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H. A. FRY.

ELECTRIC RAILWAY SYSTEM.

No. 546,143. Patented Sept. 10, 1895.

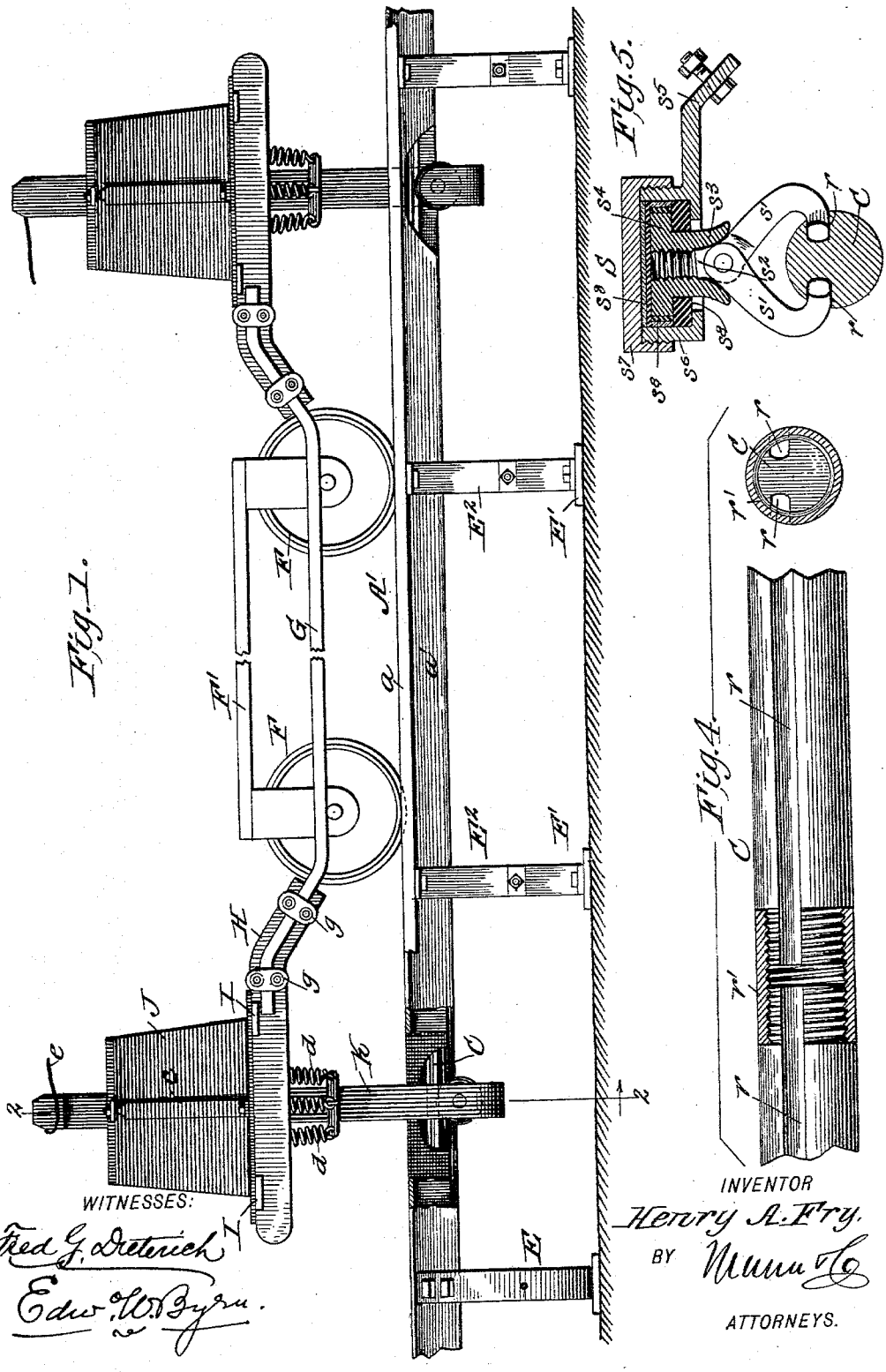

Fig. 1.

