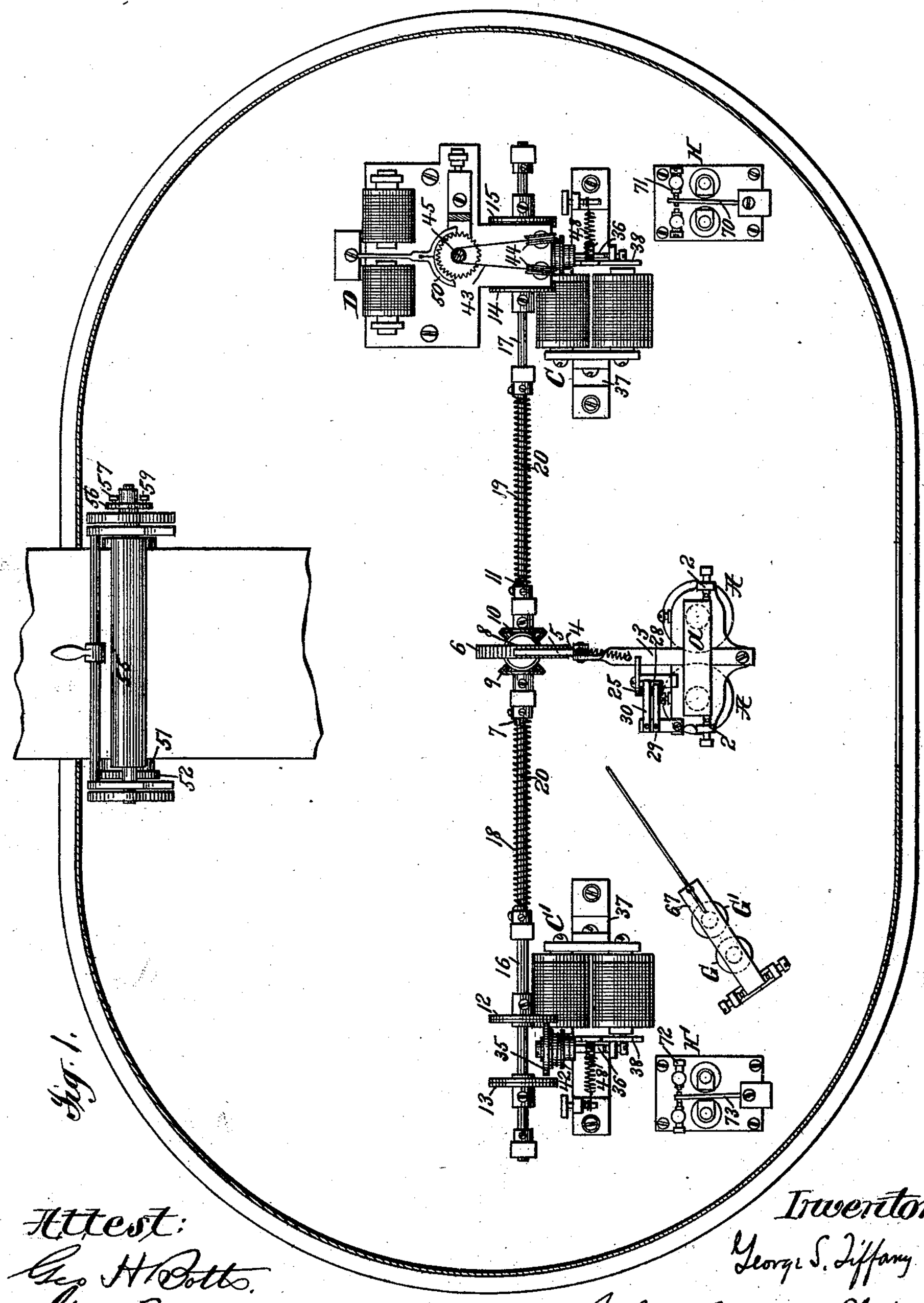
(No Model.) 4 Sheets—Sheet 1.

G. S. TIFFANY.

TELAUTOGRAPH.

No. 548,729. Patented Oct. 29, 1895.



Attest:
Geo. H. Bolte.
J. M. Borst

Inventor
George S. Tiffany
By Philipp Munson & Phelps
Attys

ANDREW B. GRAHAM, PHOTO-LITHO. WASHINGTON, D.C.

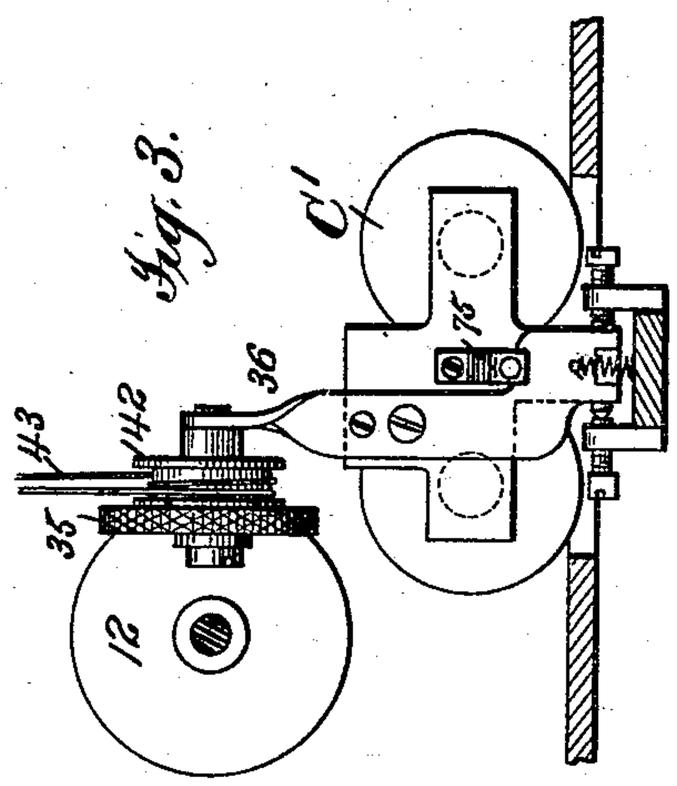
(No Model.)

