

(No Model.)

E. B. IVES.
RAILWAY TELEGRAPH.

No. 353,789.

Patented Dec. 7, 1886.

Fig. 1.

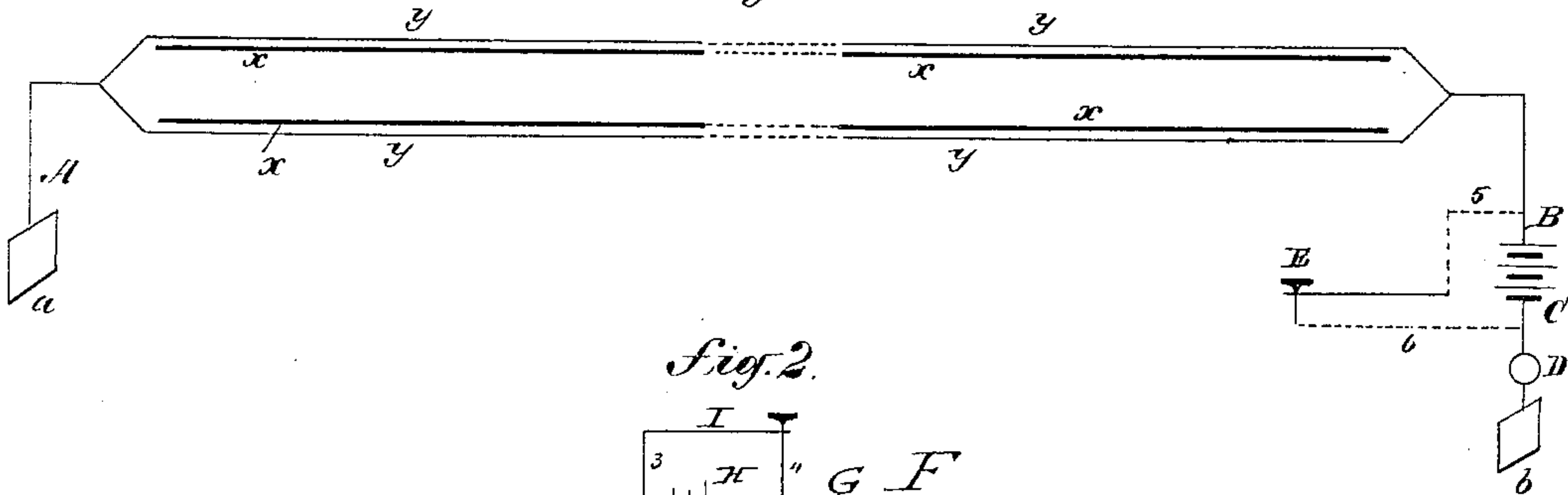


Fig. 2.

