(No Model.)

T. A. EDISON & E. T. GILLILAND.

RAILWAY TELEGRAPHY.

No. 350,235. Patented Oct. 5, 1886.

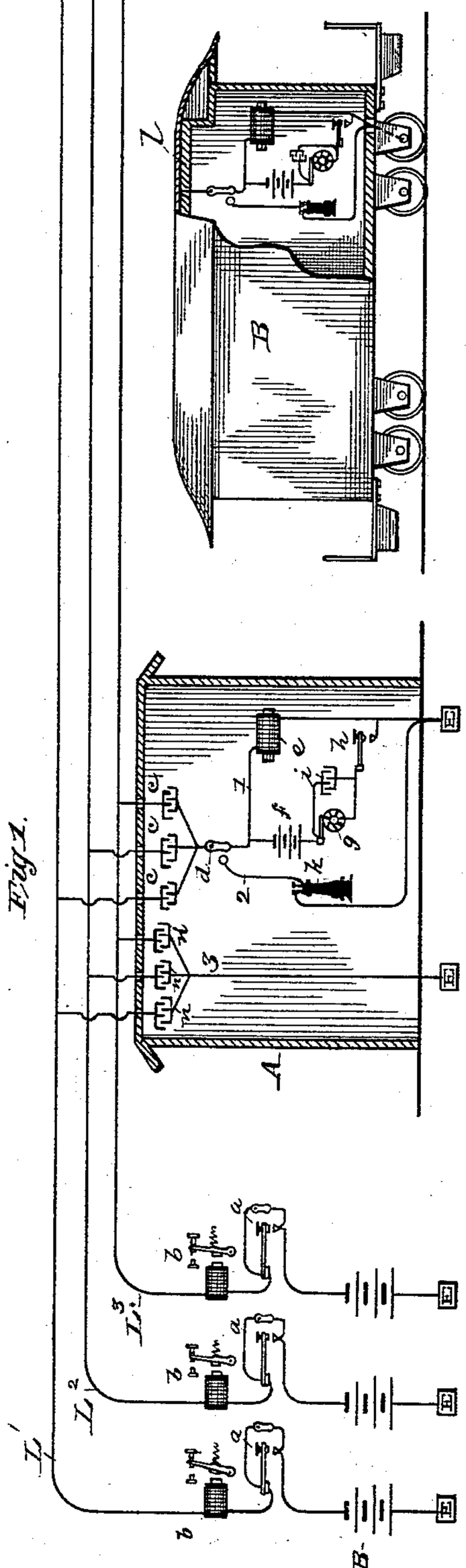

Fig. 1.

