C. R. KEERAN.

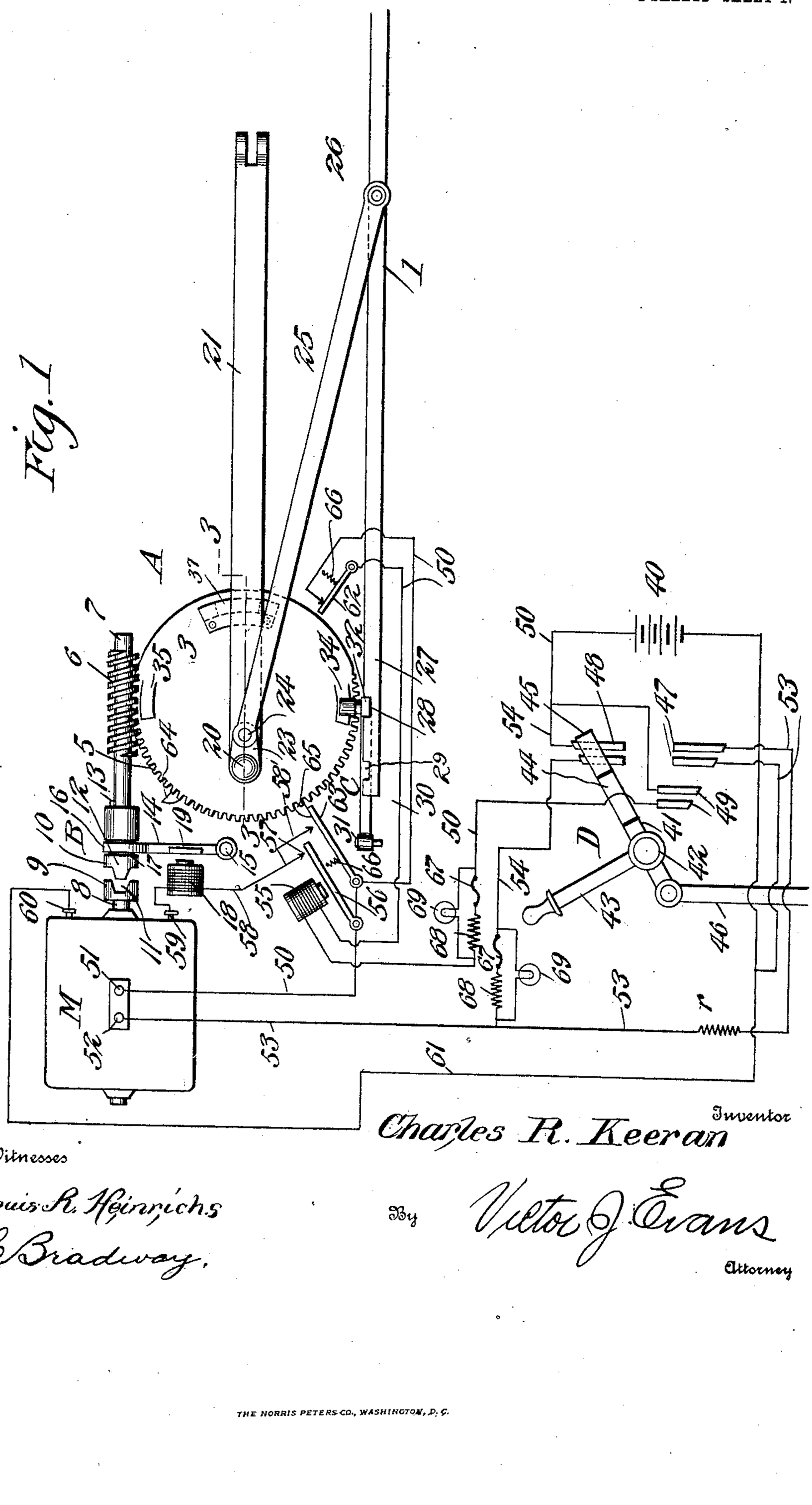
SWITCH AND DETECTOR BAR THROWING MECHANISM.

APPLICATION FILED FEB. 19, 1908.

