

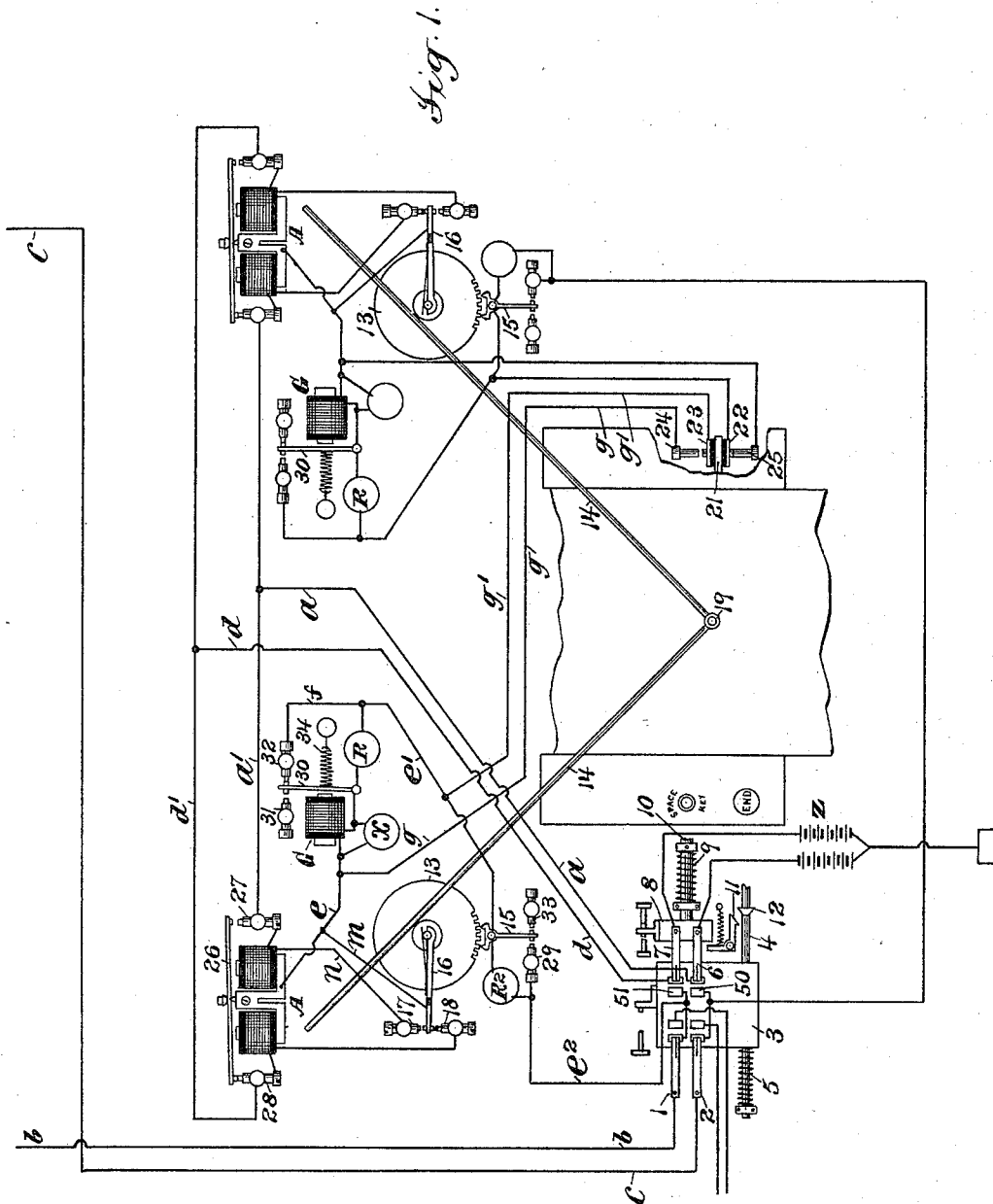
(No Model.)

3 Sheets—Sheet 1.

L. O. McPHERSON.
TELAUTOGRAPH.

No. 585,319.

Patented June 29, 1897.



