(No Model.) 4 Sheets—Sheet 1.

E. GRAY.

TELAUTOGRAPH.

No. 522,893. Patented July 10, 1894.

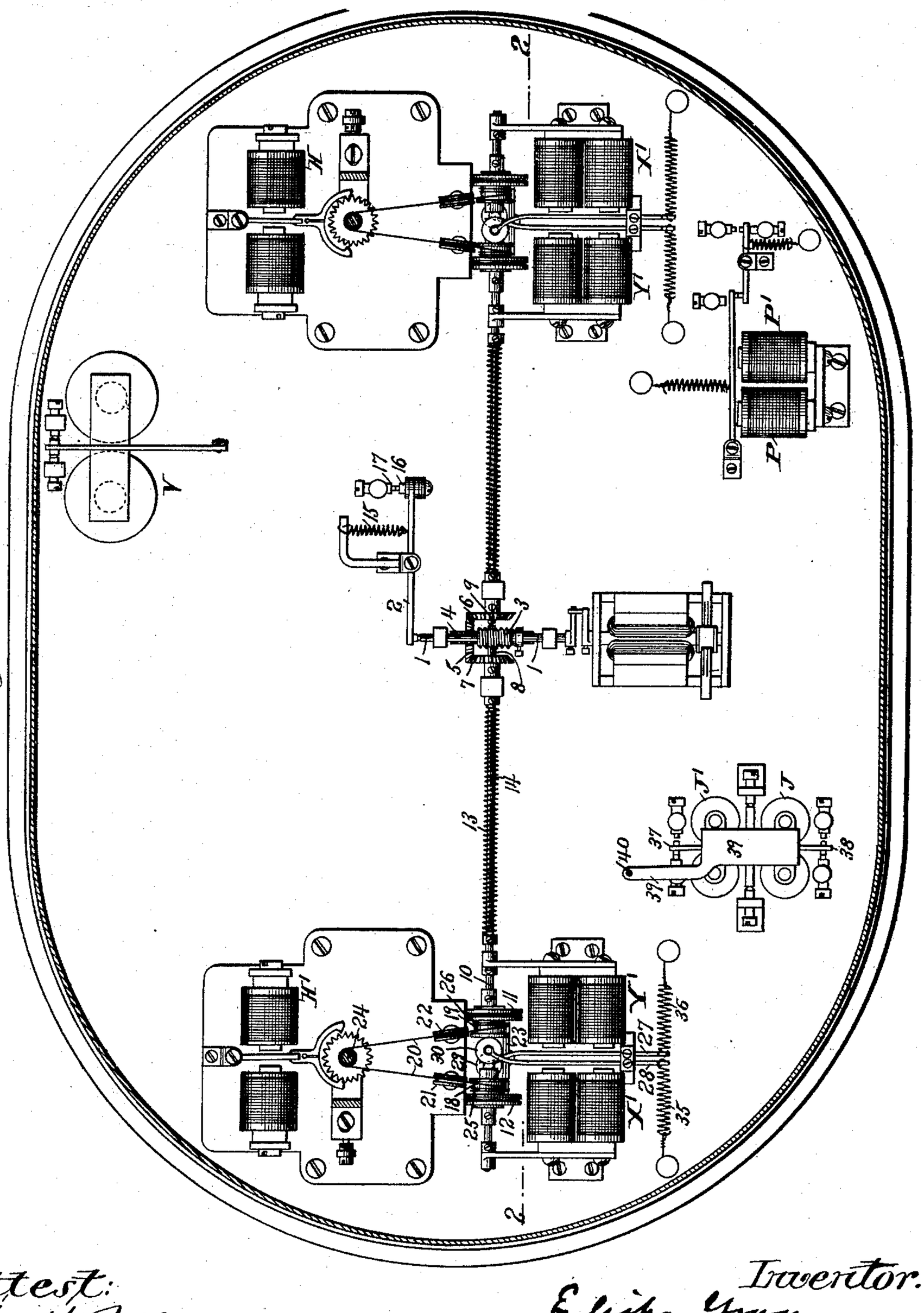

Fig. 1.

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By Philipp Munson & Phelps
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(No Model.) 4 Sheets—Sheet 2.

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TELAUTOGRAPH.

No. 522,893. Patented July 10, 1894.

