F. L. POPE.

Electric Signalling Apparatus for Railroads.

No. 145,308. Patented Dec. 9, 1873.

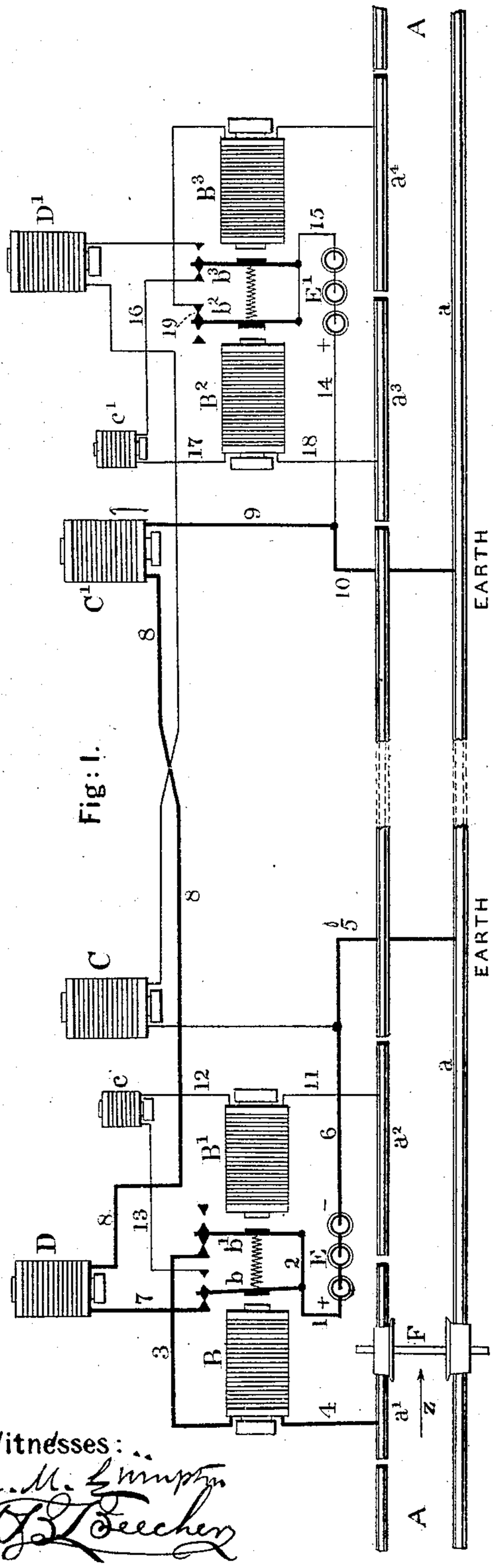

Fig: 1.

Fig: 2.

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IMPROVEMENT IN ELECTRIC SIGNALING APPARATUS FOR RAILROADS.

Specification forming part of Letters Patent No. **145,308**, dated December 9, 1873; application filed April 2, 1873.

To all whom it may concern:

Be it known that I, FRANK L. POPE, of Elizabeth, in the county of Union and State of New Jersey, have invented a new and useful Improvement in Electric Signaling Apparatus for Railroads; and I hereby declare that the following is a full, clear, and exact description of the same, reference being had to the accompanying drawing, which forms part of this specification.

The first part of my invention consists in a novel combination and arrangement of an electro-magnet or magnets for actuating an electric signal, with circuit-closing and circuit-breaking devices, whereby the said signal will be actuated by a locomotive or train going in one direction, and be not affected by a locomotive or train going in the opposite direction. The second part of my invention consists in the arrangement of a primary and a secondary signal at each end of a section of track, in combination with circuit-closers actuated by an approaching train, so that the primary signal will indicate to the engineer of the said train whether or not another train is approaching from the opposite direction, while at the same time the secondary signal will indicate whether or not the primary signal at the opposite end of the said section of track has performed its office before the train enters thereupon. The third part of my invention consists in the combination of two circuit-closers, so arranged as to be actuated by a moving train, with two electro-magnets, the latter being so connected that either one of the said magnets, when in action, will prevent any action on the part of the other.

My invention is applicable to bridges, tunnels, or any section of a railroad where it is unsafe for two trains going in opposite directions to pass each other, and to crossings, either of highways or of other railroads on the same level.

Figure 1 is a diagram showing the arrangement of a section of single track, with a primary and secondary signal at each end thereof. Fig. 2 is a diagram showing the application of my invention to a crossing.

A A, Fig. 1, designate a portion of a railroad-track. The line of rails *a a* is assumed to be placed in electrical connection with the earth. Sections of the opposite line of rails a^1 a^2 a^3 a^4, each of, say, fifty feet in length, more or less, are insulated from metallic electrical contact with each other, and from other portions of the same line of rails. Let it also be assumed that a^1 and a^2 are situated at the western end, and a^3 and a^4 at the eastern end, of a tunnel. B and B^1 are electro-magnets, provided with armatures and armature-levers *b* and *b'*. C is an electro-magnet which actuates or controls the movements of the primary signal.

The primary signal may be of any suitable construction, and must be provided with a device whereby it is retained in position or action after the circuit, through its electro-magnet C, is broken, and until it is released by the action of the electro-magnet *c*.

D is the electro-magnet which actuates or controls the secondary signal; and E is a suitable voltaic battery.

All the parts hereinbefore described are assumed to be situated at the western end of the tunnel, and in the immediate vicinity of the insulated sections of track a^1 a^2, or, preferably, at a point between a^1 a^2 and the end of the tunnel.

The apparatus at the eastern end of the tunnel, being in all respects similar to that just explained, requires no particular description.

