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E. W. ROBINSON.

APPARATUS FOR AUTOMATICALLY STOPPING RAILWAY TRAINS.

No. 492,837. Patented Mar. 7, 1893.

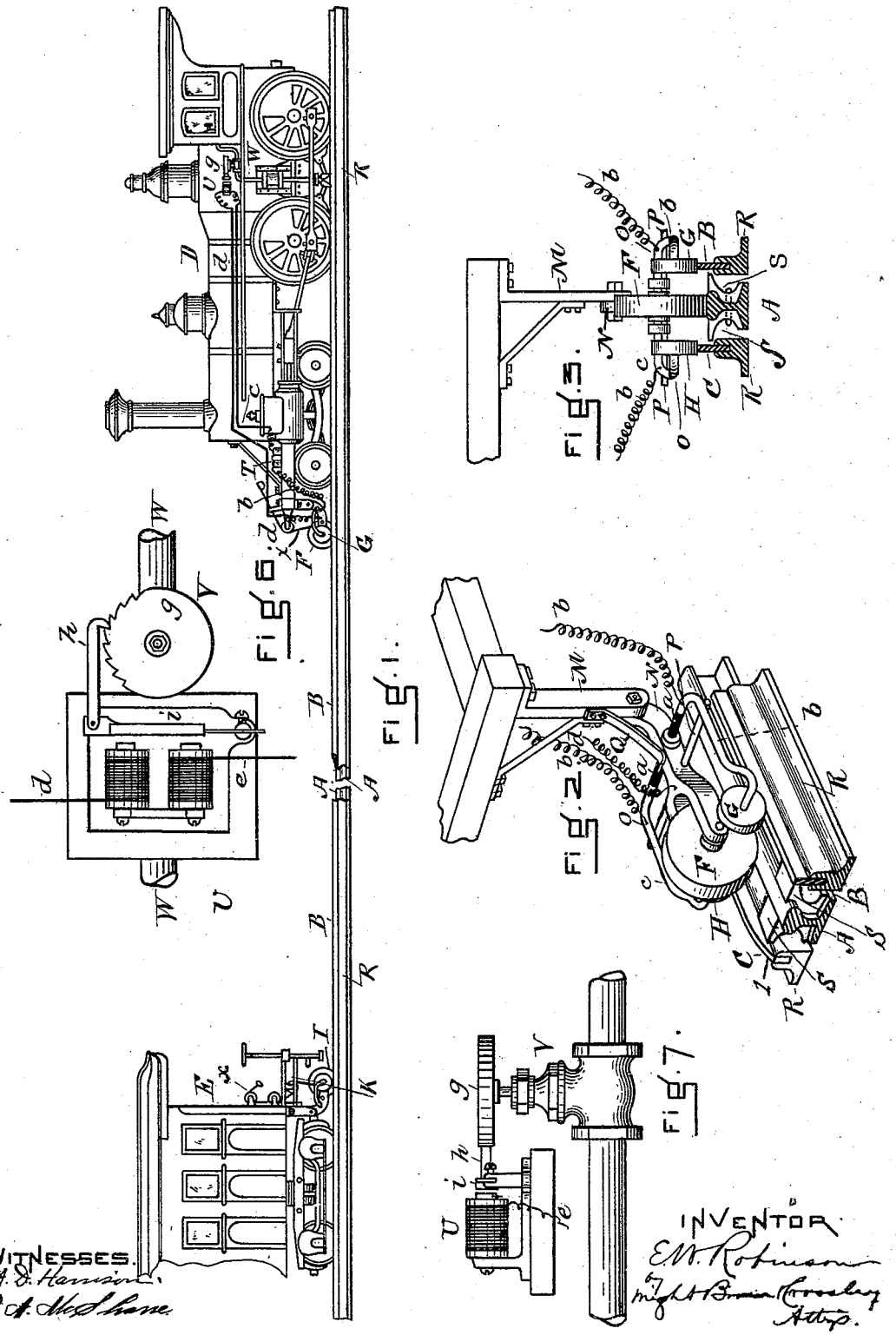

Fig. 6.

Fig. 5.

Fig. 1.

