(No Model.) 2 Sheets—Sheet 1.

W. W. SLATER.

AIR BRAKE SYSTEM.

No. 452,942. Patented May 26, 1891.

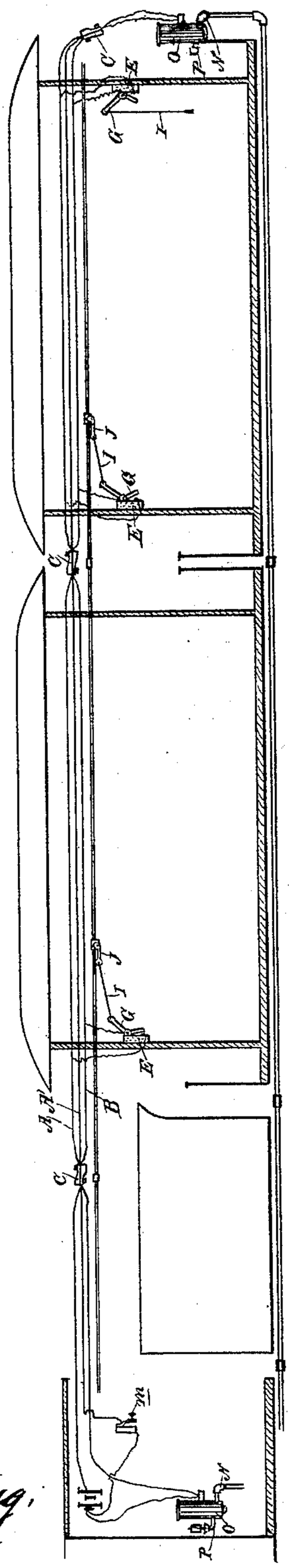

Fig. 1.

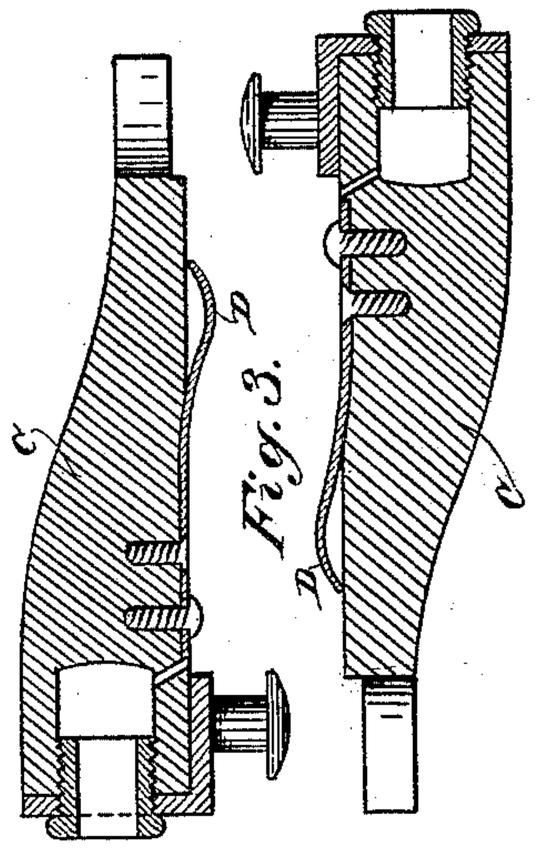

Fig. 3.

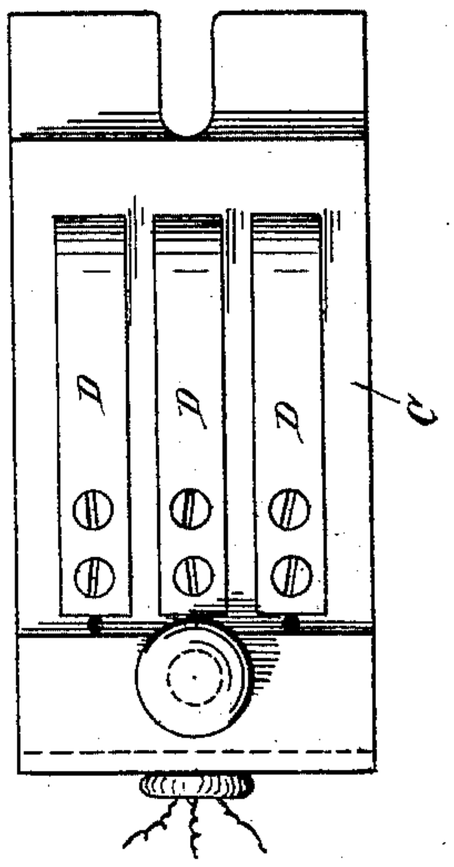

Fig. 2.

