G. S. TIFFANY.

TELAUTOGRAPH.

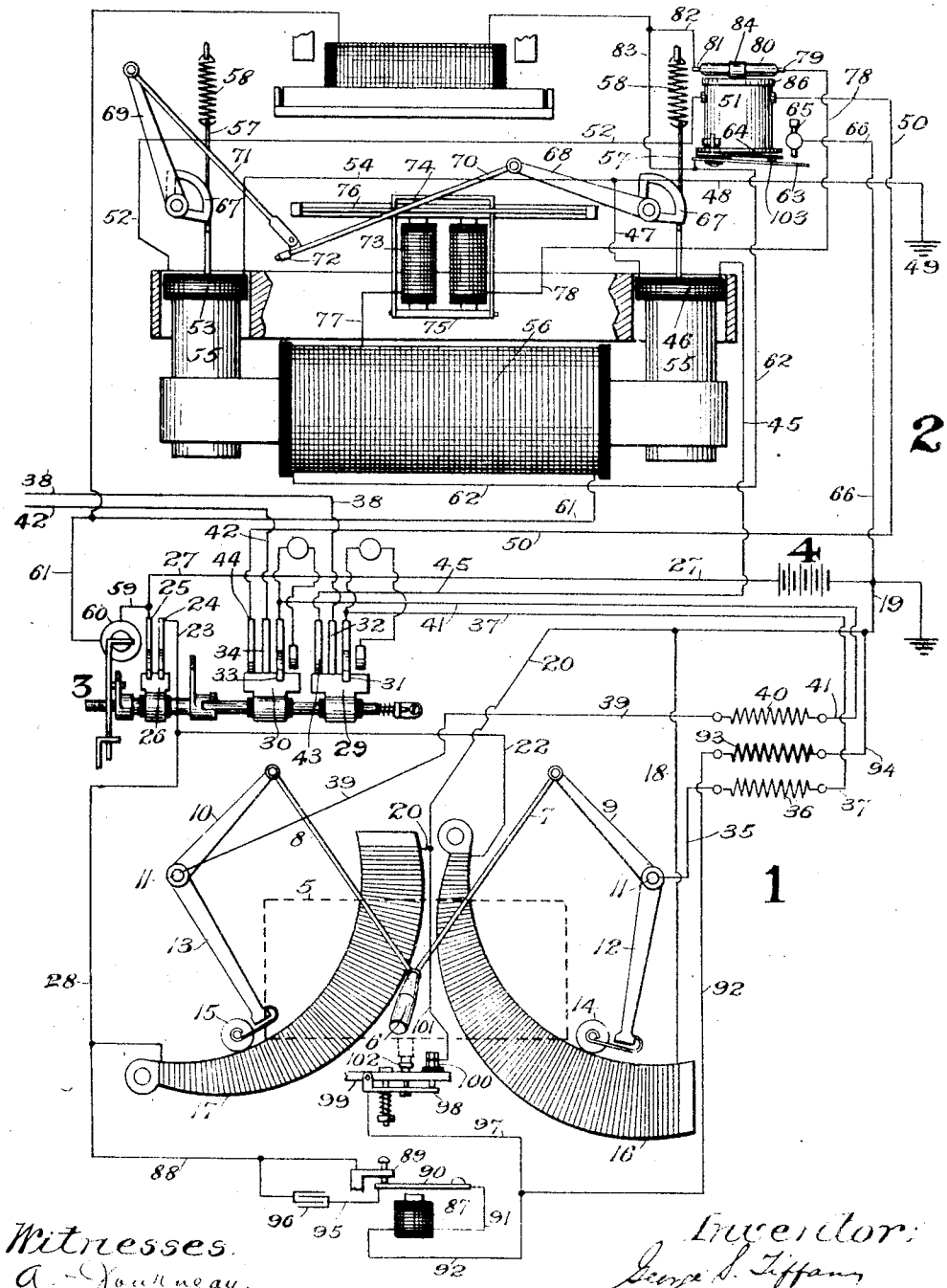
APPLICATION FILED MAY 16, 1907.

**954,062.**

Patented Apr. 5, 1910.

3 SHEETS—SHEET 1.

*Fig. 1.*




Witnesses.

A. Foulkneay.

Philip A. Tilden.

