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ELECTRIC CONTROL MEANS FOR BRAKES

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3 Sheets-Sheet 1

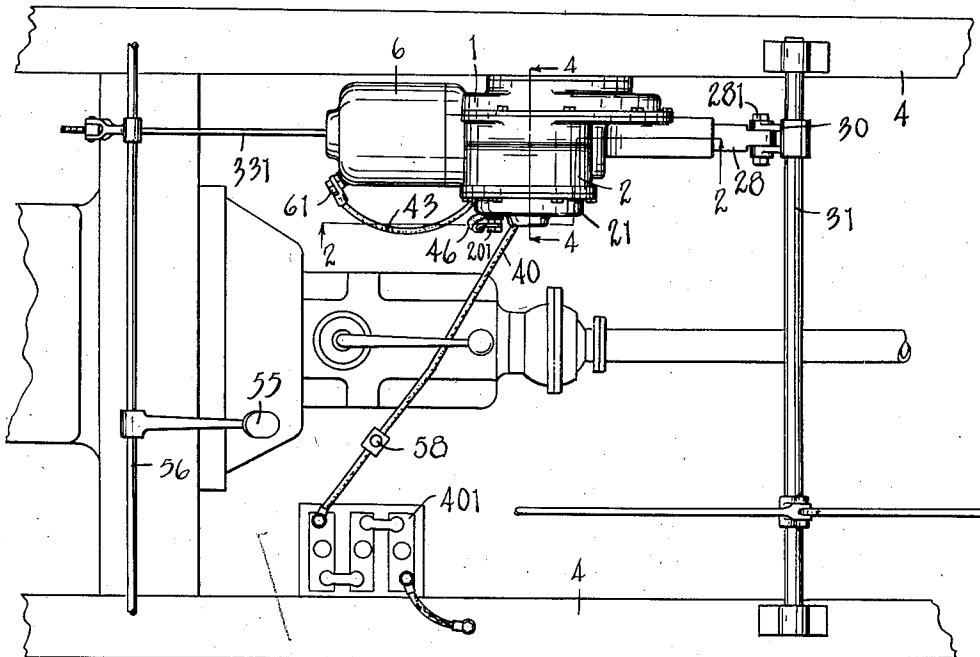


Fig. 1

