolved thereby, a mutilated gear adapted to engage the pinion, mechanism controlled in part by the mutilated gear for controlling the position of the semaphore-arm, a shaft carrying the mutilated gear, and a pivotally-mounted counterweighted lever supporting the shaft and free to yield when the gear is moved into contact with the pinion without intermeshing with the teeth.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in the presence of two witnesses.

JUDSON SHOECRAFT.

Witnesses:
JNO. E. PARKER,
W. J. DILLON.