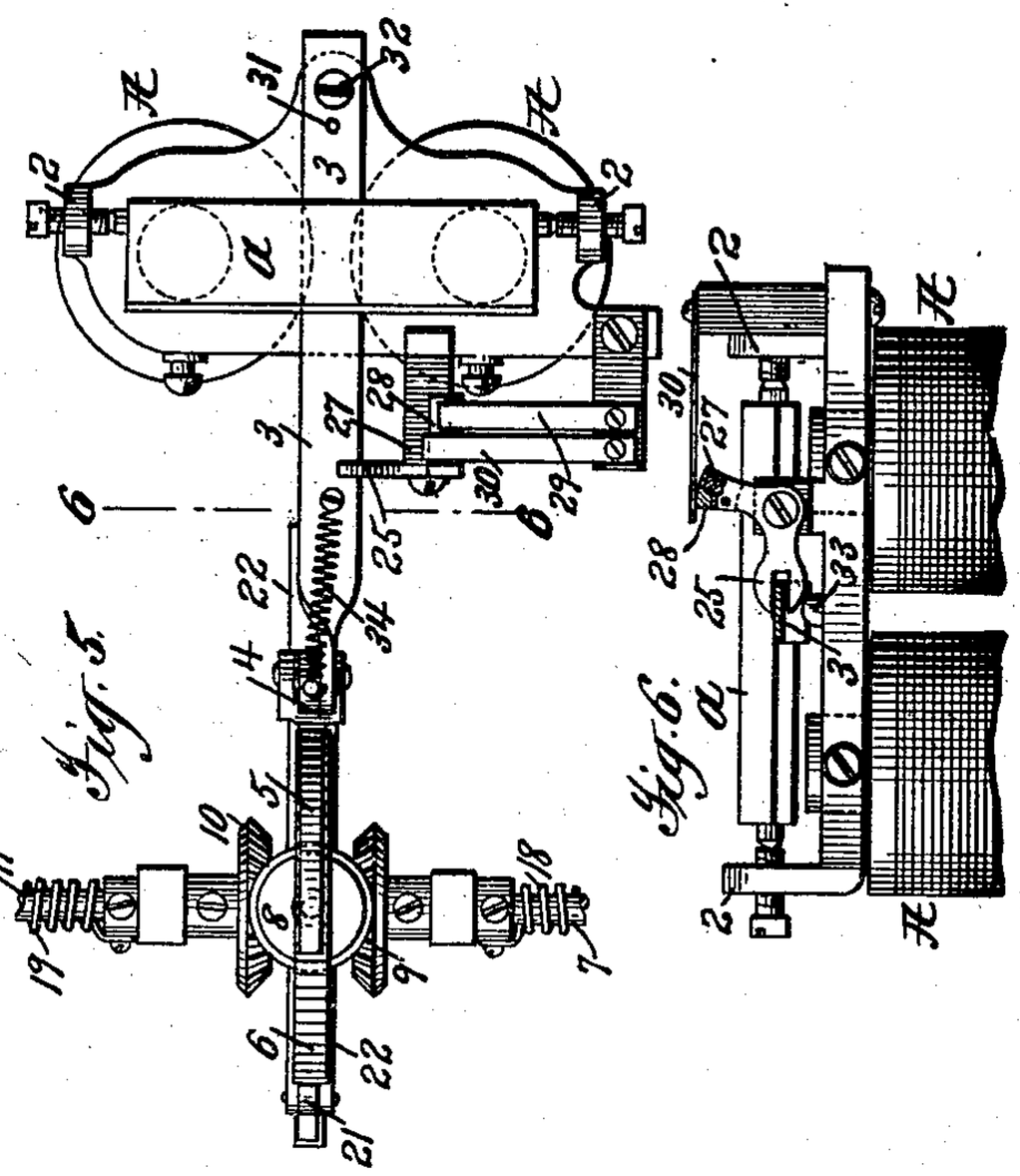
4 Sheets—Sheet 2.

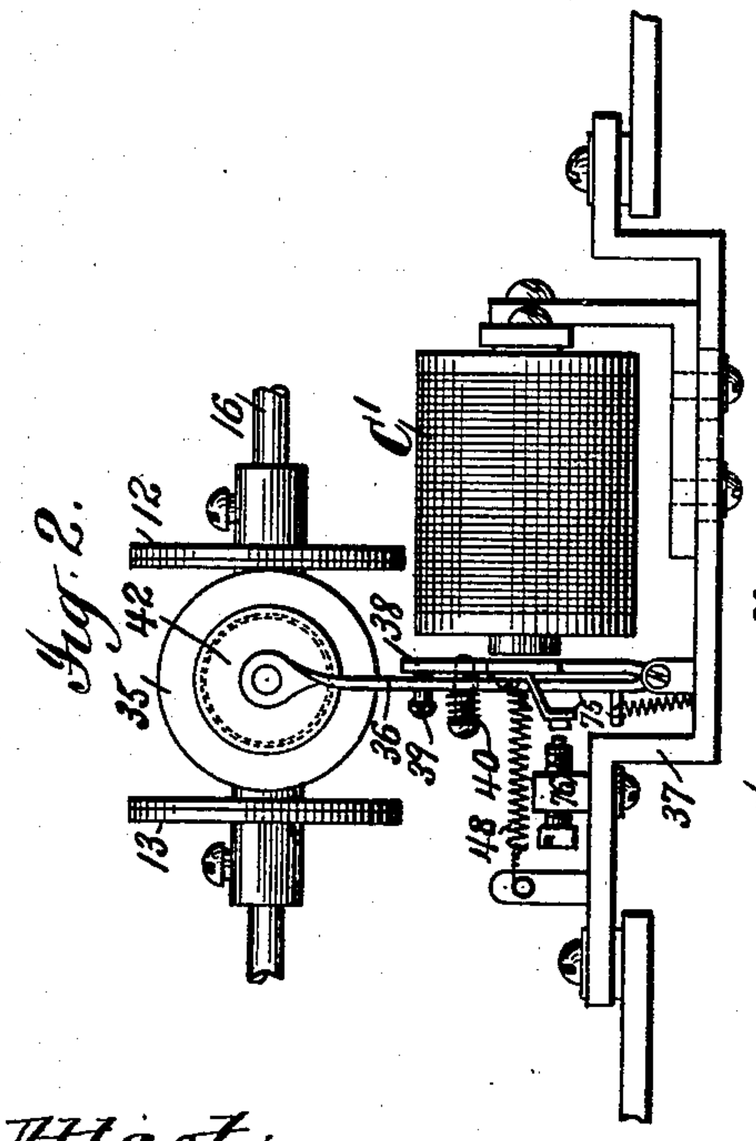
G. S. TIFFANY.