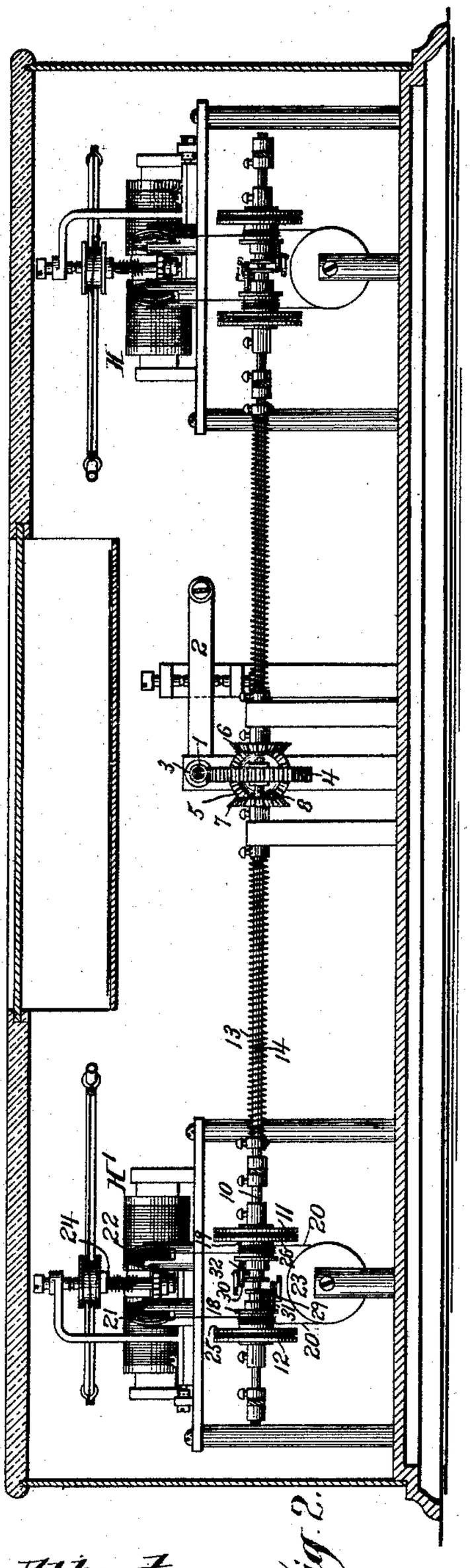

Fig. 2.

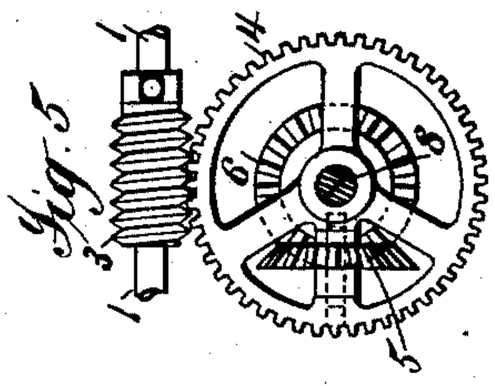

Fig. 5

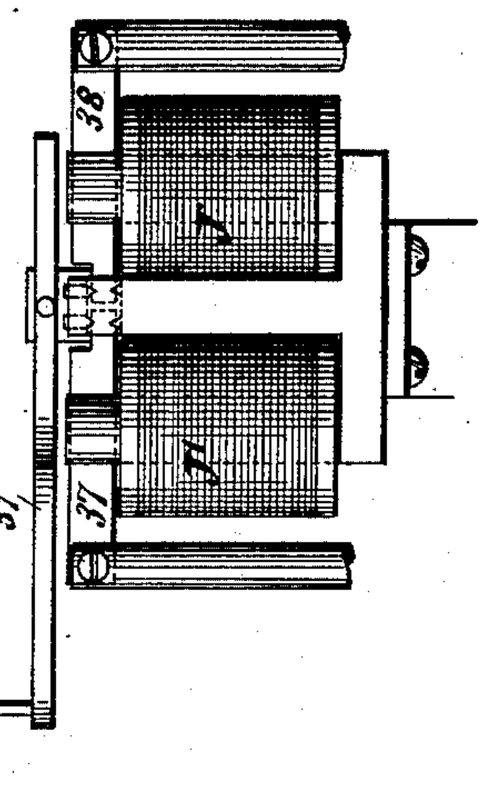

Fig. 4.

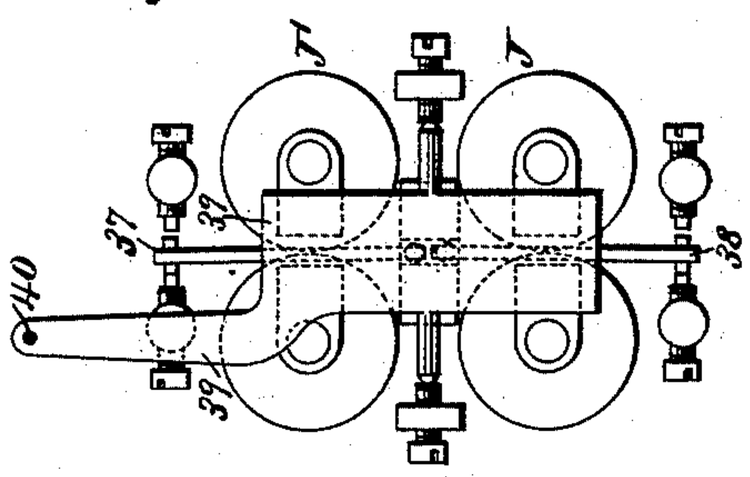

Fig. 3.

