

1,137,929.

G. S. TIFFANY.  
TELAUTOGRAPHIC APPARATUS.  
APPLICATION FILED APR. 2, 1912.

Patented May 4, 1915.

5 SHEETS—SHEET 1.

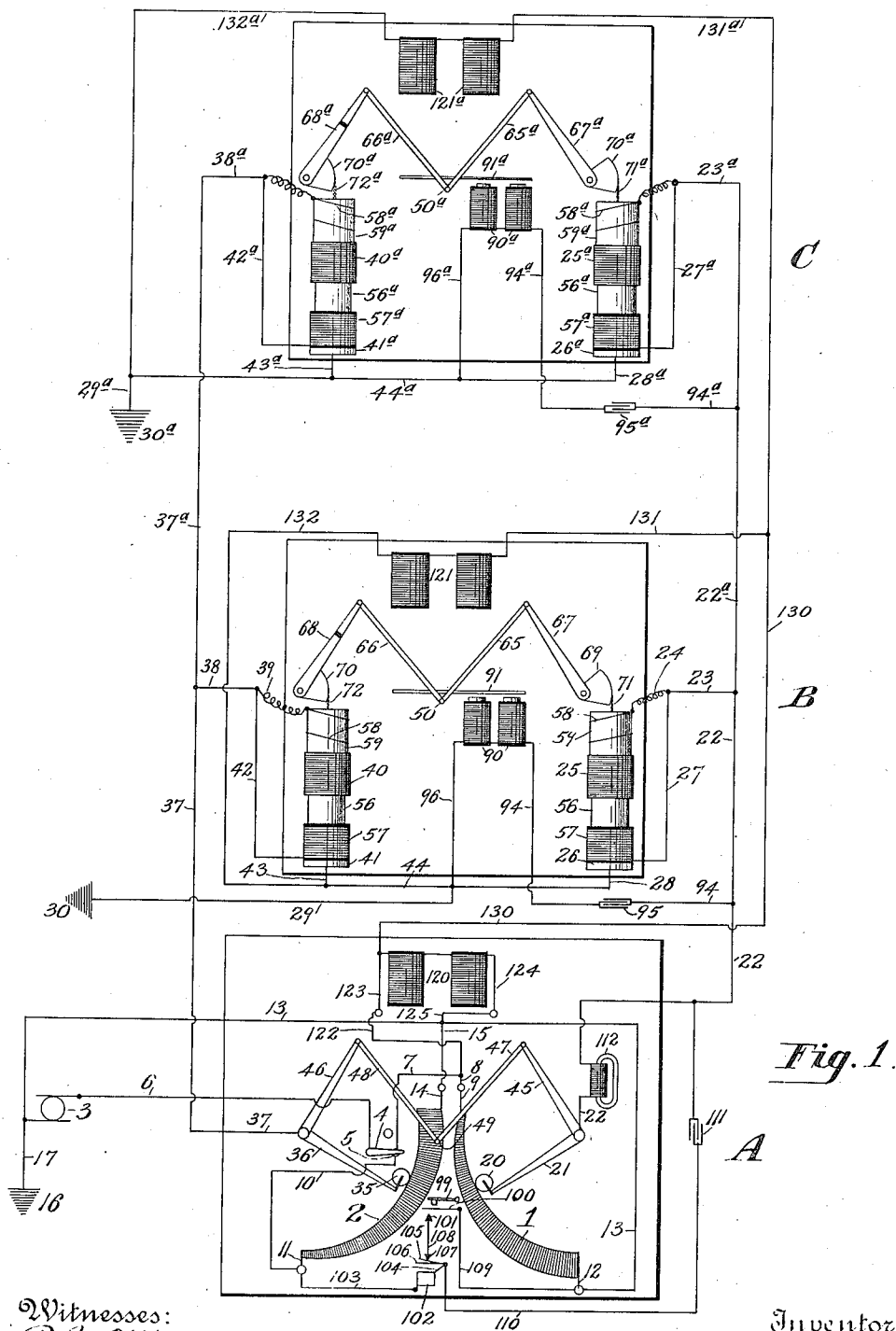


Fig. 1.

