No. 728,901. PATENTED MAY 26, 1903.

E. R. GILL.

MEANS FOR OPERATING REVERSING SWITCHES ON ELECTRIC CARS.

APPLICATION FILED OCT. 6, 1900.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

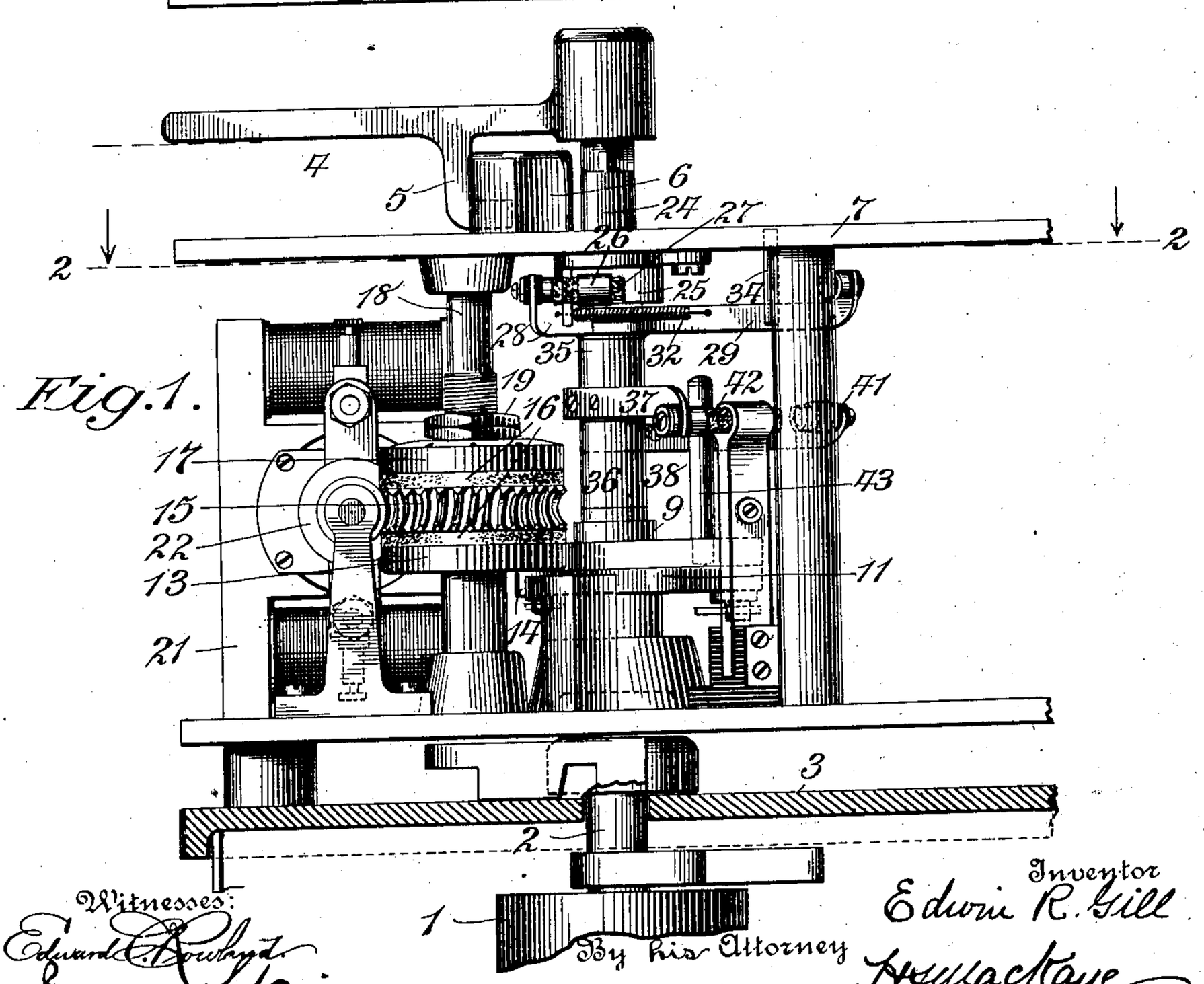

Fig. 2.

