(No Model.)

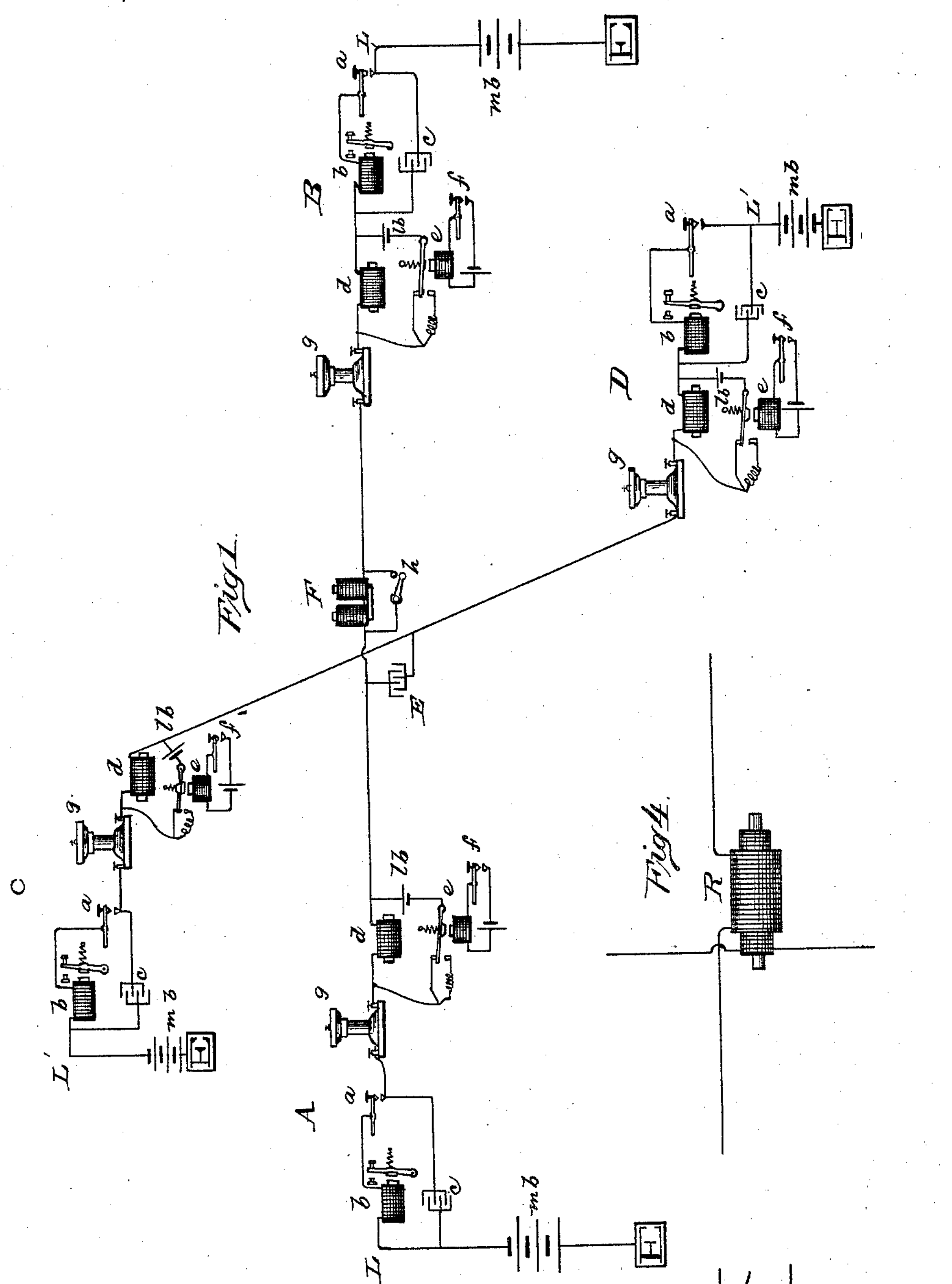
2 Sheets—Sheet 1.

T. A. EDISON.

TELEGRAPH.

No. 448,779.

Patented Mar. 24, 1891.



ATTEST:

E. C. Rowland

Wm. Pelzer

INVENTOR:

Thomas A. Edison,

By Dyer & Seely

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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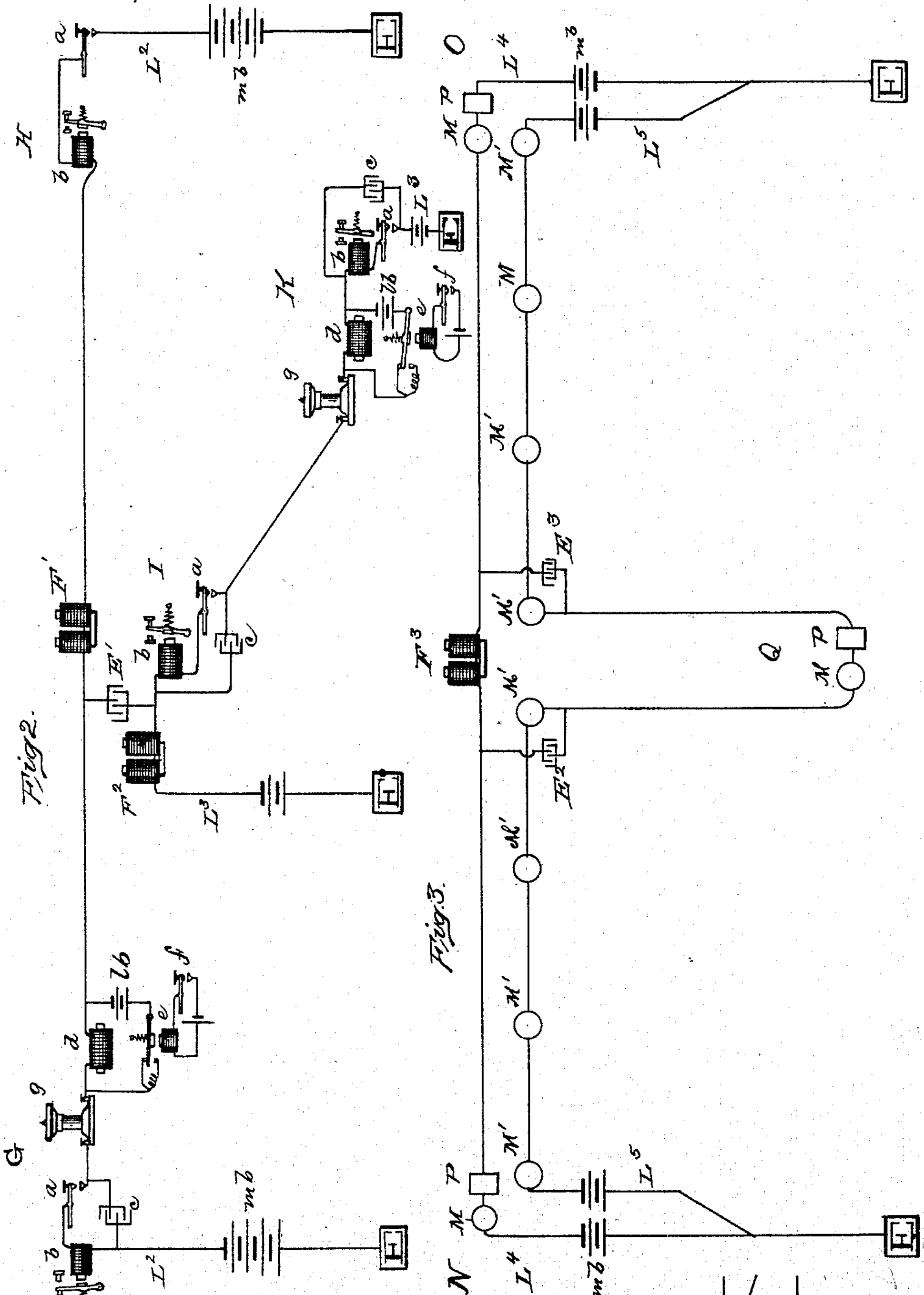

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UNITED STATES PATENT OFFICE.

THOMAS A. EDISON, OF LLEWELLYN PARK, NEW JERSEY.

TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 448,779, dated March 24, 1891.

Application filed July 19, 1886. Serial No. 208,359. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Llewellyn Park, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Telegraphs, (Case No. 673,) of which the following is a specification.

The object I have in view is to utilize for telegraphic purposes two or more ordinary telegraph-lines provided with the usual Morse instruments in such manner that parts or all of these two or more lines will form an independent circuit for the transmission and reception of telegraphic signals, while the lines will separately be operated in the ordinary manner without interference of signals. This enables me to connect crossing or intersecting lines and thus establish direct communication between points at present reached by indirect telegraphic routes, requiring the transference of messages from one line to another at one or more points and causing the delay arising from this necessity. Many other convenient and desirable arrangements of circuits are also made possible by the invention.

I employ the induction telegraphic apparatus for transmitting and receiving the extra set of signals, the principle of which apparatus is covered by my Patent No. 333,289. The signals are composed of induction-impulses produced by a key from a special source of electrical energy and received by diaphragm receivers or sounders. The regular Morse signaling-keys and relays are shunted by condensers to keep the line constantly closed for the induction-impulses.

In carrying out my invention the two or more separate Morse lines are connected by condensers or induction-coils, and, where necessary to properly direct the induction-impulses, retarding or damming magnets are inserted in the lines.

In the accompanying drawings, forming a part hereof, Figure 1 illustrates by diagram the connection of crossing Morse lines midway of the length of each. Fig. 2 is a similar view of lines, one of which is connected at its end to the center of the other line. Fig. 3 is a similar view of the connection of a "through" line and a "way" line to reach an office in a loop from the way line, and Fig. 4 a view showing the use of an induction-coil for connecting two lines. Other differences between the figures of the drawings will be specifically pointed out in the description.

