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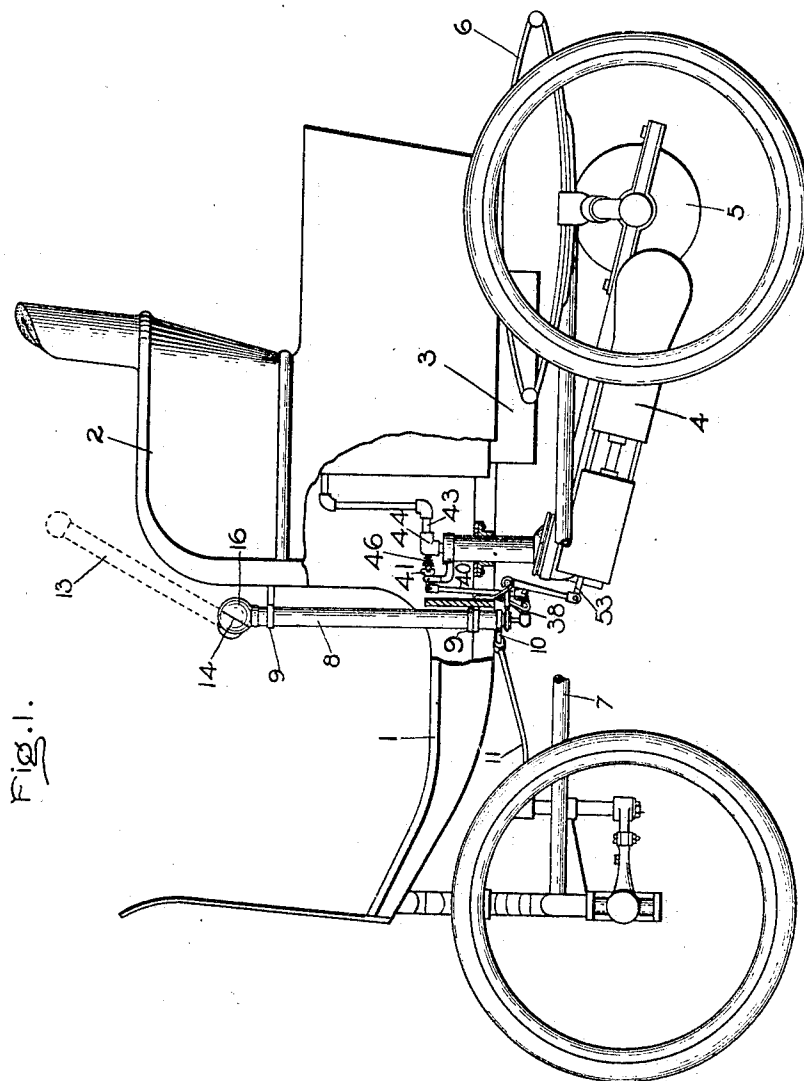
PATENTED FEB. 7, 1905.

A. A. BALL, JR.

CONTROLLING MECHANISM FOR SELF PROPELLED VEHICLES.

APPLICATION FILED SEPT. 4, 1902.

3 SHEETS—SHEET 1.



Witnesses:

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Augustus A. Ball Jr.,
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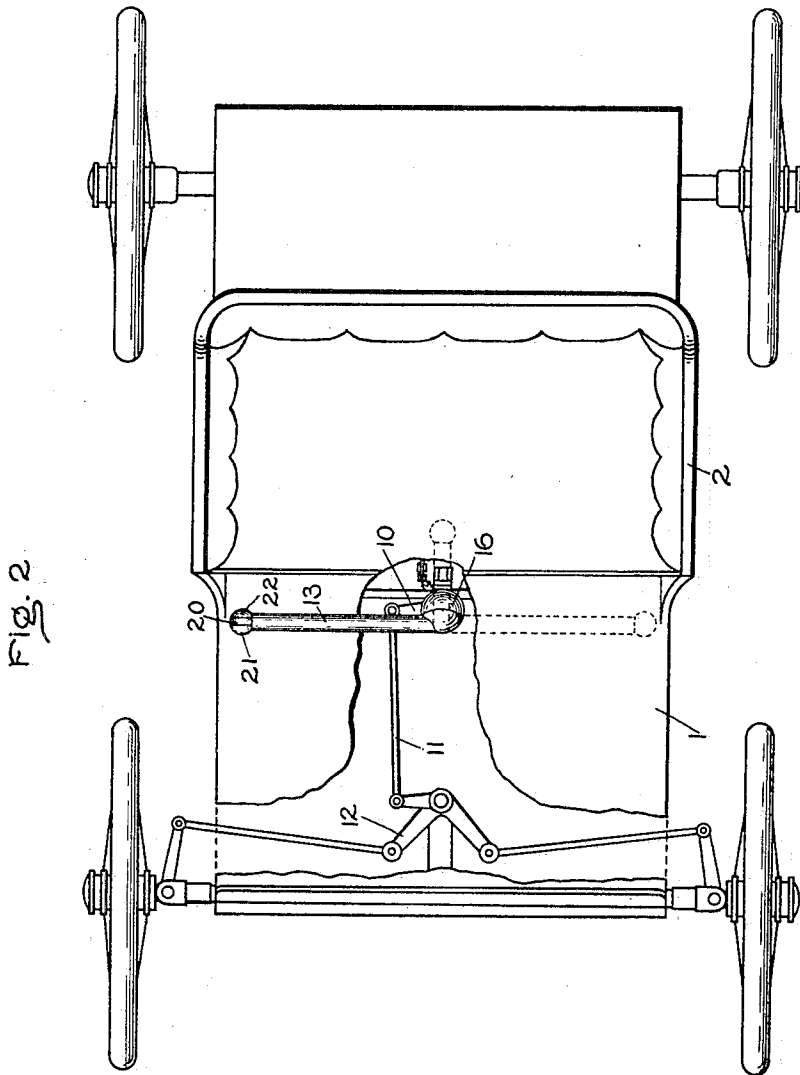
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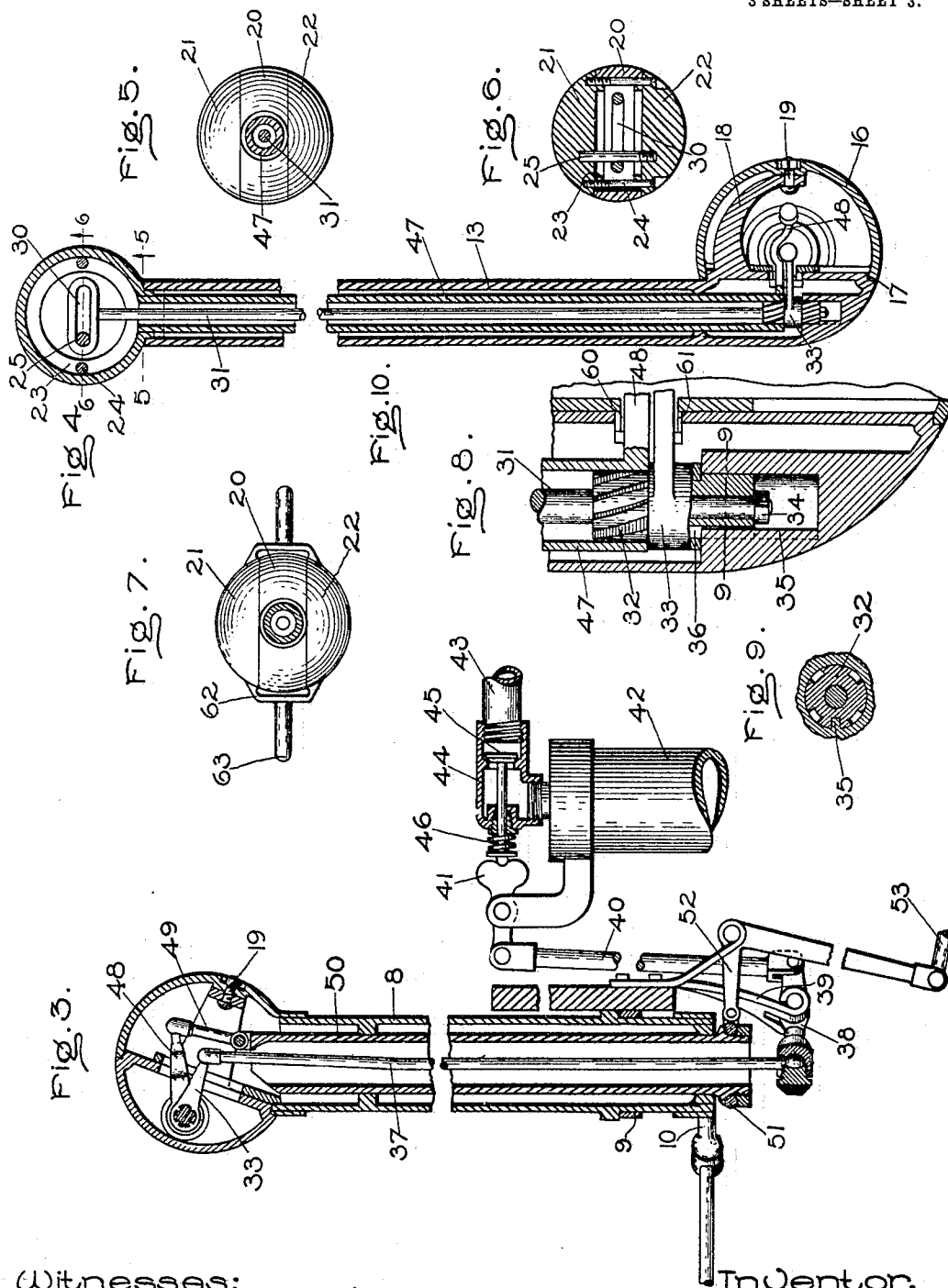
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3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