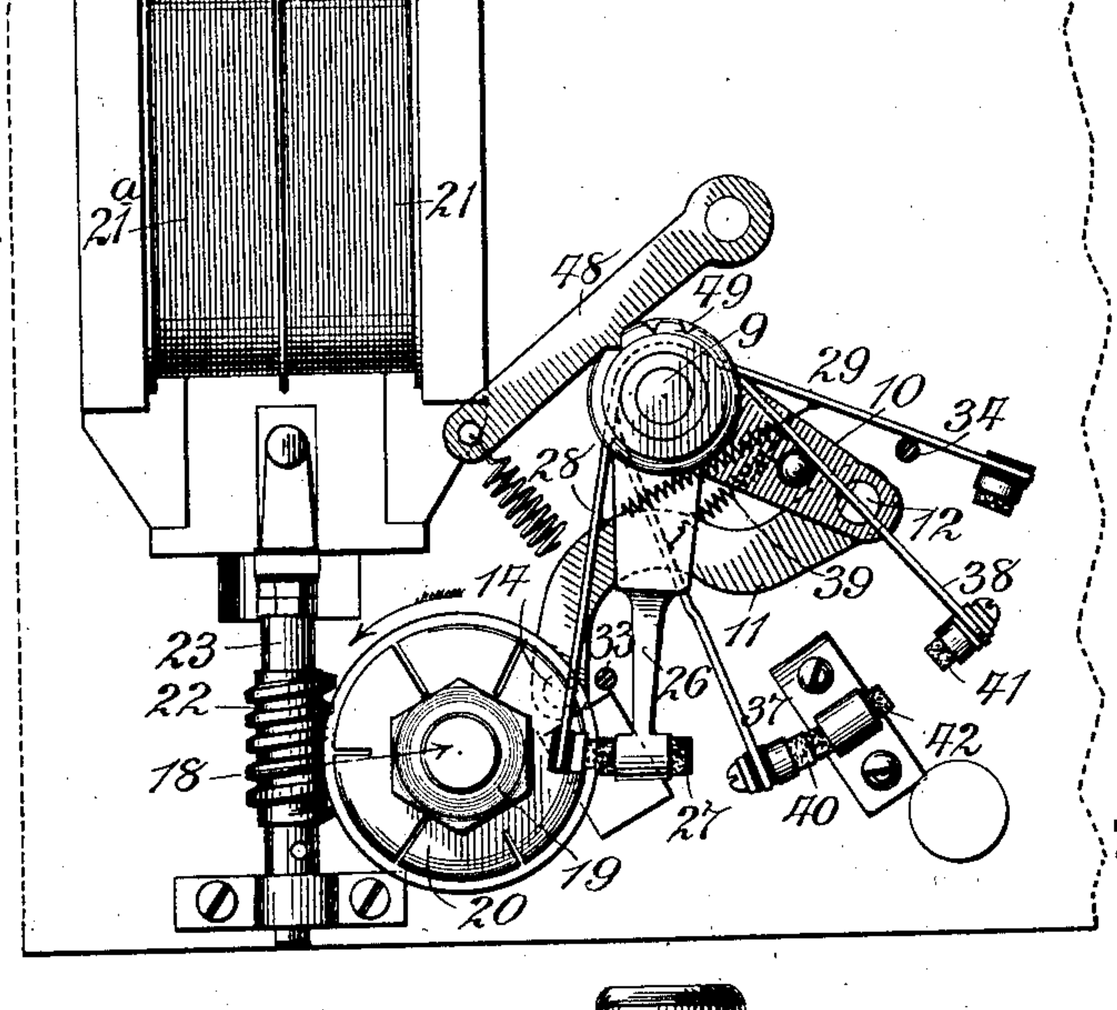

Fig. 3.

Witnesses:
Edward C. Rowland.
James L. Laing.

