No. 656,828. Patented Aug. 28, 1900.

F. RITCHIE.

TELAUTOGRAPHIC APPARATUS.

(Application filed Jan. 29, 1900.)

(No Model.) 4 Sheets—Sheet 1.

Fig. 1.

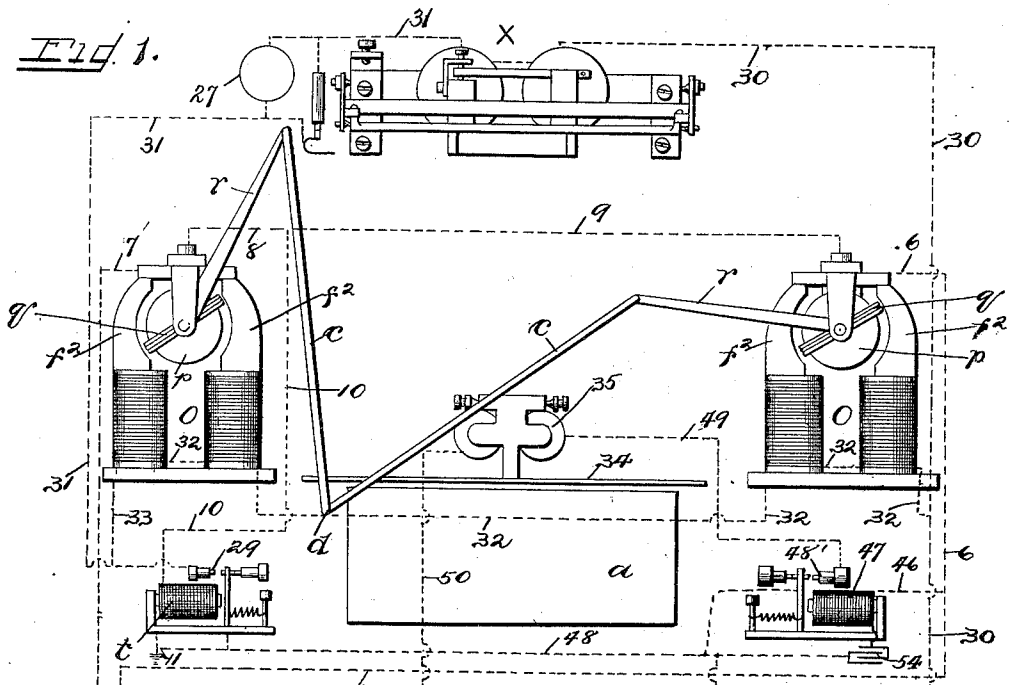
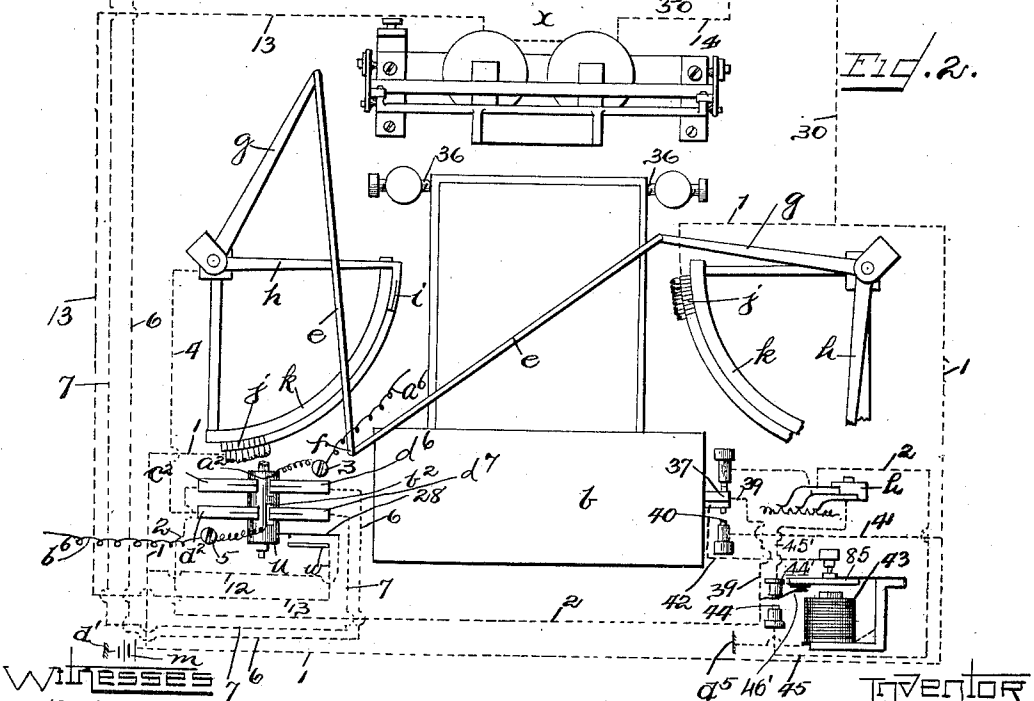


Fig. 2.



Witnesses
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(No Model.) 4 Sheets—Sheet 2.

Fig. 3.

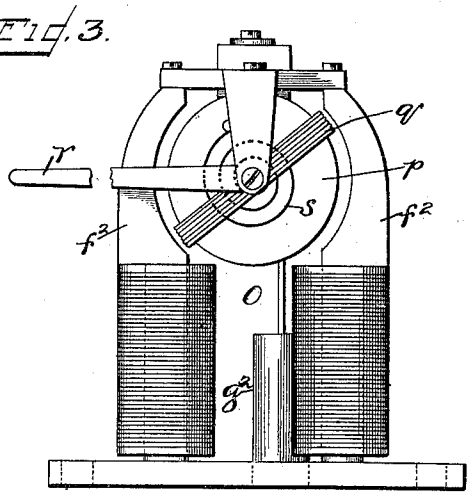


Fig. 4.

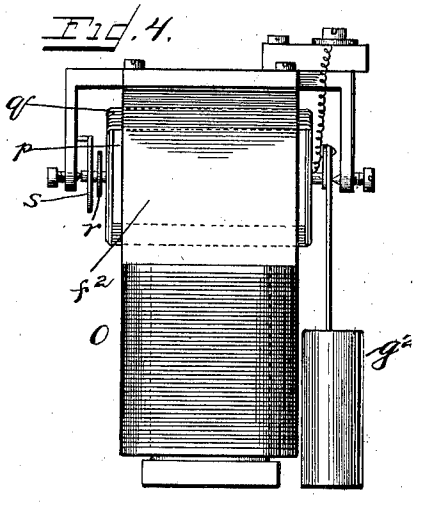


Fig. 5.

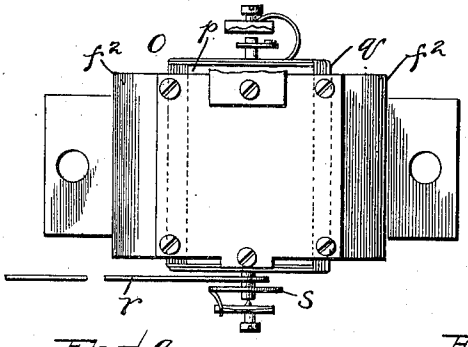


Fig. 6.