Attest:
Geo H. Bott
A. W. Bourke

Inventor
Leon O. McPherson
By Philipp Munson Phelps

Atty's

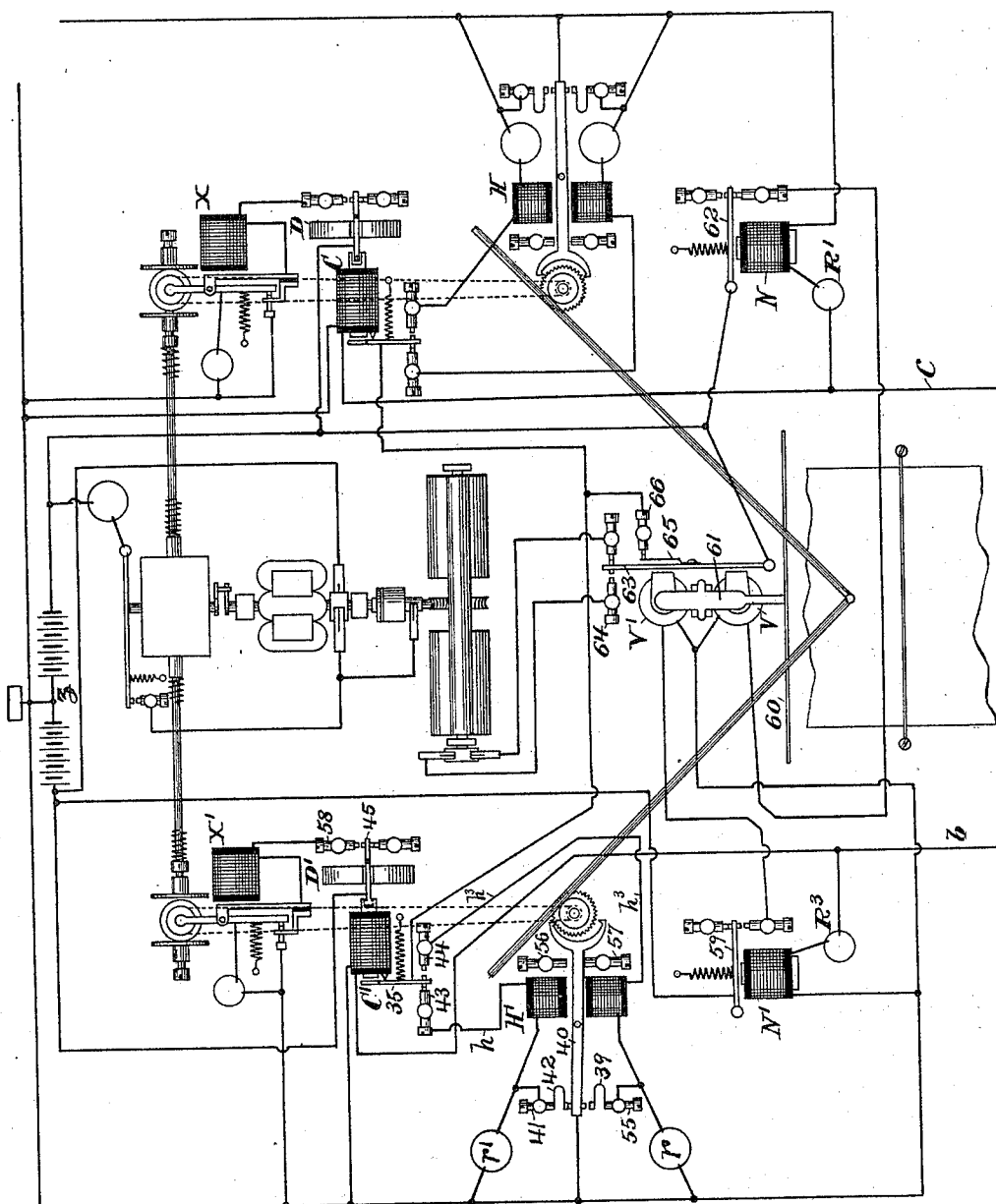
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Fig. 2.

