(No Model.) 2 Sheets—Sheet 1.

T. A. EDISON

TELEGRAPHY.

No. 422,072. Patented Feb. 25, 1890.

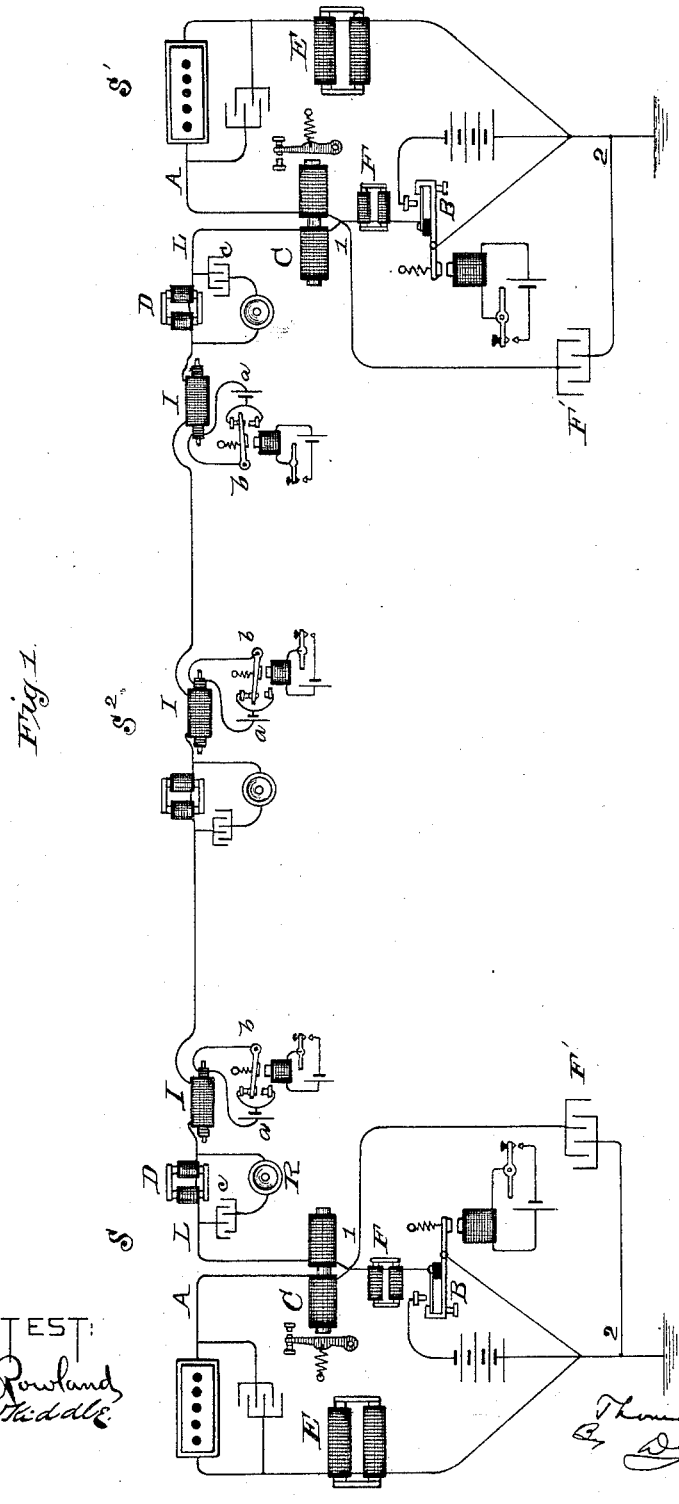

Fig. 1.

ATTEST:
E. C. Rowland
F. W. Middleton

INVENTOR:
Thomas A. Edison
By Dyer & Seely
Attys

(No Model.) 2 Sheets—Sheet 2.

