

No. 720,875.

PATENTED FEB. 17, 1903.

W. E. ATHEARN.
TELEGRAPH SYSTEM.

APPLICATION FILED MAR. 19, 1902.

NO MODEL.

2 SHEETS—SHEET 1.

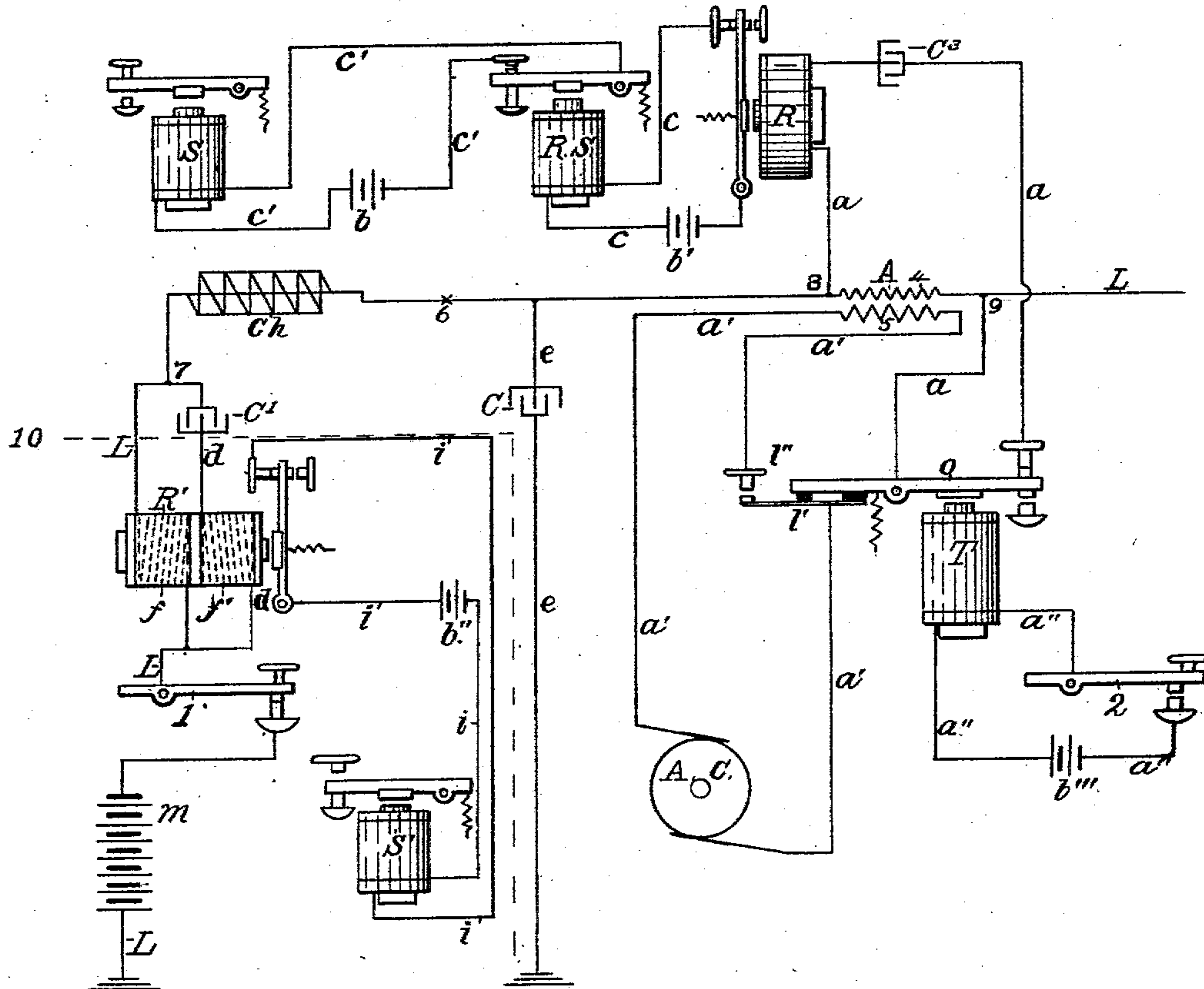


Fig. 1

