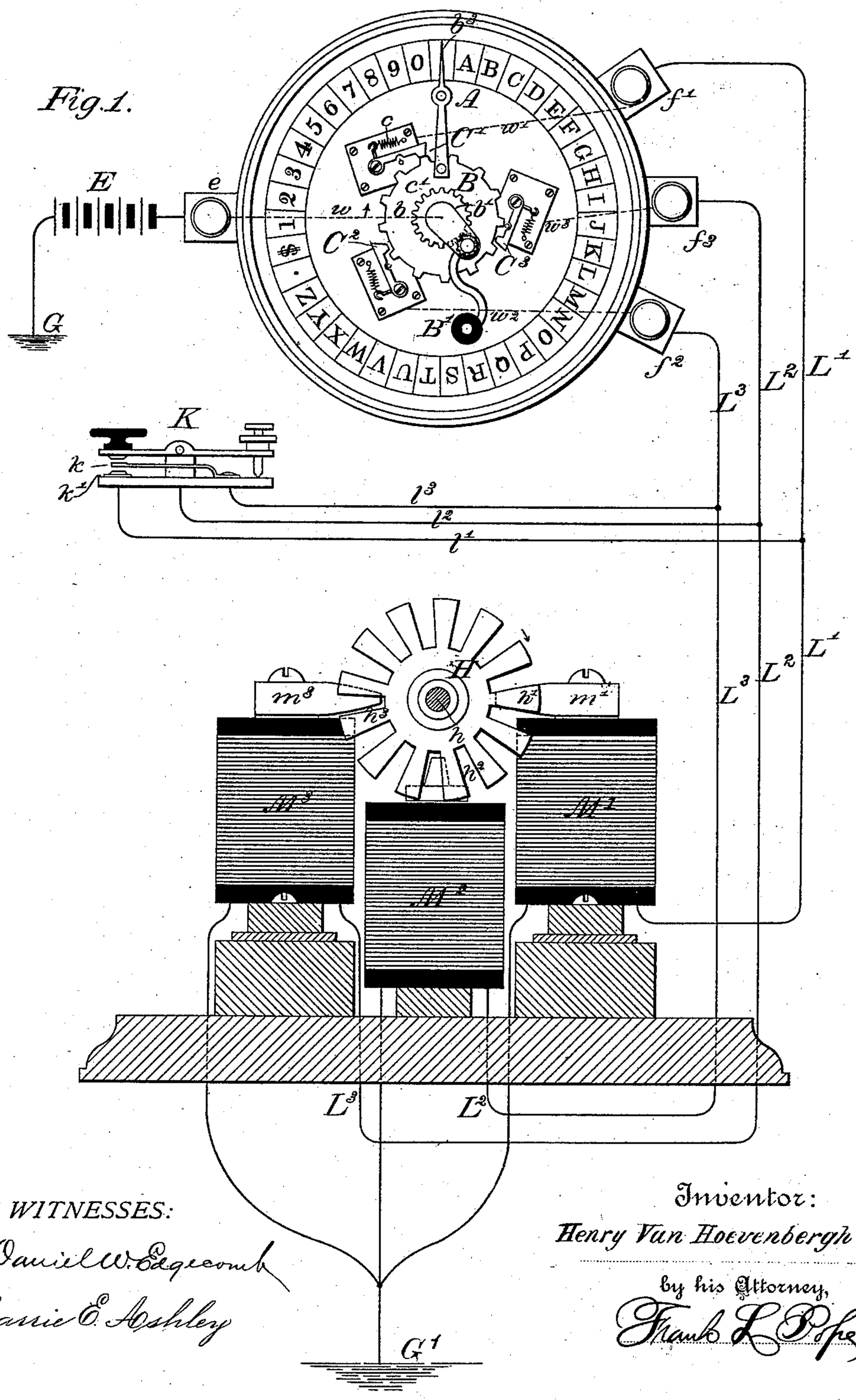
(No Model.) 2 Sheets—Sheet 1.

H. VAN HOEVENBERGH.

PRINTING TELEGRAPH.

No. 286,977. Patented Oct. 16, 1883.

Fig. 1.



WITNESSES:

Daniel W. Edgecomb

Carrie E. Ashley

Inventor:

Henry Van Hoevenbergh

by his Attorney,

Frank L. Pope

(No Model.) 2 Sheets—Sheet 2.

