March 17, 1931. C. W. DALZELL ET AL 1,796,323

RAILWAY SWITCH OPERATING APPARATUS

Filed July 24, 1930 2 Sheets-Sheet 1

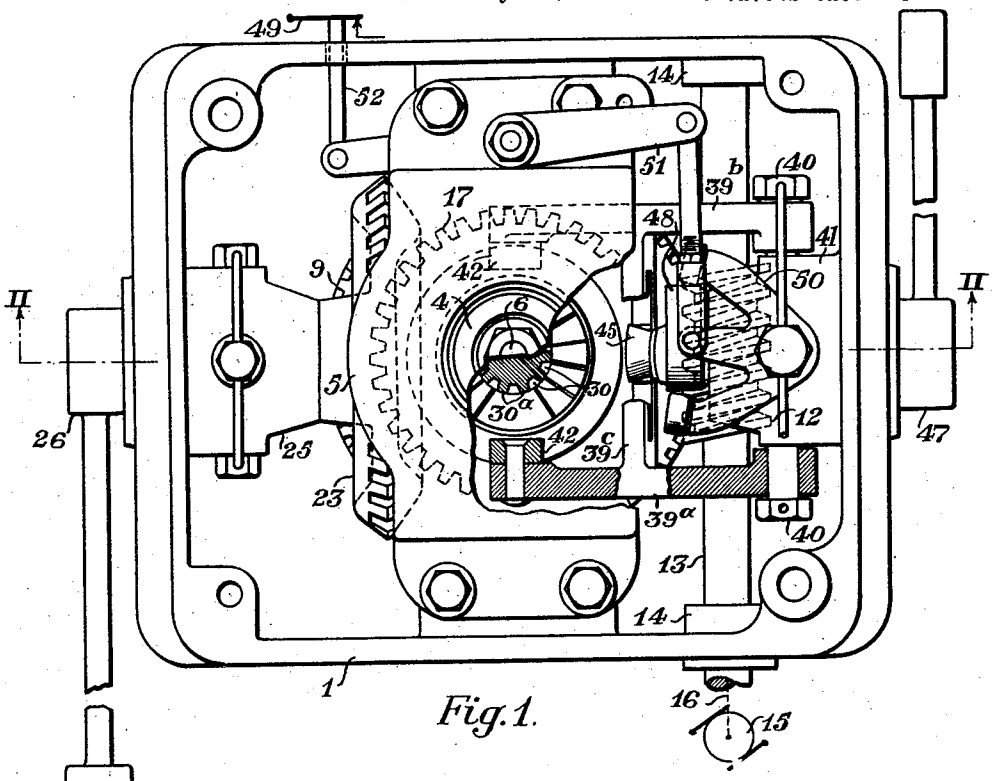


Fig. 1.