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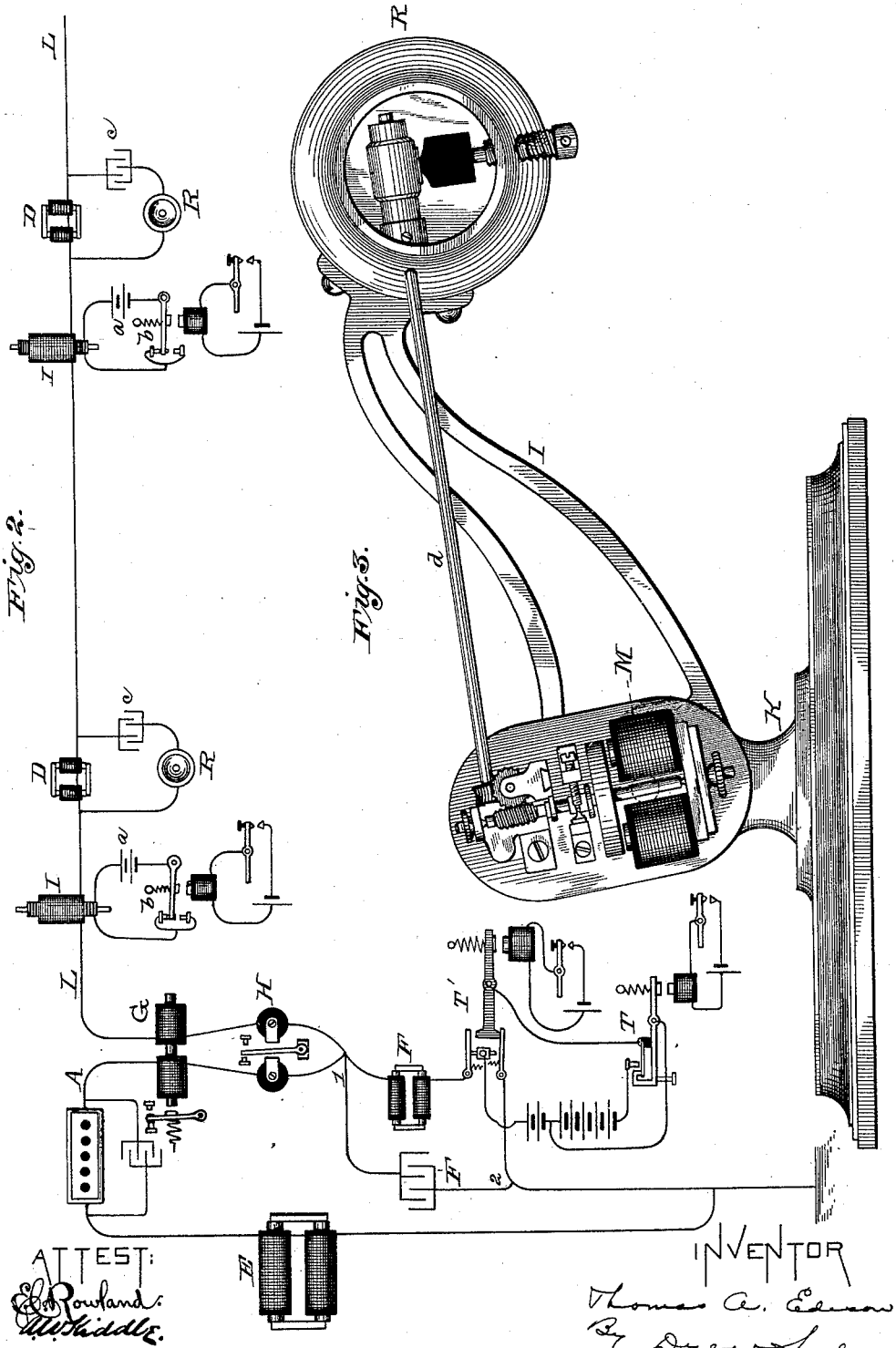

ATTEST:
E. C. Rowland.
W. Middle.

INVENTOR
Thomas A. Edison
By Dyer & Seely
Attys

UNITED STATES PATENT OFFICE.

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

TELEGRAPHY.

SPECIFICATION forming part of Letters Patent No. 422,072, dated February 25, 1890.

Application filed October 23, 1885. Serial No. 180,689. (No model.)

To all whom it may concern:

Be it known that I, THOMAS A. EDISON, of Menlo Park, in the county of Middlesex and State of New Jersey, have invented a new and useful Improvement in Telegraphy, (Case No. 653,) of which the following is a specification.

The ordinary systems for duplex and quadruplex telegraphy are operative only between the terminal stations of a line, and hence such lines have no way-stations.

The principal object I have in view is to produce apparatus whereby duplex or quadruplex transmission can be carried on between terminal stations at the same time that the line may be operated as a way-line, the two sets of signals being transmitted and received simultaneously and without interference. This I accomplish by providing such lines with my induction apparatus described in employing transmitters and receivers of induction impulses, and hereinafter referred to as "induction" apparatus, such apparatus being patents issued to me, numbered 333,289 and 333,290, a set of such apparatus being located in the main line at each terminal and way station. The artificial lines are provided each with one or more electro-magnets having an inductive capacity equal to the magnets and induction-coils of the induction sets, in order to preserve the balance necessary for the proper operation of the duplex or quadruplex apparatus. The relays of the duplex or quadruplex apparatus prove too sluggish in their action to respond to the rapid vibrations produced by the induction-transmitters, and hence the duplex or quadruplex transmission will not be interfered with.

