

G. R. LIVERGOOD & B. C. DONNELLY.

TROLLEY CIRCUIT CLOSER.

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985,685.

Patented Feb. 28, 1911.

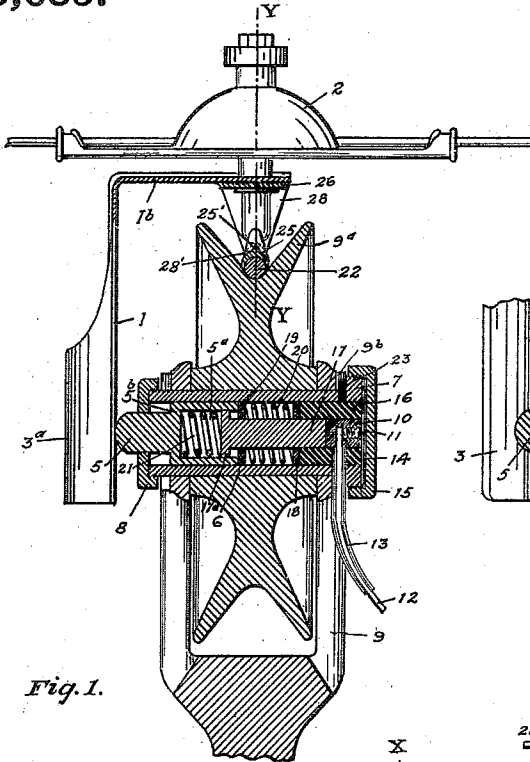


Fig. 1.

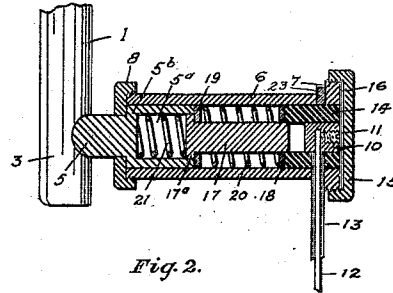


Fig. 2.

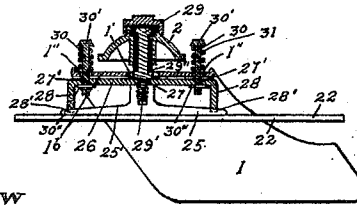


Fig. 3.

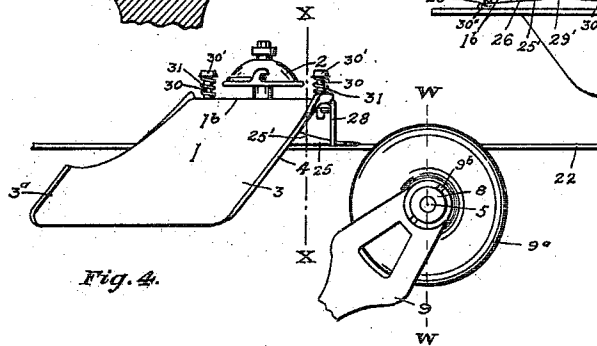


Fig. 4.

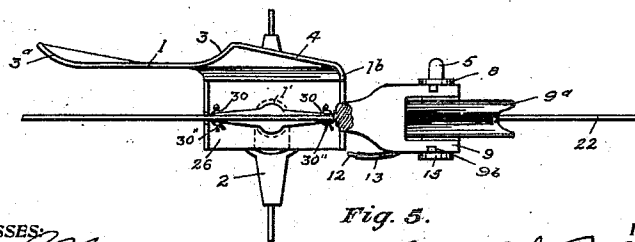


Fig. 5.

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TROLLEY-CIRCUIT CLOSER.

985,685.

Specification of Letters Patent.

Patented Feb. 28, 1911.

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To all whom it may concern:

Be it known that we, GERALD R. LIVERGOOD and BERTRAM C. DONNELLY, citizens of the United States, residing at St. Joseph, in the county of Buchanan and State of Missouri, have invented certain new and useful Improvements in Trolley-Circuit Closers, of which the following is a specification, reference being had therein to the accompanying drawing.

