(No Model.) 2 Sheets—Sheet 1.

C. E. CORPORAN.

ELECTRIC RAILWAY SIGNAL.

No. 473,614. Patented Apr. 26, 1892.

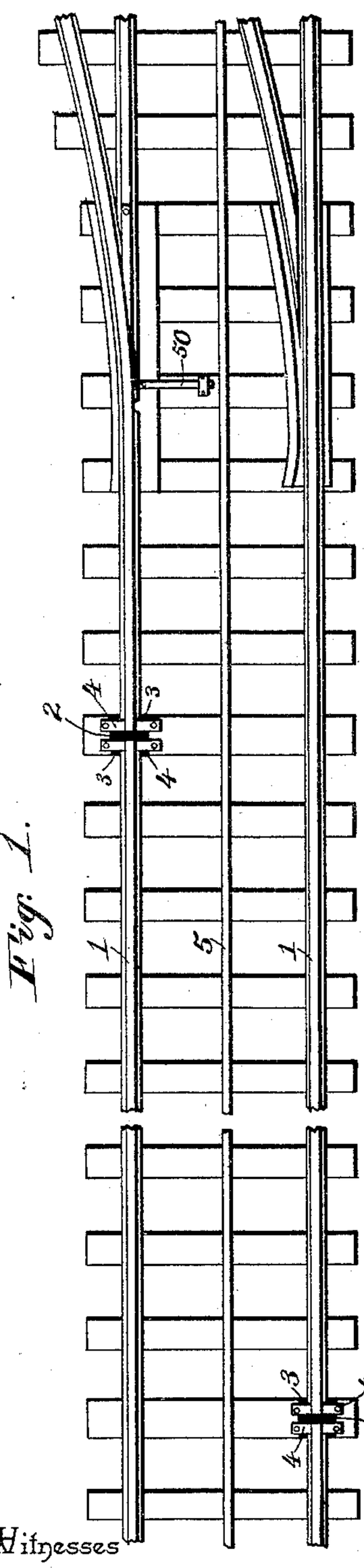

Fig. 1.

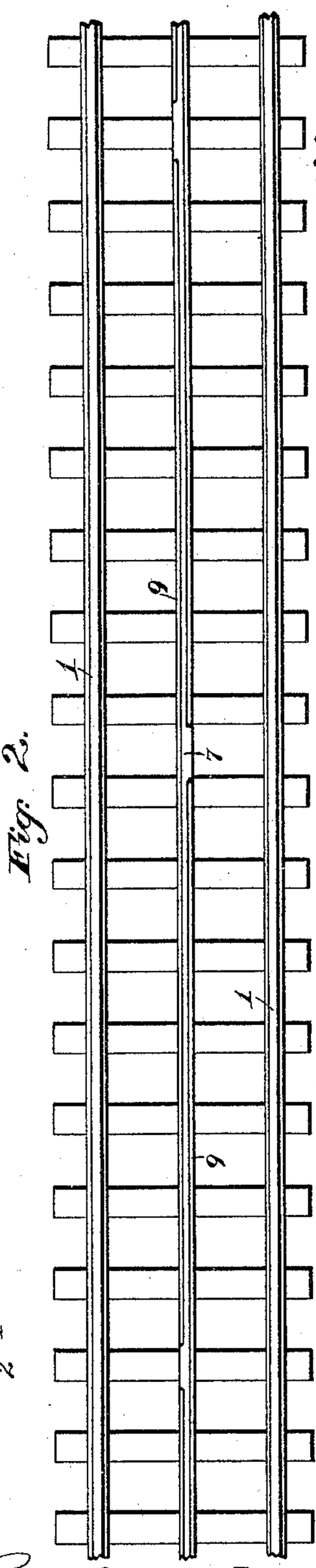

Fig. 2.

