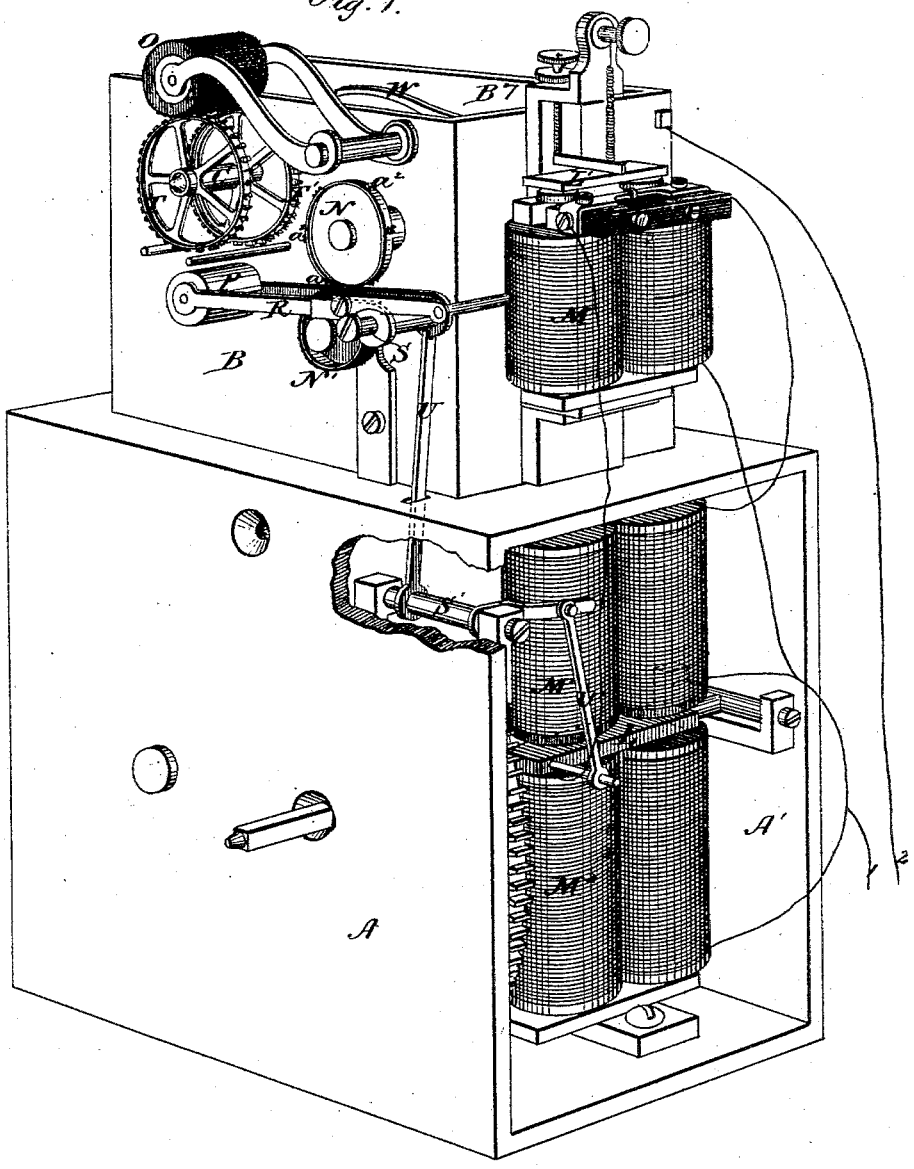
3 Sheets—Sheet 1.

G. L. ANDERS.

Printing Telegraph.

No. 210,896. **Patented Dec. 17, 1878.**

Fig. 1.



Witnesses.

David J. Hobart

Edward W. Hobart

Inventor

George Le Anders

by his attorney

Alex. L. Hayes

G. L. ANDERS.

Printing Telegraph.

No. 210,896. Patented Dec. 17, 1878.

Fig. 4.

