No. 617,890. Patented Jan. 17, 1899.

G. S. TIFFANY.

TELAUTOGRAPH.

(Application filed May 29, 1896. Renewed Feb. 11, 1898.)

(No Model.) 2 Sheets—Sheet 1.

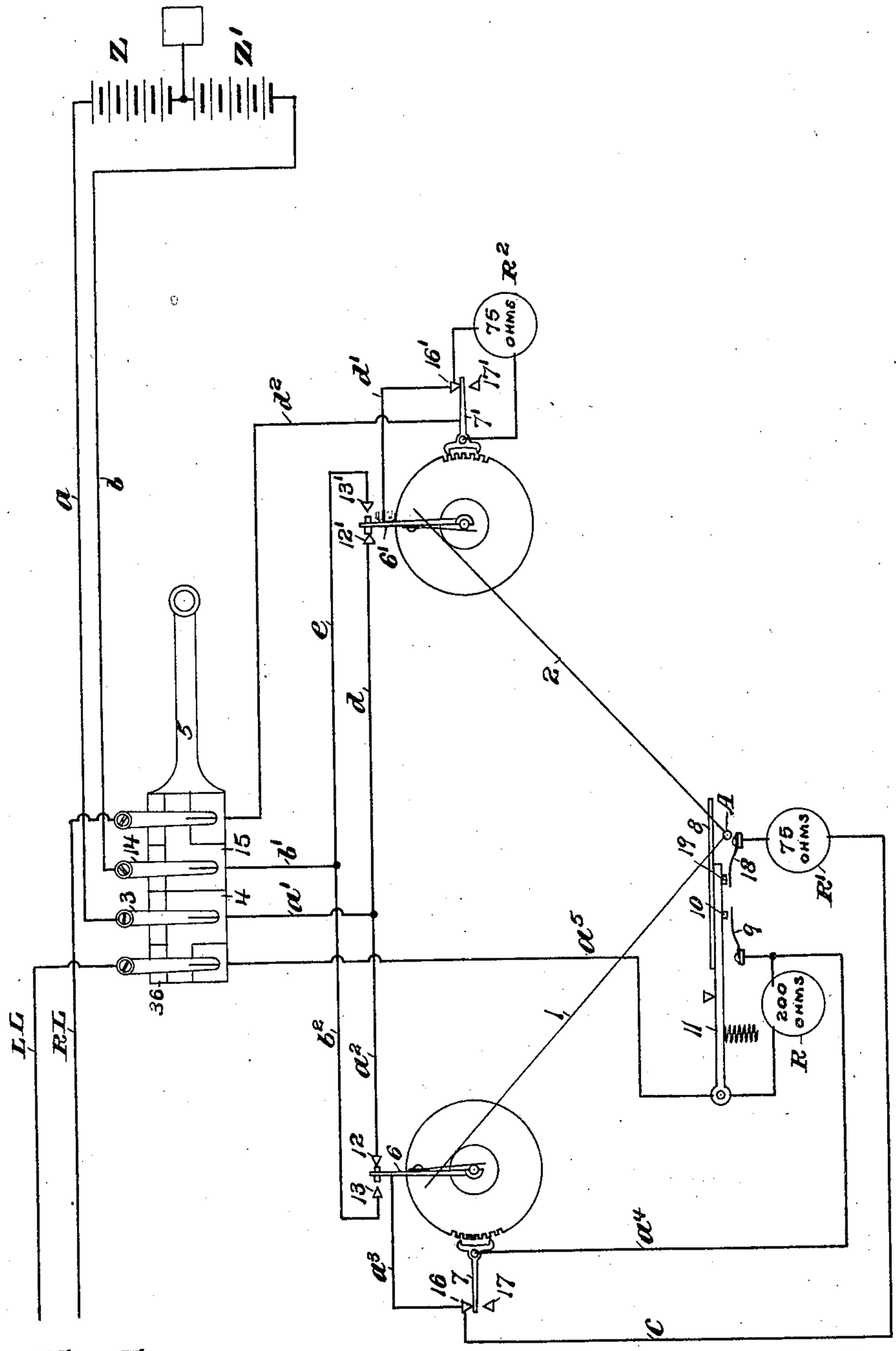

Fig. 1.