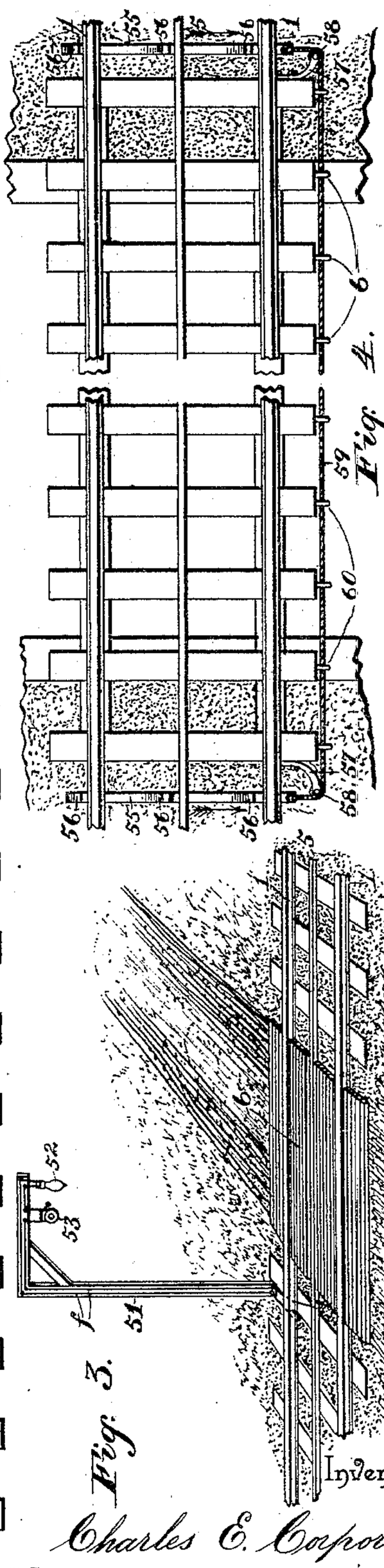

Fig. 4.

Fig. 3.

Witnesses

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(No Model.) 2 Sheets—Sheet 2.

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Fig. 5.