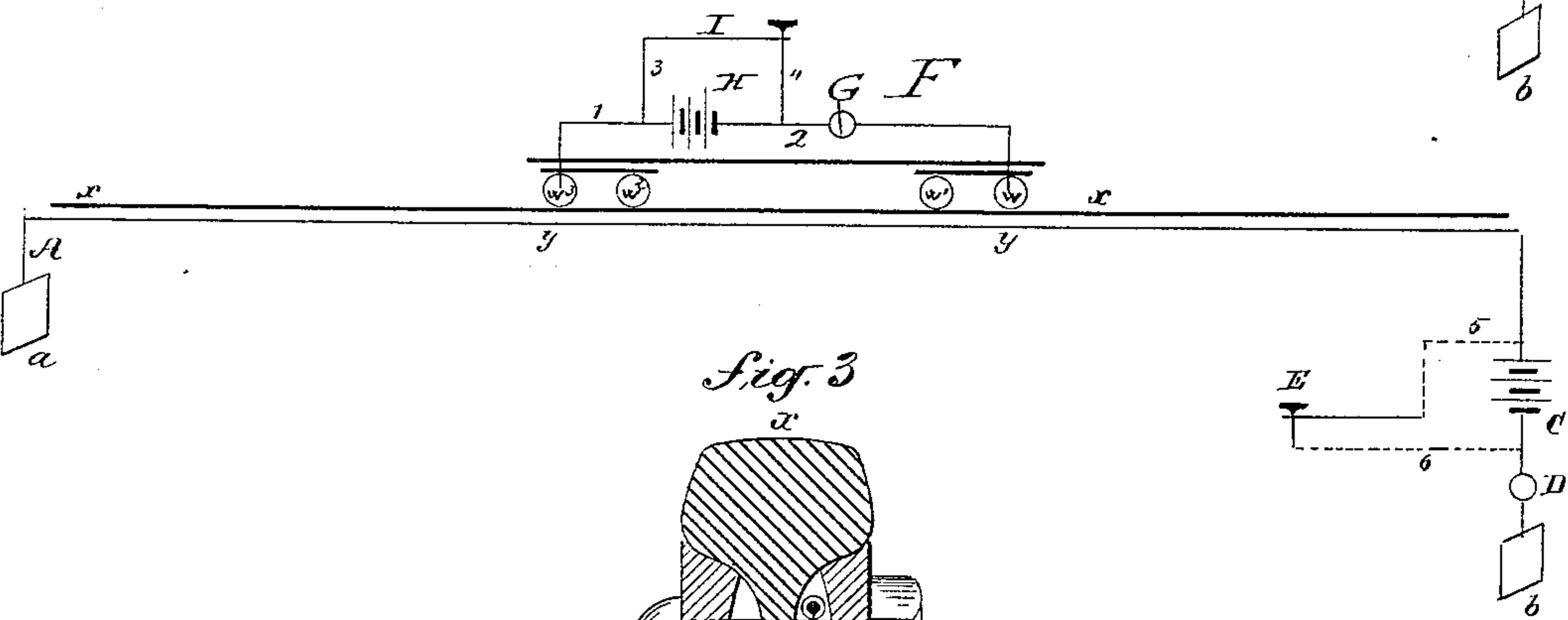


Fig. 3.

