No. 621,205. Patented Mar. 14, 1899.

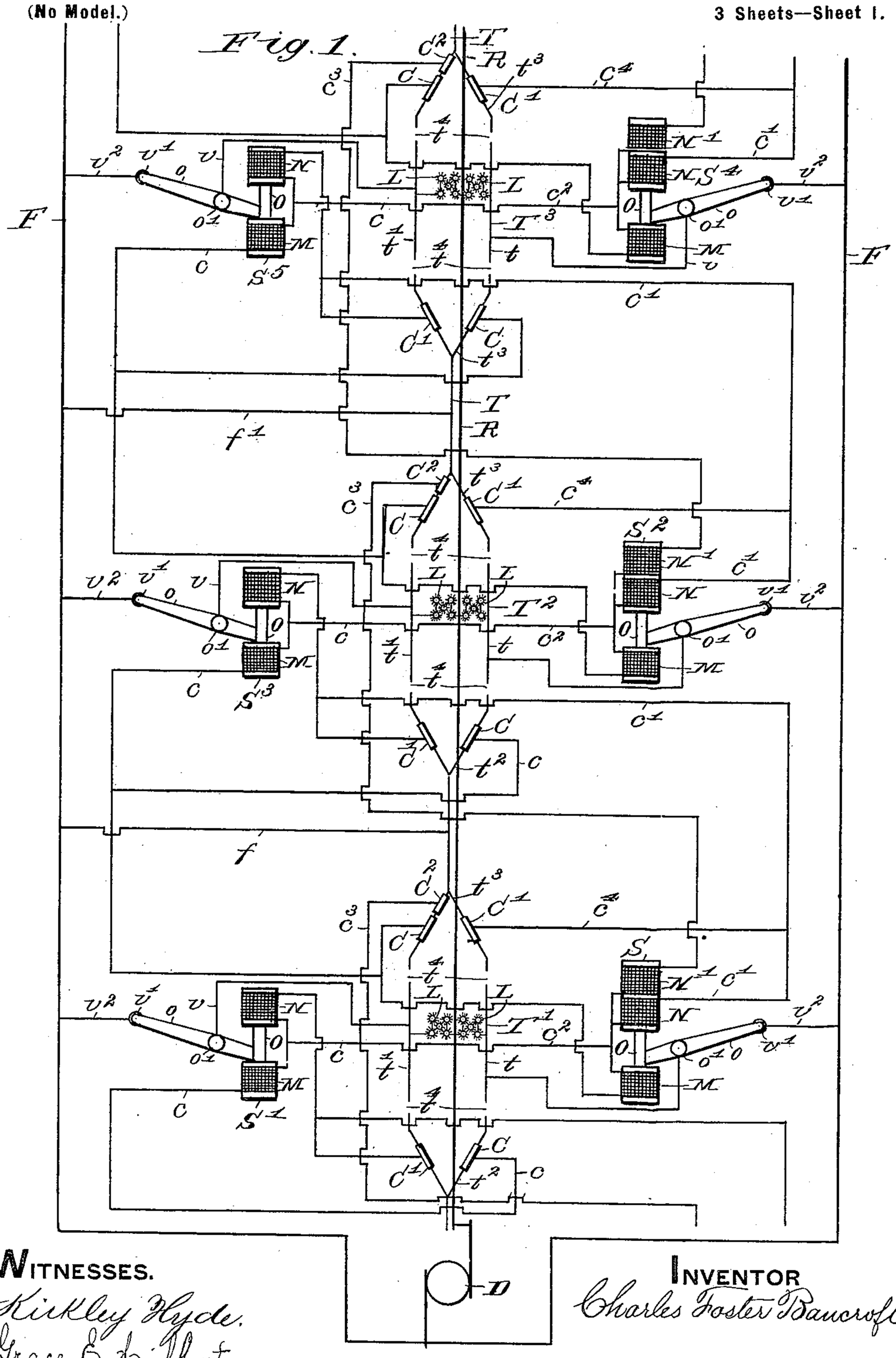
C. F. BANCROFT.

AUTOMATIC SYSTEM FOR PREVENTING COLLISIONS ON ELECTRIC RAILWAYS.

(Application filed Nov. 3, 1898.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.



WITNESSES.

Kirkley Hyde.

Grace E. Libbert.

