C. H. ROTH.

POLE CHANGER.

APPLICATION FILED MAY 5, 1911.

1,048,588.

Patented Dec. 31, 1912.

2 SHEETS—SHEET 1.

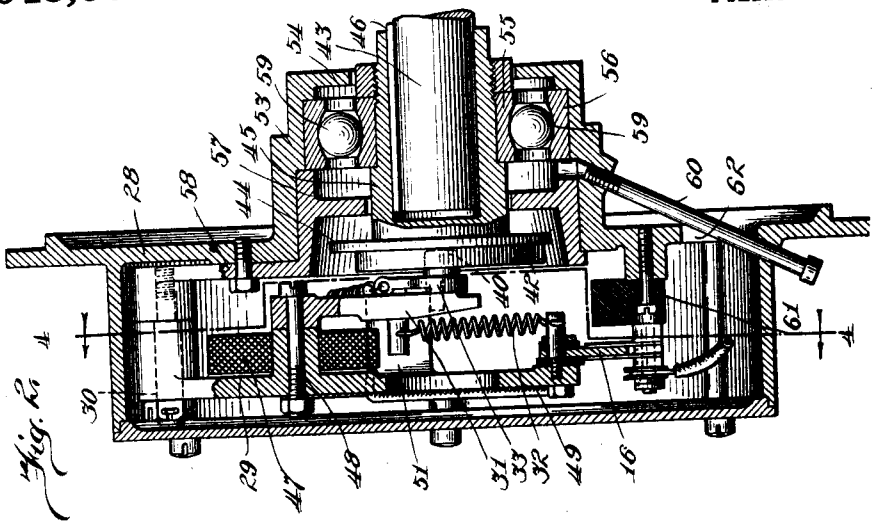

Fig. 2.

