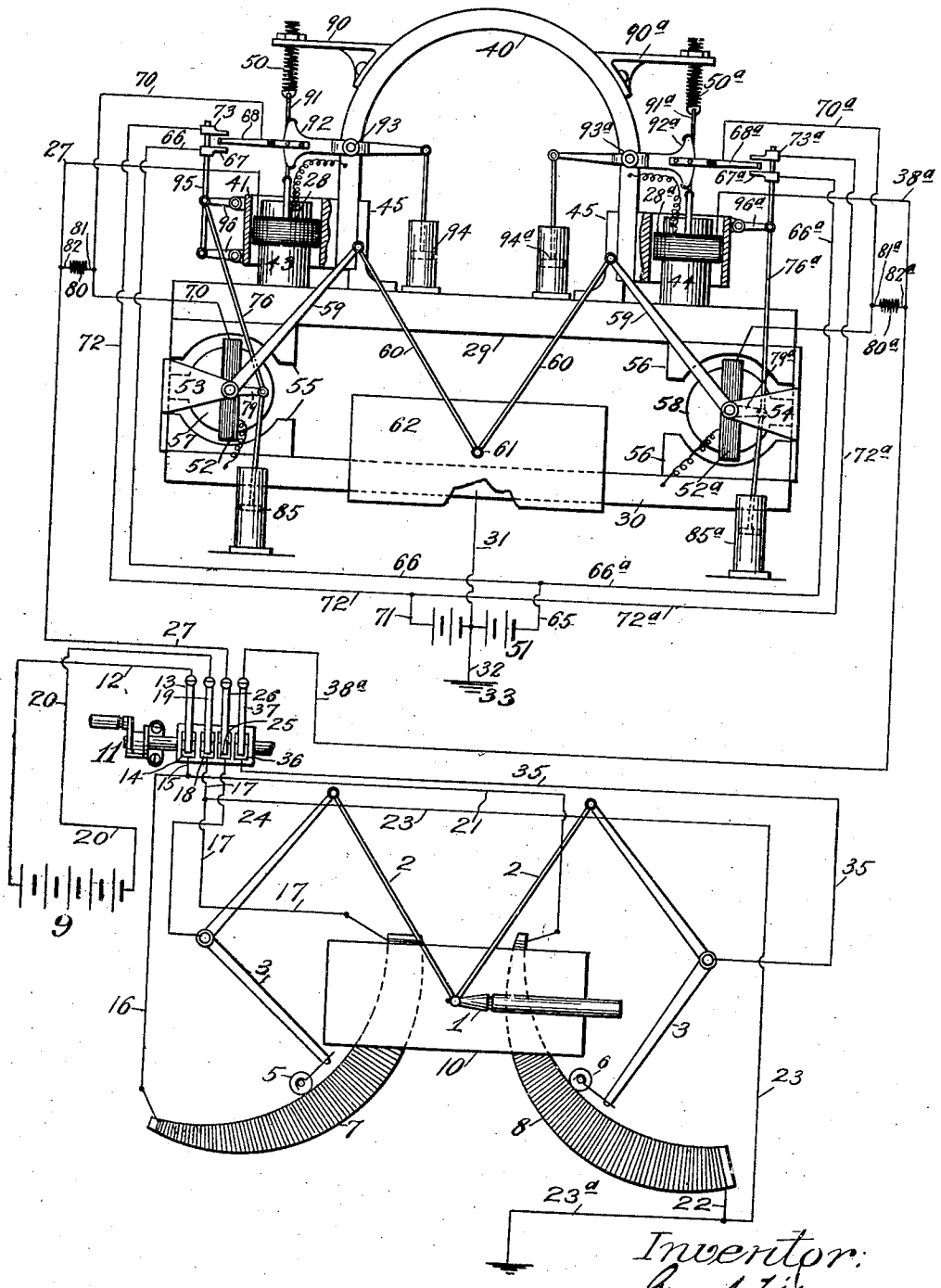
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TELAUTOGRAPHIC APPARATUS.

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1,322,372.

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UNITED STATES PATENT OFFICE.

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TELAUTOGRAPHIC APPARATUS.

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To all whom it may concern:

Be it known that I, GEORGE S. TIFFANY, a citizen of the United States, residing at Summit, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Telautographic Apparatus, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

This application is a division of that filed by me May 2, 1916, Serial No. 94,866 issued as Pat. No. 1,279,178, Sept. 17, 1918.