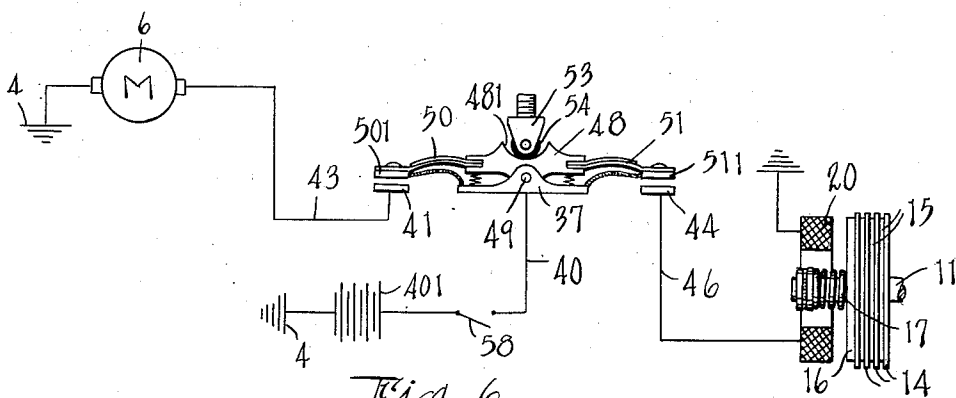


Fig. 6

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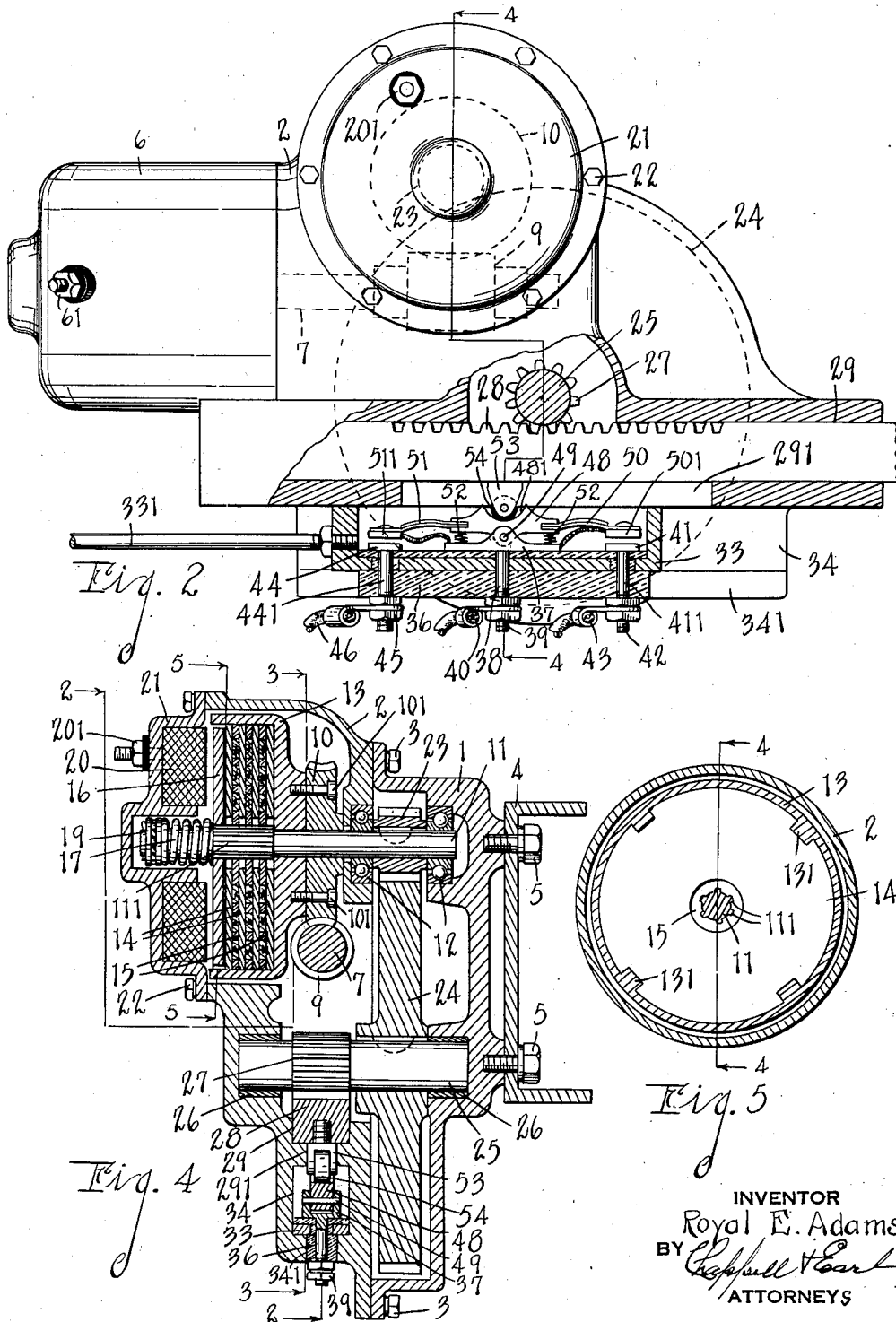
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3 Sheets-Sheet 2