Fig. 5.

Fig. 4.

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Fig. 2.

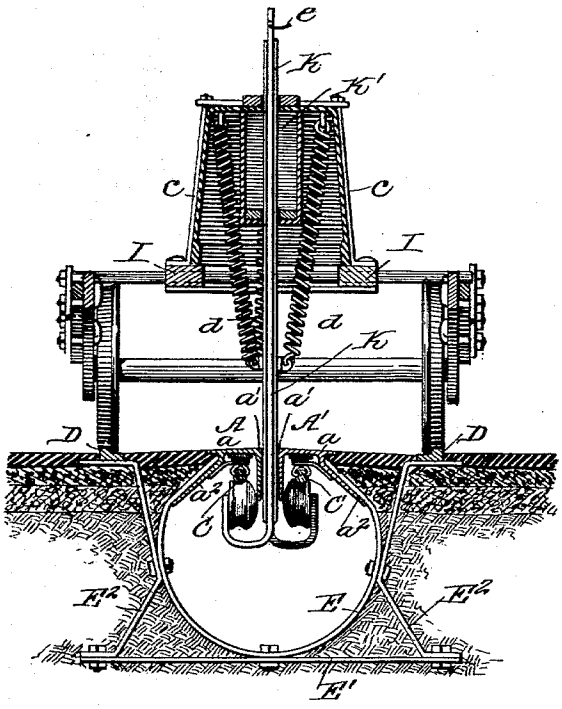

Fig. 7.

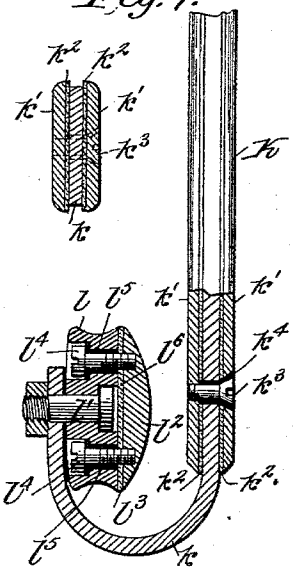

Fig. 6.

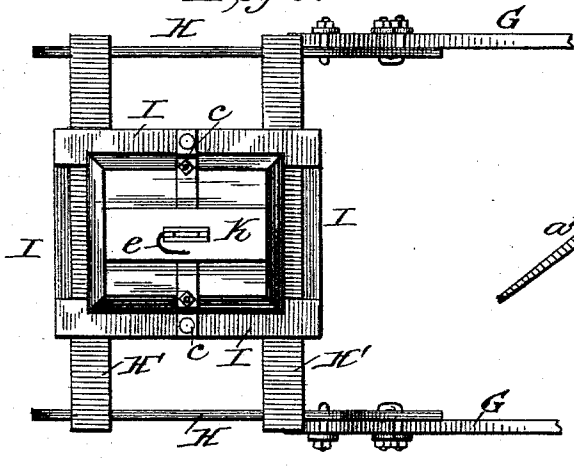

Fig. 11.

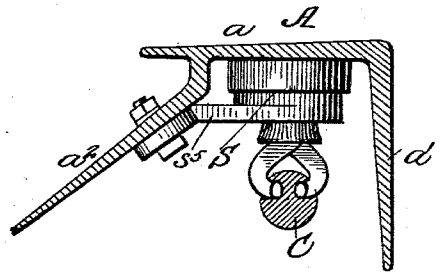

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Fig. 3.