Witnesses,
Geo. W. Strong,
J. Stroud

Inventor
William W. Slater
By Dewey & Co
Attys

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W. W. SLATER.

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Fig. 6.

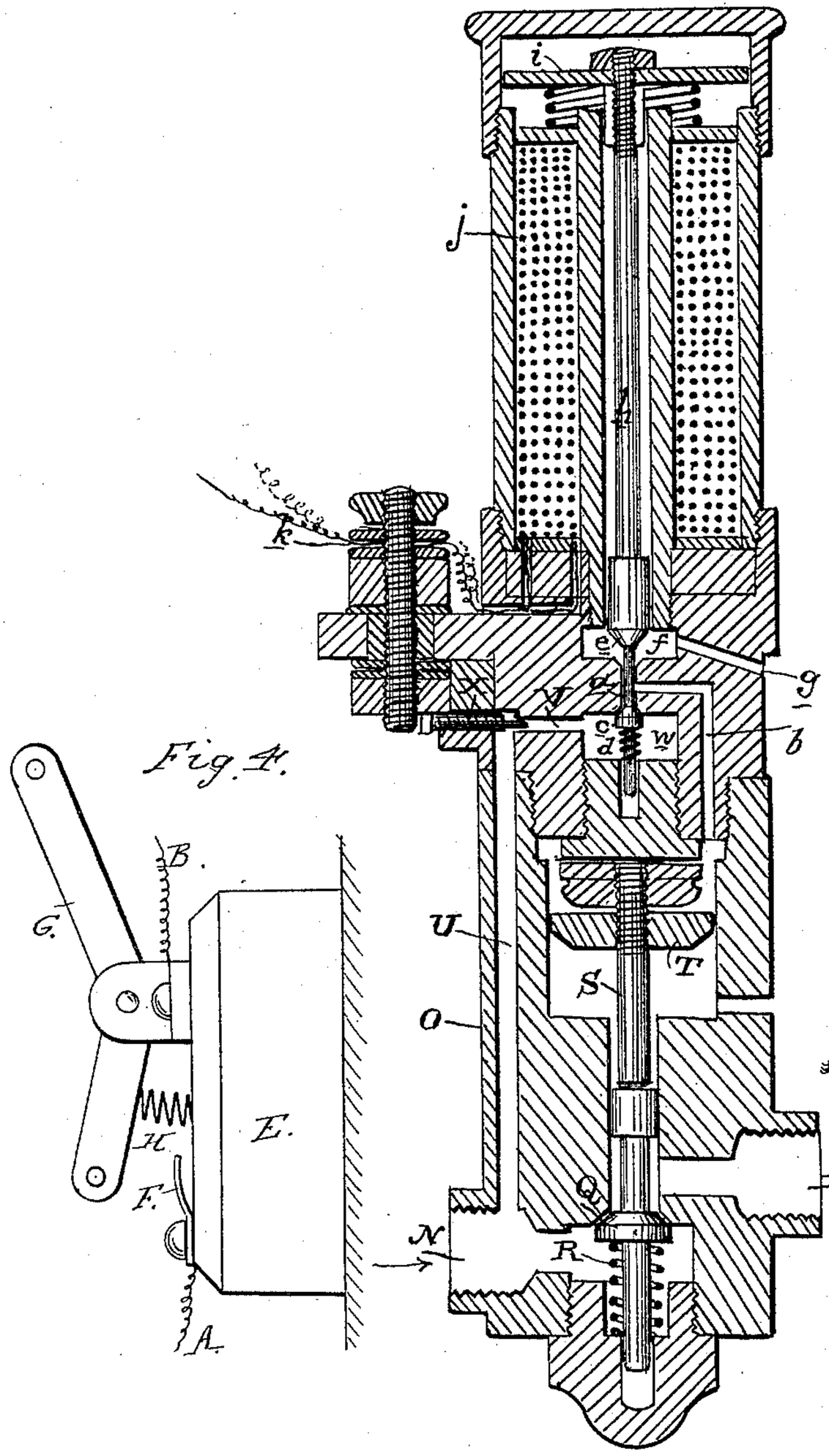
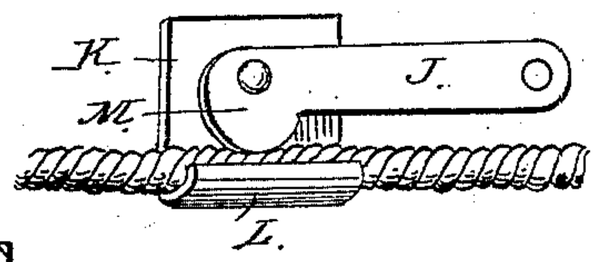


