

(No Model.)

2 Sheets—Sheet 1.

F. W. JONES.
QUADRUPLEX RELAY.

No. 424,209.

Patented Mar. 25, 1890.

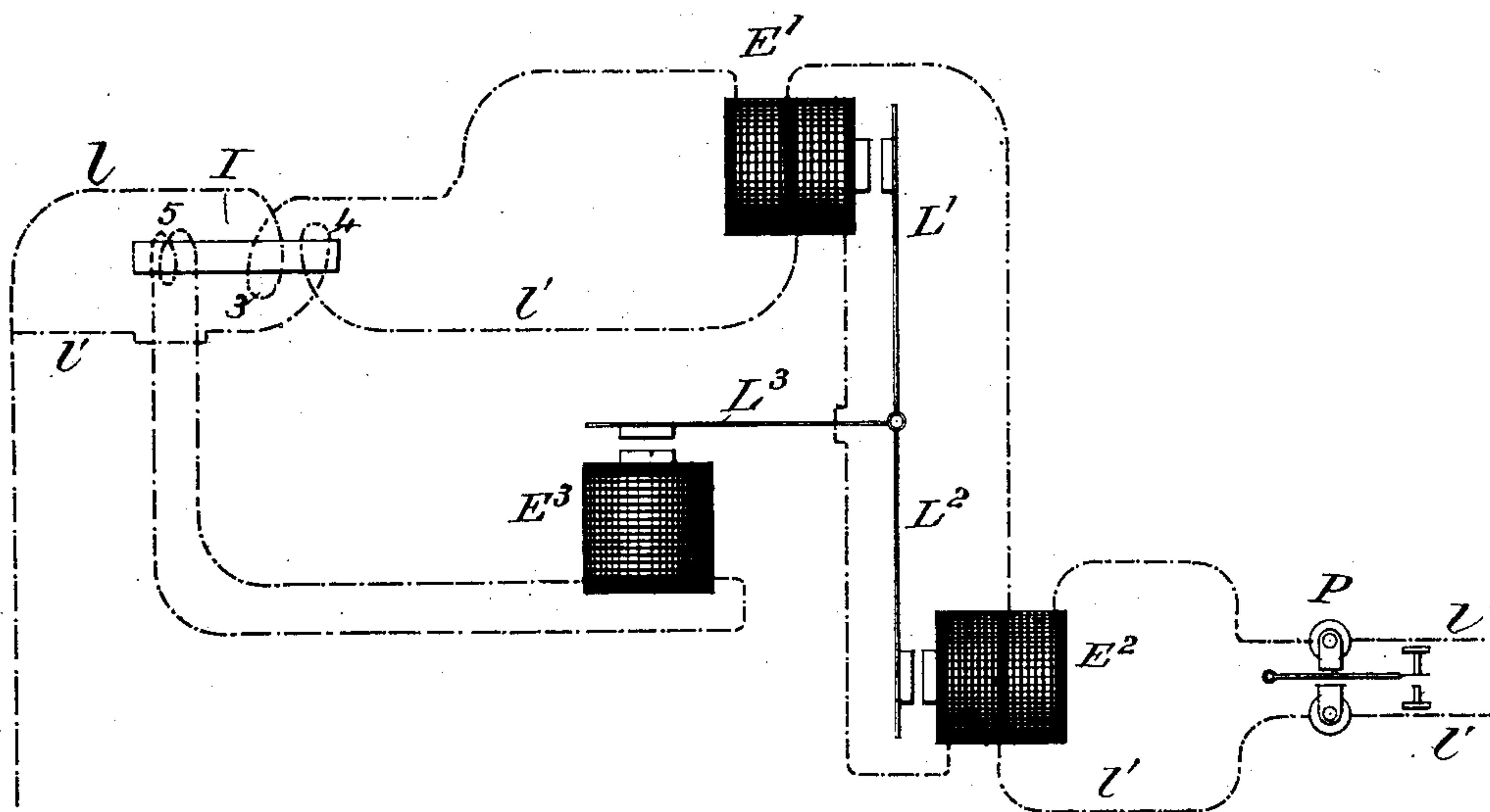


Fig. 1.