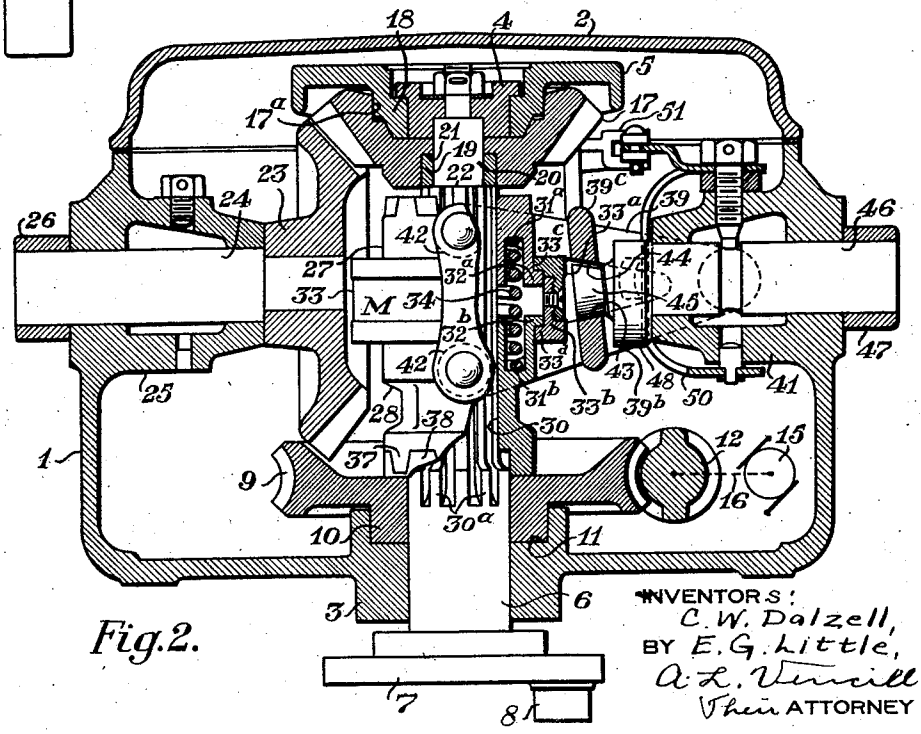


Fig. 2.

INVENTORS:
C. W. Dalzell,
BY E. G. Little,
A. L. Vincill
Their ATTORNEY

March 17, 1931. C. W. DALZELL ET AL 1,796,323

RAILWAY SWITCH OPERATING APPARATUS

Filed July 24, 1930 2 Sheets-Sheet 2

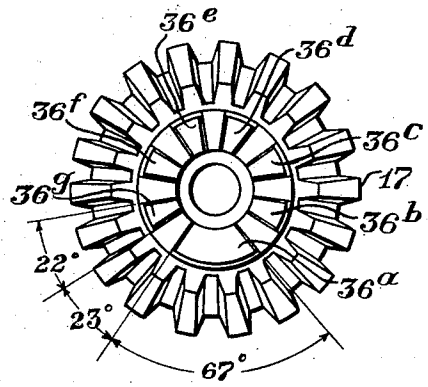


Fig.3.

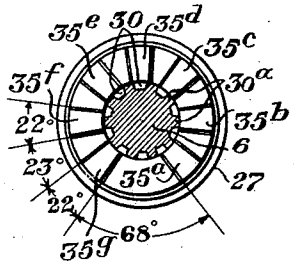


Fig.4.

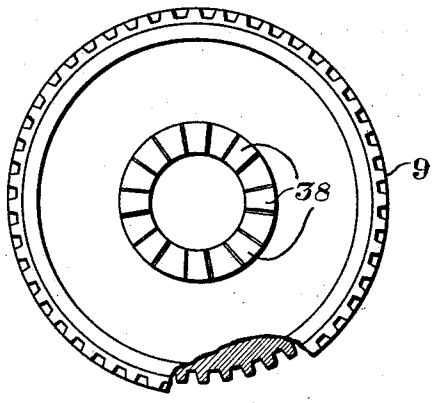


Fig.5.

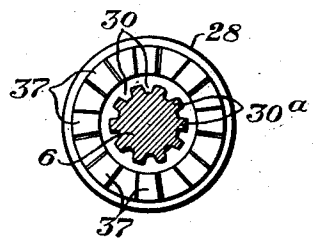


Fig.6.

INVENTORS;
C.W. Dalzell,
BY E.G. Little,
A.L. Wenzell
Their ATTORNEY

Patented Mar. 17, 1931

1,796,323

UNITED STATES PATENT OFFICE

CLARENCE W. DALZELL AND EDWIN G. LITTLE, OF WILKINSBURG, PENNSYLVANIA, ASSIGNORS TO THE UNION SWITCH & SIGNAL COMPANY, OF SWISSVALE, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA

RAILWAY-SWITCH-OPERATING APPARATUS

Application filed July 24, 1930. Serial No. 470,304.

Our invention relates to railway switch operating apparatus, and has for an object the provision of novel and improved means for permitting manual operation of a power operating switch.

We will describe one form of apparatus embodying our invention, and will then point out the novel features thereof in claims.