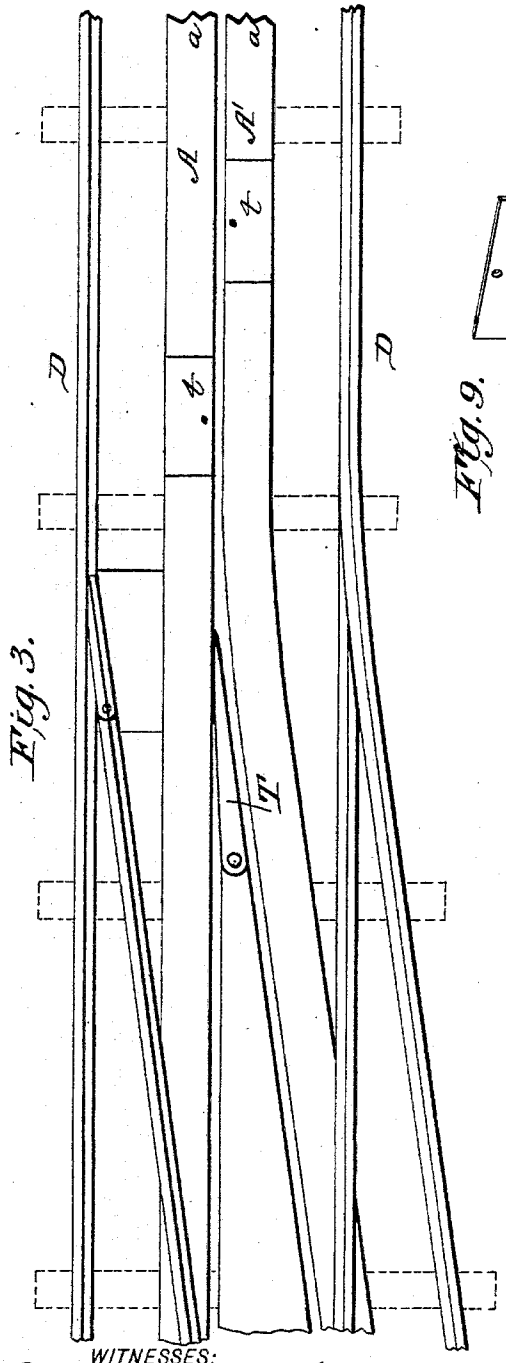


Fig. 9.

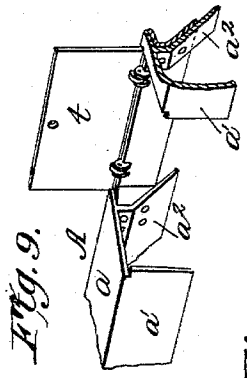


Fig. 10.

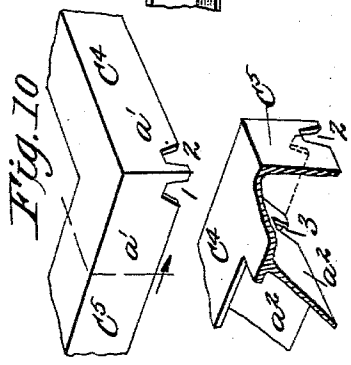


Fig. 8a.

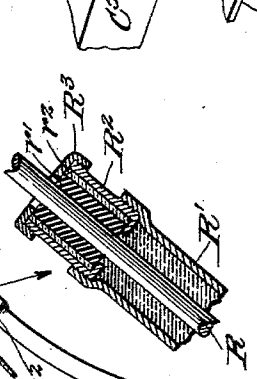
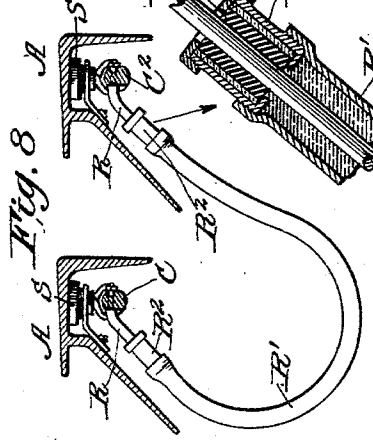


Fig. 8.



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UNITED STATES PATENT OFFICE.

HENRY A. FRY, OF PORTLAND, OREGON.

ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 546,143, dated September 10, 1895.

Application filed June 13, 1894. Renewed May 9, 1895. Serial No. 548,751. (No model.)

To all whom it may concern:

Be it known that I, HENRY A. FRY, of Portland, in the county of Multnomah and State of Oregon, have invented a new and useful Improvement in Electric-Railway Systems, of which the following is a specification.

