Feb. 16, 1926. 1,573,234

C. S. EPPLEY

AUTOMATIC RAILWAY SWITCH

Filed July 25, 1923 5 Sheets-Sheet 1

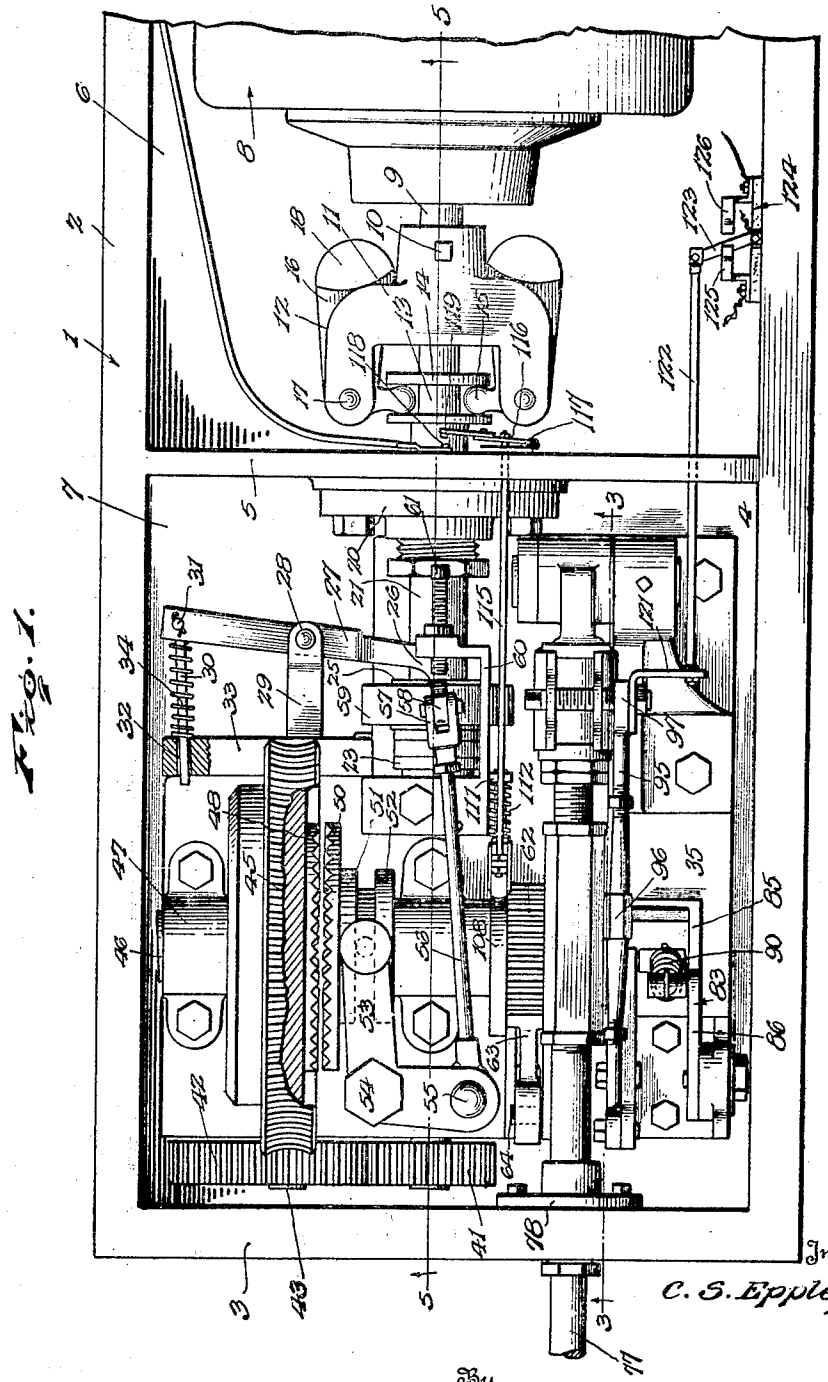


Fig. 1.

Inventor
C. S. Eppley.

By
Lacey & Lacey, Attorneys

Feb. 16, 1926. 1,573,234

C. S. EPPLEY

AUTOMATIC RAILWAY SWITCH

Filed July 25, 1923 5 Sheets-Sheet 2

Fig. 2.