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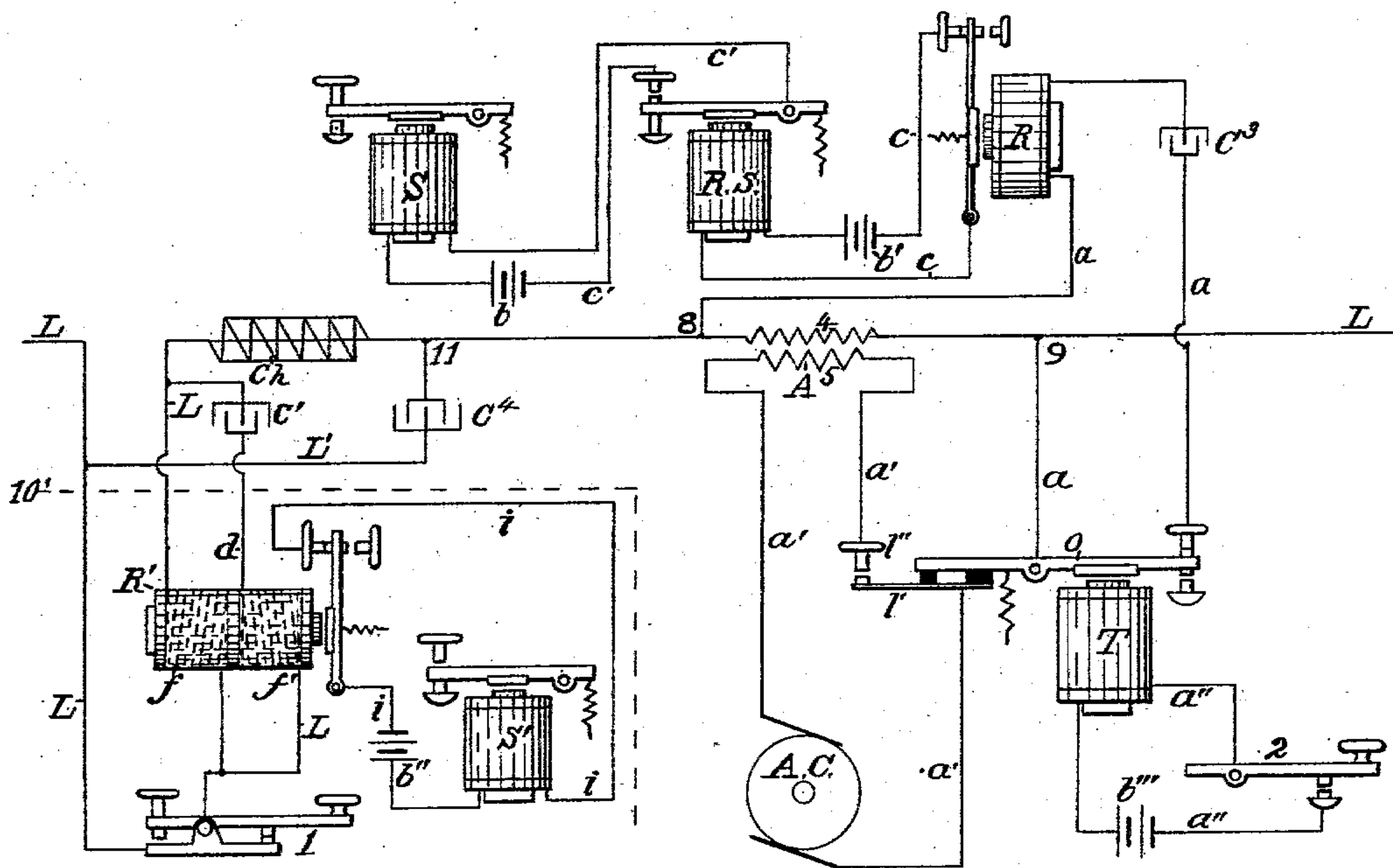


Fig. 11

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UNITED STATES PATENT OFFICE.