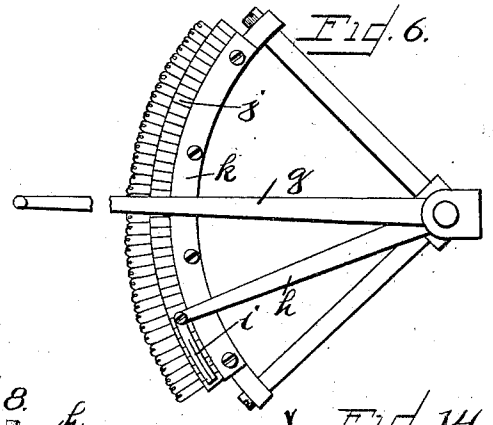


Fig. 9.

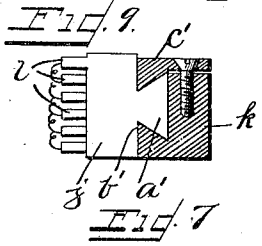


Fig. 8.

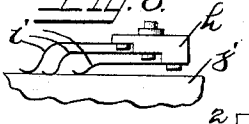


Fig. 14.

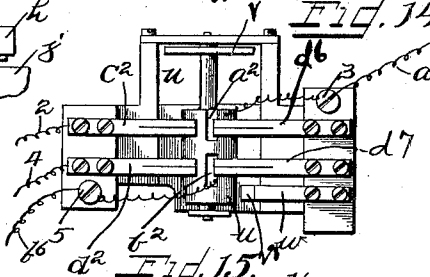


Fig. 7.

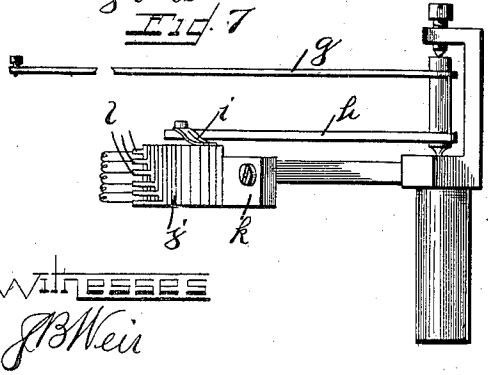
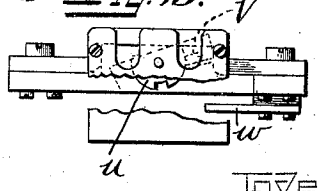


Fig. 15.



Witnesses

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(No Model.) 4 Sheets—Sheet 3.

Fig. 10.

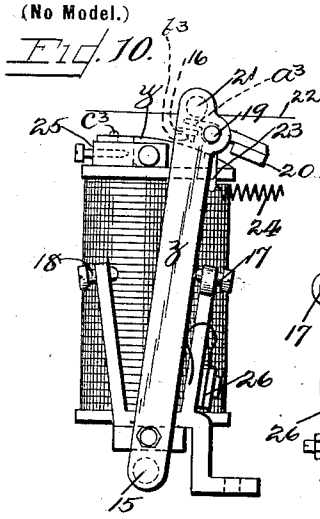


Fig. 11.

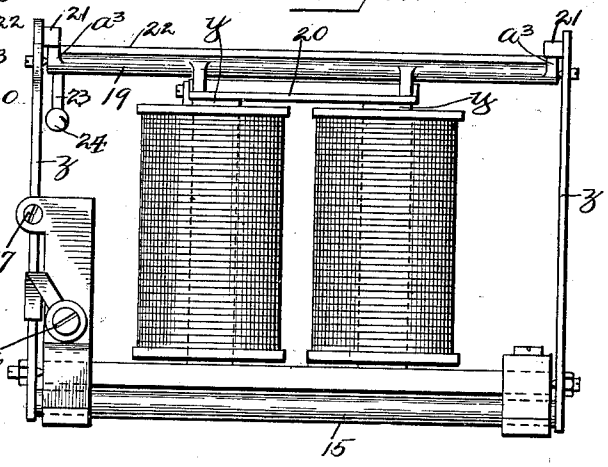


Fig. 17.

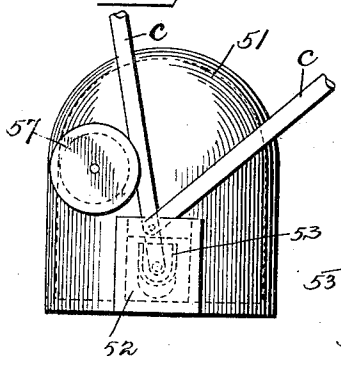


Fig. 18.

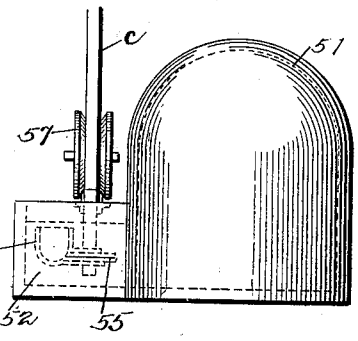


Fig. 19.

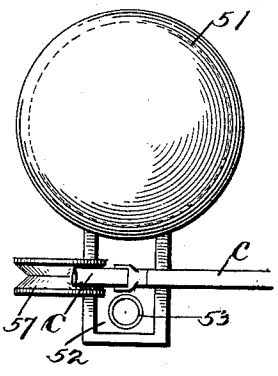


Fig. 12.

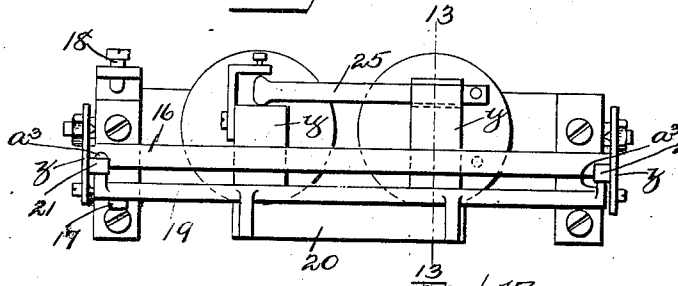


Fig. 16.

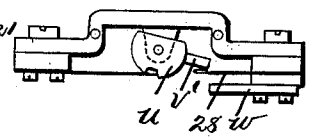
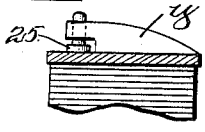


Fig. 13.



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(No Model.) 4 Sheets—Sheet 4

Fig. 20.

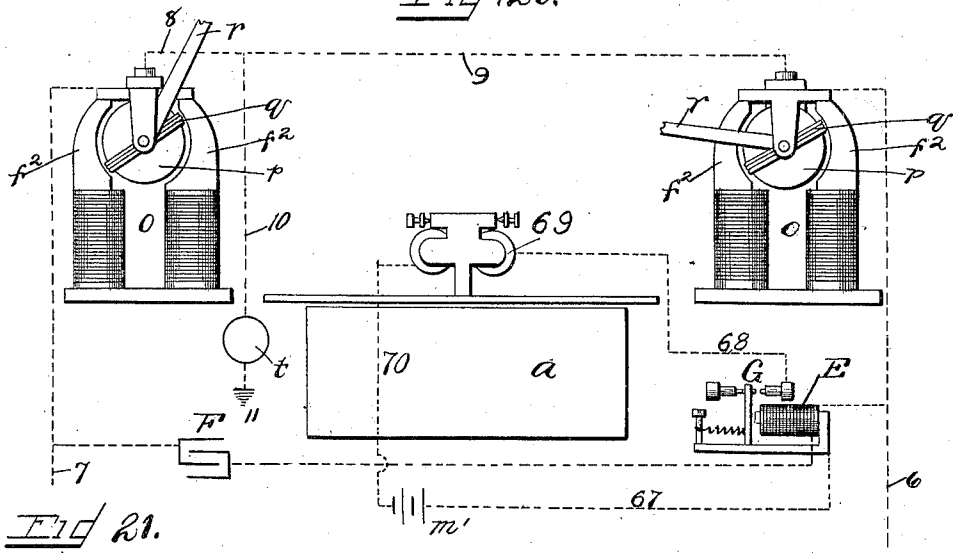


Fig. 21.