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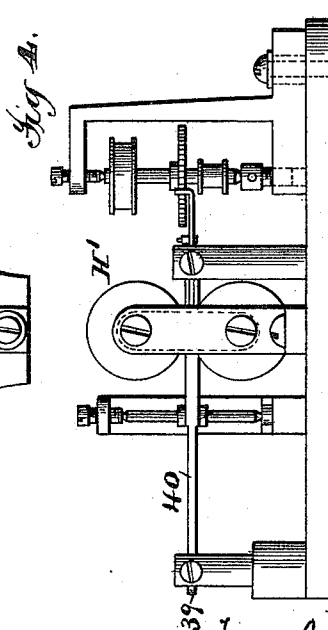
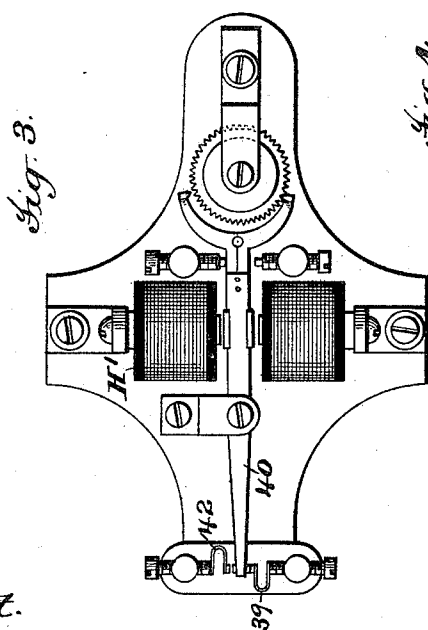
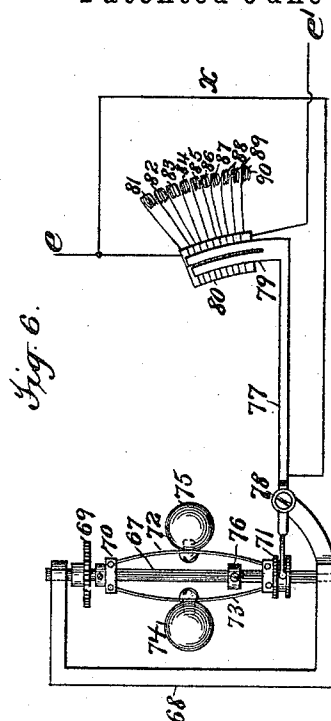
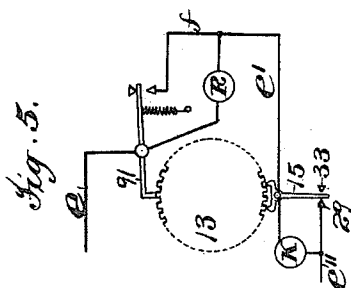
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No. 585,319.

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Attest.

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A. V. Bourke

Inventor
Leon O. McPherson
By Philipp Munson Phelps

Atty.

UNITED STATES PATENT OFFICE.

LEON O. MCPHERSON, OF HIGHLAND PARK, ILLINOIS, ASSIGNOR TO THE
GRAY EUROPEAN TELAUTOGRAPH COMPANY, OF CHICAGO, ILLINOIS.

TELAUTOGRAPH.

SPECIFICATION forming part of Letters Patent No. 585,319, dated June 29, 1897.

Application filed November 24, 1896. Serial No. 613,253. (No model.)

To all whom it may concern:

Be it known that I, LEON O. MCPHERSON, 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 telautographic instruments of the class shown in my application, Serial No. 565,129, filed October 9, 1895, and to new methods of telautographic communication.

It is a well-known fact that the frequent interruption of the circuit, either in the sending of pulsations of successively similar or opposed polarity, reduces the capacity of the circuit to transmit the current and has an effect upon the current transmitted equivalent to a reduction in its strength. The interrupters used in telautographs vibrate with great rapidity in ordinary or rapid writing and cause a great reduction in the strength of the current transmitted as compared with its strength when the interruptions are infrequent. It has, therefore, been usual to employ in telautographic transmittal currents of sufficient strength to operate the instruments when these currents are reduced by the maximum frequency of vibration of the interrupters, and at slower speeds the proportion of the current needed to counterbalance the loss due to increased frequency is wasted. I have discovered a method of applying this hitherto wasted current to the operation of the supplemental parts of the receiver—viz., the pen lifting and lowering and paper-shifting mechanisms—thereby avoiding the necessity of providing an additional strength of current for those purposes, as has heretofore been done. I accomplish this by automatically governing the amount of current used in accordance with the frequency of the interruptions, so that when that frequency is low a lesser and when it is high a greater strength of current will be supplied, the greater strength being just that required to control the operation of the escapement-magnets when the writing speed is the highest. At or below about half-speed, therefore,

there will always be in this construction a certain amount of current strength kept out of circuit by the governor, which can be utilized as desired, and as the supplemental operations are in practice only performed, as a rule, while the writing-pens, and consequently the interrupters, are moving at slow speed this part of the current is available for effecting these operations.

My invention consists in the devising and application of such a governing method and mechanism to telautographs and also in certain other particulars of construction hereinafter described, and pointed out in the claims.

In the drawings annexed, forming part of this specification, Figure 1 is a diagrammatic view of that part of the circuits of the transmitter involved in my present invention. Fig. 2 is a similar view of the receiver-circuits. Fig. 3 is a plan view, and Fig. 4 a side view, on an enlarged scale, of an improved escapement-magnet. Figs. 5 and 6 show modified forms of governor.

The transmitting portion of the instrument will first be described, then the receiving portion, and then the operation of the two together.

Referring to Fig. 1, the apparatus is shown in the position for sending a message. As shown herein, my improvements are applied to a two-wire instrument in which pulsations of successively like polarity are used for controlling the movement in extent of the receiving-pen, but many of them are equally applicable to a three or four wire instrument or to one in which pulsations of successively opposite polarity are used for the purpose indicated, and I do not limit myself in respect to them to the particular organization shown herein.