INVENTOR

Charles Foster Bancroft,

BY Albert M. Moore,

His ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 621,205. Patented Mar. 14, 1899.

C. F. BANCROFT.

AUTOMATIC SYSTEM FOR PREVENTING COLLISIONS ON ELECTRIC RAILWAYS.

(Application filed Nov. 3, 1898.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 2.

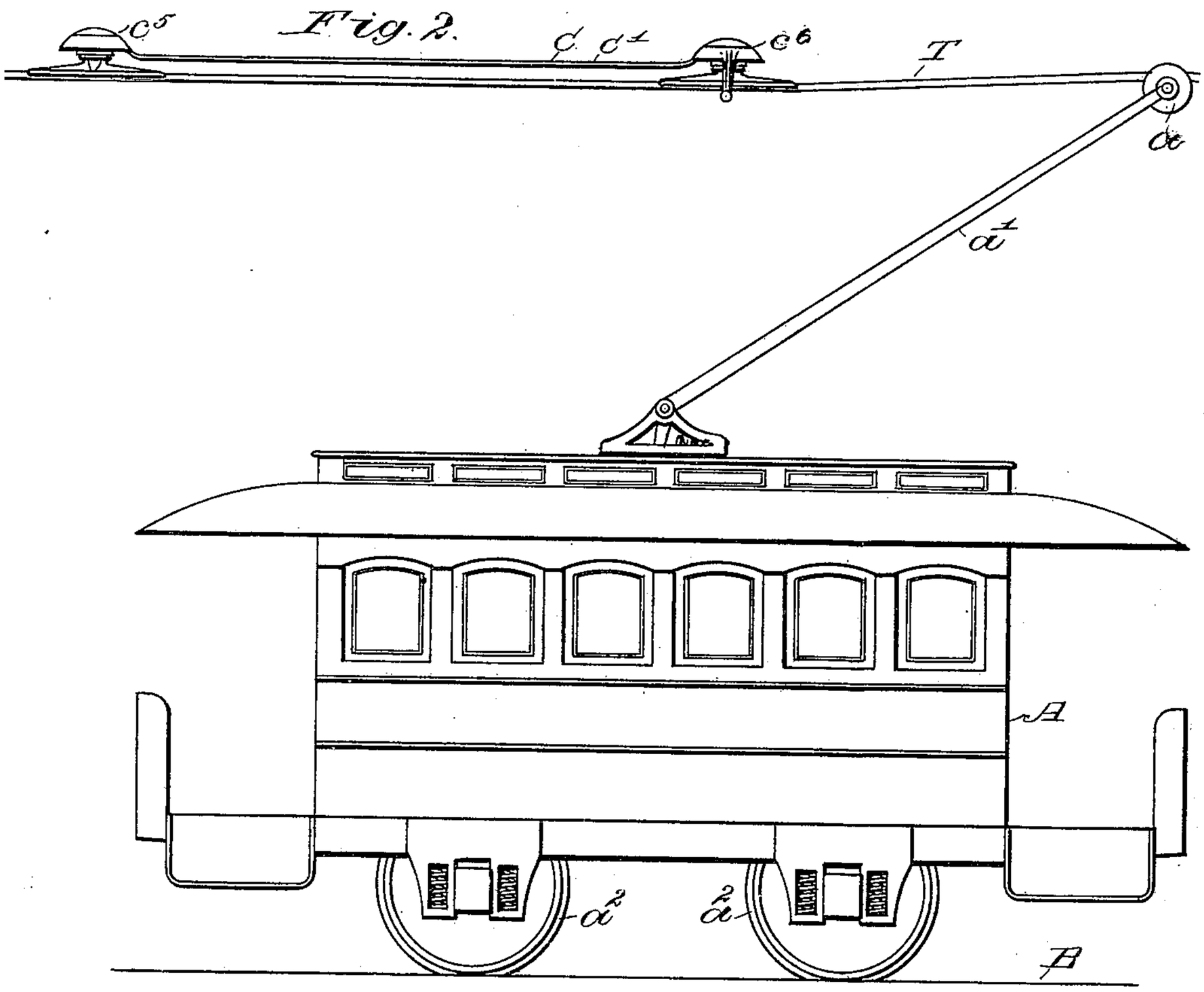


Fig. 3.