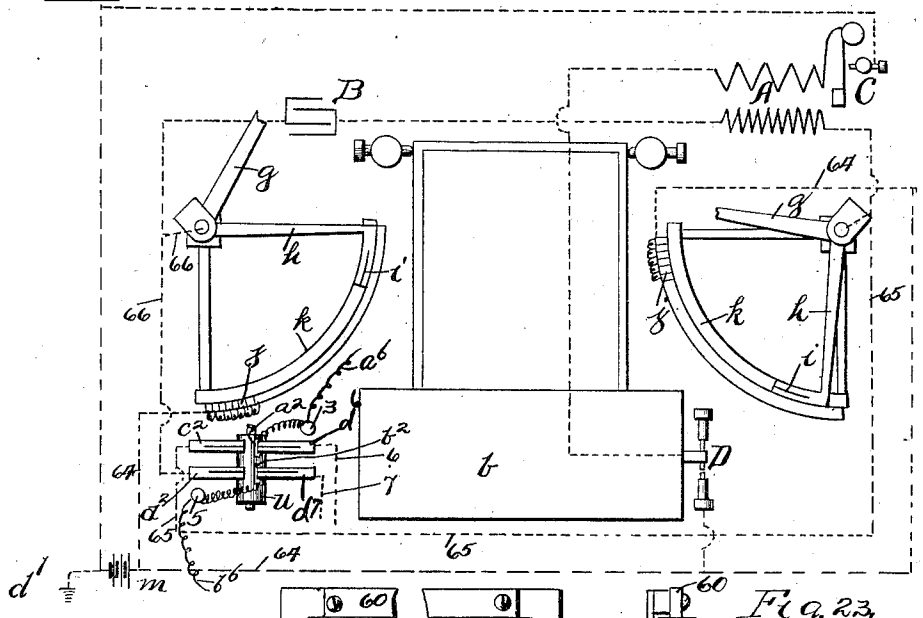


Fig. 22.

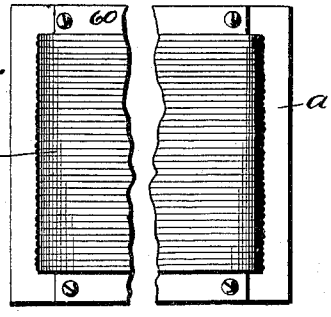
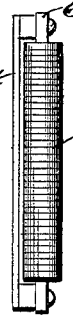


Fig. 23.



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UNITED STATES PATENT OFFICE.

FOSTER RITCHIE, OF LONDON, ENGLAND.

TELAUTOGRAPHIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 656,828, dated August 28, 1900.

Application filed January 29, 1900. Serial No. 3,066. (No model.)

To all whom it may concern:

Be it known that I, FOSTER RITCHIE, a citizen of the United States, residing at London, England, have invented a new and useful Telautographic Apparatus, of which the following is a specification.

This invention relates to telautographs.

One object of the invention is to simplify and improve the construction and operation of telautographic apparatus and to render the same more prompt and efficient.

Other objects of the invention will appear more fully hereinafter.

The invention consists substantially in the construction, combination, location, and arrangement, all as will be more fully hereinafter set forth, as shown in the accompanying drawings, and finally pointed out in the appended claims.

Referring to the accompanying drawings, and to the various views and reference-signs appearing thereon, Figure 1 is a view in elevation of a receiving instrument of a telautographic apparatus. Fig. 2 is a view in plan of the sending or transmitting instrument. Fig. 3 is a view in front elevation of that part of the apparatus which operates one of the receiving-arms. Fig. 4 is a view in side elevation of the same. Fig. 5 is a view in top plan of the same. Fig. 6 is a view in plan of one of the sending-arms, showing the rheostat over which operates the brush carried thereby. Fig. 7 is an end elevation of the same. Fig. 8 is a broken detail view of a triple-brush arrangement carried by the sending-arms. Fig. 9 is a view in transverse section through the rheostat. Fig. 10 is a side view of a form of apparatus for shifting the record sheet or paper at the receiving-station. Fig. 11 is a view in plan of the same. Fig. 12 is a front view of the same. Fig. 13 is a broken detail view in cross-section on the line 13 13, Fig. 12. Fig. 14 is a view in front elevation of the main or controlling switch. Fig. 15 is a view in top plan of the same, a part broken out. Fig. 16 is a view similar to Fig. 15 in bottom plan, showing the contact in position for sending a message. Fig. 17 is a front view of the receiving-pen, showing means for supplying ink thereto. Fig. 18 is a side view of the same. Fig. 19 is a plan view of the same. Fig. 20 is a diagrammatic elevation of a modified form of construction and arrangement of the receiving part of the apparatus embodying the principles of my invention. Fig. 21 is a similar view in plan of the transmitting or sending part of the apparatus embodying features embraced within the scope of my invention. Fig. 22 is a side view, and Fig. 23 is an end view, of a modified arrangement of receiver-pen rest or support.

The same part is designated by the same reference-sign wherever it occurs throughout the several views.

In the construction and operation of a telautographic apparatus wherein writings or drawings made at a sending or transmitting station are reproduced electrically at a distant or receiving station it is the common practice to employ a transmitting or sending pen or tracer with which the writing or drawing to be transmitted is written or drawn, such pen or tracer being carried in the joint of two jointed rods or arms, such rods or arms diverging and being connected to suitable operating-levers, and the receiving pen or tracer at the distant station being suitably supported and connected to similarly-arranged rods and levers. By means of electrical currents transmitted over line-wires connecting the transmitting instrument at one station and the receiving instrument at the other station, and which currents are controlled and regulated by the movements of the arms or levers to which the transmitting or sending pen rods are connected, the receiving-pen is caused to duplicate in extent and direction the movements of the sending or transmitting pen, thus reproducing at the receiving-station the writings or drawings made by the sending-pen. Many different arrangements and constructions have been devised and proposed for securing the coincident or synchronous movements of the transmitting and receiving pens. One way which has been proposed embodies the idea of varying the strength of the transmitting-current, as by causing a sending-arm or a brush connected therewith to travel or move over a series of contacts through which a greater or less resistance may be introduced into the circuits connecting the transmitting and distant receiving instrument, such varia-

tions in the current strength being thus dependent upon the extent and direction of movement of the transmitting-arm and effecting the movements of the receiving-pen corresponding in extent and direction to those of the transmitting-pen. The present invention relates to telautographic apparatus operating on this principle; and it consists in a simple and effective construction and arrangement whereby the desired results are secured, and which will now be described more in detail.

Referring to Figs. 1 and 2 of the drawings, illustrating, respectively, a receiving and a transmitting instrument, it is to be understood that both these instruments are employed at each station, and for the sake of explanation and description of the electrical connections of the apparatus these somewhat diagrammatic views represent the transmitting instrument at one station and the receiving instrument at the distant station. Said Figs. 1 and 2 are designed chiefly to show the electrical connections of the apparatus at two stations.