Fig. 4.

Fig. 5.



Witnesses,
F. L. Ames
H. C. Lee.

Inventor,
William W. Slater
by Dewey & Co.
attys

UNITED STATES PATENT OFFICE.

WILLIAM W. SLATER, OF OAKLAND, CALIFORNIA.

AIR-BRAKE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 452,942, dated May 26, 1891.

Application filed March 19, 1890. Serial No. 344,560. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM W. SLATER, a citizen of the United States, residing at Oakland, Alameda county, State of California, have invented an Improvement in Air-Brake Systems; and I hereby declare the following to be a full, clear, and exact description of the same.

My invention relates to an improved signal for use upon railway-trains and means for operating the air-brakes thereby.

It consists of an electric conductor extending through the train of cars, means for coupling the ends of the conductors at points where cars are coupled together, a means for completing the circuit from any point in the train, and the mechanism whereby the completed circuit is caused to act upon an electro-magnet and through it to open air-valves, so that the engineer from his station may at any time test the connections and be sure that the electrical circuit and the air-pipes have been properly coupled in making up the train, and also to operate the air-brakes while from the rear or any other portion of the train the engineer may be signaled at any time by completing the circuit.

Referring to the accompanying drawings for a more complete explanation of my invention, Figure 1 is a general view showing the arrangement of my signal and its connections. Figs. 2 and 3 are views of the coupling employed to unite the conducting-wires between cars. Fig. 4 is a view of the device for completing the circuit, so as to signal the engineer. Fig. 5 is a view of the clamp, whereby the device shown in Fig. 4 may be connected with the bell-rope, so as to be operated thereby. Fig. 6 is a full-sized vertical section of the air-passages, valves, and electro-magnet, whereby they are operated.

The usual method for making connection between the front and rear end of a train is by means of a cord extending throughout the whole length of the train from the engine, where it is connected with a bell or alarm of some sort to the rear end of the train. In practice it is found extremely difficult and almost impossible to operate this cord through a long train, when it is often broken in the attempt to use it. In my device I employ electrical conducting-wires A A′ B, fixed conveniently within each car and having, where they project at the ends of the cars, the coupling devices C C, Figs. 2 and 3, which consist of any suitable insulating material, having the brass springs or conductors D fixed thereto, and the couplers C are fitted to slide together, so that the springs D of each will be brought into contact with each other, and will thus complete the circuit of each wire between any number of cars by simply pushing these devices together. They are easily slipped apart and uncoupled whenever it is necessary to separate the parts of the train, but the springs have sufficient tension to hold the parts securely by pressing them outwardly against the buttons. The sliding contact of the springs insures a perfect connection.

At either end of each of the cars, or at any other suitable desirable points, are fixed the devices for completing the circuit, which consists of the insulated supports E, Fig. 4, having one of the wires connected with a spring or button at F and the other connected with the fulcrum of a hinge-lever G, which is fulcrumed upon the insulated supporting-block E. One end of this lever is in such position with relation to the spring F that when the lever is drawn back this end will be forced down so as to make a sliding contact with F, and thus complete the circuit at that point. The spring H throws the lever up and out of contact with the spring F as soon as the lever G is released.