Inventor:

George S. Tiffany

by his Attys

Philip George Kirkpatrick

G. S. TIFFANY.

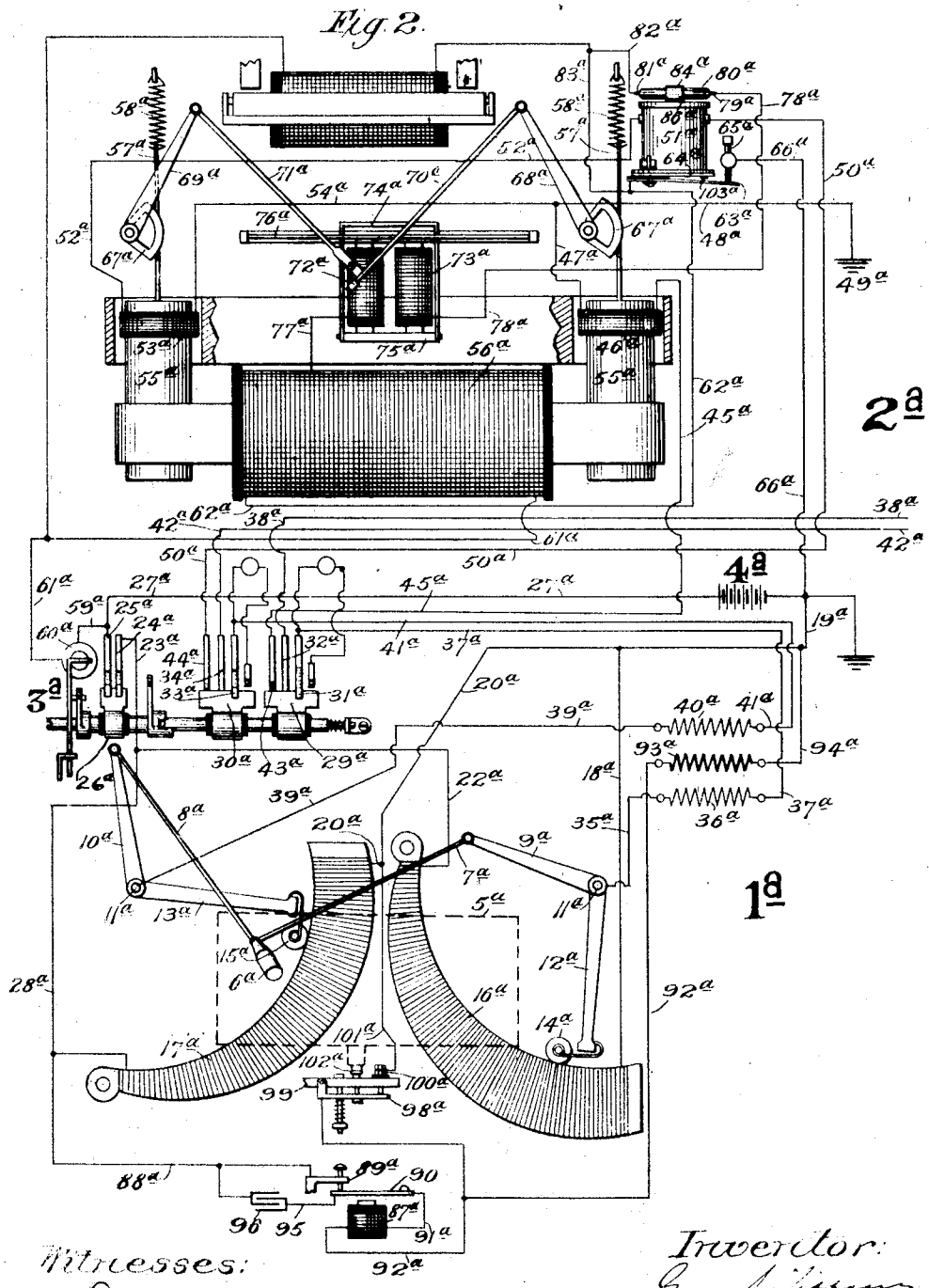
TELAUTOGRAPH.

APPLICATION FILED MAY 16, 1907

**954,062.** Patented Apr. 5, 1910.

3 SHEETS—SHEET 2.

Fig. 2.




Witnesses:
A. Journeay.
Philip W. Tilden

Inventor:
George S. Tiffany
By his Attys: Philipp Lange Rice & Kennedy

G. S. TIFFANY.

TELAUTOGRAPH.

APPLICATION FILED MAY 16, 1907.

954,062. Patented Apr. 5, 1910.

3 SHEETS—SHEET 3.

Fig. 3.

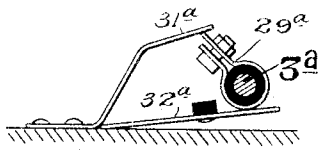



Fig. 4.

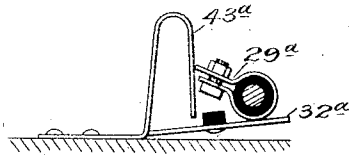



Fig. 5.

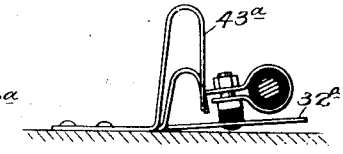



Fig. 6.