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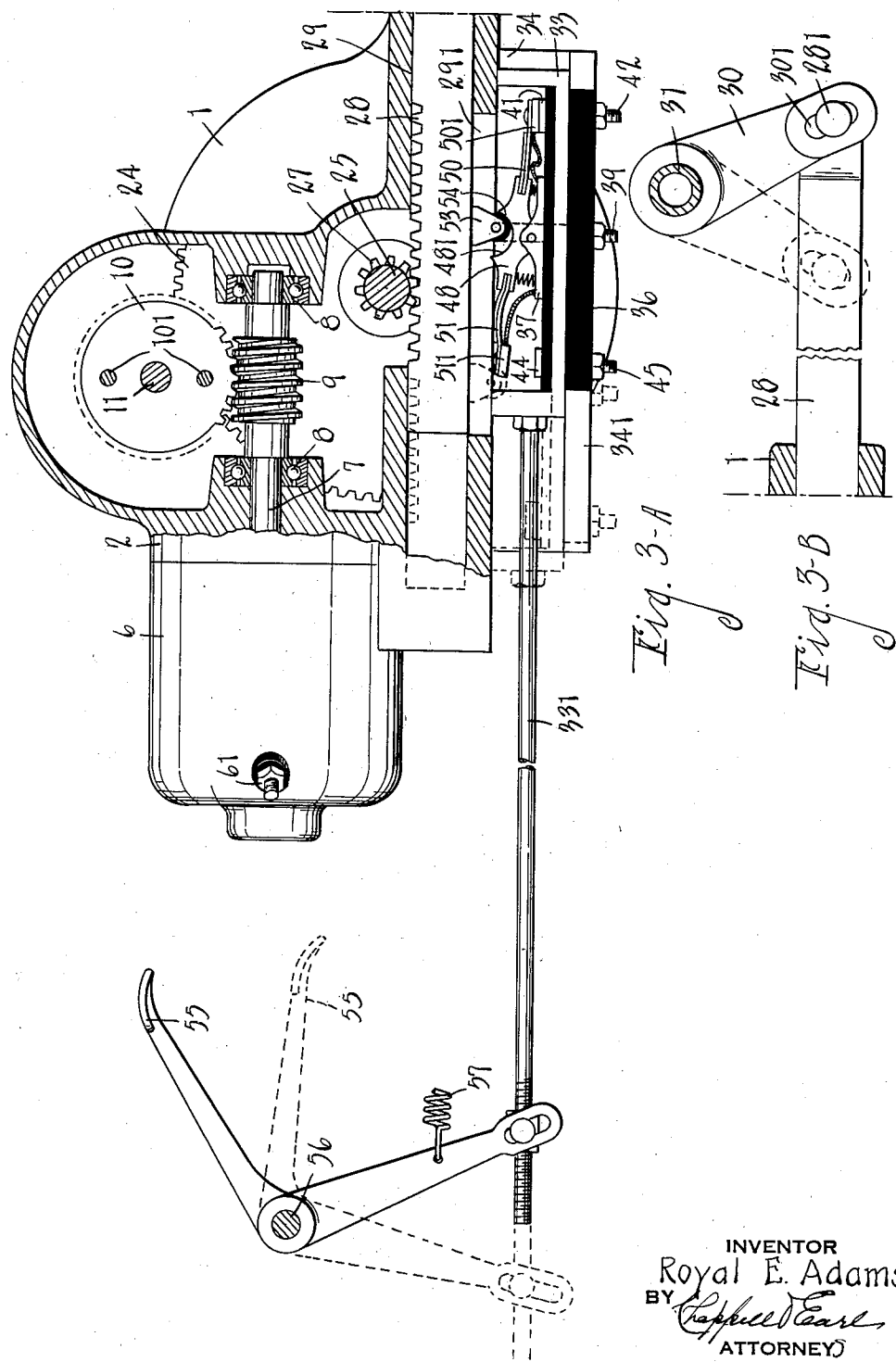
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ELECTRIC CONTROL MEANS FOR BRAKES

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3 Sheets-Sheet 3



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ELECTRICAL CONTROL MEANS FOR BRAKES

Application filed February 23, 1932. Serial No. 594,502.

This invention relates to improvements in electric control means for brakes. The invention, however, is applicable to various uses and would be particularly available for use in a hoist or in a jack.

The objects of the invention are:

First, to provide an improved electric actuating device especially adapted to the actuation of the brakes of an automobile which brakes may be of the usual mechanical or hydraulic kind, or of any desired construction.

Second, to provide improved means for applying the brakes.

Third, to provide improved means for releasing the brakes.

Fourth, to provide improved control means for delivering current to the brake actuating means.