This lever may be connected with the ordinary bell cord or rope which extends through the train by means of a short piece of cord I, which is connected with the lever J. This lever is fulcrumed to a clamping-plate K, having a groove or channel made in it, as shown at L, within which the bell-cord will lie. The lever J has an eccentric M formed upon it so as to project at one side of its fulcrum where it is connected with the plate K, and when the lever is turned in the proper position it presses the eccentric against the bell-cord, clamping it into the groove L, so that when the bell-cord is pulled it will operate through the short connecting-cord I upon the lever G, and thus make the necessary contact. If desired, the cord I may be left hanging loosely from the lever G, and may be pulled at any time to operate the signal.

The air-valve mechanism is constructed and operated as follows: N is the inlet-passage opening into the lower part of a vertical cylinder O, which contains the mechanism, and P is the outlet-passage situated sufficiently above the passage N to allow a valve-seat to be formed between the two passages, which is closed by a valve Q and kept in position by a coiled spring R around the valve-stem and by the air-pressure from below. The upper end of this valve-stem abuts against the lower end of a piston-stem S, within a hole or opening in which the two stems meet. Upon the upper end of the piston-stem S is a piston-head T, fitting a chamber of considerable diameter, and when air is admitted above the piston T its greater diameter is sufficient with the same pressure to overcome the pressure upon the valve Q and open the latter, so as to allow air to pass through the passages N and P and the connecting-pipes of the air mechanism.

In order to admit air above the piston T, I have shown a passage U made in one side of the cylinder O extending upward from the inlet-passage N and communicating through a small passage V with the chamber W. The opening in this passage V is regulated by means of a screw X. Above the chamber W is a small tubular passage *a*, and from one side of the passage *a* a passage *b* opens downwardly into the upper part of the chamber which contains the piston T, before described. The passage *a* is closed by an upwardly-closing valve *c*, which is held in place by a coiled spring *d* and by air-pressure.

To the upper end of the stem of the valve *c* is fixed another valve *e*, which closes the upper end of the passage *a* when the valves have been moved downward, so that the valve *c* is opened. By this construction it will be seen that when the valve *c* is closed upwardly the valve *e* will be opened. This valve *e* is situated within a chamber *f*, having an outlet-passage *g* from it.

By examining the passages and chambers, as above described, it will be seen that air may pass from the inlet-passage N through the passages U and V into the chamber W, and when the valves *c* and *e* have been moved downward by the downward movement of the armature *i* and the stem *h*, hereinafter described, air from the chamber W can pass up into the passage *a* around the valve-stem, there being sufficient space for this purpose, and it will pass thence through the passage *b* and into the large chamber above the piston T. The pressure upon this will be sufficient, as before described, to force the valve Q downward, and thus open communication through N and P. As soon as the pressure induced by the armature which opened the valve *c* is relieved the spring *d* will act to close the valve *c* and simultaneously open the valve *e*. This allows the air which was in the chamber above the piston T to escape through the passage *b*, the passage *a* around the valve-stem into the chamber *f*, and thence through the escape-passage *g* into the open air, thus relieving the piston T. The spring R will immediately act to close the valve Q and cut off communication between the passages N and P. The small valve *c* is opened against the comparatively small pressure which can act upon it by contact of a stem *h* of the valve *e* acting upon the stem of the valve *c*, the upper end of stem *h* being connected with the armature *i*. This armature is drawn downward upon the electro-magnet contained within the casing *j* whenever the circuit is completed by the devices previously described, the conducting-wires from the battery and circuit being connected with the wires of the electro-magnet by binding-posts and screws at *k k'*. The inlet-passage N of this mechanism is connected with the air-pipes of the air-brake mechanism, and the outlet-passage P may be connected with the alarm-whistle or other device. In my construction I have connected the passage P of the valve mechanism, which is in the engineer's cab, with a small whistle, which serves as an alarm when blown, and which will be acted upon whenever the valve Q is opened, as above described. A similar valve mechanism may be used at the rear end of the train, either with or without an alarm, the passage P being left open, if the engineer completes the circuit, by means of a button at *m* within the cab, the air will escape from the rear end of the train through the valve mechanism, and this will be independently shown by the train-pipe gage in the cab. This escape of air assures the engineer of two things, first, that the air-pipes have all been properly coupled up throughout the train, and that the brakes will work whenever needed, and consequently that the electrical connection is also complete from one end of the train to the other and all the couplings have been made. From the opposite end of the train the conductor or other person may signal the engineer at any time by completing the circuit by any of the devices previously described, and this will at once attract the attention of the engineer. If desired, signals may be made by means of the whistle connected with the escape-passage P in the form of a telegraphic code or in any other desired manner, so that the engineer and conductor may communicate with each other from the extremities of long trains. Two open circuits and one battery are employed in operating the devices herein described, one being controlled from the engine only and the other from any point on the train. I have here shown three wires to form the two circuits. The two exterior wires in Fig. 1 form the circuit by which when it is closed the valve at the engine is opened. This circuit is closed from the train. The lower wire terminates at the rear of the train without connection with the valve at that point, the central and upper wire form the circuit which is closed by the key *m*, controlled by the engineer and operates