925,345. **Patented June 15, 1909.**

2 SHEETS—SHEET 1.

Fig. 1.



Witnesses

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2 SHEETS—SHEET 2.

Fig. 2.

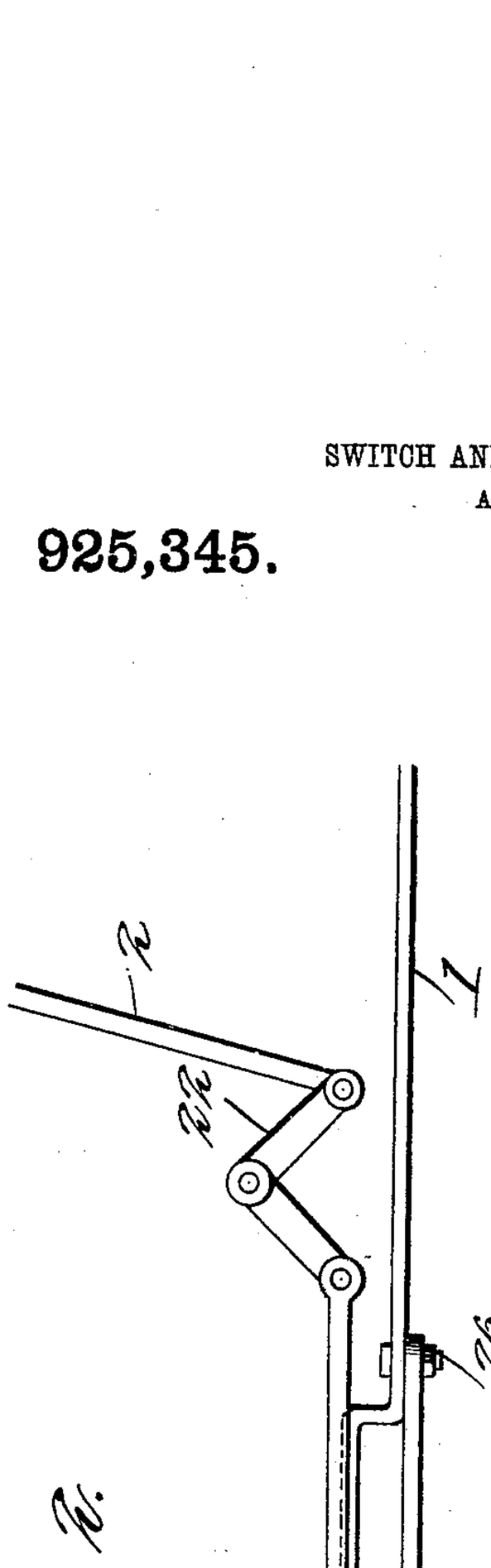


Fig. 4.

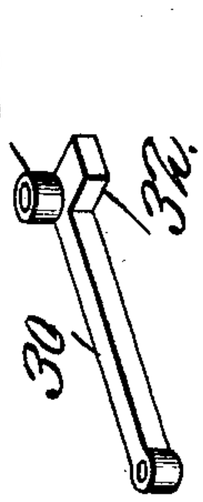


Fig. 3.

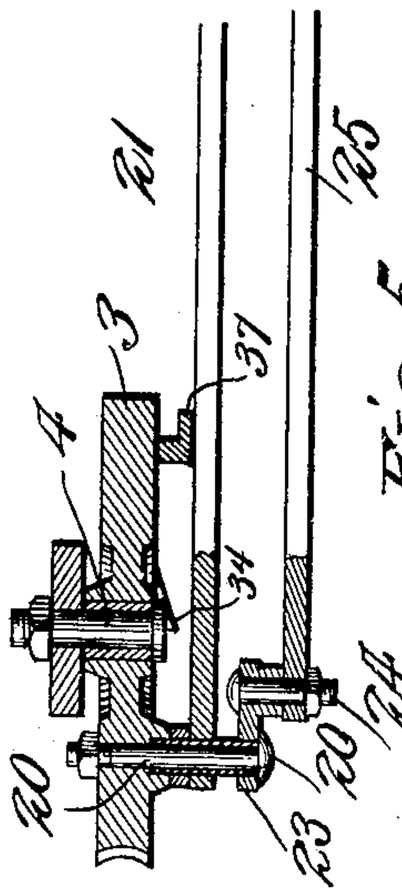
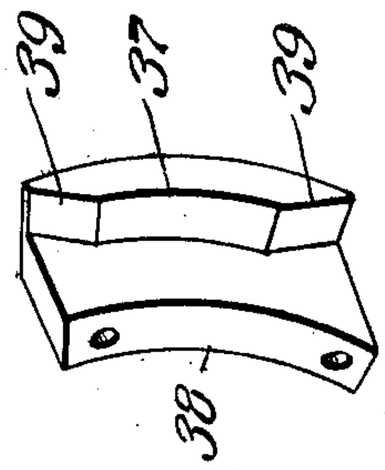