Reference-sign *a* designates the platen of the receiving instrument, and *b* the platen of the transmitting instrument. Over these platens the paper upon which the message or drawing is received or that on which the message or drawing is initially inscribed is fed, such feed being a step-by-step feed, each step of feed of the paper over either platen advancing the paper a distance sufficient to receive a line or sentence written or inscribed on the paper at the sending-station and received and reproduced at the distant receiving-station. The paper-feed mechanism for effecting this step-by-step feed and the controlling and actuating mechanism therefor will be more particularly described hereinafter.

Fig. 1 is described as being a view in elevation of the receiving instrument, and Fig. 2 as a plan of the sending instrument. This is the relative arrangement of these two instruments at each station, and from this it is to be understood that the receiving part of the apparatus is arranged in right-angular relation to the sending part, and in practice as the sending-platen is arranged most conveniently for the duties required of it in a horizontal position the receiving-platen will stand in a substantially-vertical plane. By reason of this relative arrangement the receiving-pen is relieved of any gravity-pressure upon the record or receiving sheet of paper—that is, the pressure of said receiving-pen upon the paper due to gravity is as slight as possible.

Reference-sign *d* designates the receiving-pen, said pen being carried at the joint of the angularly-arranged rods *c c*, which rods are respectively connected pivotally with levers *r r*, presently to be more fully described, the arrangement being such that said pen *d* operates against or over the vertical surface of the platen *a* to reproduce the transmitted message or drawing upon the sheet of paper carried by said platen.

Reference-sign *f* designates the sending pen or tracer, said pen or tracer being carried at the joint of the angularly-arranged rods *e e*, each rod *e e* being pivotally connected to one arm of a lever *g*, the arrangement being such that the pen or tracer *f* will rest upon or operate over the horizontal surface of the platen *b*.

The desired variation in current strength, through which is secured the synchronous action of the receiving-pen rods with respect to the movements of the sending-pen rods, may be effected by causing the movement of the sending-pen rods to vary the resistance in the circuit. This result may be obtained by arranging brushes to move coincidently with the sending-pen rods over rheostats, by which resistances may be introduced in or cut out of the line-circuits. A convenient, simple, and efficient construction is shown, wherein a series of thin metal contact-plates *j* are mounted side by side, but insulated from each other, in a frame *k* of non-conducting material, and connected to move with the pen-rods are brushes arranged to travel over these metallic plates *j*. A convenient arrangement is shown wherein the brush *i* is connected to move with an arm or lever *h*, which forms a part of or moves with lever *g*. Each of the plates *j* is provided with a projection 1 to which is attached one end of a wire of high resistance, the other end of each wire being connected to the corresponding projection of the next adjacent plate *j*. Preferably the projections 1 of the plates *j* are arranged stepwise—that is, in staggered relation—as clearly shown, thus affording convenience in attaching the wires. A convenient arrangement for mounting the plates *j* upon the frame *k* is shown, (see Fig. 9,) wherein each plate is provided with a dovetail end *a'*, arranged to fit in a corresponding seat formed by a lip *b'* of frame *k*, and a removable plate *c'*, adapted to be bolted or otherwise secured thereto, thus facilitating the assembling of these parts and efficiently holding the same in assembled relation. One end of each rheostat is connected by wire 1 to one pole or terminal of a battery *m*, the other pole or terminal of such battery being connected to earth, as indicated at *d'*. The brush carried by one of the arms *h*—say that on the right-hand side of the transmitting instrument, as viewed in Fig. 1—is, for a purpose presently to be more fully explained, triple—that is, it consists of three contact-springs, insulated from one another, bearing respectively on separate plates of the rheostat at short distances apart. When the sending-tracer is marking on the paper which rests on platen *b*, the two extreme contact-springs of the triple brush are alternately connected, as will be more fully described hereinafter, and as indicated diagrammatically in Fig. 2, through wire 2 to the main controlling-switch

u, and thence to a binding-post 3, which is connected through a line-wire a^6 to a corresponding binding-post of the apparatus at the distant station. The arm h on the left-hand side of the apparatus, as shown in Fig. 1, is connected through wire 4 and switch u to a binding-post 5, which is connected through a line-wire b^6 to a corresponding binding-post of the apparatus at the distant station.

Since the construction and arrangement of the apparatus are the same at each station, suppose, for convenience of description, we now consider the illustration of Figs. 1 and 2 to be the construction at the distant station. The line-circuits are therefore completed from the binding-posts 3 and 5 through contact-plates a^2 b^2, the contact-fingers d^6 d^7, bearing thereon, and wires 6 and 7, respectively, to the apparatus indicated generally by reference-sign o o, which actuates the levers r r, which levers are pivotally connected to and operate the receiving-pen rods or arms c c. The construction of these mechanisms is shown more fully in Figs. 3, 4, and 5, and each comprises a magnet which may be either a permanent magnet or, and preferably, an electromagnet, the coils of which may be excited from the local battery. This magnet is provided with two polar extensions f^2, between which is mounted a stationary iron core p. A coil q is arranged to freely oscillate between the polar extensions f^2 and the core p. The lever r, which carries and is pivotally connected to rod c, is connected to oscillate with coil q. The coil q, and with it the lever or arm r, is yieldingly held in one limit of its oscillation by a spring s or otherwise suitably mounted. The currents arriving over line-wires 6 and 7 after passing through the coils q traverse-wires 8 and 9 and wire 10 to a relay t and pass thence to earth at 11. Thus it will be seen that the extent of oscillation of coils q, and hence also of arms or levers r, is dependent upon the strength of current traversing such coils and that the strength of such currents is controlled at the sending-station by the movements of the sending-pen arms which control the movement of the brushes i over the rheostats. Therefore the movements of the rods e of the sending-pen are correspondingly reproduced and duplicated in the rods c, which carry the receiving-pen. If desired, the oscillating movements of the coils q may be regulated and made smooth and even in any suitable manner, as by means of dash-pots, (indicated at g^2, Fig. 4.)

The construction and arrangement of the main or controlling switch (indicated generally by reference-sign u) are shown more in detail in Figs. 14, 15, and 16 and comprise a pivoted piece of non-conducting material, on which are mounted two metal plates, (shown at a^2 b^2, Fig. 14,) and which, through any suitable flexible connection, are in electrical communication respectively with the binding-posts 3 and 5, as clearly shown. The piece u is provided with arms v, projecting from opposite sides thereof, and also with a projection v'. When one of the arms v is pressed down by the tracer f to the position shown in Fig. 16, contact is established between the plates a^2 and b^2 and a pair of springs c^2 d^2, to which respectively the wires 2 and 4 are connected, thereby completing the circuit of these wires to the binding-posts 3 and 5, respectively, and thence to the line-wires, thus placing the apparatus in condition for sending or transmitting a message or design to be traced by the pen or tracer f. When the piece u is further oscillated in the same direction, the contacts between plates a^2 b^2 and springs c^2 d^2 are broken; but another contact is established between spring 28 and a stop w by the projection v' engaging said spring and depressing the same into contact with said stop w, thereby completing a circuit from the battery m through wire 12, spring 28, stop w, wire 13, the local paper-shifting mechanism, (indicated generally by reference-sign x, Fig. 2,) thence through wires 14 and 48 to ground at 11. Under the conditions of circuit connections above described the contacts which control the wires 2 and 4 are broken, and hence no current is traversing the line-wires a^6 b^6, and consequently the relay t at the distant station, which is included in the main-line circuits, is inert, and, as will presently be more fully explained, the paper-shifting apparatus (indicated generally at x, Fig. 1) for shifting the receiving-paper at the distant station will be operated.