Our invention relates to improvements in trolley circuit closers, and has for its objects, the provision of a trolley circuit closer that will, under the most exacting circumstances, arising in actual practice, automatically close and open a local circuit on a trolley car, at predetermined fixed points along a trolley system.

A further object of our invention is to so construct and arrange the parts of a trolley circuit closer, that they may readily be applied to trolleys of the form, now generally in use, be extremely cheap in cost of manufacture and installation, neat in appearance, compact, and not at all liable to disarrangement, either of said circuit closer, or of said trolley system, by the varying of the positions of the parts of said system, caused by long and continued use.

We attain these objects by the mechanism illustrated in the accompanying drawing, in which:—

Figure 1 is an enlarged transverse section of the trolley wheel, on the line W W, and the same of the cam plate, on the line X X, seen in Fig. 4, looking toward the left, with said wheel in circuit closing position. Fig. 2, is a section similar to Fig. 1, showing the circuit closing devices, only; said parts being in circuit opening position. Fig. 3, is a longitudinal section, on the line Y Y, seen in Fig. 1, looking toward the left, the trolley wheel being omitted. Fig. 4, is a side elevation of the circuit closer, as it appears in use, with parts in circuit opened position. Fig. 5, is a bottom view of parts seen in Fig. 4.

Referring to Fig. 1, our invention comprises a cam plate 1, secured to an ordinary trolley hanger 2, (by elastic securing means, as hereinafter fully described), at each point on trolley wire 22, where it is desired to close and open the hereinafter described local circuit. Said cam plate is provided with curved faces 3 and 3^a and inclined edge 4, and is secured in suitable position to compress push

stud 5, when said stud is carried past said cam plate, as hereinafter described. Said push stud is provided with counter-bore 5^a in its inner end portion 5^b, which slides in and is guided by hollow shaft 6, provided with retaining flange 7, on one end thereof and with apertured retaining cap 8, screwed on the other end of said hollow shaft, for retaining said shaft in the ordinary trolley harp 9, and also for retaining push stud 5 in said shaft.

The fixed metal terminal 10 is provided with set screw 11, by which wire 12 is secured in an aperture in said terminal. Wire 12 is provided with insulation 13, which is removed from that part of said wire, which is in terminal 10. Terminal 10 is insulated from tube 6 and held in place therein, by fire proof insulating bushing 14, and is insulated from the weather-proof retaining cap 15, by insulating disk 16. Cap 15 is screwed on flange 7, and retains insulating bushing 14 and terminal 10 and its attached parts in place, in hollow shaft 6. The slidable terminal 17 is provided with flange 17^a, on the outer end thereof, and is slidably guided in tube 6, at the inner end thereof, by washer 18, and its flanged end is guided in counter-bore 5^a, in the larger inner end portion 5^b of stud 5. Washer 19 encircles slidable terminal 17, and is adapted, by contacting flange 17^a of said terminal and also by contacting the inner extremity of the portion 5^b, of stud 5, to move said terminal and stud outward.

In tube 6, and between washers 18 and 19 is the stronger recover spring 20. In the counter-bore 5^a in stud 5 is the weaker spring 21, adapted to push terminal 17. The flanged end portion of tube 6 is provided with key stud 23, adapted to engage key-slots 9^b, in harp 9, and thereby prevent said tube from rotating in said harp.

It will be seen and understood from the foregoing, that said trolley harp 9, provided with key slots 9^b, are old, and that the herein described circuit closing devices are designed to be attached as described, to said old harp, and to carry said old trolley wheel, rotatable on the hollow shaft 6. Referring to Fig. 3, cam plate 1 is secured to trolley hanger 2 by the following described elastic securing means.

The ordinary ear 25 is secured to trolley wire 22, in the usual manner. Base plate 26 is provided with a central aperture 27

and two apertures 27', and with a downwardly projecting portion 28, on each end thereof, the extremities of which are notched at 28', for the reception of web 25' of ear 25. The screw threaded portion 29', of hanger bolt 29, is passed through central aperture 27, of base plate 26, and is screwed into the center of ear 25, until flange 29'', of said bolt is brought to the position shown. Upper portion 1^b, of plate 1, is bent at right angles thereto, and is cut away at 1', in order to prevent said portion from contacting flange 29'' of bolt 29, said portion is also provided with large apertures 1'', which allow said portion to move freely on cam bolts 30, as hereinafter described. Cam bolts 30 are provided with heads 30' and are passed through spiral springs 31, apertures 1'', and through apertures 27' in plate 26, and are forced downward, causing heads 30' to compress said springs, after which cotter pins 30'', are secured in apertures through the lower end portions of cam bolts 30.