AUGUSTUS A. BALL, JR., OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

CONTROLLING MECHANISM FOR SELF-PROPELLED VEHICLES.

SPECIFICATION forming part of Letters Patent No. 781,989, dated February 7, 1905.

Application filed September 4, 1902. Serial No. 122,066.

To all whom it may concern:

Be it known that I, AUGUSTUS A. BALL, JR., a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have
 5 invented certain new and useful Improvements in Controlling Mechanisms for Self-Propelled Vehicles, of which the following is a specification.

The present invention relates to controlling
 10 mechanism for self-propelled vehicles, and has for its object to provide an organization wherein a single handle or lever is arranged to steer the vehicle and also to regulate speed both forward and backward by varying the admission
 15 of steam to the engine and also by varying the period of cut-off.

For a consideration of what I consider to be novel and my invention reference is made to the specification and the claims appended
 20 thereto.

In the accompanying drawings, which illustrate an embodiment of my invention, Figure 1 is a side elevation of a vehicle with certain of the parts broken away. Fig. 2 is a plan
 25 view of the vehicle. Fig. 3 is a vertical section of the steering post or stand. Fig. 4 is a longitudinal section taken through the outer end of the steering handle or lever. Fig. 5 is a cross-section of the handle, taken on the line
 30 5 5 of Fig. 4 looking in the direction of the arrow. Fig. 6 is a cross-section taken on line 6 6 of Fig. 4 looking in the direction of the arrow. Fig. 7 is a view in elevation representing a slight modification of the handle or
 35 grip for the steering-lever. Fig. 8 is an enlarged detail view of one end of the steering-lever. Fig. 9 is a cross-section taken on line 9 9 of Fig. 8, and Fig. 10 is a longitudinal section of that portion of the handle adjacent its
 40 support.

1 represents the body of a self-propelled vehicle, and 2 the seat therefor. Situated within the body is a boiler 3, which supplies steam to the engine 4. The latter is supported in
 45 any suitable manner from the rear axle and the spring-supported body. The engine or motor is geared to the driving-axes through suitable differential gearing which is inclosed

in the casing 5. The axles for the vehicle may be united in any suitable manner. In the present instance they are shown as connected to the vehicle-springs 6, which springs support the body. In addition to this they are connected by the frame-bars 7.

