(No Model.)

J. F. McLAUGHLIN.

CLOSED CONDUIT ELECTRIC RAILWAY.

No. 528,379. Patented Oct. 30, 1894.

Fig. 1.

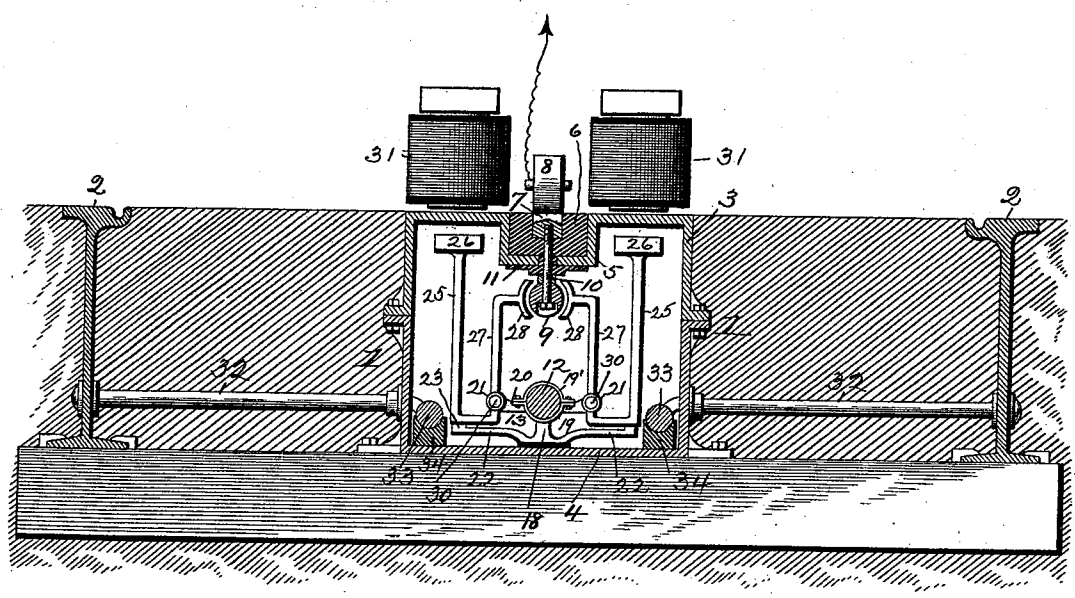


Fig. 2.

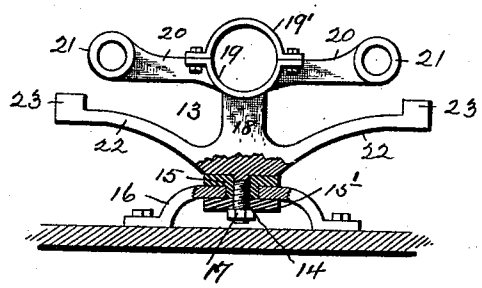
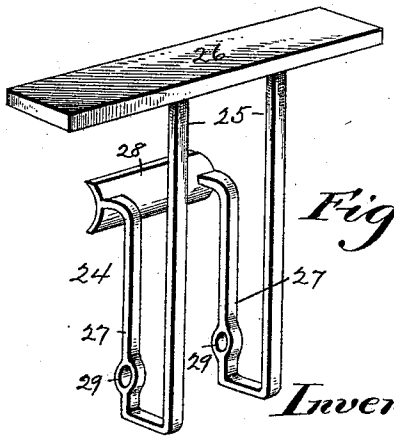


Fig. 3.



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JAMES F. McLAUGHLIN, OF PHILADELPHIA, PENNSYLVANIA.

CLOSED-CONDUIT ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 528,379, dated October 30, 1894.

Application filed May 10, 1894. Serial No. 510,762. (No model.)

To all whom it may concern:

Be it known that I, JAMES F. McLAUGHLIN, a citizen of the United States, and a resident of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented certain new and useful Improvements in Closed-Conduit Electric Railways, of which the following is a specification.

This invention has reference to improvements in closed-conduit electric railways, and its object is to provide a construction in which exposed sections of a sectional working conductor are successively coupled with a supply conductor in the closed conduit, by the passage of a motor car along the railway, the circuit between the supply and working conductors being broken at all points on the road except where covered by the motor car or cars.

The present invention is an improvement on the closed-conduit electric railway, for which I filed an application for Letters Patent on April 5, 1894, Serial No. 506,470, wherein is shown and described a conduit inclosing a supply conductor and provided with an exposed sectional working conductor, and the circuit between the supply and working conductors is progressively established by a traveling contact maker in the conduit, propelled by magnetic attraction from the car.