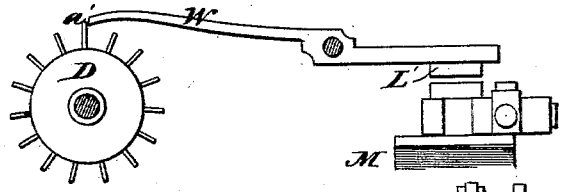


Fig. 3.

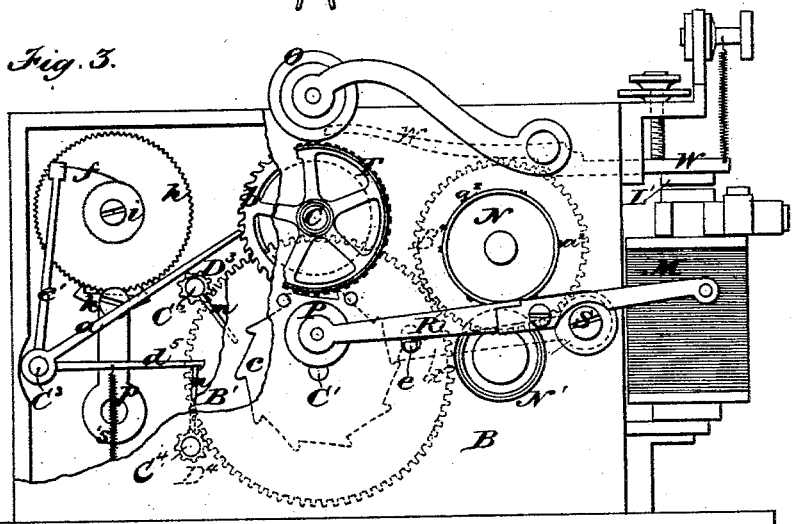
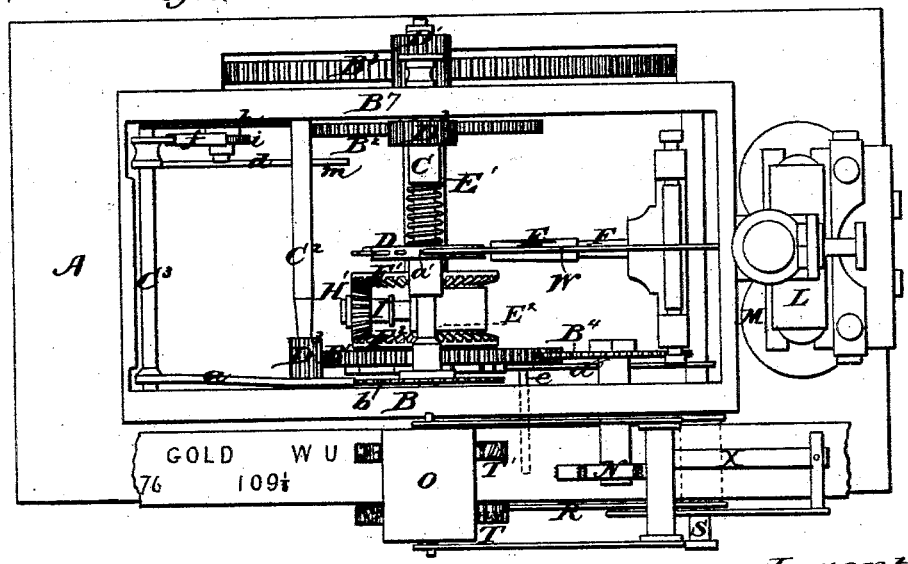


Fig. 2.



Witnesses.
David J. Hobart
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3 Sheets—Sheet 3.

G. L. ANDERS.

Printing Telegraph.

No. 210,896. **Patented Dec. 17, 1878.**

Fig. 5.