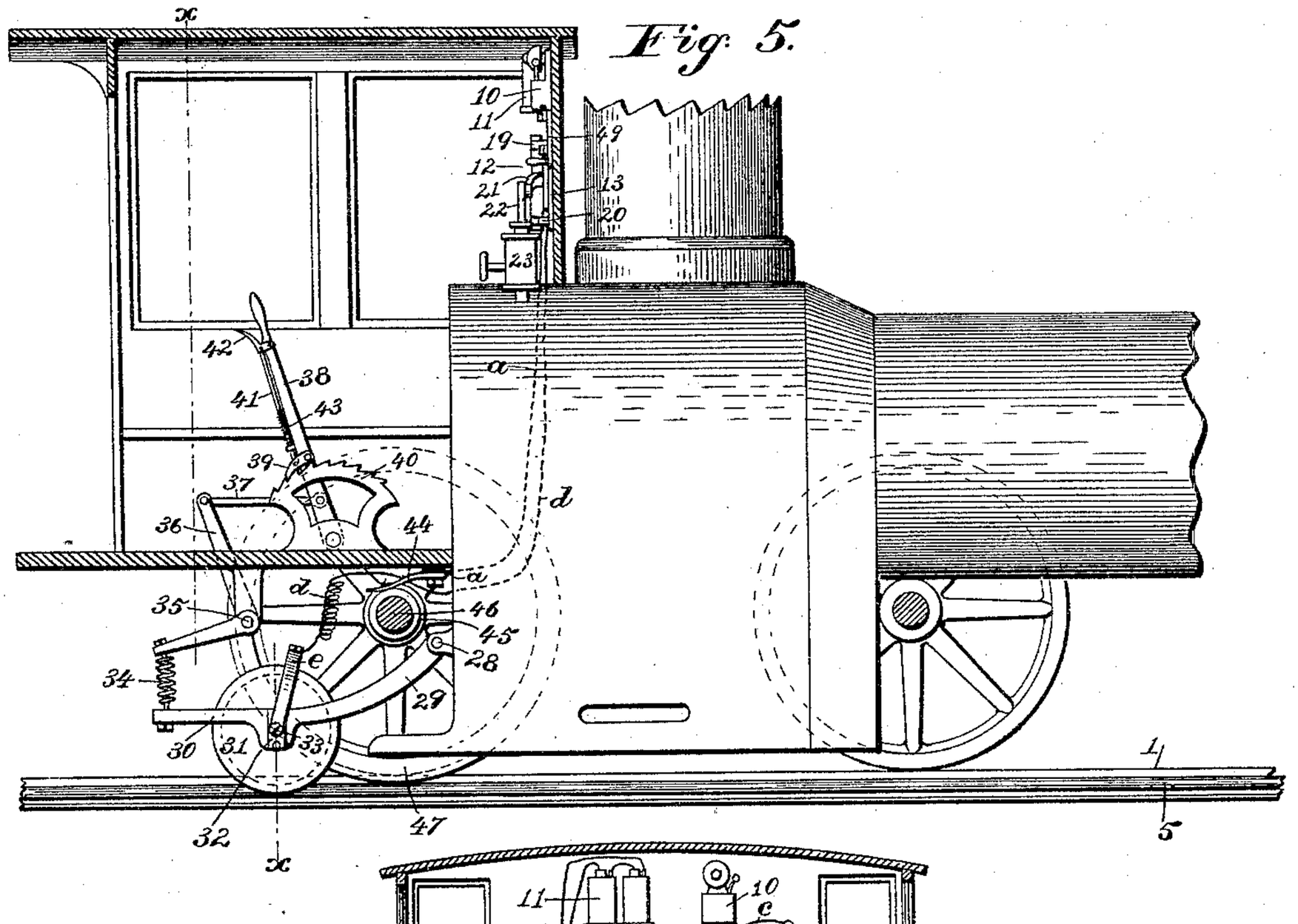


Fig. 7.

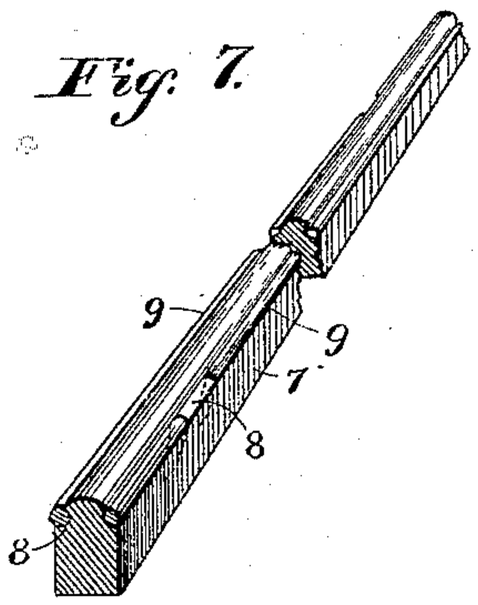


Fig. 6.