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TELAUTOGRAPH.

No. 522,893. Patented July 10, 1894.

Fig. 9.

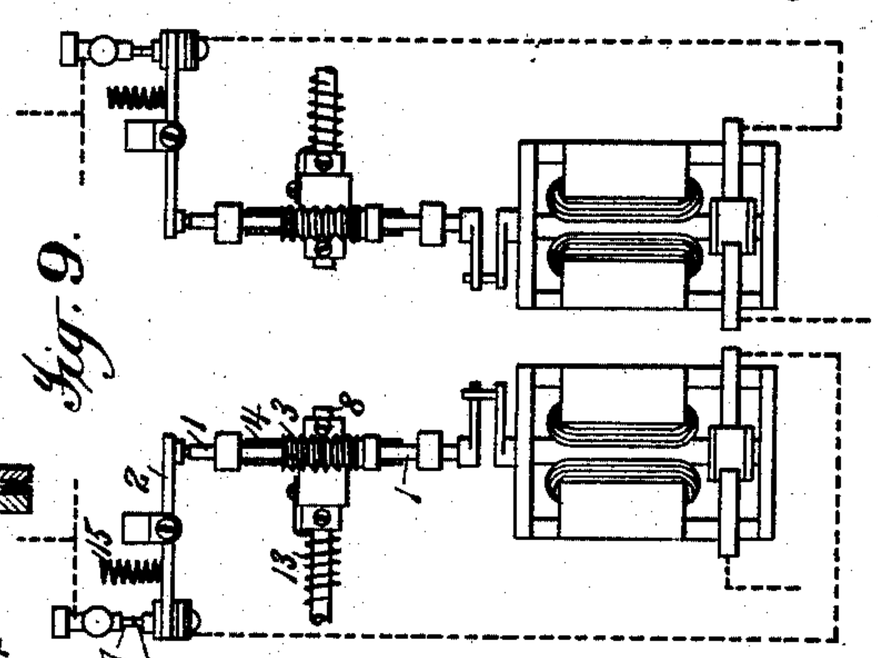


Fig. 7.

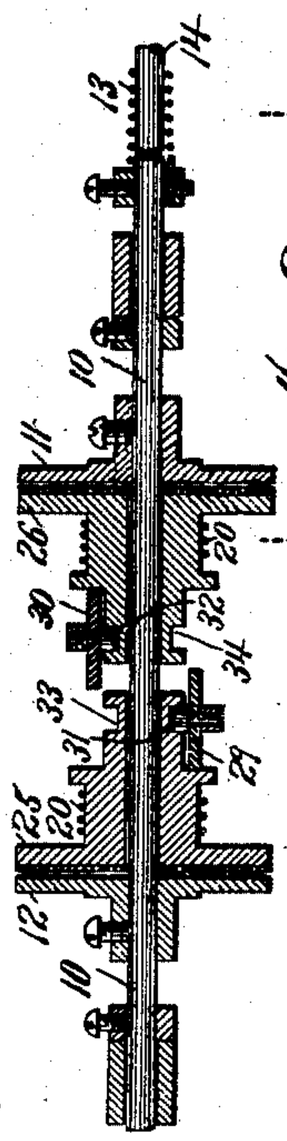


Fig. 8.