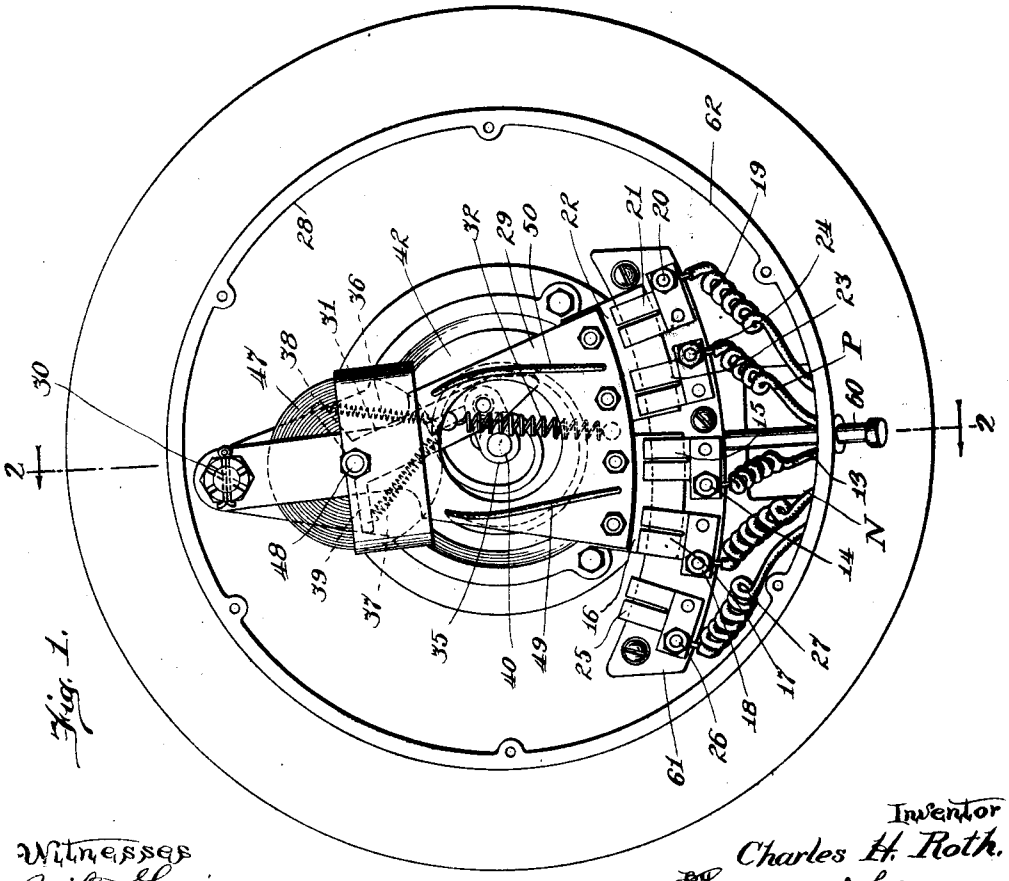

Fig. 1.

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Fig. 4.

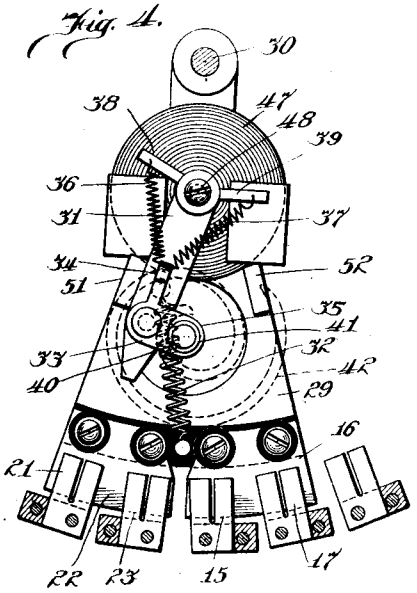


Fig. 5.

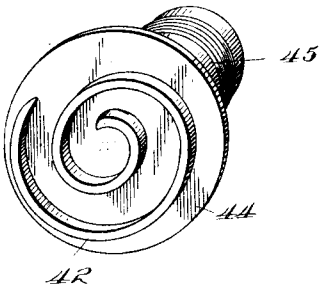
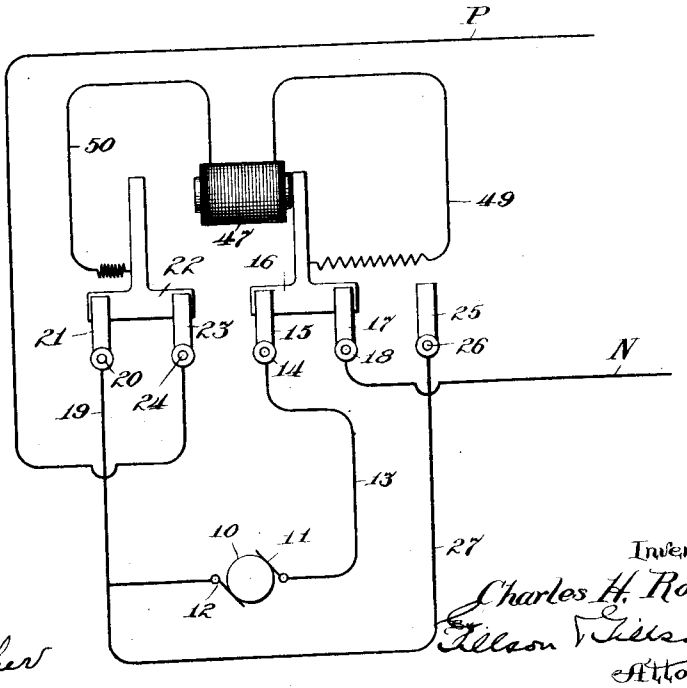


Fig. 3.



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UNITED STATES PATENT OFFICE.

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POLE-CHANGER.

1,048,588. Specification of Letters Patent. Patented Dec. 31, 1912.

Application filed May 5, 1911. Serial No. 625,367.

To all whom it may concern:

Be it known that I, CHARLES H. ROTH, a citizen of the United States, and resident of Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Pole-Changers, of which the following is a specification, and which are illustrated in the accompanying drawings, forming a part thereof.