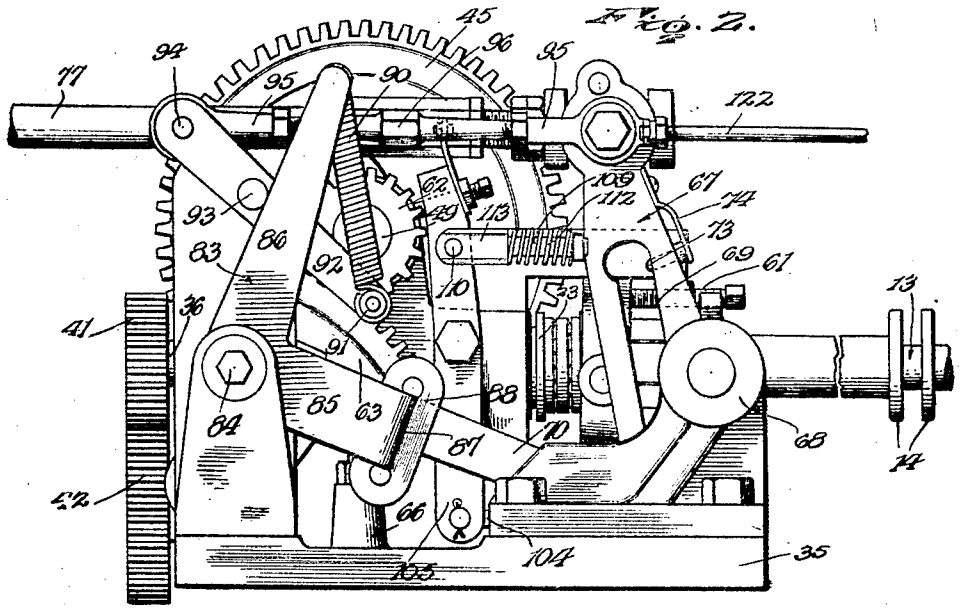
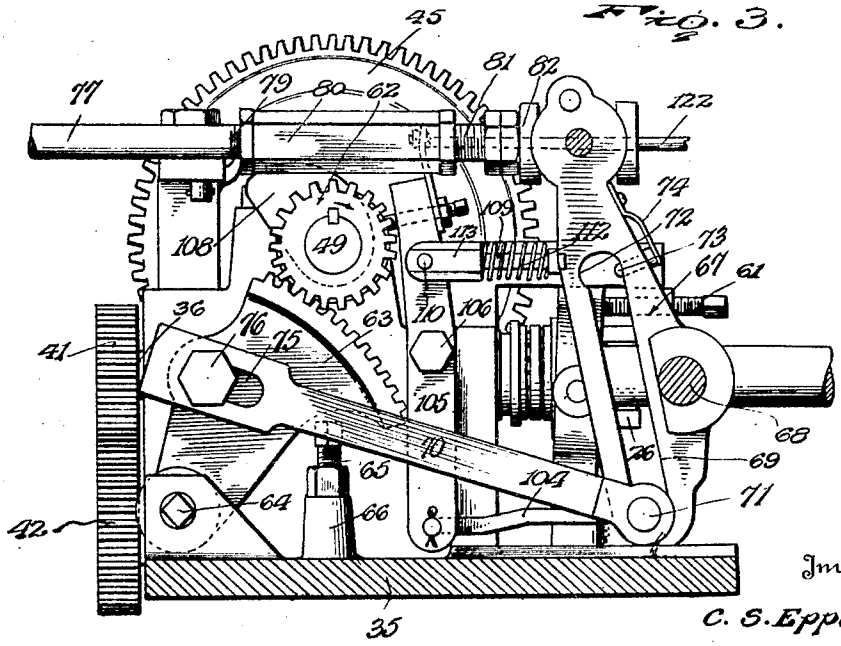


Fig. 3.



Inventor

C. S. Eppley.

By Lacy & Lacy. Attorneys

Feb. 16, 1926. 1,573,234

C. S. EPPLEY

AUTOMATIC RAILWAY SWITCH

Filed July 25, 1923 5 Sheets-Sheet 3

Fig. 4.

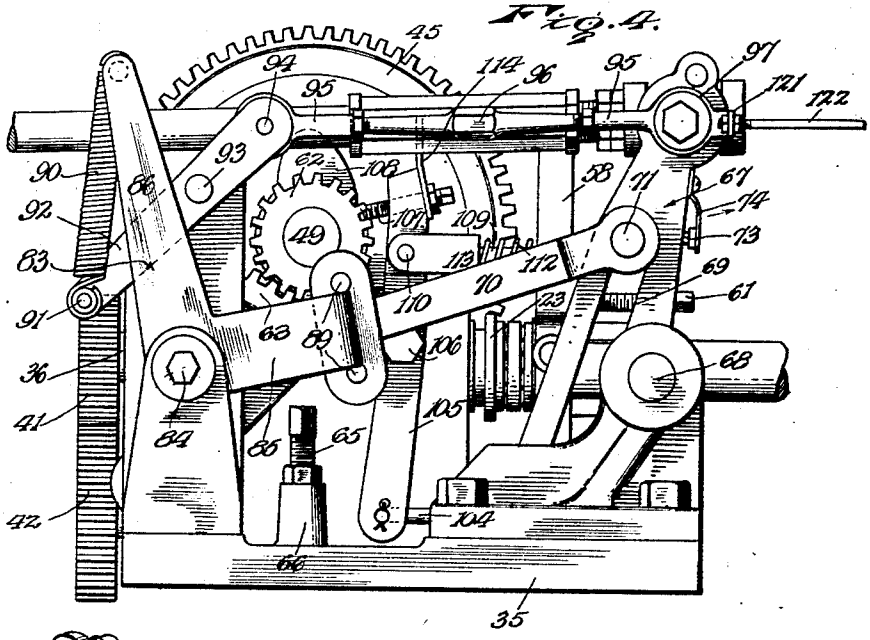


Fig. 9.

