

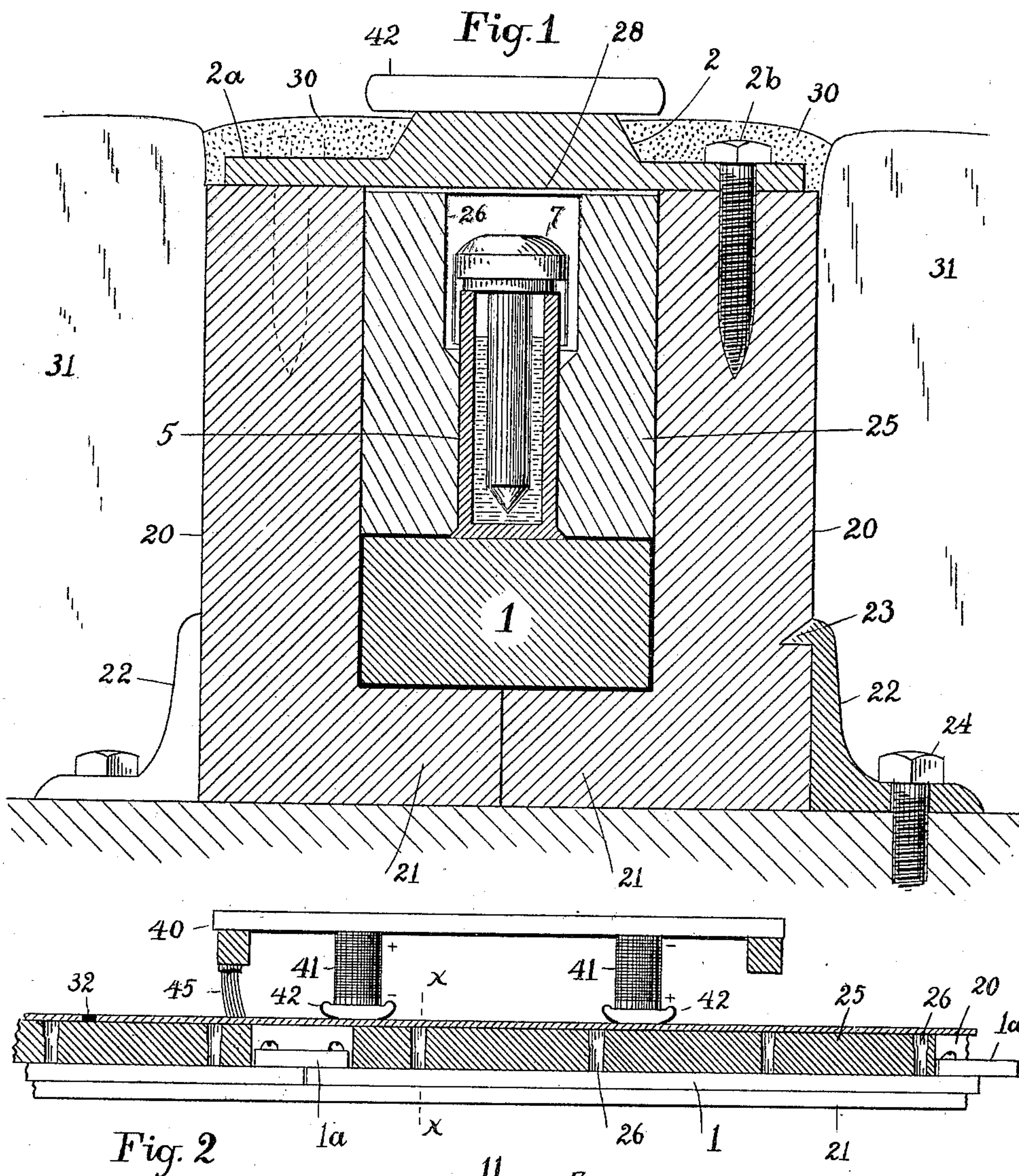
No. 652,438.

Patented June 26, 1900.

L. M. MAXHAM.  
ELECTRIC RAILWAY SYSTEM.

(Application filed Sept. 20, 1899.)

(No Model.)



Attest;

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Fig. 3 By *A. B. Upham,*  
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# UNITED STATES PATENT OFFICE.

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WEST VIRGINIA.

## ELECTRIC-RAILWAY SYSTEM.

SPECIFICATION forming part of Letters Patent No. 652,438, dated June 26, 1900.