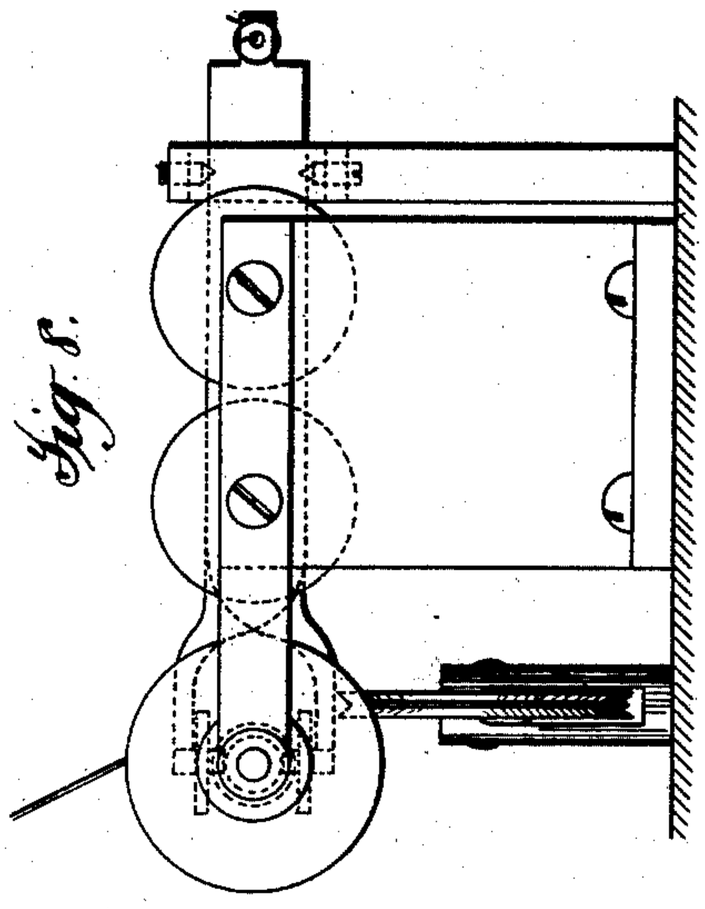
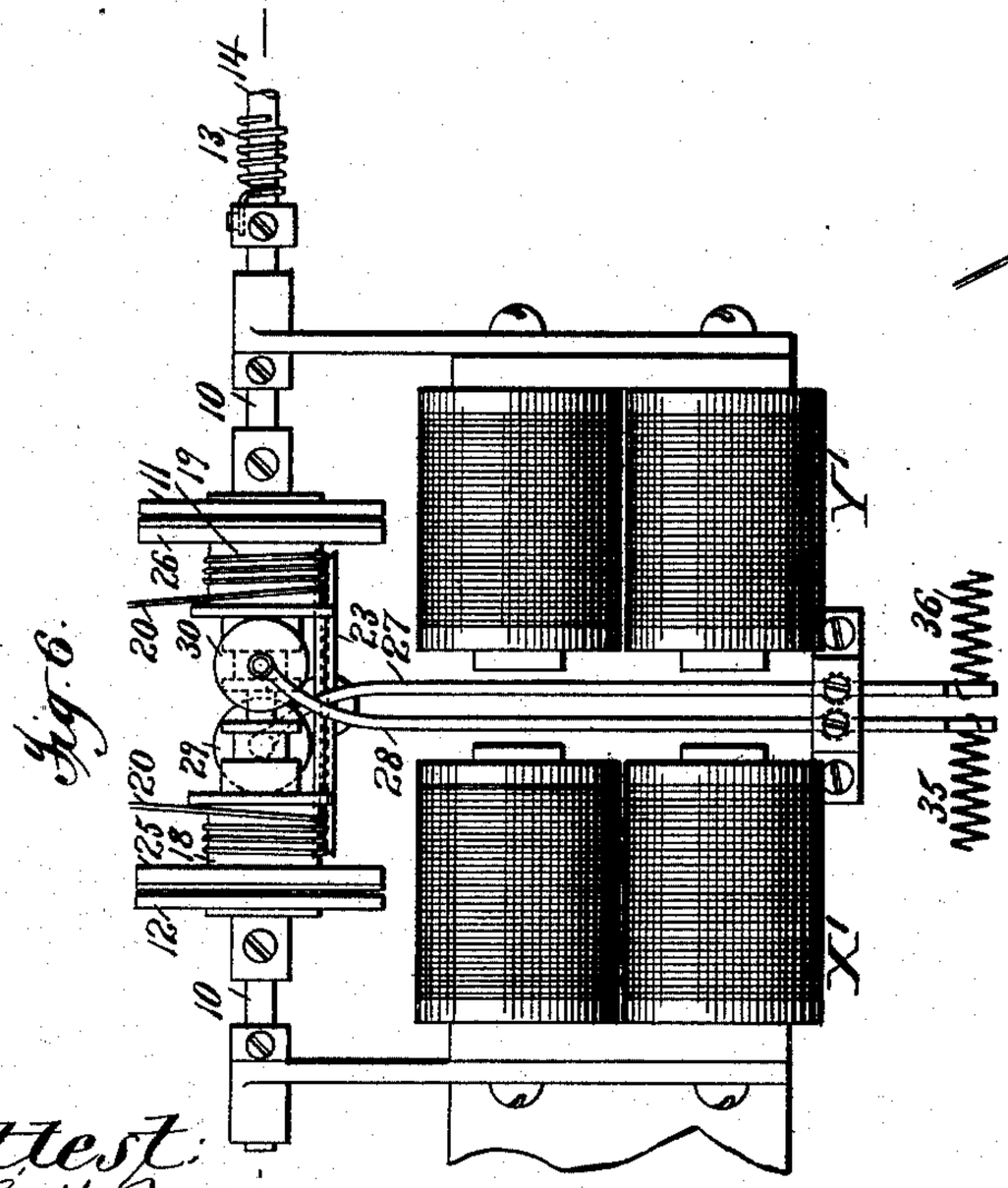


Fig. 6.



Attest:
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(No Model.)

4 Sheets—Sheet 4.

E. GRAY.

TELAUTOGRAPH.

No. 522,893. Patented July 10, 1894.

