(No Model.) 2 Sheets—Sheet 1.

W. F. D. CRANE.

SUSPENSION CLIP FOR TROLLEY WIRES.

No. 522,362. Patented July 3, 1894.

Fig. 1.

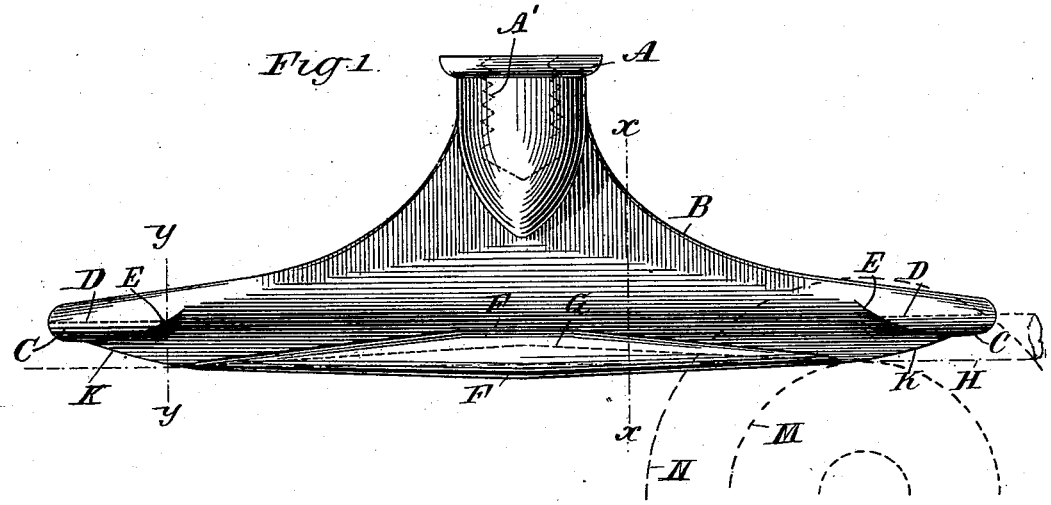


Fig. 2.

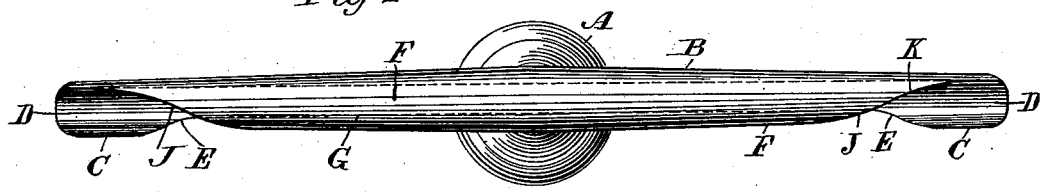


Fig. 3.

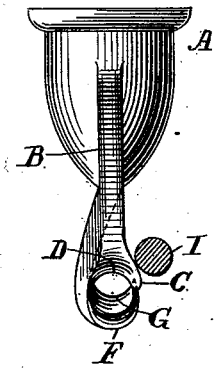


Fig. 4.

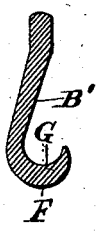
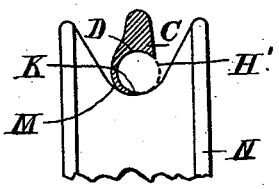


Fig. 5.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 2 Sheets—Sheet 2.

W. F. D. CRANE.

SUSPENSION CLIP FOR TROLLEY WIRES.

No. 522,362. Patented July 3, 1894.

Fig. 6.

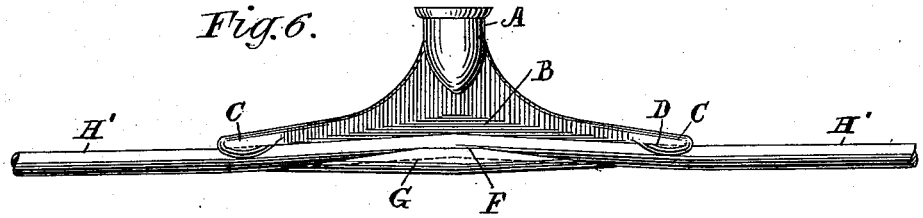


Fig. 7.