Situated in front of the vehicle-seat at a
 55 point midway between the ends is the steering and controlling mechanism. I prefer this arrangement; but it can be situated at one side, if desired, or other convenient place. The mechanism comprises a vertical supporting-
 60 tube 8, which is provided with bearings 9 at its ends. On the lower end of the tube or standard is a lever 10, Fig. 2, which is connected by a rod 11 with the lever 12, the latter being pivotally connected to the short stub-axes of
 65 the steering-wheels. The upper end of the standard or support is provided with a steering lever or handle 13, by means of which it is oscillated to and fro for the purpose of steering. It is to be noted that the handle may be either in
 70 the position shown in full lines in Fig. 2 or in the position indicated by the dotted lines. The upper end of the standard terminates in a sphere, which sphere is split on an inclined
 75 plane, as indicated at 14, and one portion of the sphere is rigidly attached to the tube or standard 8, while the other portion is attached to the steering lever or handle 13. By reason of the inclination of the joint or finished
 80 surfaces between the two parts of the sphere the handle 13 will, when swung upward, be inclined toward the rear of the vehicle, as indicated in dotted lines, Fig. 1. This construction provides more room for the occupants
 85 between the seat and the dash than where the handle swings into a vertical position parallel with the support 8 and is advantageous in getting into or out of the vehicle or changing positions therein. Swinging the
 90 steering handle or lever to the vertical position also cuts off the admission of power to the motor and brings the reverser to an intermediate or off position. This will be referred to more specifically hereinafter. It is evident
 95 that such an arrangement is advantageous in case the operator becomes frightened and

throws up the lever so as to jump from the carriage.

The steering handle or lever 13 comprises a tube which is closed at the end adjacent to the standard. This closed end has a shoulder 17 formed thereon and is seated on a similar surface formed on the sphere which is carried by the upper end of the tubular stand or support 8. The bearing-surfaces being of considerable area, the parts are capable of freely turning one on the other without binding. Formed integral with the lever 13 or otherwise secured thereto is a projection 18, of substantial size, which is secured to the fixed portion of the sphere 16 by the bolt 19. The projection is curved somewhat to leave room for the actuating-levers, to be hereinafter referred to. The end of the steering-handle is provided with a spherical handle or grip, which is divided into three principal parts 20, 21, and 22. In considering the illustrations on Sheet 3 it should be borne in mind that whereas Fig. 10 represents a section taken on a horizontal plane Fig. 4 represents a section taken on a vertical plane. The object in making these two sections at a ninety-degree relation is to more clearly set forth the relation of the moving parts one to the other. Figs. 4, 5, 6, and 7 show the grip for the handle in the same plane in order to secure correspondence between them; but Fig. 2 shows the position they occupy when in actual service. I prefer the arrangement shown; but it is not to be understood that I exclude myself from setting the parts at a point ninety degrees removed from the one shown. The grip as a whole is capable of rotating around the longitudinal axis of the steering-lever—that is to say, it can be twisted toward or away from the operator. The parts 21 and 22 are capable of rotating around a vertical axis for the purpose of imparting movement to the regulating mechanism or throttle. In other words, their plane of motion is at right angles to the one previously described. The middle element of the sphere is provided with a large central opening with which the shoulders 23, formed on the top and bottom parts of the grip, engage and prevent lateral displacement. The two parts of the grip are retained in place by screws or bolts 24, Figs. 4 and 6. Supported by the movable parts of the grip is a pin 25, which pin moves in the path of a circle when the outside segments of the grip are rotated in a vertical plane, Fig. 2. The pin 25 passes through a loop 30, that is formed on the end of the rod 31, and as the grip is rotated the pin engaging with the loop moves the rod forward or backward. It is preferable, although not necessary, to make the grip spherical, because it is easy to handle and permits the operator to shift his hand, more or less, in order to rest it, and this without relaxing the hold on the steering-handle. It is also advantageous because the various operations of the steering and con-

trolling mechanisms are similar, whether the handle is on one side or the other of the support 8.