In the accompanying drawings, Fig. 1 is a top plan view showing one form of apparatus embodying our invention with the cover of the housing removed and with certain parts broken away to more clearly illustrate the construction thereof. Fig. 2 is a vertical sectional view taken substantially on the line II—II of Fig. 1. Fig. 3 is a bottom view of the bevel gear 17 forming part of the apparatus shown in Figs. 1 and 2. Fig. 4 is a top view of the sleeve 27 forming a part of the clutch mechanism M for at times connecting the shaft 6 with the bevel gear 17 of the apparatus shown in Figs. 1 and 2. Fig. 5 is a detail view illustrating the worm wheel 9 forming a part of the apparatus shown in Figs. 1 and 2. Fig. 6 is a bottom view of the sleeve 28 forming a part of the clutch mechanism M for at times connecting the shaft 6 with the worm wheel 9 of the apparatus shown in Figs. 1 and 2.

Similar reference characters refer to similar parts in each of the several views.

Referring first to Figs. 1 and 2, the reference character 1 designates a housing provided with a removable cover 2 and adapted to be mounted adjacent a railway track switch. The housing 1 is formed with a bearing 3 in the bottom thereof, and with a bearing 4 supported by a bracket 5 which is secured to the side walls of the housing 1. A vertically extending switch actuating shaft 6 is journalled in the bearings 3 and 4, and this shaft terminates at its lower end in a crank 7 provided with a downwardly projecting crank pin 8. This crank and pin cooperate with suitable apparatus for actuating and locking a railway switch, which apparatus is not shown in the accompanying drawing but which may, for example, be similar to the apparatus shown in Letters Patent of the United States, No. 1,293,290, granted to William Zabel on February 4, 1919, for railway traffic controlling apparatus. In the said patent, the crank 55 and pin 58 correspond respectively to the crank 7 and the pin 8 in the present disclosure.

A worm wheel 9 is mounted for rotation coaxially with the shaft 6 and is formed with a hub 10 for seating engagement within a suitable step bearing 11 provided in the upper portion of the bearing 3. This gear is driven by a worm 12 fixed to a jack shaft 13 which is journaled in bearings 14 provided in the walls of the housing 1. The jack shaft 13 is operably connected with power driving means such as an electric motor 15, through suitable reduction gearing indicated in the drawing by the dash lines 16.

A bevel gear 17 is also mounted for rotation coaxially with the shaft 6 and is provided in its upper face with an annular recess 17ª which cooperates with a thrust bearing 18 formed on the lower side of the bracket 5 to prevent vertical and axial displacement of the bevel gear. Vertical and axial displacement of the bevel gear 17 is also prevented by a bushing 19 which is interposed between the bevel gear and the reduced upper end 20 of the shaft, and which cooperates at one end with a circular shoulder 21 formed integral with the bevel gear and at the other end, with a shoulder 22 formed at the bottom of the reduced upper end 20 of the shaft. The bevel gear 17 meshes with a second bevel gear 23 which is fixed to a horizontal shaft 24 mounted in a boss 25 in the wall of the casing 1. This shaft projects through the wall of the casing and carries at its outer end a hand lever 26 which is at times used for manual operation of the switch.

Manually operable means are provided for selectively connecting the worm wheel 9 or the bevel gear 17 with the switch actuating shaft 6, so that the switch may be operated either by the electric motor 15 or by the hand lever 26. As here shown, these means comprise a clutch mechanism M consisting of two sleeves 27 and 28 which are mounted on the shaft 6 for vertical sliding movement, but which are constrained to rotate with the shaft by means of integral internal splines 30 which

cooperate with corresponding splines 30^a formed on the shaft, as best seen in Figs. 4 and 6. The confronting ends of the sleeves 27 and 28 are formed with annular recesses 31^a and 31^b, respectively, and with circumferential flanges 32^a and 32^b. A clutch collar 33 comprising two cylindrical members 33^a and 33^b screwed together, surrounds the sleeves 27 and 28 at the flanges 32^a and 32^b with slight clearance, and is provided at its upper end with an inwardly extending circular shoulder 33^c which overlies the circular flange 32^a, and at its lower end, with a similar inwardly extending circular shoulder 33^d which underlies the circular flange 32^b. The sleeves are constantly urged apart by a coil spring 34, the upper and lower ends of which are located in the recesses 31^a and 31^b, respectively.