The invention relates to that class of electrical switches which are adapted to automatically transpose the connections of the lines of an electric circuit with the two sides of the line through which the current is supplied. Such device are used especially in connection with circuits supplied from dynamos which may have the direction of rotation of their armatures changed, but in which circuits it is important to have the current always flow in the same direction. Such situations arise in connection with so-called axle-light systems for railway cars in which the dynamo is driven from an axle of the car and consequently has its armature rotated in either direction according to the direction of travel of the car, and in which there is employed a storage battery which is charged from the same dynamo.

The object of the invention is to generally improve upon devices of this character with view to securing reliability of action, simplicity of construction and durability. One form of the embodiment of the invention is hereinafter described and is illustrated in the accompanying drawings in which—

Figure 1 is a rear elevation of the device with the back plate of its casing removed; Fig. 2 is a sectional view on the broken line 2—2 of Fig. 1, some of the parts being shown in elevation; Fig. 3 is a diagrammatic view of the circuit; Fig. 4 is a detail of the switch and some of its accessories and showing also the relation of the switch to the line terminals the view being on the line 4—4 of Fig. 2, and Fig. 5 is a detail of the spiral cam carried by the actuating shaft for shifting the switch.

Referring first to the diagrammatic view a dynamo is represented at 10, its brushes being designated respectively 11, 12. One branch of the circuit which may be regarded as the positive line is designated P; the other branch of the circuit which may be regarded as the negative line is designated N. As shown in the diagram the brush 11 is connected with the negative line through a line 13, the terminal 14, the brush 15 associated with this terminal, the bus-bar 16 constituting a movable element of the switch, and the brush 17 associated with the terminal 18 of the line N. The positive line is in connection with the brush 12 of the dynamo through the line 19 leading to the terminal 20, the brush 21 associated with this terminal, the bus-bar 22 forming a movable element of the switch and the brush 23 associated with the terminal 24 of the line P. Should the direction of rotation of the armature of the dynamo be reversed its brush 11 would then become the positive pole and its brush 12 the negative pole. The pole changing switch is now shifted to throw the bus-bars 16 and 22 to the right, the former connecting the terminal brush 17 with the terminal brush 25 associated with the terminal 26 of the line 27 leading from the brush 12; and causing the bus-bar 22 to connect the brushes 15 and 23. The brush 11 is now connected with the line P through the line 13, the brush 15, the bus-bar 22 and the brush 23, the dynamo brush 12 being connected with the line N through the line 27, the brush 25, the bus-bar 16 and the brush 17.

The description of the mechanism by which the change of polarity is accomplished follows: A chambered casing 28 adapted to be secured to a suitable support, which in railway practice may be a part of the casing of the dynamo, contains the switch, the terminal brushes 15, 17, 21, 23 and 25 and the mechanism for shifting the switch. The switch comprises a plate 29 pivoted at 30 within the casing 28 and carrying the bus-bars 16 and 22. A swinging arm 31 is pivoted to the plate 29 adjacent the pivot 30, its free end being connected with the outer end of the plate by means of a retractile helical spring 32, the attachment of the spring to the plate being on its median radius. An angle bar 33 is pivotally mounted upon the arm 31 near its outer end, one of its arms 34 normally extending parallel with the bar and its other arm 35 pro-

jecting laterally therefrom. Helical retractile springs 36, 37 connect the arm 34 of the angle bar respectively with arms 38, 39 projecting laterally from the pivoted end of the bar 31 and being of equal tension hold the angle bar 33 in its normal position. A stud 40 projects outwardly, parallel with the pivot 30 from the outer end of the arm 35 of the angle bar and is preferably provided with an antifriction sleeve or roller 41. The stud 40 engages a spiral cam 42 fixed upon the end of shaft 43, which may be, and usually is, the shaft of the dynamo armature.

The cam 42 is carried by a disk 44 having a hub 45 in the form of a sleeve which fits upon the end of the shaft 43 and is locked thereto by means of a spline or key 46. As the cam 42 is rotated in one direction, referring to Fig. 5 in the direction of the movement of the hands of a clock, the stud 40 is carried to the center of the shaft 43. When the cam is turned in the opposite direction the stud will be carried to the outer end of the cam. The movement of the stud in either direction carries with it the arm 31 putting the spring 32 under tension and bringing the arm into contact with one of the lugs 51, 52 which project from the face of the plate thereby causing the switch plate 29 to be thrown in the same direction.