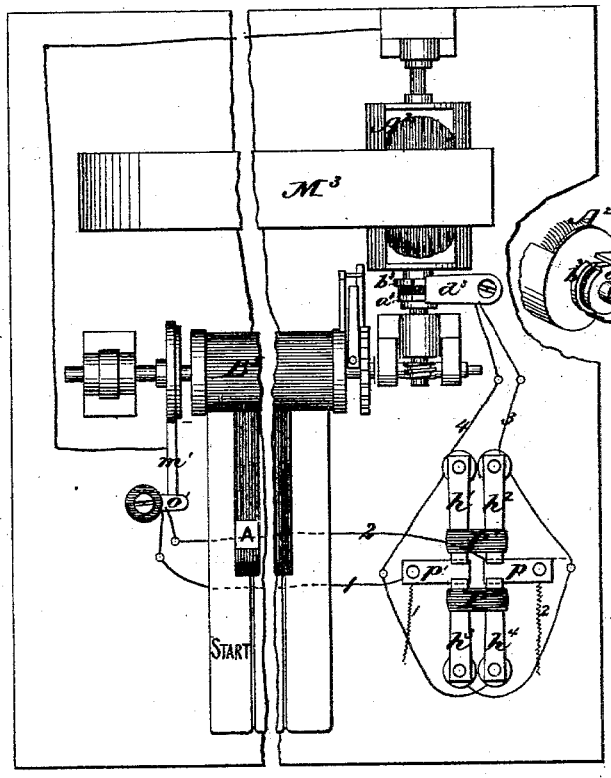


Fig. 6.

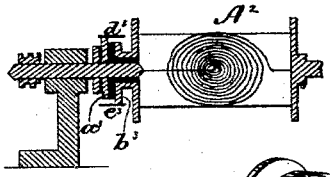


Fig. 7.

Fig. 8.

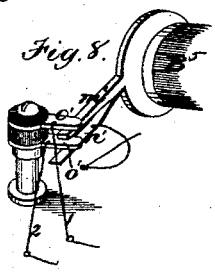
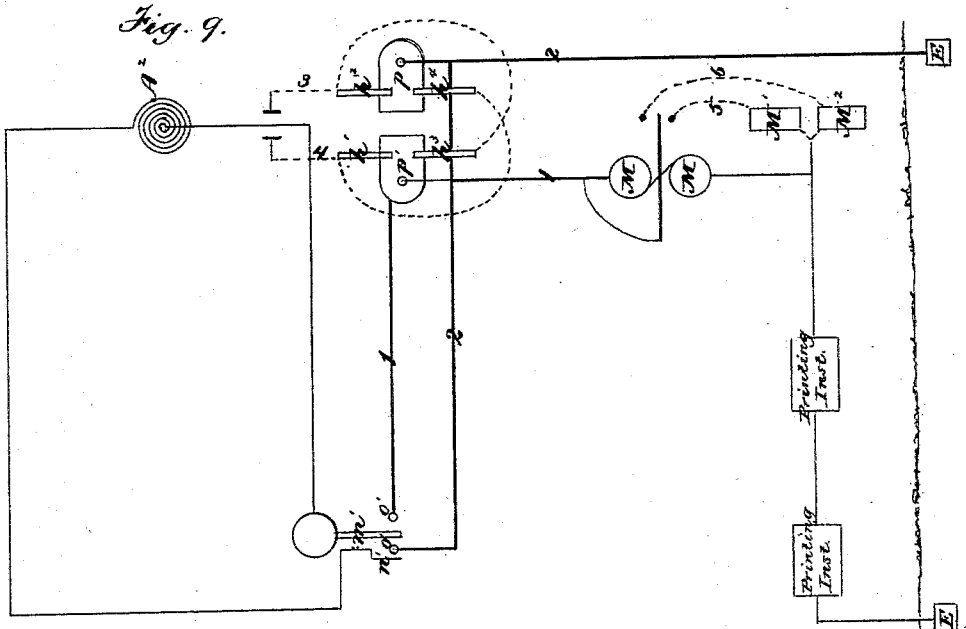


Fig. 9.



Witnesses.

