E. GRAY.

Circuit for Speaking-Telephones.

No. 203,264. Patented May 7, 1878.

Fig 1.

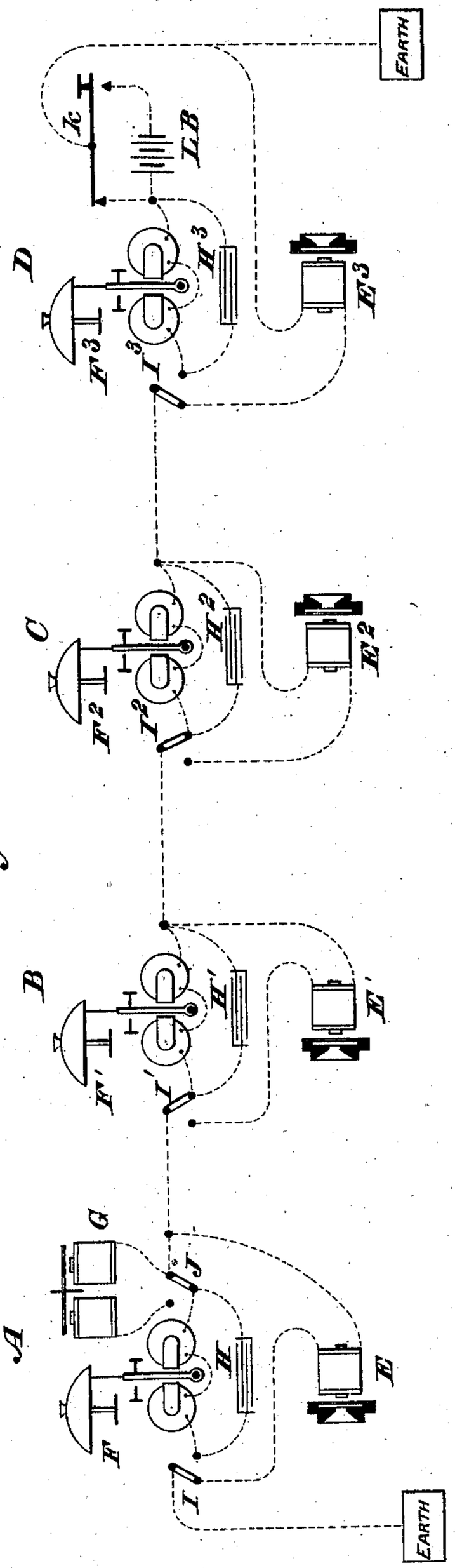
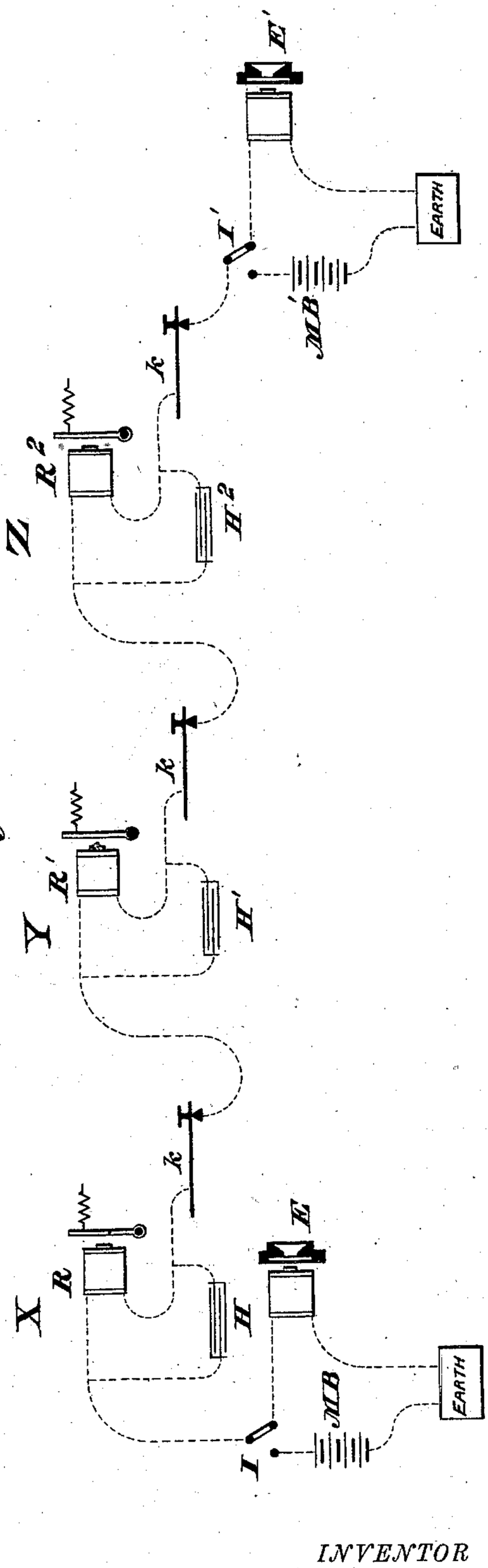