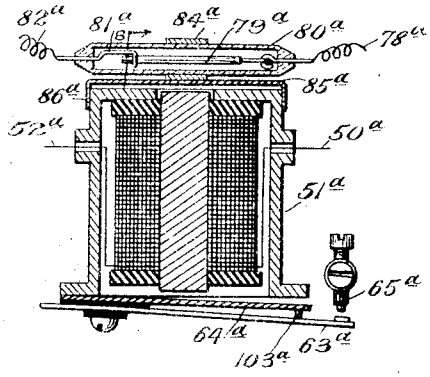



Fig. 7.

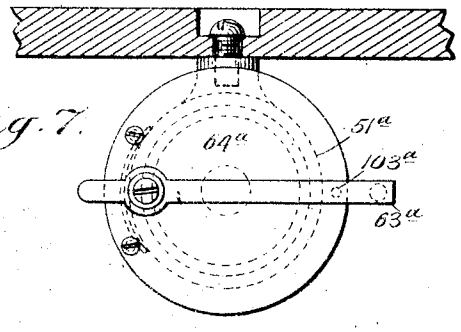



Fig. 8


Witnesses.

A. Fourneay

Philip N. Tilden

Inventor.

George S. Tiffany

by his Attys.

Philipp Lainer Rice & Kennedy

# UNITED STATES PATENT OFFICE.

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

## TELAUTOGRAPH.

954,062. Specification of Letters Patent. Patented Apr. 5, 1910.

Original application filed February 5, 1906, Serial No. 299,413. Divided and this application filed May 16, 1907. Serial No. 374,037.

*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 Telautographs, fully described and represented in the following specification and the accompanying drawings, forming a part of the same.

The invention of this application (a division of my application filed February 5, 1906, Serial No. 299,413) relates to improvements in relays for electric circuits.

Although devised with especial reference to telautographic systems, the improvements of the present invention are capable of application to other systems employing a main line circuit and another circuit the condition of which is controlled thereby through a relay, as will be apparent from the detailed description of the present invention, which will now be given in connection with a telautographic system.

In the accompanying drawings—Figures 1 and 2 illustrate, mainly in diagram, two stations of a telautographic system, each equipped with a relay embodying the present invention. Figs. 3, 4 and 5 are details, upon an enlarged scale, of the master switch with which each station is provided. Fig. 6 is a vertical section, on an enlarged scale, of the relay illustrated in Figs. 1 and 2. Fig. 7 is a bottom view of said relay; and Fig. 8 is a cross section, on the line 8 of Fig. 6, of a circuit closing device forming part of the relay.

The telautographic apparatus illustrated in the drawings is of the type in which the movements of the receiving pen of the distant station in unison with the transmitting tracer of the station from which messages are being transmitted to said distant station, are effected by variations in the strength of the currents sent to line from the transmitting instrument to the receiving instrument, such variations in current strength being in turn effected by and corresponding to the movements of the transmitting tracer. The particular apparatus illustrated in said drawings is identical with that illustrated and described in detail in my prior application aforesaid, except that here some of the devices and circuit connections which appear in the drawings of my said prior application have been omitted for clearness and because illustration thereof in the present case is unnecessary. Except for the relay constituting the present invention and the circuits and devices controlled thereby, the telautographic apparatus shown herein need only be described briefly, reference being made to my said prior application for a more detailed description of it.

Each station of the telautographic apparatus shown comprises a transmitting instrument (designated 1 in Fig. 1 and $1^a$ in Fig. 2), a receiving instrument (designated 2 in Fig. 1 and $2^a$ in Fig. 2), an oscillatory master switch (designated 3 in Fig. 1 and $3^a$ in Fig. 2) for connecting the transmitter or receiver of its station with the receiver or transmitter, respectively, of another station, or connecting together the receiver and transmitter of its own station for "testing," and a battery (designated 4 in Fig. 1 and $4^a$ in Fig. 2) from which, when the station is transmitting, currents, varying in strength in accordance with the movements of the transmitting tracer, are shunted into the main line circuits connecting the transmitting instrument with the receiving instrument to which it is transmitting, and which battery also serves as a local battery for the circuits of the receiving instrument when the latter is "receiving." As the devices and circuits at one station are identical with those at another station, a description of one transmitting instrument and one receiving instrument will be sufficient. The transmitting instrument of Fig. 1 and the receiving instrument of Fig. 2 will be selected for such description. The same reference numerals will be applied to corresponding parts in Figs. 1 and 2, except that, for convenience of description, reference letter "a" will be added to the reference numerals in Fig. 2.