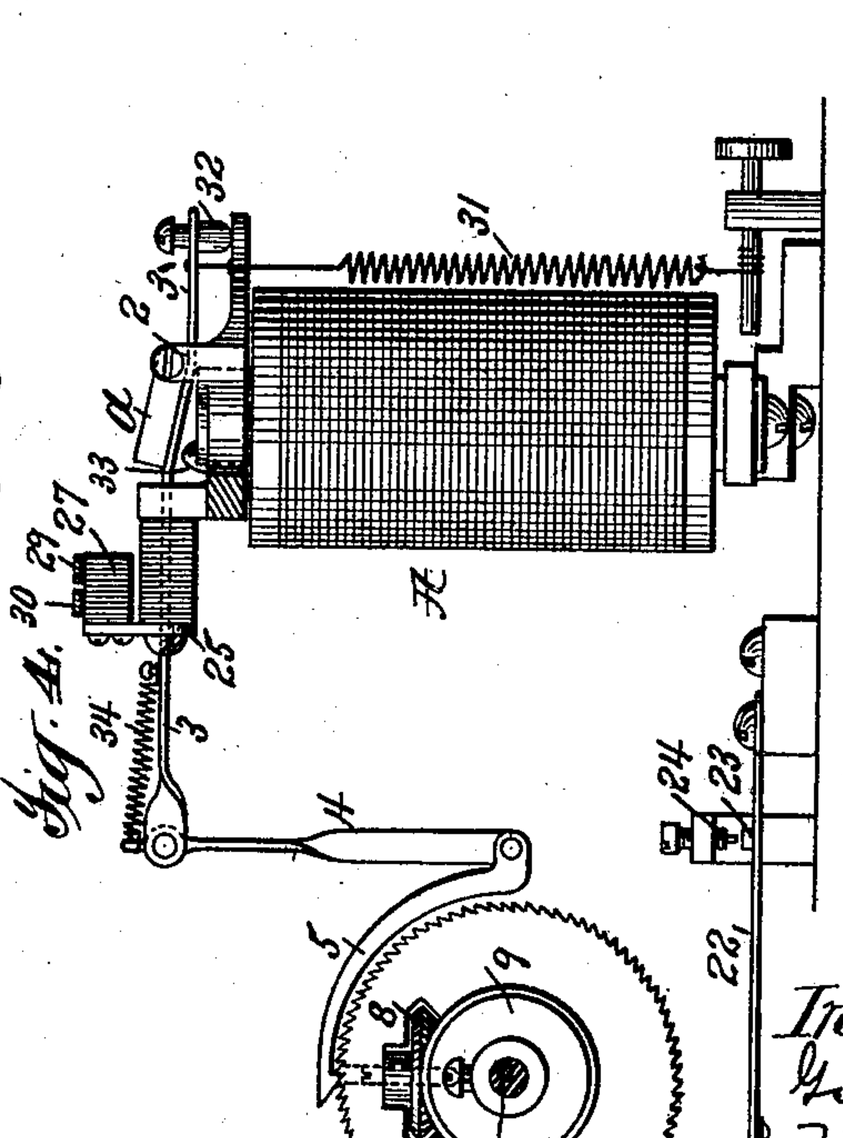
TELAUTOGRAPH.

No. 548,729. Patented Oct. 29, 1895.









Witnesses:
Geo. H. Botts.
Lyn Boyd

Inventor
George S. Tiffany
By Philipp Thomson & Philipp
Attys.

(No Model.) 4 Sheets—Sheet 3.

G. S. TIFFANY.

TELAUTOGRAPH.

No. 548,729. Patented Oct. 29, 1895.

Fig. 9.

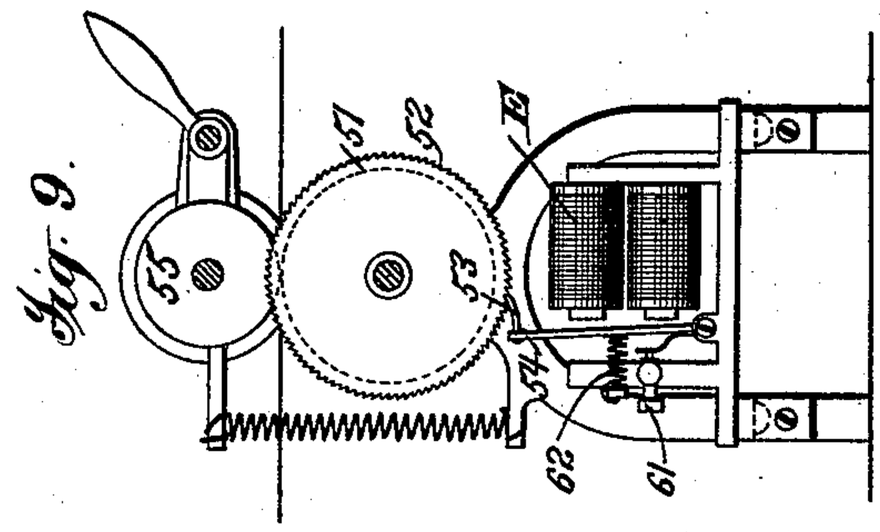


Fig. 7.