Inventor
Edwin R. Gill.
By his Attorney
H. W. MacKaye

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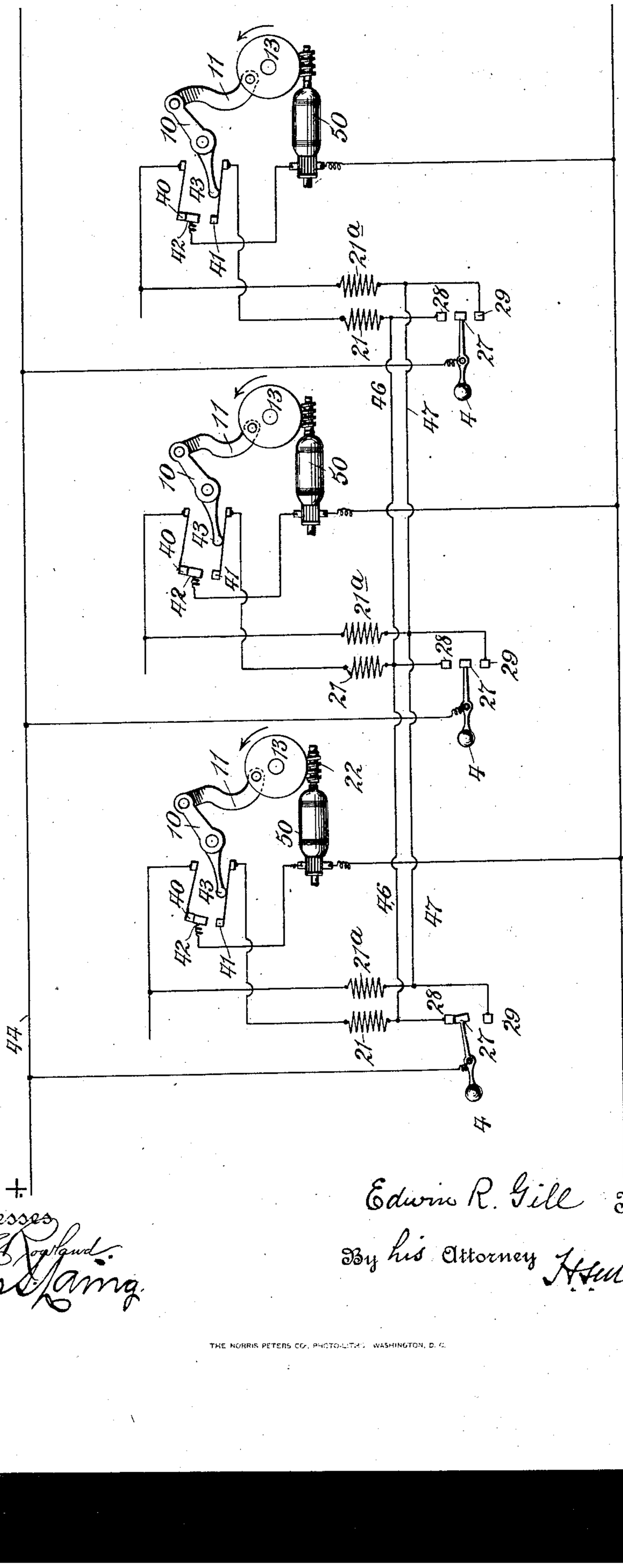
Fig. 4.



Witnesses
Edward C. Longland.
James L. Laing.

Edwin R. Gill Inventor
By his Attorney H. MacKaye

No. 728,901. Patented May 26, 1903.

UNITED STATES PATENT OFFICE.

EDWIN R. GILL, OF NEW YORK, N. Y., ASSIGNOR TO INVENTION DEVELOPING COMPANY, A CORPORATION OF NEW JERSEY.

MEANS FOR OPERATING REVERSING-SWITCHES ON ELECTRIC CARS.

SPECIFICATION forming part of Letters Patent No. 728,901, dated May 26, 1903.

Application filed October 6, 1900. Serial No. 32,205. (No model.)

To all whom it may concern:

Be it known that I, EDWIN R. GILL, a citizen of the United States, residing in the city, county, and State of New York, have invented a certain new and useful Improvement in Means for Operating Reversing-Switches on Electric Cars, of which the following is a specification.

The object of my present invention is the provision of an improved means whereby all of the reversing-switches on the various cars of a train of electric cars may be simultaneously operated for running trains backward and forward and whereby accidental misplacement of any one or more of such switches may be guarded against.

A preferred embodiment of my invention is illustrated in the accompanying drawings, wherein—

Figure 1 is an elevation of a combined manipulator and switch-moving device assembled over the usual reversing-drum as generally employed on electric-car platforms. Fig. 2 is a top view of the same as seen below the line 2 2 of Fig. 1. Fig. 3 is a sectional detail view of the operating-spindle, and Fig. 4 is a diagram of working circuits on a train of three cars.

At 1 in Fig. 1 is shown the top of the usual reversing-drum employed in standard controller-boxes on electric cars. This drum is operated in present practice by a spindle 2, projecting above the top 3 of the controller-box, and by a handle 4, hitherto adapted to be set directly upon the top of such spindle. In the preferred embodiment of my invention, which is illustrated, I interpose between said handle and said spindle a mechanism whereby the movement of one handle is made to control the positions of any desired number of reversing-drums.