The transmitting instrument (Fig. 1) is provided with the usual depressible writing platen 5 on which the writing instrument or tracer 6 rests in transmitting, the usual paper strip (not shown) on which the tracer makes its record being fed over this table by paper shifting mechanism such as shown and described in my prior application aforesaid. The tracer 6 is pivotally mounted in the converging ends of a pair of hinged arms 7, 8, the opposite ends of which are pivoted to the outer ends of a pair of arms 9, 10 pivotally

mounted at 11 so as to oscillate freely in a horizontal direction, and provided with a second pair of arms 12, 13, respectively, (from which they are suitably insulated) having at their outer ends spring plates in which are journaled roller contacts 14, 15, respectively, which, as the arms or bell crank levers 9, 12 and 10, 13 are oscillated by the movement of the transmitting tracer 6, move back and forth between the opposite ends of a pair of rheostats 16, 17, respectively. These rheostats are in circuit at their opposite ends with battery 4 so that when the circuits connecting them with said battery are closed, currents are shunted through the rheostats 16, 17 and arms 12, 13 into the main line circuits leading from the transmitting instrument to the distant receiver; these currents varying in strength in accordance with the positions assumed by the roller contacts 14, 15 between the ends of said rheostats.

One end of rheostat 16 is at all times connected by wires 18, 19 with the negative pole of battery 4, and the corresponding end of rheostat 17 is also connected therewith by wires 20, 19; this pole of the battery being grounded, as shown, so that the currents supplied by said battery to the main line circuits, or when it is serving as the local battery of the receiver, are positive. Normally the master switch 3 occupies the position in which it is shown in Fig. 3, and in this position of the master switch the transmitter of the station is "off" and the receiver of that station is "on," or ready to receive messages, and in this position of the switch the opposite or smaller ends of the rheostats 16, 17 are not connected with the positive pole of battery 4. When, however, the master switch is rocked forward from the position shown in Fig. 3 to the position shown in Fig. 4, these ends of the rheostats 16, 17 are connected with the positive pole of battery 4,—rheostat 16 by wires 22, 23, contacts 24, 25, contact plate 26 (carried by switch 3 and which in this position of said switch electrically connects said contacts 24, 25), and wire 27 to the positive pole of battery 4, and the rheostat 17 by wires 28, 23, contact 24, plate 26, contact 25 and wire 27 to the positive pole of battery 4. In this position of the master switch also two contact plates 29, 30 carried by and suitably insulated from master switch 3 close the main line circuits from the transmitting instrument to the receiving instrument of the distant station, plate 29 by engaging and electrically connecting a pair of upper and lower contacts 31, 32 in the right hand main line circuit, and plate 30 by engaging and electrically connecting a pair of upper and lower contacts 33, 34 in the left hand main line circuit. With the switch 3 in this position, the right hand main line circuit from the transmitting station (Fig. 1) consists of arm 12, wire 35, right secondary winding 36 of an induction coil, (the function of which will be hereinafter pointed out) wire 37, contact 31, plate 29, contact 32, and wire 38 leading to the right hand side of the receiving instrument (Fig. 2); while the left hand main line circuit consists of arm 13, wire 39, left secondary winding 40 of the induction coil just referred to, wire 41, contact 33, plate 30, contact 34, and wire 42 leading to the left hand side of the receiving instrument (Fig. 2).

At the time the master switch 3 of Fig. 1 is thus shifted to transmitting position, the master switch $3^a$ of the distant station being in its normal position,—that is, with the transmitter of that station "off" and the receiver thereon "on,"—the contact plate $26^a$ of switch $3^a$ will be out of engagement with contacts $24^a$, $25^a$ so that the circuits from battery $4^a$ through rheostats $16^a$, $17^a$ of that station (Fig. 2) are open. In this position of the master switch $3^a$, also, its plates $29^a$, $30^a$ are lowered out of engagement with upper contacts $31^a$, $33^a$, respectively, and into engagement with the two contacts $43^a$, $44^a$, respectively, (see Fig. 4), contact $43^a$ being electrically connected by plate $29^a$ with under contact $32^a$, and contact $44^a$ by plate $30^a$ with under contact $34^a$.

With the master switch $3^a$ in this position, the right hand main line circuit of Fig. 1 entering and passing through the receiving instrument $2^a$ of Fig. 2, consists of line wire $38^a$ (continuation of wire 38 of Fig. 1), contact $32^a$, plate $29^a$ of master switch $3^a$, contact $43^a$, wire $45^a$, vertically movable coil $46^a$ on the right hand side of the receiving instrument, and wires $47^a$, $48^a$ leading thence to ground at $49^a$ (Fig. 2) and back to the negative pole of battery 4 (Fig. 1); while the left hand main line circuit consists of wire $42^a$ (continuation of wire 42 of Fig. 1), contact $34^a$, plate $30^a$ of master switch $3^a$, contact $44^a$, wire $50^a$ leading therefrom through the winding of a combination relay $51^a$ (embodying the present invention), wire $52^a$ leading therefrom to a vertically movable coil $53^a$ at the left hand side of the receiver, and wires $54^a$ and $48^a$ leading thence to ground at $49^a$ (Fig. 2) and back to the negative pole of battery 4 (Fig. 1). The coils $46^a$, $53^a$, just referred to, fit loosely over the vertical cores $55^a$ of the field magnet $56^a$, and normally are at the upper ends of said cores, in which position they are held by chains $57^a$ and springs $58^a$.

