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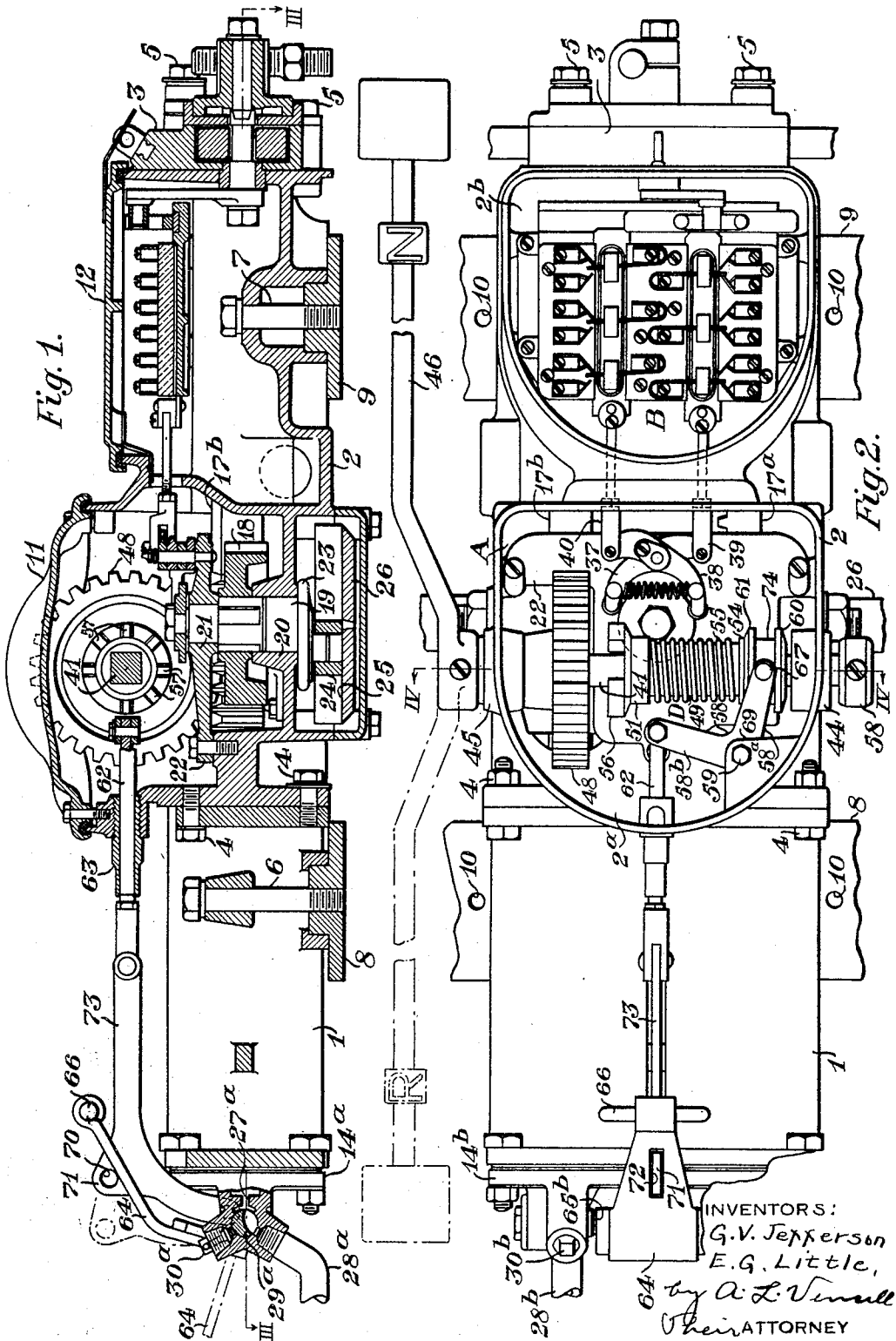
G. V. JEFFERSON ET AL