In Fig. 1 lines L L and L′ L′ cross near their centers. For simplicity each line is represented with only two telegraph-offices, those of the line L L being designated by A and B and those of the line L′ L′ by C and D. These lines are each grounded at their ends and have the usual line-batteries *m b*. At each office is the ordinary Morse telegraph set, composed of signaling-key *a*, relay *b*, and a sounder. (Not shown.) The key *a* and relay *b* at each office are shunted by a condenser *c*. At each office is also an induction telegraph set, which is illustrated as composed of magnetic coil *d*, located in the line and shunted by a local battery *l b* through the lever and points of a sounder *e*, controlled by a transmitting-key *f*, and a diaphragm-receiver *g*, also in the line. The lines L L and L′ L′ are connected together by a condenser E, joining the two lines into a common induction-circuit, while the lines remain independent for telegraphing by the ordinary Morse instruments. If it is desired to cut off an office (say B) from the induction-circuit, a retarding or damming magnet F will be introduced in the line L L between such office and the point of the connection with the line of the condenser E. A switch *h* can be provided for cutting out this magnet, so as to restore the office cut-out to the induction-circuit. It will be seen that by the use of retarding or damming magnets and switches and lines connected by condensers many different arrangements may be made of the induction-circuits without interfering with the use of the lines separately for the regular Morse telegraphing.

In Fig. 2 line L^2 L^2 is connected at its center by a condenser E′ with the end of a line L^3 L^3, extending off in another direction. The line L^2 L^2 has offices G H, the first having an ordinary Morse set and an induction set, and the second only an ordinary Morse set without a condenser around the key and relay. In line L^2 L^2 between office H and the condenser E′ is a retarding or damming magnet F′. By omitting this magnet or providing a switch to cut it out of circuit the office H could also be made an induction office, as is the office B on line L L in Fig. 1. The line

L^3 L^3 has two offices I K. The office I, which is near the inner end of the line, has only an ordinary Morse set with a shunted key and relay; but it may also have an induction set. The office K has both an ordinary Morse set and an induction set. Between the condenser E′ and the ground at that end of the line this line L^3 L^3 is provided with a retarding or damming magnet F^2 to force the induction-signals to seek ground at the farther end of the line through the instruments at office K.

In Fig. 3 for simplicity the ordinary Morse sets are designated by circles M and M′ and the induction sets by squares P.

The Morse sets of circles M have shunted keys and relays, while those of circles M′ need not be shunted. The line L^4 L^4 is a through line between stations N and O, while the line L^5 L^5 is a way line between such stations, and also has a lateral loop including an office Q. It is desired to use the through line L^4 L^4 for an induction-circuit between the stations N and O, so as to avoid the resistance of the instruments at the way offices on line L^5 L^5 and to obviate the expenses of shunting by condensers the keys and relays at such way offices, and it is also desired to include the office Q in the induction-circuit. The object stated is accomplished completely by connecting the sides of the loop from the way line L^5 L^5, leading to station Q, with the through line L^4 L^4 by condensers E^2 and E^3 and by locating in the line L^4 L^4 between such condenser-connections a retarding or damming magnet F^3. The induction-circuit will thus be established from ground at the station N over line L^4 L^4 to condenser E^2 by loop of line L^5 L^5 to station Q, back by loop and through condenser E^3 to line L^4 L^4, and thence to ground at the station O.

It is evident that instead of employing the principle of static induction to connect the lines for induction-signals the principle of current or magnetic induction may be employed, as by the use of an induction-coil R, Fig. 4, one line being connected with one circuit of the coil and the other line with the second circuit. The induction-coil preferably has an iron core, and may, for example, be of one hundred ohms resistance in each circuit.

What I claim is—

1. The combination, with two or more telegraph-lines, each having ordinary Morse sets and induction sets, of one or more induction-connections between such lines and one or more retarding or damming magnets to divert the induction-signals from portions of such lines, substantially as set forth.

2. The combination, with two or more telegraph-lines, each having ordinary Morse sets and induction sets, of one or more induction-connections between such lines, one or more retarding or damming magnets to divert the induction-signals from portions of such lines, and one or more switches for modifying the effect of such retarding or damming magnet or magnets, substantially as set forth.

3. The combination of a telegraph-line provided at two or more points with signaling-keys and receivers, and provided also at one or more points with induction sets in series with said keys and receivers, a branch or crossing line provided with similar instruments, said lines being inductively connected, a retarding-magnet in the first line, and a retarding-magnet in the branch or crossing line, substantially as set forth.

This specification signed and witnessed this 15th day of July, 1886.

THOS. A. EDISON.

Witnesses:
WM. PELZER,
E. C. ROWLAND.