The manner in which the apparatus is operated is as follows: Suppose a train, going from west to east in the direction of the arrow *z*, (said train being represented by the axle and wheels F) enters upon the insulated section of track a^1, as in Fig. 1, a metallic electrical connection will be formed between the section of rail a^1 and the earth, and a circuit will be formed from the battery E, which may be traced as follows: Commencing at the + or positive pole of battery E, by wires 1 and 2, to armature-lever b^1, wire 3, electro-magnet B, wire 4, insulated rail a^1, axle and wheels F, line of rails *a*, (or earth,) and wires 5 and 6 to the negative or — pole of the battery. This will cause the magnet B to attract its armature, as shown in Fig. 1, and a second or branch circuit from the same battery, E, will be formed by wire 1, armature-lever *b*, wire 7, and secondary signal-magnet D, thence along wire 8 to the

primary signal-magnet C′ at the eastern end of the tunnel, thence, by wires 9 and 10, to the earth, returning by wires 5 and 6 to the battery. This current will actuate the primary signal of C′ at the eastern end of the tunnel, and the secondary signal of D at the western end. Although the magnets of these two signals C′ and D are placed in, and operated by, the same circuit, yet the movements of D are dependent upon those of C′. The manner in which this is accomplished forms the subject of a separate application by me for Letters Patent, which was filed in the United States Patent Office on or about the 24th day of October, 1872, and a more particular description herein is therefore unnecessary. Thus, it will be understood that a train going from west to east, upon closing the circuit at the insulated section of track a^1, will cause a signal to be displayed at C′, at the eastern end of the tunnel, which will in turn cause a secondary signal, D, to be displayed at the western end. When the train F leaves the section a^1, the secondary signal D will return to its former position, but the primary signal at C′ will remain displayed until released by the magnet C′, as hereinafter explained.

I will here remark that it is preferable that the primary signal should indicate "safety" when in its normal position, while the normal position of the secondary signal should indicate "danger" or "caution."

When the train enters upon the insulated section a^2, the circuit through B^1 cannot be closed as long as any portion of the train remains upon the section a^1, as the contact will, in that case, continue to be broken between b and the wire 13. When the train, still proceeding eastward, has passed through the tunnel, and reaches the section a^3, it will close the circuit of the battery E^1, through the wire 15, lever b^3, wire 16, magnet c', wire 17, magnet B^2, wire 18, track a^3 and a, and wires 10 and 14, actuating the magnet c', and releasing the primary signal of C^1, and also breaking the circuit of the magnet B^3 at the point 19, so that the said magnet B^3, and consequently the signals D′ and C, will not be operated when the train makes electrical connection between a and a^4. Thus, it will be understood that the signals can only be operated by a train going toward the tunnel in either direction.

Fig. 2 shows the manner in which my invention may be applied to a grade-crossing—that is, where a highway or another railroad-track cross each other on the same level. The insulated section a^9 is assumed to be situated at the crossing, and the magnet M, which actuates or controls the primary signal, together with the circuit-breaking magnets N N′, and the battery E^2, are assumed to be placed at or near the same point. It is also assumed that the insulated sections of track a^5 a^6 are situated at a distance of half a mile, more or less, from the crossing in, say, a westerly direction; and a^7 and a^8 are situated at about the same distance from the said crossing in an easterly direction. If a train, represented by F′, proceeding eastward, forms an electrical connection between a and a^5, as shown in Fig. 2, a circuit will be formed from the battery E^2, through wires 20 and 21, armature-lever n', wire 22, magnet N, wire 23, rail a^5, train F′, line of rails a, and the earth, returning through wires 24 and 25 to the battery. This will cause the magnet N to attract its armature, and thereby close a second circuit from the same battery, (or from a separate battery, if preferable,) traversing-wires 20 and 21, lever n, wire 26, signal-magnet M, and wires 27 and 25, which will cause the signal to be displayed. The train passing over a^6 will produce no effect upon the apparatus, as the circuit connecting with a^6 has previously been broken at the point 28 by the movement of the armature-lever n. The signal will remain displayed until the train reaches the crossing and makes an electrical connection between a^9 and the earth, when a circuit will be formed from the battery E^3 through wires 30, 31, and 32, including the magnet m, which latter is employed to release or reverse the signal by means of any suitable device. A train going in the opposite direction will in the same manner make an electrical connection at a^8, and cause the signal to be displayed, which latter will be released when an electrical connection is made at a^9. Upon arriving at a^6 the circuit of the magnet N′ will be closed and the movement of its armature will break the circuit of the magnet N at the point 33, so that the subsequent closing of the circuit at a^5 by the train will not actuate the signal-magnet M. Thus the signal will always be displayed by trains approaching the crossing, but not by said trains after they have passed the crossing.

The mechanism of the signal or the lever n may be arranged to close the circuit of a suitable electric bell or alarm, situated at or near the crossing, which will continue to ring until the train has passed the crossing.

Where the distance through which the apparatus is to be operated is considerable, relays and secondary circuits may be employed. The arrangements in such cases are simple and readily understood by those skilled in the art, and therefore need not be particularly described.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The combination of the electro-magnet C′, electro-magnets B B^1, circuit-breaking levers b b^1, and circuit-closing devices a^1 and a^2, substantially as and for the purpose herein specified.

2. The combination of the magnet C′ for operating a primary signal, the magnet D for operating a secondary signal, and a circuit-closer, a^1, the latter arranged to be actuated by the passage of a train, substantially as herein described.

3. The combination and arrangement of the electro-magnets B and B^1, and armature-levers b and b^1, so arranged that the closing of the

circuit through one magnet will break the circuit of the other, substantially as herein specified.

4. The arrangement of a primary signal-magnet and a secondary signal-magnet at each end of a section of railroad-track, each secondary signal-magnet being controlled by the action of the primary signal-magnet at the opposite end, substantially as and for the purpose herein specified.

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