Line-wires *b c* connect with springs 1 2, which rest upon contacts carried by plate 3, which plate is connected to the rod 4, projecting vertically through the frame of the instrument and having at its top a button marked "End" in the drawings. This rod and plate are pressed by the spring 5 to the position shown and with the circuit connections constitute the master-switch. The transmitting-current passes from the split battery Z,

connected at the bifurcation to the earth, to springs 6 and 7, which also rest on contacts carried by the plate 3. These springs are attached to a movable block 8, held in the position shown by spring 9, but capable of being depressed by the rod 10, the upper end of which is termed herein the "space-key," so that the springs 6 and 7 shall rest on contact-plates 50 51. A pivoted lever-catch 11 is adapted to take over a collar 12 on the rod 4, and has a tail end, which is in the path of the block 8 when the latter is depressed, so that when the rod 4 is held down by the catch the depression of the block 8 will move the catch to release the rod and permit the master-switch to change its position under the pressure of spring 5, the instrument being thereby shifted from the receiving to the transmitting position.

The current is interrupted by the magnetic interrupting device patented by Elisha Gray in Patent No. 491,346, the magnet-wheel being revolved by connection with the pen-arm 14 and giving motion to the interrupter-lever 15. The Prony brake 16 is, as usual, frictionally attached to the shaft of the wheel 13 and rests against one or the other of the stops 17 18, according to the direction in which the pen-arm is moving.

The transmitting pen or pencil point 19 rests upon the paper, which is in turn supported by a movable spring-pressed platen of the usual construction, having attached to it an arm 21, to which are attached above and below insulated contact-points 22 23, adapted to meet the contact-pins 24 25, according as the platen is in its elevated or depressed position. The polarity of the current sent to line upon each make of the circuit by the interrupter 15 is determined by a pole-changer in the following manner:

The pole-changer consists of an ordinary two-spool magnet A, having a centrally-pivoted vibrating armature-lever 26, adapted to come into connecting contact at its extremities with stops 27 28. The position of the lever 26 is determined by the energization of the coils of the magnet A respectively, and the latter depends upon the position of the friction-arm 16. When the lever 26 rests against the stop 28, as shown in the drawings, Fig. 1, the positive current from battery Z passes through spring 7, wire *d*, contact 28, lever 26, frame of magnet A, wire *e*, governor, wire *e'* to line *b*, the Prony brake 16 at this time resting upon the stop 18. When the movement of the transmitting-pen changes from a backward to a forward direction, the Prony brake 16 is thrown against stop 17. The current now passes from the positive pole of battery Z to spring 7, wires *d d'*, stop 28, lever 26, frame of magnet A, wire *e* to line, and also a part of it flows from wire *e* through wire *m*, stop 17, wire *n*, right-hand coil of magnet A, wires *a' a*, spring 6, negative pole of battery Z. A powerful current is thus thrown through the right-hand coil of mag-

net A, but at the same time, the resistance of this magnet being high, this branch of the current does not have sufficient strength to substantially diminish the positive current flowing to line. The armature 26 therefore promptly leaves the stop 28.

As soon as there is a separation between lever 26 and stop 28 the positive current flowing to line is broken and a negative current is established from battery Z through spring 6, wires *a a'*, stop 27, right-hand coil of magnet A, wire *n*, stop 17, lever 16, wire *m*, wire *e* to line-wire *b*, which current also continues the energization of the right-hand coil of magnet A. The full strength of the negative current is not thrown to line until the lever 26 strikes the stop 27, when the current flows from the negative side of the battery Z to wires *a a'*, stop 27, lever 26, frame of magnet A', wire *e*, &c., to line-wire *b*. Two prominent advantages are secured by this organization of circuits. In the first place, the very prompt movement of the lever 26 is obtained. In the second place, and which is of still more importance, a path for the passage of the negative current is established as soon as the Prony brake 16 touches the stop 17, so that when a second later the current of the positive side of the battery is broken by the separation of lever 26 from stop 28 the negative impulse immediately flows to line. While this impulse is not of full strength, it is yet sufficient to prevent the condition of no current on line while it is flowing and avoid during that period the undesirable effect of such a condition at the receiver. This is much better than were it necessary, as has been the case heretofore, to wait for the reversal for the passage of the lever 26 from one to the other of its positions, since this occupies a certain length of time and extends the no-current interim to an embarrassing degree.

It will be seen that the passage of the Prony brake 16 from stop 17 to stop 18 produces the same succession of changes in reverse order as have just been described with reference to the opposite movement of the Prony brake.

