(No Model.) 2 Sheets—Sheet 1.

J. H. PENDLETON, A. BRYSON, Jr., & C. TIERS.

CABLE RAILWAY SIGNAL.

No. 418,850. Patented Jan. 7, 1890.

Fig. 1.

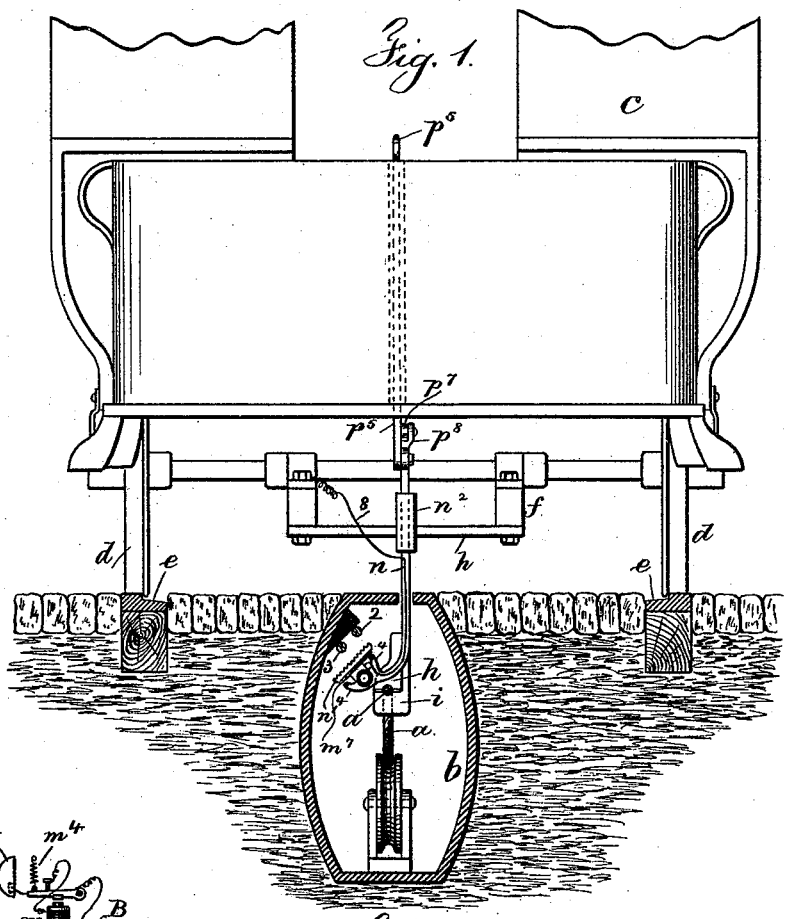

Fig. 3.

Fig. 7.

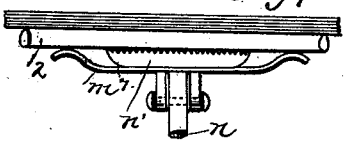

Fig. 2.

