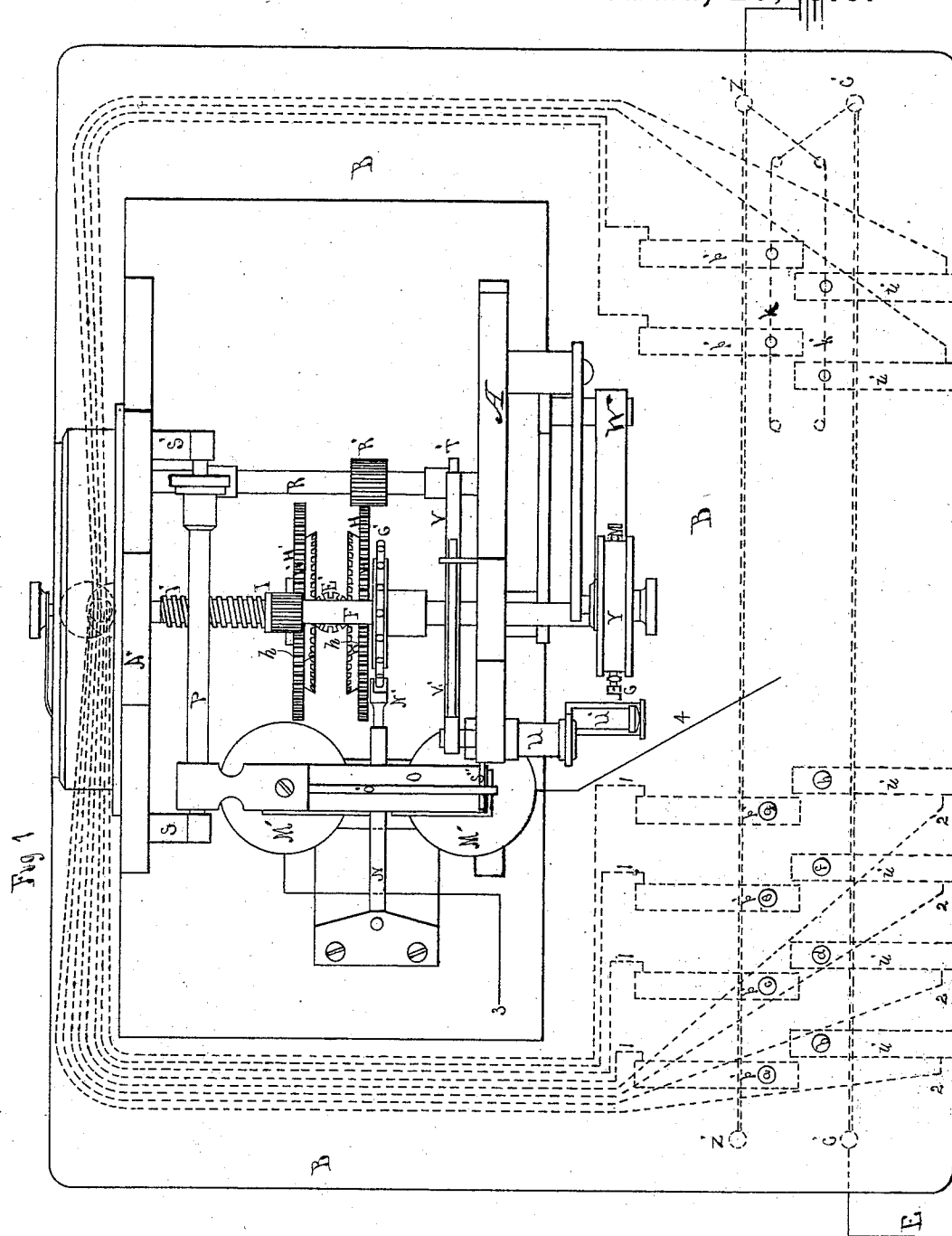


G. L. ANDERS.
Printing-Telegraph.

No. 215,551.

Patented May 20, 1879.



