

Oct. 13, 1925.

1,556,831

C. W. WYMAN

ELECTRIC CONTROLLING MEANS

Filed Nov. 25, 1921

3 Sheets-Sheet 1

Fig. 1.

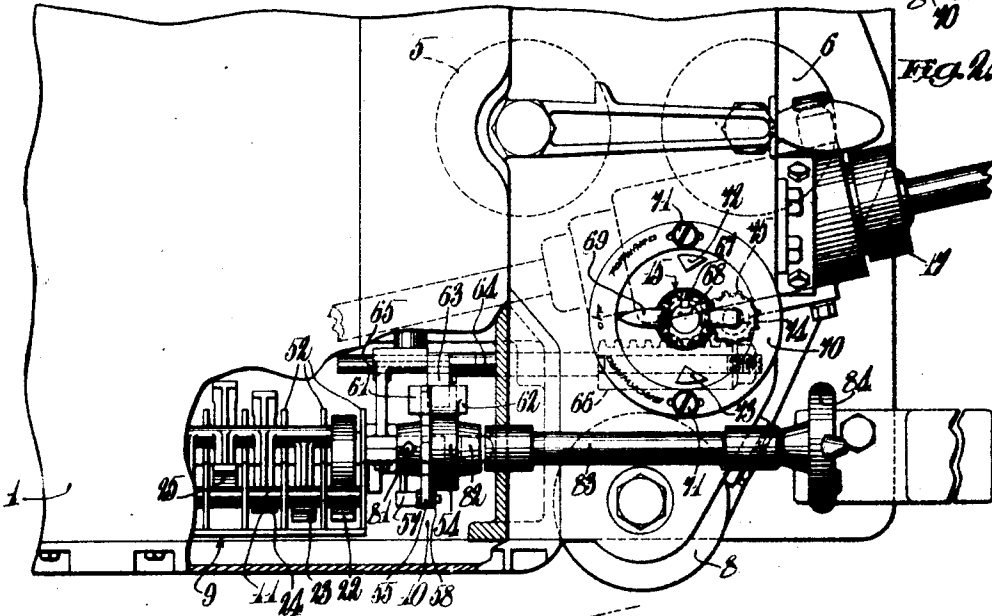
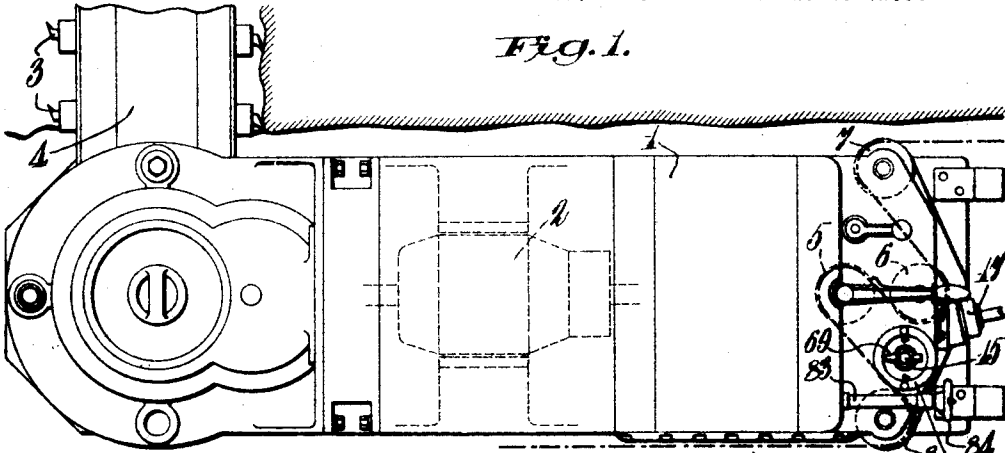
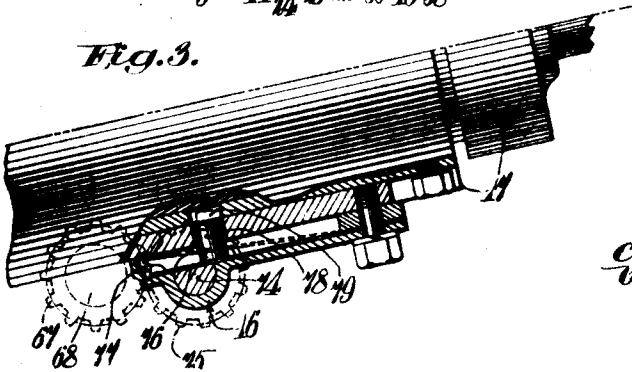


Fig. 3.