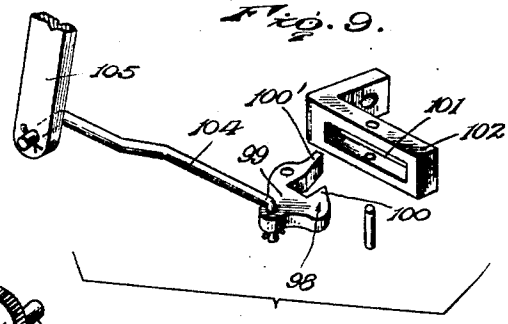
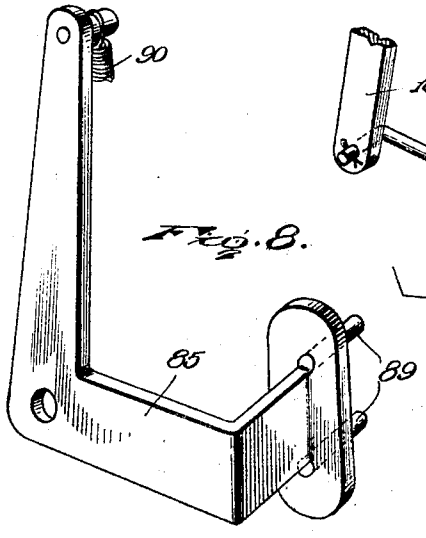


Fig. 8.



Inventor

C. S. Eppley.

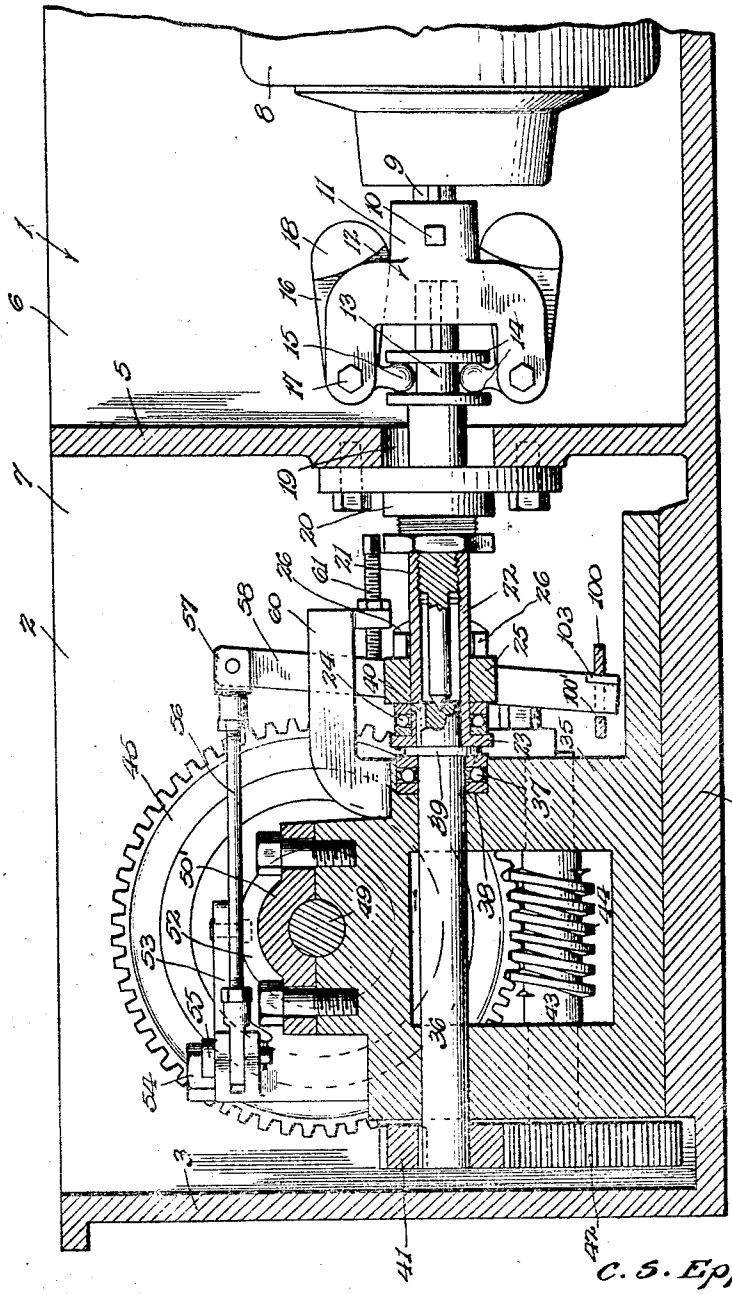
By Lacey & Lacey, Attorneys

Feb. 16, 1926. 1,573,234

C. S. EPPLEY

AUTOMATIC RAILWAY SWITCH

Filed July 25, 1923 5 Sheets-Sheet 4



Inventor
C. S. Eppley.

By

Feb. 16, 1926. 1,573,234

C. S. EPPLEY

AUTOMATIC RAILWAY SWITCH

Filed July 25, 1923 5 Sheets-Sheet 5

Fig. 6.