In the normal position, just described, of the master switch $3^a$, with the transmitter "off" and the receiver "on," battery $4^a$ of Fig. 2 serves as a local battery for the receiving instrument, one of the functions performed by it being the energization of magnet $56^a$, the circuit through which it does this work consisting of wire $27^a$ from the

positive pole of battery $4^a$, wire $59^a$, magnet $60^a$ (which, as described in my said prior application, locks master switch $3^a$ in its normal position while current is on the left hand main line circuit), wire $61^a$ to magnet $56^a$, wire $62^a$ leading from said magnet to a contact plate $63^a$ carried by but insulated from armature $64^a$ of relay $51^a$, contact $65^a$ for plate $63^a$, and wire $66^a$ leading therefrom to the negative pole of battery $4^a$ and ground. When the master switch $3^a$ is in the normal position just described and current is passing over the left hand main line circuit from battery 4 of the transmitting instrument (Fig. 1), the relay $51^a$, through which this circuit passes, will be energized, and attract its armature $64^a$, which will cause plate $63^a$ to engage contact $65^a$ and thus close the circuit just described through magnet $56^a$ from battery $4^a$, and this local circuit will remain closed so long as there is any current on the left hand main line circuit.

With the master switch 3 of Fig. 1 in the position shown in Fig. 4, that is, so that the receiver of that station is "off" and the transmitter thereof "on", and with the master switch $3^a$ of Fig. 2 in the position shown in Fig. 3, that is, so that the transmitter of that station is "off" and the receiver thereof "on", the main line circuits from the transmitter of Fig. 1 to the receiver of Fig. 2 will be closed with current passing over them from battery 4.

The operation of the apparatus, briefly described, will then be as follows: The operator of the transmitter (Fig. 1) will raise the transmitting tracer from its resting place in unison position (see Fig. 2), and move it laterally to a position over the writing platen 5, then lower it so that its point will rest upon the paper strip (not shown) passing over said platen, and then move the tracer over the paper to inscribe thereon the message to be transmitted. As the tracer 6 is thus moved laterally from unison position and over the surface of the paper, the roller contacts 14, 15 will be moved by the arms 9, 12 and 10, 13, respectively, to different positions between the opposite ends of the rheostats 16, 17, respectively. As the roller contacts are thus moved, currents, varying in strength in accordance with the different positions assumed by said roller contacts along the rheostats 16, 17, will be shunted through the said rheostats and the arms 12, 13 into the main line circuits, heretofore described, leading to the receiving instrument $2^a$ of Fig. 2 and passing through the vertically movable coils $46^a$ and $53^a$, coil $46^a$ being included in the right hand main line circuit which is supplied with current through rheostat 16 and arm 12, while coil $53^a$ is included in the left hand main line circuit which is supplied with current through rheostat 17 and arm 13. The currents thus passing through the coils $46^a$ and $53^a$ will, as is well understood by those familiar with telautographic apparatus, with the springs $58^a$, control the position of the coils $46^a$, $53^a$ vertically on the cores $55^a$ of the field magnet $56^a$, these coils being moved downwardly as the strength of the currents on the main lines increases, and upwardly as said currents decrease in strength. As the coils are thus moved vertically, they will, through the chains $57^a$ and segmental pulleys $67^a$ (around which two turns of the chains are taken), move the hinged pen arms $68^a$, $69^a$ and $70^a$, $71^a$ so as to cause the receiving pen $72^a$ to assume, over its writing field, the same positions as those to which the transmitting tracer 6 is moved laterally by the operator from unison position or in the operation of writing the message transmitted. This operation, with the construction of the receiving instrument shown, is so fully described in my prior application aforesaid, that further description thereof is deemed unnecessary here, except in so far as the combination relay $51^a$, and the parts controlled thereby, are concerned, which will presently be described in detail.