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Inventor.

George Lee Anders

by his attorney

Alex. L. Hayes

UNITED STATES PATENT OFFICE.

GEORGE L. ANDERS, OF BOSTON, ASSIGNOR TO E. BAKER WELCH, OF CAMBRIDGE, MASSACHUSETTS.

IMPROVEMENT IN PRINTING-TELEGRAPHS.

Specification forming part of Letters Patent No. **210,896**, dated December 17, 1878; application filed January 23, 1877.

To all whom it may concern:

Be it known that I, GEORGE LEE ANDERS, of Boston, in the county of Suffolk and State of Massachusetts, have invented a new and useful Improvement in Printing-Telegraphs, of which the following is a full, clear, and exact description, reference being made to the drawings accompanying and forming part of this specification.

This invention relates to improvements in the class of printing-telegraphs in which the type-wheel is rotated step by step by the action of electro-magnetism, and the printing mechanism is controlled by a device operated by the type-wheel mechanism, in connection with a peculiar retarding device, fully described hereinafter, which permits the free movement of the controlling device in one direction, but retards its movement in the other direction, so that the action of the printing mechanism is automatically effected on arresting the step-by-step movement of the type-wheel, and particularly to printing-telegraphs of the class referred to used for reporting stock or market quotations, in which printing-telegraphs there are two contiguous type-wheels, which are, respectively, used for printing, as it may be desired to print either letters or figures.

In the class of printing-telegraphs referred to having the said retarding mechanism in connection with the press-controlling device, the use of a second magnet in the main-line circuit for operating the press is avoided, and, consequently, the increase or decrease in the strength of the main current, or the reversal of the said current not being required for operating the press-magnet, as has been done in printing-telegraphs in which the press-magnet is in the main-line circuit, this current can be utilized for operating other parts of the telegraph-instrument.

My improvements, therefore, consist of the combination of the type-wheel, electro-magnet, pad, and peculiar devices, fully described hereinafter, to effect automatically the printing of a strip of paper carried between the wheel and pad, the invention further consisting in certain details of construction.

In the accompanying drawings, Figure 1 is a perspective view of my improved printing-telegraph. Fig. 2 is a plan view of the same. Fig. 3 is a view of the same in elevation. Fig. 4 is a detached view of the unison device. Fig. 5 is a plan view of the magneto generator and transmitter. Figs. 6 and 7 are detached views of the commutator and shifting keys. Fig. 8 is a view of part of the transmitter. Fig. 9 is a diagram, showing the arrangement of the circuits.

In these figures the same letters refer to the same parts.

The construction and operation of the electro-magnetic device for shifting the printing-pad will first be described, it being understood that this shifting device can be applied to any form of printing-telegraphs in which the type-wheel is rotated step by step by the action of alternate positive and negative currents, and in which the action of the press is effected otherwise than by a magnet in the same main circuit as the type-wheel magnet or magnets.

Referring to Figs. 1 and 2, A A^1 is a framing supporting and inclosing the main driving-train and the shifting-magnets. B B^1 is a framing placed upon the framing A A^1, and supporting and affording bearings for the type-wheel mechanism and press mechanism. C is the type-wheel arbor; D, the escapement-wheel on said arbor; E, the escapement attached to the polarized tongue F of a Siemens polarized magnet, M.

This method of rotating the type-wheel is the same as that shown in my patent of October 28, 1873, No. 144,045.