As best seen in Fig. 4, the upper end of the sleeve 27 is provided with teeth 35^a, $35^b \ldots 35^g$. It will be noted that, as here shown, the angular distance between each two adjacent teeth 35 is 23°, except that the angular distance between the teeth 35^a and 35^g is 68°. The angular length of each tooth 35, as here shown, is 22°. The lower face of the bevel gear 17 is likewise provided with teeth 36^a, $36^b \ldots 36^g$ as shown in Fig. 3. Each of these latter teeth, as here shown, has an angular length of 22° with the exception of the tooth 36^a which has an angular length of 67°. The angular space between each two adjacent teeth 36, as here shown, is 23°. It follows that the teeth 35 on the sleeve 27 will fit between the teeth 36 on the bevel gear 17 when and only when the space between the teeth 35^a and 35^g on the sleeve is opposite the tooth 36^a on the bevel gear. The parts are so proportioned that this relation will exist when and only when the hand lever and the switch occupy corresponding relative positions.

Of course, the described dimensions of the teeth on sleeve 27 and gear 17 are not essential, as any other proportions of parts can be employed which will permit mating of the gear and sleeve only when the hand lever and the switch occupy the proper relative positions.

The lower end of the sleeve 28 is also formed with teeth 37. These teeth are evenly spaced about the end of the sleeve, as best seen in Fig. 6, and are arranged to cooperate with similar teeth 38 formed on the upper face of the worm wheel 9 as shown in Fig. 5.

It follows from the foregoing that when the clutch mechanism M is in one longitudinal position on the shaft 6, the teeth on the lower end of the sleeve 28 connect the worm wheel 9 with the shaft 6, whereas, when the clutch mechanism is in another longitudinal position on the shaft, the teeth on the upper end of the sleeve 27 connect the bevel gear 17 with the shaft 6.

The clutch mechanism M is moved longitudinally on the shaft 6 in order to effect the desired driving connection between the bevel gear 17 and the shaft, or between the worm wheel 9 and the shaft, by means of a shifter lever 39 comprising two spaced triangular arms 39^a and 39^b connected intermediate their ends by a yoke 39^c. This shifter lever is pivotally mounted at one end on bolts 40 which are threaded into a boss 41 formed in the side wall of the casing 1, and the arms thereof extend inwardly in a substantially horizontal direction on opposite sides of the collar 33 to a position beyond the vertical axis of the collar, and are each provided at their inner ends with a pair of spaced rollers 42 which engage the upper and lower edges of the collar 33 at both sides of the collar. The yoke 39^c of the shifter lever is formed with two cam engaging surfaces 43 and 44 which, as best seen in Fig. 2, taper toward the axis about which shifter lever 39 oscillates, and these surfaces cooperate with a conical pin 45 formed on the inner end of a horizontal shaft 46 which is journalled in the boss 41. The conical pin 45 is eccentrically located with respect to the axis of the shaft 46, and is so arranged that its elements, if extended, would converge substantially at the axis about which the shifter lever 39 oscillates. The shaft 46 extends through the side wall of the casing 1 and is provided at its outer end with a selector lever 47 by means of which the shaft may at times be oscillated.

The inner end of the shaft 46 is also provided with a cam 48 which operates a circuit controller 49 through the medium of a pivotally mounted yoke 50, a crank 51, and a push rod 52. This circuit controller 49 may be employed to govern the supply of current to the electric motor 15.