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3 Sheets-Sheet 2

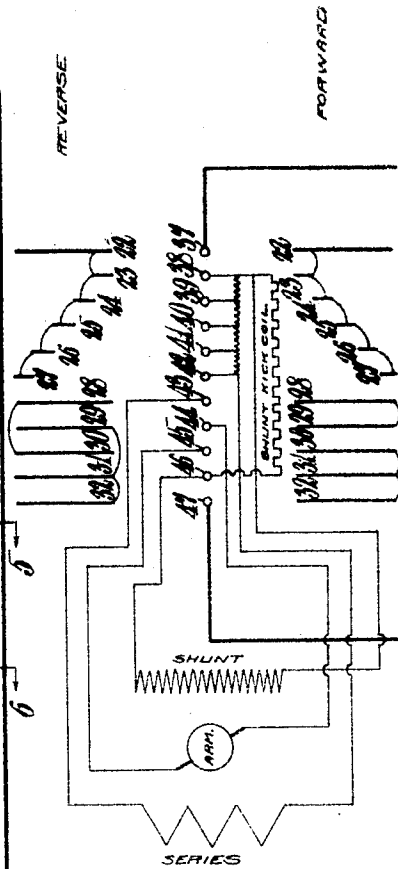
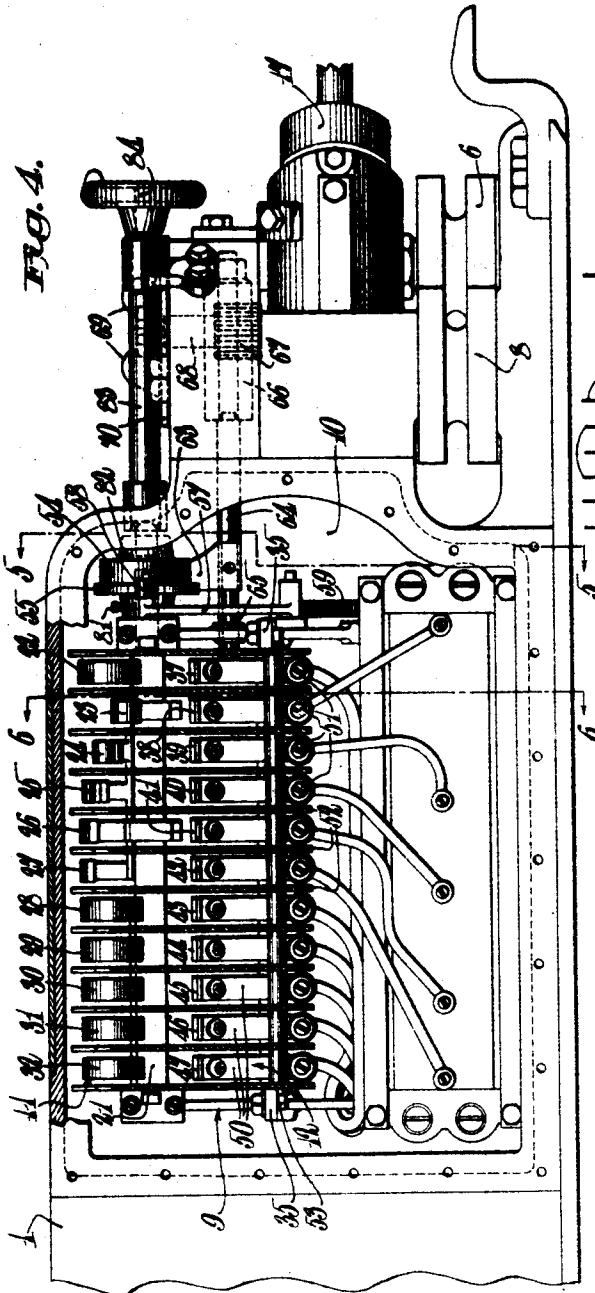


FIG. 5.

D.C.

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3 Sheets-Sheet 3

Fig. 5.