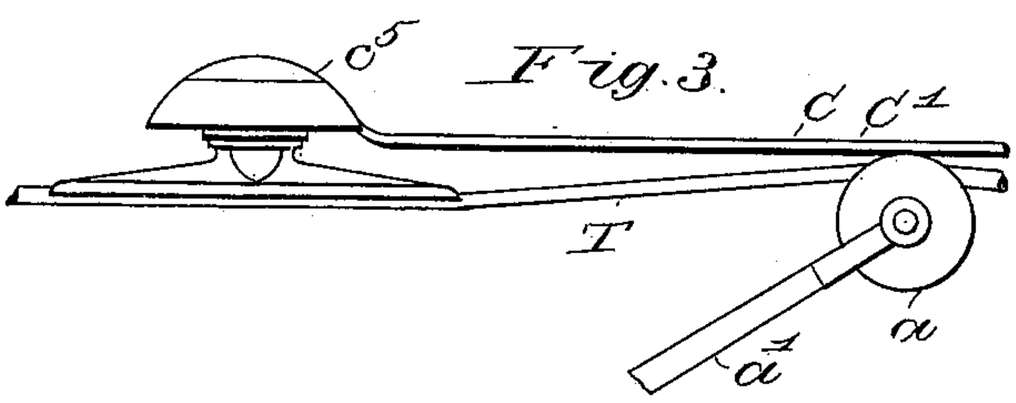


Fig. 4.

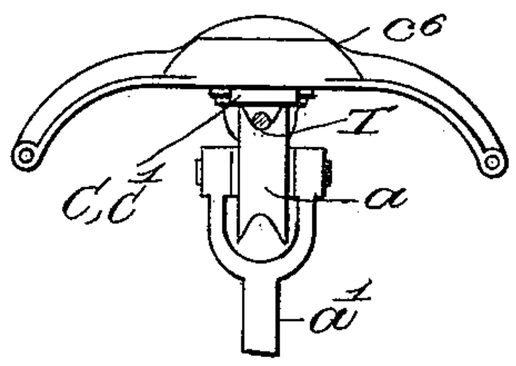
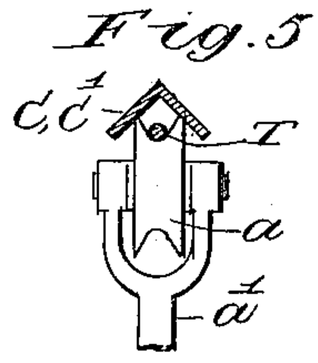


Fig. 5



WITNESSES.

Kirkley Hyde.
Grace E. Hibbert.

INVENTOR

Charles Foster Bancroft,

By Albert M. Moore,
His ATTORNEY.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 621,205. Patented Mar. 14, 1899.

C. F. BANCROFT.

AUTOMATIC SYSTEM FOR PREVENTING COLLISIONS ON ELECTRIC RAILWAYS.

(Application filed Nov. 2, 1898.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

