To all whom it may concern:

Be it known that I, GEORGE W. BULLEY, a citizen of the United States of America, and resident of Chicago, Cook county, Illinois, have invented a certain new and useful Improvement in Controllers for Electric Vehicles, of which the following is a specification.

My invention relates to improvements in controlling mechanism or apparatus for electric vehicles, and one of the objects of my invention is to provide an improved apparatus of this character which will be simple, durable and reliable in construction, and effective and efficient in operation. Other objects of my invention will appear hereinafter.

My invention consists in the features of novelty exemplified in the construction, combination and arrangement of parts hereinafter described, shown in the accompanying drawings, and more particularly set forth in the appended claims.

Referring to the accompanying drawings:

Figure 1 is a view, partly in section and partly broken away of an electric industrial tractor or power pulling unit equipped with an improved controlling mechanism embodying my invention;

Figure 2 is an enlarged longitudinal elevation of the current controller;

Figure 3 is a view of the star wheel end of the controller shown in Figure 2;

Figure 4 is a view of the opposite end of the controller showing the automatic restoring and locking mechanism;

Figure 35 is a sectional view taken substantially on the line 5—5 of Figure 1;

Figure 6 is a detail in horizontal section on the line 6—6 of Figure 1;

Figure 7 is a detail of the lost motion connection between the brake rod and the actuating means thereof;

Figure 8 is a detail of the guide plate for the controller lever, showing the forward reverse slots, and taken substantially on the line 8—8 of Figure 2; and

Figure 9 is a detail section on the line 9—9 of Figure 2.

The vehicle shown in Figure 1 is a tractor of the type used more particularly for handling or pulling loaded and unloaded trucks of merchandise along freight platforms, wharves, warehouses and the like, and is intended as representative of any type of vehicle to which my invention can be applied. This tractor A has a body or frame supported by two rear wheels and a front wheel which is also arranged for steering purposes. This front wheel is mounted in a fork 1 which extends considerably above the floor of the tractor and carries at its upper end a lever 2 convenient for the operator. On the rear portion of the tractor frame is a housing 3 which incloses a suitable storage battery for supplying current to the driving motor 4 which in this case is suspended beneath the tractor frame and is connected by suitable transmission mechanism to the rear axle 5 for driving the rear wheels. On the rear axle is a brake mechanism which may be of any suitable or standard type for the purpose, and the brake mechanism which I have shown is intended as representative thereof. It comprises a brake wheel 6 of sufficient diameter mounted on the axle 5, and embraced on its periphery by a brake or friction gripping band 7 adapted to be contracted against the periphery of the brake wheel and apply a braking action thereto. One end 8 of this brake is anchored on a transverse shaft 9 while the other end 10 is attached to the end of a short arm 11 on the shaft 9. The shaft and arm 11 are rotated to expand and contract the brake band by a longer arm 12 on the shaft, this arm being connected to a brake rod 13 which extends forward underneath the frame to a foot treadle 14 by which the operator may actuate the brake at will. In Figure 1 the brake is shown in its actuated or braking condition. In actual practice there are usually provided two brake wheels and bands, one adjacent each rear wheel, and both being actuated by the common actuating rod 13 but a description of one of them is deemed sufficient.