1,833,679

RAILWAY SWITCH OPERATING APPARATUS

Original Filed July 24, 1930

2 Sheets-Sheet 1



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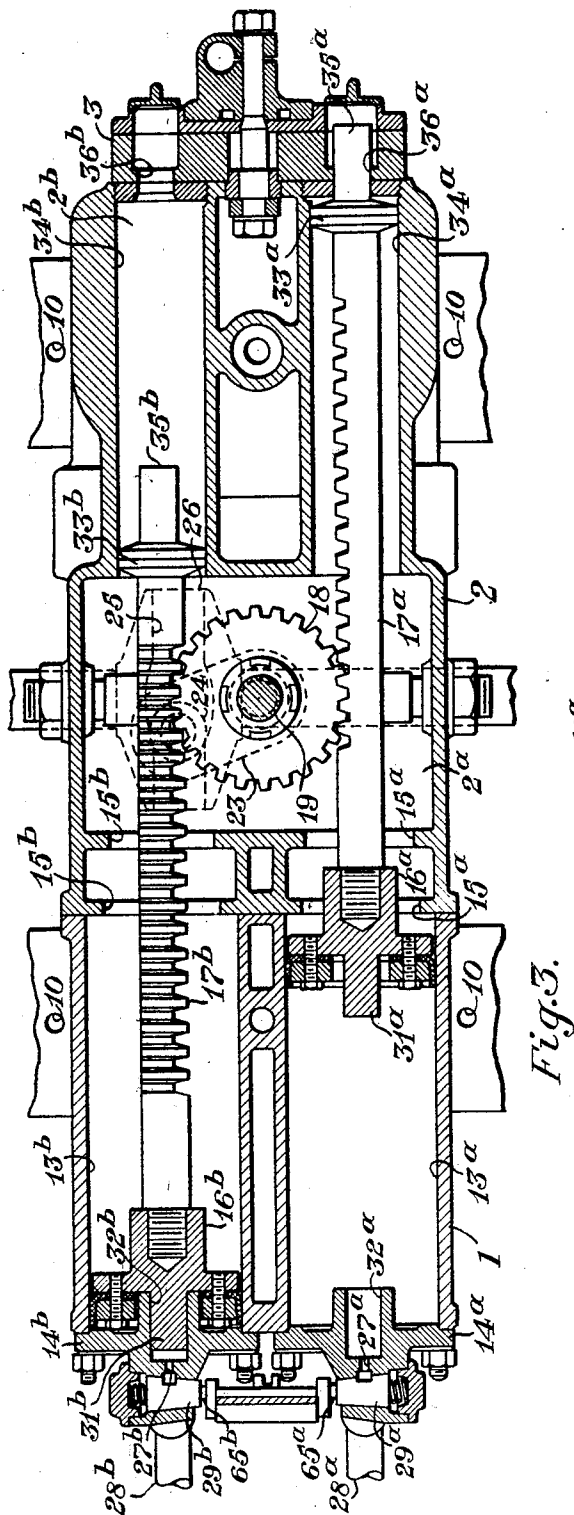
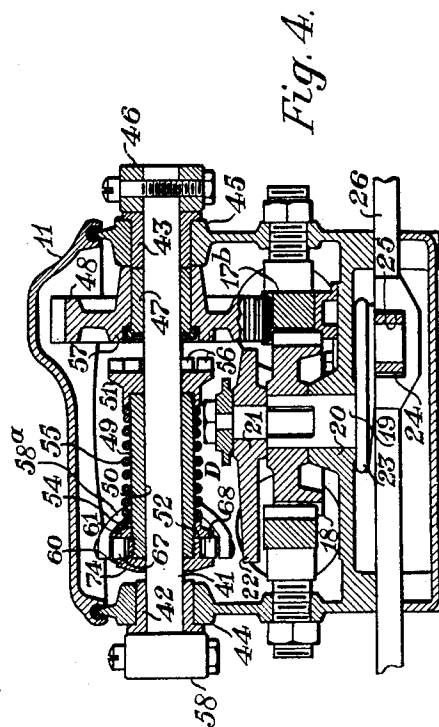
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2 Sheets-Sheet 2



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RAILWAY SWITCH OPERATING APPARATUS

Application filed July 24, 1930, Serial No. 470,370. Renewed May 5, 1931.

