No. 764,856. PATENTED JULY 12, 1904.

T. MAHONEY.

ELECTRIC RAILWAY.

APPLICATION FILED AUG. 4, 1903.

NO MODEL.

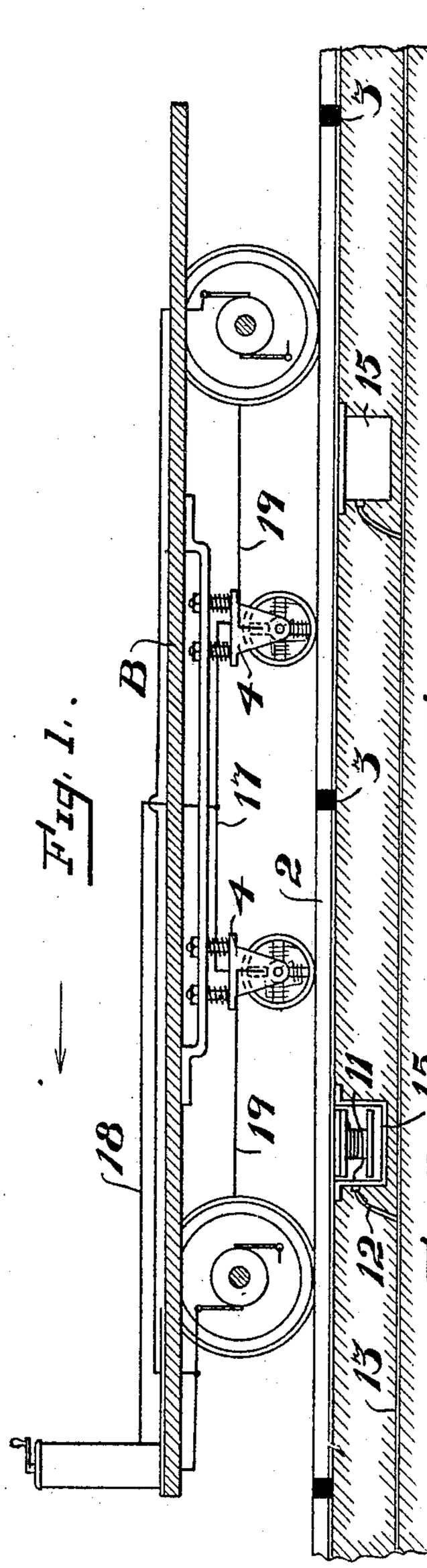

Fig. 1.

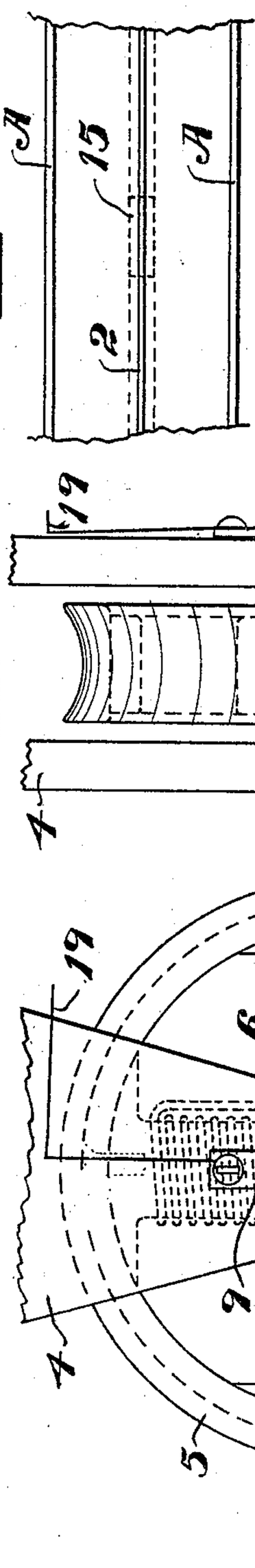

Fig. 4.

Fig. 3.