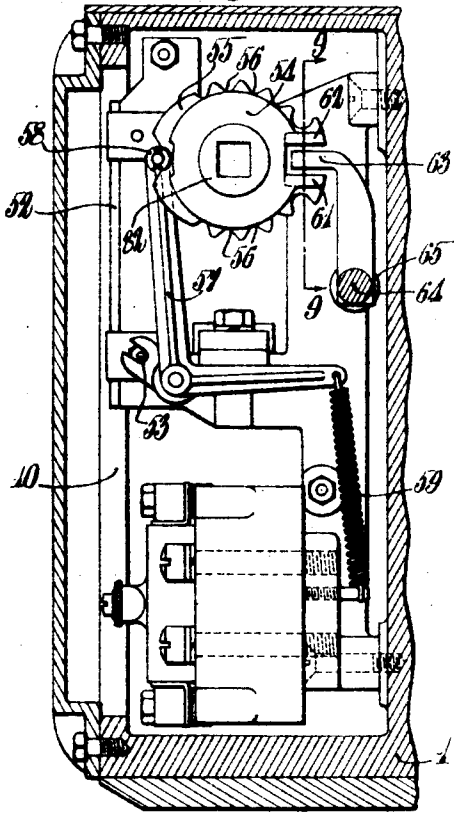


Fig. 6.

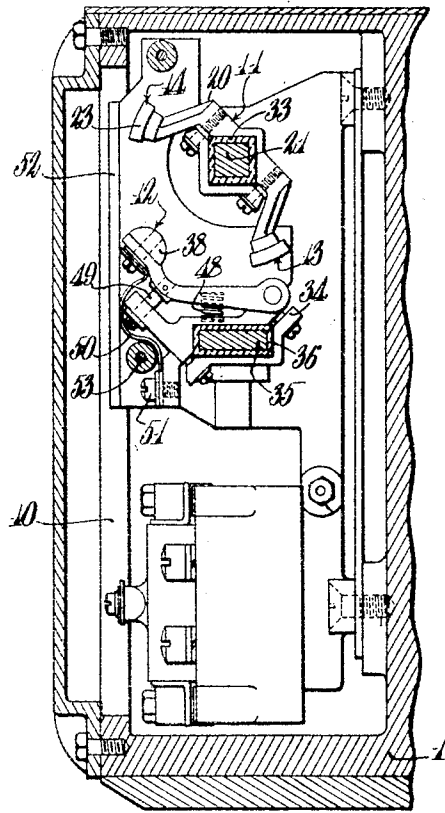


Fig. 8.

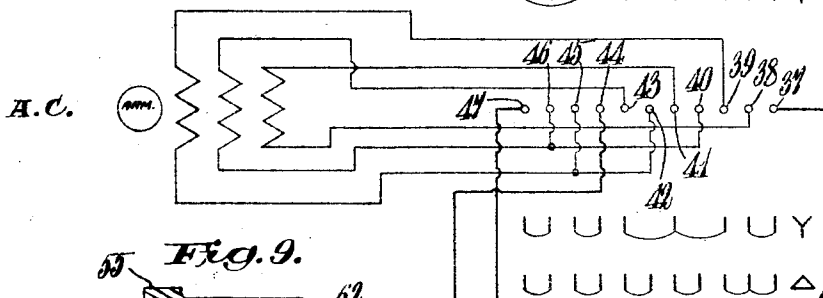
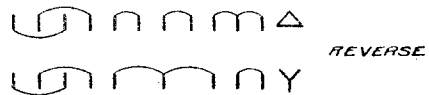
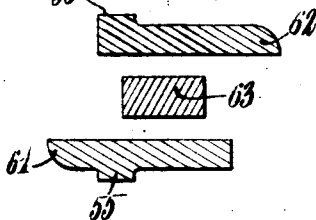


Fig. 9.



Inventor:
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 by
 Trace [Signature]
 Atty.

UNITED STATES PATENT OFFICE.

CHARLES W. WYMAN, OF CLAREMONT, NEW HAMPSHIRE, ASSIGNOR TO SULLIVAN MACHINERY COMPANY, A CORPORATION OF MASSACHUSETTS.

ELECTRIC CONTROLLING MEANS.

Application filed November 23, 1921. Serial No. 517,621.

To all whom it may concern:

Be it known that I, CHARLES W. WYMAN, a citizen of the United States, residing at Claremont, in the county of Sullivan and State of New Hampshire, have invented certain new and useful Improvements in Electric Controlling Means, of which the following is a full, clear, and exact specification.