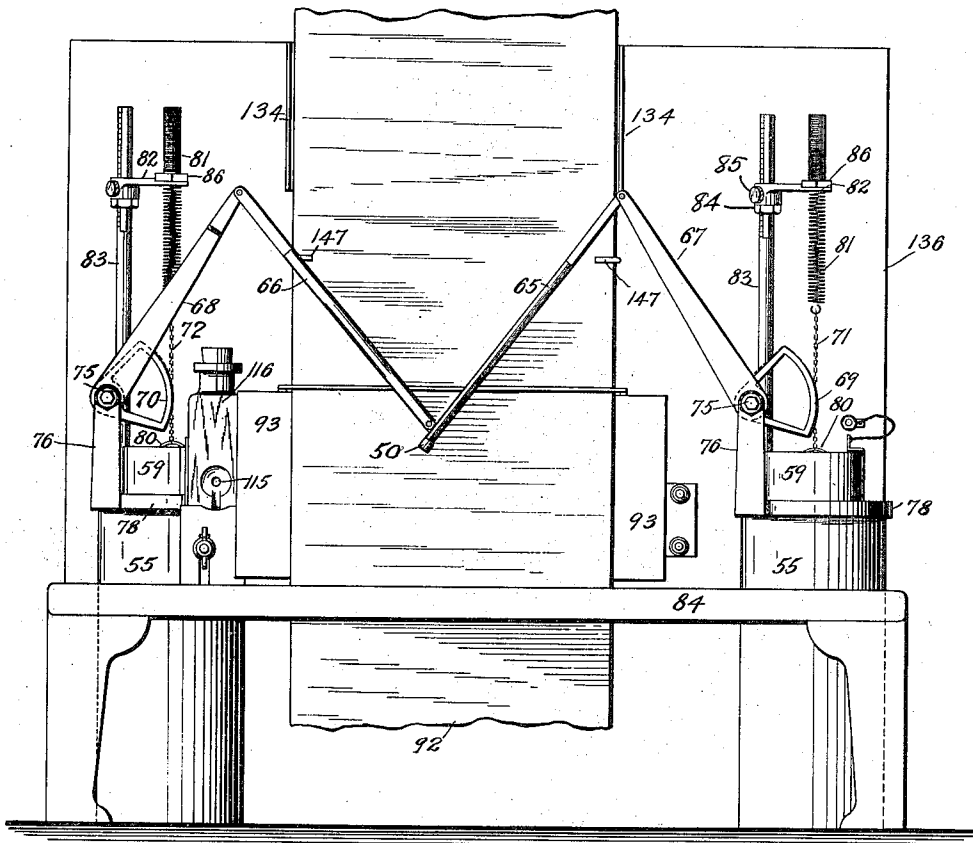
Witnesses:  
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Inventor:  
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By his Attorneys:  
Philip H. Sawyer, Ross & Hammond

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5 SHEETS—SHEET 2.



*Fig. 2.*

Witnesses:  
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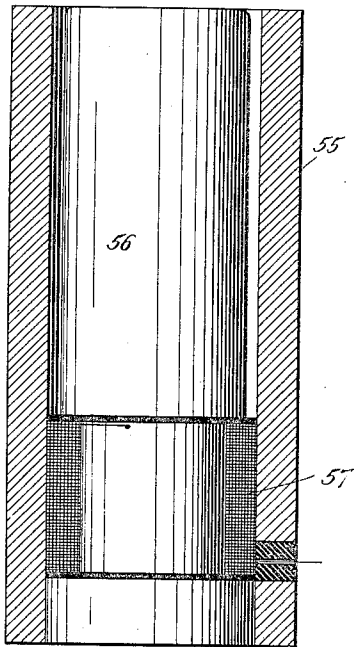
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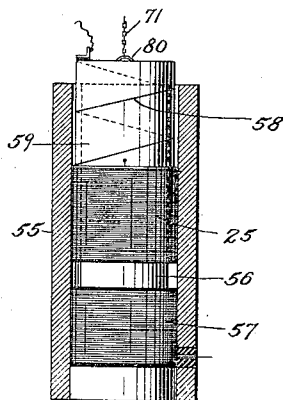
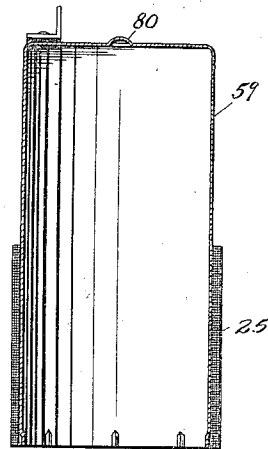
1,137,929.

Patented May 4, 1915.  
5 SHEETS—SHEET 3.

*Fig. 3.*

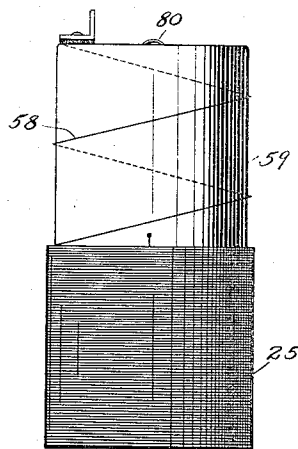


*Fig. 4.*



*Fig. 5.*

Witnesses:  
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A. White

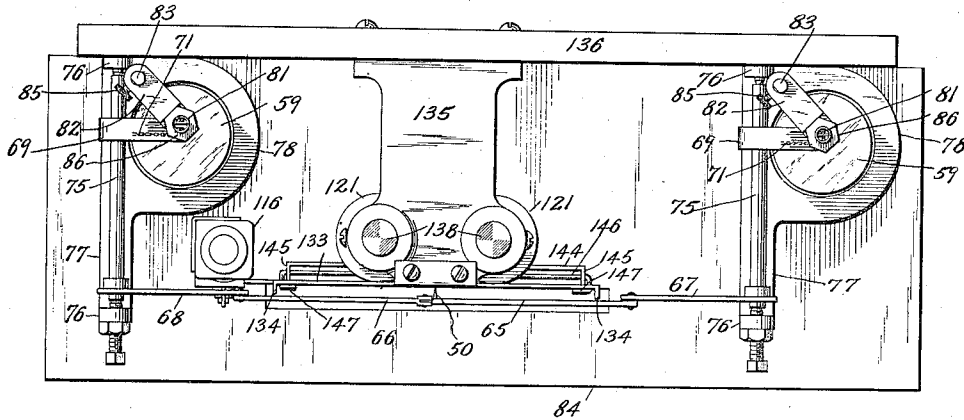


*Fig. 6.*

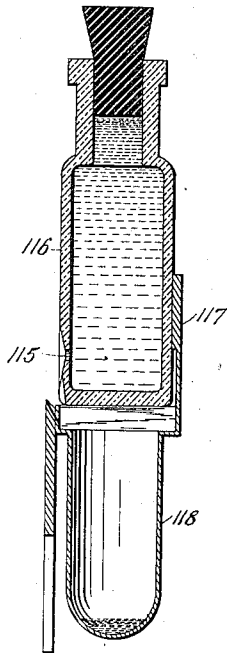
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1,137,929.