Fifth, to provide improved means for regulating the control.

Sixth, to provide improved means whereby the extent of the application of the brake is very readily controlled proportionately to the movement of the control lever or means.

Seventh, to provide such a brake structure which will lock the brakes when the current is disconnected.

Further objects and objects pertaining to details and economies of construction and operation will appear from the description to follow.

A preferred embodiment of my invention is illustrated in the accompanying drawings, in which:

Fig. 1 is a plan view of my improved brake actuating means installed in an automobile, portions only of the frame and transmission being shown in conventional form.

Fig. 2 is an enlarged detail elevation partially in section on line 2—2 of Figs. 1 and 4, showing details of the control mechanism in initial position for operation.

Figs. 3A and 3B are similar enlarged detail sectional views taken on line 3—3 of Fig. 4, showing the details of the worm gear connection and the control with the switch means in the position of applying the brakes, and also the relation of the control lever and the brake connection.

Fig. 4 is a detail transverse sectional elevation on the irregular line 4—4 of Figs. 2 and 5, showing details of construction.

Fig. 5 is a detail sectional elevation on line 5—5 of Fig. 4 showing the relation of the clutch plates.

Fig. 6 is a conventional wiring diagram.

The parts will be identified by their numerals of reference which are the same in all the views.

1 and 2 are the parts of the frame or casing which are connected together by screws or bolts 3 (see Fig. 4). 4 is the side rail of the frame to which the casing is attached by cap screws 5, 5. 6 is an electric motor. 7 is the motor shaft supported in suitable bearings 8, 8 in the frame section 2, see Fig. 3A. 9 is a worm carried by the shaft 7. 10 is the worm gear coacting with the said worm 9 and free to revolve upon its supporting shaft 11. 12, 12 are ball bearings or other anti-friction thrust bearings in the frame parts 1, 2 supporting the shaft 11.

A disk clutch housing 13 is secured rigidly to worm gear 10 by screws 101. The disk housing 13 is provided with inwardly projecting splines 131 and shaft 11 is provided with splines 111 where it extends within the clutch housing (see Figs. 4 and 5). Clutch disks 14 are splined to engage the housing 13 and alternate with clutch disks 15 which are splined to engage the splines 111 on the shaft 11. 16 is a disk armature embracing the said clutch disks and forced yieldingly against them by the coil spring 17 under the anti-friction collar 19 at the end of the shaft 11. The said spring 17 holds the said clutch disks yieldingly in engagement when the clutch is thrown in. One set of the disks (preferably disks 15) may be provided with the usual cork inserts to insure the best action.

20 is an electromagnetic coil, retained within the cap 21 which is secured to the casing member 2 by cap screws 22 and disposed to pull disk armature 16 to release the clutch. Binding post 201 is provided for the magnet connection 46 hereafter to be described.

23 is a pinion keyed to shaft 11 between the bearings 12, 12 and meshes with the driven

gear 24 which is keyed to the shaft 25. Shaft 25 is carried in bearings 26, 26 in the said casing parts 1, 2. 27 is a pinion keyed or otherwise secured to shaft 25.

5 Pinion 27 meshes with the reciprocating rack 28 which is supported in suitable way 29 in the casing part 2, (see Fig. 4). A longitudinal slot 291 is in the bottom of the way 29. The projecting end of rack 28 is connected to the brake shaft arm 30 by pin 281
10 in slot 301 and serves to rock the brake rock-shaft 31, as seen in Fig. 3B, and thereby apply the brake. The brake is released by the usual spring, not shown.

15 33 is a slide in way 34 directly below and parallel with the way 29. The way 34 is provided with a longitudinal slot 341 in the bottom of which is disposed a reciprocating insulator bar 36 carried by the slide 33. 37 is
20 a switch member provided with a downwardly projecting shank 38 carrying a binding post 39 to which is connected the conductor 40 from the storage battery 401, or other source of current. 41 is a switch contact
25 member provided with a shank 411 and binding post 42 at its lower end connecting to conductor 43 leading to the motor binding post 61. At the opposite end is the switch contact 44 provided with shank 441 having
30 a binding post 45 with a conductor 46 leading to the electromagnetic binding post 201.