The operation of the apparatus is as follows: Normally the selector lever 47 occupies a position in which the pin 45 is at the lowest point in its path of movement. Under these conditions, the pin engages the cam surface 43 of the shifter lever 39 and holds this lever in its lowermost position. When the shifter lever occupies this position, the upper roller 42 on each of the arms 39^a and 39^b engages the upper edge of collar 33 and exerts a downward force on the collar which is transmitted through the shoulder 33^c, flange 32^a, and coil spring 34 to the lower sleeve 28, thereby holding this sleeve in the position in which the teeth 37 on the sleeve mesh with the teeth 38 on the worm wheel 9. The worm wheel is therefore operatively connected with the switch actuating shaft 6 so that the apparatus is in condition for operation of the switch by the electric motor 15. At such times, the bevel gear 17 is capable of rotating freely with respect to the shaft 6 so that this gear is disconnected from the shaft, with the result that the hand lever is disconnected from the switch. In order to discon-

nect the motor from, and connect the hand lever with, the switch, the selector lever 47 is swung through 180° so that the pin 45 is rotated from the lowest point in its path of movement to the highest point in its path of movement. This rotation of the pin causes the shifter lever 39 and hence, the collar 33 to move to their uppermost positions. During the movement of the collar 33 to its uppermost position, its lower shoulder 33^d engages the flange 32^b on the sleeve 28, thereby positively moving the sleeve 28 upwardly to a position in which the teeth 37 on the sleeve are disengaged from the teeth 38 on the worm wheel, so that the worm wheel is then free to rotate with respect to the shaft. Furthermore, during the movement of the collar 33 to its uppermost position, the sleeve 27 is moved upwardly by virtue of the force transmitted through the spring 34 and, if the position of the switch and hand lever then correspond so that the long tooth 36^a on the bevel gear 17 is opposite the long space between the teeth 35^a and 35^s on the sleeve 27, the teeth on the sleeve and the teeth on the bevel gear will mesh. The bevel gear will then be connected with the shaft 6 so that the switch may be operated by swinging the hand lever from one position to the other. If, however, the position of the switch and the hand lever do not correspond when the collar is being moved upwardly, so that the long tooth 36^a on the bevel gear 17 is not opposite the long space between the teeth 35^a and 36^s on the sleeve 27, then when the collar has moved upwardly a comparatively short distance, the flat ends of the teeth 35 on the sleeve 27 will engage the flat ends of the teeth 36 on the bevel gear 17, and during the remainder of the upward movement of the collar, spring 34 will become compressed. It will be apparent, therefore, that under these conditions, the hand lever will not become connected with the switch until the hand lever is moved to the position corresponding to the position of the switch, at which time the energy stored in the spring 34 will complete the upward movement of the sleeve 27, thereby causing the teeth on the sleeve to mesh with the teeth on the bevel gear, and hence permitting manual operation of the switch in the manner previously described. The operation of the shaft 46 to transfer the switch from motor to hand operation causes the cam 48 to open circuit controller 49, thereby disconnecting motor 15 from its source of current and so preventing operation of the worm wheel 9 while the apparatus is in condition for manual operation of the switch.

When it is desired to restore the apparatus to condition for operation by the motor, the selector lever 47 is returned to its normal position in which it is illustrated in the drawing. The operation of the apparatus, under these conditions, is just the reverse of that described hereinbefore, and will be readily understood without describing it in detail. It should be noted, however, that since the teeth on the sleeve 28 and the teeth on the worm wheel 9 are evenly spaced, these teeth will mesh except when the ends of the teeth are directly opposite each other, at which time they will mesh as soon as the motor rotates the worm wheel through an angle corresponding to the width of one tooth.

It will be apparent, therefore, from the foregoing that with switch operating apparatus embodying our invention, the selector lever 47 may be thrown to its operating position for either hand or motor operation of the switch regardless of whether there is an agreement or a disagreement between the position of the switch and the position of the operating mechanism. It will also be apparent that if the hand lever is thrown to its operating position for either hand or motor operation of the switch when a disagreement between the position of the switch and the position of the operating mechanism exists, then when the position of the operating mechanism is brought into agreement with that of the switch, the desired connection between the switch and the operating mechanism will be automatically effected.

Although we have herein shown and described only one form of railway switch operating apparatus embodying our invention, it is understood that various changes and modifications may be made therein within the scope of the appended claims without departing from the spirit and scope of our invention.