T T′ are type-wheels; O, the inking-roller; P, the printing-pad, and N N′ the feed-rollers. The printing-pad is supported on a frame, R, which slides on the shaft S, connected by an arm, U, to the rock-shaft S′, attached by the lever U′ to the armature L between two magnets, M^1 M^2. This armature L is pivoted as shown, and when acted upon by either of the magnets M^1 M^2 will cause the printing-pad and paper to be shifted from one type-wheel to the other through the connections before referred to. Each of these magnets M^1 M^2 is placed in a branch of the main circuit, as shown in the diagram, Fig. 9, the connection with either branch being made by the polarized tongue of the type-wheel magnet, accord-

ing to the polarity of the current. While the type-wheel is being rotated under the influence of the alternate currents upon the polarized tongue, the oscillations of the tongue are so rapid that the contacts made with the branches 5 and 6 are not of sufficient duration to allow either of the magnets M^1 M^2 to become active; but when the rotation of the type-wheel is arrested the tongue will rest upon one of the contacts, according to the polarity of the last current transmitted, and the magnet connected therewith can then be excited by sending a prolonged current of that polarity, and the press will be shifted.

By sending a current in the reverse direction the armature of the type-wheel magnet will make connection with the other branch, the other magnet will be excited, and the press will be shifted in the other direction.

Instead of the magnets, as shown, a polarized magnet may be used, its armature being moved from one side to the other to effect the shifting of the press, according as the current is sent in one or the other direction. In this case there will be but one branch circuit, but two contacts.

It may be desirable to shift the type-wheels themselves instead of the press and paper. It is obvious that the same electro-magnetic device can be used to effect this result as is used for shifting the press and paper, as described.

The alternate positive and negative currents for rotating the type-wheel may be derived from a galvanic battery or from a magneto-electric machine. In case the former source of power is used, any of the well-known devices may be used for sending alternate currents and prolonging said currents; but when the magneto currents are used I prefer to use the transmitter patented by me April 4, 1871, No. 113,240, and also described and shown in my patent of November 2, 1875, Letters Patent No. 169,506.

For the purpose of obtaining polarized currents for operating the shifting device from this transmitter, I use the device shown in Figs. 5, 6, 7, 8, and in the diagram, Fig. 9. In these figures, A^2 is the revolving armature of the magneto-generator, which armature generates alternate currents by its rotation in the well-known manner. Upon the axis of this armature, as shown in Figs. 6 and 7, is placed a commutator of the well-known form, by which each of these series of alternate currents is practically converted into a single current in the same direction.

Referring to Figs. 6 and 7, a^3 and b^3 are the segments of the commutators, placed upon the axis of the armature and insulated from each other, and d^3 and e^3 are the contact-springs. Suitable keys (shown in Fig. 5, at P^1 P^2) are so connected with this commutator that the direction of the straight current taken from it can be reversed at will by closing either one of these keys. Each of these keys consists, as shown in Fig. 5 and in the diagram, of a pair of strips of metal, h^1 h^2 h^3 h^4, attached together, but insulated from each other, and connected to opposite poles of the commutator. When the keys P^1 P^2 are depressed or closed they make contact with metallic pieces p p', one connected to the line and the other to earth, wire 1 leading to line and wire 2 to earth; and these contact-plates are also connected to the arms m' n' of the transmitter by the contact O^1 O^2, as shown in Fig. 8 and the diagram.

The mechanical operation of this transmitter having been fully described in the patents before referred to, it need not here be described.

While the transmitter is operating and the keys P^1 P^2 are open, alternate currents will be sent to the line in the usual manner; but when the transmitting-cylinder B^5 is stopped on ceasing to rotate the type-wheel, but the armature of the generator kept rotating, a prolonged current in either direction may be sent by the depression of the proper key.

If the key P^1 is closed the current will pass from the commutator-spring e^3, strip h^1, wire 4, plate p', wire 1 to line, thence through one of the magnets M^1 M^2 to earth, and thence through wire 2 to plate p, strip h^2, wire 3, and commutator-spring d^3. If key P^2 is closed, the current will pass from the commutator-spring e^3 by wire 4, strip h^4, wire 2 to earth, thence to line through one of the magnets M^1 M^2, and through plate p', strip h^3, wire 3 to the commutator-spring d^3.

It will thus be seen that the direction of the current through the type-wheel magnet is different for each key, and, consequently, by means of the magnets M^1 M^2 the press-pad may be shifted from one wheel to the other by closing the circuit alternately on the keys P^1 P^2.