the valve mechanism at the rear of the train. The valve-cylinder O, which is designed to be used at the rear of the train, being small, is carried in the train-box, and whenever a train is made up it is coupled with the rear end of the air-brake pipes, extending beneath the cars, by means of a short piece of hose, and by means of a hook it may be hung up on the hand-rail of the rear car or other convenient point of attachment. This rear valve mechanism serves another very important purpose when used in connection with the automatic air-brakes, since it enables the engineer to reduce the pressure in the train-pipes by opening this rear valve, and thus apply the brakes without using the engineer's valve on the engine. There are two advantages in making stops by this means: First, by allowing the air to escape from this rear valve the rear brakes are set first and act as a drag from behind. This avoids the irregular end motion of the train which results from the opening and closing of the engineer's valve when that is used, and which unavoidably causes a jerky motion when coming to a stop. It is more delicate and more easily handled than the engineer's valve, and if the tension of the brake-cylinder valves varies, as it usually does, it prevents the surging motion caused by the uneven action of the brakes, because, as above stated, the application of the brakes from behind acts as a drag.

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

1. A train signaling apparatus consisting of three independent conducting-wires forming two open circuits, one of which is controlled from the engine, a battery with which said wires are connected, coupling devices by which said wires are united and rendered independently continuous between the cars, and a means for closing the second circuit at any point upon the train, consisting of the spring F, with which one of the wires of the second circuit is connected, the lever G, to which the other one is connected, the insulating-plate E, upon which connections are mounted, and the spring H, whereby contact between the lever G and spring F may be broken, substantially as described.

2. In a train signaling apparatus, the independent conducting-wires connected with the battery and extending throughout the train, the spring or button F, with which one of the wires is connected, a lever G, to which the other one is connected, and a cord connected with the lever G, and clamp J K, whereby said cord may be secured to the bell-rope extending through the train, so that the circuit may be completed by a pull upon said rope, substantially as herein described.

3. The train signaling system consisting of three conducting-wires extending from the engine to the rear of the train, coupling devices between adjacent cars, whereby said wires may be independently connected and made continuous throughout the train, an independent valve mechanism with means for connecting it with the rear of the train-pipe, an electro-magnet and armature connected with said valve mechanism, so that the movement of the armature may open or close the valve, an open circuit consisting of two of the wires connecting with said electro-magnet and with the battery upon the engine, with a means upon the engine for closing said circuit, a second valve mechanism fixed upon the engine connected with the air-reservoir and having a similar electro-magnet and armature, whereby its valve may be opened, and a second circuit composed of the third conducting-wire and one of the wires of the first circuit, and circuit-closing devices situated on each of the cars, whereby the valve upon the engine may be opened by closing said second circuit, substantially as described.

4. A train signaling system consisting of independent wires extending throughout the train, with couplings whereby said wires are united, an independent valve fixed upon the engine and controlling an escape-pipe and passage from the air-reservoir of the brake system, an electro-magnet having its armature connected with and controlling said valve, circuit-closing devices fixed upon each of the cars, whereby the circuit may be closed and the electro magnet and valve actuated, a cord connected with each of said circuit-closing devices, and a clamp fixed upon said cord whereby the bell-rope of the train may be connected through said clamp and cord with the circuit-closing devices, substantially as described.

In witness whereof I have hereunto set my hand.

WILLIAM W. SLATER.

Witnesses:
AUSTIN AMBROSE JOYCE,
HARRY CLINTON BARNES.