In the operation of our invention, trolley harp 9, by the described attached parts of the circuit closing devices carries push stud 5 against the curved face 3, of cam plate 1, and as said stud is being carried past said curved face, it is thereby pushed inward, from the position seen in Fig. 2, to the position seen in Fig. 1, and by moving washer 19 compresses spring 20 against washer 18. Stud 5, at the same time carries inward, the weaker spring 21, which by the flanged end 17^a of slidable terminal 17, moves said terminal from the position seen in Fig. 2 to the position seen in Fig. 1, in contact with fixed terminal 10; thereby closing a local electric circuit through the following conductors; source of energy, not shown, trolley wire 22, trolley wheel 9^a, hollow shaft 6, stud 5, terminal 17, fixed terminal 10 and wire 12, through any desired conductors, (not shown, in a trolley car, not shown, beneath said trolley wheel,) thence back through the ground, not shown, to said source of energy.

The previously described circuit closing movement of stud 5 is usually carried still further than heretofore stated, in order to insure positive contact of slidable terminal 17, with fixed terminal 10, and in so doing, said stud still further compresses stronger spring 20, and at the same time, compresses weaker spring 21 against the flanged end of slidable terminal 17.

When trolley wheel 9^a, has carried stud 5 past curved face 3^a, of cam plate 1, and past said cam plate, weaker spring 21 causes said contact of terminals to be retained, until stud 5 and slidable terminal 17 are moved by stronger spring 20, which movement is continued until the parts are moved from the position seen in Fig. 1, to the position seen in Fig. 2; thus opening the described local electric circuit.

To insure positive operation of the before described circuit closing stud 5, cam plate 1 is placed close to the path of the trolley wheel 9^a, (which is obviously just beneath trolley wire 22.) When cam plate 1, from any cause, is moved to a position, abnormally close to said path, harp 9 and retaining nut 8, (see Fig. 5,) in succession, contact the curved face 3 of said cam plate, and in passing same, force the lower portion of said cam plate outward from their path, this movement of cam plate 1, the upper edge 1^a, (see Fig. 1,) being fulcrumed on base plate 26, thereby causes springs 31 to be compressed, which springs cause the return of plate 1 to its former position, after said harp and nut have passed. When from any cause in action, trolley wheel 9^a, leaves trolley wire 22, and either said wheel, or its harp 9, strikes cam plate 1, the inclined edge 4 of said plate, deflects said wheel and harp, downward, thereby preventing damage to all the parts involved.

Having fully described our invention, what we claim as new and desire to secure by Letters Patent is;—

1. In a trolley circuit closer, the combination with an ordinary trolley harp, adapted to carry a shaft and provided with key slots therein, of a hollow shaft, carried in said harp and adapted to carry an ordinary trolley wheel, rotatable thereon; a stud key, secured in one of the end portions of said hollow shaft and adapted to engage one of said key slots in said harp, together with securing means, on the ends of said hollow shaft, for securing said shaft in said harp, and circuit closing and circuit opening means, in said hollow shaft.

2. In a trolley circuit closer, a hollow shaft; a trolley wheel rotatably mounted on said shaft; a trolley harp provided with securing means whereby said shaft is secured in said harp; an insulated fixed electric circuit terminal secured in one end portion of said shaft; a movable electric circuit terminal in said shaft; a push stud in said shaft, the outer end portion of said stud being projected from the other end of said shaft and the inner end thereof adapted to push said movable terminal into contact with said fixed terminal; a spring between said stud and said movable terminal and a stronger spring adapted to move said stud and movable terminal from said fixed terminal.