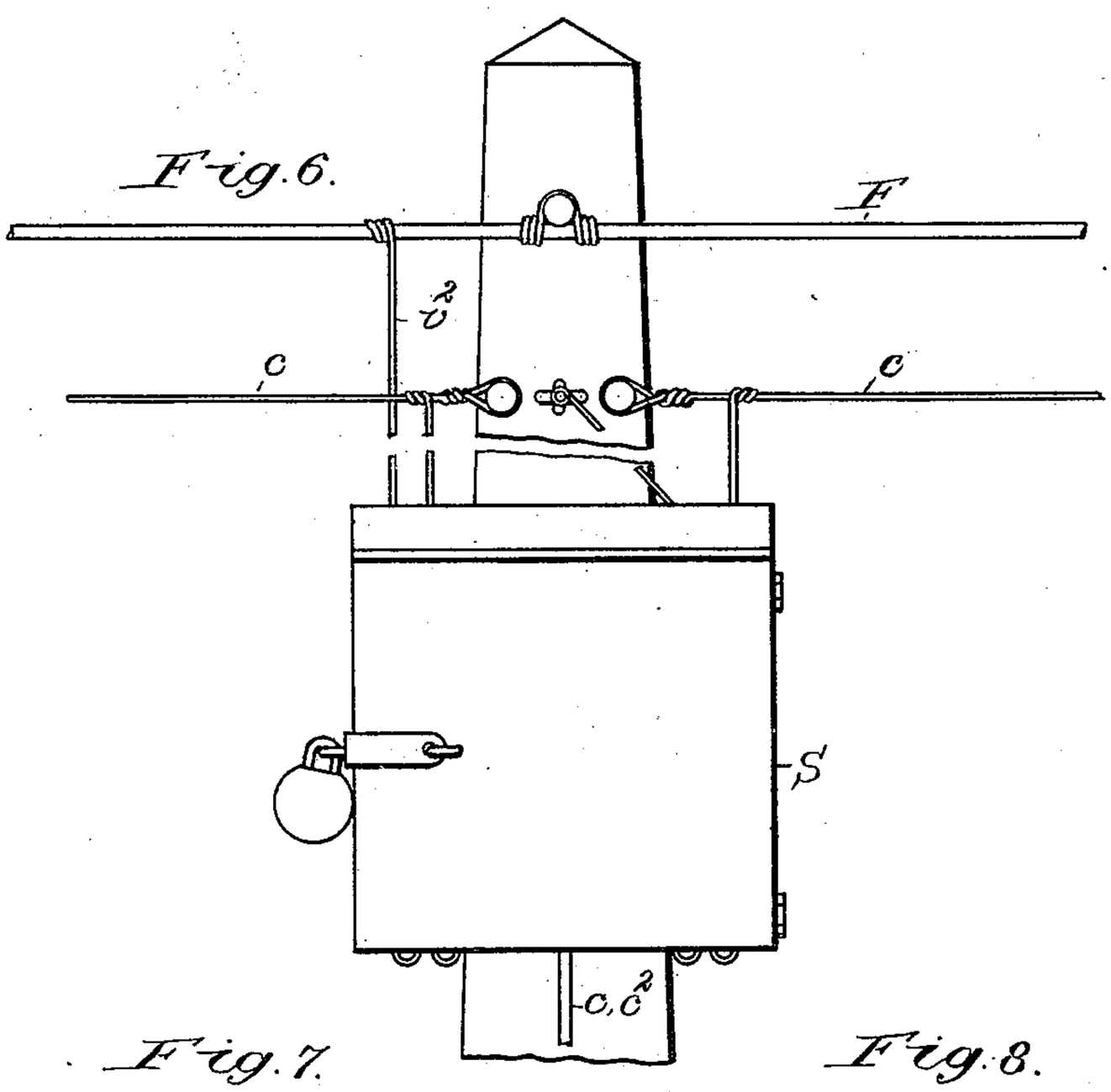


Fig. 7.