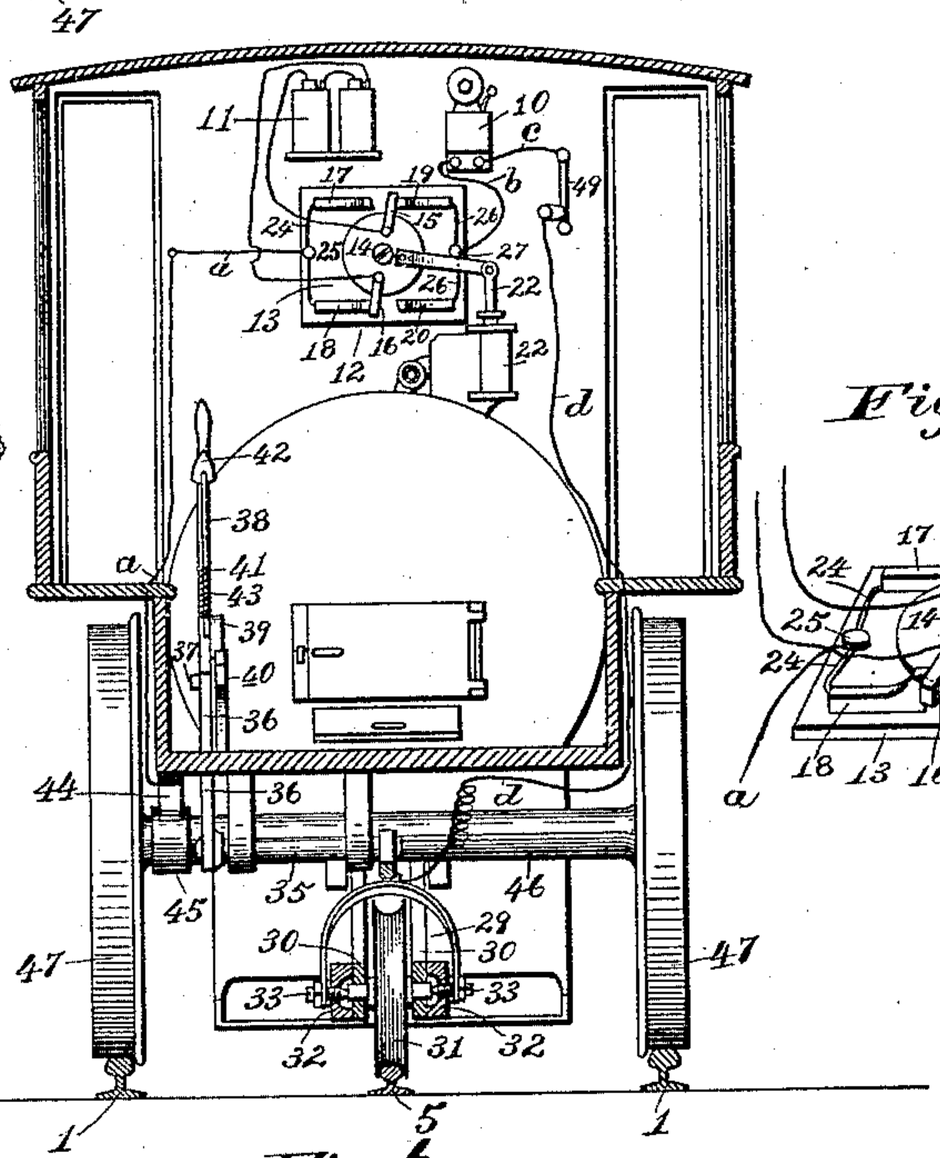
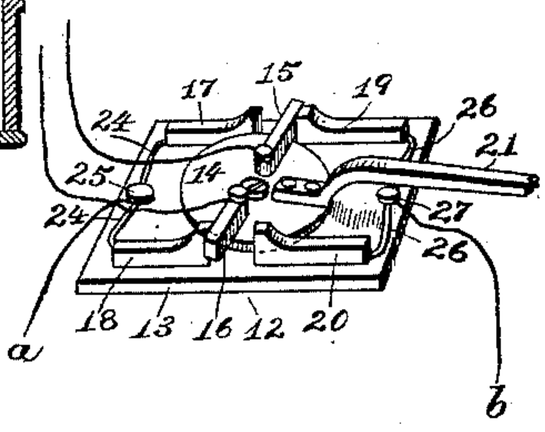


Fig. 8.



Witnesses
Percy C. Bowen.
H. C. Faul.

By his Attorneys,
Charles E. Corporan.
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UNITED STATES PATENT OFFICE.

CHARLES E. CORPORAN, OF COLORADO CITY, COLORADO.

ELECTRIC RAILWAY-SIGNAL.

SPECIFICATION forming part of Letters Patent No. 473,614, dated April 26, 1892.

Application filed June 17, 1891. Serial No. 396,587. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. CORPORAN, a citizen of the United States, residing at Colorado City, in the county of El Paso and State of Colorado, have invented a new and useful Electric Railway-Signal, of which the following is a specification.

This invention relates to signals for railways, and has for its object to provide a signal which will apprise the engineer of a train of the approach of another train on the same track, either from the front or rear, and will also give notice to the engineer of the approaching train that his train is coming dangerously near to a train on the same track, and will warn him to stop or to proceed very cautiously. I attain this object and such others as fairly fall within the scope of the invention by means of the mechanism illustrated in the accompanying drawings, the peculiar construction, combination, and arrangement of which will be hereinafter fully described, and the specific points of novelty particularly pointed out in the claims.