This invention relates to improvements in telautographic apparatus of the kind in which the currents traversing the two main line circuits from the transmitting instrument to the receiving instrument are varied in strength according to the direction and extent of movement of the transmitting tracer and, as thus varied, effect, through suitable devices at the receiving instrument, movements of the receiving pen corresponding in direction and extent to those of the transmitting tracer, so that the receiving pen will reproduce the writing done by the transmitting tracer. In apparatus of this kind as heretofore devised the movements of the parts controlling the writing movements of the receiving pen have been effected directly by the main line currents. According to the improvements constituting the present invention, however, the main line currents are relieved of this work, such movements of the receiving pen being effected by a local source of energy for the receiver, with suitable circuit and other connections between it and the receiving pen, the only work performed by the main line currents being that of controlling these circuit connections. One result of thus relieving the main line currents of the work of operating the pen-moving parts is that the length of line over which telautographic apparatus may be satisfactorily operated is very materially increased. Another result is that messages may be transmitted much more economically over lines of a given length, in that with the present apparatus the current used is very materially decreased in quantity.

The accompanying drawing represents diagrammtically a telautographic apparatus comprising transmitting and receiving stations equipped with the improvements constituting the present invention.

Referring to said drawing, 1 represents the transmitting tracer, 2 pen arms pivotally connected therewith at their converging ends and at their opposite ends with bell-crank levers 3, 4, pivotally mounted in the transmitting instrument, as is well understood. The levers 3, 4, are provided with contact rollers 5, 6, respectively, bearing against rheostats 7, 8, respectively, through which currents are shunted from a battery 9, or other source of electrical energy, into the two main line circuits leading to the receiving instrument. The currents so shunted into the main line circuits, as is well understood, vary in strength according to the direction and extent of the writing or lateral movements of the transmitting tracer 1 over the writing platen 10, and therefore the positions, from time to time, of the contact rollers 5, 6, lengthwise of the rheostats 7, 8.

When the master switch 11 of the apparatus is in the closed position in which it is shown in the drawing, rheostats 7, 8, are connected with the positive pole of battery 9 by the following circuits:—

The circuit for rheostat 7 consists of wire 12, contact brush 13, contact plate 14 of master switch 11, wires 15, 16 to rheostat 7, wire 17 therefrom, contact plate 18 of master switch 11, contact brush 19, and wire 20 to the negative pole of battery 9, this pole of the battery being connected with ground by wire 20, brush 19, contact plate 18, and wires 17, 23 and 23ª. The circuit for rheostat 8 consists of wire 12, brush 13, contact plate 14 of master switch 11, wires 15, 21 to rheostat 8, wire 22 therefrom, wires 23, 17, contact 18 of master switch 11, brush 19 and wire 20 to the negative pole of battery 9. It will of course be understood that as each of the contact rollers 5, 6, is moved lengthwise of its rheostat 7 or 8, by the lateral writing movements of the transmitting tracer 1, more or less resistance will be introduced into the circuit from battery 9, and the current shunted from the rheostat into

the left or right main line, as the case may be, to the receiving instrument, will therefore be correspondingly varied in strength.

The left main line circuit from the transmitter to receiver consists of wire 24, from lever 3, contact plate 25 of master switch 11, contact brush 26, wire 27, a relay coil or current responsive member 28 and thence through a pair of magnets 29, 30 (the function of which will be hereinafter referred to) and wires 31, 32, to ground at 33. The right main line circuit consists of wire 35 from lever 4, contact plate 36 of master switch 11, contact brush 37, wire 38[a], relay coil or current responsive member 28[a], and thence by magnets 29, 30 and wires 31, 32, to ground at 33.

A suitable magnetic field for the coils 28, 28[a], is provided by a magnet 40, between the pole pieces 41, 42, and cores 43, 44 whereof the coils 28, 28[a], respectively, are adapted to move endwise. Magnet 40 is supported on brackets 45, mounted upon magnet 29, upon which latter the pole pieces 43, 44, of magnet 40, are also mounted.

When current is on the main lines from battery 9 these coils 28, 28[a], are movable thereby downwardly, (the coils being suitably wound for such movement) against the tension of springs 50, 50[a], respectively, which resist their downward movement and tend to move them upwardly.