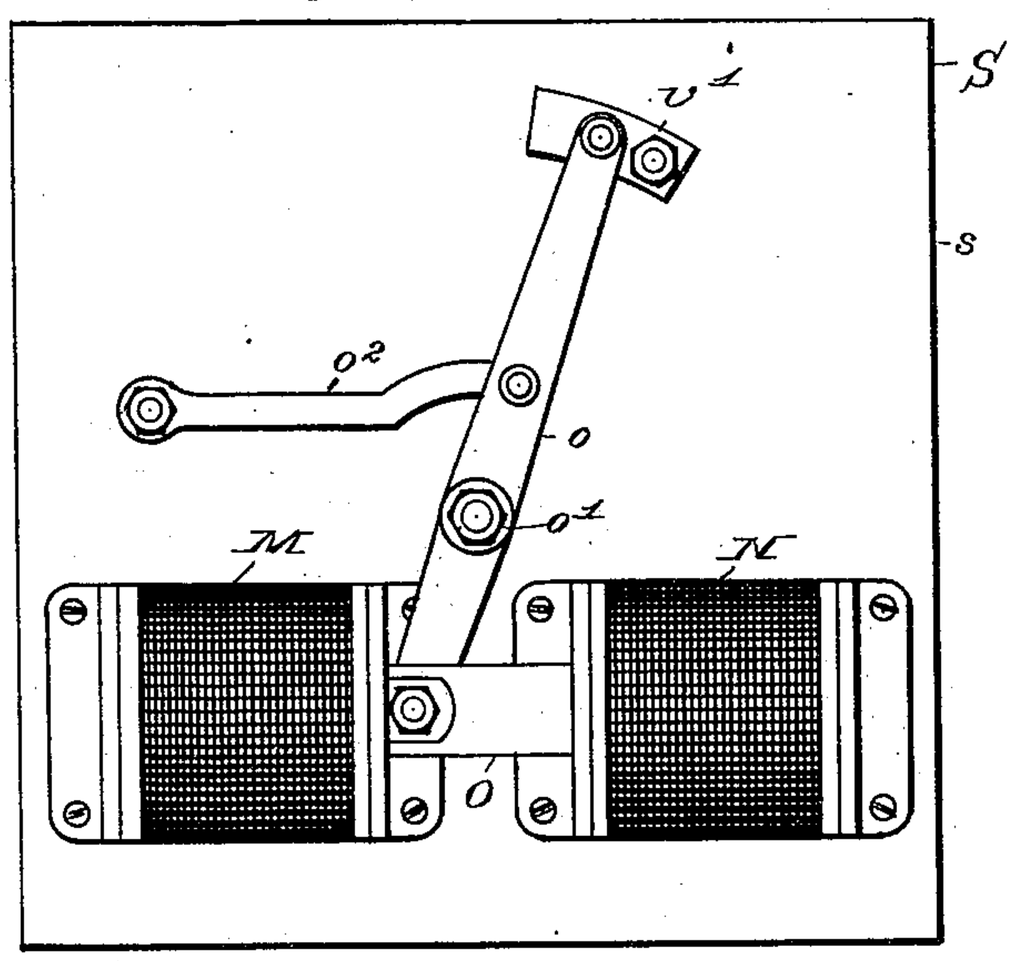
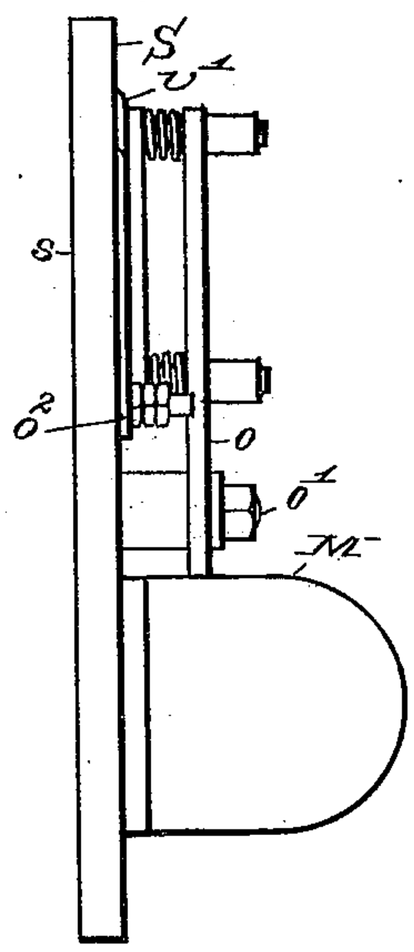


Fig. 8.



Witnesses.
Kirkley. Hyde
Grace E. Libbert.

Inventor
Charles Foster Bancroft,
By Albert M. Moore,
His Attorney.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CHARLES FOSTER BANCROFT, OF LOWELL, MASSACHUSETTS, ASSIGNOR OF ONE-HALF TO PATRICK F. SULLIVAN, OF SAME PLACE.

AUTOMATIC SYSTEM FOR PREVENTING COLLISIONS ON ELECTRIC RAILWAYS.

SPECIFICATION forming part of Letters Patent No. 621,205, dated March 14, 1899.

Application filed November 3, 1898. Serial No. 695,347. (No model.)

To all whom it may concern:

Be it known that I, CHARLES FOSTER BANCROFT, a subject of Victoria, Queen of the United Kingdom of Great Britain and Ireland, and a resident of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain new and useful Improvements in Automatic Systems of Preventing Collisions on Electric Railways, of which the following is a specification.

This invention relates to automatic systems of preventing collisions on electric railways; and it consists principally in means whereby the passing of a car along a section of line will shut off the power from another section of the same.

This invention is particularly applicable to a single-line track provided with turnouts of any usual construction, on which cars may pass each other in opposite directions, it being understood that the car going in the same direction always keeps at the same side of the turnout.

The general adoption of this invention would render traveling on single lines less dangerous to the public and less costly to the owners of the railways.