So far as the right hand main line circuit is concerned, it performs, during the transmitting operation, simply the function of controlling the vertical movements of the coil $46^a$. The left hand main line circuit, however, performs not only the function of controlling the vertical movements of its coil $53^a$, but also the function of controlling, through the combination relay $51^a$, various local circuits in the receiving instrument, including that from battery $4^a$ (which is a local battery when the station is "receiving") for energizing field magnet $56^a$. As soon as current traverses the left main line circuit of Fig. 1, relay $51^a$ is, of course, energized and attracts its armature $64^a$, thus closing the local circuit before referred to, from battery $4^a$,—consisting of wires $27^a$, $59^a$, lock magnet $60^a$, wire $61^a$, field magnet $56^a$, wire $62^a$, contacts $63^a$, $65^a$, and wire $66^a$, to negative pole of battery $4^a$, with the result that said field magnet $56^a$ is energized for the operation of the coils $46^a$, $53^a$. Lock magnet $60^a$ is also energized by the closing of this circuit so as to lock the master switch $3^a$ against movement from normal position, as fully described in my aforesaid prior application. This local circuit remains closed so long as there is any current on the left hand main line wires, and as soon as the left main line circuit is broken, by shifting the switch $3^a$ from the position indicated in Fig. 4 to its normal position indicated in Fig. 3, this local circuit is, of course, broken.

The vertical movement of the coils $46^a$, $53^a$ controls the lateral movements of the receiving pen so that they will correspond with the lateral movements of the transmitting tracer,

but it is necessary also to provide means whereby the receiving pen will be caused to move to and from its writing field and to and from its resting place in unison position, as the transmitting tracer is so moved by the operator. Such movements of the receiving pen are controlled by a magnet 73ª (hereinafter called the "pen lifter magnet"), the condition of which is, in turn, controlled by the combination relay 51ª. The armature 74ª of this pen lifter magnet has depending arms pivotally connected at their lower ends to a bracket 75ª on which said magnet is supported, so that, as said magnet is energized and deënergized, said armature will swing inwardly and outwardly over the cores of the magnet. The armature is held normally in its retracted position, from over the cores of magnet 73ª, by a spring (not shown), and is provided with a rod 76ª against which the pen arms 70ª, 71ª rest. In the retracted position of the armature 74ª, and, therefore, of this pen-arm rest 76ª, the receiving pen 72ª, when at unison, will lie in its resting place (an opening in an ink bottle, as described in my prior application aforesaid), and when over its writing field, will rest against the surface of the paper strip on which it is to record the message received. When, however, the pen lifter magnet 73ª is energized, its armature 74ª, and, therefore, the pen-arm rest 76ª, will swing outwardly over the cores of said magnet and thereby move pen arms 70ª, 71ª, and, therefore, the receiving pen 72ª, outwardly so as to move said receiving pen outwardly from its place of rest at unison or away from contact with the paper strip on which the message is being recorded. The energization of magnet 73ª is effected by battery 4ª, in the closed condition of the left hand main line circuit, through a branch circuit from the field magnet circuit just described, consisting of wire 77ª leading from the winding of magnet 56ª to magnet 73ª, wire 78ª leading from said magnet 73ª to a contact 79ª (fixed at one end in one end of a tube 80ª and the opposite end of which contact is flexible and loose), a second contact 81ª rigidly fixed in the opposite end of said tube 80ª (and between which and the free end of contact 79ª there is a certain amount of looseness so that the free end of contact 79ª may have a certain amount of play relatively to contact 81ª with which, however, it is normally in engagement), and wires 82ª, 83ª leading from contact 81ª to the wire 62ª of the circuit of field magnet 56ª. Tube 80ª is preferably of glass and is closed to the atmosphere so as to prevent oxidation of its contacts 79ª, 81ª.

From this construction it results that on the closing of the left main line circuit, by the shifting of the master switch 3 (Fig. 1) to the position shown in Fig. 4, the relay 51ª (Fig. 2) is energized and the circuit for field magnet 56ª thus closed by the movement of contact plate 63ª into engagement with contact 65ª, as before described, the branch circuit just described through pen lifting magnet 73ª being also closed by engagement of loose contact 79ª with fixed contact 81ª. Pen lifter magnet 73ª being thus energized will attract its armature 74ª, moving it outwardly toward the front of the receiver, and as the armature 74ª is thus moved the pen rest 76ª, moving with it, will move the pen arms 70ª, 71ª, outwardly, thus lifting or withdrawing pen 72ª from its place of rest at unison. The transmitting tracer 6 being then moved from unison position to a position above the writing platen 5, the receiving pen 72ª will, following the movements of the transmitting tracer, take up a position in front of but out of contact with the record strip (not shown) in its writing field. So long as the loose contact 79ª just referred to remains in a state of rest, in engagement with fixed contact 81ª, the receiving pen will maintain the position just referred to in front of but out of contact with the record strip,—the branch circuit through the pen lifting magnet 73ª being closed by the contacts 79ª, 81ª. Means are provided, however, for, in effect, opening this branch circuit while current is on the left main line, so that the pen lifter magnet 73ª will be practically deënergized and the receiving pen thus caused to move toward and into contact with its record strip, and to thereafter move over the surface of such strip so long as the transmitting tracer remains in contact with and moves over the platen 5 or paper strip thereon. The means provided for so opening this branch circuit through the pen lifter magnet will presently be described.