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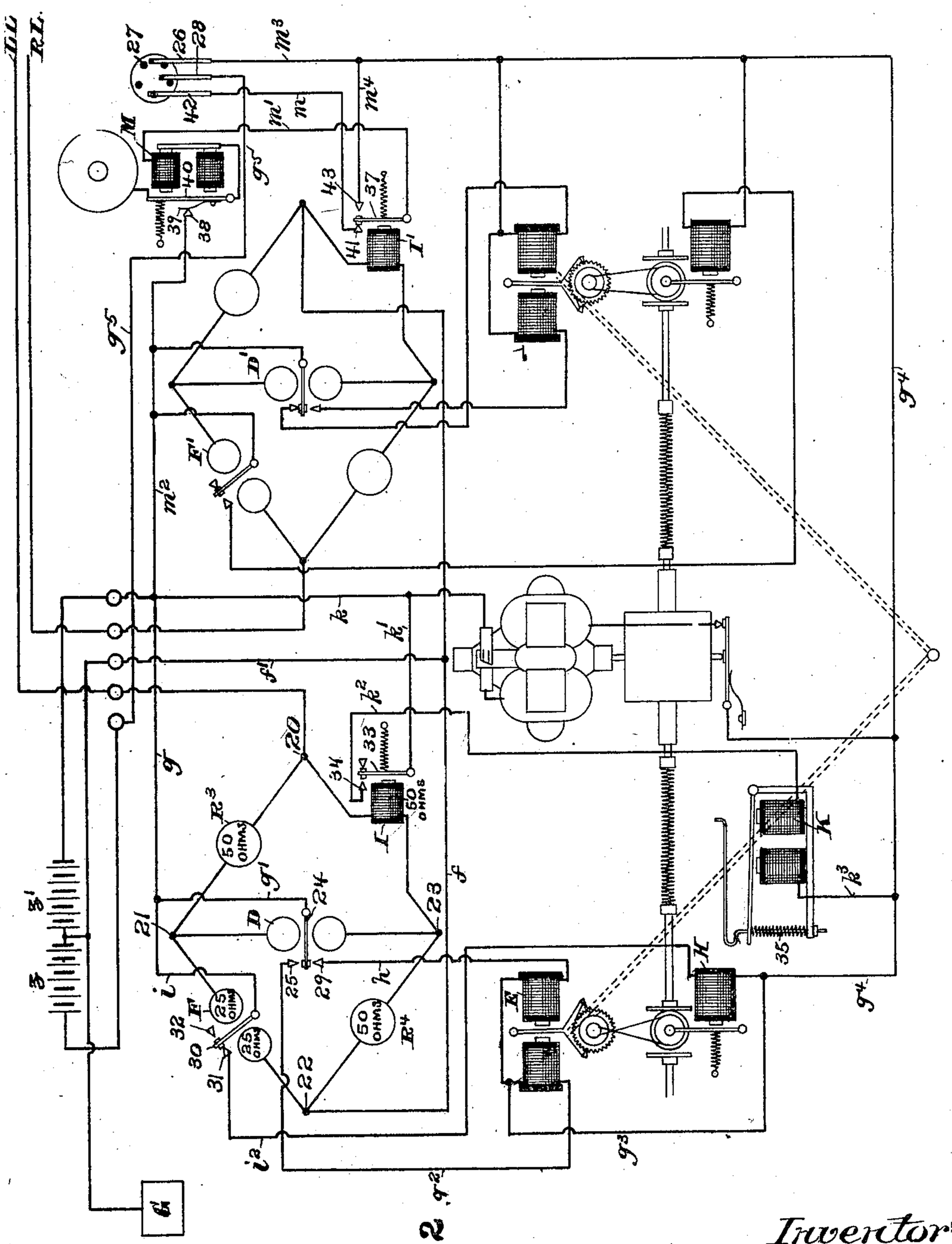

Fig. 2.

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UNITED STATES PATENT OFFICE.

GEORGE S. TIFFANY, OF HIGHLAND PARK, ILLINOIS, ASSIGNOR TO THE GRAY NATIONAL TELAUTOGRAPH COMPANY, OF RICHMOND, VIRGINIA.

TELAUTOGRAPH.

SPECIFICATION forming part of Letters Patent No. 617,890, dated January 17, 1899.