My invention relates to electric controlling means, and more particularly to controlling means for use in connection with mining machines.

An object of my invention is to provide an improved controlling mechanism. Another object of my invention is to provide an improved interlocking controlling mechanism. A further object of my invention is to provide an improved controlling mechanism permitting the operation of the motor controlled thereby in opposite directions while preventing the reversal of said motor except after the parts of the controlling mechanism have been returned to a predetermined position and a controlling member thereof has been manipulated in a predetermined manner. A still further object of my invention is to provide an improved controlling mechanism provided with improved means for preventing the movement of the controller handle in a direction to effect operation of the motor in a direction not desired. A still further object of my invention is to provide improved manually controllable controlling mechanism for an electric motor comprising simultaneously controllable reversing and resistance controlling means and means for preventing the operation of said means in other than the desired manner. A still further object of my invention is to provide improved means for controlling a mining machine motor having an interlock with the current supply or connector plug whereby the latter cannot be inserted or withdrawn except with the controller locked in off position.

In the accompanying drawings I have shown for purposes of illustration one form which my invention may assume in practice, together with two illustrations of possible adaptations thereof.

In these drawings,—

Fig. 1 is a plan view with parts broken away of a mining machine of the well known longwall type provided with the illustrative form of my improved controlling system.

Fig. 2 is a plan view of a portion of the machine shown in Fig. 1 with parts broken away and on an enlarged scale.

Fig. 3 is a detail of the connector interlock.

Fig. 4 is a side elevation with parts removed of the improved controller mechanism in its illustrative form and also showing certain of the control elements in elevation or in dotted lines.

Figs. 5 and 6 are respectively views in vertical transverse section on the lines 5—5 and 6—6 of Fig. 4.

Figs. 7 and 8 are wiring diagrams for D. C. and A. C. motors.

Fig. 9 is a detail section on the line 9—9 of Fig. 5.

In the illustrative form of my invention I have shown the same adapted for use with a D. C. motor, but it will be understood that with a simple change in the wiring connections as illustrated in Fig. 8 and a variation in the number, relative position, and dimensions of the controller arms, this mechanism may be equally well applied to alternating current motors.

In the illustrative embodiment thereof my improved controlling mechanism is arranged upon a mining machine having a main frame 1 in which there is mounted a motor 2 (shown in dotted lines in Fig. 1) adapted to drive a cutter chain 3 on a cutter bar 4 and likewise adapted in a well known manner to effect feeding movement of the machine by means of sprockets 5, 6, 7 and 8 and a suitable flexible feeding member. My improved controlling mechanism, which is generally designated 9, is enclosed in a compartment 10 arranged at the operator's end of the machine and at one side thereof. This mechanism comprises a drum type controller member, generally designated 11, a series of stationary contacts generally designated 12 cooperating therewith, sets of contacts generally designated 13 and 14 carried by the controller 11 and

operative respectively during forward and reverse running of the motor, means generally designated 15 for controlling the direction of rotation of the drum type controller 5 11, and means generally designated 16 for controlling the insertion and removal of a connector plug 17.

As the reverse segments and the resistance control segments are similar in arrangement, but disposed relatively opposite to each other on the controller member, it will suffice to describe one set of these members. In Fig. 2 the movable contacts used in reverse running alone are shown. Supported upon suitable clamping members 20 adapted to be secured to a controller shaft 21 are a series of arcuate control members respectively designated 22, 23, 24, 25, 26 and 27, the first of which is of such length as, after making contact, to remain in constant contact with the stationary contact member with which it cooperates throughout the entire remaining turning movement in one direction of the shaft 21 from its mid-position, while the contacts 23, 24, 25, 26 and 27 are set in spiral relation and progressively contact with and pass beyond the cooperating stationary contacts, the members 22 to 27 being connected in series with each other. Located next to the member 27 and mounted similarly upon the shaft 21 are a series of, herein, five reverse contact segments, each of these being in length equal substantially to the member 22 and so disposed as to make contact with their respectively cooperating stationary contacts simultaneously with the contacting of the member 22 with its stationary cooperating contact. These reverse members are designated, respectively, 28, 29, 30, 31 and 32 and are connected as shown in the wiring diagram of Fig. 7. It will be noted that each of the several members 22 to 32 is insulated from the shaft 21 by means of insulating material as is shown at 33. Pivotaly mounted upon clamping members 34 secured to a stationary bar 35 but insulated therefrom by insulation 36, are a series of stationary contacts 37 to 47, each of which is resiliently held in its extreme position toward the drum controller by a spring 48 and limited as to its movement in that direction by a stud and nut 49. Flexible connectors 50 lead from these stationary contacts to connector means 51 to which the various connections to the resistance, etc. are made. Suitable insulated partition members indicated at 52 are supported by a rod 53 in such manner as to space the various members 22 to 32 and 37 to 47. Adjacent the operator's end of the shaft 21 is provided a disc-like member 54 having a flange 55 provided thereon and suitably serrated as indicated at 56 to cooperate with a spring actuated bell crank 57 to releasably lock the controller shaft in various positions. The bell crank