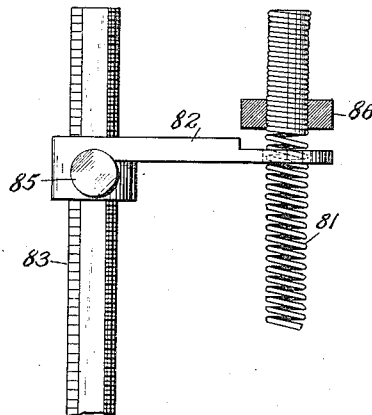
5 SHEETS—SHEET 4.



*Fig. 7.*



*Fig. 8.*



*Fig. 9.*

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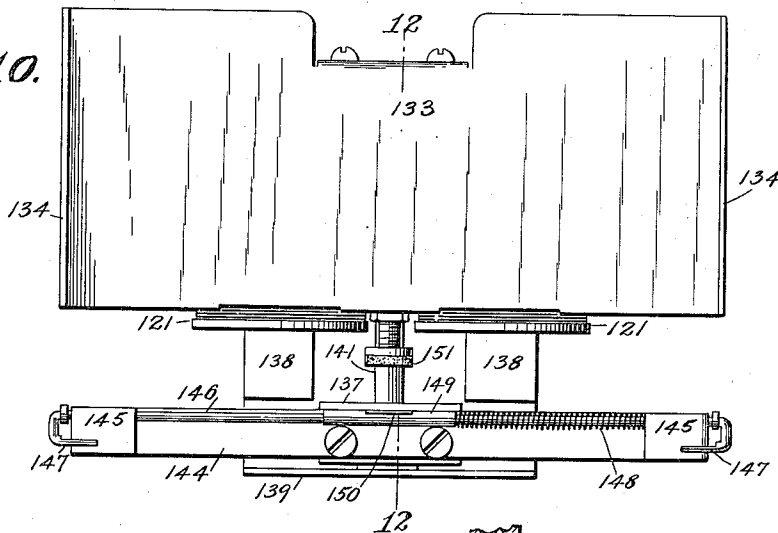
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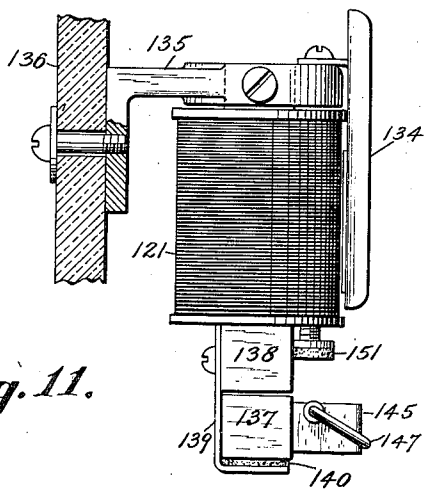
Patented May 4, 1915.

5 SHEETS—SHEET 5.

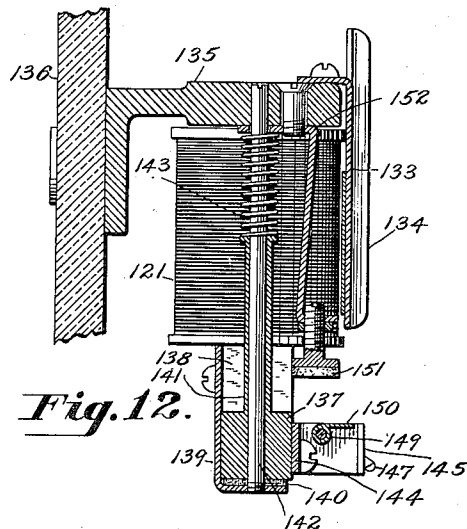
*Fig. 10.*



*Fig. 11.*



*Fig. 12.*



# UNITED STATES PATENT OFFICE.

GEORGE S. TIFFANY, OF SUMMIT, NEW JERSEY, ASSIGNOR TO GRAY NATIONAL  
TELAUTOGRAPH COMPANY, OF NEW YORK, N. Y., A CORPORATION OF VIRGINIA.

## TELAUTOGRAPHIC APPARATUS.

1,137,929.

Specification of Letters Patent.

Patented May 4, 1915.

Application filed April 2, 1912. Serial No. 687,956.

*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 invention relates to improvements in telautographic systems of the kind, which may be briefly described as of the variable current-strength type, in which the movements of the receiving pen across its writing field, in unison with the transmitting tracer, are effected by magnetic devices and opposing springs, which are, in turn, controlled by the currents traversing the tracer lines, variations in the strength of which currents are controlled and effected by the transmitting tracer.

The invention has for its primary object the provision of a system in which the pen-moving devices at the receiver include a magnet of the solenoid type. Systems such as this have been heretofore proposed but have not been commercially used for the following reasons: One of the most essential requirements of a telautographic system is that the weight of the receiver pen-moving parts must be small in relation to the power required for moving the receiving pen, in order that the pen may be moved quickly in response to small variations in the strength of the line currents; also, that the current required for developing this power should be small in relation to the power developed. In telautographic systems heretofore suggested using a solenoid type of magnet for moving the receiving pen, the iron core of the solenoid is connected with the pen through a suitable arrangement of levers, etc., but this form of solenoid is not practically useful, for with an iron core of the requisite lightness, an excessive amount of line current is required to develop a sufficient amount of power for moving the receiving pen. The reason for this is that with the common type of solenoid (in which an iron core is drawn into a helix by the action of a current traversing the helix) the magnetic circuit is of very high reluctance, because it is mostly through a long air gap, and, consequently, a high magnetizing force is required to develop a strong field.