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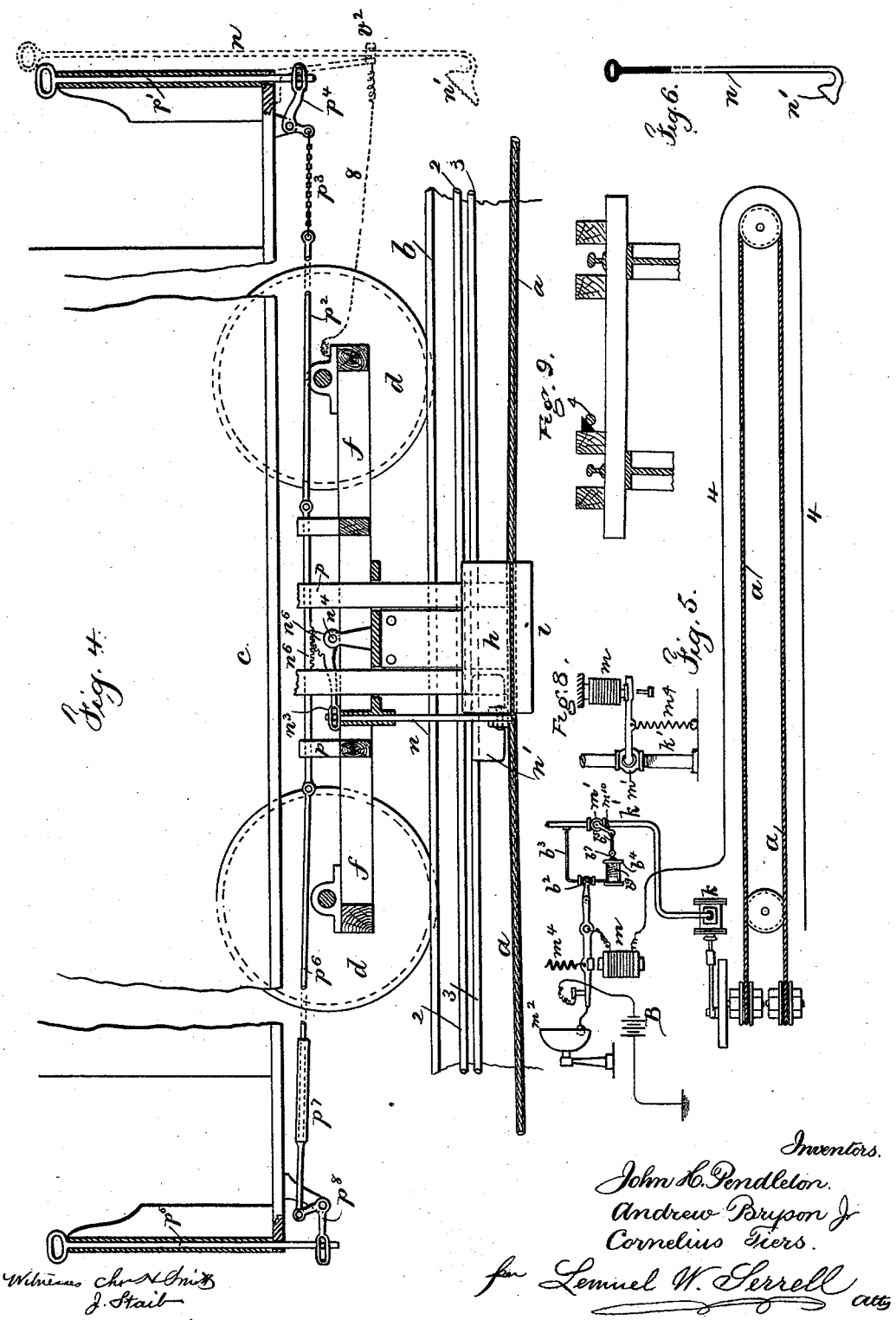

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UNITED STATES PATENT OFFICE.

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CABLE-RAILWAY SIGNAL.

SPECIFICATION forming part of Letters Patent No. 418,850, dated January 7, 1890.

Application filed November 13, 1888. Serial No. 290,683. (No model.)

To all whom it may concern:

Be it known that we, JOHN H. PENDLETON, of Brooklyn, in the State of New York, and ANDREW BRYSON, Jr., and CORNELIUS TIERS, both of the city and State of New York, have invented an Improvement in Cable-Railway Signals, of which the following is a specification.

In cable railways it sometimes happens that a strand of the endless cable parts, and when this occurs there is a possibility that a grip upon one of the cars may come in contact with a projecting end of the parted strand and cause said end of the strand to form a bunch upon the cable and this bunch may get so wedged in or entangled with the grip that the latter cannot be disconnected from the cable. If this should happen, the car would be carried along by the cable until the grip or the car struck some obstruction, and a serious accident might result.

The object of our invention is to provide means for stopping the cable in case said cable should get wedged or entangled in the car-grip.

We find that it is important to be able to send a signal to the engine-house, so as to indicate to the engineer whether to stop or start the engine, or to go slow, or even to back the cable, and we make use of either one conductor or a pair of conductors running parallel, or nearly so, to the cable by which the conductor or the attendant on the car can signal the engineer at the stationary engine, and, if desired, the engine can be stopped by the attendant on the car through a single conductor or by an electric circuit having two metallic conductors. By these improvements the trains upon the cable railway are in communication with the engineer at the stationary engine, and in cases of accident—such, for instance, as the cable becoming wedged or caught in the grip—the train can be stopped by stopping the cable, thus preventing injury from inability to disconnect the grip from the car.