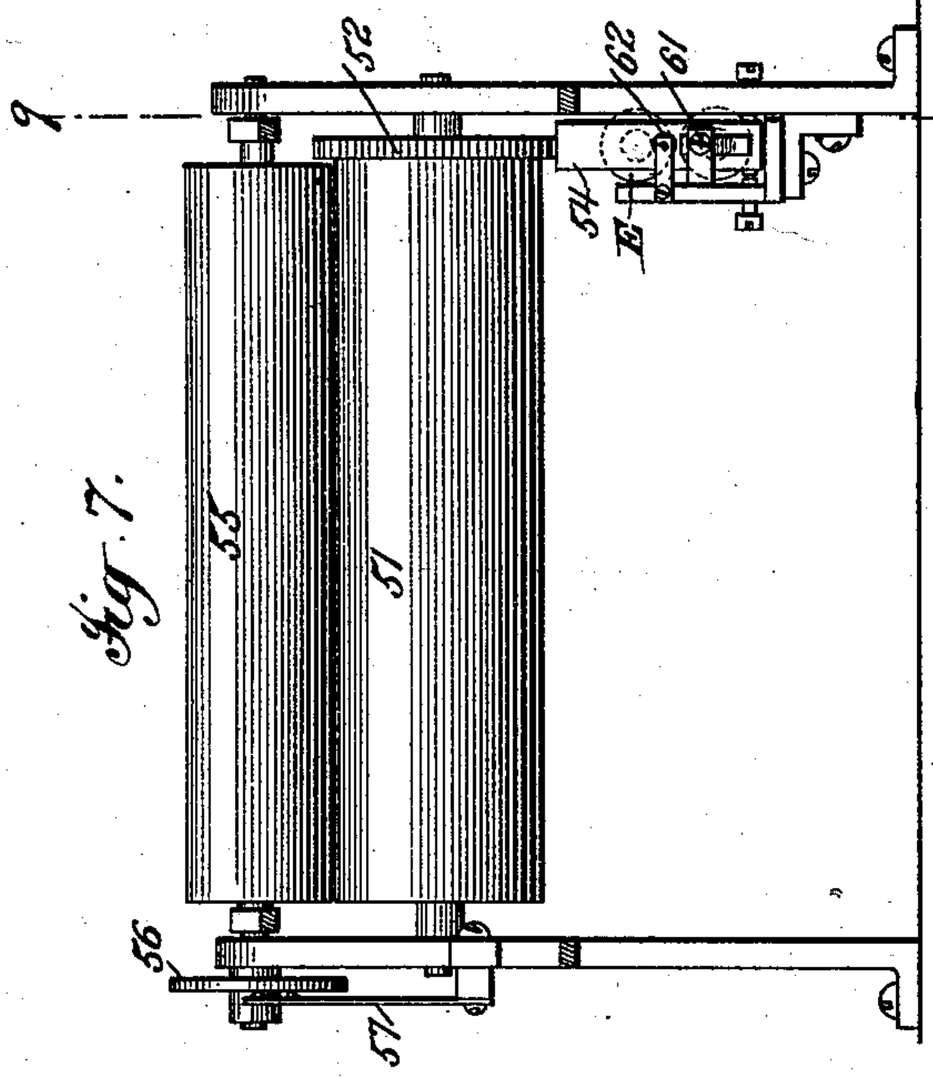


Fig. 10.

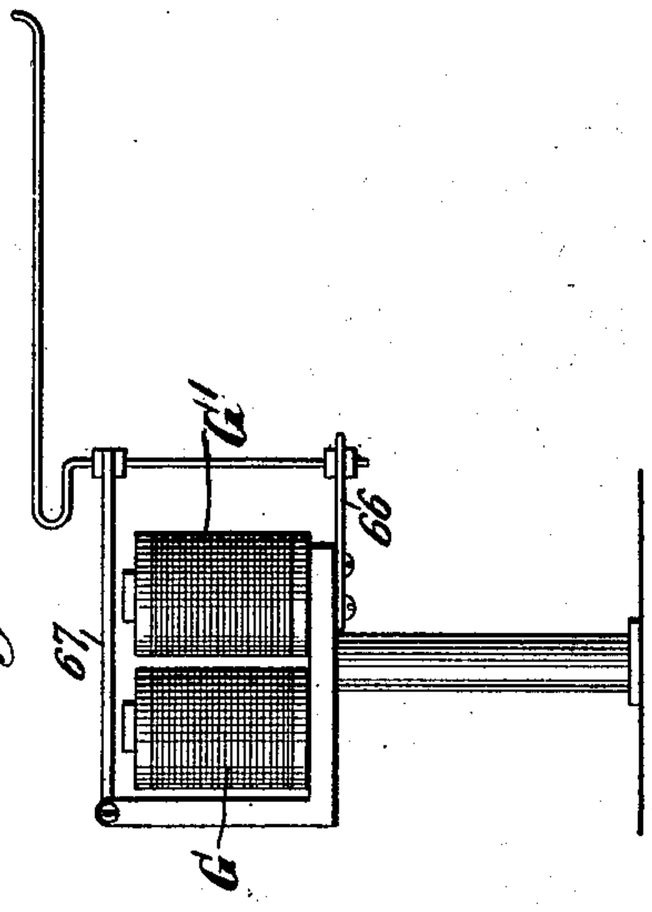
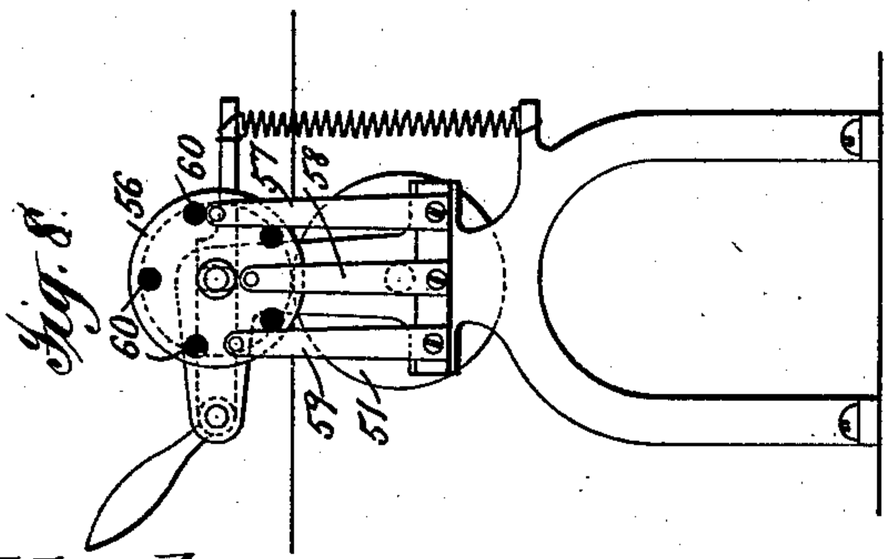