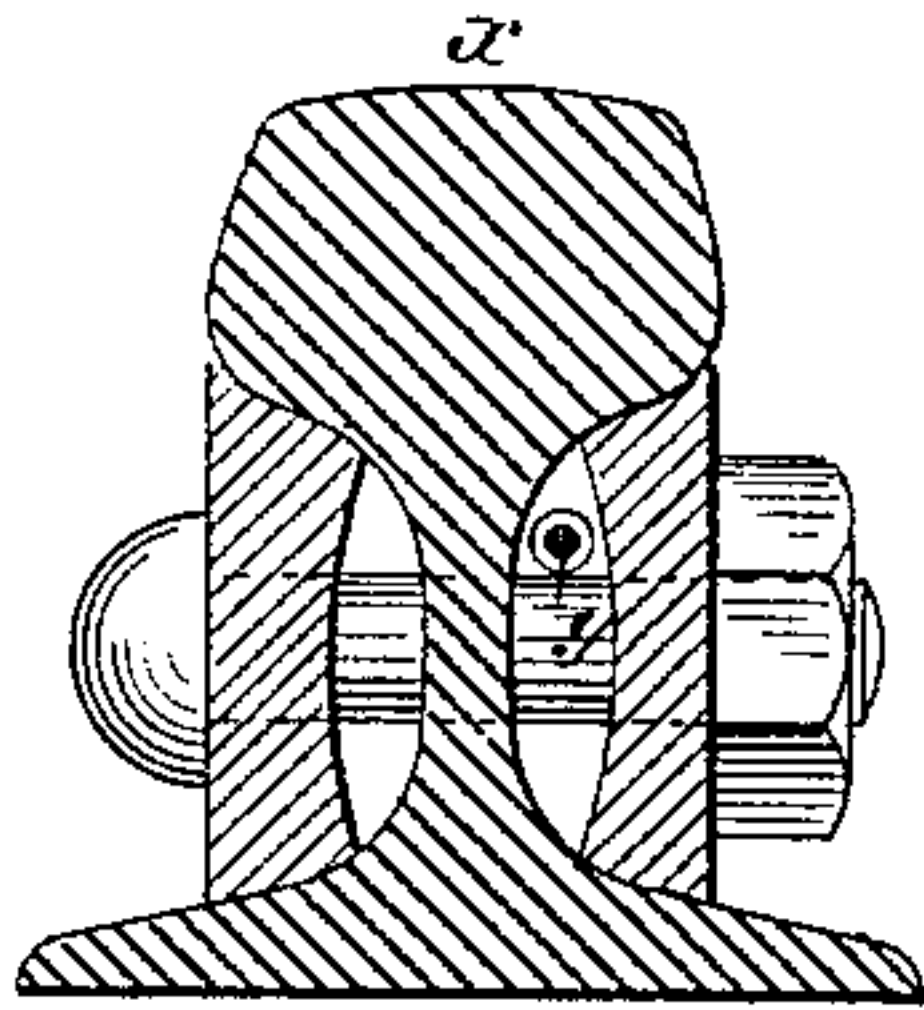


Fig. 4.