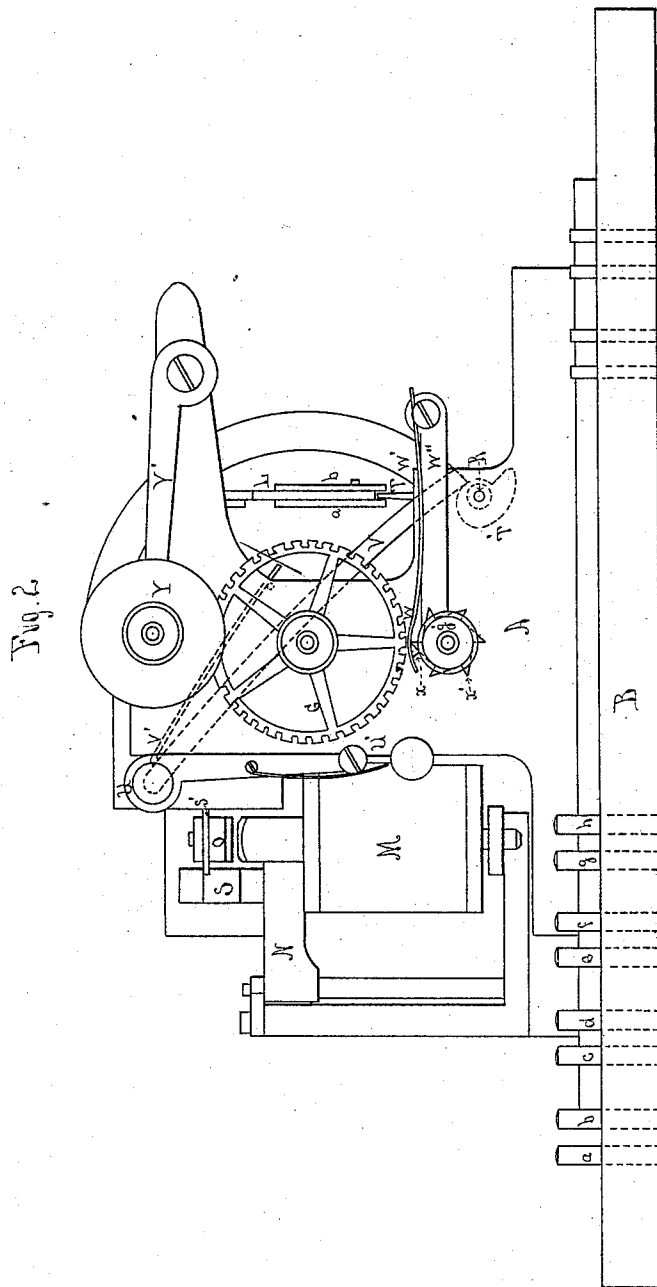
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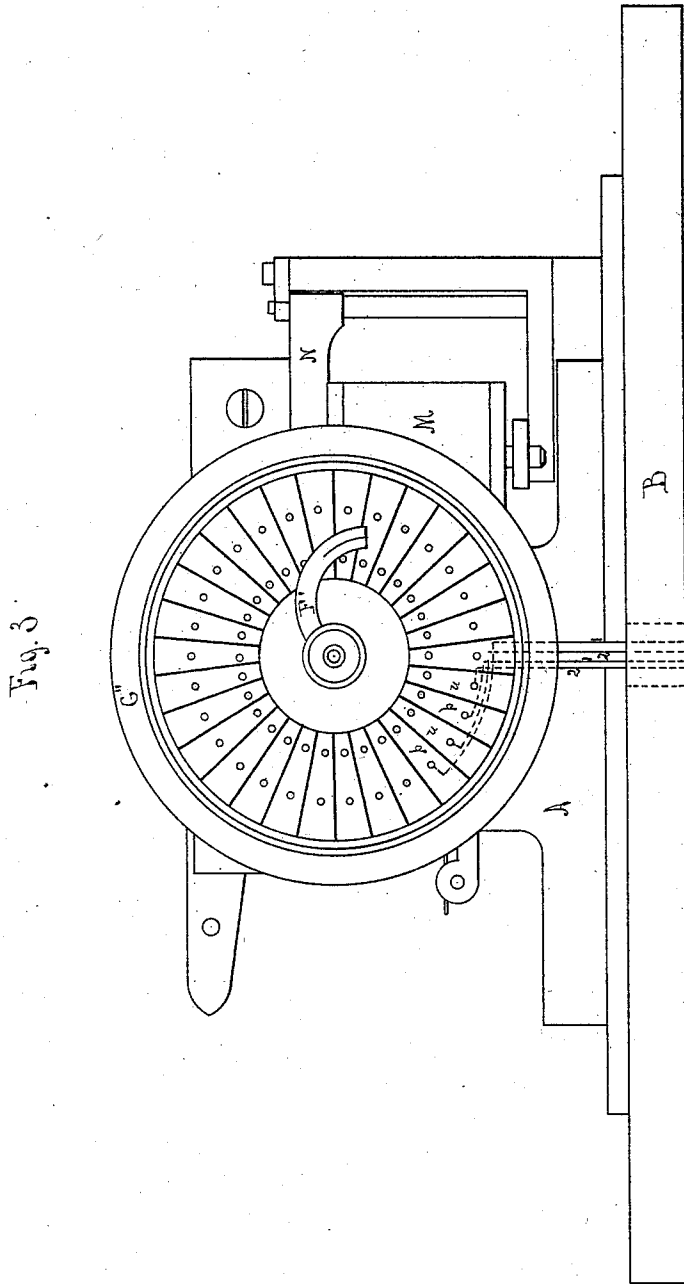
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Fig. 4