Application filed September 20, 1899. Serial No. 731,038. (No model.)

*To all whom it may concern:*

Be it known that I, LOWELL MASON MAXHAM, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Electric-Railway System, of which the following is a full, clear, and exact description.

This invention is in the line of third rails and is adapted to any form of electric-railway traction in which the electric conductor is normally insulated from the exposed rail and the contact device moving thereon, the circuit being completed by means of magnetic attraction acting to draw a circuit-closer which is permanently in circuit with said electric conductor into contact with said exposed rail.

Referring to the drawings forming part of this specification, Figure 1 is a transverse section, nearly full size, of my third rail upon the line  $x x$  in Fig. 2. Fig. 2 is a longitudinal section of my third rail upon a reduced scale, and Fig. 3 is a vertical sectional view of my circuit-closer.

In the drawings, 1 is the electric conductor, preferably consisting of a continuous length of soft iron or of moderately-long bars connected end to end, as shown in Fig. 2. I prefer iron from motives of economy only, for although an iron conductor requires to be much larger in cross-section than a copper bar in order to transmit an equal current, yet even then the price of iron per pound being so much less makes copper the more expensive.

The conductor 1 is laid upon the horizontal sections of the L-shaped stringers 20, as shown in Fig. 1, the width of said sections 21 being unitedly equal to that of the conductor. These stringers are preferably formed from wood well coated with asphaltum and are laid upon sleepers, to which they are secured by means of the angle-pieces 22, bolted to the sleepers and having the spurs 23 forced into said stringers.

In practice I prefer to first lay the stringers and secure them as described or in any other convenient manner, then pour hot asphaltum into the groove thus formed, and then press the conductor-bars down into said groove

until the soft asphaltum has risen up the sides of said conductor. A strip 25, preferably of wood, adapted to fit the remainder of said groove, has a series of holes bored vertically through it, as at 26 in Fig. 2. Into these holes 26 are pressed from below the mercury-cups 5, the flanges 6 of which enable said strip 25 to forcibly press the under ends of said cups upon the upper surface of the conductor 1. Within each cup 5 is placed a suitable quantity of mercury and the iron pin 7, the head of which is adapted to normally rest upon the edge of said cup, while its stem 8 penetrates nearly to the bottom of the cup. To prevent the evaporation of the mercury in the cup 5, I prefer to secure beneath said head a washer of cork, felt, or other material, which serves to give an air-tight closure to said cup. This washer is secured to the pin by the close fit which is given to it about the stem 8. To further assist in the prevention of the escape of the contents of the cup 5, I usually fasten about the head 7 a thimble 9, which acts as a hood to more or less close the mouth of the cup 5 when the pin is raised into its circuit-closing position. One difficulty with a circuit-closer of this character is that in order to give the stem 8 sufficient metal for carrying the powerful currents used in railway traction the weight of the pin is made such that a large amount of magnetic energy is required to elevate the pin and close the circuit. To overcome this, I reinforce the stem with another material of either reduced weight and equal conducting capacity, such as carbon, or of reduced weight and increased conducting capacity, as aluminium. As shown in Fig. 3, I have drilled out the center of the stem and filled the space with a carbon core 11. It is of course evident that this core can be increased in diameter until it practically becomes itself the stem. I prefer to point the lower end of the stem 8 to better facilitate its movement in the mercury.

The holes 26 in the strip 25 are, as shown in Fig. 1, enlarged at their upper portions to make room for the hoods 9.

After the parts already described are properly placed the exposed rail 2 is then laid down upon the upper edges of the stringers 20 and



fixed thereon by means of the bolts or lag-screws 2<sup>b</sup>. The central part of this rail is made considerably thicker than its lateral portions for the purpose of reducing the extent of exposed surface. When used for street traffic, asphaltum 30 is filled in between the paving-blocks 31 and the said thick central part of the rail 2.

The exposed rail 2 is made mechanically continuous throughout the length of the system, excepting, of course, switches, &c., the different sections of rail composing the same being only separated by a short block of insulating material 32, as asphaltum.