Fig. 8.



Attest:
Geo. H. Bott.
Jno. Borst

Inventor:
George S. Tiffany
By Philipp Munson & Philipp
Attys

(No Model.)

4 Sheets—Sheet 4.

G. S. TIFFANY.

TELAUTOGRAPH.

No. 548,729. Patented Oct. 29, 1895.

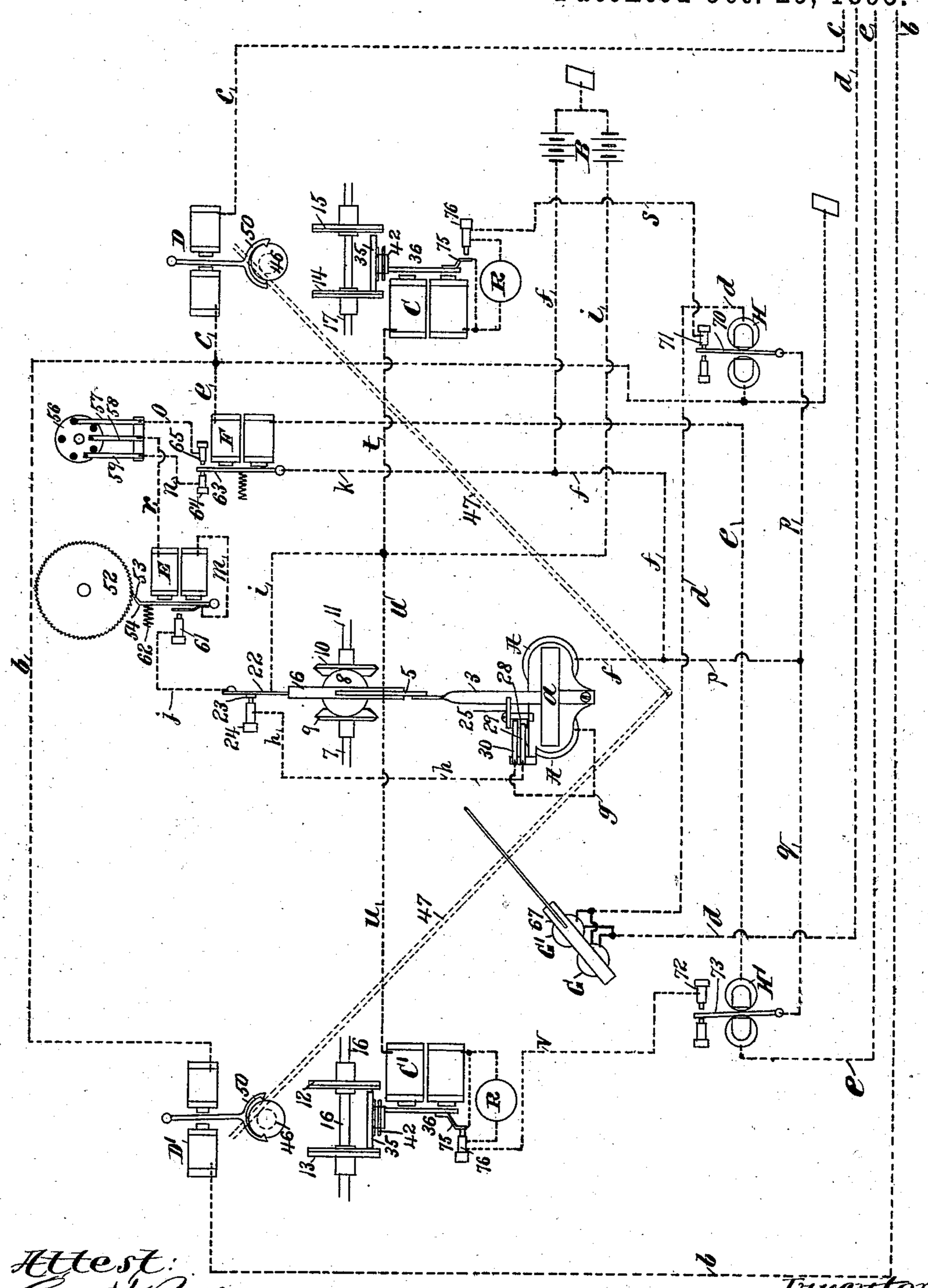


Fig. 11.

Attest:
Geo. H. Botts.
J. M. Bowers

Inventor
George S. Tiffany
By Philipp Munn & Philipp
Attys.