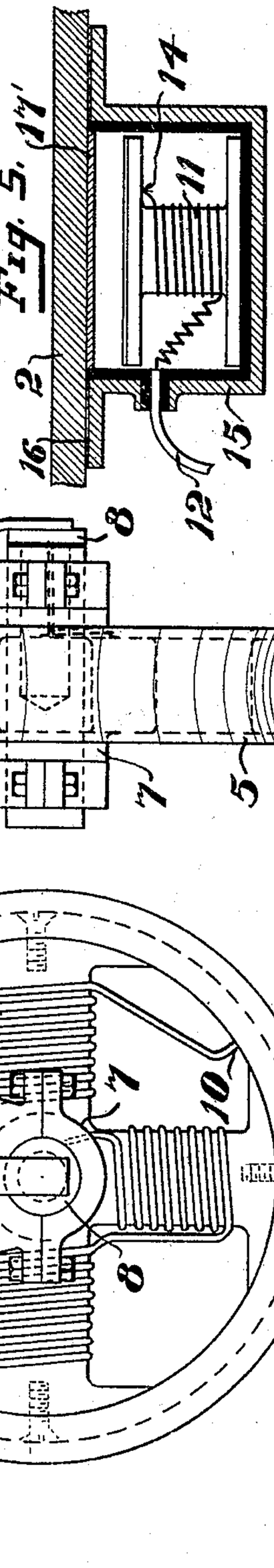

Fig. 5.

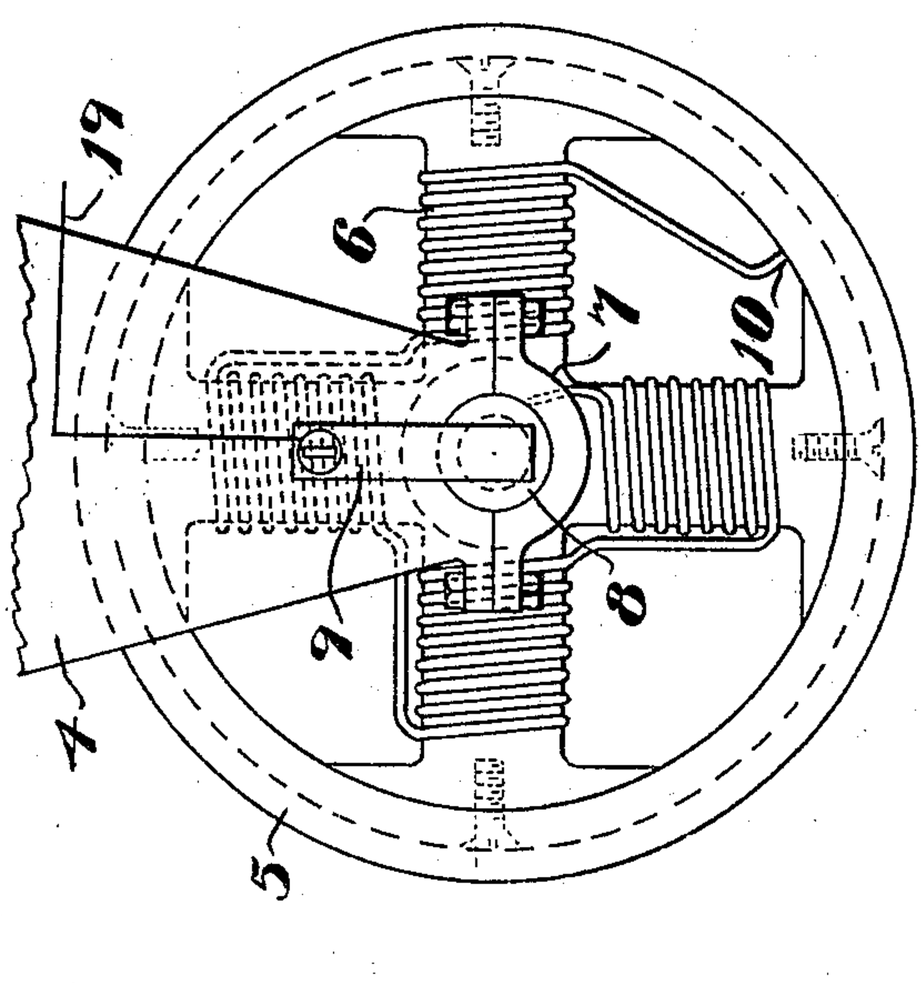

Fig. 2.

Witnesses,
J. B. Brose
Dudley Moss.

Inventor,
Timothy Mahoney
By Geo. H. Strong.
Atty

No. 764,856. Patented July 12, 1904.

UNITED STATES PATENT OFFICE.

TIMOTHY MAHONEY, OF SAN FRANCISCO, CALIFORNIA.

ELECTRIC RAILWAY.

SPECIFICATION forming part of Letters Patent No. 764,856, dated July 12, 1904.

Application filed August 4, 1903. Serial No. 168,130. (No model.)