On the frame of the tractor just forward of the battery housing is a seat for the operator, which in this instance is a box-like enclosure structure B disposed transversely of the frame, and having a suitable cushion or seat board 20 for the operator. This seat 20, as shown in Figure 5, extends substantially one-half the length of the structure B and at one end 20a is hinged to the structure so that the seat will have slight vertical movement. The controller C for governing the current through the motor 4 is situated just beneath the top of the seat box and is so...
curely mounted on the frame of the box, this top portion being also formed as a hinged or removable cover which enables convenient access to be had to the controller. This controller has an operating lever 21 which swings in a vertical plane through an arc. It projects up through a guide plate 22 formed as a part of the controller frame and into a convenient position for the operator. The guide plate 22 (see Fig. 8) is provided with two slots 23 and 24 which communicate with each other at their ends but which are offset or out of alignment with respect to each other, and one of these guide slots, in this case the slot 23, permits the operating lever 21 to be thrown in one direction to govern the forward movement of the tractor; and the other slot 24 permits the lever to be thrown in the opposite direction to govern the "reverse" or backing up movement of the tractor, the normal or intermediate position of the lever being the neutral or off position thereof. At the neutral position; that is the point where the two slots 23 and 24 meet, the lever has room for sufficient lateral movement to bring it into alignment with either slot after which it may be moved longitudinally of the slot. Normally it is arranged to stand in alignment with the "forward" slot and the operator need only move it directly along the slot. He cannot move the lever along the "reverse" slot without first shifting it laterally into alignment therewith and this arrangement operates as a check against the operator making a mistake and throwing the lever in the wrong direction accidentally. Furthermore the offset relation of the slots prevents the operator from suddenly throwing the controller into "reverse" directly from a "forward" or "ahead" position and vice versa thus serving as a protector for the motor and apparatus. The controller has a horizontally rotatory reciprocable shaft 25 which is actuated by the operating lever 21, the lever 21 being pivotally fastened at 26 (Fig. 2) by a bolt or screw to the shaft 25 to permit its relative lateral movement in cooperation with the guide plate as above described. The shaft is journeed in the triangular openwork castings 27 forming the end members of the controller frame. These end members are held rigidly in position by the longitudinal frame bars 28 of the end castings. Mounted on and rotatable with the shaft 25 is a segmental drum or contact member 27, this being carried by the end quadrant arms 28 keyed on the shaft. This drum member carries a number of contacts 29 corresponding to the several positions of the controller which determines the several speeds of the tractor both forward and reverse, and these contacts cooperate with the fixed brushes 30 carried by the frame of the controller. In order that the operator may determine when the controller is properly in any one of its positions I provide a "star wheel" or notched member 31 at one end of the drum. In this structure the star wheel consists of a segment shaped plate carried by the arm 32 on the collar 33 which is keyed on the controller shaft. On the periphery of this plate is a plurality of teeth between which are the spaces 34 which in conjunction with a spring 35 actuated finger 36 determine the positions of the controller. In this structure there are three notches 34 corresponding to three forward speeds and two corresponding to two reverse speeds, these being disposed on the opposite sides of the neutral or off-position notch 36. The finger is pivoted at 37 to the frame of the controller and carries a roller 38 at its end which is caused to yieldingly ride into and out of the star-wheel notches 34 as the drum is rotated, the finger being actuated on by a spring 40 connected to the finger. The tooth between the neutral and the first position in reverse is omitted as there is no necessity for it because the operator will know that when the finger roller engages the next tooth the controller has reached the first position reverse. The spring 40 is anchored to the arm 32 in such a manner that it is placed under tension when the controller drum is rotated for reverse and unless the operator holds the controller in its reverse position, the spring 40 will automatically restore it to normal or off-position. This is provided to make it impossible for the operator to leave the controller in any of its reverse positions. By connecting one end of the spring 40 to the finger 36 and the other end to the arm I am enabled to use a single spring for both purposes. A collar 50 is pinned on the end of the shaft and is rotatable with the shaft. This collar has a shoulder 51 which cooperates with the corresponding shoulder 52 of another collar 53 carried by the shaft but rotatable on the shaft. This latter collar 53 has a projecting arm 54 which is pivotally connected at its end to a vertically reciprocable rod 55 in such a manner that when the rod is reciprocated the collar 53 will be rotated and should the shoulder 51 of collar 50 be in the path of the collar 53 the controller shaft will be rotated. A heavy spring 56 connected to the arm 54 and the frame of the controller (as shown clearly in Figs. 2 and 4), constantly acts upon this arm 54 to rotate it. The parts are so proportioned and arranged that the spring actuated arm 54 and its collar 53 constantly act against the shoulder 51 of collar 50 to hold the controller shaft and the operating lever in their neutral or off-position and serve to lock the controller in such neutral or off-position; hence it is obvious that if the controller should be in an advanced posi-
tion in the "forward" direction, the spring mechanism just described will automatically restore said controller drum and operating lever to their normal position. Further then to render the controller freely operable by the operator in the forward direction the shoulder 51 of collar 50 must be ad-

vanced or held away from the shoulder of collar 53 so as to provide a sufficient range of free movement for the operating lever and controller shaft. This I accomplish in an automatic manner through the medium of the seat upon which the operator sits while he is driving the vehicle. I have previ-

ously mentioned that the seat is hinged at its outer end so that it will have some vertical movement. I extend the rod 55 above the controller frame in a position where the seat 20 will rest upon the end thereof (see Fig. 5). Hence any depression of the seat as by the operator sitting thereon will depress the rod and cause it to reciprocally rotate the arm 54 and its collar 53 downwardly. This moves the shoulders 51 away from the shoulder 52 and releases the con-

roller shaft and operating lever. Thus the operator having taken his position on the seat automatically unlocks the controller and leaves it free for operation throughout the range of its positions, but when he leaves his seat the controller will be automatically locked. Should he leave his seat without first returning the controller lever to nor-