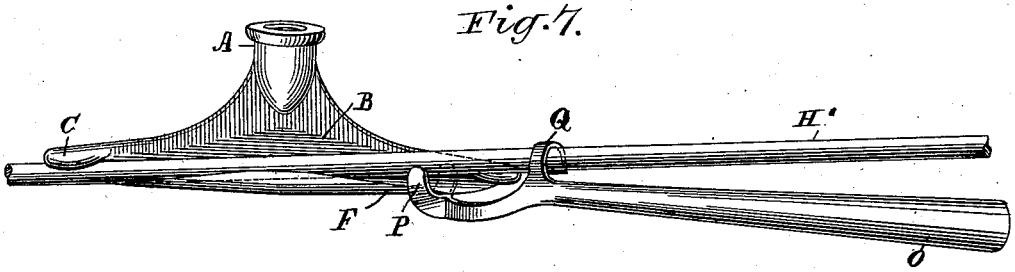


Fig. 8.

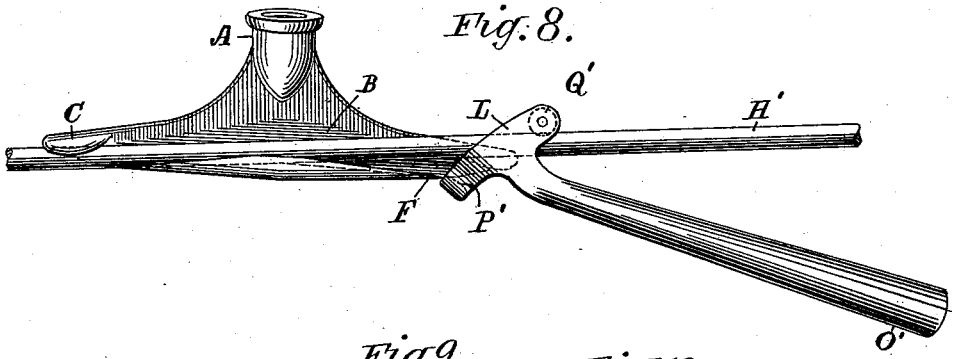


Fig. 9.

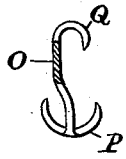
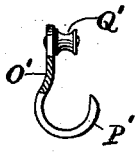


Fig. 10.



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UNITED STATES PATENT OFFICE.

WILLIAM F. D. CRANE, OF EAST ORANGE, NEW JERSEY, ASSIGNOR TO THE JOHNS-PRATT COMPANY, OF HARTFORD, CONNECTICUT.

SUSPENSION-CLIP FOR TROLLEY-WIRES.

SPECIFICATION forming part of Letters Patent No. 522,362, dated July 3, 1894.

Application filed March 10, 1894. Serial No. 503,119. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. D. CRANE, a citizen of the United States, residing at East Orange, county of Essex, and State of New Jersey, have invented certain new and useful Improvements in Suspension-Clips for Trolley-Wires, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The present invention relates to a clip formed in a single piece and provided with opposed hooks to grasp the trolley wire upon its upper and under sides when sustaining the same. In this class of clip the wire is held therein by elastic pressure and requires neither solder nor mechanical fastenings to secure it in place.

The object of the present improvement is, partly, to facilitate the movement of the trolley wheel over the supporting hook, and partly to facilitate the application of the opposed hooks to the trolley wire while under tension, as when stretched above the railway track.

To prevent any shock in the passage of the trolley wheel from the wire to the under side of the clip, the hooks which embrace the wire upon opposite sides are connected by a thin spiral edge of metal adapted to form a gradually increasing area of contact between the wheel and the clip.

To permit the application of the clip to a wire under tension, the body of the clip and the upper surfaces of the hooks at the ends of the same are so sloped that a suitable pressure of the under hook upon the wire suffices to spring the wire automatically into engagement with the hooks.