The object of my invention is to provide a simple and practical electric-railway system of that class which employs an underground conduit with a continuous electric conductor therein, from which the electric current is conveyed to the motor on the car by a trolley carried by the car and extending down into the conduit through a slot and moving along with the car in contact with the conductor.

My invention consists in the peculiar construction and arrangement of the conduit, the conductor, its insulating-supports, the slot-rails, and the trolley, which I will now proceed to describe in detail, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the truck carrying at each end a trolley shown in connection with the trolley-rail and yoke-frames under ground. Fig. 2 is a vertical transverse section taken through the line 2 2 of Fig. 1. Fig. 3 is a plan view of the track at the switch. Fig. 4 is an enlarged side and end view of the conductor which carries the current, the coupling-sleeve being shown in section. Fig. 5 is a sectional view of one of the insulating-hangers for supporting the conductor. Fig. 6 is a plan view of the trolley-supporting frame. Fig. 7 represents longitudinal and transverse sectional details of the trolley and its shank. Fig. 8 is a vertical cross-section of the slot-rails and conductors at a switch. Fig. 8^a is an enlarged sectional detail of the connection between the main and side track conductors. Fig. 9 is a perspective view of the trolley-hatch. Fig. 10 represents detail views of the slot-rail where two lines cross each other, and Fig. 11 is an enlarged cross-section of the slot-rails.

A and A′ are the two slot-rails, which are of the same construction in cross-section. They have each (see Fig. 11) a horizontal surface flange a, downwardly-bent vertical flange a', next to the slat, and an inclined outer flange a^2, which joins the surface-flange a at a point a little inside of its outer edge. Between the horizontal flange a, the vertical flange a', and the outer inclined flange a^2 is formed a protected housing, in which are located the electric conductors C C′ and where they are kept dry and clean from all particles of snow, dirt, or other trash that may enter the slot. One of these conductors is connected with the positive and the other with the negative side of the electric generator. These two slot-rails are fixed in the ground with their upper surfaces on a level with the road-bed and are held firmly there and are braced, also, to the track-rails D D by a compound yoke E E′ E^2. The section E of the yoke is circular, and its ends are bolted to the inclined flanges a^2 of the slot-rails, while its middle or lowest portion rests upon and is bolted to the horizontal base-section E′.

E^2 are knees or angular braces, which at their lower ends are bolted to the base-section E′, then extend inwardly to the circular section E and are bolted to its sides, and then extend upwardly and outwardly and are flanged to form seats for the track-rails, to which they are also bolted. This construction forms a very strong, solid, and permanent connection between the parts that prevents them from ever moving from their respective positions.

I will now describe the trolley and its connection to the car. There are two of these—one at each end of the car—and as both are exactly alike it will only be necessary to describe one, it being understood that one trolley runs against one conductor C and the other against the other conductor C′.

In Fig. 1 F represents the wheels, and F′ the truck-frame, of any car. To this truck-frame on each side is attached a horizontal bar G, which extends in an inclined position upwardly beyond the wheels at each end of the car and forms points of attachment for the trolley-supporting frame.

H H are the side bars, Fig. 6, and H′ H′ the cross-bars, of the trolley-supporting frame. The side bars H are curved or inclined at one end to correspond to the projecting ends of the bars G, as in Fig. 1, and to them they are detachably fastened by clips and bolts g, said connection being adapted to fit on either end of the car. On the cross-bars H′ is mounted to slide the rectangular laterally-adjustable frame I, Fig. 6, which carries the trolley and