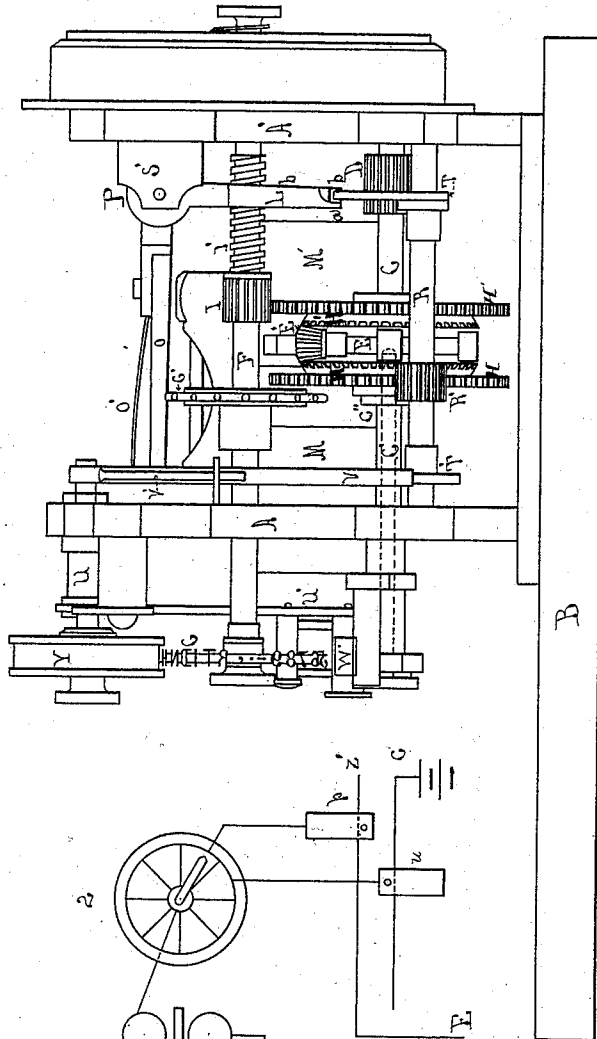
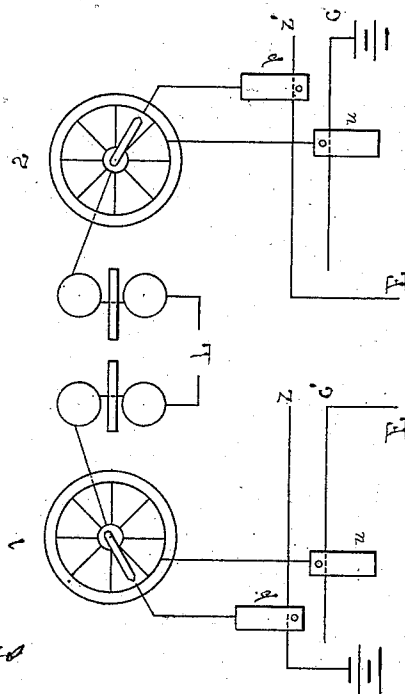