The receiving instrument is provided with a local battery or other suitable source of electrical energy 51, which, through circuit connections later on described, control the movements of a pair of reciprocating coils or current responsive members 52, 52[a], which in turn directly effect the lateral or writing movements of the receiving pen. These coils 52, 52[a], are pivotally mounted in brackets 53, 54, respectively, so as to reciprocate in a magnetic field provided by the magnets 29, 30. The pole pieces 55, 56, of these magnets inclose the coils 52, 52[a], respectively, which in turn inclose the cores 57, 58, of said magnets. Coils 52, 52[a], have rigidly connected with them the inner ends of a pair of levers 59, whose outer ends have pivotally connected with them a pair of pen arms 60, in the converging ends of which is mounted receiving pen 61.

As the coils 52, 52[a], are reciprocated, it will be understood that the levers 59, 60, will be correspondingly moved and the receiving pen 61 therefore moved laterally over the surface of the writing platen 62, as in ordinary writing. These movements of the receiving pen must of course correspond in direction and extent to those of the transmitting tracer 1, so as to correctly reproduce the writing performed by the latter. This end is attained by the relay coils 28, 28[a], and connections therefrom with battery 51 and springs 50, 50[a], which will now be described.

For brevity, these parts of the apparatus will be described with particular reference to the coil 52. The parts for coil 52[a] are generally the same, and have the same reference numerals applied to them, followed by the reference letter "a". For the purpose of moving the coil 52 alternately in opposite directions, circuits are provided from opposite poles of the battery 51, each including coil 52. The circuit from the negative pole of said battery consists of wires 65, 66, contact 67, circuit closer 68, wire 70, coil 52, and thence by magnet 30, and wire 31, to the neutral of battery 51. The circuit from the positive pole of battery 51 consists of wires 71, 72, contact 73, circuit closer 68, wire 70, coil 52, magnet 30, and wire 31, to the neutral of battery 51. The winding of coil 52 is such that when the circuit through it from the negative pole of battery 51 is closed, said coil will be moved in a clockwise direction, and when the circuit from the positive pole of battery 51 is closed, said coil will be moved in a counter-clockwise direction. Coil 52[a], also, moves in a clockwise direction when the negative circuit is closed through it and in a counter-clockwise direction when the positive circuit is closed. From this it results that, as the transmitting tracer is moved in any direction, the receiving pen arms 60, and therefore the receiving pen itself, will be correspondingly moved; the joint action of the two coils 52, 52[a], and their levers 59, expressing, at the receiving pen 61, as is well understood, duplications of the movements of the transmitting tracer 1.

Circuit closer 68 is pivoted at 93 on magnet 40 and at its inner end is connected with the piston 94 of a dash pot, the purpose of which is to prevent abrupt or violent movement of the circuit closer. As the relay coil 28 is moved downwardly by the main line current, circuit closer 68 will be moved downwardly thereby into engagement with contact 67, thereby closing the circuit just described from the negative pole of battery 51 through coil 52, which is then moved, by the current traversing this circuit, in a clockwise direction. Circuit closer 68 and relay coil 28 are connected with one end of the spring 50, whose other end has a fixed adjustment, above circuit closer 68, in a bracket 90 secured to magnet 40. The means for connecting circuit closer 68 and coil 28 with spring 50 consists of a cord 91 connected with spring 50 and coil 28 and intermediately with a segment 92 on circuit closer 68.

To provide for a long range of movement of circuit closer 68 and of coils 28 the contacts 67, 73 are movable and for this purpose are mounted on a rod 95 connected by arm 76 with crank 79 rigidly secured to and moving with coil 52 and pivotally con-

nected with a pair of parallel arms 96 pivoted to pole piece 41 of magnet 40. On the other side of the receiver the arm 95 and one of the arms 96 are omitted. Otherwise the parts are substantially the same as just described.

Spring 50 resists downward movement of the coil 28, and therefore downward movement of circuit closer 68 into engagement with contact 67, by the main line current, and, at the proper time, as hereinafter described, moves said circuit closer 68 (in opposition to the main line current) upwardly into engagement with contact 73, thereby alternately closing the negative and positive circuits just described from battery 51 through the coil 52, which is moved alternately by the currents traversing these circuits in clockwise and counter-clockwise directions. The movements of the right hand coil 52^a, by these negative and positive currents, are in the same directions as those of the coil 52. In other words, when the circuit closer 68^a engages contact 67^a, the coil 52^a will be moved in a clockwise direction, and when circuit closer 68^a engages contact 73^a, coil 52^a will be moved in a counter-clockwise direction.