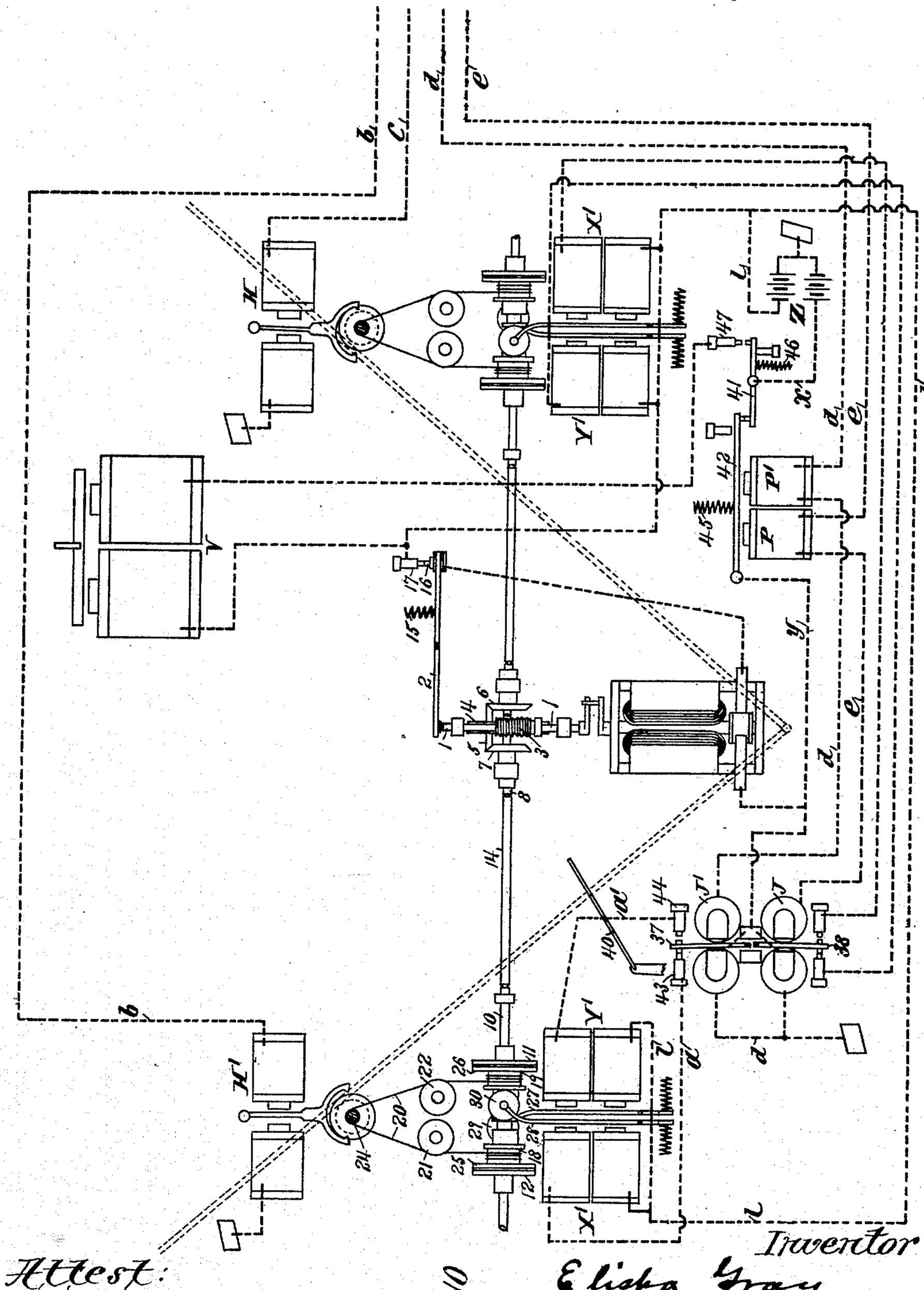

Fig. 10

Attest:
Geo H Botts
T. F. Kehoe.

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UNITED STATES PATENT OFFICE.

ELISHA GRAY, OF HIGHLAND PARK, ILLINOIS.

TELAUTOGRAPH.

SPECIFICATION forming part of Letters Patent No. 522,893, dated July 10, 1894.

Application filed January 27, 1894. Serial No. 498,199. (No model.)

To all whom it may concern:

Be it known that I, ELISHA GRAY, 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.

This invention relates to writing telegraphs of that class in which the act of writing a message at the sending station operates to reproduce it at the receiving station, forms of which are shown in my prior patents, Nos. 386,814, 386,815, and 461,472.

My present invention has for one of its objects to simplify and improve the mechanism for transmitting the power from the power mechanism to the receiving pen. As stated in a specification heretofore filed, No. 455,110, it is found desirable to use a spring under tension for transmitting this power. I find that the best form of spring for this purpose is that which is given its tension by torsional movement. I also found that a direct acting motor, by which I mean a motor acting through gearing upon the shaft from which the receiving pen is driven, is more satisfactory in this operation than one in which the connection is made through a ratchet and pawls, as in the construction described in the said application.

My invention further consists in mechanism by which a single motor is applied to driving the parts of the receiving instrument through an equalizing gear and two springs.