The pole-changer or commutator which I have thus described in combination with a magneto-generator and transmitting-instrument, operates, in connection with the magneto-generator, to continue pulsations of the same polarity upon the line after the transmitting mechanism is arrested by a key; but as such combination is well known I do not claim the same as novel.

Figs. 2 and 3 show the type-wheel mechanism and press mechanism. The trains driving the type-wheel and moving the press device derive motion from the same main train, and are connected by an epicyclic gear, described and claimed in another application for a patent filed by me.

B^3 is the gear-wheel of the main driving-train. C^1 is an arbor-bearing in framing B^1 B, and having upon it a pinion, D^1, which gears with the wheel B^3. Attached to the arbor C^1, at right angles thereto, is an arm, I, upon which, as a bearing, is the beveled pinion H′, which gears with two bevel-gears, F^1 F^2, opposed to one another. These bevel-gears are attached, respectively, to sleeves E^1 E^2 upon the arbor C^1, and upon each of these sleeves are fixed the gear-wheels B^1 B^2. The gear-wheel B^2 is connected, by a pinion, D^2, with the type-

wheel arbor C, and the gear-wheel B^1 gears into the arbor C^2 C^3 of the press-escapement by means of the pinions D^3 D^4.

By this arrangement of gearing, when the movement of the press mechanism is prevented by its escapement, the power of the main driving-train will operate the type-wheel arbor through the pinion D^1, arbor C^1, arm I, beveled pinion H′, bevel-gear F^1, gear-wheel B^2, and pinion D^2; and when the press-escapement releases the press mechanism and the type-wheel escapement holds the type-wheel arbor, the power of the main driving-train will operate the press through the pinion D^1, arbor C^1, arm I, beveled pinion H′, bevel-gear F^2, gear-wheel B^1, and ratchet-wheel *c*.

The printing-pad is shown at P in Fig. 3, and the mechanism for moving this printing-pad consists of a ratchet-wheel, *c*, attached to the sleeve of the gear-wheel B^1, and a lever, *d*, pivoted on the inside of the frame-plate B, the end of which lever bears against the ratchet-wheel, so that the lever is raised by the teeth of the ratchet-wheel when the latter rotates. A pin, *e*, projects through the plate B and raises the lever R, upon the end of which is fixed the printing-pad, when the lever *d* is raised by the ratchet-wheel.

The retarding device used in connection with the press-controlling device for causing the action of the press when the rotation of the type-wheel is arrested is constructed as follows: Fixed upon the type-wheel arbor C is a wheel, *b*, provided with teeth or pins. C^3 is a rock-shaft, properly supported in the frame B B^1, and *a* is an arm attached thereto, the end of which arm rests upon the teeth or pins on the wheel *b*, so that as these teeth or pins are successively presented to the end of the arm *a* on the rotation of the type-wheel the said arm and rock-shaft will be rotated. e^1 is another arm, also attached to the rock-shaft and rotating with it, the end of which arm is provided with a spring-pawl, *f*. *h* is a serrated disk mounted on an axis in the frame-plate B^1, and *i* is a toothed wheel upon the arbor of this disk. *p* is a pendulum pivoted to the frame B^7, and *k* is an anchor-escapement attached to it, which bears against the periphery of the serrated disk, so that when this disk rotates it will cause the pendulum to oscillate, and by the action of the escapement the disk will be prevented from rotating except at the rate determined by the time required for the pendulum to make its oscillations.

The pawl *f* acts upon the toothed wheel *i* to rotate the disk when the arm *e* moves in one direction, but slips over the toothed wheel when the arm moves in the other direction.