57 is held as to its upper end which is provided with a roller 58 in engagement with the flange 55 by means of a spring 59. The disc or collar member 54 is provided between the opposite series of notches 56 with a pair of projecting abutment members having faces disposed in opposite directions, but, longitudinally staggered relative to the member 54 so that only parts of their adjacent faces are actually opposite each other. These abutment members which are designated, respectively, 61 and 62 may be best observed in Figs. 2, 5 and 9 and it will be obvious from these facts that by reason of the staggered relation of the members 61 and 62 it is possible for a cooperating locking finger 63 to be moved to such position with respect to these abutment members as to permit rotation of the shaft 21 in either direction while preventing rotation in the other, or to such position as to prevent rotation of the shaft 21 in both directions entirely. The finger 63 is carried upon a shaft 64 which is slidably mounted near the ends of the members 61 and 62 in a suitable bearing 65. At its opposite end the shaft 64 is provided with a rack carrying member 66 with which there meshes a pinion 67 mounted upon the lower end of a vertically disposed manually controlled shaft 68. The latter is provided with a thumb nut 69 and is movable to change the position of the shaft 64 to provide for forward or reverse running rotation of the drum operating shaft 21.

An indicator plate 70 surrounds the upper end of the shaft 68 and is adjustably fixed by slotted connections and screws 71 to the top of the machine frame and is likewise provided with stops 72 and 73 for limiting the movement of the thumb nut in such manner as to provide for the proper positioning of the shaft 68 and so of the finger 63 for forward or reverse running.

A second shaft 74 provided with a pinion 75 intermeshing with the pinion 67 cooperates by means of a flattened portion 76 with a spring 77 and a locking plunger 78 carried by the spring to interlock with a socket 79 in the connector plug 17, and to release the connector plug when the parts are in the position shown in Fig. 2, that is with the locking finger 63 in position to prevent rotation of the shaft 21 in either direction. It will be noted that as the thumb nut 69 is turned in opposite directions, the shaft 74 will likewise be turned and the member 77 so moved as to force the projection 78 into the socket 79 and so prevent withdrawal of the plug except when the controller is not only in off position, but locked in off position.

The wiring diagrams shown in Fig. 7 will make it readily apparent how the mechanism so far described is connected. The station-

ary contacts 37 to 47 will be noted in the center, with the main line wires connected to the buttons or contacts 37 and 47. The resistance will be noted to lie between the buttons 38 and 42 with suitable connections between various points in the resistance and the several buttons. The button 43 will be noted to connect to one end of the series field, the button 44 to one of the brushes, the button 45 to the other of the brushes; the button 46 is connected to one end of the shunt field, whose other end is connected to the button 38, the shunt kick coil shunts the buttons 38 and 46. The forward contacts 22 to 32 will be noted at the lower side of the figure, it being noted that the contacts 22 to 27 are connected in series, that the contacts 28 and 29 are connected together, and that the contacts 30, 31 and 32 are connected. The oppositely moving or reverse running resistance controlling contacts 22 to 27 will be noted to be connected similarly to the first ones. The contacts 28 and 30 are connected together and the contacts 29, 31 and 32, are connected together. The effects of moving the shaft 21 in opposite directions are so obvious from the diagram that it is believed that to increase the length of the specification by a detailed description of the various events as the parts are turned is unnecessary.