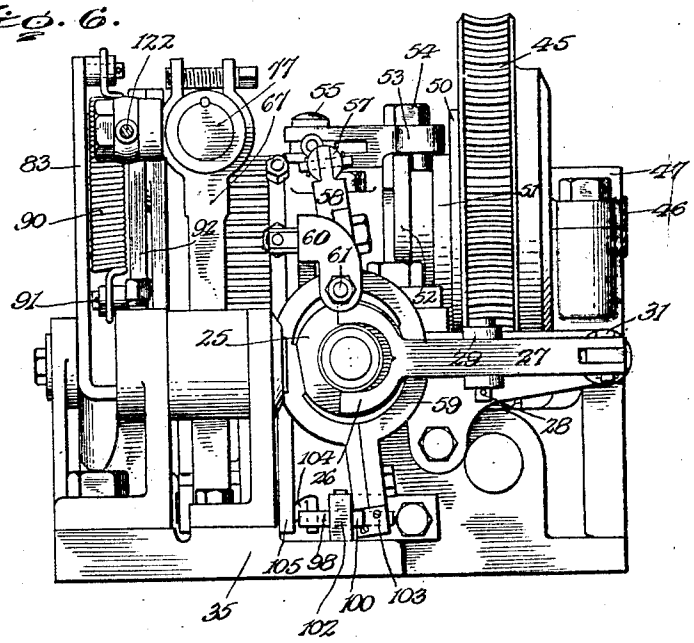
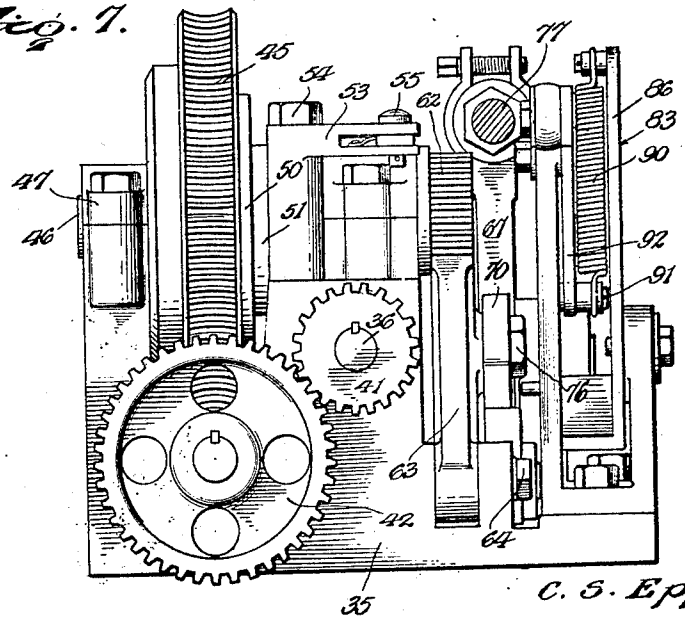


Fig. 7.



Inventor

C. S. Eppley.

By

Lacey & Lacey. Attorneys

Patented Feb. 16, 1926. 1,573,234

UNITED STATES PATENT OFFICE.

CHARLES S. EPPLEY, OF YORK, PENNSYLVANIA.

AUTOMATIC RAILWAY SWITCH.

Application filed July 25, 1923. Serial No. 653,760.

To all whom it may concern:

Be it known that I, CHARLES S. EPPLEY, a citizen of the United States, residing at York, in the county of York and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Railway Switches, of which the following is a specification.

This invention relates to railway switch operating mechanism of the motor operated automatic type.

One of the objects of the present invention is to provide a switch operating mechanism of the type mentioned which will be positive and certain in its operation and which will not be liable to a disarrangement or improper functioning of its parts.

Another object of the invention is to provide a switch operating mechanism which will require little attention after it has been installed and the operation of which may be readily controlled by the motorman of an approaching car, through the mere manipulation of the controller lever of the car control, and without any likelihood of the switch point being improperly adjusted to cause derailment of the car.

In the accompanying drawings:

Figure 1 is a plan view of the mechanism embodying the invention;

Figure 2 is a side elevation of the mechanism, the casing being omitted as well as certain other parts not necessary to an understanding of the invention;

Figure 3 is a transverse sectional view taken substantially on the line 3—3 of Figure 1 looking in the direction indicated by the arrows;

Figure 4 is a view similar to Figure 2 illustrating the parts in another position;

Figure 5 is a sectional view taken substantially on the line 5—5 of Figure 1 looking in the direction indicated by the arrows;

Figure 6 is an end elevation of the mechanism;

Figure 7 is a similar view looking at the other end of the mechanism;

Figure 8 is a perspective view of a portion of the mechanism;

Figure 9 is a group perspective view illustrating another portion of the mechanism, the component parts being relatively separated.