By the present invention I avoid the use of traveling contacts by substituting switches therefor, which switches are so constructed that they will be moved to close the circuit between the supply and sectional conductors as the car progresses, by magnetic attraction from the car, and will operate by gravity, or otherwise, to open the circuit as soon as the car has passed. All this will more fully appear from the following detail description taken in connection with the accompanying drawings, forming part of this specification, in which—

Figure 1, is a cross section of the road bed of an electric railway, embodying my invention, with the switch operating magnets on the car and other parts shown in elevation. Fig. 2, is an elevation, partly in section, of one form of support for the feeding conductor and switches, and Fig. 3, is a perspective view of one of the magnetically operated switches.

Like numerals of reference indicate like parts throughout the drawings.

Referring to Fig. 1, there is shown a rectangular conduit 1, secured to the cross-ties which support the traffic rails 2, 2. This conduit is composed of an upper part 3, and a lower part 4, secured together by bolts or screws as shown.

The conduit is made up of sections of suitable length for handling, which sections, when laid in the road bed are secured together end to end with all joints sealed with waterproof cement, thus forming an unbroken conduit, impervious to water.

Each upper part 3, of the conduit has formed in it a central longitudinal trough or channel 5, filled with insulating material, 6, in which a sectional and preferably rectangular conductor 7, is embedded, with its upper face exposed and flush with or projecting slightly above the insulation 6. The conductor 7, constitutes the exposed, sectional conductor which is supplied with current from a main supply conductor in a manner to be described, and current for feeding the motor on the car, is taken from this conductor 7, in any suitable manner but preferably by means of one or more collecting rollers 8, carried by the car and running along in contact with the said conductor.

Within the conduit, just beneath the trough 5, and directly below the conductor 7, is another, and preferably round, sectional conductor 9, connected both mechanically and electrically to the conductor 7, by bolts 10, countersunk into the conductor 9, and tapped into the conductor 7. The conductor 9, is insulated from the trough 5, by insulation 11, as shown and the bolts 10, where they pass through the trough 5, are surrounded by insulating bushings. The sections of the conductor 9, are of equal length to and match the sections of the conductor 7, and the contiguous ends of the sections of each conductor are insulated from each other.

Since matched sections of the two conductors 7 and 9 are electrically connected together, and current is collected from the conductor 7, the two conductors constitute in effect a sectional working conductor composed of an underground member and an exposed member.

As thus far described, the construction of the system is substantially like that shown and described in my aforesaid application for patent, and I will now proceed to describe the improvements, which, in connection with the parts already described, constitute the present invention.

An electrically continuous, and preferably round, main or feeding conductor 12, is supported near the bottom of the conduit, directly below the sectional conductor 9, by metal brackets 13, placed at intervals in the conduit and secured to but insulated from the bottom of the same.

In Fig. 1, no special means of securing the bracket 13, to the bottom of the conduit is shown although a plate of insulation between the bracket and conduit is indicated, but an effective construction for this purpose is shown in Fig. 2. In this construction the bracket is provided with a downwardly projecting pin 14, threaded at its lower end and passing through an insulating bushing 15, seated in a perforation formed in an arched support 16, which is bolted or otherwise secured to the bottom of the conduit. One end of the bushing 15 is expanded into a flange which is interposed between and insulates the bracket from its support, and there is an insulating washer 15′, interposed between the support and a nut 17, which latter is applied to the lower end of the pin 14, to secure the bracket in place. The bracket is thus firmly fixed to but insulated from the conduit. The bracket is formed with a central post 18, at the upper end of which is formed a seat 19, for the reception of the conductor 12, which is firmly clamped in the seat by a cap piece 19′, bolted or screwed to the seat. Projecting laterally from each side of the seat 19, are metal wings 20, each terminating in an eye 21. Projecting from the lower end of the bracket, below the wings 20, and parallel therewith, are two arms 22, each terminating in an upturned end 23, beyond, and below the wings 20. To each wing 20, is hinged a switch frame 24. Shown in perspective in Fig. 3. This switch frame is formed with two upright legs 25, which at their upper ends have an armature plate 26, either secured thereto or formed integral therewith, while the lower ends are bent up and form arms 27, 27, parallel with the legs 25, and their free ends are joined by the segmental switch plate 28. In each arm 27, is formed an eye 29, and between this pair of eyes one of the eyes 21 at the end of a wing 20 extends, and a pintle 30, completes the hinge. The segmental switch plates 28, are normally close to, but out of contact with the sectional conductor 9, so that when the armature plates 26 are elevated, the frames 24 are tilted and the switch plates 28 embrace and make contact with the sectional conductor. The pivots or hinges of the switch frames being at one side of the center of gravity, (as will be seen from Figs. 1 and 3,) the armature side of each frame will overbalance and cause the switch-plate 28, to move away from the conductor 9, until the upturned ends 23, of the arms 22, located in the path of the bend of the frames are engaged and arrested thereby. The arms 22, thus operate as stops to limit the downward movement of the switch, which movement need only be sufficient to break the circuit between the switch plate 28, and the conductor 9.

