DIAGRAM OF MOVEMENTS FOR FORWARD STROKE, REVERSE STROKE VICE VERSA.

DETECTOR BAR MOVEMENT

70 IDLE → 60 RAISE → 160 IDLE → 60 LOWER → 70 IDLE

SWITCH POINT MOVEMENT

70 IDLE → 50 UNLOCK → 180 MOVEMENT → 50 → 70

POLE CHANGER MOVEMENT

FIG 4.

FIG 3.
UNITED STATES PATENT OFFICE.

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RAILWAY SwitchING AND SIGNALING APPARATUS.


Application filed August 29, 1905. Serial No. 370,599.

To all whom it may concern:

Be it known that I, WINTHROP K. HOWE, a citizen of the United States, residing at Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Railway Switching and Signaling Apparatus, of which the following is a specification.

My invention relates to railway switching and signaling apparatus, and more particularly relates to that class of railway-switching and signaling apparatus employing electricity as the motive power.

The chief objects of my invention are,
first, to establish a sequence of movements caused by the motor, so that the motor may race after the rail-switch and the detector-bar movements and the locking are completed and before the pole-changing switch is thrown in order to store up energy to produce dynamic indication; second, to provide means whereby the locking-bolt shall have such resilient action as to prevent the shearing out of the bolt hole or slot in the locking-bar in case the bar and bolt fail to register.

To this end my invention consists of the apparatus shown in the accompanying drawings, diagrammatic in character, in which the characters of reference indicate similar parts, in which—

Figure 1 is a plan of a rail-switch provided with my invention. Fig. 2 is a section on the line y y of Fig. 1. Fig. 3 is a side elevation of the switch mechanism. Fig. 4 is a diagram of movements.

The switch-points are indicated by the figures 1, 2 is a motor for moving the switch. 3 is a motion-plate reciprocated by the engagement of the spur-gear 4 on the motor 2, with a rack 5 rigidly secured to the motion-plate 3.

6 is the switch-rod for moving the switch-points 1, 1. Pivot ed to this rod 6 is a flat plate 7, which carries pivoted to it a roller 8. This roller 8 lies in a slot 9 in the motion-plate 3. By the reciprocation of the motion-plate 3 through the roller 8 in the slot 9, the bar 7, and the switch-rod 6 the switch-points 1 are moved from one position to the other.

10 is a lock-rod connected to the switch-points and connected to the locking-plate 11. This plate 11 passes through guides and moves with the switch-points in the usual manner. This plate 11 has notches 12 and 13 for locking the switch as follows: 14 is a bar mounted in guides which are secured to the motion-plate 3, so that the bar 14 may move longitudinally independently of the motion-plate 3. Mounted upon the ends of 60 the bar 14 are rods 15 and 17, which take through holes in lugs 16 and 18, which are secured to the motion-plate 3. Interposed between lugs 16 and 18, and the ends of the bar 14 are helical springs 17 and 19. Secured to the bar 14 are lock-bolts 18 and 19, which are capable of entering the notches 12 and 13 in the bar 14—that is to say, the bolt 18 will enter the notch 12 when the rail-switch is set for the main track and the bolt 19 will enter the notch 13 when the rail-switch is set for the side track. The bolts 18 and 19 are of sufficient length to permit movement of the motion-plate 3 after the bolt 18 enters the notch 12 or the bolt 19 enters the notch 13 to produce the racing action of the motor, hereinafter described.

20 is a detector-bar of the usual type, which is raised and lowered by the rod 21, pivoted to the bell-crank lever 22, which is pivoted to the bar 23. The bar 23 is pivoted to the plate 24, and the latter moving longitudinally in guides carries pivoted to it a roller 25, which lies in a slot 26 in the motion-plate 3.

27 is a pole-changing switch of the usual type, which serves to reverse the current in the armature of the motor 2 to produce the reciprocatory movement of the motion-plate 3. This pole-changing switch is operated by a rod 28, pivoted to it and mounted in any suitable manner by the side of the motion-plate 3. The rod 28 carries a lug 29, which lies in the path of the lugs 30 and 31, which are rigidly secured to the bar 14.

It is evident that the lug 31, engaging the lug 29, will move the switch 27 to send the current through the armature of the motor 2 in one direction and that the lug 30, engaging the lug 28, will reverse the current in the armature of the motor.

Having described the several parts of the apparatus, I will now show its operation. As shown in the drawings, the rail-switch is set at a main track. I will describe a movement setting the rail-switch for the side track.

Current being supplied to the motor 2, it will rotate the spur-gear 4 in the direction to move the motion-plate 3, (to the right in Fig. 10...
During the first part of the movement, the period A B in the diagram of Fig. 4, no work is done by the motor except to move the motion-plate 3 and the parts carried by it. During the second period of the movement, the period B C on the diagram, the roller 25 enters the incline in the slot 26 and raises the detector-bar 20. The bolt 18 on the bar 14 will during this period be carried out of the slot 12 in the locking-plate 11, so that the switch-points may be moved to reverse the rail-switch during the next period. These movements completed, the conditions are proper for the movement of the rail-switch—that is, the detector-bar has been raised and the locking-bolt withdrawn. It will be noted that during these two periods the roller 8 has occupied a straight part of the slot 9—that is, a part that is parallel with the line of movement of the motion-plate 3, and consequently no energy has been employed to move the switch. On the other hand, it will be noted that while the roller 8 has occupied a straight part of the slot 9, the functions of raising the detector-bar and unlocking have been performed. With the third part of the movement, the period C D on the diagram, the rail-switch is moved by the middle inclined portion of the slot 9 contiguity in contact with the roller 8. During this period the detector-bar has remained at rest, since the middle straight portion of the slot 26 has engaged the roller 25. During this period also the bolt 19 on the bar 14 has approached the bar 11, ready for locking with the next movement. The third period just described is complete when the straight portion of the slot 9 engages the roller 8. At that time the bar 14 is carried along with the motion-plate 3, so that the bolt 19 enters the slot 13 in the bar 11 and locks the rail-switch. At the same time the roller 25 is engaged by the reverse incline in the slot 26 and the detector-bar is lowered. At the close of this movement, which is the movement D E on the diagram, the motor has no load except to move the plate 3, since the rollers 8 and 9 are both occupying portions of the slots 9 and 26, which are parallel to the line of movement of the plate 3. It races, acquiring momentum for indication for a portion of the period E F, as diagrammatically shown by the line representing the electric-switch movement in Fig. 4, until the lug 30 on the bar 14 strikes the lug 29 on the roller 7 and breaks the battery-circuit at the pole-changing switch 27 and in a moment establishes the indication-circuit by the completion of the throw of the pole-changing switch. The energy required to produce the indication will bring the motor to rest in the period E F at the time the roller 8 will have nearly reached the end of the slot 9.