Fig. 2.

Fig. 7.

WITNESSES.
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(No Model.) 3 Sheets—Sheet 2.

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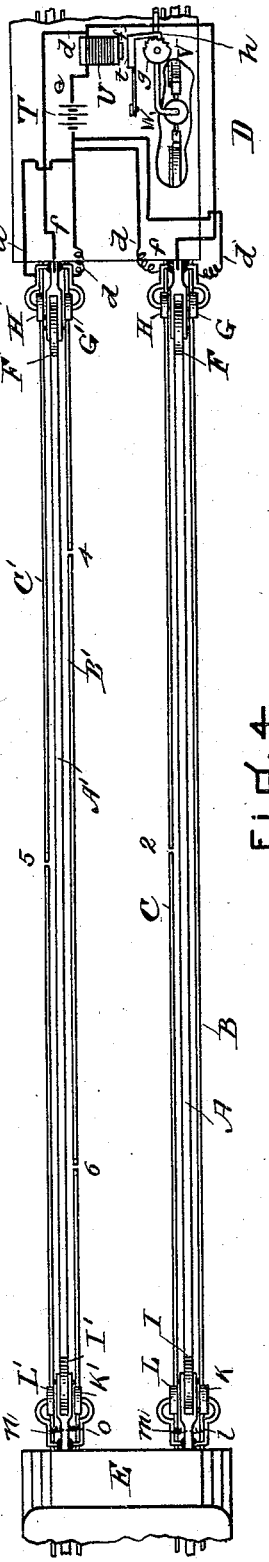

Fig. 4.

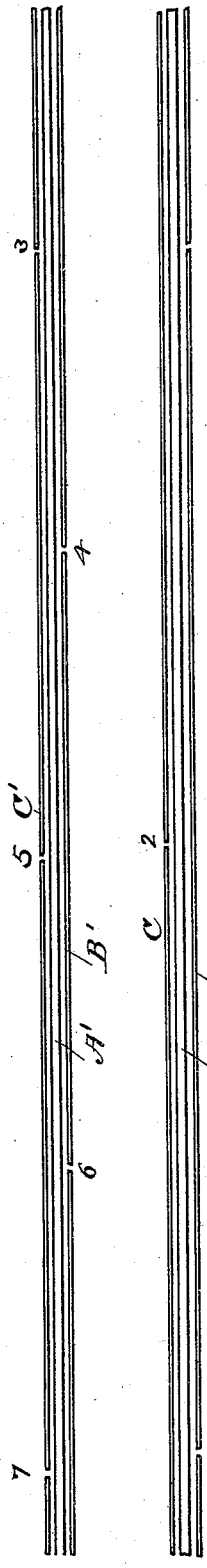

Fig. 5.

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(No Model.) 3 Sheets—Sheet 3.