Application filed May 29, 1896. Renewed February 11, 1898. Serial No. 669,975. (No model.)

To all whom it may concern:

Be it known that I, GEORGE S. TIFFANY, a citizen of the United States, residing at Highland Park, county of Lake, and State of Illinois, have invented certain new and useful Improvements in Telautographs, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

My invention relates to telautographs; and it consists of improvements whereby the movements of the transmitting-pen in each of its two angular directions are transmuted into impulses of successively like polarity, the reversal of the direction of movement of the transmitting-pen, however, reversing the polarity of the impulses, said impulses of like polarity being transmuted into pulsations of successively opposite polarity, by which the movements of the receiving-pen in extent are controlled. This transmutation of the impulses sent from the transmitter into pulsations of successively opposite polarity may be effected in a variety of ways by induction. In this application I describe the method of securing it by means of the application of the principle of a Wheatstone bridge.

In the drawings annexed to this specification, Figure 1 is a diagram of the circuits of the transmitting instrument, and Fig. 2 is a diagram of the circuits of the receiving instrument.

In the drawings, A is the usual transmitting-pen carried by the pen-arms 1 2. The line-circuit passes from the divided battery Z to wire a, contact-spring 3, plate 4 of master-switch 5, wires a' a^2 to Prony brake 6, wire a^3 to interrupter-lever 7, wire a^4, resistance R, wire a^5 to left line L L. In this position of the transmitting instrument, therefore, a positive current of minimum strength is sent to line. When the platen 8 is depressed, the current in the same positions of the Prony brake and interrupter passes from wire a^4 to contact-spring 9, contact 10, and thence through platen-support 11 to wire a^5 and to line, producing an impulse of maximum strength. When the Prony brake moves from its stop 12 to its stop 13, owing to a reversal in the direction of movement of the transmitting-pen, the current flows from the other half Z' of the battery through wire b, contact 14, plate 15 of the master-switch, wires b' b^2, Prony brake, wire a^3, interrupter, wire a^4, &c., sending a negative current to line, the strength of the current being dependent upon the position of the platen. When the interrupter moves from its contact-point 16 to its back-stop 17, the current is shifted to wire c and passes through the resistance R', when the platen is depressed, through contact-spring 18, contact 19, platen-support 11, and wire a^5 to line. When the platen is in the elevated position, as shown, this branch is broken and no current is sent to line. The purposes of these varying strengths and of the interruption of the circuit will be stated hereinafter.

The circuits of the right line are as follows: from battery Z through wire a, contact-spring 3, plate 4, wire a', wire d, Prony brake 6', wire d', interrupter 7', wire d^2, master-switch, and right line R L, sending a positive impulse. When the Prony brake moves from its contact 12' to its contact 13', owing to reversal in the direction of movement of the transmitting-pen, the right-line circuit is closed from battery Z' through wire b, spring 14, wire b', wire e, Prony brake 6', wire d', wire d^2 to R L, sending a negative impulse to line, the current strength being in each of these two cases at its maximum. When the interrupter 7' moves from its contact 16' to its back-stop 17', the current is diverted from the Prony brake through resistance R^2, and thence to line, as before, the impulse being of either polarity, according to the position of the Prony brake, and of a minimum strength, being reduced by the resistance R^2.

Referring now to Fig. 2, the left-line circuit enters the receiving instrument, divides at 20, and passes in one branch through non-inductive resistance R^3 to point 21, magnet F to point 22, where it unites with the other branch, which passes from point 20 through the coils of relay I to point 23, thence through non-inductive resistance R^4 to point 22. From the point 22 the circuit passes through wires f f' to ground. Intermediate between the points 21 and 23—*i. e.*, in a bridge between the two branches of the main-line circuit—is placed the magnet D, controlling the escapement mechanism. The magnet F controls the reversing mechanism.