The governing mechanism consists of an ordinary relay-magnet G, placed in shunt with a non-inductive resistance *x*, of which magnet G one end of the coil is connected to wire *e* and the other end to the armature-lever 30 of the magnet, which plays between front and back stops 31 32, the latter of which is connected by wire *f* to wire *e'*. Between the armature 30 and the wire *f* is a shunt containing a resistance R. The entire governing mechanism is short-circuited when the platen is in its elevated position by a circuit through the following connections: wire *g*, contact-post 24, contact 23, wire *g'*, connected with wire *e'*.

The circuit connections on the right-hand side of the transmitting instrument are precisely the same as those above described, except that the governing mechanism of that side of the transmitter is short-circuited when

the platen is in its depressed position, as shown.

The resistance of the magnet G is so adjusted that at each contact of the interrupter 15 with the contact-post 29, while the interrupter is moving with moderate frequency, the armature 30 will be attracted and the resistance R cut into the line-circuit, (assuming the platen to be depressed.) Under such circumstances, therefore, all the impulses sent to line through contact 29 will be reduced by the resistance R. The resistance R² is provided in a path completing the circuit of line b when the interrupter 15 is against its stop 33, this resistance being of such amount that only a slight current will flow through it to line, such as is normally sufficient to bias the reversing-magnet at the receiver, but insufficient to allow the escapement to operate.

The retractile spring 34 of the armature 30 and the magnet G are so adjusted that as the frequency of the interruptions increases the armature 30 will respond less promptly to the pull of the magnet, so that the successive periods during which the current on line-wire b is reduced by the resistance R are shorter, until when the interrupter reaches about half-speed the armature 30 is no longer able to respond to the short energizations of the magnet G and rests permanently against its back stop, cutting the resistance R entirely out of the circuit. The resistance R is of such amount that its reducing effect upon the current is about equal to the reducing effect of the interrupter when running at half-speed. Thus it will be seen that the reducing effect upon the current of the interrupter as it increases toward half-speed is compensated by the gradual withdrawal of the resistance R from the line until, when half-speed is reached the resistance is entirely withdrawn and the current left to operate at its full strength upon line, only reduced by the effect of the interruptions.

I secure the changes of current strength necessary to effect the supplemental operations at the receiver by short-circuiting the governing mechanism. Thus when the platen is in its elevated position the left-hand governing mechanism is short-circuited and a current of full strength sent to line b, which causes the receiving-pen to be elevated. When, on the other hand, the transmitting-platen is in its depressed position, the right-hand governing mechanism is short-circuited and the full strength of current is transmitted to the line-wire c, causing the receiving-pen to be lowered. This construction also secures a certain amount of saving in the battery-current used for moving the escapements.

Referring to Fig. 2, each line-wire on entering the receiver divides and passes to earth respectively through Morse relays N and N' and magnets C C'. The relays N N' control the paper-shifting and pen lifting and lowering circuits, as will be hereinafter described, and also perform a function with reference

to the magnets C C', as will be seen. The magnets C C' control the escapements and the reversing mechanism through two armature-levers respectively adapted to these purposes. One of these armature-levers 35 lies between stops 43 and 44. When the armature-lever 35 rests against stop 43, circuit is made through wire h, one of the coils of magnet H', and thence either through stop 41, spring 42, and lever 40 to ground or through resistance r' to ground. When the lever 35 is against the stop 44, circuit is made through wire h³ and the other coil of magnet H', and thence either through stop 55, spring 39, and lever 40 or through resistance r to ground. The position of the lever 35 is controlled by the position of the interrupting-lever 15 at the transmitter. When the latter rests against the stop 29, the full current is passed to line and the lever 35 is pulled against its stop 43, the corresponding coil of magnet H' is energized, and the armature 40, which previously rested against stop 57, is drawn to stop 56. When the lever 35 first strikes the stop 43, the current passes through the coils of magnet H' and stop 41, spring 42, and lever 40 to ground. When, however, the lever 40 changes its position in response to this impulse to that shown in the drawings, this circuit is interrupted between the spring 42 and lever 40 and shunted through resistance r'. The function of these resistances r r' is to reduce the current when the armature has reached the position of proximity to the pole of the coil to which it is attracted, in order to economize current and permit quickness of movement under the pull of the opposite coil, since, as is well known, less current is required to hold an armature in proximity to a coil than to draw it up to that position, and if the full energizing-current were left on the magnet after the armature was drawn up the magnet would become oversaturated and when the current shifted to the opposite magnet the time occupied by the de-energization of the first magnet would reduce the armature velocity toward the newly or last charged magnet.

The operation of the escapement by means of a relay is found to be advantageous for the reason that when the escapement-magnets are operated directly by line-currents, the latter should be of considerable strength in order to control the escapement, and are slow in their operation. The use of the relay organization makes possible the employment of line-currents of less strength and secures more rapid action of the escapements.