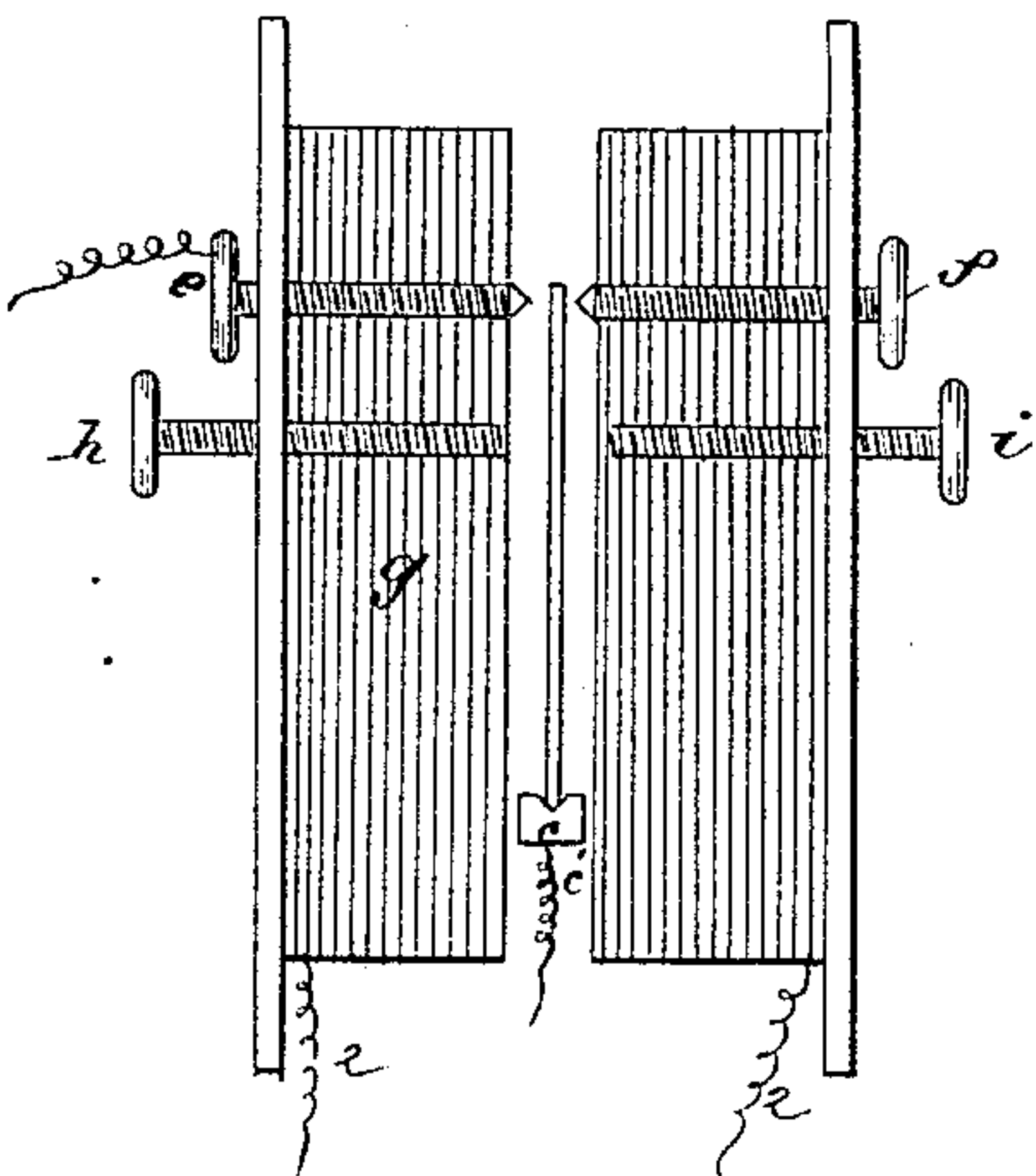
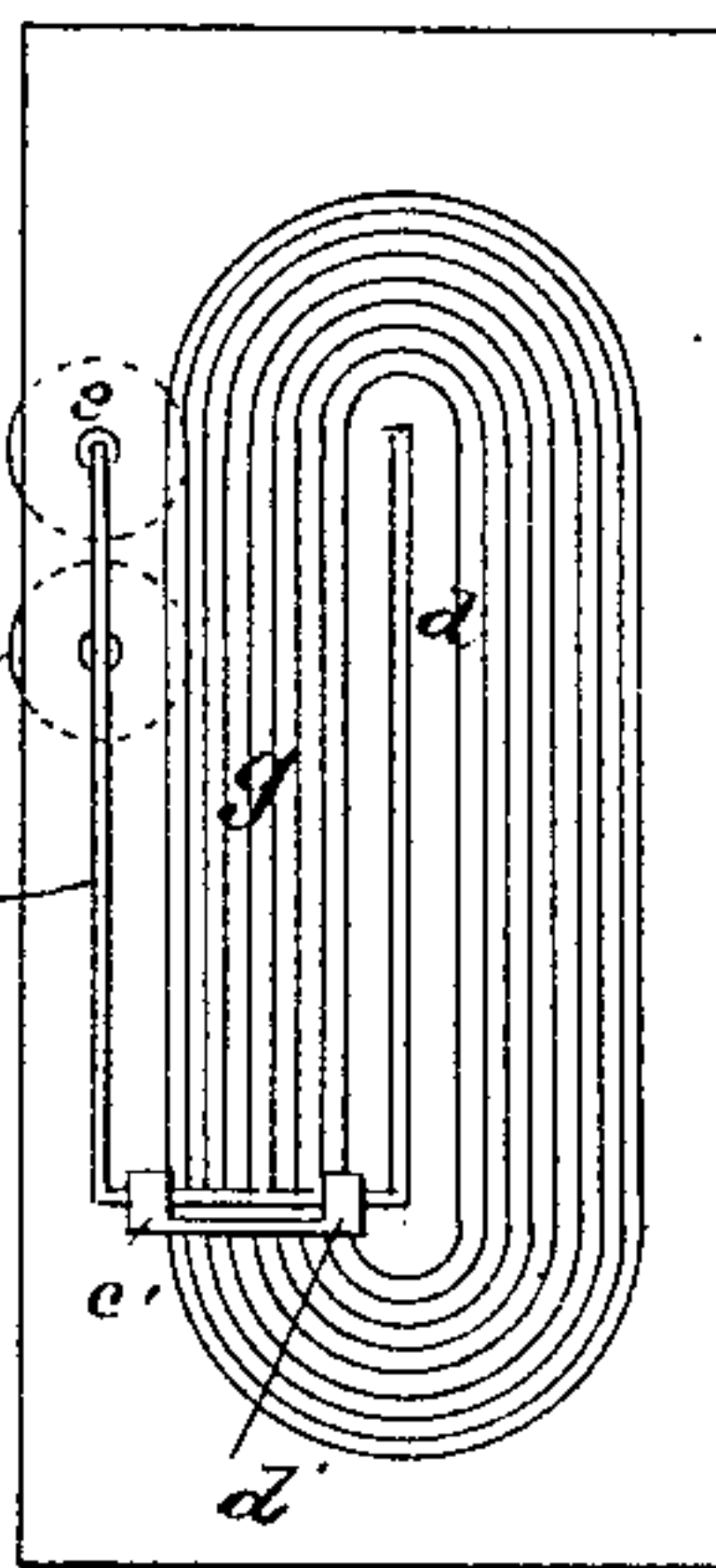