Our invention relates to railway switch operating apparatus, and has for an object the provision of means for permitting manual operation of power operating apparatus of the type described and claimed in Letters Patent of the United States, No. 1,238,889, granted to J. P. Coleman on September 4, 1917, for railway traffic controlling apparatus.

10 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 15 a longitudinal vertical sectional view showing one form of apparatus embodying our invention. Fig. 2 is a top plan view of the apparatus shown in Fig. 1 with the covers for the casing removed to illustrate the construction. Fig. 3 is a horizontal sectional 20 view of the apparatus shown in Fig. 1 taken substantially on the line III—III of Fig. 1. Fig. 4 is a transverse sectional view of the apparatus shown in Fig. 2 taken substantially on the line IV—IV of Fig. 2.

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

Referring first to Figs. 1 to 3, inclusive, the switch operating apparatus embodying 30 our invention is here shown as enclosed in a casing A made up of three castings 1, 2 and 3 held together by bolts 4 and 5. Secured to the underside of the casing A by means of bolts 6 and 7 extending downwardly through 35 suitable holes in the castings 1 and 2, respectively, as best seen in Fig. 1, are two plates 8 and 9 provided with holes 10 through which lag screws or other fastening devices may be passed for securing the casing to a 40 suitable support, such as the ties of a railway track. Casting 2 is formed with two compartments 2^a and 2^b, compartment 2^a being closed by a removal cover 11, and compartment 2^b being closed by a removable 45 cover 12.

As best seen in Fig. 3, the casting 1 is formed with two parallel cylinders 13^a, 13^b which are closed at their outer ends by cylinder heads 14^a, 14^b, and which communicate 50 at their inner ends with the compartment 2^a

of casting 2 through openings 15^a, 15^b. Pistons 16^a, 16^b are mounted for reciprocation in the cylinders 13^a, 13^b, and are attached to the ends of rack bars 17^a, 17^b which extend through the openings 15^a, 15^b into the compartment 2^b of the casting 2 for intermeshing engagement with the opposite sides of a gear wheel 18. The gear wheel 18 is secured to a vertically extending jackshaft 19, the lower end of which is journaled in a bearing 20 formed in the casting 2 as best seen in Fig. 1, and the upper end of which is journaled in a bearing 21 formed in a plate 22 attached to the casting 2. A crank 23 is provided on the lower end of the shaft 19, and this crank carries a roller 24 which co-operates with a suitable slot 25 extending transversely across the top of a switch operating rod 26, as shown in Figs. 3 and 4. The rod 26 is slidably mounted in the lower part 70 of the casting 2, and is adapted to be connected at its outer end with the movable rails of a track switch or other governing device not shown in the drawings.

Fluid pressure is admitted to the interior 75 of the cylinders 13^a, 13^b through ports 27^a, 27^b which are provided in the cylinder heads 14^a, 14^b, and which communicate with pipes 28^a, 28^b through valves 29^a, 29^b, as best seen in Figs. 1 and 3. When the valves occupy 80 the positions shown in Fig. 1, communication is established between the pipes 28^a, 28^b and the interiors of the cylinders, but when they are rotated from the positions shown through a sufficient angle in a counterclockwise direction, the cylinders are disconnected from the pipes 28^a, 28^b and are connected with atmosphere through vent plugs 30^a, 30^b. During the normal operation of the apparatus, the valves 29^a, 29^b occupy their open positions in which they are illustrated in Fig. 2, and fluid pressure from the source is selectively admitted to the cylinders 13^a, 13^b through suitable valves (not shown) provided in the pipes 28^a, 28^b. 85

