

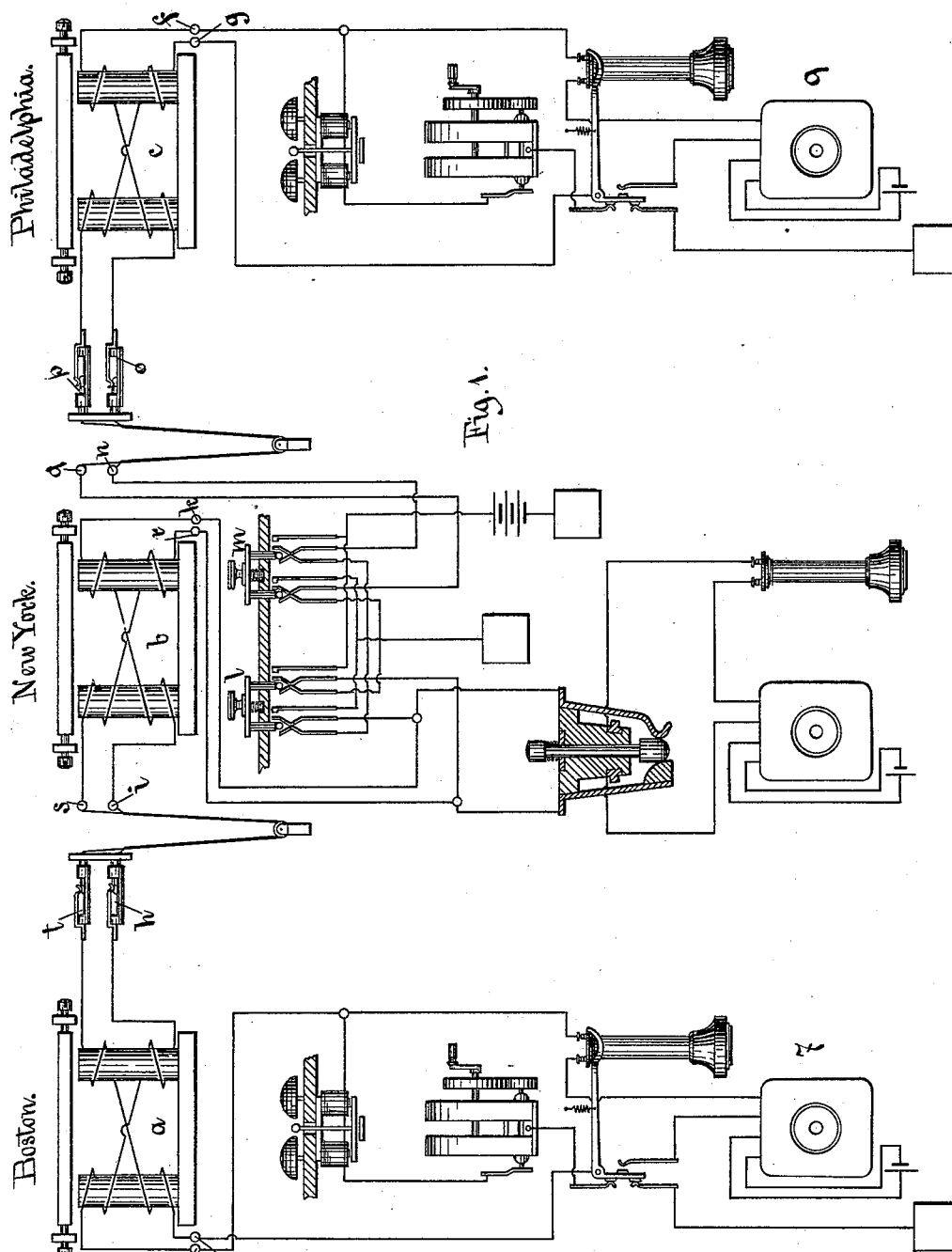
(No Model.)

2 Sheets—Sheet 1.

J. A. SEELY.
TELEPHONE SIGNAL APPARATUS.

No. 431,531.

Patented July 1, 1890.



Witnesses:

Edw. O. Zwisch.
Chas. S. Hawley.

Inventor.

John A. Seely.

by George P. Barton
Attorney.