The switch rocker 48 is pivoted at 49 on the member 37 and is provided with an arm 50 having a contact 501 to cooperate with
35 the contact member 41 to control the current to the motor. An opposite arm 51 is provided with a contact 511 cooperating with the contact 44 to deliver current to the magnet.

Compression balancing springs 52, 52 are
40 under the rocker. The rocker 48 is provided with a central depression 481. On the under side of the rack 28 is a depending arm 53 carrying an insulation roller 54 which extends
45 into the depression 481 in the rocker member 48 and cooperates therewith to control the current by movement of the same, timed and actuated to control the power applied to the brake.

The slide 33 is controlled by connecting rod
50 331. This is actuated by brake pedal 55 pivoted at 56 to the frame and held yieldingly in initial position by spring 57 (see Fig. 3A).

A cut-out switch 58 is provided in the circuit 40 so that when the switch is applied, the operator by merely opening this switch can
55 lock the same in position and it will be impossible to operate the switch until the cut-out switch is again closed.

60 The operation of my improved brake will be very readily understood from a consideration particularly of Figs. 3A and 3B. When pressure is applied to the brake pedal 55 it results in a pull on the actuating rod 331
65 which pulls the slide 33 to the left of that

figure. This causes the brake rocker 48 to contact with the roller 54 and depresses the contact 501 down into engagement with the contact 41 which, through binding post 42 and conductor 43 delivers current to the
70 motor 6. This sets the worm 9 in operation, driving the worm gear 10, which, through pinion 23, drives the gear 24, operating shaft 25 with the pinion 27, causing the rack 28 to move toward the left of Fig. 3A. As soon as
75 the travel of the slide 33 ceases, the roller 54 is carried by rack 28 to the central part of the notch 481, permitting the switch to open and the motor to stop. This applies the brake to the extent that the pedal is depressed. If
80 the pressure is relieved on the pedal 55, the spring 57 causes the slide to return, the left hand side of the notch 481 comes into engagement with the roller 54, causing the contact 411 to close onto the contact 44, delivering
85 current to the electromagnetic clutch and opens the clutch and allows the brake to return under the action of the brake spring to the initial position. The lever spring 57 causes the follow-up of the slide to accomplish this result. If it is desired to release the
90 brake only partially, the pedal is allowed to move a corresponding amount.

It is thus seen that this brake is under complete control by the mere manipulation of
95 the brake pedal. The brake is applied to the extent that the pedal is depressed and is relieved correspondingly by the control of the pedal on the return of the brake. Thus, although the brake is an electric brake, it is as
100 completely and fully under the control of the operating pedal as though the power were applied directly. This is the service brake. Of course, any car provided with this brake
105 would, under the laws of most states, be required to have an independent emergency brake, which can be of any form desired or required.

I desire to state that my improved brake mechanism is in the form especially approved
110 by me and I desire to claim it specifically, as it has proven highly effective. I, however, desire to state that while I have shown a disk clutch, other styles of clutches might be used
115 in connection with the worm gear. The switch mechanism might be reversed, the rocker part being carried by the rack and the slide being provided with a lug 53 with
120 a roller 54 for actuating the same. It is not necessary to illustrate these parts in reversed relation as it is obvious that this can be done from a statement of the matter.

I have shown the entire structure in very compact, simple form, so that it can be readily applied, but the principle is available
125 should the device be otherwise constructed. The motor mounted directly on the frame is much to be preferred, but it might be independently supported. I desire therefore
130