A form of construction and arrangement for shifting the paper and which is admirably adapted for use for the purposes for which it is intended is shown more in detail in Figs. 10, 11, 12, and 13 and comprises electromagnets having curved pole-pieces y y, to one of which is pivoted an armature-lever 25, which extends under part of the other pole-piece. On opposite sides of the electromagnets and at the ends of the base thereof are pivoted the arms z z, these arms being connected together at their lower ends by means of an arm or bar 15 and at their upper ends by a bar 16, the whole forming a frame adapted to oscillate between stops 17 and 18, which, if desired, may be adjustable. In the arms z are pivotally mounted the ends of a rocking spindle 19, carrying an armature 20. At each end of spindle 19 is provided an arm or projection a^3, arranged to extend under a stud 21, projecting from the arm z, and the sheet of paper (indicated at 22) is arranged with its edges adapted to be engaged between the studs 21 and the arms a^3. The spindle is normally held in position for the edges of the paper to be released from the gripping action of arms a^3 on lugs or projections 21. This may be effected in any suitable or convenient manner, as by means of a spring 24, suitably connected at one end to a convenient part of the frame of the apparatus and at the other end to an arm 23, connected to said spindle.

A contact 26 may serve as a convenient means of connecting this apparatus or the coils of the electromagnet thereof up into working circuit. The operation of this part of the apparatus is as follows: When the electromagnet is energized—that is, when the circuit of the coils thereof is closed—the armature 20 is drawn toward the pole-pieces y, thereby rocking spindle 19 against the action of spring 24 and causing the edges of the sheet of paper to be gripped between the arms a^3 and lugs or projections 21. The armature then moves along the pole-pieces, which are curved or eccentric, as shown and above stated, in order to approach nearer thereto, thereby drawing the sheet of paper onward, the edges of the paper being gripped, as above explained. This movement continues until the arm z engages the limiting-stop 18. When this point is reached, a stud (indicated in dotted lines at b^3 and projecting from bar 16) passes over and is caught by a stud c^3, (see Fig. 10,) carried by and projecting from the armature 25. As the arm z attains this position it leaves the contact 26, and when the circuit is broken at this point the current is required to pass through a resistance (indicated at 27, Fig. 1) which reduces the strength of the current to a point just sufficient to hold the arms in the position to which they have been moved. As above described, the armature 25 is pivoted to one of the pole-pieces y y and passes under a part of the other of said pieces, and being provided with a stud c^3 it will be seen that when the circuit of the magnets is closed the armature 25 is rocked or swung upon its pivot, so as to raise the stud c^3 into position to form a catch or trigger to engage behind stud b^3, carried by frame z, and to hold said frame in its advanced position against the action of its retractile 24. When the circuit of the electromagnets is entirely broken, the armature 25 falls, thereby releasing the engagement of stud b^3 with stud or trigger c^3, and the spring 24, acting upon arm 23, releases the edge of the paper and pulls or returns the arms z to their initial position ready to again grip the edges of the paper sheet to effect the next step of advancement.

The construction, arrangement, and operation above described relate to the paper-shifting mechanism of the receiving part of the apparatus. The paper-shifting mechanism of the sending part is similar, but the armature 25, contact 26, and resistance 27 are dispensed with. When the relay t of the receiver apparatus is rendered inert, as above explained, by breaking the circuit of the line-wires at the switch u of the transmitting apparatus the circuit of the electromagnet of the paper-shifting apparatus of the receiver is broken, such magnets are no longer energized, and consequently the sheet of paper is released and the armature is drawn back by the spring 24. On raising the sending tracer or pen from the arm of the piece u of the switch the spring 28 returns said piece u to the position shown in Fig. 16, in which position the wires 2 and 4 are again connected, through binding-posts 3 and 5, to the line-wires, thereby again energizing the relay t of the receiving apparatus at the distant station, causing its armature to be attracted to complete the circuit of the paper-shifting magnets through contact 29. Thus current from the battery m at the receiving-station traverses the following circuit: wire 1, wire 30, the electromagnets of the paper-shifting mechanism of the receiving part of the apparatus at the receiving-station, wire 31, contact 29, and to earth at 11. By the contact made at 29 the circuit of the coils of the electromagnets of apparatus o is completed as follows: from battery m, wire 1, wire 30, wire 32, wire 33, contact 29, and to earth at 11.

I have above described the arrangement and operation for effecting a shifting of the paper at both the transmitting and receiving instruments and the return of the switch u to position for transmitting a message. Now when the message is completed the operator causes the tracer f to press against the opposite end of arm v—that is, the end of said arm on the opposite side of the pivotal axis of piece u of the switch—thereby rocking said switch into position for contact-plates a^2 b^2 to engage fingers d^6 d^7, thereby breaking contact between said plates and fingers c^2 d^2 and placing the instrument in condition to receive a message.

The arms or rods c c of the receiving apparatus when not in action rest against a rod 34, which is attached to the armature of an electromagnet 35. A spring (not shown) serves to normally hold rod 34 in position to maintain the pen d out of contact with the record-paper of the receiving instrument. When, however, said magnet 35 is energized, the rod 34 is retracted against the action of the spring to permit the pen d to contact with the paper. The circuit of the electromagnet 35 is completed in the following manner by the pressure of the sending-tracer f on the paper which rests on platen b: The platen b is pivotally supported at one end or edge, as at 36, and is yieldingly supported at the opposite end or edge in any suitable manner (not shown) in position to complete a contact, as at 37, thereby completing the circuit of the middle or central finger of the triple brush i through wire 38, contact 37, and wires 39 and 2, to the main controlling-switch u, which is in the position shown in Fig. 16, so that currents pass through the line-wire connected to binding-post 3. These currents, however, do not result in the reproduction of the writing or drawing at the distant receiving-station, for the reason that the receiving-pen d is at this time held out of contact with the record or receiving paper. Now when the platen b is depressed by the sending-tracer f bearing thereon the contact at 37 is broken and contact is made at 40, so that current from battery m traverses wire 1, wire

41, contact 40, and wire 42 to and through a circuit-interrupter 43, which may be a vibrator of ordinary construction, and thence the current passes to earth at d^5. The blade 85 of the interrupter carries a contact-plate 46′, which when the interrupter is in operation vibrates back and forth between and makes alternate contact with the contacts 44 and 44′. Contact 44 is connected through wire 45 with one of the extreme or end members of the triple brush, and the contact 44′ is connected through wire 45′ to the other extreme or end member of said brush. The contact 46′ is connected to wire 2. In this manner fluctuating currents are sent from battery m, wire 1, the rheostat j, and one or the other extreme brushes of the triple brush, wire 45 or 45′, and contact 44 or 44′, as the case may be, to contact 46′ and thence by the wire 2 and line-wire a^6, which is connected to binding-post 3, to the distant receiving-station, entering the receiving apparatus at such station through wire 6, passing through the coils q. These fluctuating currents also pass from wire 6 through wire 46 to a relay 47, and thence through a condenser 54 and wire 48 to earth at 11. These fluctuating currents cause no sensible vibration of the arm r, but they do cause vibrations of the armature of relay 47, thereby making intermittent contacts at 48′, and thence causing intermittent currents by wire 49 through the coils of magnet 35, and thence by wires 50, 30, and 1 from battery m. The resulting energization of electromagnets 35 withdraws the support 34 of the receiving-pen and permits said pen to advance or move into contact with the surface of the record or receiving paper.