The construction by which these objects are attained will be understood by reference to the annexed drawings, in which—

Figure 1 is an elevation of the clip upon the front side; Fig. 2 a bottom view of the same; Fig. 3 an end view of the clip; Fig. 4 a cross section on line *x*, *x*, in Fig. 1; and Fig. 5 a cross section on line *y*, *y*, in Fig. 1. Fig. 6 represents the clip with the wire in its operative position. Figs. 7 to 10 inclusive relate to the means for applying the clip to the trolley wire under tension, Fig. 7 showing an elevation of the clip applied to the trolley wire, and a tool having a forked extremity applied to the under side of the clip, and a hook to embrace the upper side of the wire. Fig. 8 is a similar view with a tool having a hook to embrace the under side of the clip, and a grooved roll to fit upon the top of the trolley wire. Fig. 9 is a cross section of the wrench shown in Fig. 7, adjacent to the hook Q, and Fig. 10 is a cross section of the wrench shown in Fig. 8, adjacent to the roll Q′, these views showing the lateral projection of the hooks upon the tools.

The clip is formed with a suspending shank A and a back plate B, from the ends of which hooks C project forward and downwardly, having on their under sides longitudinal channels D. The hooks are tapered toward the plate upon their upper sides, as shown in Fig. 3, and upon their inner ends, as indicated by the letter E in Fig. 2.

The plate is sloped downwardly and backwardly from a line above the under side of the hooks C, as shown at B in Fig. 4, and its lower edge is bent forwardly and upwardly into a hook F, forming a longitudinal channel G, the bottom of which is arched slightly upward in the middle, as indicated by comparison with the straight dotted line H in Fig. 1.

The under side of the hook F is tapered upwardly into a thin edge at each end of the channel G; being arched upon the under side in opposition to the bottom of the channel. The front edge of the hook is, at each end, tapered backwardly to the bottom of the channel G, as shown at J in Fig. 2, and thence upwardly with a thin edge K to the rear side of the channel D in the hooks C, as shown in Figs. 1 and 2.

In the application of such a clip to the trolley wire, the hook C at one end of the clip is placed over the wire, and the adjacent end of the hook F underneath the same, and the opposite end of the clip is then pushed upward to force the other hook C over the top of the wire. The form and arrangement of the hooks are such that when the wire is thus introduced, as shown in Fig. 6, its elastic tension presses it firmly into the channels D and G and holds its under side in contact with the thin spiral edge having its parts designated

in Figs. 1 and 2 by the letters K and J. Such thin edge forms a spiral connection (which appears most plainly in Fig. 2) between the front edge of the hook F and the rear edge of the hook C at each end of the clip, and wholly prevents any severe concussion between the trolley wheel and the under side of the hook F.

In Fig. 1, a portion of the trolley wire is indicated at the right hand end of the clip by the dotted line H, with dotted circles M and N representing the groove and flange of the trolley wheel as it approaches the clip. The trolley wire and wheel are also represented in connection with the section of the clip in Fig. 5, the wire being represented by the dotted line H′, and the upper edge of the trolley wheel being shown beneath the same. In this figure the flange N is projected upward at each side of the wire, while the bottom of the groove in the wheel is shown in contact with the thin edge of the channel G. In this view it will be observed that the groove in the wheel has a slight contact only with the thin edge K at one side of the wire, and owing to the spiral disposition of such edge the area of contact is gradually increased as the trolley wheel advances toward the hook F. The wheel is thus led under the bottom of the hook without any shock, and is transferred from and to the under side of the wire without a break in its contact.

Figs. 7 and 8 show the hook C at one end of the clip and the adjacent end of the hook F engaged with the trolley wire H′, and Fig. 7 shows one form of tool with projections for engaging the clip with the wire when under tension. This tool consists of a hand-lever O having at the end a fork P to embrace the under side of the hook F, and a hook J to embrace the upper side of the wire H′. The hook Q is arranged to grasp the wire near the outer end of the hook C, and a downward pressure of the handle operates, with the hook Q as a fulcrum, to force the hook F upward against the wire. This brings the channel G into full contact with the wire and bends the latter sufficiently to spring underneath the hook C. The pressure upon the handle O being removed, the tension upon the wire then springs the latter into the channel D, where its elasticity holds it securely in place.

The automatic movement of the clip upon the wire in such operation is greatly facilitated by the backward slope of the plate B (indicated in Fig. 4) which permits the wire to gradually enter the channel G as the hook F is pushed upward. In Fig. 1 such sloping surface is shown extended diagonally upward from the under side of the hook C to the middle of the plate, as indicated by the shading of such sloping surface, which admits the wire more freely into the channel G when the hook F is forced upward.