also to claim the invention broadly, as pointed out in the appended claims.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In an electric brake structure, the combination of a housing, an electric motor having a worm shaft and worm gear mounted in the said housing, a reciprocating rack with actuating pinion within the housing in a suitable way having connections to operate the brake, a reducing train of gears from the said worm gear to said pinion to actuate the same, a spring pressed disk clutch between the said worm gear and the said train of gears, an electromagnet to throw said clutch out of gear, a slideway parallel with the said rack and beneath the same, the way for the said rack and the said slideway having longitudinally slots in their bottoms, a slide in the said slideway, a rocker switch on said slide having a contact at one end to supply current to the motor and at the other end to supply current to the electromagnet, and having a central notch over the pivot thereof, balancing spring means to hold the switch in central neutral position, a downwardly projecting lug on the said rack having an insulated contact engaging the central notch of said rocker switch, a battery connected to the said switch to supply current to the motor or to the electromagnet, and a control pedal having a return spring and having a connection for actuating the said slide, whereby on depression of said pedal the notch reacts on the downwardly projecting lug on said rack to close the circuit to said motor to apply the brake and on the reverse of said pedal reacts to close the circuit to said magnet to release the brake and control the same according to the movement or position of said slide and switch.

2. In an electric brake structure, the combination of a housing, an electric motor having a worm shaft and worm gear mounted in the said housing, a reciprocating rack with actuating pinion within the housing in a suitable way having connections to operate the brake, a reducing train of gears from the said worm gear to said pinion to actuate the same, a spring pressed disk clutch between the said worm gear and the said train of gears, an electromagnet to throw said clutch out of gear, a slideway parallel with the said rack, a slide in the said slideway, a rocker switch on said slide having a contact at one end to supply current to the motor and at the other end to supply current to the electromagnet, and having a central notch over the pivot thereof, a downwardly projecting lug on the said rack having an insulated contact engaging the central notch of said rocker switch, a battery connected to the said switch to supply cur-

rent to the motor or to the electromagnet, and a control pedal having a return spring and having a connection for actuating the said slide, whereby on depression of said pedal the notch reacts on the downwardly projecting lug on said rack to close the circuit to said motor to apply the brake and on the reverse of said pedal reacts to close the circuit to said magnet to release the brake and control the same according to the movement or position of said slide and switch.

3. In an electric brake structure, the combination of a housing, an electric motor having a worm shaft and worm gear mounted in the said housing, a reciprocating rack with actuating pinion within the housing in a suitable way having connections to operate the brake, a reducing train of gears from the said worm gear to said pinion to actuate the same, a spring pressed disk clutch between the said worm gear and the said train of gears, an electromagnet to throw said clutch out of gear, a slideway parallel with the said rack, a slide in the said slideway, a rocker switch on said slide having a contact at one end to supply current to the motor and at the other end to supply current to the electromagnet, and having a central notch over the pivot thereof, a downwardly projecting lug on the said rack having an insulated contact engaging the central notch of said rocker switch, a battery connected to the said switch to supply current to the motor or to the electromagnet, and a control pedal having a connection for actuating the said slide, whereby on depression of said pedal the notch reacts on the downwardly projecting lug on said rack to close the circuit to said motor to apply the brake and on the reverse of said pedal reacts to close the circuit to said magnet to release the brake and control the same according to the movement or position of said slide and switch.

4. In an electric brake structure, the combination of a housing, an electric motor having a worm shaft and worm gear mounted in the said housing, a reciprocating rack with actuating pinion within the housing in a suitable way having connections to operate the brake, a reducing train of gears from the said worm gear to said pinion to actuate the same, a normally engaged clutch between the said worm gear and the said train of gears, an electromagnet to throw said clutch out of gear, a slideway parallel with the said rack, a slide in the said slideway, a rocker switch on said slide having a contact at one end to supply current to the motor and at the other end to supply current to the electromagnet, and having a central notch over the pivot thereof, a downwardly projecting lug on the said rack having an insulated contact engaging the central notch of said rocker switch, a battery connected to the said switch

to supply current to the motor or to the electromagnet, and a control pedal having a connection for actuating the said slide, whereby on depression of said pedal the notch reacts
 5 on the downwardly projecting lug on said rack to close the circuit to said motor to apply the brake and on the reverse of said pedal reacts to close the circuit to said magnet to release the brake and control the same
 10 according to the movement or position of said slide and switch.