The tension of the springs 50, 50^a, is such that when no current is on the main line, as for example, when transmitting tracer 1 is at unison, namely, the upper left hand corner of writing platen 10, the circuit closers 68, 68^a, will occupy positions midway of their respective contacts 67, 73, and 67^a and 73^a, so that both of the local circuits from the battery 51, for each of the coils 52, 52^a, will be open. Assuming the transmitting tracer 1 to be moved from unison, for example, to the central position on the writing platen 10 in which it is shown, it will be obvious that roller contacts 5 and 6 will be moved downwardly and upwardly, resepctively, toward the smaller ends of their respective rheostat 7, 8, thus decreasing the resistance in the left and right main line circuits and correspondingly increasing the strength of the currents traversing said circuits. The increases in the two main line currents will move the relays 28, 28^a, downwardly against the tension of their springs 50, 50^a, and move the circuit closers 68, 68^a downwardly into engagement with contacts 67, 67^a, thereby closing the local circuits from the negative pole of battery 51 through coils 52, 52^a, each of which will then be moved in a clockwise direction, the receiving pen 61 assuming the position shown. When the movement of the transmitting tracer from the position shown is such as to cause the roller contacts 5, 6, to move in opposite directions to those described, as, for example, when the tracer is moved back to unison, the strength of the left and right main line circuits will be decreased and the movements of relays 28, 28^a, and coils 52, 52^a reversed. If the tracer, however, should be moved, for example, directly downward from the position shown, the left line current will be still further increased and circuit closer 68 will engage contact 67, but the right main line current will be decreased (by movement of roller contact 6 toward the larger end of rheostat 8) and coil 28^a will be moved upward by spring 50^a and circuit closer 68^a moved into engagement with contact 73^a, thus closing the circuit from the positive pole of battery 51 through coil 52^a, which will then be moved in a counter-clockwise direction. If the movement of tracer 1 be upward, the strength of the left main line will be decreased and that of the right main line increased, with the result that circuit closers 68, 68^a, will engage contacts 73 and 67^a respectively, thus closing circuits from the positive and negative poles, respectively, of battery 51, through coils 52, 52^a, which will then be moved in counter-clockwise directions, respectively. The result of these and other conjoint movements of the coils 52, 52^a, is that the receiving pen 61 will reproduce, in extent and direction, the lateral movements of the transmitting tracer 1, and therefore reproduce on the platen 62 the writing made by the tracer on platen 10. During these movements of the relay coils 28, 28^a, the springs 50, 50^a, moving at their lower ends with the coils 52, 52^a, will have their tension or pull upon the circuit closers 68, 68^a, increased as the strength of the main line currents increase, and decreased as the strength of the main line currents decreases. The parts are so arranged and proportioned relatively to each other, that when the main line current ceases to increase in strength the tension of the spring 50 or 50^a will dominate the main line current, and thereby move the circuit closer 68 or 68^a into engagement with the contact 73 or 73^a, thus closing the circuit from the positive pole of battery 51 with the result that the direction of movement of the coil 52 or 52^a, as the case may be, will be reversed so that the movement of the receiving pen 61, will correspond in direction and extent to that of transmitting tracer 1. In like manner, when the main line current begins to increase, the force of the spring 50 or 50^a will be overcome by the main line current and the circuit closer 68 or 68^a, as the case may be, moved again into engagement with the contact 67 or 67^a. It will thus be observed that the force of the spring and the strength of the main line current are balanced with relation to each other, so that as the current increases the coil 52 or 52^a will be moved in one direction, and, when the current decreases in strength, will be moved in reverse direction.

As the coil 28 is moved downwardly and thus moves the circuit closer 68 into engage-

ment with the contact 67, thereby closing the circuit, by wire 66, contact 67, circuit closer 68, and wire 70, from the negative pole of battery 51 through coil 52, and causing the coil 52 to move in a clockwise direction, the rod 76 will move contact 67 downwardly, in engagement with circuit closer 68, until the strength of the main line current decreases when circuit closer 68 will move upwardly into engagement with contact 73, thus breaking this circuit, and connecting coil 52 with the positive pole of battery 51. Coil 52, then moving in a counter-clockwise direction, will, through lever 76, move contact 73 upwardly, in contact with circuit closer 68, until the main line current again increases in strength, when circuit closer 66 will be again moved into engagement with contact 67, re-closing the circuit through coil 52 from the negative pole of battery 51, and so on, the coil being therefore rocked alternately in opposite directions. This description is also applicable to the apparatus on the right hand side of the receiving instrument.