UNITED STATES PATENT OFFICE.

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

TELAUTOGRAPH.

SPECIFICATION forming part of Letters Patent No. 548,729, dated October 29, 1895.

Application filed March 16, 1894. Renewed April 23, 1895. Serial No. 546,923. (No model.)

To all whom it may concern:

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

My invention relates to telautographs made on the general plan set forth in the patents to Elisha Gray, Nos. 461,472 and 491,347, and in the application for patent heretofore filed by him, Serial No. 455,110.

In telautographic instruments in which the receivers are provided with reversing mechanisms having as a part thereof clutches which are controlled by the armature of an electromagnet operated from the transmitting-station it is found that considerable more battery power is required to shift the position of the armature than to hold it in the power-transmitting position after it is shifted. If the same battery is used for both operations, there will therefore be a waste of battery energy, and to obviate this I provide means for reducing the current acting upon the armature of the magnet controling the reversing-clutch at or about the time when the armature of this magnet is drawn up to the pole. The current may be reduced in any of the many well-known ways, that which I have herein described and shown consisting of a resistance shunted into the circuit of the magnet when the magnet's armature approaches its position nearest to the magnet. In mechanism of this kind a preferred construction is that in which the pen-lifter at the receiving-station is operated through changes of strength in the current upon one or both of the reversing-circuits. The principal function of the currents is to control the reversing mechanism at the receiving-station by changes of polarity. A difficulty has been encountered in the use of this organization, due to the fact that upon each change of polarity of the reversing-current there is an instant of substantially no current on line, during which time the pen-lifter magnet becomes "neutral," as it is termed, and allows its armature to rise or "kick" when it ought to remain without movement. To overcome this difficulty I propose to employ for the pen-lifter two magnets so constructed that they will not reach the neutral point simultaneously—that is, that one of them shall be slower in being effected by the absence of current than the other, thus bridging over the short gap in the current and preventing the "kicking" of the armature. One way of constructing these magnets so that they may not be simultaneously affected by the break of the circuit is to make the coil of one of larger wire than the other, so that it shall be more rapid in its action, the two coils being connected in multiple arc. Other equivalent means for attaining this purpose may, no doubt, be devised.

Another object of my present invention is to provide an automatic cut-out for the paper-shifting mechanism, which shall insure that the said mechanism shall operate to feed the paper a definite distance and shall then stop. To effect this a cut-out mechanism is connected with one of the paper-rolls and preferably to the idle-roll, as this is less likely to slip, with reference to the paper, than the roll which does the work.

My invention further consists in certain details of construction hereinafter described, and specially mentioned in the claims.

Figure 1 is a plan view of the receiving-instrument, illustrating particularly the motor and connections for operating the receiving-pen, the escapement for controlling the application of the power of the motor to the pen, the pen-reversing mechanism, the pen-support and its lifting and lowering mechanism, and the paper-feeding mechanism. Fig. 2 is an enlarged side elevation of the pen-reversing mechanism and part of the power mechanism for driving the pen. Fig. 3 is a front view of the same, looking to the right of Fig. 2. Fig. 4 is a sectional elevation of the power mechanism. Fig. 5 is a plan view of Fig. 4. Fig. 6 is a section on the line 6 6 of Fig. 5. Fig. 7 is a front elevation of the paper-shifting mechanism. Fig. 8 is a side elevation of the same, looking toward the right of Fig. 7. Fig. 9 is a similar view looking toward the left of the same figure. Fig. 10 is a side elevation of the pen lifting and lowering mag-

nets and pen-support; and Fig. 11 is a diagrammatic view of the receiving-instrument, illustrating the several mechanisms and their circuit connections.

Referring to said drawings, A represents the motor, consisting of two magnets A, adapted when energized to attract an armature *a*, pivoted in ears 2 and carrying a plate 3, to the forward end of which is pivotally connected one end of an arm 4, which carries at its lower end a pawl 5, engaging a ratchet-wheel 6, loose upon a shaft 7 and carrying a bevel-gear 8, journaled thereon, which engages a similar bevel-gear 9, fast upon shaft 7. The bevel-gear 8 also engages a second bevel-gear 10, fast upon a shaft 11 in line with shaft 7. The shafts 7 and 11 are connected, respectively, to two pairs of friction-disks 12 13 and 14 15, fast upon shafts 16 17, respectively, by springs 18 19, secured to shafts 7 and 16 and 11 and 17, respectively, a stiffening-rod 20 being preferably inserted in each spring to preserve its alignment. The ratchet-wheel 6 is also provided with a holding-pawl 21 for preventing backward rotation of the wheel. The holding-pawl 21 is connected to a spring-plate 22, provided with a contact 23 for making and breaking through contact 24 the circuit through the motor, and thus, as will hereinafter appear, keep the torsion put upon springs 18 19 uniform. The armature *a* is also provided with a pivoted lever 25, provided with a block 27, of insulating (preferably fibrous) material, and a strip or plate 28, of conducting material, (preferably brass,) with which coact two contacts 29 30, through which the circuit to the motor is made or broken, according to the position of the armature. The lever 25, it will be observed, is bifurcated and embraces the plate 3 forward of armature *a* and is moved up and down with the plate, and as thus moved takes the plate 28 into and out of contact with the shorter contact 29 to make and break the circuit, the contact 30 always remaining in.

The plate 3 is provided at its rear end with a spring 31 for raising its forward end when the magnets are de-energized and with an adjustable back stop 32 for limiting this movement, a front stop 33 being also employed to limit the downward movement when the magnet is energized. A spring 34, connected to plate 3 and the upper end of arm 4, holds pawl 5 in position for engagement with ratchet 6. The circuit for magnets A is formed by wire *f* from one pole of a battery B to magnets A, wire *g* from magnets to contact 30 and contact-strip 28, thence through contact 29 by wire *h* to contacts 24 23, plate 22, and wire *i* to opposite pole of battery B.