In Figs. 17, 18, and 19 are shown a construction and arrangement which are simple and efficient, but to which the invention is not limited or restricted, for supplying the receiving-pen with ink. In the construction shown reference-sign 51 designates a reservoir or chamber in the form of a fountain-glass adapted to contain the ink and communicating with an open basin 52, whereby a supply of ink is maintained in said basin at a constant level. The pen (indicated generally by reference-sign d in the various diagrammatic views) consists in the detailed construction thereof of a pipe-like bowl 53, with a stem or tube 55 of fine bore extending from the bottom thereof, the end of this tube or stem bearing against the surface of the record or receiving paper when the pen is in action. When this pen is not in action, one of its carrying-arms c is brought to the position shown in Fig. 17 to bear against a roller 57 by its following the motion of the sending-tracer f when the latter pushes down the arm of the switch u, as above explained. While in this position, the bowl 53 being in basin 52, the pen receives the ink, a small quantity of such ink flowing out of the bowl through its stem, and when the end of such stem is brought into contact with the surface of the paper the desired marking thereon is effected.

Any suitable means well known in the art may be employed for indicating the failure of the operator at a sending-station to replace the sending-tracer in position to leave the instrument in condition to receive a message from some other station. Mechanism for this purpose being already known in the art, none is shown or claimed herein.

In the foregoing description I have set forth a construction and arrangement wherein the receiving-pen rests upon and is normally held out of contact with the record-paper, supported upon the platen a by means of a rod or rest 34, which is connected to the armature of an electromagnet and which is withdrawn as a support for the receiving-pen by the energization of such magnet, thereby permitting the pen to engage the surface of the record-paper. In Figs. 22 and 23 I have shown another arrangement embraced within the spirit and scope of my invention for accomplishing the same result and which may be substituted for the construction shown in Fig. 20—that is, the coil 61 may be substituted for the magnets 69, said coils 61 being included in the circuit of battery m' in identically the same manner as magnets 69 are shown included in said circuit in Fig. 20, as will be described more fully hereinafter. In other respects the construction and arrangement would remain unaltered. This construction is designed for use in connection with a receiving-pen and its supporting arms or rods, which are made of, contain, or carry suitable magnetic material and comprises the usual platen a, of brass or other suitable material, and which has secured or attached thereto an iron or other magnetizable plate 60, which forms the core of a coil 61. This coil may be arranged in the same circuit in which the coils of magnet 35 are included in the construction shown in Fig. 1 and which circuit is controlled by relay 47. In practice and in accordance with the construction of pen-rest shown in Figs. 22 and 23 the platen a and the pen are so relatively arranged and supported that said pen normally falls away from the platen. When, however, a current is traversing the coils 61, the iron plate 60 is energized and exerts an attractive force upon the magnetic pen and pen-arms, thereby drawing such pen toward and in contact with the platen a, thus producing an exceedingly simple and efficient arrangement.

In Figs. 20 and 21 I have shown a modified arrangement which in many cases I prefer to employ. In this arrangement the means for controlling the movements of the pen and the paper-shifting mechanism may be the same as above described with reference to Figs. 1 and 2. In this modified arrangement when the main or master switch u is placed in position for sending a message and the springs or contacts c^2 d^2 are in position

to contact with the plates a^2 b^2, respectively, currents pass from battery m through wires 64, the rheostats, and wires 65 66 to the contact plates or fingers c^2 d^2, to binding-posts 3 5, and thence to the line-wires. At the receiving end of the line-wires these currents enter the apparatus at the points 3 and 5 and pass through wires 6 and 7, the pen-arm-operating mechanisms o o, and the paper-shifting relay (indicated in Fig. 20 at t) to earth at 11 in the same manner as above described. However, in the modified construction now being described the wires connected to springs or contacts c^2 d^2 are bridged by the secondary windings of an induction-coil (indicated at A) in series with a condenser B. The primary circuit of the induction-coil includes a circuit-breaker (indicated at C) and also separable contacts D, controlled by the pressure of the sending-pen on platen b. From this arrangement it will be seen that the effect of depressing the platen b is to complete the circuit of the primary of the induction-coil, thereby sending induced currents to the main lines. These induced currents at the distant receiving-station pass chiefly through the relay E and condenser F, owing to the fact that this path has less inductive resistance than the path through the pen-operating mechanisms o o, thereby causing relay E to operate, allowing sufficient current to pass from battery m' by wire 67, the vibrating lever, and contact at G of relay E, wire 68, pen-lifting magnets 69, and wire 70 back to battery m'. When the sending pen or tracer is raised from its corresponding platen b, the circuit of the primary of the induction-coil is broken, thereby throwing such coil out of action, and hence the vibrating action of relay E ceases, thereby breaking the circuit at G of the pen-lifting magnets and causing or permitting the receiving-pen to return to its normal position out of contact with the record or receiving paper. The two line-wires in this arrangement serve as the circuit for the induced currents and also at the same time as independent conductors for the currents which operate the pen-actuating mechanisms o o. The advantages of this arrangement are that the apparatus is not affected by induction nor do the line-wires cause objectionable induction in adjacent lines. Moreover, only one contact finger or spring is required for the brush i of the rheostats, thereby reducing friction and enabling the apparatus to work more easily and smoothly. In cases where the conductors or line-wires are subject to inductive influences whereby the action of the pen supporting or lifting mechanism is liable to be interfered with the modified construction and arrangement above described are preferred.

It is believed that the operation of the apparatus above described will be fully understood from the foregoing description, taken in connection with the accompanying drawings, and is as follows: When it is desired to transmit a message, the operator at the sending-station engages the tracer with one arm v of the main switch, thereby rocking the block u into the position shown in Fig. 16. This causes the contact to be effected between plates a^2 b^2 and the fingers c^2 d^2, respectively, thereby completing the line-circuits from battery m through wire 1, rheostats j, and wires 2 and 4, fingers c^2 d^2, plates a^2 b^2, binding-posts 3 5, and line-wires a^6 b^6. Currents thus transmitted through the line-wires arrive at the distant station over the line-wires, and for convenience of description we will now assume that the construction and arrangement illustrated are those of the distant receiving-station, it being understood that the construction and arrangement at the sending-station are duplicates of those at the receiving-station. The current arriving over the line-wires finds the block u in the position shown in Fig. 1, with plates a^2 b^2 contacting with fingers d^6 d^7, and hence these circuits are completed through wires 6 7, coils q of the pen-actuating mechanisms o, wires 8 9, wire 10, relay t, to earth at 11, thus placing the mechanisms o in condition for action, and since the extent of rocking movement of coils q is dependent upon the strength of currents sent to the main lines, and since the strength of these currents is varied through the rheostats by the movements of the brushes thereover, which movements are dependent upon the movements of the transmitting pen or tracer, it will be understood that the completion of the line-circuits places the apparatus in condition for the receiving-pen to duplicate synchronously the movements of the transmitting pen or tracer. The writing operation is then proceeded with; but the pressure of the transmitting pen or tracer on the platen at the sending-station causes contact to be established between contacts 37 and 40, thereupon introducing the fluctuating currents to the line-wires through the medium of interrupter 43, and hence causing the receiving-pen-lifting mechanism to be actuated to cause said pen to come in contact with its record-sheets. When a line of message has been completed, the block u of the main switch is rocked into position for spring 28 to make contact with stop w, and in this position the line-circuits are broken, but a local circuit is completed at the transmitting-station from battery m, wire 12, spring 28, stop w, wire 13, paper-shifting mechanism x, wire 14, wire 48, to earth at 11, thereby advancing the record-sheet at the transmitting-station. The breaking of the line-circuits deënergizes the magnet of relay t, and hence breaks the circuit of the paper-shifting mechanism at the receiving station, thereby causing the swinging frame of said mechanism to be withdrawn into position to get a new grip upon the edges of the record-sheet at the receiving-station, so that when the line-circuits are again completed this shifting mechanism will be actuated to advance the record-sheet. The line-circuits are again completed by removing the

transmitting-pen from arm v, thereby allowing spring 28 to return to its normal position out of contact with stop w and returning block u into position for plates $a^2 b^2$, to again contact with fingers c^2 d^2, and the writing operation proceeds. When the message is completed, the transmitting-tracer is caused to engage the arm v on the opposite side of block u and to return said block into position for the plates $a^2 b^2$ thereon to engage fingers d^6 d^7, thereby placing the apparatus in receiving position.