The condition of the loose contact 79ª is controlled by the transmitting tracer 6, so that when said tracer is raised from its rest at its unison point, or is raised, from time to time, from the writing platen 5 during the writing operation, the loose contact 79ª will be in a state of rest against fixed contact 81ª and, as just described, the pen 72ª be moved and held away from its resting place at unison or from the surface of its record strip, as the case may be. When, however, the transmitting tracer 6 is lowered, from time to time during the writing operation, into contact with its record strip, this condition of loose contact 79ª with relation to fixed contact 81ª is disturbed, said loose contact at such times being in a state of agitation, with the result that the branch circuit for pen lifter magnet 73ª is repeatedly interrupted so that its armature 74ª and pen-arm rest 76ª are held retracted by the armature spring (not shown) and pen 72ª thus moved inwardly, by the resiliency of its arms 70ª, 71ª into contact with its record strip or into its

resting place at unison, as the case may be, and will retain such position so long as the transmitting tracer 6 remains lowered and will thus, while in contact with its record strip, reproduce the movements of and writing performed by the transmitting tracer.

The means by which the condition of loose contact $79^a$ relatively to fixed contact $81^a$ is thus controlled by the transmitting tracer 6 will now be described. Referring particularly to Figs. 6 to 8, it will be observed that the tube $80^a$ is secured by a suitable socket $84^a$ to the center of a thin iron plate or diaphragm $85^a$ provided with a flange $86^a$ by which it is held in position on the upper end of relay $51^a$. When said relay is energized by the current on left hand main line circuit, as heretofore described, it will attract and pull downwardly slightly the central portion of the diaphragm $85^a$ and when it is deënergized will release said diaphragm, tube 80, of course, moving with the diaphragm. So long as the current passing through relay $51^a$ is constant, loose contact $79^a$ will be in a position of rest with relation to and in engagement with fixed contact $81^a$, and thus close the branch circuit through pen lifting magnet $73^a$. Should, however, vibrations occur in the current passing through the relay it will be apparent that diaphragm $85^a$ will be rapidly vibrated, and loose contact $79^a$ disturbed from its normal state of rest and put into a state of vibration or agitated with relation to fixed contact $81^a$, with the result that the branch circuit through pen lifting magnet $73^a$ will be so interrupted that said magnet will be practically deënergized and the armature $74^a$ thereof, as well as pen rest $76^a$, therefore occupy their retracted, rearward positions, thus leaving the receiving pen $72^a$ in its innermost position at unison, or against the surface of its record strip, as the case may be. Such vibrations in the left main line circuit are produced by the lowering of the transmitting tracer 6, as will now appear.

Referring to Fig. 1, it will be observed that the transmitting instrument is provided with an interrupter magnet 87 included in a local circuit of battery 4 consisting of wire 27 from positive pole of battery 4, contact 25, plate 26 of master switch 3, contact 24, wires 23 and 28, wire 88 to contact 89, armature 90, wire 91 leading therefrom to magnet 87, wire 92 leading thence to the primary winding 93 of the induction coil, and wires 94 and 19 leading from the latter to the negative pole of battery 4 to ground. For the purpose of avoiding sparking at the contact 89 and armature 90, as the latter is repelled, a shunt circuit 95 containing a condenser 96, is formed, from wire 88 to armature 90, around contact 89. It will also be observed that a short circuit is provided around the primary winding 93 of the induction coil, consisting of wire 97 connecting wire 92 with a contact plate 98, pivotally mounted in a bracket 99 (from which it is suitably insulated), a contact 100 passing through but insulated from said bracket and engaging contact plate 98, and wires 101, 20, and 19, leading from contact 100 to the negative pole of battery 4. Writing platen 5 is located above bracket 99 and bears against a pin 102 passing through bracket 99 and bearing against the contact plate 98, so that when in the writing operation, platen 5 is depressed, contact plate 98 will also be depressed thereby breaking contact with contact stop 100 and breaking the short circuit around the primary winding 93 of the induction coil. With these two circuits the interrupter magnet 87 and its armature 90 are operated continuously, through one or the other, so long as the master switch 3 remains in transmitting position (Fig. 4) with its contact plate 26 connecting contacts 24, 25.