In Fig. 8 the wiring diagram for a three-phase A. C. motor is shown. Here again there are eleven stationary buttons, or contacts, 37 to 47. Instead, however, of having two series of movable contacts carried by the shaft 21, there are four series, two for forward running and two for reverse, these series being so arranged that the first series coming into engagement with the stationary buttons upon rotation of the shaft 21 will connect the windings of the motor in star, while a continued movement bringing the second series of movable contacts into operation will result in the connection of the windings in delta. It is believed that this description will be sufficient to render the operation of the device as modified for controlling an A. C. motor obvious.

Before taking up the mode of operation of the parts of the controller and its interlock, it should be noted that the member 54 is secured by a set screw 81 to the end of the shaft 21 and is provided at its opposite end with a polygonal socket 82 with which a short operating shaft 83 interlocks, the latter being provided at its opposite end with an operating wheel 84. Now assume that the parts are all in the position indicated in Fig. 2 of the drawings. It will be evident that the rack 66 is in such position as to bring the locking finger 63 opposite the longitudinal center of the member 54 and so as to be engaged by the adjacent ends of the members 61 and 62 if rotation of the shaft 21 is attempted. It will accordingly be evident that

the controller is positively locked in mid-position. It will also be noted that by reason of the relation between the pinions 67 and 75 the shaft 74 is in such position as to bring the flattened portion 76 thereof adjacent the spring member 77 and to permit the latter, accordingly, to withdraw the locking pin 78, so that the connector plug may be withdrawn. Before the shaft 21 can be rotated in either direction to start the motor controller thereby, it will be necessary for the shaft 68 to be turned in such manner as to move the member 63 longitudinally and free the member 54 for rotation in one direction. Assume that the thumb nut 69 is turned in a clockwise direction, i. e. toward the legend "Forward" on the ring 70. This will cause the member 63 to move toward the left in Fig. 2 and will free the shaft 21 for rotation in a clockwise direction, referring to Figs. 4 and 5, while preventing rotation thereof in the opposite direction. It will thereupon be possible by turning the hand wheel 84 to cause the drum operating shaft 21 to rotate and to connect the motor for forward running and gradually cut out the resistance from the circuit. It will be noted that the turning of the shaft 68 has turned the shaft 74 and the pin 78 has been locked in place. If the plug 17 happened to be out at the time that the shaft 68 was turned, it will be impossible to replace it until all the parts had been moved back to initial position, or, if in, it could not be removed. It will also be apparent that the plug 17 must be shoved all the way home or else entirely removed, for otherwise the shaft 74 cannot be turned. This prevents movement of shaft 68 except when the plug is either fully in, or altogether out. It will be apparent that the shaft 68 cannot be turned to reverse the position of the locking finger 63 until after the member 54 has been returned to mid-position, as the rim of the member 54 would interfere with longitudinal movement of the member 63. Upon reverse movement of the shaft 68, it will be evident that the shaft 21 can be rotated in the opposite direction to that first described, but cannot be oppositely operated. From the foregoing description it will be clearly apparent that both the controller and the connector plug are under control of a locking means which, when it releases the plug, locks the controller and vice versa.

While I have in this application specifically described one form which my invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration and that the invention may be modified and embodied in other forms of the same without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In an electric controlling mechanism, 130

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 a controller member movable in opposite directions from a given position to produce different circuits, and means including movable means comprising only a single rectilinearly movable element for selectively controlling the direction in which said member may be moved.

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 2. In an electric controlling mechanism, a controller member movable in opposite directions from a given position to produce different circuits, and means including a member having a plurality of offset controlling surfaces movable with said controller member and an abutment member for controlling the direction in which said controlling member may be moved.

10
 3. In an electric controlling mechanism, a controller member movable in opposite directions from a given position to produce different circuits, and means including members one of which is movable with said controller member for holding the latter in said given position or freeing the same for movements in said opposite directions, said means while permitting movement in one direction preventing movement in the opposite direction, one of said members presenting oppositely disposed overlapping abutment surfaces and the other an abutment portion adapted to cooperate with said surfaces.

15
 4. In an electric controlling mechanism, a controller member movable in opposite directions from a given position to produce different circuits, and means including a member movable with said controller member and an abutment member rectilinearly movable longitudinally of said controller member for controlling the direction in which said controller member may be moved.

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 5. In an electric controlling mechanism, a controller, a connector plug, and means separate from each of the same for controlling the operation of the controller and the removal of said connector plug.

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 6. In an electric controlling mechanism, a controller and operating means therefor, a connector plug, and independently manually operable means for controlling the operation of said controller and removal of said plug.