The pistons 16^a, 16^b are so arranged in the cylinders that when one piston is at the end of its stroke in one direction, the other piston will be at the end of its stroke in the other direction. It will be apparent, therefore, 100

that if fluid pressure is admitted to cylinder 13^b when the parts are in the positions in which they are illustrated in Fig. 2, piston 16^b will move rack bar 17^b toward the right, thereby rotating gear wheel 18 in a clockwise direction, and hence moving rack bar 17^a and piston 16^a toward the left. Similarly, if fluid pressure is admitted to cylinder 13^a, when the parts are in the last named positions, piston 16^a will move rack bar 17^a toward the right, thereby rotating gear wheel 18 in a counter-clockwise direction, and hence moving rack bar 17^b and piston 16^b toward the left. It follows, that the gear wheel and jackshaft can be given either a counter-clockwise or clockwise motion by admitting fluid pressure to the proper cylinder 13^a or 13^b. When the jackshaft is rotated in a counter-clockwise direction, the switch operating rod is moved downwardly as viewed in Figs. 2 and 3 by the roller 24 on crank 23 and, conversely, when the shaft is rotated in the opposite direction, the switch operating rod is moved upwardly by the roller 24.

Fluid pressure may be supplied to the pipes 28^a and 28^b selectively for the control of the apparatus by any suitable means not shown in the drawings.

The pistons 16^a, 16^b are formed with centrally disposed outwardly extending plungers 31^a, 31^b adapted to enter axially disposed cylindrical bores 32^a, 32^b provided in the cylinder heads 14^a, 14^b, as the pistons approach the limits of their strokes. The bores 32^a, 32^b communicate directly with the inlet passages 27^a, 27^b and it will be apparent, therefore, that as soon as the end of a plunger enters the corresponding bore, the fluid which remains in the cylinder between the piston and the cylinder head is trapped in the cylinder. As a result, during the remainder of the stroke of the piston this trapped air becomes compressed, thereby cushioning the action of the entire apparatus.

The right hand end of the rack bars 17^a, 17^b, that is to say, the ends opposite to the pistons 16^a, 16^b are provided with cylindrical guides 33^a, 33^b which are slidably mounted in cylindrical guideways 34^a, 34^b formed in the lower part of the casing 2. The right hand ends of the rack bars are also provided with locking dogs 35^a, 35^b which extend into the casting 3 through suitable openings 36^a, 36^b, and cooperate with suitable apparatus for locking the switch. This locking apparatus forms no part of our invention, and is described in detail in the copending application for Letters Patent of the United States, Serial No. 412,078, filed by J. P. Coleman on December 6, 1929, for railway traffic control apparatus.

The switch operating apparatus also comprises the usual circuit controller B actuated by bell cranks 37 and 38 and links 39 and 40 for controlling signals or other traffic govern-

ing devices in accordance with the positions of the switch operated by the apparatus. Since this circuit controller forms no part of our invention, a detailed description of the circuit controller will not be given here.

It is occasionally necessary to operate the switch manually and independently of the fluid pressure mechanism. At such times, it is desirable to disconnect the cylinders 13^a, 13^b from the pipes 28^a, 28^b to insure that the fluid pressure mechanism will not be operated during this manual operation and result in possible injury to the operator. With apparatus embodying our invention, one form of which we will now describe, it is impossible to actuate the switch manually as long as the cylinders are in communication with the pipes 28^a, 28^b and, conversely, it is impossible to operate the switch by fluid pressure while it is in condition to be operated manually.

This apparatus, as here shown, comprises a horizontally disposed square shaft 41 located in the upper part of the compartment 2^b of the casting 2, and provided with bushings 42 and 43 which are journaled in suitable bearings 44 and 45 formed in the side walls of the casting 2 as best seen in Fig. 4. One end of the shaft 41 is rigidly attached to a hand lever 46 and the other end of the shaft is provided with a collar 58 which prevents longitudinal displacement of the shaft.