In the telautographic system of the present invention a form of magnet is used in which the iron parts are stationary and the coil is movable for operating the pen. In this construction massive iron parts may be used in which the magnetic circuit will include a very short air gap, in which the coil may move, thus making the reluctance of the magnetic circuit very small, so that a low magnetizing force will develop a strong field in the air gap and consequently the force exerted by the coil in moving in response to the current traversing its winding, reacting against the magnetic flux in the air gap, will be high in relation to the strength of the current, as compared with the type of solenoid first referred to, and since a small magnetizing force is required to develop a strong moving force in the coil, it is obvious that a coil of light weight may be used, and it will be seen that the conditions of lightness of weight, of high power and of small current consumption as required for the operation of a telautographic system are well met by this construction.

Pen-moving magnetic coils for the receiver are, of course, old and well known, examples of telautographic systems employing such coils being shown and described in letters patent heretofore granted to me. In these systems the magnetic field in which the movable coils move are excited from a local source of electric energy, separate from that traversing the tracer lines and the movable coils. These systems are designed for use where a local source of current is available at each station or at each end of a line, one for the magnetic fields of the coils and another for the line currents. In many cases current for operating the instruments is available only at one end of a line (as in train despatching systems, etc.), and it is in these cases that an instrument in which no locally excited field is required, as in the instrument herein shown and described, is of special value.

Another desirable feature of a telautographic system is that the pen-moving elements at the receiver be such that with a given change in the strength of the line currents a given amount of movement will be imparted to the receiving pen in any part of the writing field in which the pen may be. This condition is somewhat difficult to attain in an instrument where the pen-mov-

ing electro-magnetic devices are energized by the line currents solely, for the reason that the general tendency for such devices is to have their power increased at a more rapid rate than the rate of increase in the strength of the exciting line currents. When the moving coil of the present case is at the outer end of the iron shell of the magnet, it is in the position in which it is to be acted upon by the weakest line current, but as this part of the shell forms the polar extremity of the magnet, it is the part in which the strongest field will be developed in the air gap relatively to the total field. As the strength of the line current is increased, the coil will be drawn toward the bottom of the shell or toward the neutral part of the magnet and out of the part of the field which is relatively the strongest, and, therefore, although both the current traversing the coil and the strength of the magnetic field are increased, yet the force exerted by the coil will not be proportional to the product of the current and total field, but only to the product of the current and that part of the magnetic field in which the coil is located, and as the coil is moved by a stronger current into a relatively weaker part of the field, it will follow that, by properly proportioning the length of the coil, the total movement of the coil, the length of the shell in which the coil moves, and the strength of the spring opposing the force of the coil, a combination may be made in which the movement of the coil will be approximately proportional to the changes in the strength of the line current.

The magnet in the present case preferably has a stationary winding at the bottom of its shell, and this winding is also traversed by the current traversing the tracer lines, thus serving to increase the total flux in the magnet, and thereby increasing somewhat the power of the pen-moving coil throughout its range of movement.

In the accompanying drawings—Figure 1 is a diagrammatic view of a telautographic system embodying the improvements of the present invention. Fig. 2 is a front elevation of the receiving instrument. Figs. 3 to 6 are details, on an enlarged scale, of the magnetic devices at the receiver for effecting the movement of the receiving pen across its writing platen in unison with like movements of the transmitting tracer. Fig. 7 is a plan view of the receiving instrument. Fig. 8 is a sectional elevation, or an enlarged scale, of the inking devices for the receiving pen. Fig. 9 is a detail, on an enlarged scale, illustrating the means for mounting the movable member of the magnetic devices controlling the movements of the receiving pen across its writing platen. Fig. 10 is a front elevation, on an enlarged

scale, of the paper shifting mechanism at the receiver. Fig. 11 is an end view of the same. Fig. 12 is a vertical section of the same on the line 12 of Fig. 10. Fig. 13 is a detail view, in perspective, of part of the paper gripping mechanism.

Referring to said drawings, it will be observed that in the diagrammatic view (Fig. 1) there are shown a transmitter A and two receivers B, C. Receiver B may be viewed as the local receiver, and receiver C as the distant receiver, with relation to the transmitter A. As the two receivers are identical in construction, arrangement and method of operation, only one need be described. Receiver B will be selected for this purpose. Corresponding reference numerals will be applied to the parts in receiver C, followed, however, for convenience of reference, by the reference letter "a."