Attached to the rock-shaft is another arm, d^5, to which is attached a spring, *s′*, which has a tendency to draw the arm down when raised up by the action of the teeth of the wheel *b* on the arm *a*. When the teeth on the wheel *b* strike against the end of the arm *a* the end of the arm is raised up, the rock-shaft is moved, and the spring-pawl glides over the teeth of the wheel *i* without rotating it; but when the end of the arm escapes from the pin or tooth on the wheel *b* and commences to drop down, the pawl *f* will act upon the toothed wheel *i*. But, for the reason that the rotation of this wheel is retarded by the action of the pendulum, the arm *a* will have time to move only a short distance before it is again elevated by the presentation to it of the next succeeding tooth or pin on the wheel *b*. When the arm is allowed to drop or fall its full distance, the press mechanism is released, but not until then, and consequently as long as the type-wheel rotates the press will be prevented from acting.

The use of an oscillating escapement in the combination described is an important feature of my invention, as, owing to its character, it is thrown into operation the instant the arm *a* begins to fall, and operates continuously and uniformly so long as the arm continues to descend—a result which I have found this character of escapement to be especially adapted to effect, as in other forms the time required to set them in operation is a serious obstacle to their use in this connection.

The press-escapement consists of the arbors C^2 C^4, mounted on the framing B B, one above the other, and driven by the wheel B^1 by means of the pinions D^3 D^4. Each of these arbors has an arm attached to it, (shown at *m n*,) the arm *m* extending downward, and arm *n* extending upward, so that the ends of these arms nearly meet.

Between the ends of these arms plays the arm d^5 upon the rock-shaft C^3, and when the arm d^5 is drawn down by the spring to the position shown in Fig. 3, the arm *n* will strike against the lip on the under side of the arm d^5, so that the revolution of the said arm will be prevented and the press mechanism held fixed; and when the arm d^5 is elevated by the action of the pins or teeth of the wheel *b* on the arm *a*, the arm *m* will be prevented from moving by striking the end of the arm d^5, and the press mechanism will be held.

The position of *m* and *n* in relation to each other is such that while the arm d^5 is passing between *m* and *n* and the press-train is free to move, it will be able to move the distance of one tooth on the ratchet-wheel *c*, and the press will be moved once.

Instead of the above-described escapement any other suitable form of escapement may be made use of which will accomplish the same result—as, for instance, the escapement shown in my patent of October 28, 1873, before referred to.

The feeding mechanism for feeding the paper strips after making an impression is shown in Figs. 1, 2, and 3. It consists of two wheels, N N′, between which the strip of paper is placed. The roller N is placed on the arbor of the toothed wheel B^4, (shown in dotted lines in Fig. 3,) which gears with the wheel B^1, so that the wheel or roller N rotates a short distance after each impression.

The surface of the roller N consists of alter-

nate toothed surfaces a^2 a^2 and depressed smooth surfaces. When the paper is being fed the rough surfaces are in contact with the paper, but the paper is only shifted when the smooth surface of the roller is in contact with it.

The unison mechanism is shown in Figs. 2, 3, and 4. It consists of a tooth, a^1, on the escape-wheel of the type-wheel arbor, longer than the other teeth of the wheel, and a lever, W, pivoted in the framing, and having attached to one end a piece of soft iron, which forms an armature for the type-wheel magnet.

When the escape-wheel rotates, the long tooth will strike against the end of the lever W, and consequently the movement of the type-wheel will be stopped until a stronger current than usual is sent through the type-wheel magnet, when the armature will be attracted and the tooth released. This strong current can be sent periodically at regular intervals by a suitable device in connection with the transmitter, and thus all the instruments on the line can be kept in unison.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

1. In a printing-telegraph having two contiguous type-wheels rotated step by step by the action of alternate positive and negative currents, an electro magnet or magnets for shifting the printing-pad and paper strip, or for shifting the type-wheels connected to the line by the movement of the armature of the type-wheel magnet or magnets, substantially as and for the purpose described.

2. In a printing-telegraph having two contiguous type-wheels rotated step by step by the action of alternate positive and negative currents, an electro magnet or magnets for shifting the printing-pad and paper strip, or for shifting the type-wheels, operating to shift in one direction by a prolonged current of one polarity, and in the other direction by a prolonged current of opposite polarity, substantially as and for the purpose described.