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Fig. 2.

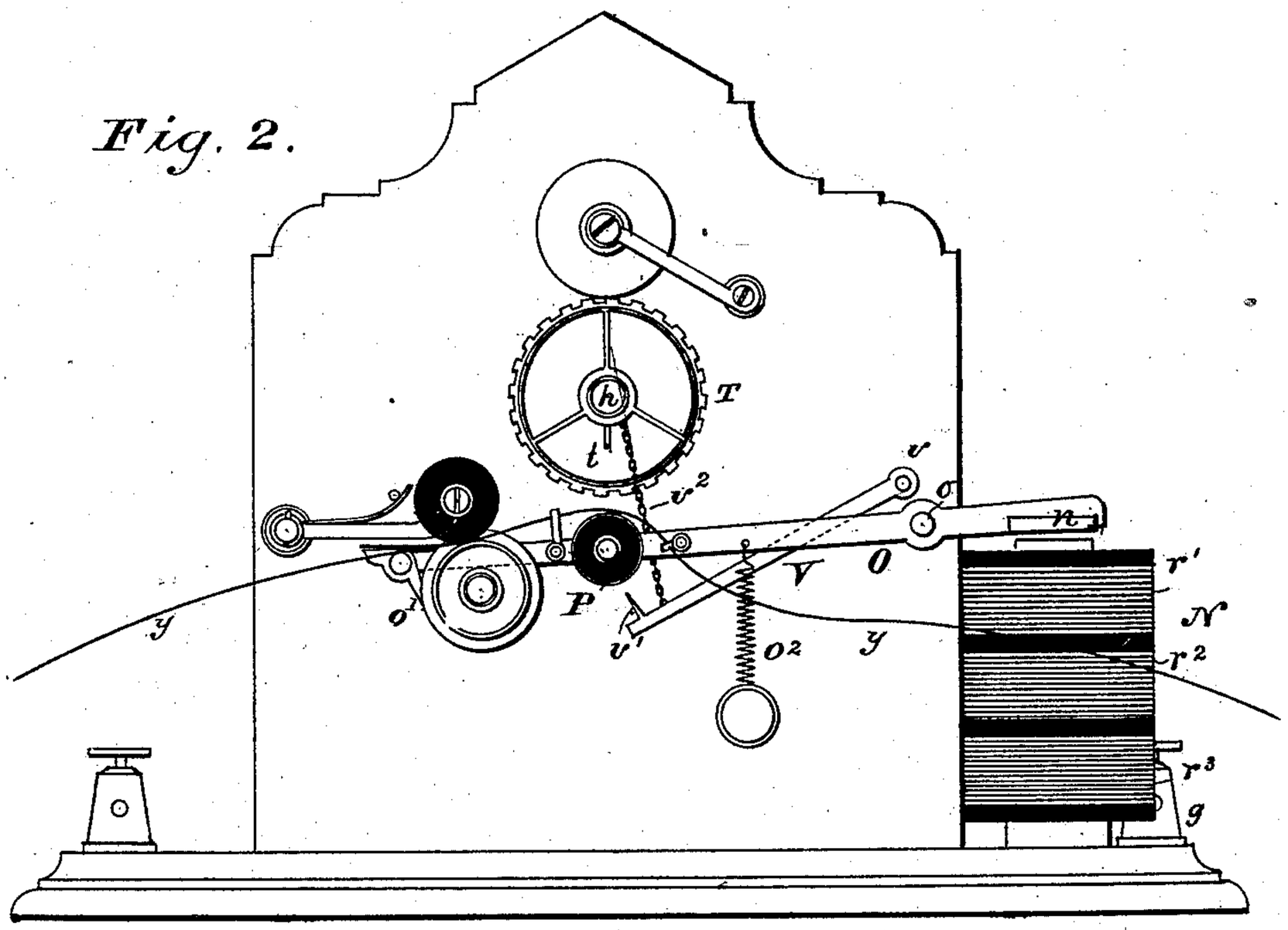
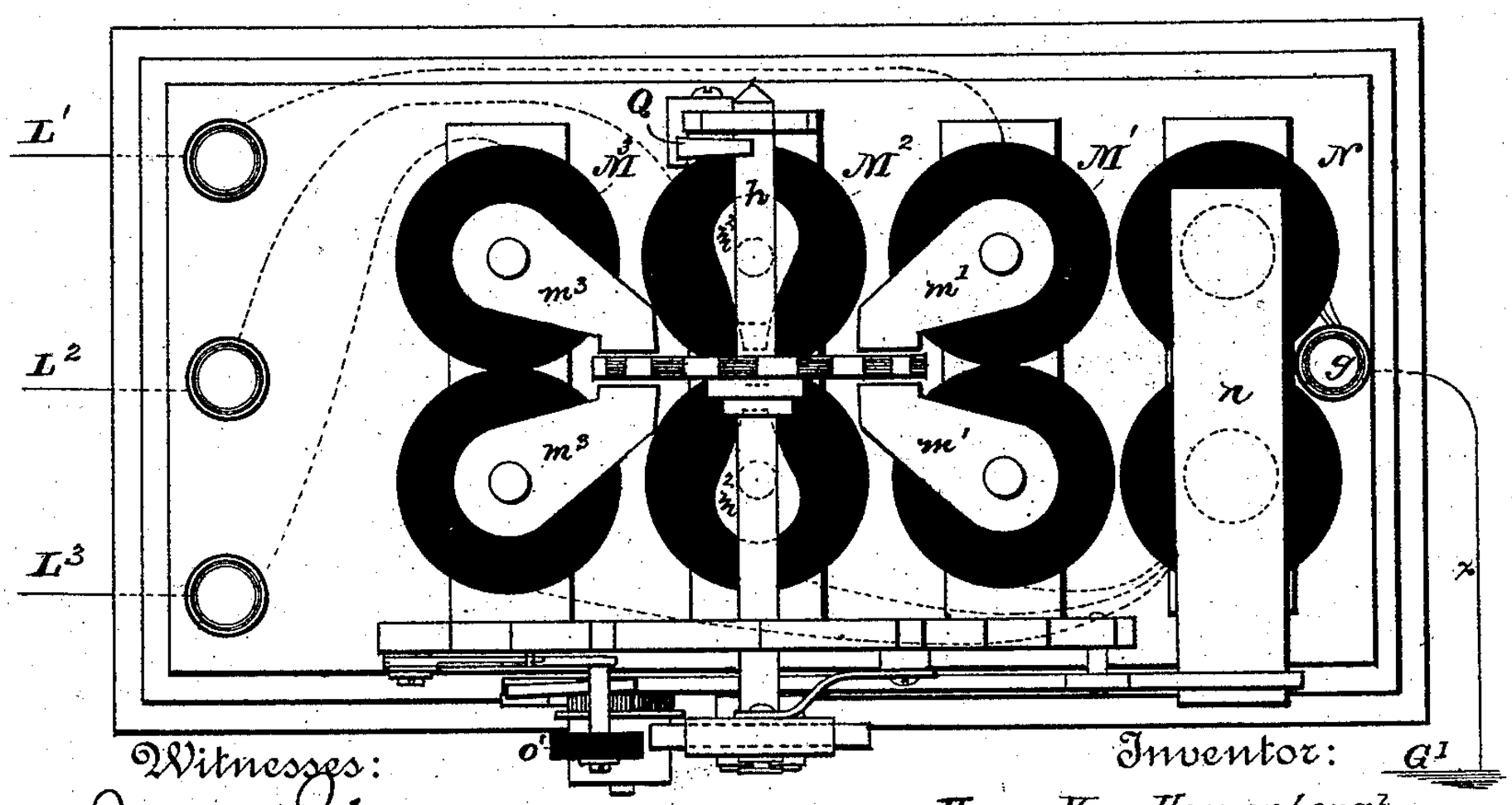