At each energization of magnets A the armature *a* is attracted, thus moving pawl 5 downward and rotating ratchet-wheel 6 and through the connections just described putting the springs 18 19 under tension. Upon each downward movement of plate 3 the contact-strip 28 will be moved from under contact 29, which latter will then be in contact with the fibrous portion 27 of lever 25, thus breaking the circuit through the magnets and permitting the armature *a* and plate 3 to be raised by their spring 31, the contact-strip 28 being then again brought into contact with contact 29, thus again completing the circuit through the magnets. This operation is continued until sufficient energy has been stored up in the springs 18 19 to resist the pull of pawl 5, when the ratchet-wheel will have a tendency to retrograde and will force its holding-pawl 21 and spring-plate 22 downwardly slightly, thus breaking circuit through contacts 23 24, the circuit remaining open until the springs have parted with sufficient of their force to enable the pawl 21 to rise and again close the circuit, when the operation first described will be repeated.

The reversing mechanism for reversing the direction of movement of the pen will now be described. As this mechanism is the same for each side of the instrument, the following description, which has particular reference to the left-hand side of the instrument, will suffice: This mechanism consists of the disks 12 13, before mentioned, and a third disk 35, journaled on a stud projecting from a plate 36, pivoted to a support 37, for a magnet C′, to the armature 38 of which the disk-carrying plate 36 is yieldingly connected by an adjustable screw 39 and spring 40. Around a pulley 42, carried by disk 35, is wound an endless cord 43, which passes over guide-pulleys 44 and around the shaft 45 of a pen-drum 46, to which the receiving-pen arm 47 is connected in the usual manner. The disks 12 13 are constantly driven, and the position of disk 35 with reference to these disks determines the direction in which the pen-drum shall rotate. Engagement of disk 35 with disk 12 is effected by the attraction of armature 38 by its magnet C′ and with disk 13 by a spring 48, so that tension is always exerted on the cord 43 in one or the other direction. The movement of the pen-drums is controlled by the usual escapement mechanism 50 and escapement-magnet D′ by changes in polarity of the current sent to line from the transmitting-station by the movement of the transmitting-pen.

The armature 38 is provided with a contact-arm 75, which is adapted to come into contact with the stop 76. These contacts form a cut-out for shunting the circuit through a resistance as the armature is drawn up to the magnet, as will be hereinafter explained.

The faces of the disks 12 13 and the contacting edge of disk 35 may be of any suitable material giving sufficient friction to insure quick clutch action.

The reversing-magnet upon the opposite side of the machine is lettered C′ and the escapement-magnet D′. The other parts on that side corresponding to those on the right side are lettered similarly to the latter for convenience.

The paper-shifting mechanism is the same, substantially, as that of Letters Patent before referred to, except for an automatic cut-out connected to one of the paper-rolls, preferably one which is moved by the paper rather than one that moves the paper. As shown in Figs. 7 to 9, the lower roll 51 is provided with the usual ratchet 52, engaged and rotated by a pawl 53, carried by armature 54 of a magnet E. The upper roll 55 is provided on one end with a disk 56, of conducting material, preferably brass, which through contacts 57 and 58 or 59 and 58, as the case may be, closes the circuit through magnet E. The disk 56 is provided with insulators 60, (five being shown,) the distance between each two representing the length of feed to be given to the paper, the circuit being broken and the magnets de-energized whenever stop 57 or 59 (whichever at the time happens to be in circuit) comes in contact with one of the insulators 60. The armature 54 in its normal position is held against a back-stop 61 by a spring 62. One pole of battery B is connected by wire *i*, plate 22, wire *j*, back-stop 61, armature 54, and wire *m* to magnet E, the opposite pole of battery to magnet by wires *f k*, armature 63 of a switch-magnet F, located in one of the reversing-circuits, as will hereinafter appear, stops 64 or 65, wires *n* or *o*, contacts 59 or 57, disk 56, contact 58, and wire *r*. The course of circuit from armature 63 to magnet is dependent upon the position of the armature 63 and the position of contacts 57 59 with reference to insulators 60, as will hereinafter appear.

The pen lifting and lowering mechanism consists of a pair of magnets G G′ for lowering the pen and a spring 66 for raising it.

The circuits (other than those local motor and paper-shifting circuits which have heretofore been described) will now be described.

The main-line escapement-circuit *b* enters the instrument and passes through escapement-magnet D′, thence to ground. Main-line escapement-circuit *c* passes through escapement-magnet D and thence to ground. Pulsations of successively-opposite polarity sent to line from the transmitting-station by the movement of the transmitting-pen over circuits *b c* control, through escapement-armatures 50, the movement of the pen-drums 46 by the springs 18 19. Reversing-circuit *d* entering the instrument passes through the pen-lowering magnets G G′, thence to polarized relay H to ground. Reversing-current *e* entering the instrument passes through polarized relay H′ through the switch-magnet F, and thence to ground.

A local circuit is provided for each of the reversing-magnets C C′, consisting in the case of magnet C of wire *f* from one pole of battery B, wire *p*, armature 70 of relay H, contact 71, wire *s*, contacts 75 76 to magnet C, wire *t*, from magnet and wire *i* to opposite pole of battery. This local circuit is opened and closed by armature 70 in accordance with polarity of current through reversing-circuit *d*. The local circuit for reversing-magnet C′ consists of wire *i* from battery B, wire *u* to magnet C′, wire *v*, contacts 75 76 from magnet to stop 72, armature 73 of relay H′, wires *q p* and *f* to opposite pole of battery, the circuit being opened and closed, as is the other local circuit, by the armature of the relay.

When local circuit to magnet C is closed, the armature 38 is attracted, thus moving disk 35 out of engagement with disk 15 and into engagement with disk 14 and reversing the direction of movement of the pen, spring 48, when magnet is de-energized, withdrawing disk 35 from disk 14 and into engagement with disk 15. The operation is the same for magnet C′ on the opposite side of the instrument.