5. In an electric brake structure, the combination of a housing, an electric motor having a worm shaft and worm gear mounted in
 15 the said housing, a reciprocating rack with actuating pinion within the housing in a suitable way having connections to operate the brake, a reducing train of gears from the said worm gear to said pinion to actuate the
 20 same, a normally engaged clutch between the said worm gear and the said train of gears, an electromagnet to throw said clutch out of gear, a slideway parallel with the said rack, a slide in the said slideway, a rocker switch
 25 on said slide having a contact at one limit to supply current to the motor and at the other limit to supply current to the electromagnet, and having a central notch over the pivot thereof, a downwardly projecting lug on the
 30 said rack having an insulated contact engaging the central notch of said rocker switch, a battery connected to the said switch to supply current to the motor or to the electromagnet, and a control pedal having a connection
 35 for actuating the said slide, whereby on depression of said pedal the notch reacts on the downwardly projecting lug on said rack to close the circuit to said motor to apply the brake and on the reverse of said
 40 pedal reacts to close the circuit to said magnet to release the brake and control the same according to the movement or position of said slide and switch.

6. In an electric brake structure, the combination of a housing, an electric motor having
 45 a worm shaft and worm gear mounted in the said housing, a reciprocating rack with actuating pinion within the housing in a suitable way having connections to operate the brake, a reducing train of gears from
 50 the said worm gear to said pinion to actuate the same, a spring pressed disk clutch between the said worm gear and the said train of gears, an electromagnet to throw said clutch out of gear, a switch to supply current
 55 to the motor or to the electromagnet.

7. In an electric brake structure, the combination of a rack and pinion structure, said
 60 rack being connected to operate the brake, an electric motor having gear connections to actuate the said pinion, a normally closed clutch in the gear connection from said motor to the said pinion, an electromagnet for releasing
 65 said clutch, a slideway parallel with the said rack, a slide in the said slideway, a

rocker switch on said slide having a contact at one limit to supply current to the motor and at the other limit to supply current to the electromagnet, and having a central notch
 70 over the pivot thereof, a downwardly projecting lug on the said rack having an insulated contact engaging the central notch of said rocker switch, a battery connected to the said switch to supply current to the motor or to
 75 the electromagnet, and a control pedal having a connection for actuating the said slide, whereby on depression of said pedal the notch reacts on the downwardly projecting lug on said rack to close the circuit to said motor
 80 to apply the brake and on the reverse of said pedal reacts to close the circuit to said magnet to release the brake and control the same according to the movement or position of said slide and switch.

8. In an electric brake structure, the combination of a rack and pinion structure, said
 rack being connected to operate the brake, an electric motor having gear connections to
 90 actuate the said pinion, a normally closed clutch in the gear connection from said motor to the said pinion, an electromagnet for releasing said clutch, a slideway parallel with the said rack, a slide in the said slideway, a switch on said slide having a contact to supply
 95 current to the motor, a projecting lug on the said rack engaging the said switch to actuate the same on the movement of said slide, a battery connected to the said switch to supply current to the motor, and a control
 100 pedal having a connection for actuating the said slide whereby on depression of said pedal the switch reacts on the projecting lug on said rack to close the circuit to said motor to apply the brake to control the same according to the movement or position of said
 105 slide and switch.

9. In an electric brake structure, the combination of a rack and pinion structure, said
 110 rack being connected to operate the brake, an electric motor having gear connections to actuate the said pinion, a normally closed clutch in the gear connection from said motor to the said pinion, an electromagnet for releasing said clutch, a slideway parallel with
 115 the said rack, a slide in the said slideway, a switch on said slide having a contact to supply current to the electromagnet, a projecting lug on the said rack engaging the said switch to actuate the same on the movement of said slide, a battery connected to the said
 120 switch to supply current to the electromagnet, and a control pedal having a connection for actuating the said slide, whereby on depression of said pedal the switch reacts on the projecting lug on the said rack to close
 125 the circuit to said magnet to release the brake to control the same according to the movement or position of said slide and switch.