Transmitter A comprises a pair of rheostats 1, 2, included in a normally open circuit connected with a source of electrical energy, for example, current generator 3, this circuit being controlled by a manually operated master switch 4, which, in closing the circuit, engages a contact 5, as shown. This current-supplying circuit, when closed, consists of wire 6 from the positive pole of generator 3, master switch 4, contact 5, wires 7, 8, 9, to right rheostat 1, and wires 10, 11, to left rheostat 2, and from right rheostat 1 by wires 12 and 13, and from left rheostat 2 by wires 14, 15, 13 to the negative pole of generator 3, which is grounded at 16 by wire 17. From the right and left rheostats 1, 2, currents are shunted into right and left main or tracer lines to the receiver B and also to the distant receiver C, these tracer lines to the receiver B being traced as follows: That for the right line comprises a roller contact 20, pivotally mounted arm 21, wires 22, 23, where the circuit divides, wire 24, connecting it with the movable coil 25 of a magnet 26, and wire 27 connecting it with the winding of said magnet, this circuit continuing from magnet 26 by wires 28, 29 to ground at 30. That for the left line comprises a roller contact 35, pivotally mounted arm 36, wires 37, 38, where the circuit divides, wire 39 connecting it with the movable coil 40 of a magnet 41, and wire 42 connecting it with the winding of said magnet, this circuit continuing from magnet 41 by wires 43, 44, 29, to ground at 30. The magnetic devices just referred to are of peculiar construction, involving certain features of the present invention. They will, therefore, be described in detail later on. The circuits at the distant receiver are sufficiently indicated by the corresponding reference characters used in such receiver, so that no detailed description of such circuits is necessary.

Turning now to the transmitter A, the

arms 21, 36 are connected rigidly to levers 45, 46, respectively, and to these arms 45, 46 are pivotally connected a pair of tracer arms 47, 48, respectively, in the converging pivoted ends of which is mounted a tracer 49. This construction and arrangement of the roller contacts 20, 35, and tracer 49, is well known, so that further illustration or description thereof is unnecessary here. It may be well to note, however, that when master switch 4 engages contact 5, the current-supplying circuit from generator 3 is closed; that current from said generator will therefore be on the two main tracer lines just described, to the receiver B and the distant receiver C; and that the currents on these two tracer lines, or, in other words, currents shunted into them from rheostats 1, 2, through roller contacts 20, 35, will vary in strength on each line in accordance with the positions of such roller contacts lengthwise of the rheostats 1, 2. The movements of the roller contacts 20, 35, and, therefore, such variations in the strength of the current traversing the two tracer lines, are, of course, controlled by the transmitting tracer, the positions of the contacts 20, 35, lengthwise of the rheostats 1, 2, respectively, and therefore, the strength of the currents traversing the right and left tracer lines, varying in accordance with the positions assumed from time to time during a writing operation by the tracer 49 as it is moved across its writing field by the transmitting operator. It may be well to note also that as the parts are shown in Fig. 1, the tracer 49, as well as the receiving pens 50, 50<sup>a</sup>, are out of their unison position; in other words, the tracer 49 is transmitting to the receivers B, C, and the receiving pens 50, 50<sup>a</sup>, thereof are, therefore, in the same positions relatively to their unison points as is the tracer 49 relatively to its unison point. The unison positions of the transmitting tracer 49 and of the receiving pens 50, 50<sup>a</sup> are to the left of their respective writing platens.

Turning now particularly to the receiver B, it will be noted that the pen-moving magnets 26, 41 thereof are of the solenoid type. As both of these magnets are identical in construction, only one need be described in detail, the magnet 26 being selected for this purpose. As shown in detail in Figs. 3-6, it consists of an iron shell 55, and iron core 56, the windings 57, with which wire 27 of the right tracer line is connected, and movable coil 25 carried by a cylindrical shell 59 fitting over the core 56, and winding 58 of which is connected by wire 24 with the right tracer line circuit heretofore described. The only movable part of this magnet is the coil 25, including, of course, its shell 59, so that the weight of the magnetic devices to be moved by the line current is reduced to the minimum. Further by reason

of the shell 59 being closed at its upper end a damping or dash-pot effect is obtained between it and the core 56 which materially adds to delicate and accurate operation of this and the other pen moving parts. The advantages otherwise of this construction of magnet, heretofore fully stated, need not be stated here.

The connections between the coils 25, 40, of the two magnets 26, 41, and the receiving pen 50 may, so far as the present improvements are concerned, be of any suitable form. The connections illustrated are those of a well known type, and, therefore, need be described only briefly. They consist of a pair of pen arms, 65, 66, in the converging pivoted ends of which the receiving pen 50 is mounted. The opposite ends of these arms 65, 66 are pivotally connected with a pair of levers 67, 68, respectively, provided with segments 69, 70, respectively, connected by chains 71, 72, respectively, with the movable coil carrying shells 59 of the magnets 26, 41, respectively. The connections between the arms 67, 68, and the shell 59, are illustrated clearly in Figs. 2, 7 and 9. As they are alike for both of the arms, only one set of connections need be described, those for arm 67 being selected for the purpose. Arm 67, it will be observed on reference to these figures, is fixed to a shaft 75 pivotally mounted in ears 76 projecting upwardly from a bracket 77, integral with an annular member 78 resting upon the magnet shell 55 and inclosing the movable coil carrying shell 59. To this shaft 75 is also rigidly secured the segment 69, and about this segment one turn is taken of the chain 71, one end of said chain being connected by means of a loop 80 with the movable coil carrying shell 59, and the other end with one end of a coiled spring 81 carried by bracket 82 secured to a standard 83, rising from the bed plate 84 of the receiver. The function of spring 81 is, of course, to oppose the force of the magnetic field in moving the coil 25 with its shell 59 downwardly as such field is excited, and as the excitation thereof is increased by increase in the current traversing the main line, and also to withdraw or retract said coil and shell as such currents decrease in strength and when no current is on line, to move the coil and its shell upwardly to normal position. Nice adjustment of the spring 81 is, therefore, necessary, and for this purpose it is so mounted in the present case as to have two adjustments, one as to length and the other as to fine degrees of tension. Its adjustment as to tension is secured by adjustably mounting the bracket 82 in the standard 83, a set screw 85 being provided for locking it in its position of adjustment, and the standard 83 being provided with a threaded portion for engagement by a nut

84. For the purpose of its adjustment as to length, spring 81 is mounted in an opening in the outer end of the bracket 82 and is provided above this opening with a threaded nut 86, resting on said bracket and the threads of which engage the coils of the spring so that by turning it in one direction or the other the effective portion of the spring, between bracket 82 and shell 59, may be lengthened or shortened.