WILLIAM EDWARD ATHEARN, OF BROOKLYN, NEW YORK.

TELEGRAPH SYSTEM.

SPECIFICATION forming part of Letters Patent No. 720,875, dated February 17, 1903.

Application filed March 19, 1902. Serial No. 98,929. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM EDWARD ATHEARN, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented a certain new and useful Telegraph System, of which the following is a specification.

My invention relates to electric telegraphs; and its object is to increase the capacity of telegraph-lines by the simultaneous transmission over them of non-interfering and non-mixing signals all of the Morse character and the employment of instruments only that are common to Morse systems. By "non-mixing of signals" is meant that the different signals may be sent from separate offices at each end of the line or at intermediate stations, and the instruments belonging to one system cannot respond to the instruments of the other, or, in other words, two parties may use the same line having separate offices, and one party cannot pick out the signals of the other party.

The objects set forth are attained by the means described in this specification and shown in the accompanying drawings.

Figure I represents the arrangement of the apparatus at terminal stations, and Fig. II represents their arrangement at intermediate stations. These apparatus represent what is called a "duplex" system, by which two messages may be sent simultaneously in one direction or two each in an opposite direction.

Fig. I represents two sets of transmitting and receiving apparatus—one for the employment of direct-current impulses and one for alternating-current impulses—both upon the line L L L L. The apparatus to the left hand of and below the broken line 10 represents the outfit for direct current-operation from the main-line battery *m*, and the remainder of the apparatus is for alternating-current operation. Except as to the relay *R'* the direct-current apparatus is in all respects similar to the usual outfit for single Morse transmission, here represented by the key 1, relay *R'*, and a reading-sounder *S'*, having operative connection with the relay through its lever, front stop, circuit *i i i i*, and battery *b''*. The relay *R'* has a double winding, affording two current-paths *ff'* through it; but the branch line *d*, forming

part of the circuit with *f'*, includes a condenser *C'*, which prevents its being traversed by the direct current, so that the direct current traverses only the winding *f* and actuates the relay. The alternating currents, however, that pass through the relay follow both circuits; but as the coil *f'* is differential to the coil *f* these currents will have no effect upon the relay. Direct-current impulses, therefore, that are sent from the battery *m* by the key 1 will go to the line by way of the relay-winding *f*. There is a ground connection of the line at *ee*; but as it includes a condenser the impulses cannot escape by that route. There is also a loop in the line at 8 9, embracing a relay *R*; but there is a condenser *C*³ in the loop, so that the impulse will not pass through it. In the main line at A is the secondary winding 4 of a transformer. The primary winding 5 of the transformer is connected with the generator A C through the spring *l'* on the lever *o* of the transmitter T, and its contact *l''* by means of the circuit *a' a' a'*. The lever of the transmitter is actuated through its magnet by means of a key 2, connected with the electromagnet by the line *a'' a'' a''*, which includes the battery *b'''*. By means of the key, impulses from the generator are caused to pass through the coil 5, which induce impulses in the secondary that traverse the line L. There is no selection of positive or negative impulses to send to the line, but each Morse character is made up of a number of alternations. In the fluctuations of these alternating impulses from line to earth at the sending-station they will travel through the ground-wire *ee* mostly by reason of the choking-coil *Ch* in the line between the ground *e* and the direct-current apparatus. A small percentage of the current, however, will penetrate the choking-coil and the resistances of the relay *R'*; but they will not affect the relay, owing to the differentiability of the relay-windings. From the line on each side of the secondary coil 4 are branches 8 9, forming a loop *aa a*, which includes the lever of the transmitter T, its upward stop, a condenser *C*³, and the relay *R*. This relay is connected with a relay-sounder RS through its lever, back-stop, circuit *cc*, and battery *b'*. The relay-sounder is connected with the reading-sounder S through the lever of the relay-