Fig. 5.



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UNITED STATES PATENT OFFICE.

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SWITCH AND DETECTOR-BAR THROWING MECHANISM.

No. 925,345. Specification of Letters Patent. Patented June 15, 1909.

Application filed February 19, 1908. Serial No. 416,741.

To all whom it may concern:

Be it known that I, CHARLES R. KEERAN, a citizen of the United States, residing at Bloomington, in the county of McLean and State of Illinois, have invented new and useful Improvements in Switch and Detector-Bar Throwing Mechanism, of which the following is a specification.

This invention relates to a mechanism for throwing the points of a railroad switch and the detector bar and relates more particularly to a mechanism of this character designed to be controlled by a suitable electrical apparatus.

The invention has for one of its objects to improve and simplify the construction and operation of mechanisms of the nature referred to so as to be comparatively easy and inexpensive to manufacture and install, thoroughly reliable and efficient in use, and readily manipulated.

A further object of the invention is the provision of a motor-driven device for actuating the switch point and the detector bar, the said device being so designed as to actuate the detector bar a suitable period in advance of the actuation of the switch points.

Another object is the employment, in connection with the actuating device, of an automatically operated lock for holding the switch points from movement during the initial part of the movement of the detector bar for effecting the coöperative relation of the switch points and bar.

A still further object is to provide a motor for driving the throwing or actuating device, in combination with a clutch for automatically connecting and disconnecting the motor and device at the limits of the movement of the latter in both directions.

An additional object of the invention is the provision of an electric circuit for the motor which includes an operator switch for reversing the connections of the motor to reversely operate the switch and detector bar throwing device, said circuit including automatic switches controlled by the movement of the said throwing device to open the circuit when the switch and detector bar are fully thrown.

With these and other objects in view, as will appear as the description proceeds, the invention comprises the various novel features of construction and arrangement of parts which will be more fully described hereinafter and set forth with particularity in the claims appended hereto.

In the accompanying drawings, which illustrate one of the embodiments of the invention, Figure 1 is a diagrammatic view of the apparatus. Fig. 2 is a view of the actuating or throwing device for the switch and detector bar. Fig. 3 is a section on line 3—3, Fig. 1. Fig. 4 is a perspective view of the lock for holding the switch set. Fig. 5 is a perspective view of one of the cams for moving the said lock.

Similar reference characters are employed to designate corresponding parts throughout the several views.

Referring to the drawings, 1 and 2 are operating rods which are respectively connected in any approved manner with the switch points and detector bar (not shown). These rods are actuated by the throwing device designated generally by A, said device being operated by a motor M that is operatively connected thereto through an automatically-controlled clutch B. The device A comprises a wheel 3 mounted to rotate on the axle or shaft 4, Figs. 2 and 3, and provided in its periphery with worm teeth 5. Meshing with the teeth is a worm 6 provided on the shaft 7 that is located in alinement with the shaft 8 of the motor. On the opposed ends of the shafts are clutch elements 9 and 10 which are formed respectively with one or more recesses 11 and teeth 12. The element 10 is feathered to the shaft 7 by the feather 13 so that the tooth 12 can be engaged with or disengaged from the recess 11, and the engagement and disengagement is effected by a lever 14 pivoted at 15 and provided with a forked extremity 16 that engages in a peripheral groove 17 in the said element. The lever may be operated in any suitable manner, and in the present instance is moved in one direction by an electromagnet 18 whose armature 19 is mounted on the lever. The recess 11 and tooth 12 are so shaped that the element 10 will be thrown out of engagement with the element 9 when the electro magnet is deënergized and the motor M reversed, and as long as the electro magnet is energized, the clutch elements will be engaged so that motion will be transmitted to the wheel 3 from the motor shaft.