Fig. 5



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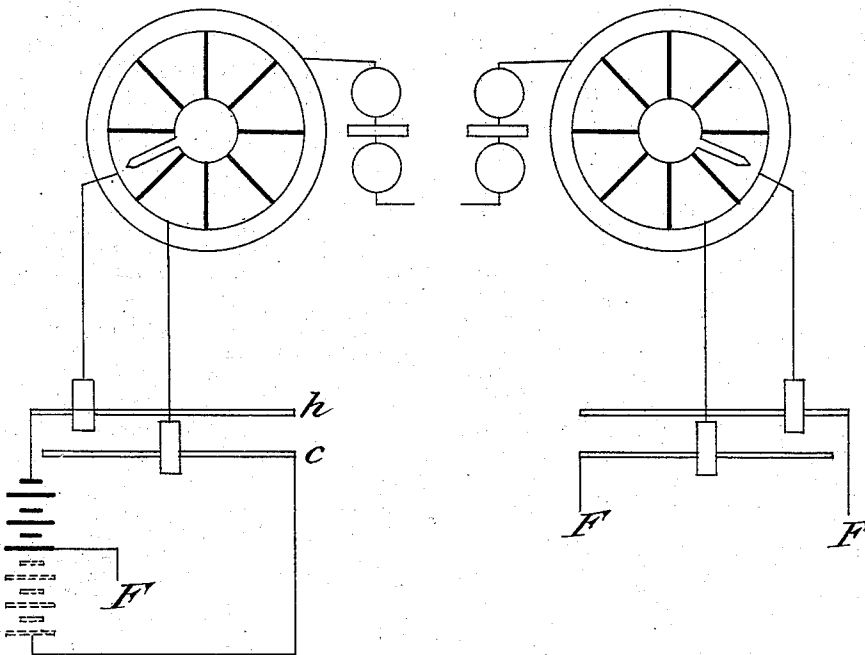
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Fig. 6.



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

IMPROVEMENT IN PRINTING-TELEGRAPHS.

Specification forming part of Letters Patent No. **215,551**, dated May 20, 1879; application filed June 1, 1874.

To all whom it may concern:

Be it known that I, GEORGE L. ANDERS, of Boston, in the county of Suffolk, State of Massachusetts, have invented certain new and useful Improvements in Printing-Telegraph Instruments, of which the following is a full, clear, and exact description, reference being had to the drawings accompanying and forming part of this specification, in which—

Figure 1 is a plan view of the instrument, showing the straight key-board and its connections in dotted lines. Fig. 2 is a front view, in elevation, showing the type-wheel and its accessory devices. Fig. 3 is a back view, in elevation, showing the face of the circuit-wheel. Fig. 4 is an end view, in elevation, and Fig. 5 is a diagram showing the manner in which the instruments are connected at terminal stations. Fig. 6 is a diagram showing the connection and arrangement of the circuits when the instruments are connected to a divided battery at the same station.

Similar letters refer to similar parts throughout these several views.