The mechanism embodying the invention is, as is usual, mounted within a suitable casing which is indicated in general by the numeral 1, this casing being preferably of cast metal and comprising side walls 2, end walls 3, a bottom 4, and a transverse partition wall 5, the casing being provided with a suitable cover (not shown) to exclude dirt and moisture. The partition wall 5 of the casing divides the interior of the casing into two compartments, one indicated by the numeral 6 and the other by the numeral 7. The numeral 8 indicates an electric motor which is suitably mounted within the compartment 6 and thus, in a sense, separated from the remainder of the mechanism in a manner to exclude oil and grease from its presence. The motor shaft is indicated by the numeral 9, and fixed thereon as by a set screw 10, is the head 11 of a governor which is indicated by the numeral 12. The numeral 13 indicates in general a shaft which is mounted, in a manner to be presently explained, in axial alinement with the shaft 9 and is longitudinally movable with relation thereto. The shaft 13 is provided with spaced collars 14 between which seat the fingers 15 of arms 16 which are pivoted, as at 17, at diametrically opposite sides of the head 11 and have weighted outer ends 18, these parts completing the structure of the governor. The shaft 13 is free to slide in the head 11 of the governor 12 and is splined or otherwise connected for rotation with the motor shaft 9 through the medium of the said head 11.

The partition wall 5 of the casing is formed with an opening 19, and a stuffing box 20 is mounted upon the partition wall at the point of location of the said opening 19 and accommodates the shaft 13, the said shaft fitting slidably through the packing of the stuffing box and having free play through the opening 19. That end of the shaft 13 which is opposite the end which is coupled with the motor shaft is reduced in diameter and threaded exteriorly as indicated by the numeral 21, and fitted thereto is a shaft section 22 which constitutes an extension of the shaft 13, this shaft section being provided at its other end with a circumscribing collar or flange 23 and having disposed upon it at its said end and behind the flange, an anti-friction thrust bearing 24 of any suitable type. A collar 25 is loosely mounted upon the shaft section 22 and is designed to rest against the anti-friction bearing 24, the collar being yieldably held in such position by means of a

yoke 26 carried at the end of an arm 27 fulcrumed as at 28 to a bracket 29 mounted in fixed position within the compartment 7. A rod 30 is pivotally connected at one end, as at 31, to the other end of the arm 27 and works loosely through an opening 32 in the fixed support 33 for the bracket 29, and a spring 34 is fitted onto the rod 30 and bears at one end against the said arm 27 and at its other end against the said support 33, and serves, as stated, to yieldably hold the yoke 26 in engagement with the collar 25. The numeral 35 indicates a base which is mounted within the compartment 7 upon the bottom 4 of the casing 1 and in which is journaled a shaft indicated by the numeral 36, this shaft being in alinement with the shaft section 22 and opposed endwise thereto. An anti-friction thrust bearing 37 is arranged within a recess 38 formed in one side of the base 35, and a collar 39 upon the said shaft 36 bears against said bearing. The end portion of the shaft 36 beyond the collar 39 accommodates the flanged end of the shaft section 22, the said shaft section 22, in its sliding movement, being longitudinally movable with relation to the said end of the shaft 36. However, in order that the shaft 36 and shaft section 22 may be at all times coupled for rotation in unison, a spline 40 is provided as clearly shown in Figure 5.

A pinion 41 is fixed upon the other end of the shaft 36 and meshes with a gear 42 fixed upon one end of a worm shaft 43, the worm of this shaft being indicated by the numeral 44. The worm 44 meshes with a worm gear 45 which is fixed upon a shaft 46 mounted in suitable bearings 47 upon the base 35. The worm gear 45 is provided with a clutch face 48. A shaft 49 is journaled in a bearing 50' upon the base 35 counter to the shaft 36, and is opposed in endwise relation to the said shaft 46. The numeral 50 indicates a clutch head which is provided with a hub 51 splined upon the shaft 49 for longitudinal shifting movement and for rotation therewith, and the face of the clutch head 50 is designed to coact with the clutch face 48 of the gear 45 in the manner clearly shown in Figure 1 of the drawings. The hub 51 is peripherally grooved, as at 52, to accommodate the ends of a yoke 53 provided for shifting the clutch member 50. The yoke 53 is carried at one end of an angle lever mounted, as at 54, upon the base 35, and to the other arm of this lever is connected, as at 55, one end of a rod 56. The opposite end of the rod is connected by a suitable coupling 57 with the upper end of a lever 58 which is provided with a yoke 59 intermediate its ends, journaled for rocking movement upon the collar 25. A bracket arm 60 is fixed upon the base 35 and supports an abutment screw 61, the end of which is positioned in the path of rocking movement of the upper portion of the lever 58 so as to limit the rocking movement of the lever in one direction, and also to serve as a fulcrum, under conditions to be presently explained.

A pinion 62 is fixed upon the shaft 49 and meshes with a segmental gear 63 mounted for oscillation as at 64 upon the base 35. An abutment screw 65 is adjustably threaded into a boss 66 upon the said base 35 and is adapted to be engaged by one edge of the gear 63 whereby to limit the movement of the gear in one direction.