To all whom it may concern:

Be it known that I, TIMOTHY MAHONEY, a citizen of the United States, residing in the city and county of San Francisco and State of California, have invented new and useful Improvements in Electric Railways, of which the following is a specification.

My invention relates to improvements in electric-railway systems of the third-rail type.

The object of my invention is to devise a switch-box and operating means therefor carried by the car which shall be simple, cheap to construct, install, and maintain, which requires a minimum amount of power to operate, and which will permit cars to travel at a high rate of speed.

It consists of the parts and the construction and combination of parts, as hereinafter more fully described, having reference to the accompanying drawings, in which—

Figure 1 is a longitudinal central section of car-truck and track. Fig. 2 is an enlarged side view of magnetic trolley-wheel. Fig. 3 is a front view of same. Fig. 4 is a plan view of a portion of track. Fig. 5 is a longitudinal central section of switch-box.

A A represent the tracks of an ordinary street-railway, between which is a sectional surface trolley-rail 2. The sections of the latter are suitably insulated one from another, as indicated at 3.

B represents a motor-car or like movable body reciprocable along the tracks A and provided with two trolley-posts 4, disposed between the car-trucks and each having a roller magnetic trolley running continuously on the sectional rail 2, the distance between the trolleys being approximately equal to the length of a section of rail 2 to insure the engagement of one trolley with a section before the other leaves it. This magnetic trolley is one of the features of my invention, for it combines the functions of a current-collector for the motor as well as furnishes the means for actuating the switch to cut the current into the trolley-rail from the main, thus doing away with separate actuating-magnets on the car. It consists, essentially, of a soft-iron annular pole-piece and combined wheel-rim 5, removably secured to the iron spokes 6, radiating from the hollow hub 7. The hub is journaled suitably in the conducting trolley-post 4 and has one end capped with a copper plate 8, which latter is in frictional engagement with a brush 9, having a fixed point of attachment with the trolley-post. The rim is preferably concaved in cross-section to aid in maintaining its engagement with the trolley-rail, which is preferably convexed. Each spoke 6 is wound after the fashion of an electromagnet, a single wire having one terminal attached to the rim 5, as at 10, and wound around the spokes successively and passing thence into the hollow hub and having the other terminal connected to the copper plate 8. The spokes thus wound are converted into magnetic cores, and the winding is such that all the magnets are of the same polarity—that is, the poles at the center will all be north or all south and the outer poles will all be south or north, as the case may be. Hence if the outer poles are all north the entire rim 5 will be north.

The second essentially novel feature of my invention is the switch. This comprises simply a magnetic pole-piece of opposite polarity to the trolley-magnets disposed in and connected with the feed-wire from the main supply-circuit and located beneath the rail and adapted to be lifted into engagement with the rail by the passing trolley-magnet and then to be held against the rail by its own attractive force so long as current is passing from its particular trolley-rail section to the car. In the present instance I have shown a soft-iron spool 11, with rectangular heads, wound a few times with the feed-wire 12, leading from the main 13. The end of the wire 12 is connected electrically with the spool, as at 14.

The spool is incased in a suitable iron box 15, having an interior lining of insulating material and disposed centrally beneath a section of the trolley-rail. The rail itself forms the cover for the box, and a suitable lead gasket 16 preserves a water-tight joint when the box is finally bolted in place. The surface of the rail included within the box may be provided with a copper plate 17′, as may likewise the adjacent end of the spool, to insure better

electrical contact of the parts when the spool is lifted. The wire 12 passes out of the box through a suitable opening in the side afterward sealed to prevent any ingress of moisture. It will be seen that the full current to the car passes around the switch-core to energize it as a magnet and also connects directly to the core to convert the latter into a conductor. The same thing is true of the spoke-cores 6 of the trolley 5.

In operation a car traveling in the direction of the arrow, Fig. 1, the front trolley as it comes onto a trolley-rail section and approaches the box of the section will lift the armature-magnet 11 in the switch-box to cut the current from main 13 into the rail. The current then passes from the rim 5 of the front trolley through spokes 6, hub 7, trolley-post 4, and connections 17 18 to the controller, thence to the motor, and finally to one of the track-rails A to complete the circuit. Wires 17 and 18 on the car connect with both trolley-posts 4 on the car, so that current may be taken simultaneously from two sections.