Mounted for rotation coaxially with the shaft 41 on a cylindrical bushing 47 which is fixed to the shaft within the compartment 2^b, is a gear wheel 48 which meshes with suitable teeth formed on the upper face of the rack bar 17^b. This gear wheel is normally free to turn with respect to the shaft but may at times be connected with the shaft when the shaft and gear wheel occupy a predetermined relative position by means of a selective jaw clutch D carried by the shaft.

As best seen in Fig. 4, the clutch D in the form here shown comprises a cylindrical sleeve 49 which receives the shaft 41 with enough clearance to permit free horizontal movement of the sleeve toward and away from the gear wheel 48. A clutch jaw 51 is screwed onto this sleeve at the end which is next to the gear wheel 48, and a collar 74 provided with a shoulder 52 is screwed onto the other end of this sleeve. The jaw 51 and collar 74 are provided with square holes which receive shaft 41 and so prevent rotation of these elements on the shaft. The shoulder 52 acts as a stop for a loose collar 54 which is constantly urged toward the collar 74 by means of a coil spring 55 interposed between the clutch jaw 51 and the collar 54.

The clutch jaw 51 is formed with teeth 56 (see Figs. 2 and 4) which cooperate with teeth 57 provided on the adjacent face of the gear wheel 48 (see Fig. 1). These two sets of teeth are preferably made with irregular

spacing as shown in Fig. 1, so that when the clutch jaw is moved toward the gear wheel, in a manner presently to be described, the teeth on the clutch will mesh with the teeth on the gear wheel and connect the gear wheel with the shaft 41 if and only if the hand lever 46 occupies a position which corresponds to the position of the switch. That is to say, if the switch is in the normal position, the teeth on the clutch will mesh with the teeth on the gear wheel only if the hand lever occupies its normal position in which it is illustrated in the drawings and, conversely, if the switch is in its reverse position, the teeth on the clutch will mesh with the teeth on the gear wheel only if the hand lever 46 is rotated from the position shown through an angle approximately 180° to its reverse or dotted line position.

The clutch is moved toward and away from the gear wheel 48, in order to effect the desired driving connection between the gear wheel and the manually operated shaft 41, by means of a bell crank lever 58. This lever is pivotally mounted on a vertical pin 59 supported by two inwardly extending vertically spaced lugs 69 formed on the side wall of the casting 2, as best seen in Fig. 2, and has one arm 58^a thereof provided with two rollers 67 and 68 which cooperate with the opposing faces of two circumferential flanges 60 and 61 formed on the fixed collar 74 and loose collar 54, respectively. The other arm 58^b of the lever 58 is pivotally attached to one end of a rod 62 which is slidably mounted in a suitable bearing 63 screwed through the casting 2. The outer end of the rod 62, in turn, is operatively connected by means of a substantially L-shaped link 73 with a member 64 which is formed with sockets at each side for engagement with the square confronting ends 65^a , 65^b of the valves 29^a , 29^b , and which is provided with a handle 66 to facilitate manual operation of this member.

The operation of the apparatus as a whole is as follows: When the member 64 occupies its normal position in which it is shown in Figs. 1 and 2, the valves 29^a , 29^b occupy the positions in which the cylinders 13^a , 13^b are connected with the pipes 28^a , 28^b , and the clutch D is held out of engagement with the gear wheel 48 by means of the rollers 67 and 68 on the bell crank lever 58 engaging the flange 60 on the collar 74. Under these conditions, the fluid pressure mechanism may be operated to cause a reversal of the switch in the manner previously described, and the only effect of this operation on the mechanism for manually operating the switch will be rotation of the gear wheel 48 about the cylindrical bushing 47 on which it is journaled. If, however, the member 64 is rotated in a counter-clockwise direction from its normal position through an angle of approxi-