The numeral 67 indicates a rocker arm which is mounted for rocking movement upon a bearing 68 upon the base 35, and this rocker arm is provided with a longitudinally extending slot indicated by the numeral 69. A connecting rod 70 is provided at one end with a pin 71 which is loosely engaged in the slot 69 and is capable of movement longitudinally in said slot, the pin being adapted to seat by gravity in the lower end of the slot when the connecting rod and rocker arm are in the positions shown in Figures 2 and 3 of the drawings, and being adapted to engage in the upper end of the slot when the parts are in the position shown in Figure 4 of the drawings. In order that the pin 71 may be held in the latter position, in such manner that it will not drop by gravity, and likewise in order that the connecting rod 70 may be caused to maintain the position shown in Figure 4 until moved from such position to the position shown in Figures 2 and 3, one wall of the slot 69, at the upper end of the slot, is recessed, as at 72, so as to accommodate the pin and provide a seat in which one side of the pin may engage, and a detent pin 73 is slidably mounted through an opening in the rocker arm opposite the upper end of the slot and the seat 72 in the wall thereof and is adapted to engage the opposite side of the pin 71 and hold the pin in the seat 72, a spring 74 being secured upon the said arm 67 and coacting with the detent pin 73 to yieldably hold the same in engaging position. The connecting rod 70 at its other end is formed with a slot 75, and a pivot bolt 76 is engaged through the slot and threaded into the segmental gear 63. At this point it will be evident that when the gear 63 is rocked through rotation of the shaft 49 and pinion 62, the connecting rod 70 will be shifted so as to impart rocking motion to the rocker arm 67.

The numeral 77 indicates a rod which is led through a bushing 78 in one end wall of the casing 1 and is connected in any appropriate manner to the tongue of the switch (not shown). The end of the rod 77 which lies within the casing of the mechanism is threaded, as indicated by the numeral 79, and a turn buckle 80 is fitted at one end

onto this end of the said rod 77. The other end of the turn buckle receives a threaded stem 81 which is connected by a suitable coupling 82 with the upper end of the rocker arm 67, it being understood that rocking movement of the arm 67 will result in longitudinal movement of the rod 77 to suitably shift the switch tongue from one position to the other.

As before stated, the connecting rod 70 is adapted to be shifted from the position shown in Figure 3, for example, to the position shown in Figure 4, in which former position the pin 71 will rest in the lower end of the slot 69 and in which latter position it will rest in the upper end of the said slot, and the purpose of so shifting the rod will presently be fully explained. The means provided for accomplishing this shifting movement of the rod, automatically, in the operation of the mechanism, comprises a rocker indicated in general by the numeral 83 mounted as at 84 upon the base 35. The rocker 83 comprises two angularly disposed arms, one indicated by the numeral 85 and the other by the numeral 86. The arm 85 is provided with a laterally turned end 87 supporting a head 88 from which project pins 89 which are located in suitably spaced relation and which engage above and below the connecting bar 70. To the upper end of the arm 86 of the rocker 83 there is connected the upper end of a tension spring 90, the lower end of this spring being connected, as at 91, to one end of a rock lever 92, mounted for rocking movement, as at 93, upon the said base 35. To the upper end of the rock lever 92 is pivotally connected, as at 94, one end of a rod 95 which may be formed in sections and the sections connected by an adjustable turn buckle 96. The other end of the said rod 95 is connected pivotally, as at 97, to the upper end of the rocker arm 67. By a comparison of Figures 2 and 4 of the drawings, it will be observed that when the shaft 49 is rotated, under conditions to be presently described, together with the pinion 62, the segmental gear 63 will be oscillated to effect rocking movement of the rock lever 67, and if the parts are in the position shown in Fig. 2, the movement of the said lever 67 will effect a pull upon the rod 95 thus rocking the rock arm 92 to so shift the point of connection of the lower end of the spring 90 with relation to the point of connection of the upper end of the spring, as to effect rocking of the rocker 83 from the position shown in Figure 2 to the position shown in Figure 4. This movement of the rocker will result in upward swinging movement of the connecting rod 70 to the position shown in the said Figure 4.

For a purpose which will be made apparent in the description of operation of the mechanism, it is necessary, to provide, for the lever 58, a fulcrum in addition to the fulcrum afforded by the screw 61. This fulcrum is best illustrated in Figure 9 of the drawings and indicated in general by the numeral 98 and comprises a small angle lever 99 one arm of which is provided with a fulcrum shoulder 100. The other arm of the said lever is formed with a trip finger 100′ the purpose of which will presently be explained. The angle lever is mounted in a slot 101 provided in a bracket 102 mounted upon the base 35. The fulcrum shoulder 100 is, in one position of the angle lever 99, located directly in the path of movement of the lower end of the lever 58, a wear plate or insert 103 being preferably provided in the said end of the lever for coaction with the said shoulder 100. To the first mentioned arm of the angle lever 99 there is connected a rod 104, the other end of this rod being connected to the lower end of a rock lever 105 mounted for rocking movement as at 106 upon a suitable fixed part of the base 35. An abutment screw 107 is adjustably threaded through the upper end of the rock lever 105 and bears at its end against the periphery of a cam 108 which is fixed upon the shaft 49. A stem 109 is pivotally connected as at 110 with the upper portion of the rock lever 105 and works through a stationary guide 111 upon an upstanding part of the said base 35, and a spring 112 is arranged upon the stem 109 and bears between a shoulder 113 upon said stem and the said stationary guide 111, the spring yieldably holding the rock lever 105 rocked upon its pivot with the end of the abutment screw 107 bearing against the periphery of the cam 108.