This invention relates to certain improvements in that class of printing-telegraphs in which a "step-by-step" movement is given to the type-wheel by the action of alternate positive and negative currents upon a magnet to whose armature is attached an escapement, which moves the type-wheel or controls its movement, and in which the circuit through the said magnet is connected to a range of circuit-breakers controlled by finger-keys corresponding to the letters upon the type-wheel by means of an arm, or its equivalent, rotated isochronously with the type-wheel, and traversing the face of a disk composed of conducting-segments insulated from each other, and each connected to one of the circuit-breakers, and in which the printing is effected by the action of a magnet operating on breaking or prolonging the current at the key corresponding to the letter to be printed.

The invention consists, first, in connecting the polarized or type-wheel magnets of two instruments at opposite stations to each other through a self-acting contact-arm at each instrument traversing the face of a "sunflower-

disk" composed of a series of metallic segments insulated from each other, and connected alternately to the opposite poles of a divided battery through suitable circuit-breakers, as hereinafter more fully set forth, whereby the reversal of the current is automatically effected as long as the circuit remains closed, and, moreover, the two instruments are kept in unison; second, in connecting the main driving-train with the train which causes the rotation of the type-wheel and the train which operates the printing mechanism by an epicycloidal gearing, whereby these trains, though driven by the same motor, act independently and separately.

In the accompanying drawings, A A' are two vertical plates of metal, which form the back and front sides of the instrument, and are supported upon a suitable base-board, B. C is the main driving-arbor, and D is a pinion on the same, which connects it to the driving-barrel, which is not shown in the drawings. One end of this arbor C bears in the side A' of the instrument, and the other end bears in the end of an arbor, C', which extends through a sleeve, C'', and the other side, A, of the instrument. Upon this end of the arbor C, and at right angles thereto, is an arm, E, having at its extremity a beveled pinion, E'. H H' are two gear-wheels provided with crown-gear *h h'* on their inside faces opposite to each other. One of these wheels, H, is attached to a shaft, C', running in the sleeve C'', and the other wheel, H', turns loosely upon the shaft C. The beveled pinion E' gears with the wheels H H', moving both if both are free, but if one wheel is held fast rolling over the face of that wheel and communicating motion to the other.

F is the type-wheel arbor, which is supported between the plates A A'. G is the type-wheel, of the usual form, on the arbor F, and G' is a toothed escape-wheel, of the usual construction, mounted on the arbor F, and I is a pinion on the arbor, which gears with the wheel H, and communicates the movement of the driving-train to said arbor.

The pinion I is attached to the arbor F by a helical spring, I', so that the pinion I is permitted to have a limited loose motion on its

arbor, thereby taking up the momentum of the train and insuring the rapid action of the type-wheel.

M M' is a polarized magnet of the usual and well-known construction, and N is its polarized armature, having attached thereto the escapement N', which engages with the escape-wheel G' upon the type-wheel arbor. O is a soft-iron armature placed over the poles of the magnet M M', and attached at one end to the rock-shaft P, which has its bearings in projections S S' extending from the inside of the vertical plate A'. When the attractive force of the magnet ceases the armature O is withdrawn from the magnet by the force of the flat spring O', which is attached at one end to the armature, and at the other end rests upon a pin, S'', extending out from the vertical plate A. L is an arm attached to the rock-shaft P, and projecting downward at right angles to the same. This arm has two pallets, *a* and *b*, secured to it on opposite sides thereof, and arranged in the manner as will hereinafter be described, so that they form an escapement for the printing mechanism.

R is an arbor supported at each end in the vertical plates A A', and R' is a pinion on the arbor, which engages with the gear-wheel H, and communicates the movement of the motor-train to the arbor. T is an arm attached at a right angle to the arbor R, and of such a length that its end will bear against the extremity of the arm L, thereby preventing the arbor R from rotating, and consequently preventing the rotation of the wheel H and arbor C'. T' is a cam on the arbor R, and V is a lever attached at one end to a rock-shaft, U, bearing on the upper part of the vertical plate A, and at the other end resting upon the cam T'. To the rock-shaft is attached the feed-lever U', which carries a feeding-clamp for moving the strip of paper similar to that which I have described in a former patent. V' is a spring bearing against the lever V. W' is a flat spring, carrying on one extremity the printing-pad W, and at the other end secured to an arm, W'', attached at right angles to the sleeve C'' on the outside of the vertical plate A. X is a projection or cam under the printing-pad, against which the teeth X' X' of the wheel g', mounted on and turning with the arbor C', bear, so that as each tooth passes under the projection X the printing-pad will be forced against the type-wheel.