It is obvious that many changes and variations in the details of construction and arrangement would readily suggest themselves to persons skilled in the art and still fall within the spirit and scope of my invention. While, therefore, I have shown and described various specific constructions and arrangements as operative embodiments of the principles of my invention, I do not desire to be limited or restricted thereto; but,

Having now set forth the object and nature of my invention and forms of apparatus embodying the same and having explained its construction, function, and mode of operation, what I claim as new and useful and of my own invention, and desire to secure by Letters Patent, is—

1. In a telautographic apparatus, transmitting appliances including a tracer, receiving appliances arranged at a distant station, a line-wire connecting these appliances, a rheostat comprising resistance-coils, said coils being arranged in series in said line-circuit, an arm connected to move with said tracer and carrying a brush arranged to move over said rheostat, whereby the line-current is varied in strength, paper-shifting mechanisms at the receiving and transmitting stations, and means whereby said mechanisms are inactive during the writing operation, and means arranged at the receiving-station, and actuated by the variations in strength of the line-current for actuating the receiving appliances, as and for the purpose set forth.

2. In a telautographic apparatus, a transmitting-tracer, a receiving-pen, line-wires connecting the same, a rheostat comprising resistance-coils arranged in series in the line-circuits, brushes connected to move coincidently with the tracer over said rheostat, whereby the strength of the line-currents is varied when said tracer is moved, an electrical apparatus arranged to actuate the receiving-pen, said electrical apparatus arranged in the line-circuit and affected by the variations in current strength, paper-shifting mechanisms at the receiving and transmitting stations, and means whereby said mechanisms are inactive during the writing operation, as and for the purpose set forth.

3. In a telautographic apparatus, a transmitting-tracer, a receiving-pen, line-wires connecting the same, jointed rods to which said tracer is connected, arms connected to said rods and carrying brushes, resistances arranged in series in the line-circuits, and over which said brushes operate, in combination with means operated by the variations in current strength thus sent to line for duplicating in the receiving-pen the movements of said tracer, paper-shifting mechanisms at the receiving and transmitting stations, and means whereby said mechanisms are inactive during the writing operation, as and for the purpose set forth.

4. In a telautographic apparatus, a transmitting-tracer and a receiving-pen, line-wires connecting the same, means actuated by the movements of said tracer for varying the strength of the current sent to the line, rocking coils connected to said receiving-pen for actuating the same, magnetic fields in which said coils operate, said coils being included in the line-circuits, paper-shifting mechanisms at the receiving and transmitting stations, and means whereby said mechanisms are inactive during the writing operation, as and for the purpose set forth.

5. In a telautographic apparatus, a sending-tracer, a receiving-pen, line-wires connecting the same, jointed rods connected to said pen, pivotally-mounted coils having arms respectively connected to said rods, said coils being respectively arranged in the line-circuits, fields for each of said coils, and means actuated by the movements of said tracer for varying the strength of the line-currents, as and for the purpose set forth.

6. In a telautographic apparatus, a sending-tracer, a receiving-pen, line-wires connecting the same, pivotally-mounted coils respectively arranged in the line-circuits and respectively connected to the receiving-pen, and coöperating to effect the movements of said pen, means for yieldingly maintaining said coils in one limit of their rocking movements, magnetic fields for said coils, and means actuated by the movements of said sending-tracer for varying the strength of the currents sent to the line-wires, as and for the purpose set forth.

7. In a telautographic apparatus, a sending-tracer, a receiving-pen, line-wires connecting the same, pivotally-mounted coils respectively arranged in the line-circuits and respectively connected to the receiving-pen, and coöperating to effect the movements of the pen, springs arranged to normally hold said coils in one limit of their movement, magnetic fields for said coils, and means actuated by the movements of said sending-tracer for varying the strength of the currents sent to the line-wires, as and for the purpose set forth.

8. In a telautographic apparatus, a sending-tracer, a receiving-pen, line-wires connecting the same, pivotally-mounted coils respectively arranged in the line-circuits and respectively connected to the receiving-pen, and coöperating to effect the movement of

said pen, magnetic fields for said coils, means actuated by the movements of said tracer for varying the strength of currents sent to the line-wires, and means for retarding the rocking movements of said coils, as and for the purpose set forth.

9. In a telautographic apparatus, a sending-tracer, a receiving-pen, line-wires connecting the same, pivotally-mounted coils arranged in the line-circuits and connected to the receiving-pen, magnetic fields for said coils, means actuated by the movements of said tracer for varying the strength of currents sent to the line-wires, and a dash-pot arranged to retard the rocking movement of said coils, as and for the purpose set forth.

10. In a telautographic apparatus, a sending-tracer, a receiving-pen, line-wires connecting the same, stationarily-mounted iron cores, magnets having pole-pieces surrounding said cores, coils pivotally mounted and interposed between said cores and pole-pieces, said coils being arranged in the line-circuits and connected to the receiving-pen, and means actuated by the movements of the sending-tracer for varying the strength of currents sent to the line-wires, as and for the purpose set forth.

11. In a telautographic apparatus, a sending-tracer, a receiving-pen, line-wires connecting the same, rheostats comprising insulated plates connected up in series and arranged in the line-circuits, brushes connected to move with said tracer and operating over said plates, to complete circuit therethrough, whereby the line-current is varied, paper-shifting mechanisms at the receiving and transmitting stations, means whereby said mechanisms are inoperative during the writing operation, and means actuated by such variations in the line-current for actuating said receiving-pen in synchronism with the movements of the tracer, as and for the purpose set forth.

12. In a telautographic apparatus, a sending-tracer, a receiving-pen, a line-wire connecting the same, a rheostat arranged in the line-circuit, and comprising a support, a series of insulated plates connected in series by high resistances, said plates having projections arranged to be received in seats in said support, and a bar for clamping said projections in said seat, in combination with a brush connected to move with said tracer and operating over said plates, and means arranged in the line-circuit and actuated by the variations in line-current for operating the receiving-pen in synchronism with the movements of the tracer, as and for the purpose set forth.

13. In a telautographic apparatus, a tracer, a receiving-pen, a line-wire connecting the same, a rheostat arranged in the line-circuit, and comprising a support having a dovetailed seat, insulated plates having dovetailed projections adapted to be received in said seats, said plates being connected in series by high resistances, in combination with a brush connected to move with said tracer and operating over said plates, and means arranged in the line-circuit and actuated by the variations in line-current for operating the receiving-pen in synchronism with the movements of the tracer, as and for the purpose set forth.