Fig 2.



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IMPROVEMENT IN CIRCUITS FOR SPEAKING-TELEPHONES.

Specification forming part of Letters Patent No. **203,264**, dated May 7, 1878; application filed March 11, 1878.

To all whom it may concern:

Be it known that I, ELISHA GRAY, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Speaking-Telephones, and in the art of transmitting vocal sounds telegraphically, of which the following is a specification:

My invention relates to, and constitutes an improvement upon, a novel art of transmitting vocal sounds telegraphically, and to improvements upon speaking-telephones heretofore invented by me, for which sundry applications for Letters Patent of the United States are now pending, and especially contemplates the employment of a number of speaking-telephones in a single circuit.

The object of my invention is to facilitate the transmission of the tones of the human voice through the alarm, call, or signal apparatus or bell-magnet of an intermediate station, or through the alarm, call, or signal apparatus or bell-magnets of a series of intermediate stations, where more than two stations are included in the same circuit, whereby my speaking-telephone apparatus is rendered especially applicable to circuits upon which ordinary Morse instruments are used.

The subject-matter claimed will hereinafter specifically be designated.

The fact is well known that when an electro-magnet is included in a circuit through which vibrations are transmitted, whether the magnet be of high or low resistance, it greatly impedes the passage of such vibrations, and the more rapid or highly attenuated they are, the more difficult it is to transmit them through the coils of such magnet. This difficulty is so prominent under the systems heretofore practiced that the insertion of even two or three extra magnets in a circuit practically prevents the transmission of articulate sounds or spoken words over a line however short. To obviate this objection, and at the same time leave the bell or call magnet in circuit, I have devised this improvement.

In the accompanying drawings, which represent the best way of carrying out my invention now known to me—

Figure 1 represents my improved arrangement upon circuit of instruments and apparatus on a line consisting of two terminal and two intermediate stations. Fig. 2 represents two terminal stations and an intermediate station, showing my improvements as more especially adapted for operation in connection with a line equipped under the Morse system.

The construction and operation of the instruments represented in the diagrams being well known, it is deemed unnecessary to represent or describe them in detail, except so far as is necessary to illustrate my new organization of apparatus.

In Fig. 1 of the accompanying drawings four stations, A B C D, are represented as arranged in a speaking-telephone circuit. Each station is provided with one or more speaking-telephones, E E^1 E^2 E^3, and also with an ordinary electric call-bell, F F^1 F^2 F^3, having either an ordinary magneto-electric generator or a battery, as the case requires. In this instance station A is shown as provided with a generator, G, while station D is represented as provided with a battery, L B, and an ordinary Morse key, K, for throwing it on and off the line. The batteries and generators are omitted from the intermediate stations for convenience of representation.

The battery is employed for calling on such lines only as use what is known as the "battery-telephone." The magneto-electric generator is used on such lines as use the "permanent-magnet telephone," no battery being required in such cases.

Each station is provided with a switch, I I^1 I^2 I^3, which, in one position, directs the circuit through its respective telephone-magnet, and in the other position through its respective bell-magnet, leaving out the telephone, as will be readily understood by reference to the drawings, which show the method of running the circuits, and which represent the telephone-connection wires as running around the bell-magnet. A similar switch, J, throws the generator on or off the line, as required. When the line is not in use the switches are all left standing, so that the circuit passes through the bell-magnets, shunting the telephones, thus enabling any one station to call any other by means of its alarm, or call-bell and battery, or bell and magneto-generator, as the case may be.