mal position the controller lever and drum will be automatically restored in the act of his leaving his seat. It is evident that the structure which I have described is fool-

proof; the operator can not leave the con-

roller in any but its off-position and the controller is locked against operation by others who are not authorized and who are not familiar with the necessity of occupying the seat to release the controller. Further-

more the operator by the reason of the guide plates 22, hereinbefore described, can not impulsively throw the controller into "re-

verse" position without first shifting the hand lever laterally, the necessity for which act will call his attention to the fact that he is operating the controller in the wrong direction. Again the controller can not re-

main in any of its "reverse" positions unless held therein by the operator, and the moment he removes his hand from the le-

ver the controller will be automatically re-

stored. The vertical actuating rod 55 is journaled in bearings on the controller frame and seat structure, as shown clearly in Figs. 2 and 4. This rod extends downwardly and is pivotally connected at its lower end to one arm 58 of a bell crank lever, this bell crank lever being pivoted at 59 to a suitable bracket on the frame of the machine. The other arm 60 of the bell crank is positioned in an elongated slot 61 in the brake rod 13 whereby it would have a lost motion connection with said brake rod 13 which permits the brake rod and the brakes to be actuated by the foot treadle 14 independently of the seat actuated mecha-

nism. The brake rod 13 is constantly acted upon by a spring 62, one end of which is connected to the vehicle and the other end to the rod in such manner as to maintain the brakes in a released or unapplied condition when the operator is occupying his seat and the rod 55 has been thereby depressed. Should the operator not be in position on his seat, however, the rod 55, as before men-

tioned, is raised and the arm 60 of the bell crank lever will be maintained in position to lock the brakes in their operated or ap-

plied condition and even render the brakes incapable of being operated by the foot treadle 14. When the operator takes his seat, however, the rod 55 is depressed and the bell crank arm 60 moved to a position where it will not interfere with the opera-

tion of the brakes by the foot treadle. Should the operator attempt to leave the vehicle, either while it is standing still or while moving, without applying the brakes by the foot treadle, the brakes will be automatic-

ally applied through the operation of the mechanism just described. In this struc-

ture I have shown a spring 65 on the rod 55 between a fixed collar 66 on said rod and the lower bearing thereof which spring sup-

plements the action of the spring 56 in lock-

ing or restoring the controller and brake mechanism, but the use of this spring 65 is a matter of proportioning the parts to meet the particular conditions.

What I claim as my invention is: 1. The combination of a support, a con-

roller mounted thereon and having a con-

roller member rotatable in opposite direc-

ions from a neutral position, a hand lever fastened to said controller for actuating said controller member in either direction, means constantly acting on said controller member to restore it to its neutral position when moved in one direction, a spring-actuated arm loose on said member normally holding the controller member against movement in the other direction, an opera-

tor's seat, and means operated by the seat in response to the occupation of the seat by the operator for actuating said arm to release said controller member.

2. The combination of a controller having a shaft rotatable in opposite directions from a normal position, a lever mounted on said shaft for rotating it, a locking arm rotatable on said shaft, a spring acting on the arm to lock the shaft in its normal position, and an operator's seat responsive to the weight of the operator for actuating said arm against the tension of the spring to release the shaft.
3. The combination of a controller, a shaft, a rotatable shaft member actuated by said shaft, a lever secured to the shaft for manually actuating said shaft, an operator's seat and an automatic restoring device comprising a collar on said shaft and a spring actuated arm operable when the operator leaves the seat to engage said collar and restore the controller to normal position.

4. The combination of an electric circuit controller having a shaft, a hand lever secured to said shaft for rotating the controller, a fixed member on said shaft, a relatively movable member on the shaft operable to engage said fixed member and rotate the shaft and controller to normal position, an arm on said movable member, an operator's seat, means operable upon the occupation of the seat for operating said arm to disengage the movable member from the fixed member, and a spring constantly acting on said arm tending to engage the movable member with the fixed member.

5. The combination of a support, an electric controller mounted thereon and having a rotary operating shaft, a hand lever secured to the shaft for rotating it, a fixed collar on said shaft having a shoulder, a rotatable collar on said shaft having a corresponding shoulder, means constantly acting on said rotatable collar to engage the shoulders and rotate the shaft, an operator's seat, and means responsive to the occupation thereof for separating said shoulder members.

Signed by me at Chicago, Illinois, this 3rd day of January, 1916.

GEORGE W. BULLEY.

Witnesses:

AMY JEHLE,

E. H. CLERG.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."