A branch circuit is provided for the circuit of each of the magnets C C′ through the resistance R. The circuit of each magnet will be forced through the resistance as its armature is drawn forward and the circuit broken between stops 75 76. The current flowing through the coils of magnets C C′ is therefore reduced.

The reversing-circuit *d* includes at the transmitting end a resistance which is thrown in and out of circuit by the raising and lowering of the transmitting-pen.

When the resistance is thrown out of circuit *d* by the lowering of the transmitting-pen, the current passing through said circuit is increased, so as to energize magnets G G′ to attract the armature and thus lower the receiving-pen to the paper. When the resistance is thrown in by raising the transmitting-pen from the paper, the magnets G G′ are de-energized, permitting spring 68 to raise the pen.

The magnets G G′ are of peculiar construction, their coils being connected in multiple arc, and the coil of inner magnet G being of larger wire and of less resistance than the outer magnet G′, the magnet G′ being therefore slower in its action to release armature 67, the lapse of time between the action of the two magnets being about equal to the instant of no current through reversing-circuit *d* after a change of polarity in that circuit. Where a single magnet or two magnets of the same resistance are employed for raising and lowering the receiving-pen when this momentary absence of current over the reversing-circuit occurs, the pen has a tendency to kick. By constructing the magnets as described this instant of no current is bridged over by the slower magnet, which holds the pen depressed until the circuit is again established through both magnets.

The circuit to paper-shifting magnet E is controlled by armature 63 of switch-magnet F, located in reversing-circuit *e*, and the position of this armature with relation to stops 64 65 is controlled by a circuit making and breaking device in this circuit at the transmitting end. When the circuit is broken,

the armature 63 rests against stop 64, thus closing the circuit through that stop, contact 59, disk 56, contact 58, magnet E, wire *m*, armature 54, stop 61, wire *j*, plate 22, wire *i* to battery B, and wire *f* from battery to armature 63, causing magnet E to attract its armature, and thus rotate feeding-roll 51 and shift the paper. The rotation of roll 51 continues until the roll 55, moving with the paper, has rotated sufficiently far to bring one of its insulators 60 under contact 59, thus cutting magnet E out of circuit with battery B, spring 62 then returning armature 54 to normal position. When the circuit is closed, magnet F will attract its armature 63 and again close the circuit through armature 63, stop 55, wire *o*, contact 57 and thence to battery and return, as before described, the shifting operation being repeated and the circuit again broken to arrest the operation when one of the insulators 60 comes under contact 57.

In shifting the paper the transmitting operator will make such a change in the circuit of magnet F as to shift its armature from one to the other of its two positions. In the organization of the circuits shown in the drawings the normal condition of the circuit *e* of magnet F will be closed, and in shifting the paper the transmitting operator will open the circuit and close it again on resuming his writing. The opening will close the circuit of magnet E through contact 64 and cause it to feed the paper a definite distance, when it will stop, and will start again on the closing of the circuit through contact 65, when the remainder of the feed of the paper will take place.

What I claim is—

1. In a telautograph in which reversal is effected by means of currents of opposite polarity in reversing circuits and in which the lifting or lowering of the receiving pen is effected by changes in the strength of the reversing current, a pen lifter magnet composed of two coils differently constructed so that they shall not reach the neutral point simultaneously upon reversal of the current, substantially as set forth.

2. In a telautograph in which reversal is effected by means of currents of opposite polarity in reversing circuits and in which the lifting or lowering of the receiving pen is effected by changes in the strength of the reversing current, a pen lifter magnet composed of two coils one of larger wire than the other so that they shall not reach the neutral point simultaneously upon reversal of the current, substantially as set forth.

3. The combination of a power mechanism, a telautographic receiving pen, a spring between the power mechanism and the receiving pen, by the tension of which the receiving pen is driven, a pawl and ratchet connection between the power mechanism and the spring whereby tension is given to the latter, and a circuit controller operated by the ratchet wheel when caused to move backward by the tension of said spring, said circuit controller governing the operation of the power mechanism upon said spring, substantially as described.

4. The combination in a telautographic receiving instrument, of a relay F, a magnet E controlling the shifting of the paper, two circuits connecting magnet E with the armature and stops of magnet F, a cut out controlled by the movement of the paper for breaking each of said circuits alternately, and circuit connections between the magnet F and the transmitting station, substantially as set forth.

5. The combination of a paper shifter, a magnet for controlling the same, two circuits for said magnet, a cut out situated in both circuits and adapted to open one circuit and close the other alternately, and electrical connections with the transmitting station for controlling the electrical condition of the said two paper shifting circuits, substantially as set forth.

6. The combination in a telautographic instrument, of a paper shifting mechanism, a magnet for actuating the same, and circuit connections for the magnet including a contact plate moving with the paper, two stationary circuit makers coacting alternately with the plate to close the circuit, a plurality of circuit breakers moved by said plate between it and the circuit makers to open the circuit, an armature for closing the circuit through one or the other of the circuit makers and a magnet and electrical connections for said armature, substantially as set forth.

7. In a telautographic system, the combination of a receiving pen, a reversing mechanism for reversing the direction of movement of the receiving pen in correspondence with reversals in the direction of movement of the transmitting pen, connections with the transmitting station controlling said reversing mechanism, a magnet for controlling the reversing mechanism, and means for reducing the amount of current energizing the magnet during a part of its operation, substantially as set forth.

8. In a telautographic instrument, the combination of a receiving pen, a reversing mechanism, a clutch forming a part of the reversing mechanism, a magnet governing the clutch, and means for reducing the current through the magnet coils when its armature is attracted, substantially as set forth.

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

GEORGE S. TIFFANY.

Witnesses:
W. M. GOODRIDGE,
F. B. GREEN.