Referring to the drawings, Figure 1 is a plan view of a railroad-track provided with my improvements. Fig. 2 is a similar view of a modification. Fig. 3 is a perspective view showing my invention as applied to a signal for railroad-crossings. Fig. 4 is a plan view showing my invention as applied to a bridge. Fig. 5 is a longitudinal sectional view of the rear part of an engine having my improvements attached thereto. Fig. 6 is a transverse sectional view on the line *x x* of Fig. 5. Fig. 7 is a perspective view of the center rail used in the arrangement of track shown in Fig. 2. Fig. 8 is a similar view of the pole-changer.

Similar numerals and letters of reference designate corresponding parts in the several views.

In Fig. 1 is shown a railroad having the rails 1 electrically connected to each other at the joints in lengths or sections of about one mile each, each section being insulated from the next section by means of an insulation 2, placed between the meeting ends of the rails. A piece of insulating material 3 may be placed upon the ties beneath the meeting ends of the rails, and the ends of the rails are secured in place by plates 4, the ends of which are placed upon the flange upon each side of the rail, and the plates are then bolted or spiked down to the tie, as shown in Fig. 1. The sections of the rail should be long enough to admit of a train being stopped within one-quarter of the length of the section. Preferably they will be made about one mile in length and arranged to break joints on the two sides of the track, as shown. A center rail 5, which may be lighter than the track-rails, is laid along the center of the track and forms a continuous conductor. At crossings and other places where necessary the center rail 5 may be protected by planks 6, laid upon the ties on each side of the said rail, the upper sides of the said planks being slightly higher than the top of the center rail.

In Fig. 2 is shown a view of a railroad-track in which the rails are all in electrical connection at their meeting ends, forming a continuous conductor. In this instance the center rail 7 is formed of wood, having the upper edge rounded in cross-section, as shown in Fig. 7, and provided with longitudinal grooves 8 along each side of the top thereof. Conductors 9, each of which is about a mile in length, are secured in the grooves 8 on the opposite sides of the upper part of the center rail 7 and are arranged so that the conductors 9 on one side will break joints with those on the other. The conductors 9 have no electrical connection with each other.

It will be seen that the arrangement of track shown in Fig. 1 differs from that shown in Fig. 2 in that in the first the center rail 5 forms a continuous conductor and the track-rails 1 are divided into separate sections of suitable lengths, each section forming a conductor and being insulated from the other sections, and in the second the track-rails 1 form the continuous conductor and the center rail 7 is of insulating material and provided with conductors of suitable lengths arranged along the top thereof and insulated from each other, the essential features being the same in each case—*i. e.*, a railroad-track provided with one continuous electrical conductor and a series of conductors, each of suitable length, insulated from each other and arranged in a double line along the track, the conductors in one line breaking joints with those in the other line.

In the cab of the engine is arranged an elec-

tric bell 10, a battery 11, and a pole-changer 12, the preferable form of battery being the dry battery. The pole-changer consists of a base 13, upon which is centrally pivoted a disk 14, having two conducting-strips 15 and 16 secured upon the face thereof and projecting beyond the edges at diametrically-opposite points. Four conducting-strips 17, 18, 19, and 20 are secured two upon each side of the base, the inner ends of each pair being placed upon opposite sides of the ends of the strips 15 and 16 upon the disk. A little space is left between the ends of the strips upon the base and the strips upon the disk, so that when the disk is turned slightly the ends of the strips 15 and 16 may be brought in contact with the adjacent ends of the strips 17, 18, 19, and 20. An arm 21 is secured to the face of the disk 14 and extends outwardly from the edge thereof at right angles to the strips 15 and 16 and is connected at its outer end with a piston-rod 22, extending from a cylinder 23, suitably connected with the steam-chest of the engine, so as to be operated by the steam. The said cylinder 23 is provided with any suitable automatic valve to give the piston a reciprocating motion and a valve by means of which the engineer may control the admission of steam to the cylinder. These valves being of any suitable construction and forming no part of the invention are not shown herein.