The leaves of the pinion R' are in such a ratio to the teeth of the gear-wheel H that the arbor R will make a complete rotation while a tooth or cam on the wheel g' is passing under the printing-pad.

Y is the inking-roller, and Y' the swinging arm supporting the same.

G'' is a circuit-closing disk of the well-known form, fastened to the outside of the vertical plate A', and composed of a series of metallic segments, *p u*, insulated from each other and from the type-wheel arbor, which passes through the center of said disk.

F' is a metallic arm attached to the type-wheel arbor and rotating with it, the end of which arm traverses the face of the circuit-closing disk.

The plan view in Fig. 1 shows the straight key-board which is used with this instrument. It consists of a row of spring or lever keys, *p' u'*, which bear against the strips of metal *z' c'*, which extend longitudinally under the key-board, and to which the keys are connected in alternate series. One of these strips is connected to the main battery at the station, and the other is connected to the earth, as shown in Fig. 1; but, as shown in Fig. 5, the connections are different at the two opposite stations, the battery at station 1 being connected by its positive pole to the strip *z*, and the battery at station 2 being connected by its negative pole to the strip *c*. Another plan is to use only one battery, but divide it into ten parts, and connect the center to the earth. In this arrangement the strips *z* and *c*, at station 1, are connected respectively to the positive and negative poles of the divided battery, and the strips *z' c'*, at station 2, are each connected to the earth.

To the springs *p' u'* are attached knobs *a b c*, marked with the letters of the alphabet, and by means of these knobs the springs or levers are depressed, and connection with the conducting-strips broken. Each of the springs *p'* is in connection, by a wire, 1, with a segment, *p*, of the circuit-wheel, and each of the springs *u'* is in connection, by a wire, 2, of a segment, *u*, of said wheel.

The circuit is as follows: Supposing the arm F' of each instrument to be upon a positive segment of the circuit-wheel, the current will then pass from the positive pole of the battery M B, at station 1, to the conducting-strip *z'*; thence, by one of the springs *p'* and its connecting-wire 1, to the corresponding segment in contact with the arm F'; thence, through the type-wheel arbor, to the wire 3; thence, through the polarized magnet and wire 4, to the line; thence, through the circuit wheel and magnet of the other instrument, to its strip *z*, and thence to earth.

If the arms be upon a negative segment of the corresponding circuit-wheels, the course of the current will be reversed, and it will pass from the negative pole of the main battery at station 2 to the strip *c'* of the key-board of the instrument at that station, thence through the instrument to the line, thence through the instrument at station 1 to the strip *c*, and thence to earth.

When the instruments are at rest, the type-wheel magnets are thrown out of circuit by a switch in the usual manner; but when the switch is closed the current will pass as before explained, the magnets will be excited, and their armatures will vibrate. This movement will allow one tooth of the escape-wheel on the type-wheel arbor to escape. The arbor will rotate, moving the type-wheel one letter and the arm F to the next segment of the cir-

cuit-wheel. As before explained, the current will now be reversed, and the armatures will vibrate to the opposite poles of the magnets, and the type-wheel will again rotate one tooth, and this automatic action will continue as long as the switch is closed, causing the rapid rotation of the type-wheel.

If now it is desired to print a letter, the spring corresponding to that letter is pressed down by its knob, and connection with the battery is interrupted at that point, so that when the arm F' in its rotation reaches the segment corresponding to and connected with the depressed spring, the circuit will be broken, and the rotation of the type-wheel will be arrested.