The wheel 3 of the actuating or throwing device A serves as a common actuator for the rods 1 and 2, and the connections between the latter and wheel are so designed as to permit a certain lag in the movement of the rod 1 for throwing the switch with respect to

the movement of the rod 2 for throwing the detector bar. On the wheel 3 is a crank pin 20 disposed in a line extending diametrically of the wheel and located centrally between the extremities of the toothed portion of the wheel, and connected with this crank pin is a pitman 21 that has its outer extremity connected with the rod 2 by a bell crank lever 22 or other suitable means. Also mounted on the crank pin is a link 23 that carries a crank pin 24 to which is connected a pitman 25 that has its outer extremity hingedly connected at 26 with the switch-throwing rod 1. By connecting the rods 1 and 2 to the wheel 3 in this manner, the latter rod will be given a continuous movement during the turning of the wheel 3, while the rod 1 is held stationary for a certain period during the initial part of the movement of the wheel in either direction, thereby permitting the detector bar to be fully raised before any movement of the switch points takes place. During the independent movement of the rod 2, the rod 1 will be held stationary by a locking device C to be hereinafter more fully described.

To explain the movement of the parts more in detail, let it be assumed that the worm shaft is clutched to the motor and the wheel 3 driven in a clockwise direction from the position shown in Fig. 1. As the rod 1 is locked stationary, the pitman 25 will be prevented from moving so that the secondary crank pin 24 will be relatively fixed, so that the rotation of the wheel 3 will carry the crank pin 20 upwardly and impart longitudinal movement to the pitman 21, and the link 23 turns about a secondary crank pin 24 as a pivot. After the wheel has moved a suitable distance, say about one quarter of a revolution, the locking device C will be released so as to permit the continued movement of the wheel 3 to simultaneously actuate the switch-throwing rod 1. At the end of the movement of the wheel, the locking device C is again automatically engaged to hold the rod stationary so as to lock the switch in either open or closed position. In order to throw the detector bar and switch in reverse direction, the motor will obviously be reversed so as to turn the wheel in an anticlockwise direction with the result that the rods 1 and 2 will be returned to their former positions, the rod 2 moving in advance of the rod 1 in the same manner already described.

The locking device C for holding the switch in either open or closed position consists of an extension 27 on the rod 1 that is disposed adjacent the periphery of the wheel 3 and has spaced notches 28 and 29. Coöperating with the notched extension or member 27 is a latch or detent 30 pivoted at 31 and provided at its free extremity with a laterally extending lug or nose 32, as clearly shown in Fig. 4, said nose being arranged to engage in either one of the notches 28 or 29 when the switch is in one extreme position or the other. On the free end of the pivoted member 30 is a roller 33 arranged in the path of cams 34 and 35 disposed at diametrically opposite points on the wheel 3, whereby the cams cause the nose 32 of the member 30 to be positively engaged in one of the notches of the extension 27 when the wheel has reached the end of its movement. To assist in this engagement of the nose in either of the recesses and to hold the nose so engaged during the independent movement of the detector bar operating rod 2, a spring 36, Fig. 2, is arranged to press on the latch or detent 30 to hold it in locking position. At the proper period, the detent 30 is released so as to permit the rod 1 to be actuated, and this is effected by a cam 37 formed on a block 38 which is bolted or otherwise secured to the wheel 3 at a point midway between the cams 34 and 35, the cam 37 being so arranged as to engage the roller 33 at a point opposite from where it is engaged by the cams 34 and 35 so as to move the detent 30 away from the extension 27 and thus disengage the nose 32 from the notch of such extension. The cam 37 is beveled at each extremity 39 so as to effectively release the detent during the forward and reverse movement of the wheel 3.