The magnets C C' are each provided with a second armature 45, pivoted in a forked extension of its core and vibrating between the two poles of a permanent magnet D D'. As the polarity of the line-currents is reversed the armature 45 is drawn to one or the other of the poles of the permanent magnet. In one position it makes contact with the stop 58 and energizes magnet X', causing the lat-

ter to draw up its armature and effect a reversal of the motion of the receiving-pen. In the other position of the armature 45 the magnet X' is deenergized and the motion of the receiving-pen again reversed.

It will now be understood why the magnets N and C and N' and C' are placed in parallel arcs. Ordinarily the armature 35 would be subject in the operation of the instrument to occasional false movements, due to the reason that a reversal in polarity of the current so weakens it momentarily as to cause the armature to fall back when the lever 15 at the transmitter is against the stop 29 and therefore the full strength of the current on line. The winding of N' is, however, so proportioned that at the moment of reversal it will give forth a counter electromotive force which will flow through the coils of the magnet C' and shorten the period of inactivity in the coils of the latter magnet at the reversal of polarity.

The resistance R³ is provided in the circuit of magnet N' and is an adjustable resistance and provided for the purpose of properly adapting the circuit of magnet N' to the coils of magnet C', so that the proper counter electromotive impulse will be given at the moment of reversal. This adjustable resistance would not be necessary were the conditions of use uniform for all instruments; but as line conditions vary according to the particular circumstances it is desirable for convenience to provide an adjustable resistance at this point. By this arrangement I am enabled to reduce the period of no magnetism in the coils of magnets C C' to the minimum. In the first place, the organization of circuits at the transmitter for reversing the current on line is such that the reversal is as nearly instantaneous as possible, and, in the second place, the period of no magnetism is reduced as far as practicable by the counter-current given off by magnet N' at the moment of reversal. It results from this that the effect of the reversal upon the magnet C' is not sufficient to permit the armature 35 to drop back; but the latter remains almost continuously on stop 43, while the transmitter-interrupter 15 is at rest on stop 29 regardless of reversals due to the Prony brake 16 and pole-changing lever 26.

The operation of raising and lowering the pen is as follows: When the transmitting-platen is in its elevated position, the left-hand governing mechanism is cut out of the line b, and in consequence the current on b is sufficient to cause the magnet N' to attract its armature 59 and close the circuit of magnet V' through battery z. The pen-rest 60 is mounted upon pivoted armature 61, common to the two coils V and V', and the energization of V' therefore elevates the pen-rest and the receiving-pen. When the transmitting-platen is on the paper, the right-hand governing mechanism is cut out of the line-wire c, and in consequence the current on the left-hand line-wire is strong enough to draw up the ar-

mature 62, close the circuit of magnet V through the battery z, and the circuit of magnet C, being at this time broken, depressing the pen-rest and dropping the receiving-pen to the paper.

When it is desired to shift the paper, the transmitting-pen is carried to the space-key and the letter depressed until the springs 67 rest upon the contact-points 50 51, when the full strength of the battery is thrown onto each line. The armatures 59 62 are then both attracted, and consequently both the magnets V V' energized, and the armature 63, which is a second armature arranged in connection with lateral pole of the magnets V V' and attracted only when both of these magnets are energized simultaneously, is drawn up. As the armature 63 strikes its front stop 64 the paper-shifter is caused to move one step, as explained in my application above referred to, and when the transmitting-pen is removed from the space-key the armature 63 falls to its back stop, again closing the circuit of the paper-shifter and causing the latter to move another step, thus completing a full normal movement of the paper. The instrument is so adjusted that when the space-key is depressed the current sent to line will be of a polarity such as to bias the receiving-pen to move to a position corresponding to that occupied by the transmitting-pen at the space-key. At the same time a break will be caused in all the escapement-circuits of magnets H H', since all these circuits pass through spring 65 on the armature-lever 63 and stop 66. The pen will therefore be free to move in the direction indicated by the polarity of the line-currents and will so move until the receiving-pen is arrested at the unison point by the usual stop.

It will be understood that I do not limit myself to the special form of construction shown in any of the details of this invention. Thus many other forms of governing mechanism may be devised without departing from the scope of my invention, and these mechanisms may regulate either the resistance of the line or the number of battery-cells or other units of electrical force employed. I intend to include in my claims any form of governor regulating the current used for the purpose indicated.