In Fig. 1, the switches I I^3 on the terminal stations A and D are, respectively, shown in position for conversing between those two stations. The intermediate stations B and C are necessarily left in position for calling; therefore the circuit is directed through the bell-magnets of those stations, as it would be impracticable to have them all switched out of circuit whenever any two stations wished to converse. My improvement allows these magnets to remain in circuit, and, therefore, be in position to receive calls without in the least interfering with the transmission of the voice-vibrations over the lines from one terminal station to the other.

Letters Patent No. 198,738, granted to me January 1, 1878, for transmitting double signals simultaneously through a single wire—one by the ordinary Morse method, and the other by harmonic or telephonic vibrating signals—show Morse relay-magnets, with a condenser shunting or connected around each magnet in circuit. This was done partly to facilitate the passage of vibrations through the way or Morse stations, thus making a channel for vibrations through the condenser, and thereby relieving the vibrations of the necessity of passing through the magnets, which, as hereinbefore stated, offer great resistance to the transmission of such vibrations, owing to the fact that at the time the magnet is being charged a momentary induced current is set up in the opposite direction, thus retarding the first flow of the current, which, in the case of rapid vibrations, amounts to an obstruction almost total; whereas in signals of longer duration it is not perceptibly felt. Experience has demonstrated that the remedy afforded by my improvement above mentioned is so complete that, with four or six stations in circuit, there is scarcely any perceptible diminution in volume of sound over that of a clear wire of the same length; whereas without my improvement it would be impossible to work through so many instruments, unless the bell-magnets were made very small, in which case the alarm-signal would be too light.

My improvement is applicable to any form of signaling apparatus whatever.

The condenser may be made a part of the apparatus—that is, for instance, it may be placed in the bottom of signal-boxes, as ordinarily constructed, or it may be made separate, as in the ordinary form, and connected through the box by means of wires of such length as may be most convenient.

In the drawings, the condensers H H^1 H^2 H^3 are shown as shunting the alarm or call apparatus; or, in other words, as arranged in branch circuit with each bell-magnet, as in the patent above mentioned.

It is frequently desirable to use the speaking-telephone on ordinary Morse circuits, which my improvement renders it practicable to do very advantageously by means of the arrangement represented in Fig. 2, which shows three stations, X Y Z. When the two terminal stations X and Z wish to communicate with each other over an ordinary Morse telegraphic circuit, it is only necessary to arrange the switches I I^1 in the position indicated, so that the batteries at each end are off, and the circuit is directed to earth through the speaking-telephones E E^1, respectively. In addition to this, each relay-magnet, R R^1 R^2, in circuit must be provided with a condenser, H H^1 H^2, connected as hereinbefore described; otherwise it would be necessary to switch out of circuit all the relays on the line when the terminal stations wish to converse.

I claim as of my own invention—

1. The hereinbefore-described art of transmitting vocal sounds or spoken words through a bell-magnet or other signal-magnet and condenser arranged in branch circuits in a main line.

2. The hereinbefore-described art of transmitting vocal sounds or spoken words through a series of bell-magnets or other signal-magnets and condensers arranged in branch circuits in a main line.

3. The combination, substantially as hereinbefore set forth, in a speaking-telephone, of a bell-magnet or other signal-magnet and its actuating apparatus, a condenser shunting said magnet and actuating apparatus, and a telephone-magnet shunting said bell-magnet, actuating apparatus, and condenser, and a switch controlling the shunts.

4. The combination, substantially as hereinbefore set forth, in a Morse circuit, of a series of condensers shunting the relays at each station, telephone-magnets at two or more stations, and switches which simultaneously shunt the telephone-magnets into line and throw off the batteries.

5. The combination, substantially as hereinbefore set forth, in a single electric circuit, of a series of stations, each provided with a bell-magnet or other signal-magnet and its actuating apparatus, a condenser shunting them, a telephone-magnet shunting the bell-magnet, actuating apparatus, and condenser, and switches controlling the shunts, whereby the signal-magnet, actuating mechanism, and condenser at the transmitting-stations are cut out of circuit which passes through the corresponding apparatus at the intermediate stations, shunting the telephones.

In testimony whereof I have hereunto subscribed my name.

ELISHA GRAY.

Witnesses:
A. G. SWARTWOUT,
CHAS. S. SHEPARD.