The switches are arranged opposite each other in pairs, that is, there are two matched switches to each section of the working conductor, both switches being hinged to one bracket 13, but it is obvious that the switches might be arranged all on one side of the conductor 9, or alternately on opposite sides thereof, with but one switch to each section of the said conductor 9.

The legs 25, of the switch frames 24, are of such length that the armature plates 26 are close to the top of the conduit, between the central trough 5, and the corresponding side wall, but sufficiently far removed from the top and side walls of a conduit to permit the necessary free movement.

Depending from the motor car (not shown) are electro-magnets 31, preferably of the horse-shoe type, arranged on each side of the central trough 5, as close to the top of the conduit as practicable, in the same manner as is shown in my aforesaid application. The line of travel of these magnets is directly over the armatures 26, which are attracted by the magnets as the latter, being properly energized, pass over them. The magnets may be energized by a branch of the motor circuit or by a current from an independent source carried by the car, and they are of sufficient strength to tilt the switch frames, until the plates 28, are in firm contact with the conductor 9, thus establishing the circuit between the main and working conductors. The armature plates 26, are placed in the conduit with their contiguous ends a short distance apart, and are preferably made of such length that they will average about four to the length of a motor car. The sections of the conductors 7 and 9, are of corresponding length, that is, about four to the length of a motor-car. By this arrangement, there can be no exposed conductors in which current is flowing, except those covered and protected by the motor-car, since the magnets are so disposed that not more than two contiguous pairs of switches are operated at the same time, and consequently but two adjoining sections of the working conductor can be active at any one time. This is due to the fact that as soon as the magnets have passed from over and cease to attract the armature plates 26, of a pair of switches, these plates fall, by gravity, turning the switches on their hinges and thereby moving the plates 28, out of contact with the corresponding section of the conductor 9, while the magnets are each so constructed that they can only bridge two contiguous armature plates, in which latter

case both will be lifted and operate the switches to close the circuit between the main conductor and two adjacent sections of the working conductor at the same time. It will be understood that as the motor-car travels along, the pairs of switches will be operated progressively to close and open the circuit.

The return circuit of the motor is through the wheels of the car to the traffic rails 2, 2, and from thence to the generator, and in order to insure the continuity of the said return circuit, without depending on the fish plates or other connections at the rail joints, the rails are connected at intervals by branch conductors 32, to continuous return conductors 33, leading to the generator. The conductors 33, are located within the conduit, one at each lower corner thereof and are preferably placed upon grooved supports 34, as shown. The branch conductors 32, pass through the sides of the conduit and are soldered or otherwise fixed to the return conductors 33. The supports 34, may be of insulating material and the branch conductors 32, may be insulated from the point of junction with the rails, to a point within the interior of the conduit so that the latter will not be included in the circuit.

In an electric railway constructed as herein described the current will pass through the main conductor 12, which is connected at one end to the stationary generator, to a point on the road occupied by a car, thence through the wings 20, of a bracket 13, to the switch frames 24, hinged thereto. As before explained, the switches over which the car is passing are closed on a section of the conductor 9, and consequently the circuit is completed through this section and by way of the bolts 10, to the corresponding section of the conductor 7, from whence the current is collected by the roller or rollers 8, and passes through the motor, and returns to the generator through the car wheels, rails, branch conductors 32, and return conductors 33, which latter are connected in multiple to the generator.

When the switch operating magnets are energized by a branch of the motor circuit, that is, when they are included in the circuit in multiple arc with the motor they will remain energized when the motor circuit is broken, as in stopping the car, and it is then necessary, when the car is first started on a trip, to provide a means for energizing the magnets, either by the momentary use of a battery on the car, or by mechanically closing one of the switches 24, under the car.

After the main circuit has been once established the magnets will remain energized and operate the switches as long as desired.

If the energizing current for the magnets for the whole run be derived from a source of electrical energy carried by the car, such for instance as a secondary battery, instead of being derived from the main circuit, the charge of the magnets may be controlled independently thereof.

Having now fully described my invention, I claim and desire to secure by Letters Patent—

1. In an electric railway the combination with a closed conduit, of a main or supply conductor housed therein, a sectional working conductor composed of sections in the conduit and exposed sections seated in the top of the conduit and electrically connected to the sections in the conduit, and magnetically operated switches, pivoted to the main conductor, formed with switch plates in operative relation to the underground sections of the working conductor and with armatures close to the top of the conduit, substantially as described.

2. In an electric railway, the combination with a closed conduit provided with a central longitudinal groove or trough along its top, of a main or supply conductor housed in the conduit, a working conductor composed of sections in the conduit and exposed sections seated in the trough and electrically connected to the sections in the conduit, and magnetically operated switches pivoted to the main conductor and formed with switch plates in operative relation to the underground sections of the working conductor and with armatures close to the top of the conduit between the trough and sides of the conduit, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES F. McLAUGHLIN.

Witnesses:

F. T. CHAPMAN,

E. C. MARSHALL.