Fig. 5.



Witnesses:

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UNITED STATES PATENT OFFICE.

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RAILWAY-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 353,789, dated December 7, 1886.

Application filed May 10, 1886. Serial No. 201,733. (No model.)

To all whom it may concern:

Be it known that I, EDWARD B. IVES, of the city of New York, in the county and State of New York, and a citizen of the United States of America, have invented a new and useful Improvement in Railway-Telegraphs, of which the following is a specification, reference being had to the accompanying drawings, forming part of the same, in which—

Figure 1 is a plan view of the rails of the road and the conductor, battery, &c., of a system embodying my invention. Fig. 2 represents a portion of said system with the car fully equipped standing on the track. Fig. 3 is a sectional view of the rail near a joint, showing a method of supporting and placing the line-conductor. Fig. 4 is a side view, and Fig. 5 a sectional view, of a relay adapted for use in such a system.

The object of my invention is to maintain telegraphic communication between instruments on a moving railway-carriage and a fixed station or a second carriage, and in so doing to dispense with all ordinary contact devices for maintaining electrical connection between the circuit, which includes the car-instruments and the main-line conductor. I accomplish this by utilizing electric induction, the principles of which are too well known to need particular description; and the special invention herein intended to be secured relates to the particular and special means claimed by which I attain this end, and especially to the use of the rail to constitute one of the two conductors, where the same are in proximity to each other. I, however, consider my invention broader than as claimed herein, and in an application, of which this is a division, I have claimed, broadly, what I believe to be my full invention.

In the drawings, X X represent the rails of a railway upon which my invention is employed.

Y Y is the main-line conductor running from station A to station B, grounded, preferably, at *a* and *b*, and provided with batteries, relays, and transmitters, in the usual manner, one of each being shown at C, D, and E, respectively. Said line-conductor Y is preferably made in two branches of equal resistance and placed just under the crown of the rail X, but

insulated therefrom, and supported by the bolts which are used at the joints to secure adjacent rails together, as seen plainly in Fig. 3, as by thus placing said wire I am enabled to make use of the rail as a part of the car-circuit between which and the main conductor inductive action is to take place, for, as is well known, the rails of the road, being metallic, form a conductor between which and the circuit which lies substantially parallel and in proximity thereto inductive action will take place. Now, by making the rails a part of one of the circuits, between which and the other circuit (as shown here the main-line conductor) inductive action is desired, I am enabled to dispense with any other circuit-connection—such, for instance, as a coil of wire carried by the car, as shown in patent to Phelps of February 17, 1885, No. 312,506—and thereby to secure increased inductive power over an apparatus in which an additional conductor is employed, dividing between it and the rail whatever inductive action is produced, and am also enabled to conveniently bring the two circuits in closer proximity than if I employed as one a circuit carried entirely upon the car, which closer proximity also increases the inductive action in the second conductor.