moves from side to side to accommodate curves or other irregularities in the track. On this adjustable frame I is mounted and secured a pyramidal housing J, closed on its four sides and top and open at the bottom. Posts *c*—one on each side of housing—are secured to and made a part of adjustable frame, and projecting eyes slip over the posts, which are threaded, and a nut is screwed on, which holds said housing securely to frame. Through a slot in the top of this housing there slides vertically the shank K of the trolley, being guided in its vertical play by a hollow projection K′, Fig. 2, through which it passes, and which hollow projection extends downwardly inside the housing from the top part to which it is attached, and has a wearing-plate at bottom same as top. The housing is intended to be cast in one piece and dressed out for trolley-bar. To hold the trolley up in the housing with an elastic pressure, so as to cause the trolley-wheel in the conduit to bear with an elastic pressure upwardly against the conductor, several spiral springs *d* are connected to the shank of the trolley and are anchored at their upper ends within the housing to the upper portion of the same. The trolley-shank is composed (see Fig. 7) of a central bar *k*, of copper, with two steel plates *k′ k′*—one on each side—with a layer of mica k^2 between each steel plate and the copper bar. These steel plates are bolted to the central bar with bolts k^3, having insulation around them at k^4 to prevent the current from the central bar from reaching the steel plates and escaping to the slot-rails against which the steel plates are liable to abrade. Extending down below the steel plates there is a curve in the trolley-bar forming a half-circle, and the trolley-wheel *l* is loosely fastened onto it with the bolt-head *l′* countersunk so as to leave a flat surface on the side of the wheel. A rounding plate of steel l^2 is then placed on this side of the wheel next to the vertical flange of the slot-rail A, and a layer of mica l^3 is put between this steel plate and the trolley-wheel, and the bolts l^4 which fasten on this plate are encircled with hard-rubber insulation l^5. As this steel face comes in contact at times with the vertical flange of the slot-rail, this provision is for the purpose of preventing the escape of the current from the trolley-wheel to the slot-rail, and also for the purpose of giving a hard steel wearing-face to the trolley-wheel where it is liable to abrade against the flange of the slot-rail. This flange of the slot-rail, it will be seen, thus serves as a guide for the trolley-wheel, preventing it from ever jumping off the conductor. The two steel plates on the trolley-shank are wider than the central copper bar, so that the latter is not only perfectly insulated, but is also protected from wear. The connection with the motor is made directly under the car by a wire *e* from the trolley-bar to the proper binding-post on the motor. The current goes from one of the conductors C to one of the trolleys K and thence by wire *e* to the motor on the car and returns to the other conductor C′ by the other trolley at the other end of the car. The trolley-frame can be placed on any style of truck by making the supporting-bars to suit, and the trolley-bar can be made to extend any desired distance above its supporting-housing. The trolley may be removed from the conduit, Figs. 3 and 9, by opening a trolley-hatch *t*, formed by cutting away sufficient of the slot-rail to make an opening large enough for trolley to pass up through and depressing the trolley beneath vertical flange of slot-rail and lifting to one side, which throws the trolley-wheel off the conductor. In switches for branch lines a metal tongue T, Fig. 3, is employed at the junction of the slots, and to this tongue on the lower side is attached a section of the conductor that is movable with the tongue, which serves to guide the trolley-wheel across the slot in passing from the main conductor C to the branch conductor C^2. The circuit connection between the main conductor and the conductor of the branch line (see Figs. 8 and 8^a) is made by a silk insulated copper rod R in a lead pipe R′, filled with oil closed by insulating stuffing-boxes R^2 and curved to fit the walls of the conduit, the ends of the pipe terminating near the branch and main line conductors. The conductors C C^2 are composed of sections of copper or brass rod grooved on each side at *r*, Fig. 4, and the ends of the sections are coupled in alignment by being screw-threaded and screwed into a coupling sleeve or thimble *r′*. These conductors are supported in place beneath the slot-rail A by insulating-supports, (see Fig. 5,) whose clamps enter the grooves *r r* on the sides of the conductors, thus leaving the bottom of the conductor smooth and without any projection to interfere with the passage of the trolley-wheel. These insulating-supports are constructed as follows: A curved or hook-shaped jaw *s′* is formed on a short screw-stem s^2 and has another jaw *s′* pivoted to it. Stem s^2 is surrounded by a sleeve s^3, which is screw-threaded interiorly to fit the stem, and has a tapering mouth at its lower end where the jaws *s′ s′* touch it, and has at the top an enlarged swiveling head s^4. This head and sleeve when turned down upon the screw-stem cause the clamp-jaws *s′ s′* to be forced together and their lower ends to penetrate the grooves *r r* and firmly hold the conductor suspended therefrom. The swiveling head s^4 is retained in an outer casing composed of a cup s^6 and a screw-cap s^7, but is prevented from having any electrical contact therewith by layers of insulation s^8, placed in the casing between the bottom, sides, and top of the head s^4. The bottom portion of the casing s^6 is provided with an offsetting flange s^5, whose inclination corresponds to the flange a^2 of the slot-rail, (see Fig. 11,) to which it is bolted and by which the insulator and conductor are held up close to the top of the slot-rail between