In the raised position of the transmitting tracer 6, the short circuit around primary winding 93 of the induction coil is closed by the engagement of contact plate 98 and contact 100 under the platen 5, so that the current from battery 4 does not pass through the primary winding 93 but by wires 101, 20 and 19 to the negative pole of battery 4, no vibrations therefore being produced in the main line circuits, with the result that loose contact $79^a$ in tube $80^a$ (Fig. 2) above combination relay $51^a$ will be at rest against fixed contact $81^a$ and thus properly close the circuit through pen lifting magnet $73^a$ to cause it to attract its armature $74^a$ and move and hold the receiving pen $72^a$ in its outer position away from the surface of its record strip. When, however, the transmitting tracer 6 is lowered to writing position and therefore depresses platen 5, the contact plate 98 will be depressed (by pin 102) out of engagement with contact 100, thereby opening this short circuit. The interrupter current will thereupon pass, by wires 92, 94, and 19 through the primary winding 93 to the negative pole of battery 4 and thus induce vibratory currents, superposed upon the right and left hand writing currents. Each time the tracer 6 is raised, primary winding 93 is short circuited. The vibratory currents thus traversing the two main line circuits, while the transmitting tracer is lowered, serve to vibrate slightly the operating parts of the receiver and thus overcome their friction of rest so that they may be more easily operated; while the vibrations in the left hand main line serve the additional function, heretofore referred to, of keeping the loose contact $79^a$ (Fig. 2) above combination relay $51^a$ in a state of agitation so that the pen lifter magnet circuit is interrupted and pen lifter magnet $73^a$ practically deënergized with the result that its

armature 74ª and pen-arm rest 76ª are retracted and permit receiving pen 72ª to approach and rest against the surface of its record strip, which position it will retain, reproducing on said strip the writing produced by the transmitting tracer, until the tracer 6 is again raised.

The armature 64ª (Fig. 2) of relay 51ª is of large area and comparatively thick, (being preferably of the disk shape shown) so that, unlike the delicate, loose contact 79ª and tube 80ª, it is unaffected by these vibrations on the left main line circuit but, notwithstanding them, maintains contact plate 63ª in engagement with contact 65ª and thus maintains the circuit from battery 4ª, for field magnet 56ª and lock magnet 60ª, closed. It will also be observed that in its normal retracted position, the free end of spring contact plate 63ª rests against armature 64ª, being engaged by a contact 103ª on the under side of the armature; while in its attracted or raised position, the armature is moved away from spring contact plate 63ª, leaving it in engagement with contact 65ª which limits its upward movement, as shown in Fig. 2.

It will, of course, be understood from the description above given of the devices for effecting the to and fro movements of the receiving pen relatively to its recording strip or place of rest at unison, and the brief description preceding it of the devices for effecting the movement of the receiving pen over its recording strip to reproduce the writing performed by the transmitting tracer, that, starting with the transmitting tracer at unison or in its normal position, the first movement given it by the operator is to raise it and then move it laterally to a position over the writing field of platen 5,—and it will also be understood that the receiving pen will at the same time be withdrawn from its place of rest at unison and then moved (as the tracer is moved) laterally to a position over the writing field of its recording strip. The transmitting tracer being then lowered onto platen 5, the receiving pen will be moved inwardly into contact with its recording strip, and the transmitting tracer being then moved over its writing platen to trace or write the message, the receiving pen will be correspondingly moved over the surface of its recording strip reproducing thereon the writing performed by the tracer. When the tracer is raised to dot an "i" or cross a "t" or to make a change or correction in matter previously written or to begin a new line,—the receiving pen will, in like manner, be moved away from its recording strip and then be brought again into contact with it whenever the transmitting tracer is lowered into contact with its writing platen.

What I claim is:—

1. The combination with a main line circuit, of a second circuit, and circuit closing means controlling said second circuit and inclosed in a receptacle comprising a pair of contacts loosely engaging each other whereby, when vibrations occur in the main line circuit, one is agitated relatively to the other and thus correspondingly interrupts said second circuit, substantially as described.

2. The combination with a main line circuit, of a second circuit, and circuit closing means controlling said second circuit and inclosed in a receptacle closed to the atmosphere, said circuit closing means comprising a pair of contacts loosely engaging each other whereby, when vibrations occur in the main line circuit, one is agitated relatively to the other and thus correspondingly interrupts said second circuit, substantially as described.

3. The combination with a main line circuit, of a relay controlled thereby, a second circuit, and circuit closing means controlled by said relay and in turn controlling said second circuit, said circuit closing means being inclosed in a receptacle closed to the atmosphere and comprising a pair of contacts loosely engaging each other whereby, when vibrations occur in the main line circuit, one is agitated relatively to the other and thus correspondingly interrupts said second circuit, substantially as described.

4. The combination with a main line circuit, of a relay controlled thereby, a second circuit, circuit closing means controlled by said relay and in turn controlling said second circuit, a third circuit and circuit closing means therefor also controlled by the relay, said latter circuit closing means comprising a pair of contacts loosely engaging each other whereby, when vibrations occur in the main line circuit, one is agitated relatively to the other and thus correspondingly interrupts said second circuit, substantially as described.

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

GEORGE STEELE TIFFANY.

Witnesses:

A. WHITE,

A. JOURNEAY.