The motor M in the present instance is an electric motor of any approved type and is supplied from a suitable source of electromotive force such as a battery 40, there being included in the electric circuit a hand-operated switch D, whereby the towerman or other operator can control the connections of the motor from a more or less remote point for the purpose of actuating the switch and detector bar. The switch D comprises a lever 41 pivoted at 42 and provided with a grip 43, and on the lever or blade are separate contact or bridging pieces 44 and 45 insulated from each other and from the lever. Connected with the lever 41 is a tappet bar 46 which runs to a locking board of standard type. Coöperating with the bridging piece 45 are two sets of separated contacts 47 and 48 so arranged that when the bridging piece is engaging one set, the circuits will be such as to cause the motor to rotate in one direction and that when the bridging piece engages the other set, the motor will be driven in the opposite direction, while coöperating with the bridging piece 44 is a set of contacts 49. The contacts 49 are connected with the wire 50 leading from the battery 40 to the field terminal 51 of the motor, and between the other field terminal 52 is a wire 53 that leads to the other side of the battery and includes the contacts 47 and also a resistance r which is used to prevent excessive current flowing through the field coils of the motor when current is not passing through the armature. Connected with the wires 50 between the battery and contacts 49 is a wire

54 which includes the contacts 48 and this wire is also connected with the wire 53. Included in the wire 50 is an electro magnet 55 having its armature 56 connected in circuit with the electro magnet 18, so that when the electro magnet 55 is energized, the armature 56 will engage the contact 57 so that current will pass from the battery 40 through the wire 50, armature 56, contact 57, wire 58, (which includes the electro-magnet 18), motor armature terminal 59, winding of the armature, armature terminal 60, and wire 61 which connects with the opposite side of the battery. As the current passes through the electro magnet 18, the lever 14 will be actuated so as to clutch the motor M to the worm shaft 7. In order to open the motor circuit automatically when the track switch and detector bar are thrown, separate switches 62 and 63 are arranged so as to be opened respectively by fingers 64 and 65 on the wheel 3 when the latter reaches the limit of its stroke in either direction. When the switch 62 is opened it breaks the continuity of the conductor 50, and when the switch 63 is opened, current is prevented from flowing through the conductor 58 so that the electro magnet 18 will be deënergized for permitting the shaft 7 to be automatically unclutched from the motor shaft, the conductor 58 being provided with a branch 58′ which coöperates with the switch 63. The switches 62 and 63 are normally held in closed position by spring 66 or equivalent means and the armature 56 is so arranged as to be normally out of contact with the contact 57. Included in each wire 50 and 54 is a fuse 67 arranged in series with a resistance 68 and shunting each resistance and fuse is an incandescent lamp 69 or equivalent signal, the lamps being arranged preferably adjacent the lever so as to be within in convenient view of the operator while manipulating the switch D. The resistances 68 cause the lamps to glow dimly when current is flowing in the normal operation of the apparatus. In case the fuse in shunt with either lamp should blow, the lamp would receive sufficient current to cause it to glow brightly, thereby warning the operator of the condition of the circuit, so that he can correct it.