The pair of conducting-strips 17 and 18 are connected together by wires 24, as at 25, and the pair 19 and 20 are also connected together by wires 26, as at 27.

Beneath the engine is pivoted, as at 28, a frame 29, consisting of two side pieces 30, connected together at their ends and having a trolley-wheel 31 arranged between them and journaled in suitable openings through the said side pieces 30 near the middle thereof. A bracket 32 is secured upon the outside of the side pieces 30 over the ends of the journals of the trolley-wheel 31, having a screw-threaded opening in line with the center of the said journals. A screw 33, having a pointed or cone-shaped inner end, is passed through each of the threaded openings in the brackets 32, and the cone-shaped end of the screw 33 enters a correspondingly-shaped depression in the center of the ends of the journals of the trolley-wheel 31, thus making electrical connection with the said wheel.

As has been hereinbefore stated, one end of the frame 29 is pivoted beneath the engine. The other end of the said frame is secured to the lower end of a stiff coiled spring 34, the upper end of which spring is connected with an arm on the inner end of a rock-shaft 35, journaled in suitable bearings beneath the engine, and the rock-shaft is in turn connected by an arm 36 and link-rod 37 with an operating-lever 38, fulcrumed in the cab of the engine. The lever 38 is provided with a pawl 39, adapted to engage with ratchet-teeth upon a segmental rack 40, and thus hold one end of the frame 29 in a raised position. A rod 41 is connected with the pawl 39 and with a hand-piece 42 upon the handle of the lever 38, by means of which the pawl may be raised when it is desired to lower the frame 29. A spring 43 is arranged to hold the pawl 39 in engagement with the teeth of the segmental rack 40. From the foregoing it will be understood that the trolley-wheel 31 is adapted to run upon the center rail of the track. It may be conveniently raised or lowered by the lever 38, the pawl of which will retain it in a raised position when desirable, and the spring 34 will keep it pressed upon the center rail when lowered, and will also allow it to ride over small obstructions or inequalities in the rail. Should the trolley-wheel meet a larger obstruction upon the track, it will jump upwardly and move the lever 38, the pawl 39 of which will pass freely over the ratchet-teeth of the segmental rack 40 and hold the frame and wheel in a raised position until lowered again by the engineer. The poles of the battery are each connected with one of the conducting-strips upon the disk 14, as shown in Fig. 6. For instance, the positive is connected with the conducting-strip 15 and the negative with the strip 16.

A wire *a* is connected with the point 25 of the pole-changer and extends therefrom to a brush 44, which is arranged to make contact with a collar 45 of good conducting material upon the shaft 46 of the driving-wheels 47 of the engine, thus connecting one pair of the conducting-strips of the pole-changer through the driving-wheels with the rails, and the other pair of conducting-strips of the pole-changer are connected by a wire *b* (which extends from the point 27) with the electric bell 10, which latter is connected by a wire *c* with a key or switch 49, from which a wire *d* extends beneath the engine and is connected with a strip *e*, which is connected at its ends with the screws 33 to make electrical contact with the trolley-wheel 31 and forms an arch over the said trolley-wheel, as shown in Fig. 6. The trolley-wheel being in contact with the center rail, it will be seen that one pole of the battery is connected with the continuous conductor and the other pole thereof with the lengths or sections of conductor which are beneath the engine, the circuit being open until a connection is made between the section of conductor upon which the engine is and the continuous conductor. Now if an engine provided with the herein-described electrical appliances enters upon the same section of the conductor (either in front or in rear of the first-mentioned engine) it will be apparent that the circuit will be closed through the electrical appliances in the two engines and ring the bell 10 in both cabs, thus notifying both engineers that there is another engine on the same section of conductor. By means of the key 49 or by raising and lowering the trolley-wheel 31 the engineers can signal to each other, and by using a code of sig-

nals they can inform each other of their movements.

By having the series of conductors arranged in two lines, with their insulated ends at alternate points, the danger of two trains meeting between two sections of conductor is entirely obviated, as two engines cannot approach nearer together than half the length of one section of conductor without closing the circuit and sounding an alarm in both engines.