My contact device for taking the current from the exposed rail and my magnetic arrangement for raising the circuit-closing pins are constructed as follows: 40 indicates the car-truck frame, and 41 are two electromagnets carried thereby and located at considerable distances apart. The pole-piece of each electromagnet is provided with a wear-receiving shoe 42, as shown in Fig. 2. By this arrangement I have what is a plurality of magnets with an armature comprising the section of the rail in contact therewith. It is this armature which performs the immediate work of attracting the circuit-closers 7, and consequently its thickness is immaterial, it in no way reducing the power of the electromagnets to move the said circuit-closers.

To prevent sparking when the circuit-closers drop back from their contact with the exposed rail 2, I introduce a thin strip 28 of brass or other material of high conductivity transversely between the under side of said rail and over each of the holes 26, its width being but little more than the diameter of such holes.

I prefer to secure a brush 41 to the truck-frame just in advance of the shoes 42 in order to clean the exposed rail of dirt and gravel.

In bonding the conductor-sections 1 together I prefer to employ short lengths of similar bars 1<sup>a</sup>, bolted or screwed thereto and, as shown in Fig. 2, having the wooden strips 25 made sufficiently shorter than said conductor-sections to stop short of said bonding-bars.

I prefer to use an ample supply of asphaltum upon the surfaces of the stringers 20 and strip 25 when putting the latter in place and also when laying the exposed rails 2 thereon. When the parts are thus put together, there is no possibility of moisture reaching the conductor or the circuit-closers. Hence there can be no deterioration of parts and no way in which the system can be short-circuited. Neither is there any possibility of taking the current from the conductor except by the presence of a sufficiently-powerful magnet.

I prefer the spaces separating the circuit-closers to be such as will bring a plurality of the same between the magnets 41. This will insure more than a single completion of the circuit and prevent danger of sparking.

The specific construction of the circuit-

closer 7 is more fully set forth and claimed in my pending application, filed April 28, 1900, Serial No. 14,777.

What I claim as my invention, and for which I desire to secure Letters Patent, is as follows, to wit:

1. The combination of the metal bar forming a continuous electric conductor, the mercury-cups seated upon said bar, the circuit-closing pins located in said cups, the exposed rail normally insulated from said conductor and pins, and the insulating material enveloping said conductor and mercury-cups and supporting said rail, substantially as set forth.

2. The combination, in a third rail, of the two insulating L-shaped stringers, the electric conductor supported upon and between the same, the insulating-strip filling the remainder of the space between said stringers and having a series of vertical apertures, the mercury-cups located in said apertures and held thereby in close contact with said conductor, the circuit-closing pins in said cups, and the exposed rail secured upon said stringers, substantially as set forth.

3. In an electric-railway system, the combination of the mechanically-continuous but electrically-broken exposed rail, the magnetically-actuated circuit-closers, the electric conductor in permanent communication with said circuit-closers, the traveling magnets presenting their poles to said rail, and the individual shoes for each magnet, substantially as set forth.

4. In a third rail, the combination with the electric conductor having a flat upper surface, the stringers supporting the same, the insulating-strips held upon said conductor and having the vertical holes, the mercury-cups fitted in said holes and having the flanges by which the strips retain them upon said conductor, the circuit-closers in said cups, and the exposed rail, substantially as set forth.

5. In a circuit-closer, the combination with the mercury-cup, of the circuit-closing pin composed of the iron head and stem having a core passing longitudinally through said stem and head and formed of a material of superior conducting capacity to the iron, substantially as set forth.

6. In a circuit-closer, the combination with the mercury-cup, of the circuit-closing pin having the washer adapted to form an airtight closure between the said pin and the edge of said cup, substantially as set forth.

7. The combination with the separable insulating-stringers, and the sleepers supporting the same, of the angle-pieces having the spurs adapted to be forced into said stringers, and means for securing said angle-pieces to said sleepers, substantially as set forth.

8. The combination with the L-shaped stringers, the electric conductor inclosed therein, the circuit-closers and the strip filling the remainder of the space between said



stringers, of the exposed rail having the thickened central portion and thin lateral edges, and the means for securing said thin edges to said stringers, substantially as set forth.

5 9. In a circuit-closer, the combination with the exposed rail, of the magnetically-raised head having the central core of higher electric conductivity, said core being connected with the electric circuit and having its upper

end adapted to contact with said exposed rail; 10 substantially as set forth.

In testimony that I claim the foregoing invention I have hereunto set my hand this 18th day of September, 1899.

LOWELL MASON MAXHAM.

Witnesses:

GUY H. HOLLIDAY,  
A. B. UPHAM.