3. In a printing-telegraph having two contiguous wheels rotated step by step by the action of alternate positive and negative currents, the combination, with the type-wheel magnet or magnets, of two electro-magnets operating mechanism for shifting the printing-pad and paper strip, or the type-wheels when excited by a prolonged current, as described, one magnet shifting in one direction and the other magnet shifting in the other direction, and each placed in a branch of the main-line circuit, which branches are respectively connected to the line as the type-wheel magnet or magnets is influenced by a positive or negative current, substantially as and for the purpose set forth.

4. The combination, substantially as set forth, of a main driving-train, mechanism for rotating a type-wheel or type-wheels, mechanism for moving the printing-pad to effect an impression, and a specific gearing connecting said mechanisms, so that both are driven by the said driving-train when the action of mechanism rotating the type-wheel or type-wheels is controlled by electro-magnetism, so that a step-by-step rotation is given, and the mechanism moving the printing-pad is controlled by a device operated by the type-wheel mechanism, in connection with a retarding device which permits the free movement of the controlling device in one direction, but retards its movement in the other direction, whereby the action of the printing-pad is automatically effected on arresting the step-by-step movement of the type-wheel or type-wheels.

5. A unison device acting to stop the type-wheel at each revolution, and released by a periodic variation in the strength of the line-current, substantially as and for the purpose set forth.

6. A printing-telegraph having two contiguous type-wheels rotated step by step by the action of alternate positive and negative currents controlling mechanism driven by a main driving-train, and connected to the type-wheel mechanism by epicyclic gearing, substantially as described, having its press mechanism driven by the same driving-train, and controlled by a device operated by the type-wheel mechanism in connection with a retarding device, acting as described, to cause the printing to be automatically effected on the arrest of the step-by-step movement of the type-wheel, and having a mechanism for shifting the printing-pad and paper strip or the type-wheels, operated by a prolongation of the main-line current, substantially as and for the purpose described.

7. A printing-telegraph having its type-wheels rotated step by step by the action of alternate positive and negative currents, having its printing mechanism controlled by a device operated by the type-wheel mechanism, in connection with a retarding device, as described, so that the action of the printing mechanism is automatically effected on arresting the step-by-step movement of the type-wheel, and having a unison device operated by a periodic increase of the main-line current.

8. The combination, in a printing-telegraph, of a type-wheel or contiguous type-wheels rotated step by step, a press or type-wheel shifting device, and a unison device, all separately and independently operated by the direct action of the main-line current, with mechanism for moving the printing-pad to effect an impression, operated automatically on arresting the step-by-step movement of the type-wheel or type-wheels.

9. The combination of the magnets M^1 M^2, when arranged and connected to the line as described, with the pivoted armature L and press-shifting mechanism operated thereby, substantially as and for the purpose described.

10. The combination of the printing-pad P, frame R, levers W W′, rock-shaft armature L, and magnets M^1 M^2, substantially as and for the purpose described.

11. The combination of an escapement-wheel having one tooth longer than the others with the lever W, armature L′, and type-wheel magnet M, substantially as and for the purpose described.

12. A feed-roller having alternate smooth and serrated surfaces, substantially as and for the purpose described.

13. The combination of a toothed wheel, *c*, lever *d*, pin *e*, and press-frame R, substantially as and for the purpose described.

14. The combination, with the magneto-transmitter, of the commutator, keys P^1 P^2, and their connections, for sending a continued current of the line of either polarity, substantially as and for the purpose described.

15. The combination, in a printing-telegraph, of a printing-wheel controlled from a polarized magnet to rotate step by step, and a power-press mechanism provided with an oscillating escapement, which prevents the press from acting except when the succession of currents through the type-wheel magnet is suspended, substantially as set forth.

In testimony whereof I have signed my name to this specification in presence of two subscribing witnesses.

GEORGE L. ANDERS.

Witnesses:
DAVID J. HOBART,
CHARLES W. HOBART.