The method of operation of the parts as thus far described, briefly stated, is as follows: As the tracer 49 is moved across its writing field, as in writing, spacing between words, spacing between lines, etc., currents varying in strength in accordance with the extent and direction of such movements will be shunted over the right and left tracer lines to the receiver B, where these currents will produce greater or less movement of the coils 25, 40, downwardly in the magnetic field provided for them by the magnets 26, 41, such downward movement of the coils being, of course, opposed by their respective springs 81, which, as the currents traversing their right and left lines decrease in strength, withdraw the coils 25, 40, or, in other words, move them upwardly. As the coils 25, 40 are thus moved downwardly and upwardly they will, through the chains 71, 72, segments 69, 70, and levers 67, 68, and arms 65, 66, move the receiving pen 50 laterally or across its writing field, causing it to reproduce, in extent and direction, the movements of the transmitting tracer.

Of course, provision is necessary for the movement of the receiving pen 50 to and from its writing field as the tracer 49 is so moved. The means provided for that purpose in the present case consists of a pen lifter magnet 90, which, through its armature (not shown) controls the inward and outward movement of the pen rest 91 engaging pen arms 65, 66, on their inner sides, so that when said pen rest 91 moves outwardly it will, through its engagement with arms 65, 66, move the receiving pen 50 away from its writing field, and when it is moved inwardly it will permit the levers 67, 68 and arms 65, 66, through their own resiliency or that of a spring, to move the receiving pen toward its writing field and into contact with a recording strip 92, passing over a writing platen 93. Such movement of the pen rest 91, and, therefore, of the receiving pen 50, are controlled from the transmitting instrument through connections which will now be described. Upon referring to Fig. 1, it will be noted that the pen-lifter magnet 90 is connected by wire 94 through a condenser 95 with wire 22 of the right tracer line, and is connected to ground at 30 by wires 96, 29.

Referring now to the transmitter, it will be observed that it is provided with a platen

switch 100 controlled in the usual way by the platen 99 which, as usual, is pivotally mounted and is depressed by the pressure of the transmitting tracer or the hand of the operator in the operation of writing, and is raised by a spring (not shown) from its depressed position when relieved from the pressure of the tracer or the hand of the operator, as is the case, for example, in spacing between words, or between lines. Beneath the platen switch 100 is provided a contact 101 engaged by the platen switch when the transmitter platen 99 is depressed, the effect of such engagement being to close a branch of the current-supplying circuit heretofore described, through an interrupter buzzer magnet 102. This branch circuit is traced as follows: Wire 103 from wire 10 of said current-supplying circuit, buzzer magnet 102, wire 104, contact 105 carried by armature 106 of said buzzer magnet, contact 107, wire 108, contact 101, platen switch contact 100, and wire 109 connecting with wire 13 leading, as before described, to the negative pole of generator 3. This branch circuit in turn divides at armature 106 and connects through wire 110, containing a condenser 111, with wire 22 of the right tracer line.

From this construction it results that while the tracer is in its raised position and the writing platen thereof is also raised, platen switch 100, is disengaged from contact 101, so that this circuit is open. This is the condition of the parts while the transmitter is raised away from platen 99. When it rests against said platen, however, and depresses the same and switch contact 100, the latter, engaging contact 101, closes this circuit. Current will then traverse this branch circuit from generator 3 through magnet 102, until magnet 102 has acquired sufficient energy to attract its armature 106. This will break the branch circuit at the contacts 105, 107, and condenser 111 will then discharge to ground at 30 over the right tracer line. Magnet 102 is then deenergized, releasing its armature 106, so that the branch circuit is again closed at contacts 105, 107, only to be broken again when magnet 102 is again energized, when condenser 111 again discharges over the right line, and so on. An impedance coil 112 is interposed between the connection of condenser 111 with the right line and the arm 21, to prevent discharges by the condenser to ground through rheostat 1, and to direct such discharges over the right line. This condition of alternating and breaking of this branch line circuit, and discharging of condenser 111, continues so long as the platen switch 100 remains in engagement with stationary contact 101, as it does while transmitting tracer rests upon and depresses platen 99 in writ-

ing. These discharges produce a vibratory condition in the current traversing the right line, and this vibratory current condition produces two results, first, shaking or vibration of the pen-moving parts in the receiver, thus reducing their frictional resistance to their movement, and, second, energization of pen-lifting magnet 90, and consequent lowering of receiving pen 50 into contact with its record strip 92, as now described. Because of the interposition between it and the main line of the condenser 95 before referred to, pen-lifter magnet 90 is unaffected by the direct current traversing the right line, and is, therefore, deenergized so that the pen rest 91 is in its outer position, holding the receiving pen 50 away from its writing field or record strip 92, which is the position at the time of the tracer 49 relatively to its writing field. When, however, alternating waves are superimposed on the right line, as just described, condenser 95 discharges to ground through magnet 90, thereby energizing said magnet, which, attracting its armature (not shown), will draw pen rest 91 inwardly, and the receiving pen 50 therefore be moved into contact with its record strip, a condition which continues so long as the transmitting platen remains in its depressed position. These movements of the receiving pen to and from its writing field are utilized also for the purpose of inking the receiving pen, at its unison position, which is represented by an opening 115 in the side of an ink bottle 116, in a holder 117, having a waste receptacle 118, and mounted to the left of the platen 93 in substantially the manner shown and described in Letters Patent heretofore granted to me. In other words, the operator at the transmitter, when he wishes to ink the receiving pen, will move the transmitting tracer to its unison position, when the receiving pen will also move into its unison position, and by then depressing the transmitting platen, and, therefore, the platen switch 100, pen rest 91 will be withdrawn from pen supporting position and the point of the receiving pen 50 moved into the opening 115 in the bottle 116 and be supplied therefrom with ink.