One of the many forms of governing mechanism which may be employed is shown in Fig. 5. In this a lever 91, having a tip of magnetic material, is pivoted adjacent to the interrupter-disk 13, so that it will be drawn to the disk by the teeth as the latter pass it and drop back under the pull of its spring when its tip is opposite the spaces between the teeth of the disk. A resistance R and circuit connections such that the resistance will be cut into the circuit e e' when the lever 91 is drawn up toward the disk and cut out of it in the other position of the lever are provided. The lever 91 is so placed that when its tip is opposite a tooth the lever 15

will rest against the stop 29. The spring on the lever 91 is so adjusted that as the speed of the disk 13 decreases the movements of the lever 91 away from the stop connected by the wire f will be successively shortened, and when the disk 13 reaches about half-speed the lever will cease to respond to the magnetic pull of the teeth of the disk and rest permanently against the last-mentioned stop, cutting out the resistance R from the circuit.

A second form of governing mechanism is shown in Fig. 6, in which a mechanical equivalent of the electromagnetic governor is shown. A shaft 67, mounted in a suitable support 68, carries rigidly connected to it at its upper end a gear-wheel 69 and flattened collar 70. At its lower end is splined a double-flanged collar 71, which is free on the shaft lengthwise, but is prevented from rotating by the spline. Two flat springs 72 and 73 are attached to collars 70 and 71 by hinge pin-joints. The tendency of springs 72 and 73 is to remain in a nearly straight position parallel with the shaft 67. Rigidly attached to these springs are two weights 74 and 75, preferably ball-shaped. When shaft 67 is rotated, it carries springs 72 and 73, with the weights 74 and 75, around, and the centrifugal force acting on the weights bends the springs outward, causing them to draw collar 71 upward toward the stop-collar 76, which is pinned to the shaft 67. A forked lever 77, pivoted at 78, engages with collar 71 and carries at its other end a contact-brush 79, which is arranged to make contact with the sections of a commutating-strip 80. As the weights move outward, drawing up collar 71, the outer end of lever 77 carries the brush 79 downward, making connection with the various segments of the strip 80 in succession until the collar 71 rests against the collar 76, when no further movement can take place, and brush 79 will then rest upon the last one of the segments. The gear 69 engages with a similar gear on the lower end of the shaft of the interrupter-wheel 13 of the transmitter. Now on rotating the transmitter by the movement of the pen-arm 14 the governor-weights will tend to move outward and begin drawing up the collar 71 until the speed reaches a predetermined rate, say about half of the full attainable speed, when collar 71 bears against stop-collar 76 and further increase of the speed will have no effect upon the governing device.

The electrical operation can be best understood by supposing the wire e , Fig. 1, to connect with the upper portion of the circuit, as shown, and the wire e' to connect with the lower portion. The route of the current from the pole-changer A to line is then via wires e x , lever 77, brush 79, resistance-coils 81 82 83 84 85 86 87 88 89 90 to wire e' , interrupter-lever 15, wire e^2 to line. As soon as the lever 77 is moved so that the brush moves from the first to the second segment of the strip

80 this route is changed to the extent that the resistance 81 is cut out of it. As the brush 79 continues to move downward across the segments the resistances are cut out until in the extreme position of the lever 77, corresponding to the extreme upward movement of the collar 71, all the resistances 81 to 90 are cut out of line.

The proper amount of the resistance represented by each segment depends somewhat upon the line in which the instrument is to be used, thus for a line having a resistance of twenty-five ohms to fifty ohms ten segments of five ohms each will be found about right for resistance. In any specific case the resistance can readily be adapted to the line by trial.

What I claim is—

1. The combination of a line-wire, means for causing pulsations to traverse the same, and a governor operating to change the strength of current on line to compensate the effects of changes in frequency of the pulsations, substantially as described.

2. The combination of a line-wire, means for causing pulsations to traverse the same, and a governor controlled by said pulsations and operating to change the strength of current on line to compensate the effect of changes in frequency of the pulsations, substantially as described.

3. The combination of a line-wire, a current traversing the same, an interrupter, and a governor operating to change the strength of current on line to compensate the effect of changes in frequency of the interruptions, substantially as described.

4. The combination of a line-wire, means for causing pulsations to traverse the same, and a governor operating to vary the resistance of the line to compensate the effects on the current of changed frequency in the pulsations, substantially as described.

5. The combination of a line-wire, means for causing pulsations to traverse the same, a resistance, and a governing device operated by said pulsations to switch the resistance into and out of line in accordance with the frequency of the pulsations, substantially as described.

6. The combination of a telautographic transmitting-pen, a line-wire, means for sending pulsations over said wire depending in number upon the rapidity of the movement of the transmitting-pen, and a governor operating to change the strength of the current on line to compensate the effect of changes in the frequency of the pulsations, substantially as described.

7. The combination of a telautographic transmitting-pen, a line-wire, an interrupter, the movements of which are controlled by the movements of the transmitting-pen, and a governor controlled by the pulsations sent to line by the interrupter and operating to change the strength of the line-current to

compensate the effect of changes in frequency of the interruptions, substantially as described.