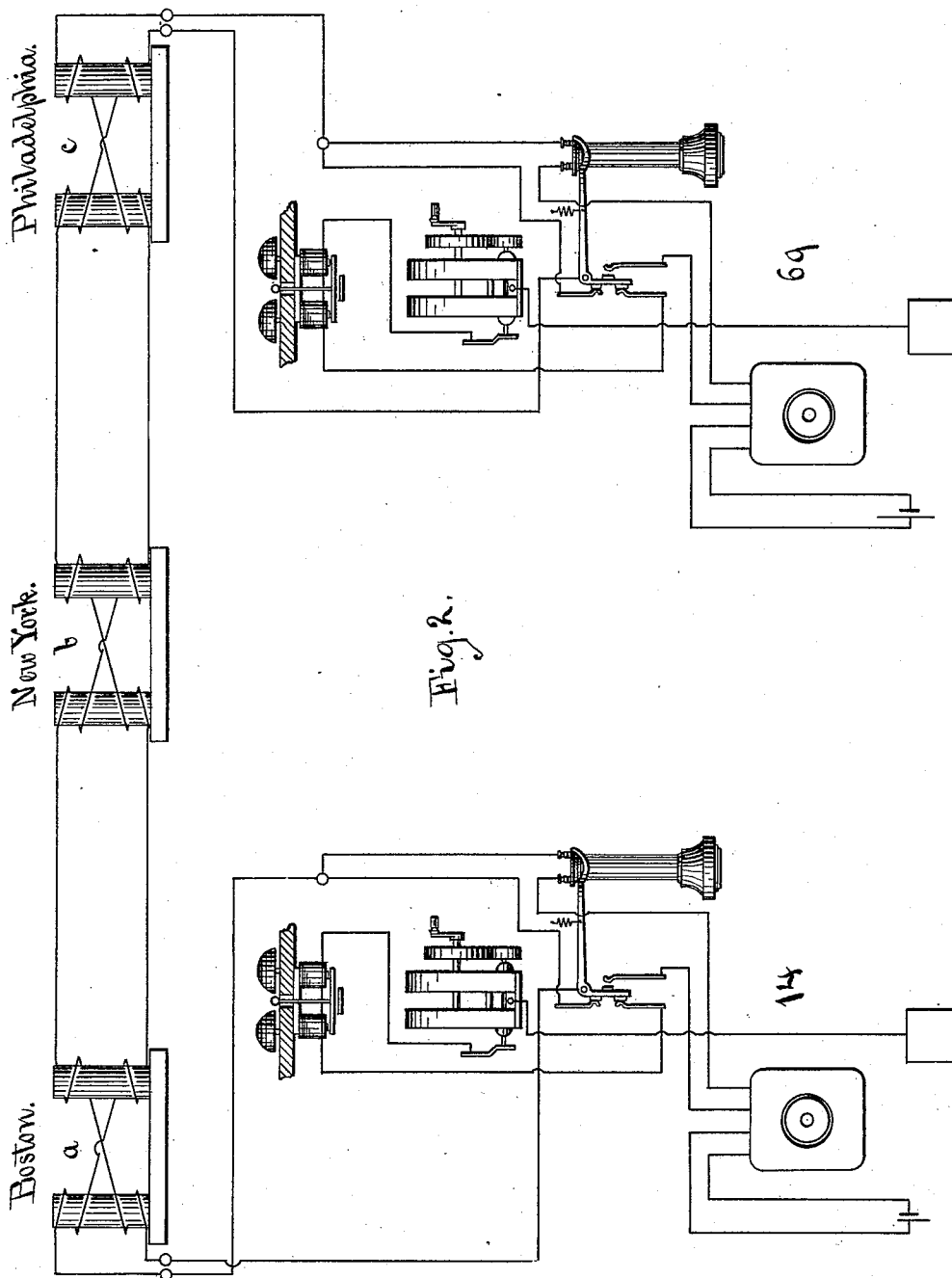
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UNITED STATES PATENT OFFICE.

JOHN A. SEELY, OF BROOKLYN, NEW YORK, ASSIGNOR TO THE WESTERN
ELECTRIC COMPANY, OF CHICAGO, ILLINOIS.

TELEPHONE SIGNAL APPARATUS.

SPECIFICATION forming part of Letters Patent No. 431,531, dated July 1, 1890.

Application filed January 21, 1888. Serial No. 261,491. (No model.)

To all whom it may concern:

Be it known that I, JOHN A. SEELY, a citizen of the United States, residing at Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Improvement in Long-Distance Telephone Signal Apparatus, (Case 7,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to long-distance systems of telephony, in which systems, as is well known, metallic circuits are employed. These metallic circuits are sometimes termed "two-wire circuits" or "two-wire trunk circuits."