Means are also provided in the present case for shifting the paper at the receiving instrument, like means being also provided at the transmitter for shifting the paper there; the means at the transmitter comprising a paper shifting magnet 120, and at the receiver a similar paper shifting magnet 121. The energization and deenergization of these paper shifting magnets are controlled by circuits from generator 3, traced as follows: For magnet 120, wire 6 from the positive pole of said generator, master switch 4, contact 5, wires 7, 122, 123, magnet 120, and wires 124, 125 and 13, to the

negative pole of generator 3. For magnet 121, wire 130 from wire 123, wire 131, magnet 121, and wires 132, 44, and 29, to ground at 30. These two paper shifting magnets are energized and deenergized simultaneously, simply by the closing and opening, respectively, of the master switch 4, so that, as the paper is shifted at the transmitter, it is similarly shifted at the receiver. Furthermore, the operator at the transmitter may, by repeatedly opening and closing the master switch 4, shift the paper at the receiver as well as at the transmitter any distance he desires. Coming now to the mechanism through which these paper shifting magnets 120, 121 shift their respective paper strips, such mechanism for both of the magnets is identical, so that the following description, which refers specifically to the magnet 121 is applicable to magnet 120: As indicated in Fig. 2, the paper strip 92 at the receiver passes upwardly from a source of supply (not shown) over writing platen 93, thence upwardly over a guiding plate 133 bolted to the heel 135 of magnet 121, and having side paper guides 134, and finally out of the receiving instrument, or onto a take-up reel (not shown). The magnet 121, it will be observed (Figs. 10-13), is supported by means of its heel iron 135 from a slab 136 of slate or other suitable material, resting on bed plate 84, which slab also supports writing platen 93. Magnet 121 is provided with armature 137 vertically movable between the cores 138 of the magnet. An angle plate 139, secured to the cores, limits its downward movement, its downward movement being also cushioned by a pad 140 of suitable material in the lower end of the angle plate. Armature 137 is also provided with a sleeve 141 embracing a rod 142 passing through the armature and secured at one end to plate 139, and at the other to the heel 135 of the magnet. Between the heel iron 135 and the upper end of sleeve 141 is a coiled spring 143, which normally thrusts the armature 137 downward. Bolted to armature 137 is a frame 144 having outwardly and inwardly bent ends 145, which engage the inner face of the record strip 92 near its edge (see Figs. 2, 10-13). Frame 144, with its inwardly bent ends, constitutes one member of the paper-gripping mechanism. The other member consists of a rod 146 journaled in the ends 145 (see Fig. 13), and provided with outwardly and inwardly bent fingers 147 for embracing the edges of the record strip and engaging it on the outer surface near the edge and in line with the ends 145 with which they coact to grip it. The rod 146 is held normally in the paper gripping position shown in Fig. 13 by a spring 148 coiled about the rod, one end thereof being connected with a hub 149 at about the middle

of the rod, and the other with one of the ends 145 of frame 144. From this construction it results that as magnet 121 is energized and attracts its armature 137, frame 144 will be moved upwardly and the fingers 147 coacting with the ends 145 of said rod, will move the record strip upwardly a predetermined distance. When magnet 121 is deenergized, frame 144 will be moved downwardly, with magnet 137, by spring 143, and, as the frame is thus moved, spring 148 will permit fingers 147 to release their grip on the paper and slide downwardly along it. To provide for a secure grip upon the paper and also to relieve the paper from pulling engagement by fingers 147, said fingers are cut away as shown in Fig. 13 so as to provide at their lower portions a sharp paper engaging edge. To provide for holding the paper taut on the writing platen, during a writing operation, and, therefore, while magnet 121 is energized, or, in other words, while current is on the tracer lines, rod 146 is provided with a lateral wing 150 integral with hub 149 and normally occupying a horizontal position (see Fig. 12). On the upward movement of frame 144 this wing is engaged by a cushioned stop 151, which, by such engagement, prevents any rocking upwardly or premature paper releasing movement of fingers 147. This stop is adjustably mounted in a hanger 152 depending from heel 135 of magnet 121, so that the extent of feed of the record strip on each energization of magnet 121 may be regulated as desired.

What is claimed is:—

1. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising a plurality of magnets of the solenoid type excited by currents traversing the tracer line circuits and each having a movable coil electrically connected with the tracer lines and mechanically connected with the receiving pen.

2. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a current supplying circuit, a transmitting tracer and connections controlled thereby for shunting therefrom into the tracer lines currents varying in strength in accordance with the movements of the tracer across its writing field, and pen-moving

ing parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising a plurality of magnets of the solenoid type excited by currents traversing the tracer line circuits and each having a movable coil electrically connected with the tracer lines and mechanically connected with the receiving pen.

3. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having stationary windings and movable coils, both electrically connected with the tracer lines and said coils being mechanically connected with the receiving pen.

4. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a current supplying circuit, a transmitting tracer and connections controlled thereby for shunting therefrom into the tracer lines currents varying in strength in accordance with the movements of the tracer across its writing field, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having stationary windings and movable coils both electrically connected with the tracer lines and said coils being mechanically connected with the receiving pen.

5. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising a plurality of magnets of the solenoid type excited by currents traversing the tracer line circuits and each having a mov-

able coil electrically connected with the tracer lines and also, by levers, with the receiving pen.

6. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having stationary windings and movable coils both electrically connected with the tracer lines and said coils being connected also, by levers, with the receiving pen.

7. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and each having a stationary winding at one end and a movable coil both electrically connected with the tracer lines and said coil being mechanically connected with the receiving pen.

8. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and each having a stationary winding at one end and a movable coil both electrically connected with the tracer lines and said movable coil being connected also, by levers, with the receiving pen.

9. The combination in a telautographic system of the variable current-strength type,

of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, and electro-magnetic devices at the receiver controlled by the transmitting tracer for controlling the movements of the receiving pen to and from its writing field.

10. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a current-supplying circuit, a transmitting tracer and connections controlled thereby for shunting therefrom into the tracer lines currents varying in strength in accordance with the movements of the tracer across its writing field, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, and electro-magnetic devices at the receiver controlled by the transmitting tracer for controlling the movements of the receiving pen to and from its writing field.

11. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, means controlled by the transmitter tracer for producing a vibratory condition in the current traversing one of the tracer lines and electro-magnetic devices at the receiver controlled by such vibratory current condition

and controlling the movements of the receiving pen to and from its writing field.

12. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a current-supplying circuit, a transmitting tracer and connections controlled thereby for shunting therefrom into the tracer lines currents varying in strength in accordance with the movements of the tracer across its writing field, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, means controlled by the transmitting tracer for producing a vibratory condition in the current traversing one of the tracer lines and electro-magnetic devices at the receiver controlled by such vibratory current condition and controlling the movements of the receiving pen to and from its writing field.

13. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, electro-magnetic devices at the receiver controlled by the transmitting tracer for controlling the movements of the receiving pen to and from its writing field, and electro-magnetic paper-shifting devices at the receiver and controlled from the transmitter.

14. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a current-supplying circuit, a transmitting tracer and connections controlled thereby for shunting therefrom into the tracer lines currents varying in strength in accordance with the movements of the tracer across its writing field, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving

parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, electro-magnetic devices at the receiver controlled by the transmitting tracer for controlling the movements of the receiving pen to and from its writing field, and electro-magnetic paper-shifting devices at the receiver and controlled from the transmitter.

15. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, and pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, and said coils provided with shells mounted on the magnet cores and closed at their outer ends to form dash-pots with said cores.

16. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a current supplying-circuit, a transmitting tracer and connections controlled thereby for shunting therefrom into the tracer lines currents varying in strength in accordance with the movements of the tracer across its writing field, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising magnets of the solenoid type excited by currents traversing the tracer line circuits and having movable coils electrically connected with the tracer lines and mechanically connected with the receiving pen, and said coils provided with shells mounted on the magnet cores and closed at their outer ends to form dash-pots with said cores.

17. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter and receiver, a source of electric energy therefor, a transmitting tracer and connections controlling the strength of the currents traversing the tracer lines in accordance with the movements of the tracer over its writing platen, pen-moving parts at the receiver controlled by the currents traversing

the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving parts comprising a plurality of magnets of the solenoid type  
5 excited by currents traversing the tracer line circuits and each having a movable coil electrically connected with the tracer lines and mechanically connected with the receiving pen, and means controlled at the transmitter  
10 for vibrating the pen-moving parts at the receiver.

18. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter  
15 and receiver, a current-supplying circuit, a transmitting tracer and connections controlled thereby for shunting therefrom into the tracer lines currents varying in strength in accordance with the movements of the  
20 tracer across its writing field, pen-moving parts at the receiver controlled by the currents traversing the tracer lines and controlling the movements of the receiving pen across its writing field, said pen-moving  
25 parts comprising a plurality of magnets of the solenoid type excited by currents traversing the tracer line circuits and each having a movable coil electrically connected with the tracer lines and mechanically connected  
30 with the receiving pen, and means controlled at the transmitter for vibrating the pen-moving parts at the receiver.

19. The combination in a telautographic system of the variable current-strength type,  
35 of tracer lines connecting the transmitter

and receiver, a source of electric energy therefor, electro-magnetic paper-shifting mechanism at the receiver controlled from the transmitter and comprising an armature  
40 and a pair of gripping devices for engaging the paper on its opposite surface, one of said gripping devices being spring mounted so as to engage the paper on its feeding movement and release it on its return movement, and a stop engaging the spring mounted device  
45 at the end of the feeding movement to prevent premature release by it of the paper.

20. The combination in a telautographic system of the variable current-strength type, of tracer lines connecting the transmitter  
50 and receiver, a source of electric energy therefor, electro-magnetic paper-shifting mechanism at the receiver controlled from the transmitter and comprising an armature and a pair of gripping devices for engaging  
55 the paper on its opposite surface, one of said gripping devices being spring mounted so as to engage the paper on its feeding movement and release it on its return movement, and an adjustable stop engaging the spring  
60 mounted device at the end of the feeding movement to prevent premature release by it of the paper.

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

GEORGE S. TIFFANY.

Witnesses:

S. E. BROWN,  
T. F. KEHOE.