When the stud 40 is in either of its extreme positions the spring 32 tends to hold it in engagement with the cam 42. In order to avoid the clicking of the stud as the end of the cam leaves it at each of its rotations, a magnet is provided for holding the arm 31 against the pull of the spring. This magnet may comprise a coil 47 carried by the switch plate 29 and encircling the pivot 48 of the arm 31, this coil being connected with the bus-bars 16 and 22 by means of the wires 49, 50. The lugs 51, 52 in addition to forming abutments for the arm 31 also constitute the poles of the magnet. The arm 31 is made of iron or steel and is consequently magnetically held against the pole piece 51, 52 toward which it is thrown by the action of the cam 42.

The casing 28 may be provided with a ball bearing for the shaft 43, as shown. To this end the casing is provided with an outstanding hub portion 53 having at its end an instanding flange 54. The inner ring 55 of the ball race is screwed upon the outer end of the sleeve 45. The outer ring 56 of the ball race is fitted within the hub 53, and is held in place by means of a lining 57 for the hub 53, having an outstanding flange 58, bolted to the inner wall of the casing 28. The balls of the bearing are shown at 59. A tube 60 provides means for lubricating the ball bearing.

As the coil 47 is supplied with current from the dynamo it follows that the magnetic attraction of the bar 31 ceases when the dynamo comes to rest, thereby permitting the spring 32 to draw the stud 40 into contact with the cam 42. When the dynamo armature is again rotated, if its direction of movement is reversed, the switch is thrown before sufficient speed is attained to generate a current of such strength as to magnetize the pole pieces 51, 52. It will be seen that the spring 32 is not alone relied on for throwing the switch as this action will result from the positive engagement of the arm 31 with the elements 51 or 52.

The brushes 21, 23, 15, 17 and 25 and the terminals with which they are associated are fixed upon a bar 61 of insulating material which is secured to the wall of the casing 28. The various wires leading from the dynamo and extending to the outer circuit enter the casing 28 through a suitable aperture as at 62.

I claim as my invention—

1. In a pole changer, in combination, an oscillatable plate, a rotatable spiral cam mounted in a plane parallel with the plane of oscillation of the plate, and a stud carried by the plate and engageable with the cam.

2. In a pole changer, in combination, an oscillatable plate, a rotatable disk, a spiral rib carried by the face of the disk, and a stud carried by the plate and engageable with the rib.

3. In a pole changer, in combination, an oscillatable plate, a swinging arm carried by the plate, lugs projecting from the plate into the path of the arm, a stud carried by the arm, and a spiral cam engageable with the stud.

4. In a pole changer, in combination, an oscillatable plate, a swinging arm carried by the plate, a helical spring connecting the free end of the arm with the plate, a stud carried by the arm, and a spiral cam engageable with the stud.

5. In a pole changer, in combination, an oscillatable plate, a swinging arm carried by the plate, a helical spring connecting the free end of the arm with the plate, a stud carried by the arm, a spiral cam engageable with the stud, and a pair of lugs projecting from the face of the plate into the path of the arm.

6. In a pole changer, in combination, an oscillatable plate, a swinging arm carried by the plate, lugs projecting from the plate into the path of the arm, a stud carried by the arm, a spiral cam engageable with the stud, and an electric coil carried by the plate and arranged to magnetize the studs.

7. In a pole changer, in combination, an oscillatable plate, a swinging arm carried by the plate, a stud mounted on the arm, a reversible cam engageable with the stud, and an electro-magnet for holding the stud out of engagement with the cam.

8. In a pole changer, in combination, an electric circuit having a plurality of terminals, an oscillatable switch plate coöperating with the several terminals, a reversible cam engageable with an appurtenance of the switch-plate for swinging the plate on its pivot, and an electro-magnet in shunt from the circuit for disengaging the switch from the cam.

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