3. In a trolley circuit closer, the combination with an ordinary trolley harp, of a hollow shaft carried in said harp, said shaft having an ordinary trolley wheel, rotatably mounted thereon; a trolley wire for contracting and guiding said wheel; a hanger whereby said wire is suspended; securing means, for securing said hollow shaft in said harp; circuit closing and circuit opening means, in said hollow shaft; a push

stud, in said shaft and projecting from one end thereof, said stud being adapted to push said circuit closing means, for closing an electric circuit; a cam plate, secured to said trolley hanger, said plate being adapted to push said push stud, by the passage of said stud past said cam plate, and spring actuating means for actuating said stud to recover the movement thereof.

4. In a trolley circuit closer a trolley harp, a hollow shaft, provided with a trolley wheel rotatably mounted thereon and with securing means whereby said shaft is secured in said harp, said shaft also being provided with screw threads on one of its ends and a flange on the other end thereof, provided with screw threads thereon; an insulating bushing, within the flanged end portion of said hollow shaft; a fixed electric circuit terminal, secured in the outer end portion of said bushing; an electric conductor, provided with insulation thereon, and electrically connected with said fixed terminal; securing means, for securing said conductor in said terminal; an insulating disk, on the flanged end of said hollow shaft; a retaining cap, screwed on the flange of said shaft, for retaining said parts therein; a slidable electric circuit terminal, in said shaft, and provided with a flanged end, and adapted to have its opposite end contacted with said fixed terminal; two washers in said shaft and encircling said slidable terminal; a stronger spiral spring, encircling said slidable terminal and between said washers; a push stud, having an enlarged counterbored portion in said shaft, and a smaller portion projecting from said shaft, the flanged end of said slidable terminal being in the inner end of the counter-bored portion of said stud; a weaker spring, in said counter-bored portion of said stud, and an apertured cap, screwed on the threaded end of said hollow shaft and adapted to have said push stud slidably moved in the aperture of said apertured cap.

5. In a trolley circuit closer, a cam plate, adapted to be contacted by a push stud, said plate having an upper portion, bent at right angles thereto, said upper portion having large apertures therethrough, and the central portion thereof cut away; a base plate, adapted to be secured to an ordinary trolley hanger, said base plate having apertures formed therethrough, in register with said large apertures in said cam plate; bolts in said apertures, said bolts being provided with heads, one on the upper end of each of said bolts, a spring on each of said bolts, between

the head thereof and said cam plate and securing means, whereby the lower ends of said bolts are secured in said base plate.

6. In a trolley circuit closer, a cam plate, adapted to push a push stud carried past said plate; said cam plate being provided with curved edge portions, adapted to guide said stud in said passage; said cam plate being also provided with an inclined edge, adapted to downwardly deflect any object carried in contact therewith; together with securing means, adapted to secure said cam plate to an ordinary trolley hanger of an ordinary trolley system.

7. In a trolley circuit closer, in combination, an ordinary trolley harp, adapted to be carried by a trolley car; a hollow shaft, adapted to be carried by said harp; securing means, whereby said shaft is secured in said harp; a push stud, having its inner end portion slidably secured in said shaft, and its outer end portion projecting from said shaft; circuit closing and circuit opening means, in said hollow shaft, adapted to be operated by said push stud; for opening and closing an electric circuit; an ordinary trolley wheel, rotatably mounted on said hollow shaft; an ordinary trolley wire, for contacting and guiding said wheel; an ordinary trolley hanger, whereby said wire is suspended; a cam plate, provided with securing means, whereby said plate is secured to said hanger; said plate being adapted to be contacted and be passed by said stud, and adapted to push said stud, in its said passage.

8. In a trolley circuit closer, a base plate, having a plurality of apertures formed therethrough and provided with a downwardly projecting portion on each end thereof, each of said portions having a notch formed in the extremity thereof; a trolley ear, provided with a web formed on the upper side thereof, adapted to engage said notches; a trolley hanger bolt, provided with securing means on the lower end thereof, whereby said base plate is secured on said ear, with said web thereby held rigidly in said engagement in said notches; a cam plate; and a plurality of bolts, one through each of said apertures for securing said cam plate on said base plate.

In testimony whereof we affix our signatures in the presence of two witnesses.

GERALD R. LIVERGOOD.
BERTRAM C. DONNELLY.

Witnesses:

JAMES R. CLAY,
JOHN A. FLOURNOY.