14. In a telautographic apparatus, a tracer, a receiving-pen, a line-wire connecting the same, a rheostat comprising insulated plates, each having a projection, said projections arranged in staggered relation with respect to each other, the projections of adjacent plates being connected in series by a high resistance, in combination with a brush connected to move with said tracer, and means arranged in the line-circuit and actuated by variations in the line-current for operating the receiving-pen in synchronism with the tracer, as and for the purpose set forth.

15. In a telautographic apparatus, a paper-shifting mechanism, including a swinging frame, clamping-jaws carried thereby and arranged to grasp the edges of the paper, and electromagnetic means for swinging said frame and opening and closing said jaws, as and for the purpose set forth.

16. In a telautographic apparatus, a paper-shifting mechanism including a swinging frame having lugs, clamp-arms coöperating with said lugs to grasp the edges of the paper therebetween, and electromagnetic means for swinging said frame and rocking said arms, as and for the purpose set forth.

17. In a telautographic apparatus, a paper-shifting mechanism comprising an electromagnet, a swinging frame carrying the armature of said magnet, said armature being pivotally mounted in said frame and carrying clamp-arms for engaging and gripping the edges of the paper, and means for energizing said magnet, whereby said armature is rocked to clamp the edges of the paper, and said frame is swung to advance the paper, as and for the purpose set forth.

18. In a telautographic apparatus, a paper-shifting mechanism comprising an electromagnet, a pivotally-mounted armature for said magnet, a swinging support in which said armature is pivotally mounted, clamp-arms carried by said armature and arranged to engage and release the edges of the paper, means for normally holding said clamp-arms released and said support retracted, and means for energizing said magnet, as and for the purpose set forth.

19. In a telautographic apparatus, a paper-shifting mechanism comprising an electromagnet, a swinging frame, an armature for said magnet, pivotally mounted in said frame, stops between which said frame swings, means for normally maintaining said frame in one limit of its movement, clamping-jaws actuated by the rocking movement of said armature, and means for energizing said magnet, as and for the purpose set forth.

20. In a telautographic apparatus, a paper-shifting mechanism comprising an electro-

magnet, a swinging frame, an armature for said magnet, pivotally mounted in said frame, said armature having clamping-arms arranged to clamp the edges of the paper, a spring connected to said armature to hold the same in position to release the paper and said frame in retracted position, and means for energizing said magnet, as and for the purpose set forth.

21. In a telautographic apparatus, a paper-shifting mechanism comprising an electromagnet, a curved pole-piece therefor, a movable armature arranged to be attracted toward and to move over said pole-piece, clamping devices actuated by said armature and adapted to engage the paper to be shifted, and means for energizing the electromagnet, as and for the purpose set forth.

22. In a telautographic apparatus, a paper-shifting mechanism comprising an electromagnet having a curved pole-piece, a swinging frame, an armature pivotally mounted in said frame and having clamping-jaws arranged to engage and grip the edges of the paper, means for normally holding said frame retracted with said armature over the smaller part of said pole-piece, whereby said clamping-jaws are released, and means for energizing said magnet, as and for the purpose set forth.

23. In a telautographic apparatus, a sending-tracer, a receiving-pen, and a line-circuit connecting the same, in combination with a main switch for controlling said circuit, comprising a rocking piece having insulated metal plates connected to the line-wires, contact springs or fingers arranged to engage said plates, and means actuated by the tracer for controlling the movements of said rocking piece, as and for the purpose set forth.

24. In a telautographic apparatus, a sending-tracer, a receiving-pen, and a line-circuit connecting the same, in combination with a main switch comprising a movable piece having contact-plates, fixed fingers or springs, into engagement with which said contact-plates may be moved, a projection carried by said movable piece, an auxiliary contact arranged to be engaged thereby, a paper-shifting mechanism, a circuit therefor, said circuit arranged to be controlled by said projection and auxiliary contact, and means actuated by the tracer for operating said switch, as and for the purpose set forth.

25. In a telautographic apparatus, a movable receiving-pen, in combination with an independent inking device therefor, comprising a reservoir, a basin communicating therewith, whereby the ink is maintained at a uniform level therein, said pen arranged to be moved into and out of said basin, as and for the purpose set forth.

26. In a telautographic apparatus, a receiving-pen comprising a bowl and a stem having a fine orifice communicating therewith, and means for movably supporting said pen, in combination with an ink-reservoir, a basin communicating therewith, said pen arranged to be moved into and out of said basin, as and for the purpose set forth.

27. In a telautographic apparatus, a receiving-pen, a platen upon which said pen operates, electromagnetic means whereby said pen may be brought into contact with the surface of the paper resting on said platen or raised therefrom, a circuit for said means, a relay for controlling the circuit of said means, and a condenser arranged in the circuit of said relay, as and for the purpose set forth.

28. In a telautographic apparatus, a receiving-pen, a platen therefor, a sending-pen and a platen therefor, electrical devices for controlling movements of said receiving-pen toward its platen, a relay for controlling the circuit of said electrical devices, a condenser arranged in the circuit of said relay, and means actuated by the pressure of the sending-pen on its platen for controlling the circuit of said relay, as and for the purpose set forth.

29. In a telautographic apparatus, a receiving-pen or pen-arms, containing or carrying magnetic material, normally out of contact with its record-paper, a magnet arranged adjacent to the record-paper, and a circuit therefor, whereby when said magnet is energized said pen is attracted to contact with its record-sheet, as and for the purpose set forth.

30. In a telautographic apparatus, a transmitting-pen, a receiving-pen, line-wires connecting the same, platens upon which said pens operate, said receiving-pen containing or carrying magnetic material and normally out of contact with its platen, an iron core arranged behind said platen, a coil therefor, a circuit for said coil, and means actuated by the pressure of the transmitting-pen on its platen for completing the circuit of said coil, as and for the purpose set forth.

31. In a telautographic apparatus, a transmitting-pen, a receiving-pen, and line-wires connecting the same, electrical devices for causing said receiving-pen to contact with its record-paper, a relay controlling the circuit of said electrical devices, an induction-coil having its secondary winding arranged to bridge said line-circuit, and means actuated by the pressure of the transmitting-pen on its record-paper for completing the circuit of the primary of said induction-coil, as and for the purpose set forth.

32. In a telautographic apparatus, a transmitting-pen, a receiving-pen, line-wires connecting the same, electrical devices for controlling the approach of the receiving-pen to its record-paper, a relay arranged to control the circuit of said electrical devices, an induction-coil having its secondary winding arranged to bridge said line-circuit, a condenser arranged in said secondary circuit, and means actuated by the pressure of the transmitting-pen on its record-paper for completing the circuit of the primary of said induction-coil, as and for the purpose set forth.

33. In a telautographic apparatus, a paper-shifting mechanism at the sending-station and a paper-shifting mechanism at the receiving-station, a line-circuit connecting the stations, a local circuit for each paper-shifting mechanism, a relay arranged in the line-circuit for controlling the circuit of the paper-shifting mechanism at the receiving-station, and a switch arranged at the sending-station for simultaneously breaking the line-circuit and making the local circuit of the paper-shifting mechanism at the sending-station, as and for the purpose set forth.

In witness whereof I have hereunto set my hand, this 12th day of January, 1900, in the presence of the subscribing witnesses.

FOSTER RITCHIE.

Witnesses:
T. J. OSMAN,
W. J. NORWOOD.