The two branches of the main line between the points 20 and 22, together with the cross connection through magnet D, constitute a

Wheatstone bridge, in each of the four sides of which is an equal resistance, the non-inductive resistance R^3 R^4 having fifty ohms, the relay I having a like resistance, and the coils of magnet F having each a resistance of twenty-five ohms. Were a continuous current of one polarity to pass through this arrangement of circuits and resistances the current would speedily recover its equilibrium after the completion of the circuit, and an equal amount of the current would flow through each branch between the points 20 and 22, and no current would pass through the magnet D. The condition of equilibrium is, however, disturbed by each making and breaking of the circuit with the following results: When the circuit is closed, as the current increases in intensity in the coils of the relay I a counter electromotive force is developed by this relay which is equivalent to an added resistance in the path 20 23, while at the same time a counter electromotive force is developed by the magnet F which is equivalent to an added resistance in the path 21 22. Consequently the major part of the current is diverted from the point 20 into the path 20 21, thence through the bridge and magnet D to the point 23, thence to the point 22 and ground, causing magnet D to draw its armature 24 to one of its poles.

When the line-current is interrupted, magnets I and F each discharge induced currents of the same polarity as the line-circuit theretofore passing through them. This induced current of magnet I passes through the triangular path 23 21 20, while the induced current discharged from magnet F passes through the triangular path 21 22 23. Both of these induced currents therefore flow in the same direction through the bridge 21 23 and are opposed in direction to the main-line current just before flowing through the bridge. Their combined effect, therefore, is to cause the magnet D to move its armature over to its other pole. The vibrations of the armature D thus produced control the escapement-magnet E in the following manner: When the armature 24 is against its stop 25, the current of local-receiver battery z' passes from battery through wire g, wire g', armature 24, wire g^2, coils of magnet E, wire g^3, wire g^4, contact-spring 26, disk 27, contact-spring 28, wire g^5 to the positive pole of battery z, causing the armature of magnet E to move in one of its two directions. When the armature-lever 24 is against its contact-point 29 the current of battery z' passes, as before, to armature-lever 24, thence to contact 29, wire h, coils of magnet E, wire g^3, and thence to the positive pole of battery z, as before.

The reversal in the direction of movement of the receiving-pen is effected by the action of magnet F in the following manner: When the impulses sent from the transmitting-station are of the proper polarity the armature 30 of the magnet F will be drawn toward its contact-point 31, in which position the current will pass from the local battery z' through wire g, wire i, armature-lever 30, contact 31, wire i^2, magnet H, wire g^4, &c., as before, to the positive pole of battery z, causing the magnet H to draw up its armature and place the reversing-clutch in one of its two positions. When the polarity of the impulses sent from the transmitting-station is reversed, the armature 30 is brought against its back-stop 32, the circuit of magnet H is broken, its armature is released, and the reversing-clutch assumes its opposite position.

The raising and lowering of the pen at the receiving-station are effected as follows. I have heretofore spoken of the movements of the receiving-pen as controlled by making and breaking the line-circuit. Under the term "making and breaking," I mean to include the equivalent of an absolute make and break—*i. e.*, a substantial reduction in strength. The resistances of the left-line circuit are so arranged that at no time when the transmitting-platen is depressed will the circuit be entirely interrupted, but sufficient current will be left on line to cause the relay I at all such times to attract its armature.

The difference in potential required to cause the successive impulses which control the movements in extent of the receiving-pen is secured by the resistance R′, placed in one of the paths of the line-circuit. This resistance is adjusted to the transmitter-battery strength, so that when it is in circuit sufficient current will be on line to actuate magnet I. In the organization shown herein the resistance R′ is placed at seventy-five ohms. When the transmitting-platen is in its elevated position, the current is alternately wholly broken and passed through the higher resistance R, which is so adjusted to the strength of the transmitting-battery that when the current passes through the same the strength of the latter will be insufficient to cause the magnet I to draw up its armature, but will be sufficient to actuate the magnets D and F. It results, of course, from this organization that when the transmitting-platen is in its elevated position the armature of relay I will at all times be on its back-stop and when the transmitting-platen is in its depressed position the armature of relay I will at all times be on its front stop.

The pen-raising mechanism at the receiving-station is controlled by the armature of relay I as follows: When the latter, 33, is on its front stop 34, the circuit of local battery z' is completed through wires k k', armature 33, wire k^2, pen-lifting magnet K, wire k^3, wire g^4 to the positive pole of battery z, and the receiving-pen rest is lowered. When the armature 33 is on its back-stop, the circuit of magnet K is broken and the receiving-pen rest elevated by the spring 35.