My invention also consists in improvements in the reversing mechanism by which the action of the latter is rendered more quick and certain, and in other details and features of construction which will be hereinafter described and pointed out in the claims.

In the drawings hereto annexed which form a part of this specification and illustrate my invention, Figure 1 is a plan view of the instrument. Fig. 2 is a sectional view on the line 2—2 of Fig. 1. Fig. 3 is a top view, and Fig. 4 a side view of the magnets which control the reversing circuits and operate the pen lifter. Fig. 5 is a side view on an enlarged scale of a part of the equalizing gear. Fig. 6 is a top view on an enlarged scale of the reversing magnets and connected parts. Fig. 7 is a sectional view of the same on the line 7—7 of Fig. 6. Fig. 8 is a side view of the same. Fig. 9 shows a modified construction in which two instead of one motor are used, and Fig. 10 is a diagram of the circuit connections of the receiver.

The general organization of the apparatus is that shown in my Patent No. 491,347.

The construction of the different parts will first be explained, and then the connections of the circuits. The motor is shown in Figs. 1 and 2 as an electric motor, a single motor serving for operating both sides of the receiving instrument. In line with the axis of the motor is mounted a shaft 1 free to move longitudinally in its bearings, and pressed toward the motor by a spring actuated lever 2. The shaft 1 carries a worm wheel 3 which meshes with the gear 4 of an equalizing gear. The equalizing gear consists of the gear 4 in which is journaled a miter gear 5, which engages with the miter gears 6 and 7, the latter fixed to shaft 8 and the former to shaft 9, each shaft being journaled in bearings and free to revolve. The gear 4 revolves loosely on shaft 8.

Connection is made between the shaft 1 and the motor shaft by means of two arms and a pin, as shown, which permits longitudinal movement of the shaft 1 without disarranging the connection. In line with shaft 8 is mounted another shaft 10 which carries fast upon it two disks 11, 12. The connection between shafts 8 and 10 is made by means of a spring 13. A rigid piece 14 may be placed within this spring to keep it axially straight, but this piece has no connection with the shafts 8 and 10. The action of the motor, therefore, is to give rotation to the shaft 8 and to twist the spring 13, placing it under torsional tension. This action will continue until the tension of the spring 13 is greater than the tension of the spring 15 holding the lever 2 in its place, when the worm 3 and its shaft 1 will move outward from the motor until the circuit of the motor is opened at the contacts 16, 17, causing the motor to stop.

When the tension of the spring 13 is reduced sufficiently, the worm 3 will move backward until the circuit of the motor is closed, when it will again re-establish the

movement of the motor and increase the tension of the spring 13. Thus the tension of the spring 13 will be kept at substantially a constant degree.

A similar spring and connections are provided on the right hand side of the apparatus, and shown in the drawings. The power of the motor is divided between these springs by the equalizing gear, and as the two together reach a degree of tension sufficient to overcome the tension of the spring 15, the motor will be stopped, and restarted whenever the combined tension of the springs falls below the tension of the spring 15.

The reversing mechanism includes the disks 11 and 12 before mentioned, the other parts consisting of drums 18, 19 mounted loosely upon the shaft 10 and connected by an endless cord 20 passing over idle pulleys 21, 22, 23 to shaft 24 carrying the drum driving the receiving pen, on which shaft the usual escapement is mounted. The drums 18 and 19 are respectively provided with face pieces 25, 26 contiguous to the disks 11 and 12. The reversing magnet is stationary, that is, not mounted upon the shaft, and is made in two parts X′ and Y′, each part being provided with a pivoted armature, respectively 27, 28, carrying journaled upon their ends preferably metal disks 29, 30 which are adapted to bear upon the ends of the drums 18, 19. Each armature lever also carries a projection 31, 32 which engages with a recess 33 or 34 in a sleeve attached to the drums 18, 19, so that when these ends are moved, through the action of either springs or magnets, they will slide the drums on the shaft 10.

The armature levers 27, 28 are respectively drawn backward away from their magnets by the springs 35, 36. As stated the disks 29, 30 are preferably of metal, as are the contiguous surfaces of the drums 18, 19, in order to reduce the friction. The contiguous faces of the disks 12, 25 and 11, 26 are of any material which will give sufficient friction to form clutches, but preferably one of these disks is covered in whole or in part with soft rubber, and the other of some hard substance roughened, as, for instance, a plate of metal which has been roughened by scratching or indenting; or a plain surface covered with sand. It has been found that the combination of soft rubber with a hard roughened surface gives the best and quickest clutch action. If desired, both clutching surfaces may be faced with soft rubber.