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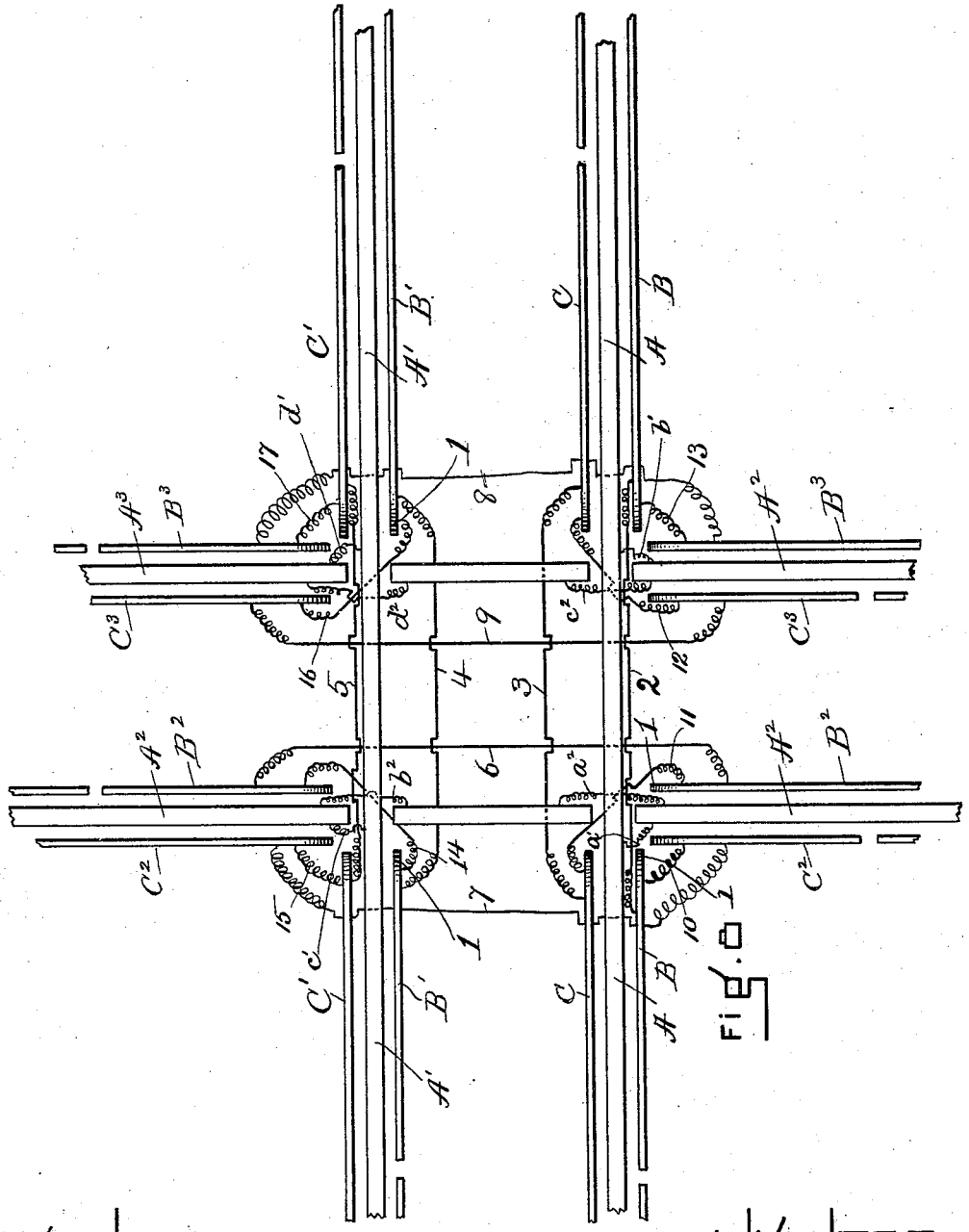

Fig. 1.

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UNITED STATES PATENT OFFICE.

EDWARD W. ROBINSON, OF BOSTON, ASSIGNOR OF ONE-HALF TO E. B. WELCH, OF CAMBRIDGE, MASSACHUSETTS.

APPARATUS FOR AUTOMATICALLY STOPPING RAILWAY-TRAINS.

SPECIFICATION forming part of Letters Patent No. 492,837, dated March 7, 1893.

Application filed July 13, 1891. Serial No. 399,290. (No model.)

To all whom it may concern:

Be it known that I, EDWARD W. ROBINSON, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Apparatus for Automatically Stopping Railway-Trains, of which the following is a specification.

The object of my invention is to provide a practical and efficient means for stopping a moving train within a substantially certain distance of another train in advance of the first named one, or within the same distance of a break in or obstruction on the track ahead of the moving train.

To these ends my invention consists generally in providing electric conductors extending parallel with the rails of the track, two or more of which are broken at intervals, as hereinafter described; and also a series of electric contacts suspended from the trains, and adapted to ride over said parallel conductors, and electrically connected with an electric generator and mechanism on the train for being operated by an electric circuit from said generator, all as hereinafter more particularly described.

In the accompanying drawings—Figure 1 illustrates my invention as applied to two trains in which a locomotive and the rear of a train are shown in side elevation, and both on the same track, and with the latter in advance of the former. Fig. 2 illustrates in perspective my improved trolley or drag conductors as resting on the road contacts, and the manner of applying them to a locomotive or car. Fig. 3 is a front elevation of the same. Fig. 4 is a diagram showing the parallel road conductors and the means of completing the electric circuit from one train to another. Fig. 5 is a diagram simply showing the road conductors. Figs. 6 and 7 illustrate details of my improved brake operating mechanism. Fig. 8 is a diagram showing my invention as applied to two cross tracks, and the means for transmitting the electric current from one track to the other.