Secured to the end of the rod 31 adjacent to the vertical support 8 is a detachable screw-threaded plug or actuator 32, the latter being retained in place by the nut 34. This plug is adapted to be moved longitudinally by the rod or actuator 31 in order to impart movement to the speed-regulator. The threads which are formed on the plug 32 have a quick pitch, and surrounding the said plug is a lever 33, which is provided with screw-threads that engage with those of the plug 32. The lever is prevented from moving longitudinally with respect to the rod by stationary abutments on each side. The screw-threaded plug or actuator 32 is prevented from turning by a spline or key 35 on the handle, which enters a corresponding groove 36 in the plug. The relation between the threads on the piece 32 and those in the lever 33 is such that as the rod 31 is moved longitudinally it will cause the lever 33 to be rotated around the rod 31 as a center. The lever 33 is connected at its outer end by a flexible connection, such as a ball-and-socket joint, with the vertically-extending rod 37, Fig. 3. The lower end of the rod is connected by a flexible connection, such as a ball-and-socket joint, with the lever 38, that is supported by the bracket 39. The lever 38 is pivotally connected by a rod 40 with the pivotally-supported cam 41, which cam is employed to actuate the regulator. In the present form of my invention it serves to open and close the throttle-valve of the engine.

Referring more particularly to Fig. 3, the construction and operation of the throttle-valve will be described. 42 is a support for one end of the engine and also acts as a conduit for conveying steam from the inlet-pipe 43. On the upper end of the support is a bracket, to which the cam 41 is pivotally secured. Situated above the support is a valve-casing 44. The valve 45 is normally seated by the steam-pressure on the inlet side, and this section is assisted by the coiled extension-spring 46. On the end of the valve-stem is a head which engages the faces of the cam 41. When the parts are in the position shown, the valve is closed; but when the cam is moved up or down one or the other of its curved cam-faces will engage with the head and force the stem longitudinally in a direction to open the valve and admit steam to the engine. One cam-face is used when the steering-handle is on one side of the support and the other cam-face when it is on the other side. Assuming that the operator desires to start the vehicle by admitting power, such as steam, to the engine, he takes his position in the carriage on the right-hand side and rotates the segmental pieces 21 and 22 of the steering handle or lever around a horizontal axis. This causes the

pin 24 to move the loop 30 either to the right or left, depending upon the direction of motion. When the motion is toward the left or in an anticlockwise direction, the screw-threaded plug or actuator 32, being held against rotation by the spline, will cause the lever 33 to move upward. This upward movement causes a corresponding movement of the connecting-rod 37. The upward movement of the connecting-rod causes a downward movement of the connecting-rod 40. Consequently the lower face of the cam will move around its pivot as a center and cause the valve 45 to open and admit steam to the engine. Moving the segments 21 and 22 of the grip in the opposite direction from the position which they now occupy will cause the parts to assume the position shown in Fig. 3. If the handle is always intended to be used on one side of the center support, it is unnecessary to provide means for opening the throttle-valve in two ways; but where it is intended to be used on both sides it is desirable to provide for a double cam, so that corresponding movements of the hand will produce corresponding effects on the apparatus, and this whether the operator be on the right-hand or left-hand side of the seat.

Surrounding the rod 31, Figs. 2, 4, and 10, and connected to the segment 20 of the grip is a tube 47, which is mounted for oscillatory movement within the handle. This tube is provided on the end adjacent to the support 8 with a lever 48, which lever is connected by a short link 49 with the vertically-moving tube 50. The link 49 is connected to the lever 48 by a ball-and-socket joint or its equivalent and to the tube by an ordinary pin, so that the parts will be permitted to move freely and without causing undue strain on the parts. The tube 50 is connected to the reverser or cut-off mechanism, and by changing the vertical position of this tube the direction of the vehicle can be changed, also the period of admission of steam to the engine or power to the motor. The lower end of the tube is expanded to form a shoulder, and seated thereon and retained in place by a nut is a ring 51. This ring is pivotally connected to the bell-crank lever 52, which lever is mounted on a fixed part of the vehicle-body, and therefore is held in rigid alinement with the support for the actuating-lever 38 of the speed-regulator. The lower end of the bell-crank lever is connected by a rod 53 with the reverser or cut-off mechanism of the engine. With the parts in the position shown the period of cut-off is at the maximum. Rotating the segment 20 and also the segments 21 and 22 toward the body of the operator will cause the tube 50 to be forced downward, and as it moves downward the bell-crank lever forces the cut-off mechanism to a point where the period of steam admission is reduced. From the foregoing it will be noted that the speed-regulator

can be actuated without interfering with the reversing mechanism and the reversing mechanism can be operated without interfering with the speed-regulator.