In the accompanying drawings, on three sheets, Figure 1 is a diagrammatic plan of a dynamo and a conducting system or line, representing three turnouts provided with my improvement; Fig. 2, a side elevation of an electric car carrying a trolley, part of a trolley-wire, and a longitudinal section of a conducting or contact plate insulated from said wire and adapted to form with said trolley a circuit-closer; Fig. 3, a side view of the trolley-wire, contact-plate, and trolley; Fig. 4, a cross-section of the trolley-wire and a rear elevation of the trolley, the upper part of the trolley-pole, the contact-plate, and a hanger; Fig. 5, a cross-section of a modification of said plate and wire and a rear elevation of the trolley and upper part of the trolley-pole; Fig. 6, a front elevation of a post with feed-wire, a feed tap and wire from contact-plates, feed-wire for a turnout-section of the trolley-wire, and automatic switch-box; Fig. 7, a front elevation of the switch and its base; Fig. 8, a side elevation of said switch and base.

The car A, Fig. 2, is of any usual construction, in which the current is taken from a trolley-wire T by a trolley a, brush or equivalent device, and pole a' through an electric motor (not shown) carried by the car, and through the wheels a^2 and by the rails (indicated in Fig. 2 by line B) or by a return-wire R, Fig. 1, to the dynamo or other electric source. The track forms no part of my invention and is not herein shown, except as above stated.

The trolley-wire T, feed-wires F, feed-wire taps ff', return-wire R, dynamo D, and turnouts T' T^2 T^3 are all of any usual construction.

In each turnout the branches or sides t t' are in separate sections from the end portions or frogs t^2 t^3, being electrically separated from and mechanically connected to said frogs by section-insulators of usual construction. (Indicated by breaks at t^4, see Fig. 1.)

Parallel with each branch of each frog t t' and in close proximity thereto, but insulated therefrom, is arranged a plate C or C′ of conducting material, Figs. 2, 3, 4, and 5, against which the trolley-wheel a presses in passing (the trolley-wire between the ends of said plate yielding upward, as shown in Fig. 3) and closes a circuit from the trolley-wire through a switch-box S S' S^2 S^3 S^4 S^5 to the return-wire R, there being at each turnout such a switch-box, as shown in Fig. 1.

The construction of each switch-box is shown in Figs. 6, 7, and 8. Each switch-box contains, supported on a non-conducting plate or base s, a pair of solenoids M N, surrounding a core O, common to both solenoids, to which core is pivoted a lever o, the fulcrum o' of said lever being also secured on said base, and said lever being electrically connected, as by wire v, to the adjacent branch t or t' of the nearest turnout, said wire v being connected directly to the fulcrum o', as indicated in Fig. 1, or to a conducting-plate o^2, over which said lever swings and with which said lever is always in contact, as indicated in Fig. 7. When the lever o is in the position indicated in Figs. 1 and 7, its free end rests on a contact v' of a supplementary feed-tap v^2, thus connecting the feed-wire F to the branch t or t' through the wire v^2, lever o, and wire v. When the lever o is moved by the action of the solenoid N on the

core O and opens the line v^2 *o* v, the corresponding branch *t* or *t'* is dead.

The cars are supposed to be passing from and toward the power-station or dynamo D and keeping to the right on the turnout. As the first car out from the power-station passes the contact-plate C of the first turnout T' the circuit is closed from the trolley wire or frog t^2 (which is part of said trolley-wire) through the trolley, said plate C, line *c*, solenoid M, (of the switch-box S',) and line *c* to the return-wire, leaving the lever *o* in the position shown in Fig. 1 at said first turnout T'. The car will proceed over the branch *t*, (if the lever *o* of the switch-box S' is in the position shown,) and passing the contact-plate C' will close a circuit from the trolley wire or frog t^3 through wires c^4 *c'* to the solenoid N of the switch-box S' at the right of the first turnout T' and by wire c^2 to the return-wire R, thus energizing said solenoid, moving the corresponding lever *o*, and rendering the branch *t*, which the trolley has just left, dead, and by a smaller circuit (marked with corresponding letters of reference) energizing the solenoid N of the switch-box S^3 at the left of the next turnout in advance and breaking the line v^2 *o* v to the branch *t'* of the turnout T^2, thus making said last-named branch *t'* dead. As the car proceeds at each turnout the trolley branch *t* at the right is thrown out of circuit after the trolley leaves it, and simultaneously the trolley branch *t'* on the left of the next turnout in advance is thrown out of circuit. When in the progress of the car the trolley comes in contact with the switch-plate C at the right of any turnout T^2 or T^3, after the first a circuit is closed through the solenoid M at the left of that turnout, as above described with relation to the first turnout T', but by wires *c* the magnet M at the right of the turnout last passed is energized to move the corresponding lever *o* and to connect the dead branch of the last-named turnout with the feed-wire. When the car having reached the end of the line returns, the same operation is repeated, the terms "right" and "left" still applying to the motorman who faces in the direction in which the car moves and therefore to the car.