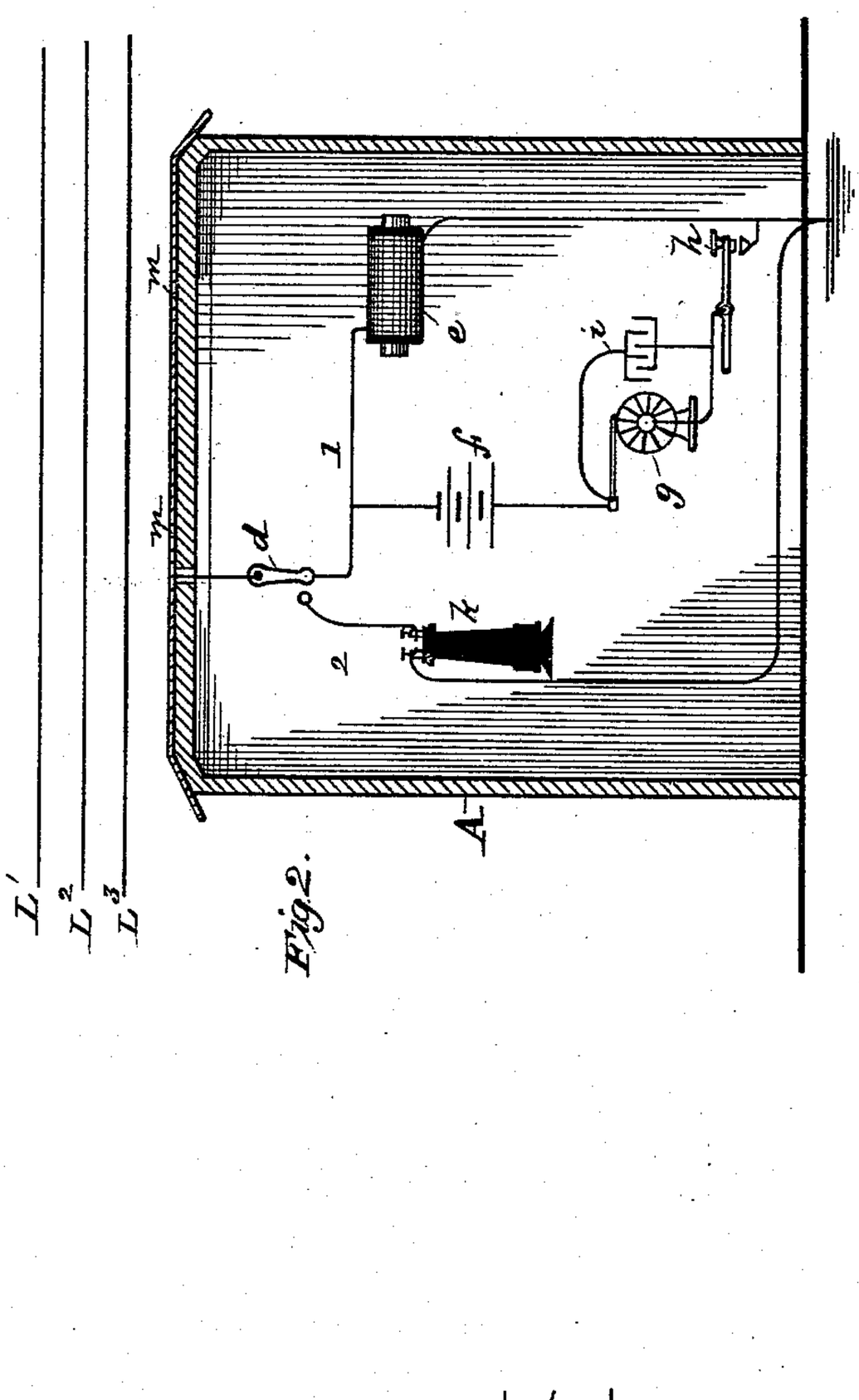

Fig. 2.

ATTEST:
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UNITED STATES PATENT OFFICE.

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RAILWAY-TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 350,235, dated October 5, 1886.

Application filed January 13, 1886. Serial No. 188,448. (No model.)

To all whom it may concern:

Be it known that we, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, and EZRA T. GILLILAND, of Boston, in the county of Suffolk and State of Massachusetts, have invented a certain new and useful Improvement in Systems of Railway-Signaling, of which the following is a specification.

Our invention relates to systems for signaling with moving railway-trains by induction between the trains and a line-wire—such as described in patent of William Wiley Smith, No. 247,127.

The principal object we have in view is to utilize the ordinary telegraph-wires extending along a railway collectively as the line for the inductive railway signaling apparatus without interfering with the use of such lines for general telegraphing purposes, so as to avoid the expense of constructing a special line for the railway-signals and to take advantage of the large inductive surface afforded by the numerous telegraph-wires, which is a point of great practical importance.

A further object is to provide means for keeping the telegraph-lines constantly closed for the railway-signals without the necessity of shunting the signaling-keys in the terminal or main telegraph-office.

Another feature of invention is an improved combination and arrangement of parts forming more efficient transmitting and receiving apparatus for the railway-signals.

In the accompanying drawings, forming a part hereof, Figure 1 is a view, principally in diagram, of a signaling system embodying our invention; and Fig. 2 is a similar view of a modified station arrangement.

L′ L² L³ represent telegraph-wires running along the railway, of which A is a station, and B a moving car forming part of a train. The ordinary telegraph-instruments at the terminal office are alone shown, the wires being through or trunk wires. These instruments are signaling-keys *a* and relays *b*. The usual main battery M B for each line is also shown.