In the drawings, Figure 1 is a section of the roadway and of the tube for the traveling cable and an end view of part of a car. Figs. 2 and 3 are diagrams representing the electro-magnet in a closed and open circuit, respectively. Fig. 4 is a sectional elevation representing a portion of a car and its grip, the tunnel or tube for the cable, and the means for operating the bridge-plate or short-circuiting device. Fig. 5 is a diagram illustrating our invention as used with a single conductor. Fig. 6 is an elevation of the circuit-closer in a modified form, and Fig. 7 is an edge view of the circuit-closing plate. Fig. 8 represents the steam-cock operated by the armature of the electro-magnet, and Fig. 9 shows the electric conductors as upon the guard-rail of an elevated railroad structure.

We have shown our improvement in connection with a surface railway, in which the cable *a* travels within a tube or tunnel *b*.

c represents part of the body of an ordinary street-car, *d* the wheels for the same, and *e* the track upon which the wheels run.

h represents the stationary portion of the grip that is suspended from the frame *f*, carried by the car-axles, and *i* the moving part of the grip.

2 and 3 are electric conductors that follow the line of the cable *a*, as seen in Figs. 1, 2, and 3, and said conductors are to be supported upon insulating material secured to one of the side walls of the tunnel *b*.

There is a battery B and an electro-magnet *m* in the circuit formed by the conductors 2 and 3, and when a closed circuit is employed, as in Fig. 2, the battery is at one end of the circuit and the electro-magnet at the other end of the circuit. When an open circuit is used, as in Figs. 3 and 5, then said battery and electro-magnet will be at the same end of the circuit. In either case the electro-magnet is at the house where the engine *k* is located that gives motion to the endless cable *a*, in order that the bell that is rung by the action of said electro-magnet will be heard by the engineer in charge of the engine. To operate said electro-magnet *m* and ring the bell, we employ a metallic circuit-closing plate *n'* upon each car, which plate, when brought into contact with said conductors 2 and 3 at any place in the line

of the road, forms a bridge-plate or circuit-closer for the current to pass from one electric conductor to the other. When said plate n' is brought into contact with the electric conductors of the closed circuit, Fig. 2, the current takes the route of least resistance and passes from the battery by wire 2, bridge-plate n', and wire 3, back to the battery, and the electro-magnet is demagnetized, and its armature-lever is drawn back by the spring m^4, and the bell m^2 is rung.

If our invention is employed with an open circuit, as illustrated in Fig. 3, then when the plate n' is brought into contact with the electric conductors 2 and 3 it closes the circuit to the battery B, and the current passes from said battery, by wire 2, plate n', and wire 3, to the electro-magnet m, and back to the battery, and said electro-magnet is energized, and its armature-lever is attracted and the bell m^2 rung.

If a single electric conductor is used, as illustrated in Fig. 5, then one pole of the battery B is connected with the ground, and there is a wire or metallic connection between the plate n' and a box of the car-axle, as indicated at 8, Fig. 1, so that when the plate n' is brought into contact with the electric conductor 4 the circuit is closed to the electro-magnet m, and the current from the battery passes, by wire 4, plate n', and wire 8, to the car-axle, and by the metallic railway structure and ground back to the battery.

In Figs. 3 and 5 we have shown the circuit-connections to the electro-magnet m arranged so that the bell m^2 will ring continuously as long as the plate n' is in contact with the electric conductor or conductors 2 3, the current being pulsated at the back-stop of the armature, as usual, and in Fig. 2 we have shown by dotted lines a separate battery a^4, electro-magnet a^5, and bell a^6, with circuit-conections arranged as shown, so that when the electro-magnet m is demagnetized and its armature-lever rests against the back-stop a^8 the circuit will be closed to the battery a^4 and the bell a^6 will be rung continuously. In this latter instance the bell m^2 may be dispensed with.

It is now to be understood that if the conductor or attendant upon the car desires to signal the engineer to stop the cable, or to run the cable faster or slower, said attendant brings the plate n' into contact with the electric conductor or conductors and the electro-magnet is operated as aforesaid, and the bell at the engine-house is rung a succession of peals, according to the number of times the attendant brings said plate into contact with said conductor or conductors. Thus one peal may indicate "stop the cable;" two peals, "run the cable slower;" three peals, "run the cable faster," and so on, according to the preconcerted system adopted.