mately 100° to the dotted line position shown in Fig. 1, the valves 28^a , 29^b will be rotated to the positions in which the cylinders 13^a , 13^b are disconnected from the pipes 28^a , 28^b and are connected with the vent plugs 30^a , 30^b , and at the same time, the link 73 and rod 62 will be moved toward the left as viewed in Fig. 1 so that the bell crank lever 58 will be rotated in a counter-clockwise direction. When the lever 58 is rotated in this direction, the rollers 67 and 68 carried thereby engage the flange 61 on the movable collar 54 and force this collar upwardly as viewed in Fig. 2, thereby moving the clutch D toward the gear wheel 48 by virtue of the force which is transmitted through the spring 55. If the switch and hand lever 46 then occupy corresponding relative positions, the clutch jaw teeth 56 will mesh with the teeth 57 on the gear wheel 48 as described hereinbefore but, if the switch and hand lever 46 do not occupy corresponding relative positions, the flat ends of the two sets of teeth will move into contact with each other and the spring 55 will become compressed, so that if the hand lever is subsequently moved to the position which corresponds to the position of the switch, the two sets of teeth will immediately mesh. When the clutch is operatively connected with the gear wheel, operation of the hand lever 46 will rotate the gear wheel 48 which, in turn, will actuate the rack bar 17^b to operate the gear wheel 18 and crank 23. It will be apparent, therefore that under these latter conditions operation of the switch by the fluid pressure mechanism is prevented, while operation by the hand lever 46 is permitted.

When it is desired to condition the apparatus for subsequent operation by the fluid pressure mechanism, the member 64 is restored to its full line or normal position in which it is shown in Fig. 1. The bell crank lever 58 is thereby rotated in a clockwise direction as viewed in Fig. 2, to the position shown, so that the clutch is moved out of engagement with the gear wheel 48 by engagement of the rollers 67 and 68 with the flange 60 on the collar 74, and the valves are restored to the positions in which communication is established between the cylinders 13^a , 13^b and the pipes 28^a and 28^b .

When the member 64 has been restored to its normal position, it may be locked in this position by inserting a padlock or other suitable fastening device through an eye 70 in a lug 71 formed on the member 63, which lug extends upwardly through a suitable slot 72 in the member 64.

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 de-

parting from the spirit and scope of our invention.

Having thus described our invention, what we claim is:

1. Railway switch operating apparatus comprising a movable member adapted to be operatively connected with the switch, fluid pressure means for at times actuating said movable member, a hand lever, means including a clutch for at times connecting said hand lever with said movable member, and manually operable means for controlling said clutch and the supply of fluid pressure to said fluid pressure means jointly in such manner that the supply of fluid pressure to said fluid pressure means is cut off when said hand lever is connected with said movable member by said clutch.

2. Railway switch operating apparatus comprising a movable member adapted to be operatively connected with the switch, fluid pressure means for at times actuating said movable member, a valve for controlling the supply of fluid pressure to said fluid pressure means, a hand lever, means including a clutch for at times connecting said hand lever with said movable member, and manually operable means for controlling said valve and said clutch jointly in such manner that said valve is operated to cut off the supply of fluid pressure to said fluid pressure means when said hand lever is connected with said movable member by said clutch.

3. Railway switch operating apparatus comprising a movable member adapted to be operatively connected with the switch, fluid pressure means for at times actuating said movable member, a manually controlled clutch, other means for actuating said movable member adapted to be at times connected with said member by means of said clutch, and means for interrupting the supply of fluid pressure to said fluid pressure means when said other means is connected with said movable member by means of said clutch.

4. Railway switch operating apparatus comprising a movable member adapted to be operatively connected with the switch, fluid pressure means for at times actuating said member, a valve for controlling the supply of fluid pressure to said fluid pressure means, a clutch, other means for actuating said member arranged to be connected with said movable member by means of said clutch, and means for controlling said valve and said clutch jointly in such manner that when said valve is operated to the position for supplying fluid pressure to said fluid pressure means said other means is disconnected from said movable member.