Similar letters and numerals represent like parts in all the figures.

A A′ are the two parallel rails of a railroad track.

B C and B′ C′ are the broken parallel conductors, the conductors B and C extending parallel with and on either side of the rail A, and the conductors B′ C′ extending parallel with and on either side of the rail A′. The conductors B and C are broken at intervals, making the length of each section nearly twice as long as a very long train, say about three thousand feet, and the breaks of each of these conductors are at points midway between the breaks of the other. The conductors B′ C′ are also similarly broken to B and C, but each section is much shorter than those of the latter, or a little less than the length of a short train.

D (Fig. 1) is a locomotive resting with its wheels upon the rails A A′, and E is the rear of a train in advance of the locomotive, with its wheels resting on the same rails.

F, G, H, and F′ G′ H′ are trolleys or drag wheel contacts suspended from the front of the locomotive D, and resting upon the rails A and A′ and the conductors B C and B′ C′, and I K L I′ K′ L′ are similar trolleys suspended from the rear of the train E, and also resting on the same rails and conductors.

The trolleys above mentioned are attached to the locomotive and car by a springing and yielding mechanism, such mechanism being similar for supporting each set of trolleys, a description for supporting one set, say F G H will suffice for all.

M is a vertical hanger extending downward from the locomotive or car near the lower end of which is laterally and loosely pivoted an arm N, and to the free end of said arm is pivoted the trolley F, which is adapted to ride over the rail A.

O is a yoke extending laterally through the arm N, and with its central portion *a* rounded in cross section and adapted to rotate freely in said arm, and insulated from the same. The two arms *b c* of the yoke O extend substantially parallel with the arm N, and the outer ends support the trolleys G and H, which are somewhat smaller than and parallel with the trolley F.

P is a bar secured to the arm N in front of the bearing of the yoke O and extending outward on either side of said arm and under the parallel portions of the yoke, so that the lower peripheries of the trolleys G H will be slightly

elevated above the lower periphery of the trolley F.

Q is a tension spring fixed to the hanger M and bearing down upon the arm N to give said arm a constant downward pressure. The arm N with its supporting trolleys and other devices is adapted to be drawn up by a chain *x*, lever or other appropriate device.

The road conductors B C and B′ C′ rest in chairs or supports R of insulating material, and have their upper edges somewhat raised above the upper edges of the tracks or rails A A′, so that when trolley F or any of the trolleys running on the tracks A or A′ should come to an irregularity or a slight rise in the usual level, like a cross rail or switch, the course of the smaller trolleys riding on the conductors B and C and B′ C′ would be high enough to be unaffected by said irregularity. The cross bar P furnishes means for raising the smaller trolleys when the larger trolley F is raised by its arm N.

If the set of conductors A B and C are to be brought into operation by a long train, for which said conductors are adapted to be used, the trolleys on the rear of said train should be raised from said conductors while the train is in motion, as otherwise the circuit would be completed on the train itself between its front and back trolleys and through the conductors A and B or A and C, and the brakes would be operated to stop the train. If it be desired to stop the train however, the trolleys in the rear may be let down on the conductors A B and C, when the circuit will be completed on the train and the brakes will be operated. The rear trolleys should, in any event, be upon the conductors A B and C when the train is stopped, so that another approaching train in the rear and on the same track would complete the circuit between its front trolleys and the rear trolleys of the stopped train, and operate the brakes on the approaching train. When the brakes are applied the engineer would immediately perceive it, and could then pull the reversing lever and stop the train. The trolleys of a long train which are adapted to run on the conductors A′ B′ C′ may either be lifted up from said conductors, or allowed to drag upon the same, for the brakes will be unaffected in either case, as the train will always be a break of the current between the front and rear trolleys on said conductors, or rather there will be no circuit whatever over said conductors.