The handle 4 is provided with the usual depending hook 5, which coöperates with the usual locking member 6 on the top frame-plate 7 of my device, whereby said handle can only be removed when the switch is in the middle position. This forms no part of my present invention, however.

Upon the spindle 2 there fits the socket 8 at the lower end of the operating-shaft 9. This shaft has an arm 10 and is adapted to be turned by an appropriate connecting-link 11, pivoted upon the pin 12 at one end and at the other end upon the under side of the disk 13 at the pin 14. Upon turning this disk 13 in the direction of the arrow in Fig. 2 the shaft 9 will be turned in one direction through a given arc, and vice versa. The disk 13 is preferably moved by a frictional driver, which, as illustrated, includes a worm-wheel 15, concentric with said disk, and on each side of which is a leather or other frictional cushion 16. The disk 17 lies over the worm-wheel. Both disks are keyed to the counter-shaft 18, and the worm-wheel and cushions are loose thereon. By screwing the lock-nuts 19 up or down the frictional engagement between the worm-wheel and the disks may be adjusted. A spring-plate 20 is preferably placed under the nuts 19.

The prime mover which I employ is a small electric motor 21 for each reverser, there being a worm 22 on the armature-shaft 23, which is adapted to drive the wheel 15. It is evident that by driving the motor 21 in one direction or the other the disk 13 and link 11 may be made to turn the shaft 9 one way or the other, and so operate the reversing-drum 1. At the same time when the drum reaches either extreme position the inertia of the motor-armature is allowed for by the lost motion permitted at the friction-cushions 16.

I prefer to employ the usual handle 4 for operating the manipulator or master-switch. By this means in case of accident my reversing mechanism can be lifted off and the handle 4 used in the usual manner to throw each individual drum 1.

Projecting through the plate 7 is a sleeve 24, turning on the shaft 9 and carrying upon appropriate insulation 25 an arm 26. This arm carries a contact-button 27, preferably of carbon, as are all the switch-contacts hereinafter described.

The two arms 28 and 29 are sleeved at 30 and 31 on the shaft 9, and the spring 32 tends constantly to bring these arms together, thus holding them against the respective stop-pins 33 34. At the end of each arm 28 29 is an insulated carbon contact-button, as shown.

The sleeves 35 and 36 on the shaft 9 respectively carry the arms 37 and 38, which are

normally held together by the spring 39, so as to bring the contact-buttons 40 and 41 against the insulated stationary contact 42. The arm 10 carries a pin 43, adapted to come against one or the other arm 37 38, according to the position of the reversing-drum 1 and shaft 9. This causes either the button 40 or 41 to be out of contact with 42 in the extreme position of said drum 1. In the middle position of the drum 1 both buttons 40 and 41 make contact. It will also be seen that when the pin 43 is moved away from either extreme position the corresponding spring-arm 37 38 follows it, and its button 40 or 41 makes contact with 42 before the other spring-arm is moved for breaking the other contact at 42. At the same time whenever the pin 43 occupies one extreme position one of the buttons 40 41 is drawn away from the button 42.

Inspection of Fig. 4 will make clear the electric connections controlled by the devices so far described. The positive and negative mains running through the train are shown at 44 and 45. These are supplied with current by any desired means, preferably from the circuits which propel the cars. Under proper circumstances one or the other of these mains may be replaced by the ground. The button 27 on each car is connected to one of these mains, as 44, while the other main is connected to one commutator-brush on each reversing-motor. The buttons on the spring-arms 28 and 29 on each car are respectively connected to two train-wires 46 and 47. Each reversing-motor is supplied with duplicate field-windings 21 21[a]. The two windings on each motor are so wound as to mutually counteract each other, so that when current passes through both the motor stands still, and it runs in one direction or the other, according as one or the other field-magnet winding is in circuit. The diagrammatic representation of these coils in Fig. 4 indicates their opposite effects. For greater clearness in the diagram the pins 43 are shown on a separate arm, which turns with the arm 10.

The switch controlled by the handle 4 I term the "manipulator-switch." That operated automatically by the pin 43 I term the "selecting-switch."