The operation of the apparatus will be briefly described as follows. When the parts are in the position shown in Fig. 1, no current is passing through the electric circuits and the track switch is locked in either open or closed position. When it is desired to reverse the position of the track switch and detector bar, the switch D is thrown by the operator so as to bring the bridging pieces 44 and 45 into engagement with the contacts 49 and 47, respectively. Current then flows from the battery through the wire 50 which includes the contacts 49, lamp 69 and fuse 67 in parallel, electro magnet 55 and switch 62, to the terminal 51 of the motor, thence through the field of the latter, terminal 52, and back to the battery through the wire 53 which includes the resistance r and contact 47. This flow of current energizes the electro magnet 55 so that the armature 56 will be brought into engagement with the contact 57 and thereby connect the armature of the motor in shunt relation with the field-containing circuit. The motor is thus started and simultaneously the electro magnet 18 operates the clutch B so as to connect the motor shaft with the worm shaft 7. The throwing mechanism A is thus brought into operation and as the wheel 3 rotates in a clockwise direction, the finger 64 finally engages the switch 62 so as to open the circuit by the latter and cause the electro magnet 18 to become deënergized, whereupon the shaft 7 will be automatically unclutched from the motor shaft 8, due to the fact that the rotation of the armature under its momentum will cause the element 10 to be disengaged from the element 9 of the clutch, since the recess 11 and tooth 12 are so shaped as to produce a cam effect for releasing the clutch under these circumstances. In order to return the track switch and detector bar to initial position, the operator throws the switch D to the full line position shown in Fig. 1, whereupon current passes from the battery 40 through a portion of the wire 50, wire 54 including the contacts 48 and its signal lamp 69, fuse 67 in parallel, wire 53, field terminal 52, field winding for the motor, terminal 51, wire 50, switch 63, wire 58, electro magnet 18, motor armature terminal 59, armature winding of the motor, armature terminal 60, and wire 61, which leads back to the battery. It is to be noted that the current passes through the field in reverse direction so that the armature will rotate in a direction opposite from that previously described, in order that the wheel 3 will be rotated in an anti-clockwise manner until the motor circuit is opened by the finger 65 opening the switch 63.

From the foregoing description, taken in connection with the accompanying drawings, the advantages of the construction and of the method of operation will be readily apparent to those skilled in the art to which the invention appertains, and while I have described the principle of operation of the invention, together with the apparatus which I now consider to be the best embodiment thereof, I desire to have it understood that the apparatus shown is merely illustrative, and that such changes may be made when desired as are within the scope of the claims.

Having thus described the invention, what I claim is:—

1. The combination of a switch-throwing element, a detector-bar actuating element, a mechanism for operating the elements, a mo-

tor, and automatically actuated means for connecting and disconnecting the mechanism with the motor, said means comprising a clutch including a movable element, a lever for actuating the element, an electro magnet arranged to operate the lever, and means for simultaneously closing the magnet and motor circuit.

2. The combination of a rotary element, a switch throwing element, means connecting the elements together, a worm gearing for driving the rotary element, a reversible motor, an electrically actuated clutch for connecting the motor with the gearing, a controlling switch for reversing the motor, switches for automatically opening the motor circuit when the rotary element has reached the limit of its movement in either direction, a locking device arranged adjacent the rotary element, and cams arranged on the rotary element to lock and unlock the said device.

3. The combination of a rotary element, a crank pin eccentrically mounted thereon, a member connected directly with the crank pin for actuation thereby, a link carried solely by the crank pin and of less length than the distance between the crank pin and axis of the rotary element, a member connected with the free end of the link to be actuated thereby, and a locking device automatically released and set by the movement of the rotary element for preventing the second member from moving until after the first member is actuated.

4. The combination of an operating element, a motor-driven rotatable member connected therewith, a locking device for the element, and cams on the member for moving the device into and out of locking position.

5. The combination of an operating element, a rotatable member, means connecting the member with the element for actuating the latter, a pivoted locking device arranged to engage the element, spaced cams on the member for engaging the device and moving the same into locking engagement with the element when the member is in either of its extreme positions, and cams on the member between the first-mentioned cams and arranged with the latter in an arc of a circle around the center of the member for releasing the locking device.

6. The combination of a switch-throwing element, a detector-bar actuating element, a rotatable member, and connections between the elements and member for actuating the elements one before the other, with a motor, driving means between the motor and member, said means including a clutch, a lever for moving the clutch, an electro-magnet for moving the lever in a direction to close the clutch, means for reversing the motor, a circuit for the electro-magnet, separate switches tending constantly to close and included in the said circuit, and devices on the rotatable member for opening the said switches respectively as the member reaches the end of its movement.

7. The combination of a switch-throwing element, a detector-bar actuating element, a rotatable member, gear teeth extending partly around the periphery of the member, a gear meshing with the teeth connections between the elements and member for actuating the elements one before the other, one of the connections being located on the said member in a line passing radially through the middle of the teeth on such member, and a motor operatively related to the gear for moving the member in one direction or the other.