the vertical flange a' and inclined flange a^2. By this insulator and hanger the conductor is firmly sustained, and yet no current can escape therefrom to the slot-rail by reason of the perfect insulation of the head s^4 of the hanger.

Referring again to Figs. 8 and 8^a, it will be seen that the stuffing-box R^2 must be so constructed as to both prevent the loss of the insulating body of oil in pipe R′ and also to prevent the conducting-wire R from coming in contact with the pipe R′. For this purpose the stuffing-box R^2 has at one end an external screw-thread that screws into pipe R′ and at the other end has another external screw-thread that receives a screw-cap R^3, that has a hole through it larger than the conductor-wire R, so that it does not touch the latter, and between the box R^2 and the conducting-wire R are layers of packing and insulation r' r^2, that make a tight and non-conducting joint. Where the wire R connects with the conductors C C^2, said wire is passed through a transverse hole in said conductors and is screw-threaded to receive a nut upon the other side of said conductor, as shown in Fig. 8. At crossings a special right-angular form of slot-rail C^4 C^5, Fig. 10, is used, which has notches 1 2 3 cut in its flanges a' and a^2 to give passage to the trolley-wheel.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The slot rail A having a horizontal surface flange, a vertical pendent slot flange, and an inclined outer flange joining on to the horizontal surface flange, and forming a housing or inclosure for an electric conductor substantially as shown and described.

2. The slot rail A having a horizontal surface flange, a vertical pendent slot flange, and an inclined outer flange joining on to the horizontal surface flange, in combination with an electric conductor arranged between the vertical and inclined flanges, and connected to said rail by insulated supports substantially as shown and described.

3. The combination with the two track rails D D, and the two slot rails having inclined outer flanges; of the compound yoke consisting of the circular section E connected to the inclined flanges of the slot rails the base E, and the bent or knee section E^2 connected at the bottom to the base, at its side to the circular section, and at the top to the track rails, substantially as and for the purpose described.

4. The combination with a slot rail having a pendent vertical flange extending down into the conduit; of a conductor located beside said flange, and a trolley having a wheel running against said conductor and provided with an insulated wearing face adapted to abrade against said flange, substantially as and for the purpose described.

5. The trolley composed of a central bar k having steel face plates k' k' with insulation beneath them, and a curved lower end bearing a trolley wheel with an insulated face plate, substantially as and for the purpose described.

6. The combination with the trolley shank; of a housing having a guide for the trolley shank, spiral springs connecting the trolley shank to the housing, a laterally adjustable frame supporting the housing, and a support fixed to the car for carrying the laterally adjustable frame substantially as and for the purpose described.

7. A trolley shank, combined with a trolley shank guide constructed as a housing fixed upon and carried above a laterally adjustable frame, and springs arranged within a housing and connecting the latter to the trolley shank substantially as and for the purpose described.

8. The insulating conductor hanger consisting of a pair of hinged clamp hooks or jaws having a screw stem, a flanged or headed sleeve turning thereon and compressing the jaws, a casing inclosing the headed or flanged sleeve and insulation arranged between the same and the casing substantially as shown and described.

9. The connection for the main and branch conductors consisting of wire R, pipe R′ with a filling of oil surrounding the wire, and an insulating stuffing box fixed at the ends of the pipe R′ substantially as shown and described.

10. The crossing rail C^4 C^5 having its two sections made at right angles and provided with flanges a' a^2 notched at 1, 2, 3, substantially as and for the purpose described.

HENRY A. FRY.

Witnesses:
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RICHD. V. CURTIS.