The letters upon the type-wheel are arranged in such relation to the the segments of the circuit-wheel that when the type-wheel stops the letter corresponding to the depressed key will be over the printing-pad.

The printing is effected as follows: On the interruption of the currents in the type-wheel magnet the soft-iron armature O, which was held down by attraction, is released. The rock-shaft P will oscillate, moving the arm L, and withdrawing the pallet *b* on the arm L from the end of the arm T. The motion of the wheel H' having been arrested by the arrest of the type-wheel, the bevel-gear wheel E' will roll over the face of the wheel H', and will communicate motion to the toothed wheel H, thence to the arbor C' and toothed wheel *g'*, and to the pinion R' and arbor R.

The arbor R will now rotate once until the arm T strikes against the pallet *a* on the arm L, and the wheel *g* will move one tooth, thereby operating the printing-pad and effecting the impression of the letter on the paper strip and the cam T', at the same time rotating once, will operate the lever V and rock-shaft U, and cause the feeding-clamp to draw the paper strip the proper distance after the feeding has been effected.

When the key is released the circuit will again be closed, and the armature O will be attracted, causing the oscillation of the shaft P and releasing the end of the arm T from the pallet *a*, but arresting it by contact with the pallet *b*, so that the train will again act upon the type-wheel arbor.

Instead of effecting the printing by breaking the circuit and releasing the armature O, this printing may be effected by prolonging either of the currents and attracting the armature, which is provided with a retracting-spring of sufficient strength to resist the attraction due to the magnetism derived from the rapid alternating currents in the polarized magnet, but not of sufficient power to hold the armature if either of these currents is prolonged.

The prolongation of the current is effected when a key is depressed by means of the arrangement of the additional conducting-bars *k* *k'*. (Shown in the plan view in Fig. 1.) These

bars are arranged in such a manner that when the key is depressed and leaves the bar *c'* or *z'* it comes in contact with *k* or *k'*, and the reversal of the current by the circuit-wheel is thereby prevented. The rotation of the type-wheel is consequently arrested, and the prolonged current in the polarized magnet will cause the attraction of the soft-iron armature and the printing will be effected.

I am aware that it is not new to effect an automatic transmission of currents in a printing-telegraph instrument by means of a segmental disk with suitable connections, as this is found in the patent to Moses G. Farmer, July 22, 1856, No. 15,373, where an automatic make and break is effected by a system of circuits and the use of a segmental disk, which differ from the system which I use in that they produce currents in the main circuit in one direction only.

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

1. A divided battery having its opposite poles connected alternately, through suitable circuit-breakers, to the segments of a sunflower-disk, in combination with a self-acting contact-spring traversing the sunflower-disk and acting to complete the circuit, substantially as and for the purpose set forth.

2. In combination with the conducting-strips *z'* *c'* and their respective ranges of circuit-breakers and keys, the conducting-strips *k* *k'*, arranged and connected substantially as and for the purpose set forth.

3. In a printing-telegraph, two trains independently and separately operating to rotate the type-wheel and move the printing mechanism, respectively connected to the main driving-train by epicycloidal gearing, as described, and each operated by said main train, substantially as and for the purpose set forth.

4. The combination of the magnet M M', polarized armature N, escapement N', escape-wheel G, type-wheel arbor F, pinion I, wheel H, pinion E', arm E, arbor C, and pinion D, substantially as and for the purpose set forth.

5. The combination of the magnet M M', armature O, arbor P, arm L, arm T, arbor R, pinion R', wheel H, and arbor C', substantially as and for the purpose set forth.

6. The combination of the wheels H H', arbor C, arm E, beveled pinion E', and arbor C', substantially as and for the purpose set forth.

7. The combination of the magnet M M', armatures N and O, escapement N', escape-wheel G, type-wheel arbor F, pinions I, E, D, and R', arbors C, C', P, and R, arms E, T, and L, and wheels H and H', substantially as and for the purpose set forth.

GEORGE LEE ANDERS.

Witnesses:

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L. C. DUNTON.