Since a movement from reverse back to the main track would be substantially a repetition of the steps just described, it need not be further described here. It will also be noted that the system of indication employed is the Taylor dynamic indication, shown in patents to John D. Taylor, as follows: No. 516,903, March 26, 1894, No. 554,097, February 4, 1896; No. 600,359, June 7, 1898, reissue No. 11,983, May 6, 1902.

The first object of my invention is thus evident. By the diagram of Fig. 5 I have shown graphically the sequence of movements. If the entire movement from normal to reverse or from reverse to normal be composed of four hundred and twenty units, we may divide the same into five periods—viz., A B, B C, C D, D E, E F, in which A B equals E F and B C equals D E. In the periods A B and E F we employ, say, seventy units each. In the periods B C and D E we employ, say, sixty units, and for the switch 85 movement, the period C D, we employ one hundred and sixty units. This of course is merely illustrative and not necessarily the divisions required in any particular construction. By reference to the periods B C and D E it will be noted that it requires sixty units time to raise the detector-bar and fifty units to unlock the switch. During the period C D the energy of the motor is expended for a period of one hundred and sixty units 95 in moving the rail-switch. With the beginning of the period E F the motor is without load and immediately begins racing, thus acquiring abundant momentum to give the dynamic indication after the pole-changing switch has been thrown, as is diagrammatically shown by the line representing the electric-switch movement in Fig. 4. Midway in this period the pole-changing switch is thrown, closing the indicating-circuit, and the load of indication will slow down the motor before the limit of the period is reached. The object of this disposition of functions, as has been shown, is to insure a strong indication. For example, suppose the rail-switch is closed badly with snow or other obstruction.

In that case the motor barely moves and barely sends the switch home. It has no momentum, and in the short movement of locking and lowering the detector-bar the load may be so great as to prevent the motor from acquiring any momentum and a weak indication will be given; but with my system abundant momentum will be acquired after the locking and lowering of the detector-bar have been accomplished to give dynamic indication, since the motor is cut loose from all load after all movements have been completed and before the pole-changing switch has been thrown.

By the use of my invention it will be apparent from the foregoing that so far as the indication is concerned it makes no difference how hard a switch moves or how slowly the motor is rotating while moving the switch,
since if it is able to throw the switch over at all the fact that it is cut free and given a chance to race insured a strong indication.

The second object of my invention is to prevent the common difficulty of shearing out the bolt-hole or slot edge in the locking-bar by forcing the bolt when the hole or slot does not register with the bolt. By repeatedly forcing the bolt, one side of the hole or slot in the locking-bar will be sheared out until there may be danger of a flange of a wheel catching the switch-point. This I overcome by mounting the locking bolt bar 14 resiliently upon the motion-plate 3, so that in case the bolt fails to register the spring 17 or 17', as the case may be, will permit the bolt to remain out of lock.

Having thus described my invention, what I claim is:

1. The combination with a motor and a rail-switch of an arrangement of mechanisms for performing the functions of unlocking the switch-points, moving the switch-points and locking the same in sequence and means for providing a motor movement free of load with power applied after the last function of the sequence is performed.

2. The combination with a motor, a rail-switch and a detector-bar of an arrangement of mechanisms for performing the functions of raising the detector-bar, unlocking the switch-points, moving the switch-points, locking the same and lowering said detector-bar in sequence and means for providing a motor movement free of load with power applied after the last function of the sequence is performed.

3. The combination with a motor, a rail-switch and an electric switch controlling the operation of said motor of means for unlocking, moving and locking the rail-switch, means for freeing said motor of load after the rail-switch is moved and locked, and means for throwing said electric switch after said motor has had time to acquire ample momentum to produce dynamic indication.

4. The combination with a motor, a lock-bolt and means for moving the same, of a switch-rod and means for moving the same, and an electric switch controlling the operation of said motor, the operation of said several means being timed in sequence and an interval of time being allowed to intervene after the rail-switch is moved and locked and prior to throwing said electric switch during which no load is on said motor.

5. The combination with a motor, a rail-switch, a detector-bar, a lock-bolt, and an electric switch controlling the operation of said motor of means for raising and lowering, said detector-bar, means for locking and unlocking said rail-switch, means for moving said rail-switch, means for throwing said electric switch, and means for producing dynamic indication by the rotation of said motor due to momentum acting as a generator, said several functions being timed in sequence, and so timed as to permit said motor to race for an interval of time prior to throwing said electric switch so that sufficient momentum of said motor to produce indication is insured.

In testimony whereof I have hereunto set my hand in the presence of two witnesses.

Witnesses:

F. L. DODGSON,
J. F. BIAAH.