The plate n' should be made with a roughened face or file surface, so that when it is brought into contact with the electric conductor or conductors it will scrape off any dirt or oxide that may be upon said conductor or conductors, so as to insure a good electrical contact of said plate and the conductor or conductors.

Upon each car we provide a rod n, having a plate n' at its lower end, and this rod n passes through the slot in the tube b, and is guided at its upper end in a tube n^2, connected to the stationary part of the grip. At said upper end of the rod n there is a pin entering a slot in the lever n^3, which lever is pivoted at n^4, and it has a toothed segment n^5, engaging teeth upon a rack-bar n^6. The rack-bar n^6 is supported in the guides p p, and one end of said rack-bar is connected with the rod p' by the rod p^2, chain p^3, and bent lever p^4. The other end of said rack-bar is connected to the rod p^5 by the rods p^6 and p^7 and bent lever p^8.

A portion of the rod p^7 is made tubular to receive one end of the rod p^6, and it will be apparent upon reference to Fig. 5 that when either rod p' or p^5 is lifted the rack-bar n^6 will be moved to the right and its teeth will swing the lever n^3, which lever will lift the rod n and bring the plate n' into contact with the conductors 2 and 3, and when said rod p' or p^5 is lowered the weight of the rod n and lever n^3 will cause the parts to resume their normal position. The chain p^3 prevents the lever p^4 being moved when the rod p^5 is lifted, and the tubular portion of p^7 allows the rod p^6 to move in said tubular portion when the rod p' is lifted, thereby preventing the lever p^8 being moved when said rod p' is lifted.

The rods p' and p^5 are each provided with handles, and each rod is supported in a tube upon the dash-board of the car, so as to be easily reached by the conductor or attendant upon the car, and when either of said rods p' or p^5 is lifted the plate n' is brought into contact with the conductor or conductors.

The plate n' is connected by a bolt or rivet to the rod n, and said plate can move slightly upon its pivot, so that said plate, when brought in contact with the conductors 2 and 3, can accommodate itself to any elevations or depressions in said conductors, the movement of said plate being limited by the stops 4 4.

The plate n' is preferably insulated from the arm n by a tube of insulating material around the pivot-pin of said plate.

If desired, a spring m^7 may be connected to the plate n', which spring is sufficiently wide at its ends to rest upon both conductors when the plate n' is brought into contact with said conductors, and the current will pass from one conductor to the other by the springs as well as by the plate n', thereby insuring a perfect electrical contact of the short-circuiting device with the conductors.

Instead of using aforesaid arrangement of parts, the plate n' might be at the end of a rod having a handle of insulating material, as shown in Fig. 6, which rod the attendant passes down through the slot in the tube b,

and then gives the rod a quarter-turn to bring the plate n' under and into contact with the electric conductor or conductors. When this separate rod n is used, it is preferable to employ a metallic guide v^2, (shown by dotted lines in Fig. 4,) which guide is supported by the car, and said guide is slotted, so that the plate n can be passed down through said slot and then through the slot in the tube b, and there is a wire 8, connected to one of the journal-boxes of the car-axles and to this guide v^2, as shown also by dotted lines in Fig. 4, so that when the separate rod n is used with the single conductor, Fig. 5, there is a route for the current to pass from the electric conductor 4 by the plate n', rod n, guide v^2, wire 8, car-axle wheels, and railway structure to the ground whenever said plate n' is brought into contact with the electric conductor 4.

When our invention is used upon an elevated cable road, the electric conductor or conductors are to be placed upon one of the wooden guard-rails, as shown in Fig. 9, and the metal plate may be upon a rod, the same as shown in Fig. 6, so that the attendant upon the car can bring said plate into contact with said conductor or conductors whenever he desires to signal the engineer at the engine-house.

We remark that instead of the electro-magnet m ringing a bell it may operate a signaling device of any desired kind.