It is well understood that the coils of an electro-magnet included in a telephone-circuit are very objectionable by reason of the retardation resulting from self-induction. Various systems of shunt-circuits around the electro-magnet coils and condensers placed around the electro-magnet coils have been heretofore used to eliminate, as far as may be possible, this objectionable dynamic retardation. These previous devices have all been successful to a certain extent in diminishing the retardation due to self-induction, but have been objectionable on account of the fact that these shunts and condensers, as heretofore used, have cut down the working margin of the magnets when required for receiving signals.

My invention is designed to remove the dynamic retardation, heretofore considered unavoidable, in circuits in which clearing-out signal devices have been employed.

My invention consists in using doubly-wound clearing-out annunciators in the metallic circuits, so connected that current sent over either limb or both limbs of the metallic circuit will operate the clearing-out annunciators, while current sent over the limbs when connected in metallic circuit and disconnected from ground will not operate or in anywise affect the clearing-out annunciators, the coils of the clearing-out annunciators being neutrally disposed with respect to the two limbs when connected in metallic circuit for talking purposes.

In the accompanying drawings, which are illustrative of my invention—

Figure 1 is a diagram illustrative of a two-wire trunk-line and its connections at its extremities with subscribers' stations, the connections at the intermediate station being also shown. The connections at the subscriber's station are such that when either subscriber turns his generator current will be sent over only one of the two limbs of the metallic circuit between the two stations. Fig. 2 is a diagram of a similar two-wire trunk circuit, showing a subscriber's station connected at each of the outer stations in a modified manner, so that when either subscriber turns his generator current will pass over both wires of the metallic circuit to ground at the other subscriber's station.

I will now describe my invention as illustrated in Fig. 1:

We will consider the clearing-out annunciators *a*, *b*, and *c* connected in the trunk-circuit respectively at Boston, New York, and Philadelphia. The coils of these clearing-out annunciators are doubly wound, the different windings of each annunciator being in different limbs of the metallic or trunk circuit. The two wires of the metallic circuit of subscriber, station 7, of the Boston exchange, are shown connected at points *d* and *e* with the two limbs of the trunk circuit, and in like manner the two wires of the metallic circuit of the subscriber at station 9 of the Philadelphia exchange are shown connected with the two limbs of the trunk circuit at points *f* and *g*. The metallic circuit between subscriber 7 of the Boston exchange and subscriber 9 of the Philadelphia exchange may be traced, beginning at point *d* in the Boston office, through one winding of annunciator *a* to switch *h*, and thence through the plug inserted in said switch and one strand of the flexible cord to point *i*, and thence through a winding of clearing-out annunciator *b* to point *k*, and thence through the springs of calling-keys *lm* to point *n*, and thence through a strand of the flexible cord to the tip of the plug inserted in switch *o*, and thence through a winding of the clearing-out annunciator *c* to point *f*. From point *f*, when the telephone

of subscriber's station 9 is removed from the hook, the circuit may be traced through the telephone and back to point *g*, and from point *g* back through the other winding of annunciator *c* to switch *p*, and thence to point *q*, and thence through the other springs of the calling-keys *m l* to point *r*, and thence through the other winding of clearing-out annunciator *b* to point *s*, and thence to switch *t*, and thence through the other coil of clearing-out annunciator *a* to point *e*, and thence, when the telephone of subscriber 7 is removed from the hook, through said telephone to point *d*, the place of beginning, thus completing the metallic circuit between the telephones at stations 7 and 9.

In Fig. 2 I have shown similar clearing-out annunciators having their coils connected in the same manner as described with respect to the coils of the clearing-out annunciators *a b c*. (Shown in Fig. 1.) I have, however, omitted, as unnecessary for the purposes of this description, the usual signaling and listening-in apparatus used at the New York office. The switching apparatus shown at subscribers' stations 14 and 69 in Fig. 2 is so arranged that when the telephones are hung up, as shown, both limbs of the metallic circuit will be united and connected to ground through the generator and bell at each of said subscribers' stations.

In Fig. 1, when the telephones of stations 7 and 9 are hung upon the hooks, as shown, one limb of the metallic circuit is disconnected, the other limb forming the ground-connection between the two subscribers' stations.

I have not shown the apparatus in detail for making the calls and connections at the stations Boston, New York, and Philadelphia, since there are various forms of apparatus for doing this work well known to those skilled in the art.