10. In an electric brake structure, the com- 130

5 combination of a brake actuating member, an electric motor having a suitable gear connected to actuate and the said member to apply the brake, a releasable clutch interposed in the said gear for releasing the brake, an electromagnet connected to said clutch to release the same, a battery having a circuit connected to said motor and a circuit connected to said electromagnet, a double switch having contacts for closing the circuit to the said motor or the said magnet, a lug carried by a movable part of the said switch mechanism to cooperate with the said switch to close the circuit to the motor or to the magnet, the movement of said part in applying the brake or in releasing the brake serving to open the said switch to control the position of the brake.

10 11. In an electric brake structure, the combination of a brake actuating member, an electric motor having a suitable gear connected to actuate the said member to apply the brake, a releasable clutch interposed in the said gear for releasing the brake, an electromagnet connected to said clutch to release the same, a battery having a circuit connected to said motor and a circuit connected to said electromagnet, a slide in a suitable slideway in proximity to a movable part of the said brake mechanism, an actuating lug on said movable part, a rocker switch on the said slide having a contact at one limit to supply current to the motor and at the other limit to supply current to the electromagnet and having a central notch over the pivot thereof cooperating with the said lug, and a control pedal having a spring return and having a connection for actuating the said slide, whereby on the depression of said pedal the notch reacts on the said lug to close the circuit to said motor to apply the brake and on the reverse of said pedal reacts to close the circuit to said magnet to release the brake and control the same according to the movement or position of said slide and switch.

15 12. In an electric brake structure, the combination of a brake actuating member, an electric motor having a suitable gear connected to actuate the said member to apply the brake, a releasable clutch interposed in the said gear for releasing the brake, an electromagnet connected to said clutch to release the same, a battery having a circuit connected to said motor and a circuit connected to said electromagnet, a slide in a suitable slideway in proximity to a movable part of the said brake mechanism, an actuating lug on said movable part, a rocker switch on the said slide having a contact at one limit to supply current to the motor and at the other limit to supply current to the electromagnet and having a central notch over the pivot thereof cooperating with the said lug, and a control pedal having a connection for ac-

tuating the said slide, whereby on the depression of said pedal the notch reacts on the said lug to close the circuit to said motor to apply the brake and on the reverse of said pedal reacts to close the circuit to said magnet to release the brake and control the same according to the movement or position of said slide and switch.

13. In an electric brake structure, the combination of a brake actuating member, an electric motor having a suitable gear connected to actuate the said member to apply the brake, a battery having a circuit connected to said motor, a slide in a suitable slideway in proximity to a movable part of the said brake mechanism, an actuating lug on said movable part, a switch on the said slide having a contact to supply current to the motor and having a part thereof cooperating with the said lug, a control pedal having a connection for actuating the said slide, whereby on the depression of said pedal the notch reacts on the said lug to close the circuit to said motor to apply the brake to control the same according to the movement or position of said slide and switch.

14. In an electric brake structure, the combination of a brake actuating member, means to apply said brake, a releasable clutch interposed in the said gear for releasing the brake, an electromagnet connected to said clutch to release the same, a battery having a circuit connected to said electromagnet, a slide in a suitable slideway in proximity to a movable part of the said brake mechanism, an actuating lug on said movable part, a switch on the said slide having a contact to supply current to the electromagnet and having a part thereof cooperating with the said lug, and a control pedal having a connection for actuating the said slide, whereby on the depression of said pedal the notch reacts on the said lug to close the circuit to said magnet to release the brake to control the same according to the movement or position of said slide and switch.

15. In a structure of the class described, a control comprising the combination of a reciprocating actuator element having a projecting lug thereon, a reciprocable slide arranged to operate parallel to said actuator, a rocking switch on the said slide notched to embrace said lug having independent contacts for delivering current to a motor or to a cut-out device being adapted on the actuation of the slide to close the circuit and automatically open the switch due to the action of the actuator on said switch when the slide comes to rest.

16. In a structure of the class described, a control comprising the combination of a reciprocating actuator element having a projecting lug thereon, a reciprocable slide arranged to operate parallel to said actuator,

a switch on the said slide adapted to cooperate with said lug to control said switch and automatically open the switch due to the action of the actuator on said switch when the
5 slide comes to rest.

In witness whereof I have hereunto set my hand.

ROYAL E. ADAMS.

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