In addition to employing the electro-magnet m for signaling, it may be used for operating the steam-cock m', that controls the supply of steam to the engine that drives the endless cable, as shown in Fig. 5.

k represents the engine for giving motion to the endless cable; k', the pipe for supplying steam to the cylinder of said engine, and m' is a cock in the supply-pipe k', which cock when turned in one direction allows steam to pass to the engine, and when turned in the other direction shuts off the supply of steam to said engine. The armature of the electro-magnet m may be connected directly to the plug of said cock m', so that when said electro-magnet is demagnetized a spring may draw down said arm, and turn the plug of said cock, so as to shut off the supply of steam to the engine and stop the same. We prefer, however, the arrangement of devices shown in Fig. 5 for operating said cock. In this figure b^2 is a small cock in a pipe b^3, passing from the steam-supply pipe k' to the small cylinder b^4, which cylinder contains a piston and spring b^9. The piston-rod of said piston is connected by a link b^5 to the arm m^{10}, which latter is connected to the plug of the cock m'.

When the electro-magnet m is energized to stop the engine and cable, it draws down the armature and opens the small cock b^2 and allows steam to pass to the cylinder b^4, which steam moves the piston of said cylinder, and by the rod b^7, link b^5, and arm m^{10} turns the plug of the cock m' and shuts off the supply of steam to the engine. As soon as the electro-magnet m ceases to act the spring m^4 moves the armature the other way and turns the cock b^2 and shuts off the supply of steam to the small cylinder b^4 and opens an exhaust-passage for the steam to escape from said cylinder b^4. The spring b^9 now moves back the piston in said cylinder, and by the rod b^7, link b^5, and arm m^{10} the cock m' is turned and steam again admitted to the engine k to put the same running.

By the arrangement shown the signal will be given each time said electro-magnet is energized; hence if the devices operated by said electro-magnet should fail to turn said cock and shut off the supply of steam then the signal operated by said electro-magnet will notify the engineer that he must stop the engine.

By combining the signaling device with the devices for operating the steam-supply cock of the engine there is a double provision made for stopping the engine and cable, for if the devices operated by the electro-magnet fail to turn the cock m' and shut off the supply of steam there is a certainty that said electro-magnet will operate the signal to notify the engineer that he must stop the engine.

We are aware that electric devices have been employed upon railway-cars for giving signals to or from distant stations, and in this case the magnet has been upon the car, and in many instances the battery has also been placed upon the car, and in some instances conductors have been employed adjacent to the railway track for signaling purposes, and electric conductors have been placed in the conduit or trench containing the cable, and such conductors have conveyed the electric current to lighting and heating appliances within the car.

By our present improvements the circuit-closing devices upon the car perform no office except to bring into action the electric current to operate the electro-magnet at the engine-house where the power is located that energizes the cable, in order that the distant motive power that drives the car through the cable-connection may be stopped or started from either one of a number of cars that are driven by the cable, whereby the instrumentalities brought into combination are effective in preventing accident at either of the cars that may be driven by such cable in consequence of the appliances under the control of the conductor for stopping the cable whenever necessary.

We claim as our invention—

1. In a railway system having a stationary engine, an endless cable propelled by such engine, cars, and grip-connection between the cars and cable, and insulated electric conductors parallel with the cable, a source of electric energy, an electro-magnet at the stationary engine for signaling purposes, and circuit-

closing mechanism upon the cars for enabling signals to be given by the conductor to the engineer in charge of the engine, that the cable may be stopped, started, or slowed, substantially as set forth.

2. The combination, with the endless cable, a car and grip, and the engine for giving motion to said cable, of the conductor or conductors following the line of the cable, a battery in the circuit formed by said conductors, a metallic plate upon the car adapted to be brought into contact with said conductors, and an electro-magnet also in said circuit for controlling the supplying of steam to said engine, substantially as and for the purposes set forth.

3. The combination, with the endless cable, a car and grip, and the engine for giving motion to said cable, a steam-supply pipe and cock for said engine, the conductor or conductors, the electro-magnet and battery in the circuit formed by said conductors, a metallic plate upon the car adapted to be brought into contact with said conductors, and means, substantially as specified, operated by said electro-magnet for working the steam-supply cock, as specified.

4. The combination, with the endless cable and the car and grip, of the rod n, plate n', the lever n^3, rack-bar n^6, rods p' and p^5, and connections between said rack-bar and the rods p' and p^5, substantially as specified, so that the rod n may be operated from either end of the car, as set forth.

Signed this 10th day of November, 1888.

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Witnesses:
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