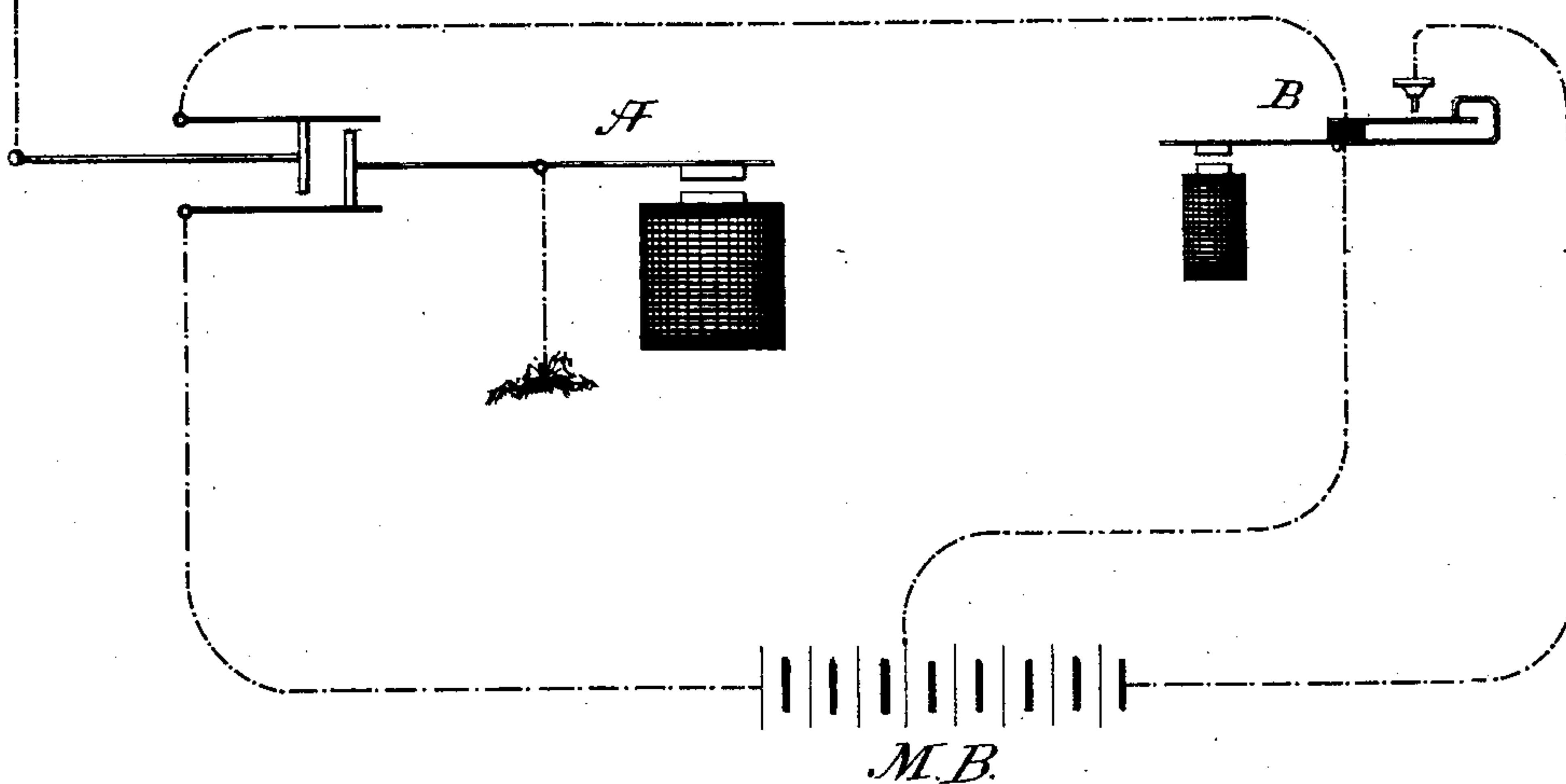


Fig. 3.