The parts shown in Fig. 4 exhibit the condition existing after operation of all the reversers by making contact at spring-arm 28 at the left-hand manipulator-switch. Assuming now that all of the reversers are to be operated in the direction of the arrows in Fig. 4, the handle 4 is thrown over to make contact between 27 and 29. In this position the toothed lever 48 falls into the notch 49 (see Fig. 2) on the collar carrying the arm 26. This lever is provided for the guidance of the operator, who can feel by changes in resistance to motion when the handle is properly placed in each extreme or the middle position. Contact being thus made at 29, current passes from train-wire 44 through buttons 27 29, through field-magnet winding 21[a], buttons 40 42, armature 50 of motor, and thence to wire 45. The train-wire 47 insures simultaneous production of this circuit in all the reversers. The coils 21[a] are so wound as to drive the armatures 50 in the right direction for turning the disks 13 in the direction of the arrows, thus acting, through the links 11, to operate the reversing-drums 1. As before explained, this operation of the reversers causes the pins 43 to successively permit contact between 41 and 42 and then open the circuit between 40 and 42.

It is advisable to so space the spring-arms 37 and 38, carrying the buttons 40 and 41, as to allow an appreciable time to elapse between making contact at one button and breaking it at the other. This is for the following reason: Supposing Fig. 4 to represent the conditions existing on a train of three cars just coupled together, the handle 4 on the left-hand car having been carelessly left on and the switch left in the position shown, if now it be desired to reverse the train from the right-hand end in Fig. 4 by throwing the handle 4 in that car to 29 a confusion might arise as follows: All the motors being energized to move with the arrows, contact would shortly occur between the buttons 41 and 42. This would at once close all circuits through field-magnet coils 21, because of the closure at 27 28 on the left-hand car. This would destroy the magnetism in all the field-magnets and tend to stop the motors. Inertia would cause these motors to run onward a short distance, however. It is therefore evident that if separation of button 40 from 42 is practically simultaneous with contact between 41 and 42 the motors will be kept swinging back and forth; but if time is allowed for the motors to stop all the reversing-drums will be brought to a middle position and will so remain until some one finds the handle carelessly left thrown and removes it.

It is of course evident that where the manipulating-switches are in the middle position in all the cars the positions of the reversing-switches may agree or not when the train is made up, since on operating any one manipulator only such reversers will be operated as are not already in the desired position.

It is evident that it is not essential to my invention that the manipulator-switch be placed near or upon the reversing mechanism. For instance, each car might be provided with one manipulator-switch and one reversing mechanism, the switch being capable of use at either end of the car.

In order to prevent confusion where cars for trains are intended to be run in either direction indifferently, as is now the case with steam-railway cars, the arrangement of wires may be as follows, the cars being assumed to be run by overhead trolley and ground-return: Each car being first assigned arbitra-

rily a forward end, the button 28 or 29, corresponding to that position of the reverser which produces movement toward the forward end, is connected to a main wire 46 or 47, extending to the right side of the forward end and the left side of the rearward end, or vice versa, in every car of the system of cars to be connected in trains. Of course the other main 47 or 46, corresponding to rearward movement, would occupy the opposite side of each car. This arrangement being established, the right-hand main at each coupling-point on one car would be coupled to the adjacent or left-hand main on the abutting car, and the train would then run as it should in every instance whether all the cars were running toward the same conventional ends or not.

The terms "right" and "left" as above used apply to the position of the wire ends as seen by a person standing on an end platform and looking away from the body of the car in each instance.

What I claim is—

1. In a mechanical reverser for electric-car controller-boxes, an operating-shaft 9 having a socket fitting upon the reversing-drum spindle, an electric motor and means including friction-transmission whereby said motor operates to turn said operating-shaft with lost motion.

2. In a mechanical circuit-reverser for electric cars, an electric motor having two oppositely-wound field-magnet coils, operating means driven by said motor and a switch moving with said operating means acting first to close a break in the circuit of the inactive field-magnet coil and then to open the active circuit of the motor.

3. In a mechanical circuit-reverser for electric cars, an operating-shaft carrying a socket for actuating a reverser, a pin on said shaft, a middle fixed electric contact, two swinging arms in the path of movement of said pin and a spring tending to hold the ends of said arms against said middle contact.

4. In a mechanical circuit-reverser for electric-car controller-boxes, mechanism for turning the reversing-drum adapted to be set upon the end of said controller-box and a switch for controlling said mechanism adapted to be operated by means of the usual removable handle for direct operation of said drum.

EDWIN R. GILL.

Witnesses:
H. S. MACKAYE,
JAMES S. LAING.