If a train a little longer than the sections of the conductors B′ and C′ be upon the track and ready to run, the front and rear trolleys on the train should be let down upon the conductors A′ B′ and C′, while the front trolleys on the left of the train should be raised from the conductors A B and C, or said trolleys should be disconnected with the circuit wires, otherwise there would always be a continuous current between the two ends of the same train between its front and rear trolleys, and continually keep the brakes in operation.

The rails A A′ are provided with lateral projections S of conducting material, secured to and extending on either side of the rail, within a very short distance, say a quarter of an inch, of the conductors B C B′ C′. The projections S are placed near the ends of two adjoining rails or wherever the rails are likely to spread, in order that such spread or expansion may cause the conducting projections to meet the conductors B or C, or B′ or C′, and thus complete the circuit on a coming train, to operate the brakes of the same.

T is an electric generator carried on the locomotive in any appropriate place, one pole (say the positive) is electrically connected by wires or other conductors *d* with the conducting support O P O′ P′ of the trolleys which are adapted to run on the broken road conductors. The opposite pole of the generator (say the negative) is connected by a wire or other conductor *e*, with one end of the coil of an electro magnet U, the other end of said coil being connected by a wire or other conductor *f* with the arm N and its supported trolley F or F′.

V is an ordinary spring valve connected with the tube W of a pneumatic or other similar brake, the spring of said valve tending constantly to keep the latter closed. The crank wheel *g* of the valve V V has a partial ratchet periphery, and a dog *h* pivoted to the armature *i* of the magnet U engages with said ratchet. When the magnet is energized, the armature *i* is drawn against it, and pulls the dog *h* so as to partially rotate the crank *g*, and thus open the valve V, when the brake will be operated. As soon as the magnet U is unenergized, the spring valve V will close, and the brake will be out of operation.

Referring to the diagram Fig. 4, if both sets of the rear trolleys of the train E are resting on the road conductors, as they should be if said train is a short one or had stopped, and the front trolleys of the train or locomotive D were also resting on the same road conductors, when said locomotive had arrived at the position shown in the figure, the circuit generator T would pass along the conducting wire *d* to the bearing of the trolley G, thence to said trolley, along the road conductor B (which is unbroken between the two trains) to the trolley K, its bearing, through the wire *l*, to the bearing of the trolley I, to said trolley, to the rail A, back to the locomotive trolley F, to its bearing, to the conducting wire *f*, to the magnet U and wire *e*, when the circuit would be completed, the magnet U would be energized, the armature *i* would be drawn against said magnet, and the brakes would be operated as above described.

If the rear trolleys of the train E have passed the break 1 of the conductor B (see Fig. 5) and the train or locomotive D should

get near enough to the train E so that the conductor C is continuous and unbroken between the trolleys of the two trains, as for example the front trolleys of the train D being beyond or to the left of the break 2, and the rear trolleys of the train E be beyond or to the left of the break 1, the circuit will then pass from the generator T to the trolley H of the train D, then to the road conductor C, to the trolley L of train E, through the bearing of said trolley and the wire *m* to the trolley I, and thence through the rail A back to the train D as before described, completing the circuit and operating the brakes.

If the locomotive D be attached to a short train, or one a little longer than one of the sections of the conductors B′ or C′, the left trolleys, which are adapted to rest on the conductors A B and C should be lifted above said conductors or disconnected from the battery, to prevent the circuit being completed on the train itself between its front and rear trolleys. If now the train or locomotive D should get near enough to the train E so that the rear trolleys I′ K′ L′ of the latter and the front trolleys F′ G′ H′ of the former should have an unbroken conductor between them, as for example the section between the breaks 5 and 7 of conductors C′, the circuit would be completed to operate the brakes, through the wire *d*, trolley H′, conductor C′, trolley L′ and its bearing of train E, wire *n*, bearing of trolley I′, and said trolley back along the rail B′ to trolley F′ of locomotive D, through the bearing of said trolley, wire *f′* to the magnet U, and the brakes will then be operated as above described. If the two trains above named have passed the breaks 5 and 7 of the conductors C′ at distances apart greater than the length of a section of either of the conductors B′ and C′, and have then approached near enough to each other so that there is a continuous portion or section of the conductor B′ (say between the breaks 6 and the one beyond said break) between the trolleys F′ G′ H′ and I′ K′ L′, the circuit would be completed to operate the brakes through the trolley G′, conductor B′, trolley K′ of train E, the bearing of said trolley and the wire *o* to the bearing of the trolley I′, the rail A′, back to the trolley F′ of the locomotive D, the wire *f*, and magnet U, as above described.