The shifting of the paper is effected at the transmitter as follows: The right-line circuit is at no time wholly broken, but is alternately closed by the interrupter 7′ without resistance

and through the resistance R^2, which is so adjusted with reference to the transmitting-batteries that the difference in potential which it affords is sufficient to produce the impulses required to control the movement of the receiving-pen by means of the magnet D'; while at the same time sufficient current will be at all times on line when the master-switch is in the position shown in Fig. 1 to cause the magnet I' to draw up its armature. When it is desired to shift the paper, the master-switch is shifted until the contact-springs rest upon the row of contact-plates 36. In this position of the master-switch the battery is entirely cut off from the line and the relay I' releases its armature. The shifting of the paper is controlled by the relay I' as follows: When its armature 37 is against its front contact-stop, as is the case while the instrument is employed in transmitting and receiving messages, the circuit of the paper-shifting magnet is broken. This magnet has a double circuit, as follows: from the positive pole of battery z through wire g^5, contact-spring 28, metal disk 27, and thence through two paths, either contact-spring 42, wire m, contact-point 41, lever 37, wire m', coils of magnet M, armature 40, spring 39, contact-point 38, wire m^2 to negative pole of battery z', or through spring 26, wires m^3 m^4, contact-point 43, armature-lever 37, wire m', &c., as before, to the negative pole of battery z'. The disk 27 is furnished with a number of insulating-pins, which successively intervene between the springs 42 26 and the disk 27, but do not affect the connection of spring 28 with the disk. As stated above, in the normal writing position of the instrument the circuit of magnet M is broken because the spring 42 rests upon one of the insulating-pins. Now when the master-switch at the transmitting-station is shifted, so as to break the line-circuits, magnet I' releases its armature and the circuit of magnet M is completed through spring 26, causing the paper-shifting reel to revolve until the circuit of magnet M is interrupted by the lifting of the spring 26 by one of the insulating-pins on the revolution of the disk 27, which revolves with the paper-shifting mechanism. When the writing position of the instrument is resumed by the shifting back of the master-switch, the magnet I on drawing up its armature again completes the circuit of the magnet M through the spring 42, which causes the paper to be further shifted until the circuit of magnet M is broken by the interposition of another insulating-pin between the spring 42 and the disk 27, these two movements of the paper shifting the latter through the space ordinarily left between two lines of writing.

I do not limit myself to the organization shown for transmuting by inductive action the direct impulses sent from the transmitter into to-and-fro impulses for controlling the receiving-escapement, as various other organizations accomplishing this result may be employed. Neither do I limit myself to the particular devices shown for controlling the position of the receiving-pen and for shifting the paper, nor to the particular organization of circuits for reversing the direction of movement of the receiving-pen, nor to other details of construction and organization.

What is claimed is—

1. The method of transmitting telautographic messages which consists in transmuting the movements of the transmitting-pen into impulses of successively like polarity, transmuting these impulses by induction into pulsations of successively opposite polarity, and causing the receiving-pen to move a step under the influence of each of the latter pulsations, substantially as described.

2. The method of transmitting telautographic messages which consists in transmuting the movements in extent of the transmitting-pen into impulses of successively like polarity, transmuting said impulses into pulsations of opposite polarity by induction, controlling the movements in extent of the transmitting-pen by means of said pulsations, and reversing the direction of movement of the receiving-pen by reversal in the polarity of the impulses sent from the transmitter, substantially as described.

3. The method of telautographic transmission which consists in transmuting the movements in extent of the transmitting-pen into impulses of successively like polarity, transmuting said impulses by induction into pulsations of successively opposite polarity, controlling the movements in extent of the receiving-pen by said pulsations, reversing the movement of the receiving-pen in direction by changing the polarity of said impulses sent from the transmitter, and performing a supplemental operation at the receiver by means of a change in strength in one of the line-currents, substantially as described.

4. In a telautographic instrument, the combination of means for sending impulses of like polarity to line dependent in number upon the extent of movement of the transmitting-pen, means for causing the production of induced pulsations through the agency of said direct pulsations, and step-by-step mechanism operated in part by said induced pulsations and in part by said original direct pulsations for controlling the movements of the receiving-pen, substantially as set forth.

5. In a telautographic instrument, the combination of means for sending impulses of like polarity to line dependent in number upon the extent of movement of the transmitting-pen, means for transforming these impulses by induction into to-and-fro pulsations, and means for moving the receiving-pen step by step in accordance with said pulsations, substantially as described.