Having thus described our inventon, what we claim is:

1. Railway switch operating apparatus comprising a rotatable switch actuating shaft, a movable member associated with said shaft, means for at times operating said member, a sleeve mounted on said shaft to rotate therewith but slidable thereon toward and away from said member, resilient means for moving said sleeve toward said member, means connected directly with said sleeve for moving said sleeve away from said member, and means associated with said sleeve for connecting said member with said shaft if said member and said shaft occupy corresponding relative positions when said sleeve is moved toward said member.

2. Railway switch operating apparatus comprising a rotatable switch actuating shaft, a gear wheel mounted concentrically with respect to said shaft, means for at times rotating said gear wheel, a sleeve mounted on said shaft to rotate therewith but slidable thereon toward and away from said gear wheel, teeth on said sleeve and said gear wheel so arranged that said teeth will mesh when said sleeve is moved toward said gear wheel and connect said gear wheel to said

shaft if and only if said shaft and said gear wheel occupy one relative position, resilient means for moving said sleeve toward said gear wheel, and means directly connected with said sleeve for moving said sleeve away from said gear wheel.

3. Railway switch operating apparatus comprising a rotatable switch actuating shaft, a gear wheel mounted concentrically with respect to said shaft, means for at times rotating said gear wheel, a sleeve mounted on said shaft to rotate therewith but slidable thereon toward and away from said gear wheel, teeth on said sleeve and said gear wheel so arranged that said teeth will mesh when said sleeve is moved toward said gear wheel and connect said gear wheel to said shaft if and only if said shaft and said gear wheel occupy one relative position, means including a spring for moving said sleeve toward said gear wheel, and means independent of said spring for moving said sleeve away from said gear wheel.

4. Railway switch operating apparatus comprising a rotatable switch actuating shaft, two movable members associated with said shaft, means for independently operating said two members, two sleeves mounted on said shaft to rotate therewith but each slidable thereon between two extreme positions, means associated with one of said sleeves for connecting one of said members with said shaft when said one sleeve occupies its one extreme positon but not when such sleeve occupies its other extreme position, means associated with the other sleeve for connecting the other member with said shaft when said other sleeve occupies its one extreme position but not when such sleeve occupies its other extreme position, manually operable means for positively moving either of said sleeves from its one extreme position to its other extreme position, and resilient means effective when one such sleeve is moved from its one extreme position to its other extreme position for moving the other such sleeve from its other extreme position to its one extreme position.

5. Railway switch operating apparatus comprising a rotatable switch actuating shaft, two movable members associated with said shaft, means for independently operating said two members, two sleeves mounted on said shaft to rotate therewith but each slidable thereon between two extreme positions, means associated with one of said sleeves for connecting one of said members with said shaft when said one sleeve occupies its one extreme position but not when such sleeve occupies its other extreme position, means associated with the other sleeve for connecting the other member with said shaft when said other sleeve occupies its one extreme position but not when such sleeve occupies its other extreme position, manually operable means for positively moving either of said sleeves from its one extreme position to its other extreme position, and a spring associated with said two sleeves in such manner that when one such sleeve is moved from its one extreme position to its other extreme position the other such sleeve is moved from its other extreme position to its one extreme position by the force transmitted through said spring.

6. Railway switch operating apparatus comprising a rotatable switch operating shaft, two gears associated with said shaft, means for rotating said two gears independently of each other, two sleeves mounted on said shaft to rotate therewith but each slidable thereon toward and away from an associated one of said gears, means associated with one of said sleeves for engaging the associated gear to connect such gear with said shaft if the associated gear and said shaft occupy one relative position when said one sleeve is moved toward the associated gear, means associated with the other sleeve for engaging the associated gear to connect such gear with said shaft when said other sleeve is moved toward the associated gear regardless of the position of such associated gear and the shaft, means directly connected with said two sleeves for moving either of said sleeves away from its associated gear, and resilient means effective when one such sleeve is moved away from its associated gear for moving the other such sleeve toward its associated gear.