In order to steer the vehicle, the tube 13, which forms the steering handle or lever, is moved toward or away from the operator. This action takes place independent of the position of the speed-regulator or the reversing mechanism, and the operation of the regulating and reversing mechanism does not interfere with the steering of the vehicle. As the tube 13 is moved toward or away from the operator an angular motion is imparted to the vertical tube or support 8. This support is provided with suitable bearings at the top and bottom in order to maintain it at all times in a vertical position. As the support is rotated it transmits motion to the steering wheel or wheels by means of the lever 10 and suitable connecting-rods. It should be noted that by placing the hand on the segments 21 and 22 and properly manipulating the same the operator has entire control of the vehicle. The following are the movements of the grip: First, movement toward and away from the operator for steering; second, rotation on a horizontal axis parallel to the lever for actuating the reverser or cut-off; third, rotation on a horizontal axis at right angles to the lever for actuating the speed-regulator; and, fourth, the grip as a whole can be swung from one side of the vehicle to the other. All of the movements of the grip are distinct from each other and are of a simple natural kind. A combination of two or more movements can be effected simultaneously without confusion. In other words, a single grip without separately-actuated locks or catches of any kind will effect the absolute control of the vehicle. This feature is of great importance, because no time is lost in moving the hand to the right lever. It is practically necessary to keep at least one hand continuously on any kind of a steering device. Hence by properly combining the controlling devices everything is ready for instant operation.

It is desirable that both the reversing mechanism and the speed-regulating mechanism, and particularly the latter, should be moved to an off or inoperative position whenever the steering-lever is moved from the horizontal to a vertical position. This feature is particularly advantageous when for any reason a person attempts to leave the vehicle without completely shutting off the supply of power to the engine. In carrying out this feature of my invention that portion of the sphere which is attached to the vertically-extending tube 8 is provided with two cam-surfaces 60 and 61. These cams are situated on opposite sides of the levers 33 and 48 and are normally out of engagement therewith; but when the handle 13 as a whole is rotated around the bolt 19 as a center these cams en-

gage with the levers and move them toward an intermediate position. As shown in Fig. 3, the lever 33 is directly in line with the center of the bolt 19. Hence this lever will not be affected; but the lever 48, which stands at an angle thereto, will be forced downward, so that its position will coincide with that of the lever 33. This means that all of the parts are brought to an intermediate position, and this without thought on the part of the operator. The ball-and-socket connections between the levers and the connecting-rods 37 and 49 permit the handle to be used on either side of the support and at the same time maintain definite relation between said parts.

Attention is called particularly to the fact that whenever the steering lever or handle 13 is moved into a vertical position it moves the reverser to an off or intermediate position regardless of the position it formerly occupied. Moreover, the reverser will remain in said off position after the lever is moved to its horizontal or operating position, thus requiring the operator to exercise some thought as to which way the vehicle is to travel. The parts are so arranged that the handle can be thrown down and the speed-regulator operated; but the vehicle cannot start until the reverser is properly positioned. This is an important feature, as it tends largely to decrease accidents, particularly at starting.

Referring to Fig. 7, a slight modification is shown wherein the outer segments 21 and 22 are connected by a bridging-piece 62, and to these bridging-pieces are secured projections 63, which engage with the hand and prevent it from slipping.

It is evident that the actuator or rod 31 and the tube instead of being connected to the regulator and reverser, as shown, can be exchanged without departing from my invention—that is to say, the rod can be connected to the reverser and the tube to the regulator.

I have shown my improved controlling mechanism adapted for use with a steam-propelled vehicle; but it is obvious that it can be utilized with vehicles using other kinds of power.

In accordance with the requirements of the patent statutes I have described the principle of operation of my invention, together with the apparatus which I now consider to represent the best embodiment thereof; but I desire to have it understood that the apparatus shown is only illustrative and that the invention can be carried out by other and equivalent means.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. In a controlling mechanism, the combination of a lever mounted to turn on either of two axes, a grip thereon mounted to turn with the same and adapted to have an independent movement, and means capable of actuation by the grip when the lever swings about one axis

and incapable of actuation when the lever swings on the other axis.