8. The combination of a switch-throwing element, a detector-bar actuating element, a member mounted to turn alternately in opposite directions; an axle for the member, a crank pin disposed parallel with the axle and connecting the second element with the member, a link hingedly connected with the crank pin, and a pin carried by the link and disposed parallel with the axle for connecting the first-mentioned element also with the crank for actuation by the latter.

9. The combination of separate elements, a member mounted to move alternately in opposite directions, means for connecting one element to the member to move throughout the entire period of movement of the latter, a pin on one of the elements, a pin on the other element, and a link between the pins and attached thereto for connecting the other element to the member to move during only a portion of the period of movement of the member, with a motor, controllable driving connections between the motor and said member, electrical means for controlling the said connections, means for reversing the motor, a circuit for the electrical means, separate switches in the said circuit, devices on the member for opening the switches independently, and an electro-magnetically actuated circuit closer for connecting the said electrical means in circuit when one of the said switches is open and the other closed.

10. The combination of separate switch and detector-bar actuating elements, a member mounted for oscillatory movement, means for connecting one of the elements directly to the member, means for connecting the other element with the member for movement by the latter after the directly connected element has completed part of its movement, a locking device for holding the one element stationary during the movement of the other element, said device having a projecting portion, oppositely-disposed cams spaced apart on the said oscillatory member for engaging one side of the projecting portion to move the locking device in one

direction, and additional cams arranged on the oscillatory member between the first-mentioned cams to engage the other side of the projecting portion of the said locking device to move the latter in the opposite direction.

11. The combination of separate switch and detector-bar actuating elements, a member mounted for oscillatory movement, a shaft for the member, a crank pin on the member eccentric to the shaft and to which one element is connected, a link on the crank pin to move therewith as the member turns, and means for connecting the other element with the link.

12. The combination of separate switch and detector-bar actuating elements, a member mounted for oscillatory movement, a crank pin on the member and to which one element is connected, a link on the crank pin, means for connecting the other element with the link, and a locking device for the element connected with the link.

13. The combination of separate switch and detector-bar actuating elements, a member mounted for oscillatory movement, a crank pin on the member and to which one element is connected, a link on the crank pin, means for connecting the other element with the link, a locking device for the element connected with the link, and means carried by the member for releasing the locking device.

14. The combination of a switch and detector-bar actuating mechanism including a worm wheel, a shaft provided with a worm meshing with the wheel, a motor, a clutch between the shaft and motor, an electro-magnet connected in series with the armature of the motor for actuating the clutch, a manually controlled switch for reversing the motor, and automatically actuated switches for opening the circuit of the electro-magnet when the wheel reaches the limit of its movement in either direction.

15. The combination of a rotary element, a crank-pin thereon, a detector bar actuating member connected with the crank pin, a switch actuating member, an actuating means between the last mentioned member and crank pin for permitting the first member to move before the second, a locking device for holding the second member stationary during the initial part of the movement of the first member, means for rotating the element back and forth, a reversible motor, a clutch device between the last mentioned means and motor, an electro-magnet controlling the clutch, automatically actuated switches for cutting the electro-magnet out of circuit, and devices turning with the element for opening each switch when the element reaches the limit of its movement in either direction.

16. The combination of a rotary element having gear teeth extending part way around the periphery thereof, a worm meshing with the teeth, a reversible motor, a clutch for connecting the worm with the motor, a detector bar actuating member connected with the element, a switch throwing member, a connection between the two members for permitting the first to move before the second, a locking device for the second member, two cams on the element for locking the said device and two cams located intermediate the first for unlocking the device, and means controlling the clutch for opening the same when the element has reached the end of its movement in either direction.

17. The combination of a mechanism for actuating a switch and detector bars, said mechanism including a movable element, a reversible motor for actuating the element, a clutch device between the element and motor, an electro-magnet controlling the clutch, a pair of switches arranged to open the circuit of the electro-magnet when the element reaches the limit of its movement in either direction, an electro-magnetically actuated switch for connecting the electro-magnet initially in circuit, and a manually controlled switch for reversing the motor connections.

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

CHARLES R. KEERAN.

Witnesses:
THOMAS TOBIN,
JOHN CARR.