The rock lever 105 is provided at its upper end with an extension 114 which projects upwardly therefrom and to which is connected one end of a rod 115 which leads through the partition wall 5 of the casing and is connected to the movable arm 116 of a switch which is indicated in general by the numeral 117, the fixed contact of this switch being indicated by the numeral 118, and the movable blade of the switch being provided with a contact 119.

A bracket 121 extends laterally from the rocker 67, and a rod 122 is connected at one end to this bracket and at its other end to the movable blade 123 of a selecting switch 124. The said switch 124 is mounted within the compartment 6 and comprises spaced contacts 125 and 126 with either of which the blade 123 may be brought into engagement upon swinging of the blade through rocking of the rocker 67.

In order that the operation of the mechanism may be understood, it will be assumed that when the parts are in the positions shown in Figures 1, 2, 3, and 5 of the draw-

ings, the switch is open to the side track, and it will further be assumed that the motorman of a car approaching the switch wishes to pass onto or continue upon the main track. Through proper manipulation of the control lever of the car and through the instrumentality of a control panel which is mounted in juxtaposition to the switch and which constitutes the subject matter of my co-pending application filed July 27, 1923, Serial No. 654,223, the electric motor 8 is energized thus imparting rotary motion to the motor shaft 9 and through this shaft to the shaft 36. This will effect rotation of the pinion 41 and corresponding rotation of the gear 42 and shaft 43. The rotation of the shaft 43 effects rotation of the worm gear 45 through the meshing of the worm 44 with the said gear, and rotary motion is therefore imparted to the shaft 46. At this time the clutch head 50 is out of engagement with the clutch face 48 of the said gear 45. However, the governor is in the meantime actuated, through the rotation of the shaft 9, to shift the shaft 13 in the direction of the motor 8, and inasmuch as the fulcrum shoulder 100 is at such time in engagement with the lower end of the rock lever 58, the shifting movement of the said shaft 13 will result in rocking of the said lever about the said shoulder as a fulcrum, the upper end of the lever being swung in the direction of the partition wall 5 of the casing so as to exert a pull upon the rod 56 and effect rocking of the rocker 53. This movement of the rocker will serve to bring the clutch head 50 into coactive engagement with the clutch face 48 of the gear 45, whereupon rotary motion will be imparted to the shaft 49 and consequently to the pinion 62 and cam 108 upon this shaft. Rotation of the pinion 62 will, of course, effect rotation of the segmental gear 63 in a direction to exert a pull upon the connecting rod 70 and this pull will effect rocking of the rocker 67 so as to swing its upper end toward the partition wall 5 of the casing and exert a pull upon the rod 77 to swing the switch tongue (not shown) to position spaced from the main track rail thus permitting the car to continue on the main track. In the meantime rotation of the cam 108 will bring its high portion into engagement with the abutment screw 107 and effect rocking of the lever 105 so as to throw the switch blade 116 away from the fixed contact 118 and separate the contacts 118 and 119 thereby breaking the circuit through the motor. At the same time this movement of the lever 105 will result in a pull being exerted upon the rod 104 to oscillate the fulcrum 98 and move the fulcrum shoulder 100 out of engagement with the lower end of the lever 58. At the same time, the finger 100′ will act against the lower end of the lever 58 to move the said end of the lever toward the partition wall 5 and at this time the screw 61 will constitute a fulcrum for the lever resulting in its upper end being swung in the opposite direction so as to shift the clutch member 50 out of engagement with the clutch face of the gear 45, the spring 34 acting through the yoke 27 to return the shaft 13 to its normal position.

During the operation above described, and through shifting movement of the rod 77, the rod 95 will be shifted so as to rock the lever 92 and effect a rocking movement of the rocker 63 from the position shown in Figure 2 to the position shown in Figure 4, which movement of the said rocker 83, as before stated, effects an upward swinging or shifting movement of the connecting rod 70 so that the rod will assume the position shown in Figure 4 and with the pin 71 seating in the upper end of the slot 69 in the rocker 67.

Assuming now that the switch point or tongue is in the open position, and the motorman of an oncoming car wishes to turn onto the side track, he will effect closing of the circuit through the motor 8 by the medium heretofore referred to, namely the control panel of my co-pending application, and when the motor is energized and the shaft 9 is rotated, motion will be imparted to the segmental gear 63 in the same manner as before, it being understood that in the movement of the connecting rod 70 from the position shown in Figure 2, and at the time of unclutching of the member 50, a pull has been exerted upon this rod as its outer end has moved upwardly in the slot 69 in the rock lever 67, to effect return of the said gear 63 to the normal position shown in Figure 3. As the gear 63 is now rotated in the same manner as before, a pull will again be exerted upon the connecting rod 70 and as a consequence the rod 77 will be shifted to throw the switch tongue to closed position, and the parts will operate as before except that in this phase of operation, the movement of the rod 95 will, at the proper time, effect actuation of the arm 92 and finally the angle lever 83 through the medium of the spring 90, to swing the connecting rod 70 downwardly and restore it to the position shown in Figure 3.