At the railway-station A the several telegraph-wires are connected with separate condensers, *c*, which are connected together on their other sides. A switch, *d*, at one point connects this latter side of the condenser with a wire, 1, running to earth through an electromagnet, *e*. This magnet is shunted by a battery, *f*, a revolving circuit-breaker, *g*, and a signaling-key, *h*, the revolving circuit-breaker *g* being shunted by a condenser, *i*. Circuit-breaker *g*, whose surface is broken at intervals by insulation, is kept revolving by a suitable motor, electrical or mechanical, while signals are being transmitted. By closing key *h* circuit-breaker *g* will cause the rapid charging and discharging of magnet *e*, throwing sharp induction impulses upon wire 1 and through condenser *c* to line-wires. These impulses produce a sound in all the diaphragm sounders or receivers, whether in stations or on trains, which sound is continued as long as key *h* is closed, and ceases when key *h* is opened. The railway-signals formed by these sounds may be composed of Morse signals, or of a code of numerical or other signals. Condenser *i* serves to sharpen the impulses and to absorb the sparks which might otherwise be produced at breaker *g*. A wire, 2, runs from another point of switch *d* to ground, including a diaphragm sounder or receiver, *k*, which may be similar in construction to any ordinary telephone-receiver. Switch *d* is thrown to the right for transmitting, and to the left for receiving, the receiving or transmitting wire being kept open when the other is in use.

Upon the car B, and preferably upon a car of every train upon the road, is similar transmitting and receiving apparatus connected between the insulated metal roof *l* of the car, forming a condensing-surface and an axle thereof, forming a ground connection through the wheels of car and the rails upon which they travel.

Instead of condensers *c* in station, the metaltic roof *m* of station, should it have one, may be utilized as condensing-surface, as shown in Fig. 2.

Signaling can be carried on between station and moving train by the apparatus described, the telegraph-wires being used collectively as the signaling-line and being connected inductively both with the train and station. Two trains can also communicate, as will be well understood. The railway-signals being formed of short sharp induction-impulses of high ten-

sion, the telegraph-relays are too sluggish to respond to them, while the comparatively-low tension, gradual, and prolonged waves produced by the ordinary Morse signaling-keys do not disturb the diaphragm-sounders when arranged as shown and described.

To keep the telegraph-lines constantly closed for the railway-signals, the ordinary Morse keys at terminal and way offices may be shunted by condensers or high resistances, as described in our application Serial No. 161,438; but we have found that with a number of telegraph-wires one or more lines will always be closed to carry railway-signals, although they may be all in operation for telegraphing, and hence it is not necessary to shunt the telegraph-keys, although it is desirable to do so in order to secure the full benefit of the inductive surface afforded by all the wires collectively. A way of doing this for the keys of the terminal office outside the telegraph-office itself is shown in Fig. 1. A ground-connection, 3, is made from all the wires through condensers *n*, such connection being located between the connection of railway-station signaling apparatus with the lines and the terminal telegraph-office.

What we claim is—

1. In railway inductive signaling apparatus, the combination, with a number of telegraph-wires and their instruments, of a train having railway signaling, transmitting, and receiving instruments operating to transmit and receive signals produced by induction impulses, and acting inductively upon and from the telegraph-wires collectively, and a station having transmitting and receiving instruments for such induction railway-signals, substantially as set forth.

2. In railway inductive signaling apparatus, the combination, with a number of telegraph-wires and their instruments, of a train having railway signaling, transmitting, and receiving instruments operating to transmit and receive signals produced by induction impulses, and acting inductively upon and from the telegraph-wires collectively, and a station having transmitting and receiving instruments for such induction railway-signals, also acting inductively upon and from the telegraph-wires collectively, substantially as set forth.

3. In railway inductive signaling apparatus, the combination, with the line therefor composed of one or more telegraph-wires having ordinary Morse instruments at a terminal office beyond the railway signaling office, of a ground-connection from such telegraph wire or wires between the terminal telegraph-instruments and the railway-station signaling apparatus, such ground-connection acting to shunt for the railway-signals the breaks formed by the Morse keys at the terminal telegraph-office, substantially as set forth.

4. In railway inductive signaling apparatus, the combination, with the line therefor composed of one or more telegraph-wires having ordinary Morse instruments at a terminal office beyond the railway signaling office, of a condenser, ground-connection from such telegraph wire or wires between the terminal telegraph-instruments and the railway-station signaling apparatus, such ground-connection acting to shunt for the railway-signals the breaks formed by the Morse keys at the terminal telegraph-office, substantially as set forth.

5. In railway inductive signaling apparatus, the combination, for transmitting signals, of a magnet, a shunt around such magnet, including a battery, a revolving circuit-breaker and a key, and a condenser shunting such circuit-breaker, substantially as set forth.

This specification signed and witnessed this 28th day of December, 1885.

THOMAS A. EDISON,
EZRA T. GILLILAND.

Witnesses:
A. W. KIDDLE,
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