It is evident from the foregoing that when a car has passed over a branch of a turnout no car can enter on said branch until the car in advance has reached the next turnout and that no car can approach it in the opposite direction nearer than the next turnout.

A convenient way of supporting and insulating the contact-plates C C' is by means of insulating-hangers c^5 c^6 of common form, such as are used for span-wire clamps and insulator-holders, and I prefer to make said plates of the form of angle-plates, as shown in Fig. 5, with the external angle on top to prevent the lodgment of ice or snow thereon. At each turnout each branch *t t'* may be connected with the return-wire by a local circuit containing an audible or visible signal. Thus in Fig. 1 a light-circuit is shown at L, the lights being extinguished when the branch is dead or out of circuit and glowing at other times, thus indicating to the motorman that the power is off and warning him not to enter on the dead branch for fear of putting out the electric lights on the car or of shutting off the heaters or leaving the car without power to move in case of accident or other necessity.

It is evident that with this invention there can be no collision between cars approaching the section between the turnouts except in the rare case where the trolleys of two cars simultaneously operate corresponding contact-plates, unless the cars were carried across the insulated section by their own momentum; but to guard against even this source of danger I use an additional contact-plate C^2, arranged at the entrance of the turnout at the right of a car approaching the turnout, and an additional solenoid N' is arranged to operate the lever *o* to cut off the current from the middle or insulated section *t* on the opposite of the next turnout, making it impossible for another car to leave the insulated section of said last-named turnout if the first-named car had already entered upon the insulated section *t'* of its own turnout, thus making a collision impossible. It will be understood that the solenoid N' is electrically connected to the return-wire R by the wire c^2 and to the contact-plate C^2 by the wire c^3, and that the contact-plate C^2 is like the contact-plates C C' and that the solenoid N' is like the solenoid N.

It is obvious that where one track of a double track is discontinued temporarily for repairs on account of less travel or because of the expense and difficulty of keeping both tracks open and a comparatively short section of track is connected to the other track by crossovers said short section and crossovers constitute, in effect, a turnout, and in such cases corresponding turnouts are formed in the wire, and the above-described invention is applicable as well as where two parallel tracks are continued in a single track.

I claim as my invention—

1. The combination in an electric railway, of a feed-wire, a trolley-line, provided with turnouts, having in each branch an insulated section, and means whereby the moving of a trolley or equivalent device over one branch of one of said turnouts will render the insulated section of the opposite branch of the next turnout in advance dead and prevent an approaching car from passing over said last-named turnout.

2. The combination in an electric railway, of a feed-wire, a trolley-line, provided with a turnout, having an insulated section in each branch thereof, and means whereby the moving of a trolley or equivalent device over a branch of one of said turnouts will leave the insulated section of said branch dead and prevent a following car from passing over said turnout.

3. The combination in an electric railway, of a feed-wire, a trolley-line provided with turnouts having in each branch an insulated section, and means whereby the moving of a trolley or equivalent device over a branch of one turnout will render dead said branch and the opposite branch of the next turnout in advance and prevent any car from passing onto the line between said turnouts.

4. In an electric railway, a return-wire, a single trolley-line, having turnouts, provided with insulated sections, feed-wires, in circuit with the sections between said insulated sections, contact-plates, insulated from said last-named sections but adapted to be electrically connected therewith by a trolley or equivalent conducting device passing along said contact-plates, electric switches, electric conductors, connecting said feed-wire and said insulated sections through said switches, and electric circuits, including said contact-plates, and means for operating said switches, to open or close said switches.

5. The combination of an electric railway, of a feed-wire, a single trolley-line, having turnouts, each provided with an insulated section, a switch, in circuit between said feed-wire and said insulated section at one turnout, and another circuit normally open, means, arranged in said last-named circuit, for operating said switch and a circuit-closer, arranged in said last-named circuit at another turnout.

In testimony whereof I have affixed my signature in presence of two witnesses.

CHARLES FOSTER BANCROFT.

Witnesses:
ALBERT M. MOORE,
KIRKLEY HYDE.