Having thus described the invention, what is claimed as new is:

1. In switch operating mechanism of the class described, a prime mover, a shaft, operative connection between the prime mover and the shaft for rotating the latter, a second shaft, a switch rod, means actuated through rotation of the second mentioned shaft for operating the switch rod to adjust the switch, a clutch for connecting the said

shafts for rotation in unison, a shiftable member, a lever supported upon the shiftable member, means yieldably urging the shiftable member in one direction, operative connection between the lever and the clutch for actuating the clutch when the lever is rocked, a member engaged by the lever and constituting a fulcrum for the lever when the shiftable member is shifted, and means actuated through operation of the prime mover for shifting the said shiftable member.

2. In switch operating mechanism of the class described, a prime mover, a shaft, operative connection between the prime mover and the shaft for rotating the latter, a second shaft, a switch rod, means actuated through rotation of the second mentioned shaft for operating the switch rod to adjust the switch, a clutch for connecting the said shafts for rotation in unison, a shiftable member, a lever supported upon the shiftable member, means yieldably urging the shiftable member in one direction, operative connection between the lever and the clutch for actuating the clutch when the lever is rocked, a member engaged by the lever and constituting a fulcrum for the lever when the shiftable member is shifted, means actuated through operation of the prime mover for shifting the said shiftable member, and means actuated through rotation of the second mentioned shaft, at a predetermined period, for moving the lever engaged member out of active position.

3. In switch operating mechanism of the class described, a prime mover, a shaft, operative connection between the prime mover and the shaft for rotating the latter, a second shaft, a switch rod, means actuated through rotation of the second mentioned shaft for operating the switch rod to adjust the switch, a clutch for connecting the said shafts for rotation in unison, a shiftable member, a lever supported upon the shiftable member, means yieldably urging the shiftable member in one direction, operative connection between the lever and the clutch for actuating the clutch when the lever is rocked, a fulcrum member movable into and out of position to be engaged by the lever and constituting a fulcrum for the lever when in engagement therewith and when the shiftable member is shifted in one direction, and means actuated through operation of the prime mover for shifting the said shiftable member.

4. In switch operating mechanism of the class described, a prime mover, a shaft, operative connection between the prime mover and the shaft for rotating the latter, a second shaft, a switch rod, means actuated through rotation of the second mentioned shaft for operating the switch rod to adjust the switch, a clutch for connecting the said shafts for rotation in unison, a shiftable member, a lever supported upon the shiftable member, means yieldably urging the shiftable member in one direction, operative connection between the lever and the clutch for actuating the clutch when the lever is rocked, a fulcrum member movable into and out of position to be engaged by the lever and constituting a fulcrum for the lever when in engagement therewith and when the shiftable member is shifted in one direction, means actuated through operation of the prime mover for shifting the said shiftable member, and means actuated through rotation of the second mentioned shaft for moving the fulcrum member to inactive position.

5. In switch operating mechanism of the class described, a prime mover embodying a driving shaft, a driven shaft, a sleeve shaft connecting the first mentioned shafts and shiftable with relation thereto, governor means actuated through operation of the prime mover to shift the sleeve shaft, a switch rod, gear means for actuating the switch rod through rotation of the driven shaft embodying a clutch, a lever supported upon the sleeve shaft, means yieldably urging the sleeve shaft in one direction, operative connection between the lever and the clutch for actuating the clutch when the lever is rocked, and a member engaged by the lever and constituting a fulcrum for the lever when the sleeve shaft is shifted.

6. In switch operating mechanism of the class described, a prime mover embodying a driving shaft, a driven shaft, a sleeve shaft connecting the first mentioned shafts and shiftable with relation thereto, governor means actuated through operation of the prime mover to shift the sleeve shaft, a switch rod, gear means for actuating the switch rod through rotation of the driven shaft embodying a clutch, a lever supported upon the sleeve shaft, means yieldably urging the sleeve shaft in one direction, operative connection between the lever and the clutch for actuating the clutch when the lever is rocked, a member engaged by the lever and constituting a fulcrum for the lever when the sleeve shaft is shifted, and means actuated through operation of the said gear means, for moving the lever engaged member out of active position.

7. In switch operating mechanism of the class described, a prime mover embodying a driving shaft, a driven shaft, a sleeve shaft connecting the first mentioned shaft and shiftable with relation thereto, governor means actuated through operation of the prime mover to shift the sleeve shaft, means yieldably urging the sleeve shaft in a direction opposite to that in which it is moved through actuation by the governor means, a

switch rod, gear means for actuating the switch rod through rotation of the driven shaft embodying a clutch, a lever supported upon the sleeve shaft, operative connection between the lever and the clutch for actuating the clutch when the lever is rocked, a fulcrum member movable into and out of position to be engaged by the lever and constituting a fulcrum for the lever when in engagement therewith and when the sleeve shaft is shifted in one direction, and means actuated through the operation of the gear means for moving the fulcrum member to inactive position.

In testimony whereof I affix my signature.

CHARLES S. EPPLEY. [L. S.]