It will be seen that when no current is in line both of the drums 18 and 19 are pressed outward by the force of the springs 35, 36, and the two clutches are fast. The pull upon the cord 20 caused by the tension of the spring 13 is, therefore, balanced, and no movement results. When, however, the reversing current, as will always be the case during the operation of the instrument, is only through one of the magnets X′, Y′, the said magnet will hold the disk 29 or 30 corresponding to it out of contact with its drum, and the other of the two drums 18, 19 will be pressed outward and caused to perform its clutch function. The tension upon the cord 20 will, therefore, be in one direction only, and the shaft 24 will have the tendency to revolve in that direction when permitted to do so by the escapement pallets. When, in reversal, the current is taken from the previously energized magnet and thrown through the other magnet the clutch action is transferred to the other disks not before in contact, and the tendency of rotation of the shaft 24 is reversed.

In the drawings, the reversing mechanism is described only as to one side of the apparatus, but it will of course be understood that it is duplicated for both sides, as in other instruments of this character and as shown in the drawings. In these drawings the polar relays J, J′ are shown as forming one structure with the pen lifting magnet, the change of polarity in the current on the two reversing lines shifting the position of the polarized armatures 37, 38, respectively, and a change in strength of the currents operating a second armature provided for the magnets 39, to which is attached the pen lifter 40.

The paper shifting magnet is shown at V but the paper shifting mechanism is not shown and may be of any suitable construction.

The escapement magnets are shown at H, H′.

The circuits will now be described. The main line escapement circuit *b* enters the instrument and passes through magnet H′ to earth. The main line escapement circuit *c* passes likewise through escapement magnet H to earth. The reversing line *d* passes through the coil of magnet P′ to polarized relay J, J′ and thence to earth. The reversing circuit *e* passes through the coil of magnet P, polarized relay J, and thence to earth. A local circuit is provided from battery Z through wire *x*, lever 41, armature of magnets P, P′ 42, wire *y*, armature 37 to one or the other of the two contact points 43, 44, and then either by the wire *a* to magnet X′ or by wire *a′* to magnet Y′ and thence by wire *l* to the battery. The current will, therefore, pass through one or the other of the magnets X′, Y′ according to the position of the armature 37 as determined by the polarity of the current passing through the coils of the magnet J′. A similar circuit is provided for magnet Y′ controlled in a similar manner by the armature lever of magnet J.

The armature lever 42 is pivoted at its left hand end, and its back spring 45 and also the spring 46 of lever 41 are so adjusted that when only one of the magnets P, P′ is energized the lever 42 will be in the position shown in the drawings; but when both are energized simultaneously, as in the shifting of the paper by the transmitting operator, the lever 42 will be thrown down moving the lever 41

until it makes contact with the stop 47, and closing the circuit of battery Z through the paper shifting magnet V. On the other hand, if the current through both magnets P, P′ is cut off, as in the hanging up of the transmitting pen, the armature 42 will rise, breaking the local circuit of the reversing mechanism.

It will thus be seen that when the transmitting pen is normally engaged in the act of writing a message, reversals in the polarity of the respective levers and circuits caused by movement of the transmitting pen will cause corresponding reversals in the receiving instrument through the action of the magnets J, J′; that changes of strength in the reversing circuits due to the placing of the transmitting pen upon the paper and removing it therefrom, will operate upon the magnets J, J′ to lower or raise the receiving pen; that the simultaneous sending of current to line over both the reversing circuits *d*, *e* will operate the paper shifting magnet, and that the cutting out of the current on both these lines simultaneously will break the circuit of the local battery at the receiving instrument.

It is to be understood that I do not confine myself to an electric motor, having within my contemplation any kind of a device or power mechanism from which power may be derived. Instead of using an equalizing gear and a single power mechanism, I may employ two power mechanisms, a form of which construction is shown in Fig. 9.

What I claim is—

1. The combination in a telautograph of a power mechanism, a torsional spring, and means for maintaining constant the tension of the spring, a reversing mechanism, and a receiving pen, substantially as set forth.

2. The combination of a telautographic receiving pen, power mechanism for driving the same, a spring placed under torsional tension by the power mechanism through which spring the power is transmitted to the receiving pen, and means for suspending the operation of the power mechanism upon the spring when the latter has been placed under sufficient tension, substantially as set forth.

3. The combination of a telautographic receiving pen, power mechanism for driving the same, a spring placed under torsional tension by the power mechanism through which spring the power is transmitted to the receiving pen, and a circuit maker and breaker for suspending the operation of the power mechanism upon the spring when the latter has been placed under sufficient tension, substantially as set forth.

4. The combination of a telautographic receiving pen, power mechanism for driving the same, a spring placed under torsional tension by the power mechanism through which spring the power is transmitted to the receiving pen, and a reversing mechanism between the spring and the receiving pen, substantially as set forth.

5. The combination of a spring, power mechanism for giving torsional tension thereto, means for suspending the operation of the power mechanism upon the spring when its tension reaches the normal amount, means for reestablishing the operation of the power mechanism upon the spring when the tension of the spring falls below its normal amount, and a receiving pen driven by the power of the spring, substantially as set forth.

6. The combination of a telautographic receiving pen, a shaft from which said pen is driven, means for rotating said shaft, a spring put under torsional tension by the rotation of the shaft and serving by means of its tension, to drive the receiving pen and a reversing mechanism, substantially as set forth.