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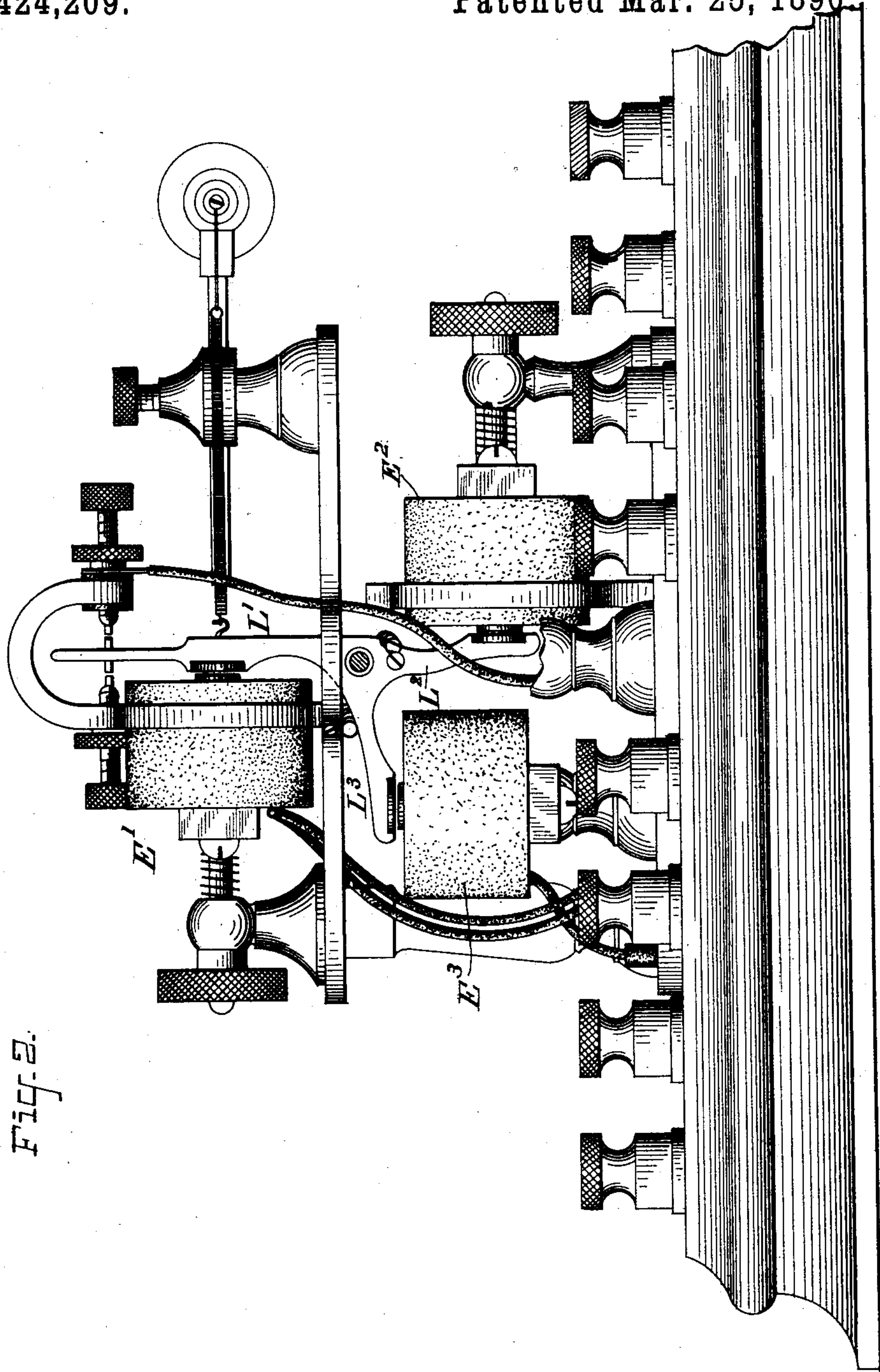


Fig. 2.

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UNITED STATES PATENT OFFICE.

FRANCIS W. JONES, OF NEW YORK, N. Y.

QUADRUPLIX RELAY.

SPECIFICATION forming part of Letters Patent No. 424,209, dated March 25, 1890.

Application filed July 13, 1889. Serial No. 317,429. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS W. JONES, a citizen of the United States, and a resident of New York, in the county of New York and State of New York, have invented a certain new and useful Relay, of which the following is a specification.

The object of my invention is to overcome a practical difficulty in the use of neutral relays in quadruplex-telegraph apparatus where reversals of current are employed, and to increase the rapidity and certainty of operation of the apparatus. It is well known that in this class of devices there is a tendency of the neutral relay to give a false signal at the time of reversal, owing to the fact that when the neutral magnet is excited a period of cessation of magnetism in the same occurs at the instant of reversal. With lines of moderate length this difficulty is overcome to some extent by making the cores of the magnet short and employing suitable compensating devices; but with longer lines it is necessary to use magnets of greater power. To increase the magnetic effect by using more wire, increasing the mass of iron, or lengthening the core is, however, to increase the tardiness of action, so as to increase the natural time of reversal, thus giving rise to false signals and imperfect action.

The aim of my invention is to provide a relay which shall be free from this defect on long circuits, and to this end I propose to virtually subdivide the large magnet heretofore proposed and to use two or more electro-magnets, each having a short core, such as is employed on the relays of shorter circuits, and both pulling together upon a common relay-lever in a direction to assist one another. The coils and cores being separate, the time required for reversal is not increased over what is necessary when one only is used. I thus accomplish a decided saving in the use of battery, especially on long circuits, and greatly increase the speed of operation of long quadruplex-telegraph circuits.

My invention consists, further, in the particular combinations and organizations of apparatus hereinafter described and claimed. In the accompanying drawings, Figure 1 is a diagram of circuits and apparatus embodying my invention. Fig. 2 is a side elevation

of the relay. Fig. 3 is a cross-section through one of the magnet-cores of the same.

Referring to Fig. 1, A indicates a pole-changing transmitter of ordinary character, and B a tension-changing transmitter. The pole-changing transmitter A sends signals by reversals of the current of the main battery M B, whether the whole or a part of the same is in circuit, while the transmitter B sends its signals by changing the strength of the current of the main circuit independently of the condition of the transmitter A.