The inner ends of the hooks C are sloped upwardly and backwardly toward the plate B, as indicated by the line E in Figs. 1 and 2, and the upper surface of the hook is also sloped gradually backward as shown in Fig. 3, which shape greatly facilitates the movement of the hook past the wire when the clip is forced upward. The passage of the hook upward past the wire as indicated by the wire I in Fig. 3. By such disposition of the sloping surfaces, the clip may be applied to the wire by a single movement of the tool, and with the exercise of very little skill upon the part of the operator.

Fig. 9 illustrates the relation of the fork P to the hook Q shown in Fig. 7; while Fig. 10 illustrates the relation of a hook P′ to engage the under side of the clip, and a roll Q′ to press upon the wire, which are shown conjoined with a handle O′ in Fig. 8. In this tool the hook P′ and roll J′ are mounted upon a transverse head L at the end of the handle, and the roll is grooved to prevent it from slipping off the wire. Such tool operates substantially the same as that shown in Fig. 7, while the roll is adapted to diminish the friction where the tool presses upon the wire.

My clip is readily constructed in a single piece by casting of suitable metal, and is readily applied to the trolley wire, and requires no fastenings to secure it in place.

The clip is applied to the wire in a suitable location to connect with a suspender and electrical conductor, and the shank A is shown with a threaded hole A′ to effect such connection; but any other form of shank or connection may be employed, as the essential part of the invention is the construction herein described for the plate, the hooks, and their connection by means of the thin spiral edge J, K.

In the clips heretofore made, the bottom line of the lower hook has been made straight between the ends, so as not to deflect the trolley wheel from a right line; but I have found in practice that the lower hook F needs a great deal of strength to sustain the load and strain imposed upon it, and I therefore prefer to arch the under side of the hook, as shown in Fig. 1, which secures a greater thickness without an increased deflection of the trolley wire where it passes through such hook. With the form thus secured, my clip is obviously much stronger than a divided clip with the same weight of material, in which the wire is clamped between two jaws; neither of which can possess the strength of my hook F.

In my clip the use of loose bolts and fastenings to secure the wire is avoided, and cheapness of construction is thus secured as well as strength and ease of application to the wire.

I do not claim the mere use of opposed hooks upon a trolley wire hanger, nor a hanger detachable from the trolley wire, as such constructions are old; but,

Having fully set forth the specific features of my invention, which render it useful and valuable in practice, I claim the same as follows:

1. In a trolley wire clip, the combination,

with the plate B sloped backwardly toward the bottom as described, of the hooks C projected downwardly at the ends of the plate, and the hook F having the under side arched downward and its edge projected forwardly and upwardly from the bottom of the plate, substantially as herein set forth.

2. In a trolley wire clip, the combination, with the plate B sloped backwardly toward the bottom as described, of the hooks C projected downwardly at the ends of the plate, and tapered toward the plate upon their upper sides and upon their inner ends, and the hook F projected forwardly and upwardly from the bottom of the plate with the channel G upon its upper side, and the under side of the hook being tapered upwardly into a thin edge at each end of the channel, as and for the purpose set forth.

3. In a trolley wire clip, the combination, with the plate B sloped backwardly toward the bottom as described, of the hooks C at the ends of the plate having the channels D upon their under sides, the hook F provided with the channel G, and the front of the hook at each end being sloped backwardly and upwardly with a thin edge in a spiral line to the rear side of the channel D, as and for the purpose set forth.

4. In a trolley wire clip, the combination, with the plate B sloped backwardly toward the bottom as described, of the hooks C at the ends of the plate having the channels D upon their under sides, the hook F provided with the channel G, and the under side of the hook being tapered upwardly into a thin edge at each end of the channel, and the front edge of the hook at each end being sloped backwardly with a thin edge in a spiral line to the rear side of the channel D, as herein set forth.

5. The means for applying a trolley wire clip having opposed hooks, consisting of the handle with projections adapted to engage the upper side of the wire and the under side of the clip, substantially as herein set forth.

6. The tool for applying a trolley wire clip having opposed hooks, consisting of the handle O provided with the fork P adapted to fit the under side of the hook F, and the hook Q adapted to fit the upper side of the trolley wire, substantially as herein set forth.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM F. D. CRANE.

Witnesses:
THOMAS S. CRANE,
FRED M. PATRICK.