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 7. In an electric controlling mechanism, a controller having operating means therefor, a connector plug, means whereby said controller is movable to a plurality of successive positions while said plug is in an operative position, and independently manually operable means for controlling the operation of said controller and movement of said plug operative in one adjusted position to permit operation of said controller while preventing insertion or removal of the plug.

35
 8. In an electric controlling mechanism,

70
 a controller having operating means therefor, a connector plug, and separate independently manually operable means for controlling the operation of said controller and movement of said plug operative in one adjusted position to permit insertion or removal of said plug while locking said controller against operation.

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 9. In an electric controlling mechanism, a reversing switch, a connector plug, and manually operable controlling means separate from each of the same for controlling the direction in which said reversing switch may be moved and insertion and removal of the plug.

80
 10. In an electric controlling mechanism, a reversing switch, a connector plug, means for operating the reversing switch, and means separately controlled for locking said reversing switch against movement in either direction or for freeing it for movement in one or the other direction, said means being operative also to control said plug.

85
 11. In an electric controlling mechanism, a rotatable controller adapted to be moved in opposite directions, a releasable connector plug, and manually controlled means operable to lock said controller against rotation while releasing said connector plug and to lock said connector plug while releasing said controller.

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 12. In an electric controlling mechanism, a rotatable controller adapted to be rotated in opposite directions, a releasable connector plug, and manually controlled means operable to lock said controller against rotation while releasing said connector plug and to lock said connector plug while releasing said controller, said means being operative on opposite actuation thereof to permit opposite actuation of said controller while locking said connector plug irrespective of its direction of actuation.

95
 13. In a controlling mechanism, a rotatable drum, and means for controlling the direction of rotation of said drum including a member rotatable with said drum and having a pair of spaced oppositely facing wings carried thereby so disposed as to provide a notch between said wings with shoulders disposed at opposite ends of said notch, and a member longitudinally movable with respect to said notch and wings and adapted to cooperate therewith to control the direction of rotation of said drum.

100
 14. In a controlling mechanism, a rotatable drum, and means for controlling the direction of rotation of said drum including a member rotatable with said drum and having a pair of spaced oppositely facing wings carried thereby so disposed as to provide a notch between said wings with shoulders disposed at opposite ends of said notch, a member longitudinally movable with respect to said notch and wings and adapted to co-

operate therewith to control the direction of said drum, and means including a rack, a rotatable pinion and means for rotating said pinion for controlling said locking means.

15. In an electric circuit controlling mechanism, a plug operative when removed to open said circuit, a controller rotatable to make or break the circuit and means including a longitudinally movable shaft cooperating with said controller to control the operation thereof, and a rotating shaft cooperating with said plug to control insertion and removal thereof, and common operating means for said shafts for interlocking said connector plug and said controller.

16. In an electric controlling mechanism, a controller, a connecting plug, and independently operable means for controlling the movement of said controller operative on movement to release the latter to first lock the plug.

17. In an electric controlling mechanism, a controller, a connecting plug, and independently operable interconnected controlling means therefor operative on movement to release said plug to first lock said controller.

18. In an electric controlling mechanism, a controller, a connecting plug, and independently operable means for controlling said controller and plug operative to prevent release of the former unless the latter is in full circuit closing position or totally removed.

19. In an electric controlling mechanism, a controller, a connecting plug, and independently operable means for controlling

said controller and plug operative to prevent release of the former when the latter is partially inserted.

20. In an electric controlling mechanism, a controller normally movable to successive positions, and a connector plug, and controlling means for said controller and for said plug including an independently movable element normally movable to effect release or locking of either of said devices as desired.

21. In an electric controlling mechanism, a controller member movable in opposite directions from a given position, a connector plug, operative connections between said member and plug whereby one of the same is adapted to control the other, said connections including relatively movable rack and pinion elements, and means whereby upon a predetermined relative movement thereof said member may be moved in one of said directions.

22. In an electric controlling mechanism, a controller member movable in opposite directions from a given position, a connector plug, operative connections between said member and plug whereby one of the same is adapted to control the other, said connections including relatively movable rack and pinion elements, and means whereby one of said relatively movable elements may have extreme positions and operative to allow said controller to be moved in opposite directions when said positions are obtained.

In testimony whereof I affix my signature.

CHARLES W. WYMAN.