To the pivoted rails of switches a rod 50 is attached, which when the switch is open will make contact with the conductor of the center rail, and so make electrical connection between one section of conductor and the continuous conductor, so that should an engine enter upon that section of conductor while the switch is open the circuit will be closed and the bell will ring, and so apprise the engineer that the switch is open.

At crossings, as shown in Fig. 3, a signal-post 51 may be erected having an arm to which an incandescent lamp 52 and an electric bell 53 are attached. Wires *f* extend from the center rail 5 to the said bell and lamp and return to the track-rail, thus making electrical connection between the center rail and the track-rails through the bell and lamp. When an engine passes upon the section of track with which the signal is connected, the circuit will be closed through the coils and through the signal devices at the crossing and in the cab, causing the bell to ring. The engineer can determine whether the alarm is caused by the signal at the crossing or by an approaching train by signaling, as hereinbefore described.

In Fig. 4 is shown a device by which my invention may be utilized to warn the engineer of the sagging or breaking of a bridge. The device consists of a metallic bar 55, laid across the track at each end of the bridge beneath the rails and provided with upwardly-projecting lugs 56 in proper position to come in contact with the conducting portion of the center rail and the track-rails when the said bar is moved in the direction of the arrow, thus electrically connecting the said rails together. Upon the ends of the ties next to the bars 55 are secured brackets 57, which project in line with the ends of the said bars and have journaled in their outer ends small pulleys or sheaves 58. A cable 59, which may be of wire, is connected with the ends of the bars 55 and passes over the pulleys 58 and through eyes 60 in the ends of the ties from one end of the bridge to the other, as shown in the figure of drawings referred to. The bars 55 will be secured in place with sufficient firmness to support the weight of the cable and to withstand any ordinary jar or shock; but should the bridge sag down or break, thus throwing its weight upon the cable, the bars 55 will be pulled against the rails and establish electrical connection between them at each end of the bridge. From the foregoing it will be understood that when an engine runs upon the section of track which is closed by the bars 55 at either end of the bridge the signal devices in the cab will sound, and thus apprise the engineer of the danger.

In operation all the engines going in one direction and on schedule time will have their pole-changers set in the same position. For instance, all the engines going west, if on time, will have their pole-changers set as shown in Fig. 6—*i. e.*, the arm 21 in its lowest position, the strip 15 on the disk in contact with the strip 19 on the base, and the strip 16 on the disk in contact with the strip 18 on the base. Thus the positive pole of the battery will be connected through the strips 15 and 19, wire 26, point 27, wire *b*, bell 10, wire *c*, switch 49, wire *d*, strip *e*, and trolley-wheel 31 with the center rail 5, and the negative pole will be connected through the strips 16 and 18, wire *a*, brush 44, collar 45, and driving-wheels 47 with the track-rails. The engines going east will have their pole-changers set in the opposite position—*i. e.*, the arm 21 in the raised position, the strip 15 in contact with the strip 17 and the strip 16 in contact with the strip 20. This position will connect the positive pole of the battery through the strips 15 and 17 and the aforesaid connections with the track-rails and the negative pole through the strips 16 and 20 and the aforesaid connections with the center rail. From the foregoing it will be understood that if two engines should approach each other upon the same track, one going west and one going east, when they run upon the same section of conducting-rails the circuit will be closed from the positive pole of the battery in the first-mentioned engine through the devices in the cab to the center rail, from the center rail through the devices in the cab of the second engine to the negative pole of the battery there, and from the positive pole of that battery through the track-rails to the negative pole of the battery in the first engine, completing the circuit and sounding the alarm in both engines. When trains are running on schedule time, there is no danger of other trains colliding with them from the rear, so the aforedescribed arrangement of pole-changers will be all that is necessary to prevent collision; but should a train lose time or stop for any length of time the pole-changer must be changed so that the poles of the battery will be properly connected with the rails to receive a signal from an engine approaching from the rear, (it being necessary that the positive pole of the battery in one engine be connected with the rail to which the negative pole of the battery in the other engine is connected in order to establish a flow of electricity;) but if the pole-changer remained in this position it would cut off communication with an engine approaching in front. In order to give warning of the approach of an engine either from the front or rear, the engineer when he finds he is behind time turns steam into the