6. In a telautographic instrument, the combination of means for sending impulses of like polarity to line dependent in number upon the movement in extent of the transmit-

ting-pen, means for transforming these impulses by induction into to-and-fro pulsations, means for controlling the movements in extent of the receiving-pen by means of said pulsations, means for reversing the polarity of the said impulses sent from the transmitter on reversal in direction of movement of the transmitting-pen, and means for reversing the direction of movement of the receiving-pen controlled by said changes in polarity, substantially as described.

7. In a telautographic instrument, the combination of means for sending to line impulses of like polarity, means for transmuting said impulses by induction into to-and-fro pulsations, a polarized magnet for controlling the movements in extent of the receiving-pen by means of said pulsations, a polarized magnet at the receiver for controlling the direction of movement of the receiving-pen, and means for reversing the polarity of the impulses sent from the transmitter on reversal of the direction of movement of the transmitting-pen, substantially as described.

8. In a two-wire telautographic instrument, the combination of means for sending impulses of like polarity to the transmitter dependent in number upon the movement in extent of the transmitting-pen, means for transmuting said impulses by induction into to-and-fro pulsations, means for controlling the movements in extent of the receiving-pen by means of said pulsations, means for reversing the polarity of the impulses sent from the transmitter on reversal of the direction of movement of the transmitting-pen, means controlled by said reversal in polarity for reversing the direction of movement of the receiving-pen, and means for performing the supplemental operations at the receiver by changes in the two line-circuits, substantially as described.

9. In a telautographic instrument, the combination of means for sending to line impulses of like polarity dependent in number upon the movement in extent of the transmitting-pen, the main-line circuit being provided with two branches which afterward unite, said branches being provided with inductive and non-inductive resistances, a bridge for connecting the two, and a magnet controlling the movements in extent of the receiving-pen placed in said bridge, whereby said impulses sent from the transmitter are transmuted into to-and-fro pulsations traversing said bridge and controlling through said magnet the movements in extent of the receiving-pen, substantially as described.

10. In a telautographic instrument, the combination of a main-line circuit, a magnet in said circuit for controlling the vertical position of the receiving-pen, means for sending to line impulses of a given strength alternating with interruptions in the circuit for one position of the writing-platen, means for sending to line impulses of another strength alternating with reductions in the strength of the line-current in the other position of the writing-platen, the receiving-pen-positioning magnet being energized by the current at all times in the second position of the writing-platen, and being deënergized during the first position of the writing-platen, substantially as described.

11. In a telautographic instrument, the combination of a main-line wire, means for sending to line impulses of a given strength for controlling the movements in direction of the receiving-pen, said impulses alternating with currents of reduced strength so as not to affect the movements in extent of the receiving-pen, a magnet in the main-line circuit at the receiver for controlling the shifting of the paper, said magnet being energized by the main-line current in both of its said conditions, and means for interrupting the main-line current when it is desired to shift the paper, substantially as described.

12. In a telautographic instrument, the combination of means for transmuting the movements of the transmitting-pen into two sets of impulses of successively like polarity dependent in number respectively upon the extent of movement of the pen in each of its two directions of movement, means for producing two sets of induced impulses actuated respectively by the said two sets of direct impulses and two mechanisms each operated in part by one of said sets of induced impulses and in part by one of said original sets of direct impulses, for controlling the movements of the receiving-pen step by step in its two directions of movement, substantially as set forth.

13. In a telautographic instrument, the combination of means for sending impulses of like polarity to two line-wires dependent in number respectively upon the extent of movement of the transmitting-pen in each of two directions of motion, means for transforming each set of these impulses by induction into to-and-fro pulsations, and means for controlling the movements in extent of the receiving-pen in two directions by means of said two sets of to-and-fro pulsations respectively, substantially as described.

14. In a telautographic instrument, the combination of means for sending impulses of like polarity to line dependent in number upon the extent of movement of the transmitting-pen, means for transforming these impulses by induction into to-and-fro pulsations, an escapement governing the movement of the receiving-pen in extent, and means for controlling the escapement through the agency of said to-and-fro pulsations, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

GEORGE S. TIFFANY.

Witnesses:
M. MOSES,
WM. H. BOWDEN.