We will suppose that subscriber 7 of the Boston exchange requires a connection with subscriber 9 of the Philadelphia exchange. Subscriber 7 will, in the usual manner, notify the Boston office of the connection required. Boston thereupon will communicate with Philadelphia either through the New York office or directly, as may be most convenient. In practice it is found most convenient and economical to have an intermediate station, as at New York, at which intermediate station all the trunk wires are run and are connected with one another, as may be found most convenient. For this reason it is necessary to have a clearing-out annunciator in the circuit of a through-trunk connection, not only at Boston and Philadelphia, but also at the intermediate station at New York. In case the system were more extended, two or more intermediate stations might be required, in which case a clearing-out annunciator would be required at each of the intermediate stations. The importance, therefore, of preventing any retardation at the clearing-out

annunciators of long-distance circuits is obvious.

By my system, as herein described, I have completely overcome or eliminated such self-induction as has heretofore been considered unavoidable and which has resulted in such hurtful retardation.

I have heretofore traced the talking-circuit between subscribers' stations 7 and 9. It will be observed that the voice-currents are sent around each coil of the annunciators *a, b*, and *c* in such direction that there will be no extra current induced—that is to say, there will be no magnetization of the cores—and any self-induction that might exist between different convolutions will be completely neutralized. The clearing-out annunciators will be, however, operative as clearing-out signals when required.

As shown in Fig. 1, current sent from ground at said station 7 will pass to point *d*, and thence, as heretofore traced, to point *f* at the Philadelphia station, and thence through the bell of station 9 to ground—that is to say, the generator at station 7 is included in that side or that limb of the metallic circuit which includes point *d* at the Boston station and point *f* at the Philadelphia station; hence, when the generator at station 7 is turned current will be sent through one winding only of each of the clearing-out annunciators, and the same may be said with respect to the generator at station 9. Thus, in either case, when the generator is turned at station 9 or 7, the cores of all the clearing-out annunciators will be energized.

As shown in Fig. 2, the circuits are so connected that when the generator at station 14 or the generator at station 69 is rung current will be sent through both limbs of the metallic circuit, and hence through both windings of the coils of the clearing-out annunciators *a b c*. The current through the different coils will, however, be in the same direction, and hence the cores of the annunciators *a b c* will be energized when the generator at either of the stations 14 or 69 is operated. Current sent over either one limb or the other or over both limbs in one direction will serve to energize the clearing-out signal devices.

I have shown two different ways of making the connections between the subscriber's apparatus and the metallic circuits. My invention is not limited to any particular manner of making the connections or to any particular manner of making the connections at the intermediate station. It is evident that the intermediate station might be entirely dispensed with. It is evident, also, that my neutrally-connected signal-receiving device might be used at one station only upon a metallic circuit.

Having thus described my invention, I claim as new and desire to secured by Letters Patent—

1. The combination, with doubly-wound

coils of a signal-receiving device, of the two limbs of a metallic telephone-circuit and branch connections to ground at each of two stations, the coils of said signal-receiving device being neutrally connected in the metallic circuit, but connected in the same direction with respect to the ground branches, whereby current in the ground branches will operate the signal-receiving device and current in the metallic circuit will leave the signal-receiving devices neutral.

2. A metallic telephone-circuit containing at the terminal stations thereof and at an intermediate station thereon clearing-out signal devices wound neutrally with respect to the said metallic circuit, in combination with a telephone and ground branch and switching apparatus at each of said stations, and a generator or source of current at each of the terminal stations adapted to be included in the ground branch thereof, whereby current from the ground branch at either terminal station operates the clearing-out signal devices at the other stations, while the voice-currents sent over the metallic circuit when

the telephones are in use act neutrally upon the clearing-out signal devices.

3. The combination, with a metallic circuit passing through a subscriber's telephone to the central office and from said central office through an intermediate station to another central office and through a subscriber's telephone of the latter exchange, of clearing-out electro-magnetic signal devices, one at each of said central offices and one at the intermediate station, said electro-magnetic signal devices being each doubly wound, and one of the windings of each being included in one limb of said metallic circuit, and the other winding of each being included in the other limb of said metallic circuit, whereby retardation of voice-currents between the subscribers' stations is prevented at the signal-receiving devices, substantially as described.

In witness whereof I hereunto subscribe my name this 23d day of December, A. D. 1887.

JOHN A. SEELY.

Witnesses:

W. G. SELLERS,
EDWARD W. BOSTWICK.