7. Railway switch operating apparatus comprising a rotatable switch operating shaft, two gears mounted concentrically with respect to said shaft, power mechanism operatively connected with one of said gears, a hand lever operatively connected with the other of said gears, two sleeves mounted on said shaft to rotate therewith but each slidable thereon between two extreme positions, means associated with one of said sleeves for connecting one of said gears with said shaft when said one sleeve occupies its one extreme position but not when such sleeve occupies its other extreme position, means associated with the other sleeve for connecting the other gear with said shaft when said other sleeve occupies its one extreme position but not when such sleeve occupies its other extreme position, manually operable means for moving either of said sleeves from its one extreme position to its other extreme position, and resilient means effective when one such sleeve is moved from its one extreme position to its other extreme position for moving the other such sleeve from its other extreme position to its one extreme position.

8. Railway switch operating apparatus comprising a rotatable switch operating shaft, two gears mounted concentrically with respect to said shaft, power mechanism op-

eratively connected with one of said gears, a hand lever operatively connected with the other of said gears, two sleeves mounted on said shaft to rotate therewith but each slidable thereon between two extreme positions, means associated with one of said sleeves for connecting one of said gears with said shaft when said one sleeve occupies its one extreme position but not when such sleeve occupies its other extreme position, means associated with the other sleeve for connecting the other gear with said shaft when said other sleeve occupies its one extreme position but not when such sleeve occupies its other extreme position, said last mentioned means being so designed that said other sleeve is prevented from moving to its one extreme position unless said other gear and said shaft occupy one and only one relative position, manually operable means for moving either of said sleeves from its one extreme position to its other extreme position, and resilient means effective when one such sleeve is moved from its one extreme position to its other extreme position for moving the other such sleeve from its other extreme position to its one extreme position.

9. Railway switch operating apparatus comprising a splined rotatable switch actuating shaft, a worm wheel and a bevel gear concentrically mounted on said shaft in axial spaced relation, an electric motor operatively connected with said worm wheel, a hand lever operatively connected with said bevel gear, two splined sleeves mounted on said shaft for vertical sliding movement on said shaft in the region between said worm wheel and said bevel gear, each said sleeve being provided at the end which confronts the other said sleeve with an annular recess and with a circumferential flange, a collar surrounding said sleeves at said flanges with some clearance and provided with two inwardly extending circular shoulders each of which cooperates with the outer face of the flange on one of said sleeves, a compression spring interposed between said two sleeves and having one end located in the recess in each sleeve, a shifter lever comprising two arms connected together intermediate their ends by a yoke which is provided with two spaced cam surfaces, means for pivotally supporting said lever at one end of said arms in such manner that said arms extend past the axis of said collar on opposite sides of said collar, four rollers two attached to the free end of each arm in such manner that one of said rollers engages each end of said collar on both sides of the collar, and a manually operable shaft having an eccentric pin cooperating with said cam surfaces in such manner that oscillation of said shaft causes longitudinal movement of said collar along switch actuating shaft.

10. Railway switch operating apparatus comprising a rotatable switch operating shaft, a clutch mechanism comprising two sleeves slidable on said shaft, means for urging said sleeves apart, means for limiting the movement of said sleeves away from each other, two independently operable driving elements, means for moving said clutch mechanism bodily along said shaft to cause engagement of one sleeve with one said driving element or of the other sleeve with the remaining driving element, and means for driving said shaft by said clutch mechanism.

11. Railway switch operating apparatus comprising a rotatable switch operating shaft, a clutch mechanism comprising two sleeves slidable on said shaft, means for urging said sleeves apart, means for limiting the movement of said sleeves away from each other, a wheel and a gear mounted coaxially with respect to said shaft, means for driving said wheel and gear independently, means for moving said clutch mechanism bodily along said shaft to cause driving engagement of one said sleeve with said wheel or of the other sleeve with said gear, and means for preventing relative rotation of said shaft and the sleeves of said clutch mechanism.

In testimony whereof we affix our signatures.

CLARENCE W. DALZELL.
EDWIN G. LITTLE.