F is the telegraph-car. Upon it is a relay, G, a battery, H, a transmitter, I, and conductors 1 and 2, running from the respective poles of said battery to the front and rear ends of the car, or points some distance apart where they are connected to rail-contacts, those shown being the wheels of the car, and to these they may be connected in any suitable way—as, for instance, that shown in Figs. 6 and 10 of Letters Patent No. 313,462, heretofore issued to Messrs. Williams, Barnum, and myself. If preferred, these wires may terminate in metallic brushes making direct contact with the track. The circuit described as being, partly at least, on the car is called the “car-circuit,” and to it the transmitter may be connected by two short wires, 3 and 4, running, respectively, from wires 1 and 2 to its respective ends, thus providing a short circuit—battery, 1, 3, 1, 4, 2, battery—for the battery when the key is closed. When the key is opened, the circuit is battery H, wire 1, wheel W³, rail X to wheel W, wire 2, relay G,

battery, such being the circuit, currents in which are to induce currents in the main line, and vice versa. The transmitter or key at the station is similarly arranged, the circuit being when said key is closed battery Y, 5, E, 6, Y, battery. When the station-key is opened, however, a current flows from battery C at station B through Y Y equally to station A, and by opening and closing said key electric impulses of long and short duration will be sent through Y Y.

As has been said, opening the key on the car sends a current through the closed circuit partly upon it, but completed by the rail or rails, through which the current will pass from W³ to W, and upon the well-known principle of induction, at its initiation such current induces a momentary impulse in the proximate conductor Y Y in the direction from *b* to *a*. Closing the car-key cuts off the battery and shuts off the current through the rails. This, of course, induces a momentary impulse in Y Y from *a* to *b*. These alternating electric impulses necessarily pass through the relay D, which is arranged to be thereby operated to open and close a local circuit through a sounder which is connected with such relay, thus producing at the station the ordinary signals; but, as such relays and sounders are of the character now in daily use, it is not considered necessary to illustrate all their parts in the drawings. I do, however, show one which is novel and better adapted to use in this system than most if not all of those now known. Opening and closing the key at the way-station will create and cut off a current through Y Y from B to A, which likewise induces electric impulses in the car or train circuit, which impulses passing through the train-relay to the left and right operate it to open and close the local circuit through the train-sounder, thus producing signals at the car-station.

Owing to the alternating character and short duration of the induced impulses many of the ordinary forms of relays are not adapted for use in a system of this nature; but I have devised and here show one which is simple and at the same time may be successfully used for the required purpose. It consists of a light horseshoe magnet, *c d*, supported on points *c'* *d'*, so as to swing in a plane at right angles to the plane of the two arms *c d*. Two screws, *e* and *f*, susceptible of lateral adjustment by means of threads cut on their bodies, regulate the amount of swing of the magnet *c d*. The local circuit, through the sounder, terminates

in the points *e* and *e'*, so that when the magnet is touching *e* the local circuit is closed, and when touching *f* it is open. One arm, *d*, of the magnet is inclosed in a coil of insulated wire, 9, the axis of which is at right angles to the plane of the magnet *c d* when said magnet is upright, the coil and magnet together forming what might be called an "estatic galvanometer." The ends of the coil are connected, respectively, to the wires of the train or car circuit leading from the trucks, and *h i* are soft-iron adjusting-screws, which, by being turned in or out, cause the magnets *c d* to press harder or less hard against *e f*, as may be desired.

As is obvious, the current from the rail (or impulse) which is induced by opening the key at the station B, passing through *g*, throws *c* against *f*, and the one induced by closing said key throws *c* against *e*, thus closing and breaking the local circuit and causing the car-sounder to respond properly to the signals of the operator at B. The relay at the station being similar and connected with the main-line circuit as the car-relay is with the train-circuit, will operate to close and open the local circuit at station B in a similar manner as *g* does the car local circuit.

Thus by means of the described devices I am enabled more easily and perfectly than by other devices to communicate between a car equipped as described and any station upon the line or other car without the necessity of providing for actual contact between the car-circuit wires and the main-line conductor or devices in said circuits, and in this way to obviate many of the difficulties attendant upon a system requiring such actual contact.

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

In a railway-telegraph system, the combination, with a line-conductor running along the road, of a car-circuit partly upon a car upon said road and partly in close proximity to said line-conductor, the portion of one of said circuits where they are in proximity being formed by the rails of the road, and means, substantially as described, for producing electrical impulses in one of said circuits, transferring them by inductive action to the other of said circuits, and there causing them to produce signals, all as and for the purpose specified.

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Witnesses:

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