Brushes 9 are connected by circuit 19 with the track-rail A. The trolley-magnets are connected in multiple, so that the magnets of both trolleys will always be in a state of excitation in readiness to act on a switch immediately in advance of either end of the car, according to the direction of travel. The current for the trolley-magnets passes from the trolley-rail to a rim 5, thence around the spokes to plate 8, brushes 9, circuit 19, and the car-wheels to rail A.

The moment the front trolley-magnet has acted to lift armature 11, as previously described, and the circuit between the feed-main and the trolley-rail closed the switch itself is forthwith converted into a magnet of high power, since the full current for the motors is passed a number of times around the spool. The switch thenceforth adheres to the rail, which becomes for the time being its armature. Before the first trolley passes from the active section the rear trolley has come upon the section, and the current passing from the main through the lifted switch 11 to the rail will continue to pass to the car through the rear trolley even after the front trolley has gone onto the next section to actuate its switch. The moment, however, the rear magnet passes from the section the circuit between that section and the return-conductor is broken and switch 11 loses its power as a magnet, falling inert to the bottom of the box.

The advantages of the switch mechanism lies in its simplicity, its cheapness of construction, and in the fact that it can be economically operated. It requires no other circuit than that which connects the rail and the main feed-wire. The rail itself forms the cover for the box, since the latter need not be very large, inasmuch as the rail is half the switch. The spool being small requires very little power to move it, and its own magnetism causes it to adhere to the rail when lifted.

The advantages of the magnetic trolley are that it makes a very good contact with the rail on account of the magnetic attraction, which holds the trolley against or in contact with the rail around curves or on heavy grades. It rolls very freely, therefore doing away with friction caused by one magnetized body sliding over another, as in some systems. This is a very important feature of my invention. It will also be noted that these trolleys, of which there are two on every motor car or train, both act as contact devices or current-collectors; but they are functionally different. The forward magnet, according to the direction of travel, is the one that acts, essentially, on the switch magnetically to lift the switch, while the rear magnetic trolley acts on the switch mechanism rather merely as an electrical conductor. If the car is reversed, then what was the rear trolley before becomes the front trolley and the active switch-operating agent.

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

1. A magnet comprising an annular rotatable pole-piece and radial cores fixed thereto and connected at their inner ends, and a helix for each core and all the helices formed of a continuous conductor and wound in the same direction to produce a single magnet the opposite poles of which are represented by the periphery and center of the rotatable pole-piece, and connections with a source of energy.

2. In an electric-railway system, a trolley-wheel comprising a magnetizable rim and a series of radial magnetizable spokes inclosed thereby said series of spokes being helically wound by a continuous conductor to form a single magnet whose opposite poles are at the center and periphery of the wheel.

3. In an electric-railway system, a trolley-wheel comprising a magnetizable rim and magnetizable spokes said spokes united at their inner ends to form a central hub, a series of coils, one for each core, and all made from a continuous conductor and wound in the same direction, with one terminal of the conductor connecting with the rim and the other terminal of said conductor leading to the interior of the hub.

4. In an electric-railway system, the combination of a trolley-wheel having a magnetizable rim and a series of radial magnetizable cores united at their inner ends, a coil for each core said cores being each surrounded by the same conductor and all the coils wound in the same direction whereby the center and circumference of the wheel form opposite poles, a sectional current-conducting track for said wheel, a switch relative to the track, connections between the switch and a source of

energy, and means carried by the trolley-wheel to actuate the switch to cut in the current to the track.

5. In an electric-railway system the combination with a car, and a sectional current-conducting track, of a trolley-wheel comprising a magnetizable rim and a series of radial cores inclosed thereby and united to form a hub at their inner ends, a wire having one end connected to the rim and thence coiled around the cores in the same direction and having its opposite end leading to the interior of the hub whereby the perimeter and the center of the same wheel form opposite poles, and connections between the wheel and a source of electrical energy.

6. In an electric-railway system, the combination with a car or vehicle and a trolley-track, of a trolley-wheel including a magnetizable rim and magnetizable spokes, a hub uniting the inner ends of the spokes, a series of coils, one for each spoke and all wound in the same direction whereby the perimeter and center of the wheel form opposite poles of the magnet, and connections between the rim and a source of energy.

7. In an electric-railway system, the combination of a track, a switch-box open at the top and disposed beneath the track and covered thereby, a magnetizable core loose in said box and in series with a source of supply and the rail and a magnetic trolley reciprocable along said track.

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

TIMOTHY MAHONEY.

Witnesses:

HENRY P. TRICOU,

S. H. NOURSE.