cylinder 23. This will cause the piston and piston-rod 22 to reciprocate vertically and vibrate the arm 21, which will oscillate the disk 14 and bring the conducting-strip 15 alternately in contact with the ends of the strips 17 and 19 and the strip 16 in contact with the ends of the strips 18 and 20 alternately, thus constantly changing the relation of the poles with the rails many times per minute, so that should an engine run upon the same section of track either from the front or rear an alarm will be sounded. When the engineer hears the bell ring, he will stop the motion of the pole-changer, trying it first in one position and then in the other, until he obtains communication with the approaching engine. The position of the pole-changer will indicate whether the engine is approaching from the front or rear. The two engineers can then signal each other in relation to their movements.

I am aware that slight modifications may be made in the herein-described devices without departing from the spirit of the invention, and I therefore reserve the right to make such changes as fairly fall within the scope of the invention.

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

1. In an electric signaling device, the combination of a railway the rails of which form continuous conductors, an intermediate conductor between said rails, the same comprising an insulated rail provided with longitudinal grooves on either side of the top thereof and sectional conductors secured in said grooves, a vehicle to travel upon the track, the wheels of which make electrical contact with the rails, a frame pivoted at one end beneath the vehicle, a trolley-wheel journaled in the opposite end of the frame to make contact with the conductors of the central track, a lever flexibly connected with said frame and provided with a spring-actuated dog, a notched segment adjustably engaged by said lever-dog, and a battery and signaling device carried by said vehicle and connected with the driving-wheels and trolley thereof, respectively, substantially as set forth.

2. In an electric signaling device, a frame pivoted at one end beneath a vehicle, a trolley-wheel journaled in the sides of the frame, an arched connector spanning said trolley-wheel and attached to the opposite journals of the same, a spring to which the other end of the frame is attached, a lever suitably connected with the said spring to raise and lower the frame, and a locking device upon said lever to hold the trolley in a raised position, substantially as described.

3. In an electric signaling device, a railway the rails of which form an electrical conductor, a second conductor along the track, one of said conductors being formed in sections, bars 55, arranged across the track at the ends of the bridges, and a cable 59, extending across the bridge and connected at its ends to the bars 55 and along its length with the bridge, so that should the bridge press upon the cable the bars 55 will be moved into electrical contact with the conductors along the track connecting them together, in combination with a vehicle carrying a battery and signaling devices connected to the said conductors, so that when the vehicle passes upon the section of conductor which is in connection with the said bar 55 the circuit will be closed and sound an alarm in the said vehicle, substantially as described.

4. In an electric signaling device, the combination of a railway the rails of which form an electrical conductor, a second conductor along the track, one of said conductors being formed in sections, a vehicle adapted to travel upon said track, a pole-changer within the said vehicle, one side of which is connected with the track-rails and the other side connected with the second conductor, a battery connected with the said pole-changer, a supplemental cylinder and piston, a lever connected with the piston of said cylinder and with said pole-changer, so as to connect the poles of the battery with the rails and the second conductor and to change the polarity of the said rails and conductors, and signaling devices included in the circuit to sound an alarm when the circuit is closed from the rails to the second conductor, substantially as described.

5. In an electric signaling device, a frame pivoted at one end beneath a vehicle, a trolley-wheel journaled in the sides of the frame, having recesses in the ends of the journals, connectors secured to the frame, having pointed ends which extend into the recesses in the ends of the journals, an arched connector located over said trolley and attached to said pointed connectors and bearings to make electrical connection therewith, a spring to which the other end of the frame is attached, a lever suitably connected with the said spring to raise and lower the frame and provided with a spring-actuated locking-pawl, and a notched segment adapted to be adjustably engaged by said locking-pawl, substantially as described.

In testimony that I claim the foregoing as my own I have hereto affixed my signature in presence of two witnesses.

CHARLES E. CORPORAN.

Witnesses:
C. A. CRANE,
E. A. BRACKETT.