5. Railway switch operating apparatus comprising a rack bar adapted to be operatively connected with the switch, fluid pressure means for actuating said rack bar, a gear wheel meshing with said rack bar, a

clutch, means for rotating said gear wheel adapted to be connected with said gear wheel by said clutch, and means for cutting off the supply of fluid pressure to said fluid pressure means when said means for rotating said gear wheel is connected with said gear wheel by said clutch.

6. Railway switch operating apparatus comprising a rack bar adapted to be operatively connected with the switch, power operated means for actuating said rack bar, a gear wheel meshing with said rack bar, a manually operable lever, a clutch for connecting said gear wheel with said lever, and means for controlling said clutch and the supply of power to said power operated means jointly in such manner that when said gear wheel is connected with said lever by means of said clutch the supply of power to said power operated means is automatically cut off.

7. Railway switch operating apparatus comprising a rack bar adapted to be operatively connected with the switch, fluid pressure means for actuating said rack bar, a valve for controlling the supply of fluid pressure to said fluid pressure means, a gear wheel meshing with said rack bar, a manually operable lever, a clutch for connecting said gear wheel with said lever, and manually operable means for controlling said valve and said clutch simultaneously in such manner that when said gear wheel is connected with said manually operable lever said valve is operated to a position in which the supply of fluid pressure to said fluid pressure means is cut off.

8. Railway switch operating apparatus comprising a movable member adapted to be operatively connected with the switch, fluid pressure means for actuating said member, a manually operable shaft, a gear wheel mounted for rotation coaxially with said shaft and operatively connected with said member, clutch mechanism on said shaft for at times connecting said gear wheel with said shaft, and manually operable means for controlling said clutch mechanism and the supply of fluid pressure to said fluid pressure means jointly in such manner that when said gear wheel is connected with said shaft by said clutch mechanism the supply of fluid pressure to said fluid pressure means is cut off.

9. Railway switch operating apparatus comprising a rack bar adapted to be operatively connected with the switch, fluid pressure means for actuating said rack bar, a valve for controlling the supply of fluid pressure to said fluid pressure means, a square shaft, a hand lever for oscillating said shaft, a gear wheel mounted for rotation coaxially with said shaft and meshing with said rack bar; a clutch mounted on said shaft and comprising a sleeve provided with a square hole which receives said shaft with

sufficient clearance to permit sliding movement of said sleeve toward and away from said gear wheel, a clutch jaw attached to one end of said sleeve, a collar fixed to the other end of said sleeve and provided with a circumferential flange and with a shoulder at its inner end, a loose collar on said sleeve provided with a circumferential flange which confronts the flange on said fixed collar, and a spring on said sleeve between said loose collar and said clutch jaw for biasing said loose collar toward the shoulder on said fixed collar; a pivoted bell crank lever for moving said clutch toward and away from said gear wheel, said bell crank lever having one arm provided with two rollers which cooperate with the flanges of said fixed and loose collars respectively, a slidably supported rod having one end pivoted to the other arm of said bell crank lever, a link pivotally attached at one end to the free end of said rod, a member attached to said valve in such manner that rotation of said member operates said valve, said member being pivotally attached to the free end of said link, the parts being so proportioned that when said member is rotated to the position in which said valve admits fluid pressure to said fluid pressure means said bell crank lever is rotated to a position in which said clutch is held out of engagement with said gear wheel by means of said rollers engaging the flange on said fixed collar, but that if said member is rotated to the position in which said valve cuts off the supply of fluid pressure to said cylinder said bell crank lever is rotated to the position in which the rollers carried thereby engage the flange on said loose collar and moves said clutch to the position in which said clutch jaw engages said gear wheel, said clutch jaw and said gear wheel being provided with teeth which mesh when and only when said clutch and said gear wheel occupy a predetermined angular position with respect to each other.

10. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a rack bar, a first gear wheel fixed to said shaft and constantly meshing with said rack bar, a second gear wheel constantly meshing with said rack bar, a manually operable lever, clutch mechanism for at times connecting said lever with said second gear wheel, manually operable means for operating said clutch mechanism, and power means for at times actuating said rack bar.

11. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a rack bar, a first gear wheel fixed to said shaft and meshing with said rack bar, a second gear wheel constantly meshing with said rack bar, a manually operable lever, manually operable means for at times connecting said lever

with said second gear wheel to permit operation of said shaft by said lever, and power means for at other times actuating said rack bar to cause operation of said shaft.

12. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a fluid pressure motor comprising a cylinder containing a reciprocable piston, a rack bar attached to said piston, a first gear wheel fixed to said shaft and meshing with said rack bar, a second gear wheel constantly meshing with said rack bar, a manually operable lever, and means for at times connecting said lever with said second gear wheel.

13. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a fluid pressure motor comprising a cylinder containing a reciprocable piston, a rack bar attached to said piston, a first gear wheel fixed to said shaft and meshing with said rack bar, a second gear wheel constantly meshing with said rack bar, a manually operable lever, and manually operable means for at times connecting said lever with said second gear wheel.

14. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a rack bar, a first gear wheel fixed to said shaft and meshing with said rack bar, a second gear wheel meshing with said rack bar, a manually operable lever, manually controlled clutch mechanism effective for connecting said lever with said second gear wheel if and only if said lever and said second gear wheel occupy one relative position, and power means for at times operating said rack bar.

15. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a rack bar, a first gear wheel secured to said shaft and meshing with said rack bar, a second gear wheel meshing with said rack bar, a clutch, a manually operable lever arranged to be connected with said second gear wheel by means of said clutch if and only if said lever and said second gear wheel occupy one relative position, manually operable means for controlling said clutch, and power means for at times operating said rack bar.

16. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a rack bar, a first gear wheel secured to said shaft and meshing with said rack bar, a second gear wheel meshing with said rack bar, a clutch, a manually operable lever arranged to be connected with said second gear wheel by means of said clutch if and only if said lever and said second gear wheel occupy one relative position, manually operable means for controlling said clutch, and power means effective for operating said rack bar when and

only when said lever is disconnected from said second gear wheel.

17. Railway switch operating apparatus comprising a rotatable shaft adapted to be operatively connected with the switch, a rack bar, power means for at times actuating said rack bar, a first gear wheel fixed to said rotatable shaft and meshing with said rack bar, a manually operable shaft, a second gear wheel mounted for rotation coaxially with said manually operable shaft and meshing with said rack bar, clutch mechanism on said manually operable shaft for at times connecting said second gear wheel with said manually operable shaft, manually operable means for controlling said clutch mechanism, and power means for at times actuating said rack bar.

18. Railway switch operating apparatus comprising a rack bar adapted to be operatively connected with the switch, power means for at times actuating said rack bar, a square shaft, a hand lever for oscillating said shaft, a first gear wheel mounted for rotation coaxially with said shaft and meshing with said rack bar; a clutch mounted on said shaft and comprising a sleeve provided with a hole which receives said shaft with sufficient clearance to permit sliding movement of said sleeve toward and away from said gear wheel, a clutch jaw attached to one end of said sleeve and constrained to rotate with said shaft, a collar fixed to the other end of said sleeve and provided with a circumferential flange and with a shoulder at its inner end, a loose collar on said sleeve provided with a circumferential flange which confronts the flange on said fixed collar, and a spring on said sleeve between said loose collar and said clutch jaw for biasing said loose collar toward the shoulder on said fixed collar; a pivoted bell crank lever for moving said clutch toward and away from said gear wheel, said bell crank lever having one arm provided with two rollers which cooperate with the flanges of said fixed and loose collars respectively, and manually operable means attached to the other end of said bell crank lever for operating said bell crank lever, said clutch jaw and said gear wheel being provided with teeth which mesh when and only when said clutch and said gear wheel occupy a predetermined angular position with respect to each other.

In testimony whereof we affix our signatures.

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EDWIN G. LITTLE.