The apparatus A B is of well-known character, and need not be described further in detail, it only being stated that the devices shown are typical of any apparatus adapted to send signals by reversals of current and changes of tension, respectively, in a quadruplex-telegraph apparatus.

The main and the artificial lines of the apparatus are indicated at 1 1', respectively.

P indicates the ordinary polar relay, connected into or between the main and artificial lines in the ordinary manner, so that it will be balanced with respect to outgoing currents and to respond only to currents coming over the line 1 from the distant station under the operation of a similar apparatus A at such station.

E' E² indicate two neutral electro-magnets, which are magnetically independent of one another in the sense that their cores are not magnetically connected in any manner. These two magnets act in conjunction upon a relay-armature lever, the two parts of which are indicated at L' L², and are each provided, as is well known in the art, with an armature placed opposite the pole of the magnet E' or E². Magnet E' corresponds to the magnet known as the "number 2 relay-magnet" of an ordinary quadruplex-telegraph circuit. Its core is made as short as possible, and its core is slotted, as indicated in the cross-section, Fig. 3, with a very narrow slot entering to the center of the core. This slot is for the purpose of cutting off the Foucault currents, and must be narrow and deep, as shown. The magnet E' is balanced with respect to outgoing currents in any ordinary way—as, for instance, by winding it with two coils, as indicated, placed, respectively, in the main and artificial lines, and operating to oppose one another.

other's action when currents pass through the same from the battery M B. The magnet E^2 is similar to E' , and is also balanced with respect to outgoing currents. As the two magnets pull in conjunction on the armature-lever, the magnetic effect of arriving currents is augmented, and as the cores and coils for such magnets are independent of one another the time of reversals is not increased beyond that incurred with only one of them in circuit. It is thus possible to preserve or even increase the magnetic pull for the neutral relay, while greatly reducing the time of reversal.

My invention also permits of the use of very coarse wire, thus avoiding heating in the coils of the magnet, which is at present a very serious defect in quadruplex-telegraph apparatus when very heavy currents are used, as from dynamo-electric machines.

E^3 indicates a third magnet, which is preferably a neutral magnet, and acts on a third arm L^3 of the relay-armature lever. The magnetic pull of such third magnet is in a direction to assist the magnets E' E^2 . The coils of the magnet E^3 are connected to the secondary of an induction-coil I, which has two coils 3 4, placed, respectively, in the main and artificial lines, or otherwise balanced with respect to outgoing currents. These devices operate after the manner described in my prior patent, No. 360,528, and with the effect of preventing any mutilation of the signal received by the neutral relay in case the time of reversal should be extended so far as to permit the relay-armature to fall back to its back-stop.

The subdivision of the ordinary magnet-core for the neutral relay into two cores and sets of coils is of itself an important factor in increasing the rapidity of signaling without mutilation of signal on the neutral relay; but in conjunction therewith the action of the magnet E^3 is such that I am enabled to attain results far superior to any before secured.

I am aware that it has heretofore been proposed in other kinds of apparatus to use two or more magnets operating on the same armature-lever, and do not therefore wish to be

understood as broadly claiming such a device. My invention, however, is for the purpose of overcoming a practical defect in quadruplex-telegraph apparatus not hitherto attained, and consists, essentially, in cutting the magnet of the original neutral relay heretofore employed into two, or providing two cores and bobbins of smaller size than the ordinary quadruplex neutral relay.

What I claim as my invention is—

1. In a quadruplex telegraph, the combination of a receiving neutral main-line relay consisting of separate electro-magnets E' and E^2 , differentially wound, each having short cores, arranged as shown, with a local electro-magnet E^3 , arranged to act upon an armature fixed upon an arm of the main armature-lever, all substantially as hereinbefore set forth.

2. In a quadruplex telegraph, the combination of a receiving neutral main-line relay consisting of separate electro-magnets E' and E^2 , differentially wound, each having short cores, and a local electro-magnet E^3 , all arranged to control the same armature-lever, as shown, with an induction-coil, the secondary wire of which is connected in local circuit with the electro-magnet E^3 , all substantially as set forth, for the purposes specified.

3. In a quadruplex telegraph, the combination of a receiving neutral main-line relay consisting of separate electro-magnets E' E^2 , differentially wound, each having short cores, a local magnet E^3 , all arranged to control the same armature-lever, and an induction-coil placed in a position neutral to outgoing currents, but active to incoming currents, and the secondary coil of said induction-coil connected in local circuit with the electro-magnet E^3 , all substantially as hereinbefore set forth, with transmitters and a polar relay, as and for the purpose specified.

Signed at New York, in the county of New York and State of New York, this 12th day of July, A. D. 1889.

FRANCIS W. JONES.

Witnesses:

WM. H. CAPEL,
THOS. F. CONREY.