8. In a telautograph, the combination of two line-wires, a transmitting-pen, a receiving-pen, means for transmitting the to-and-fro movements of the transmitting-pen into pulsations on the two lines, means for reversing the polarity of said pulsations on each reversal in direction of movement of the transmitting-pen, means operated by each reversal for reversing correspondingly the direction of movement of the receiving-pen, and means for increasing the current strength in one of said lines to lower said pen and in the other to raise it, substantially as described.

9. In a telautograph, the combination of two line-wires, a transmitting-pen, a receiving-pen, means for transmitting the to-and-fro movements of the transmitting-pen into pulsations on the two lines, means for reversing the polarity of said pulsations on each reversal in direction of movement of the transmitting-pen, means operated by each reversal for reversing correspondingly the direction of movement of the receiving-pen, a paper-shifter, and means for increasing the current strength in both of said lines simultaneously to shift the paper, substantially as described.

10. In a telautograph, the combination of two line-wires, a transmitting-pen, a receiving-pen, means for transmitting the to-and-fro movements of the transmitting-pen into pulsations on the two lines, a governor in each line operating to change the strength of the line-current in accordance with changes in the rapidity of said pulsations, and means for cutting out the governors in order to effect supplemental operations at the receiver, substantially as described.

11. The combination of a line-wire, a current traversing the same, an interrupter, a relay and a resistance in the line, the relay being so adjusted as to cut the resistance out of the circuit as the frequency of the pulsations increases and to return it to the circuit as the frequency diminishes, substantially as described.

12. In a telautograph, the combination of a receiving-pen, means for moving the same, a reversing-magnet for reversing its direction of movement, said reversing-magnet having two armatures, one polarized and operating to control the reversing mechanism, and the other unpolarized and operating to control the movements of the receiving-pen in extent, substantially as described.

13. The combination in a telautograph, of a pen-raising and pen-lowering magnet, a common armature therefor operated by said magnets alternately, a second armature operated by said magnets jointly, a paper-shifter, and connections whereby the second armature controls the paper-shifter, substantially as described.

14. The combination in a telautograph, of two magnets, mechanism for raising and low-

ering the receiving-pen operated by said magnets respectively when separately excited, a paper-shifter, and mechanism for controlling the paper-shifter operated by said magnets when jointly excited, substantially as described.

15. The combination of a receiving-pen, means for giving it a tendency to progressive movement in two angular directions, escapements for restraining the movement of the receiving-pen, magnets controlling the escapements, means for controlling the direction of movement of the receiving-pen, means for sending to line proper currents to bias the receiving-pen to move to a certain unison position, and means for interrupting the circuits of the escapement-magnets when said currents are sent, whereby the receiving-pen is left free to move to the unison position, substantially as described.

16. The combination of a receiving-pen, means for giving it a tendency to progressive movement in two angular directions, escapements for restraining the movement of the receiving-pen, magnets controlling the escapements, means for controlling the direction of movement of the receiving-pen, means for sending to line proper currents to bias the receiving-pen to move to a certain unison position, a paper-shifter, and an armature controlling the same, the circuits of the escapement-magnets being also controlled by said armature, so that when the paper is shifted the escapement-circuits are interrupted and the receiving-pen is left free to move to unison position under the influence of said biasing-currents, substantially as described.

17. The method of telautographic transmission, which consists in employing to transmit the movements in extent of the transmitting-pen a current of strength suitable for the most rapid succession of pulsations, withdrawing from the circuit a portion of said current during the slower succession of pulsations, and utilizing the current so withdrawn to effect the supplemental operations of the receiver, substantially as set forth.

18. The method of telautographic transmission, which consists in employing to transmit the movements in extent of the transmitting-pen a given current, increasing the resistance of the line during the slower succession of pulsations, and decreasing it during the more rapid succession of pulsations, and employing the current saved by such regulation for performing supplemental operations at the receiver, substantially as set forth.

19. In a telautographic transmitting instrument, the combination of the line-wire, Prony brake, the pole-changer, the battery and circuit connections as described, whereby the movement of the Prony brake closes a circuit for the transmission of a current opposite in polarity to that on line before the pole-changer is caused to operate as a result of the same movement of the Prony brake, substantially as described.

20. In a telautographic receiving instru-
ment, the combination of a magnetic escape-
ment for controlling the movements of the re-
ceiving-pen in extent, a magnet for regulating
5 the movement of the escapement dependent
for this operation upon changes in strength
of the transmitted current, and an induced
coil in parallel circuit with the last-named
magnet for reducing the effect thereon of re-

versal in polarity of the transmitted current, 10
substantially as described.

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

LEON O. MCPHERSON.

Witnesses:

JOHN HASTRONT,
W. M. DOOLEY.