sounder and its upperstop, the circuit $c' c' c'$, and battery b . In transmitting signals with the key 2 the effect is this: Closing key 2 closes the alternating circuit by the path a' 5 $a' a' a' 5$ and opens the circuit of the lever o with the loop $a a a$, so that the coil 5 transfers its signals by induction to coil 4 directly upon the line, the fluctuations of the impulses occurring principally through the ground 10 connection e , the portion that finds a path through the coil Ch producing no effect upon the relay R' , as already explained. Incoming impulses will have paths as follows: The direct-current impulses will pass through the 15 coils 4 and Ch and will go through the winding f of the relay R' , actuating the sounder S' , thence through the key 1 and battery m to the ground. The alternating-current impulses will be deflected by the coil 4 to the 20 loop $a a a$, passing through the relay R and actuating the sounders connected therewith, returning to the line at the point 8, thence mostly to the ground by way of the ground-wire e . The amount of current that will 25 pass through the coil Ch will follow both windings of the relay R' to the ground without affecting the relay. The direct currents and the alternating currents will not interfere one with the other on the circuits or the line.

30 Fig. II represents a duplication of the instruments used at the terminal stations for an intermediate station. The direct-current apparatus is shown to the left hand of and below the broken line 10'. No battery is provided at the intermediate station; but since 35 the alternating-current impulses are put upon the line by induction a source of alternating current is provided. In place of a ground-line to correspond with the line e , Fig. I, the 40 direct-current apparatus is bridged by a line L' , embracing a condenser C^4 . If the main line should be opened at a point, as 6, Fig. I, between the ground-line e and the other apparatus, the line would still be available 45 for the alternating-current service, and the alternating-current apparatus may be disconnected from the main line without affecting the direct-current apparatus.

The direct-current apparatus may be placed 50 in offices of one party, and the alternating-current apparatus may be placed in the offices of another party, all using the same main line, and the messages of one system cannot be taken by the apparatus of the other 55 system.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, in a system of tele- 60 graphy, of a direct-current system embracing a differential relay with two paths there-

through, connections from each of said paths to the key and to the line, a condenser in one of said paths, an alternating system embracing a transformer and a source of currents, 65 the secondary of the transformer forming a part of the main line, means for sending Morse signals through the primary of the transformer, a main-line ground connection between the transformer and the direct-cur- 70 rent apparatus, a condenser in said ground connection, a choke-coil between the said ground connection and the direct-current apparatus, a loop branching from the main line on each side of the transformer, and a con- 75 denser and receiving-relay in said loop, substantially as herein set forth.

2. The combination, in a system of telegraphy, with a main line, of a transformer the secondary of said transformer constituting a 80 part of the main line, a source of alternating current, means for sending Morse signals from said source of current through the primary of the transformer, a loop from the main line branching from each side of the transformer, 85 a relay and a condenser in said loop, receiving-sounders actuated by said relay, direct-current apparatus at the terminal of the line, a ground-line from the main line at a point between the transformer and the said direct-cur- 90 rent apparatus, a condenser in said ground-line, and a choking-coil between the ground-line and the said direct-current apparatus, substantially as herein set forth.

3. In a system of telegraphy the combina- 95 tion with a main line of a transformer the secondary of said transformer constituting a part of the main line, a source of alternating current, means for sending Morse signals there- 100 from through the primary of the transformer, a loop from the main line around the transformer, a relay and a condenser in said loop, receiving-sounders actuated by said relay, a direct-current apparatus at the terminal of the 105 line, a ground-line from the main line at a point between the transformer and the said direct-current apparatus, a condenser in said ground-line, a choking-coil in the main line between said ground-line and said direct-current ap- 110 paratus, a relay in said direct-current apparatus having two current-paths through it connected with the transmitting-key and with the main line, and a condenser in one of said paths, substantially as herein set forth.

Signed at New York city, in the county of 115 New York and State of New York, this 15th day of March, A. D. 1902.

WILLIAM EDWARD ATHEARN.

Witnesses:

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R. H. MORRIS.