Since a duplex or quadruplex line is never open, there does not exist the necessity for providing condenser-shunts around keys in order to preserve the continuity of the circuit for the induction signals, as pointed out in the applications referred to; but I have found that special means are desirable or necessary to prevent false sounds in the diaphragm receivers of the induction apparatus, due to the responding of such receivers to the extra vibrations produced by the duplex or quadruplex transmitting-instruments, and caused by the vibration of the contacts. This difficulty is especially present when the induction apparatus is used on quadruplex lines, the extra vibrations accompanying the reversals of current produced on such lines by the double-current transmitters of the quadruplex sets having a particularly disturbing effect upon the diaphragm sounders. This disturbance can be avoided if the extra vibrations referred to can be neutralized and the impulses of the current-transmitters of the duplex or quadruplex apparatus be converted into simple waves or waves with a less number of vibrations than are required to produce sound. This I accomplish by including in the current-transmitter circuit at each end of the duplex or quadruplex line, and before such line is divided at the junction of the main and artificial lines, an electro-magnet, and providing a condenser-shunt around this electro-magnet and the transmitter-contacts. By the combined action of the electro-magnet and condenser the extra vibrations caused by the rebound of the contacts are neutralized entirely, or to a sufficient extent to prevent false signals in the diaphragm receivers of the induction sets. This device, when applied to duplex or quadruplex sets, prevents inductive disturbances in telephones connected with adjoining lines. This device is only claimed herein in combination with the other novel features described, it being broadly covered by another application for patent of even date herewith.

In the accompanying drawings, forming a part hereof, Figure 1 is a view, principally in diagram, showing the application of the invention to a duplex line; Fig. 2, a similar view of a quadruplex line, one end of line being alone shown; and Fig. 3, an elevation from the rear side of the diaphragm sounder and support with portions of the case removed to show working parts.

Referring more particularly to Fig. 1, L L represent the main line, and A A the artificial lines. B is the current-transmitter of the duplex sets, and C the duplex relays. Three stations are shown on the line—two terminal stations S S′ and a way-station S^2. The duplex sets are at the terminal stations, at which are also phonoplex sets located in or connected with the main line. At each of the one or more way-stations on the line is also an induction set located in the line. The induc-

tion sets have each a transmitter and receiver of the induction signals. The transmitter is an induction-coil I, having its secondary circuit directly in line, and having in its primary circuit a local battery *a* and a suitable circuit-controlling device *b*. The receiver is a diaphragm sounder R, located in a shunt around an electro-magnet D in line, this shunt including also a condenser *c*. Each artificial line A has one or more electro-magnets E, equal in inductive capacity to the coils and magnets of the induction sets in line. In the circuit of each duplex-current transmitter B before that circuit divides into the main and artificial lines is an electro-magnet F. A shunt-circuit 1 2 is formed around magnet F and transmitter B, which shunt includes a condenser F′. These parts are for the purpose already explained.

In Fig. 2 the same parts are shown in connection with a quadruplex set, of which T T′ are the single and double current transmitters, and G H the non-polarized and polarized relays. The shunt 1 2 is formed around the points of both transmitters. The induction sets transmit and receive Morse signals by rapid induction impulses which do not affect the relays of the duplex or quadruplex sets.

The diaphragm sounder is shown in detail in Fig. 3. It is an electro-motograph telephone-receiver mounted on the outer end of an arm I, which is pivoted at its inner end to a suitable support K. The chalk cylinder of the motograph is on a spindle *d*, extending to the inner end of arm I, where it is connected by a speed-reducing gearing with an electric motor M, all these parts being mounted on arm I and turning therewith. The chalk cylinder of the motograph is kept in constant rotation by the electric motor, so that the instrument will be ready at all times to respond to induction signals.

What I claim is—

1. The combination, with duplex or quadruplex telegraph instruments and the main line therefor, of telegraph-instruments employing transmitters and receivers of induction impulses located in said main line for permitting single transmission back and forth over said line without interference with the duplex or quadruplex transmission, substantially as set forth.

2. The combination, with duplex or quadruplex telegraph instruments and the line therefor for duplex or quadruplex transmission between terminal stations, of telegraph-instruments employing transmitters and receivers of induction impulses located in said line at terminal and way stations, substantially as and for the purposes set forth.

3. The combination, with duplex or quadruplex telegraph instruments and the main and artificial lines therefor, of telegraph-instruments employing transmitters and receivers of induction impulses located in the main line, and one or more balancing electro-magnets in each artificial line, substantially as set forth.

4. The combination, with duplex or quadruplex telegraph instruments and the main line therefor, of telegraph-instruments employing transmitters and receivers of induction impulses located in the main line, an electro-magnet in each duplex or quadruplex transmitter circuit, and a condenser-shunt around such magnet and the transmitter-contacts, substantially as set forth.

5. The combination, with duplex or quadruplex telegraph instruments and the main and artificial lines therefor, of telegraph-instruments employing transmitters and receivers of induction impulses located in the main line, balancing electro-magnets in the artificial lines, a magnet in each duplex or quadruplex transmitter circuit, and a condenser-shunt around each of such magnets and the transmitter-contacts, substantially as set forth.

This specification signed and witnessed this 7th day of October, 1885.

THOS. A. EDISON.

Witnesses:
A. W. KIDDLE,
E. C. ROWLAND.