The apparatus, as described up to this point, would require very nice adjustments of the moving parts with relation to each other, and to the main line and local currents, to avoid rough writing. To avoid the necessity for this and secure smooth writing, resistances 80, 80^a, are interposed between the circuit closer 68 and coil 28, and circuit closer 68^a and coil 28^a, respectively, the resistance 80 being connected by wires 81, 70, circuit closer 68, and wires 82, 27, with relay coil 28, while resistance 80^a is connected by wires 81^a, 70^a, circuit closer 68^a and wires 82^a and 38^a, with relay coil 28^a. When circuit closer 68 is in engagement with contact 67, coil 28 will be connected, through wires 27, 82, resistance 80, wires 81, 70, 69, circuit closer 68, contact 67, and wire 66, with the negative pole of battery 51, thus weakening the effect of the main line current upon the coil 28 and permitting movement of circuit closer 68 away from contact 67 by the spring 50, thus breaking this resistance circuit. Circuit closer 68 will then again be moved by the main line current into engagement with contact 67, thus reëstablishing the resistance circuit, and so on, the circuit closer 68 being maintained in vibratory make-and-break relation to the contact 67 so long as the main line current increases in strength. When the main line current decreases in strength spring 50, dominating the main line current, will, as before described, move the circuit closer 68 into engagement with the contact 73, thus closing the circuit from the positive pole of battery 51 through the coil 52. When the circuit closer 68 thus engages contact 73 relay coil 28 will be connected by wires 27, 82, resistance 80, wires 81, 70, circuit closer 68, contact 73, and wire 72, with the positive pole of battery 51. The effect of this is to augment the main line current passing through the coil 28 with the result that the latter will move the circuit closer 68 away from contact 73, thus opening the resistance circuit just referred to. The spring 50 will thereupon again move the circuit closer 68 into engagement with contact 73 and reëstablish the resistance circuit, when the circuit closer 68 will be again moved away from the contact 73, reopening the resistance circuit, and so on. So long as the main line current decreases in strength, the circuit closer 28 will thus be maintained in the vibratory make-and-break condition with relation to the contact 73.

The vibrations thus set up act as a cushion in the local circuits at the moment of closing the circuits through coils 52, 52^a, avoiding the violent action that a sharp make-and-break would produce. They also serve to vibrate the receiving-pen 61 and other moving parts attached to the coil 52, and thus diminish friction and improve the reproduction of the writing performed by the transmitting-tracer.

To prevent violent oscillation of the receiving-pen 61 a dash pot 85, 85^a, is provided for each side of the receiving-instrument, the piston thereof in each case being connected with the crank 79 or 79^a, of the coil 52 or 52^a.

What I claim is:—

1. In a variable-current-strength telautographic system the combination with each main line and a local source of electrical energy for the receiving instrument, of a pair of circuits from opposite poles thereof including movable terminal contacts, movable circuit-closing means and a reciprocating pen-controlling current-responsive member, a reciprocating current-responsive member in the main line, a member acting in opposition thereto, connections between said two members and the circuit-closing means for moving the latter alternately into engagement with the terminal of said circuits as the strength of the main line current increases and decreases respectively, and connections between said circuit terminals whereby the one engaged by said circuit-closing means is caused to follow the movements of the latter, substantially as described.

2. In a variable-current-strength telautographic system the combination with each main line and a local source of electrical energy for the receiving instrument of a pair of circuits from opposite poles thereof including movable terminal contacts, movable circuit-closing means and a reciprocating pen-controlling current-responsive member, a reciprocating current-responsive member in the main line, a spring acting in

opposition thereto, connections between said member and spring and the circuit-closing means for moving the latter alternately into engagement with the terminals of said circuits as the strength of the main line current increases and decreases respectively, and connections between said circuit terminals whereby the one engaged by said circuit-closing means is caused to follow the movements of the latter, substantially as described.

In testimony whereof I have hereunto set my hand.

GEORGE S. TIFFANY.