2. In combination, a rotatable support, a steering-handle adapted to turn with the support and to turn independently thereof, a grip movably mounted on the handle, and a regulating device controlled by the grip, said grip being operatively connected with the regulating device when the handle occupies one position and inoperatively connected therewith when the handle occupies another position.

3. In combination, a rotatable support, a steering-handle adapted to turn with the support and to turn independently thereof, a grip on the handle, a motor, and a regulator for the motor adapted to be controlled only by the grip when the handle occupies a definite position and to be controlled by the handle independently of the grip when the handle occupies a different position.

4. In controlling mechanism, the combination of a rotatable support, a steering-handle secured thereto to turn in a horizontal plane with the support and to turn on an inclined plane independently of the turning of the support, a grip on the handle capable of rotating at an angle to the horizontal plane of movement of the handle, a regulator, and a connection between the grip and regulator by which the former controls the latter only when the handle occupies the horizontal position, said connection being inoperative when the lever occupies a position inclined to the horizontal.

5. In combination, a support, a steering-handle mounted thereon, a motor, separate regulating devices therefor, a grip on the handle composed of at least two independently-movable parts, separate operating connections permanently uniting the parts of the grip and regulating devices whereby the grip controls said devices, and means whereby the handle renders the grip inoperative relatively to the regulating devices.

6. In combination, a support having an inclined surface, with a handle that is pivotally secured to the inclined surface of the support and so arranged that when it is swung upward it will have the same general inclination as said surface.

7. In combination, a support, a handle secured thereto to swing in an inclined plane, and a controlling mechanism rendered inoperative when the handle occupies an inclined position.

8. In a controlling mechanism, the combination of a support, a handle pivotally secured thereto and adapted to be swung in an inclined plane from a horizontal operative position to a vertical inoperative position, a speed-regulator, a reverser, and flexible connections between the handle and the regulator and the reverser.

9. In a controlling mechanism, a support having an inclined surface near its upper end, a handle, and a pivot for securing the handle

to the support in such manner that it can be used on either side of the support, and when swung upward into a vertical position will have the same general inclination as said surface.

10. The combination of a steering mechanism with a controlling mechanism, a support, a handle for rotating the support which is pivotally mounted thereon to turn in an inclined plane without rotating the support, whereby the handle may occupy a position on either side of the support or a forwardly-inclined position, a regulator permanently connected with the handle, and means on the support whereby the regulator is rendered operative or inoperative according to the position occupied by the handle.

11. In combination, a tubular support mounted to rotate, means actuated thereby, a tubular handle pivotally secured thereto and adapted to rotate with the same, an actuator mounted within the handle, a means carried by the handle and rotatable in two directions for moving the actuator longitudinally, an actuator mounted within the support and adapted to be unaffected by rotation of the latter, and a connection between the actuators whereby longitudinal movement of one imparts a corresponding movement to the other.

12. In combination, a vertical tubular support rotatably mounted, a handle extended angularly therefrom, an actuator mounted within the support relatively fixed as to the rotative movement of the latter, a lever attached thereto, a second actuator longitudinally movable within the handle and also attached to the lever, means capable of partial rotation for longitudinally moving the second actuator, and means for operating the actuator in the handle for imparting movement to the lever.

13. In combination, a support, a tube mounted therein, a rod mounted within the tube, a handle which is secured to the support, a tube mounted therein, a rod mounted within the tube, and levers which transmit motion from the tube and rod of the handle to the corresponding parts in the support.

14. In combination, a support, a handle secured thereto, an actuator mounted within the handle for endwise movement, a lever having a screw-threaded opening, and a screw-threaded plug which fits into said opening and is moved by the actuator.

15. In combination, a support, a handle secured thereto, an actuator mounted within the handle, a screw-threaded plug mounted in the handle, a spline to prevent the plug from rotating, a lever which is arranged to receive the plug and be moved angularly thereby, and abutments for preventing the lever from moving longitudinally on the plug.

16. In combination, a support, a handle mounted thereon to turn therewith and to turn independently thereof and adapted to occupy

interchangeably positions on either side of the support, and a controlling mechanism connected in operative relation with the handle when the same occupies either of said positions and adapted to be operatively disconnected when the handle swings from one position to the other.