7. The combination of a telautographic receiving pen, a shaft from which the said pen is driven, means for rotating said shaft, a coiled spring put under tension by the rotation of the shaft and serving by means of its tension to drive the receiving pen and a reversing mechanism, substantially as set forth.

8. The combination of a telautographic receiving pen, a shaft or sleeve from which said pen is driven, means for rotating said shaft, a coiled spring axially placed with reference to the shaft and put under tension by the rotation of the shaft and serving by means of its tension to drive the receiving pen and a reversing mechanism, substantially as set forth.

9. The combination of a power mechanism, a shaft connected therewith by gearing so as to be rotated thereby, a spring put under torsional tension by said shaft, a reversing mechanism and a receiving pen driven by the tension of the spring, substantially as set forth.

10. The combination of a power mechanism, a shaft connected therewith by gearing so as to be rotated thereby, a spring put under torsional tension by said shaft, a reversing mechanism and a receiving pen driven by the tension of the spring, substantially as set forth.

11. The combination of a power mechanism, a shaft connected therewith so as to be rotated thereby, a spring put under torsional tension by said shaft and mounted with its axis of torsion in the line of said shaft, a reversing mechanism, and a receiving pen driven by the tension of the spring, substantially as set forth.

12. The combination of a power mechanism, a shaft connected therewith so as to be rotated thereby, a spring put under torsional tension by said shaft, a receiving pen driven by the tension of the spring, and means for keeping the tension of the spring substantially constant, substantially as set forth.

13. The combination of a power mechanism, a shaft connected therewith by gearing so as to be rotated thereby, a spring put under torsional tension by said shaft, a receiving pen driven by the tension of the spring, and an electrical make and break for suspending the operation of the power mechanism upon the spring when the tension thereof reaches the

normal and for reestablishing said operation when said tension falls below the normal, substantially as set forth.

14. The combination of a power mechanism, an equalizing gear, two springs connected with the equalizing gear, placed under tension by the power mechanism, and a receiving pen driven in its two directions of motion by the power of the two springs respectively, substantially as set forth.

15. The combination of a power mechanism, an equalizing gear, two springs connected with the equalizing gear and placed under tension by the power mechanism, two reversing mechanisms and a receiving pen driven in its two directions of motion by the power of the two springs, respectively, substantially as set forth.

16. The combination of a power mechanism, an equalizing gear, two springs connected with the equalizing gear and placed under tension by the power mechanism, two reversing mechanisms, means for maintaining the tension upon the said springs constant, and a receiving pen driven in its two directions of motion by the power of the two springs respectively, substantially as set forth.

17. The combination of a power mechanism, an equalizing gear, two springs connected with the equalizing gear and placed under tension by the power mechanism, two reversing mechanisms, means for suspending the operation or the power mechanism upon each of said springs when the tension upon said springs becomes normal, means for reestablishing the operation of the power mechanism upon said springs when their tension falls below normal, two reversing mechanisms, and a receiving pen driven in its two directions of motion by the power of the two springs respectively, substantially as set forth.

18. The combination of a power mechanism, an equalizing gear, two shafts rotated by the motor through the equalizing gear, two torsional springs having their axes of torsion respectively in line with the said shafts and put under tension by the power mechanism, and a receiving pen driven in its two directions of motion by the force of said two springs, substantially as set forth.

19. The combination of a power mechanism, an equalizing gear, two shafts rotated by the power mechanism through the equalizing gear, two torsional springs having their axes of torsion respectively in line with the said shafts, and put under tension by the power mechanism, means for maintaining the tension of said springs substantially constant, and a receiving pen driven in its two directions of motion by the power of said two springs, substantially as set forth.

20. The combination of a receiving pen, a shaft from which the receiving pen is driven, two clutches on said shaft for causing the receiving pen to be driven in opposite directions, a stationary magnet or magnets, connections between said magnets and the said two clutches, and electrical connections from the transmitting station whereby one or the other of said clutches is brought into operation through the said magnet or magnets according to the direction of motion of the transmitting pen, substantially as set forth.

21. The combination of a receiving pen, a shaft from which the receiving pen is driven, two clutches on said shaft for causing the receiving pen to be driven in opposite directions, stationary magnets, two armature levers for said magnets respectively, springs operating upon said two armature levers to cause them to act upon the two clutches respectively, and electrical connections with the transmitting station whereby through said magnets one or the other of said clutches is brought into operation according to the direction of movement of the transmitting pen, substantially as set forth.

22. The combination of a power mechanism, a shaft connected therewith by gearing so as to be rotated thereby, a spring put under torsional tension by such shaft, a reversing mechanism, a receiving pen driven by the tension of the spring, and an escapement controlling the application of the power to the receiving pen, substantially as set forth.

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

ELISHA GRAY.

Witnesses:
T. F. KEHOE,
J. A. DUNN.