Referring to Fig. 8, A and A′ are the rails of the main track, and A^2 A^3 are the rails of the cross track, which are disconnected at the points of crossing, as is usual, said disconnections or breaks being shown exaggerated in the figure to more clearly show the construction. The broken road conductors B C and B′ C′, of the main track and B^2 C^2 B^3 C^3 of the cross track are formed of narrow rails as shown in the drawings, except where said tracks meet, and between the rails of the same. The rail portions of each of said conductors terminate a little outside of the cross rails, and their ends have a gradual decline or slope, as shown at 1 in Figs. 2 and 8, so that there will be no abrupt fall of the trolleys riding on said conductors when they come to the break caused by the cross rail or an abrupt vertical obstruction to encounter, when said trolleys come to the rail portion of the conductor again after leaving the cross rail. The broken rails and rail conductors above named are connected by wire loops *a′ b′ c′ d′*, 2, 3, 4 and 5 for those of the main track, and a^2 b^2 c^2 d^2, 6, 7, 8 and 9 for those of the cross track, thus insuring continuous electrical conductors. In addition to the above the conductor B is connected with the conductor C^2 of the cross track by the loop 10, and with the conductor B^3 of the cross track by the loop 13; C is connected with B^2 by the loop 11, and with C^3 by the loop 12. B′ is connected with B^2 by the loop 14, and with C^3 by the loop 16. C′ is connected with C^2 by the loop 15, and with B^3 by the loop 17. These wire loops 10 to 17 inclusive, form electric connections between the conductors of the two tracks, and these insure a continuation of the circuit from a train on one track to another train on the cross track so that either or both trains may be stopped by the action of the electric current.

What I claim as new, and desire to secure by Letters Patent, is—

1. The combination with the two track rails, of two pairs of conductors, all of which are parallel with each other and with said rails, one pair of said conductors being adjacent to one rail, and the other pair of conductors being adjacent to the other rail, and each of said conductors being disconnected or broken at intervals, with the breaks of one conductor alternating with or between the breaks of the other conductors of the same pair, and with the distances between the breaks of the conductors of one pair greater than the distances between the breaks of the other pair, and none of said broken conductors being connected with each other or with either rail, nor having normally any electric connection with each other or either rail, all as and for the purposes set forth.

2. The improved means whereby an electric circuit may be completed from one locomotive or train to another on the same track, for operating mechanism on either locomotive or train, consisting of an electric generator and a set of traveling contacts attached to one locomotive or train, two contacts being connected with one pole of the generator, and the other contact connected with the other pole of the generator, a set of contacts attached to the other locomotive or train and connected together by a conductor, but having no connection with any electric generator on the same locomotive or train,—a continuous road conductor on which two corresponding contacts of the two trains are adapted to ride, and two broken road conductors, with the breaks of one alternating

with the breaks of the other, on which the remaining contacts of the two trains are adapted to ride, all as set forth.

3. The combination with the track rail of two conductors extending on either side of the rail, and parallel with the same, each of said conductors being disconnected or broken at intervals, and with the breaks of one conductor alternating with the breaks of the other conductor, and said broken conductors having normally no electric connection with each other, and cross-pieces of conducting material extending between the rail and broken conductors without normally connecting the same, all as and for the purposes set forth.

4. In combination with a hanger suspended from the car or locomotive, of the arm N pivoted to said hanger, trolley F, yoke O extending through said arm and insulated from the same, trolleys G H, bar P secured to the arm N and extending under the yoke O, all as and for the purposes set forth.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 9th day of May, A. D. 1891.

EDWARD W. ROBINSON.

Witnesses:
C. F. BROWN,
A. D. HARRISON.