17. In a vehicle, the combination of a steering-support having a surface which is inclined rearwardly, a handle, and a pivot for attaching the handle to the surface in such manner that when it is swung upward it will be inclined rearwardly toward the seat.

18. In a controlling mechanism, the combination of a pivotally-supported steering-handle, which normally occupies a substantially horizontal position, a regulator, and a connection between the handle and the regulator which moves the regulator to an off position whenever the handle is raised to a substantially vertical position.

19. In a controlling mechanism, the combination of a pivotally-supported steering-handle, which normally occupies a substantially horizontal position, a speed-regulator, a reverser, and connections between the regulator and reverser and the handle which moves them to the off position whenever the handle is raised to a substantially vertical position.

20. In a controlling mechanism, the combination of a support, a handle pivotally secured thereto, a pair of levers which are carried by the handle, a speed-regulator and a reverser which are connected to the levers, and a cam for moving the levers whenever the handle is moved to an abnormal position.

21. In a controlling mechanism, the combination of a support which is connected to the steering-wheel, a handle that is pivotally secured to the support and is capable of operating on either side thereof, a movable grip on the handle, a regulator and a reverser, connections between the grip and the regulator and reverser, and means for automatically moving the regulator and reverser to the off position whenever the handle is elevated to a certain point.

22. In a controlling mechanism, the combination of a support, a handle pivotally secured thereto, and a segmental grip attached to the handle, the segments of said grip being capable of moving independently.

23. In a controlling mechanism, the combination of a support, a handle pivotally secured thereto, a segmental grip attached to the handle, the segments of said grip being capable of individual movement, a regulator which is operatively attached to one segment, and a reverser which is operatively attached to another segment.

24. In a controller mechanism, the combination of a support, a handle pivotally secured thereto, a segmental grip attached to the handle, an actuator mounted within the handle and

capable of longitudinal movement, a means operated by a segment for imparting movement to the actuator, and a second actuator which is operatively connected to another of the grip-segments.

25. In a controller mechanism, the combination of a support, a handle pivotally secured thereto, a segmental grip the parts of which are capable of individual movement, a support for the grip which is movable with respect to the handle, and an actuator which is connected to one of the grip-segments and is capable of being moved thereby independently of the position of the grip as a whole.

26. In a controlling mechanism, the combination of a support, a handle which is secured thereto for imparting angular movement thereto, a grip which is mounted on the handle and is capable of rotating toward or away from the operator, and also to the right or left, and controlling mechanism actuated by the grip.

27. The combination of a lever, controlling mechanisms, and a grip for the lever composed of at least two members which rotate as a whole and independent of the position of the lever for actuating one mechanism, while a single member rotates for actuating the other mechanism.

28. The combination of a lever, a support therefor, controlling mechanisms, and a grip on the lever movable therewith and capable of turning on an axis common with the lever for actuating one controlling mechanism, and of turning on an axis at right angles to that of the lever and independent thereof for actuating the other controlling mechanism.

29. In a steering and controlling mechanism, the combination of a lever, and a grip for

actuating the mechanism comprising separable members capable of differential rotation.

30. In a controlling mechanism, the combination of a lever, and a grip having separate rotatable parts for operating independent controlling devices.

31. In a controlling mechanism, a grip comprising two members capable of rotating together, one of the members being capable of independent rotation.

32. In a controlling mechanism, a grip comprising two movable members assembled to rotate together on a common axis, one of the members being capable of independent rotation on a different axis.

33. In a controlling mechanism, the combination of a pivoted steering-handle, a controlling device, and means for moving said device to an inoperative position whenever the handle is moved to a predetermined abnormal position and leaving it in said inoperative position when the handle resumes its normal position.

34. In a controlling mechanism the combination of a pivoted steering-handle, a controlling device, a means for actuating the device which is carried by the handle, and means for moving the controlling device to an inoperative position whenever the handle is moved to an abnormal position, and leaving it in said position when the handle is returned to its normal position.

In witness whereof I have hereunto set my hand this 2d day of September, 1902.

AUGUSTUS A. BALL, JR.

Witnesses:

ALEX. F. MACDONALD,
DUGALD MCK. MCKILLOR