Fig. 3.



Witnesses:
James Young,
Nellie L. Holmes.

Inventor:
Henry Van Hoevenbergh
by his Attorney,
Frank L. Dyer

UNITED STATES PATENT OFFICE.

HENRY VAN HOEVENBERGH, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO THE WESTERN UNION TELEGRAPH COMPANY, OF NEW YORK, N. Y.

PRINTING-TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 286,977, dated October 16, 1883.

Application filed March 13, 1882. (No model.)

To all whom it may concern:

Be it known that I, HENRY VAN HOEVENBERGH, a citizen of the United States, residing at Elizabeth, in the county of Union and State of New Jersey, have invented certain new and useful Improvements in Printing-Telegraphs, of which the following is a specification.

My invention relates to that class of printing-telegraphs which are designed to be operated automatically through the agency of electric pulsations proceeding from a suitable transmitter situated at a point more or less distant from the receiving instrument or instruments and connected therewith by electric conductors.

My invention embraces certain improvements upon an apparatus of like character, for which Letters Patent No. 130,831 were granted to me on the 27th day of August, 1872.

The general object of my present invention is to increase the rapidity and certainty of operation of such an apparatus, which end I attain by constructing the same in such a manner that the type-wheel is capable of rotation in both direction.

The invention also comprises an improved mechanism for maintaining synchronism between the transmitter and the type-wheel, together with its motor at the receiving station or stations, which unison mechanism is caused to act upon the type-wheel whether the same be rotating in one direction or the other.

For convenience of description, my invention may be divided into three parts—the transmitting apparatus, the receiving apparatus, and the unison mechanism.

Three line-wires are employed for actuating the apparatus, each of these being provided with an independent circuit-closer at the transmitting-station, which circuit-closers are actuated successively and in regular rotation by suitable mechanism—in this instance a toothed wheel actuated by a crank. While the type-wheel is being moved into position these circuit-closers are actuated one at a time in regular succession; but when the type-wheel has been properly set, the circuits of the three lines are simultaneously closed by an independent device, by which means the printing mechanism of the receiving instrument or instruments is actuated, as hereinafter explained. The unison mechanism is brought into action at pleasure by turning the transmitter a certain number of revolutions in either direction without reference to the action of the printing mechanism.

The receiving apparatus comprises a shaft so mounted as to be capable of rotation in either direction, upon which are rigidly fixed a type-wheel and a series of projecting radial armatures. These armatures as they rotate pass in succession in close proximity to the poles of three independent electro-magnets, one of these being included in the circuit of each of the respective line-wires. Whenever the circuit of any one line-wire is closed, and a current is made to traverse the coils of the electro-magnet included therein, one of the radial armatures is attracted by the said electro-magnet and moves forward, thus causing the shaft and type-wheel to turn through a small portion of a complete revolution, and in so doing the center of another radial armature is brought into a position to be acted upon in like manner by the next succeeding electro-magnet. Thus by the successive operation of the three electro-magnets in proper rotation the shaft upon which they are mounted may be made to revolve in either direction with a progressive intermittent movement which is imparted to the type-wheel rigidly fixed thereon. The impression is effected by the action of an independent electro-magnet, the armature of which is fixed upon a printing-lever carrying a platen and a suitable device for feeding the paper forward to the type-wheel, all of which devices may be of any construction usual or suitable in instruments of this character. The electro-magnet which actuates the impression mechanism is preferably provided with three independent coils upon its cores, each coil having a like number of convolutions, and the separate coils are placed in the circuit of the three independent line-wires respectively. In case a single receiving instrument only is employed a single coil may be made use of, to which all the line-wires are joined in multiple arc; but when two or more instruments are employed the sepa-

rate coils are necessary. The magnetic effect produced by a current from one line only, or traversing one coil only, is not sufficient to actuate the printing mechanism; but the simultaneous transmission of a current through each of the three lines will be sufficient to cause the electro-magnet to attract its armature and to effect the printing.

The unison mechanism consists of a unison stop on the type-wheel shaft, and a detent which is carried upon a pivoted arm or lever, and is capable of being drawn into the path of the unison stop by means of a cord or chain, one end of which is secured to the exterior circumference of the type-wheel axis, and the other to the pivoted unison lever, so that by the continued rotation of the type-wheel and type-wheel shaft a sufficient number of times in either direction the cord or chain will be wound up thereupon and the detent brought into the path of the unison stop, thus arresting the type-wheel at the zero-point. Its release is effected by simply moving the transmitter in the opposite direction.

In the accompanying drawings, Figure 1 is a diagram showing a plan of the transmitter and its circuit-closers with the printing-key in elevation, and also the type-wheel motor and the electro-magnets at the receiving-station in elevation. Fig. 2 is a front elevation of the receiving-instrument, showing the printing and unison mechanism; and Fig. 3 is a plan view of the same, showing the electrical connections.

Referring to Fig. 1, A represents a dial-plate having in the present instance thirty-nine equal divisions of its periphery, which divisions may be marked with letters, numerals, and other characters corresponding to those required upon the type-wheel of the receiving-instrument. B is a transmitting-wheel mounted upon a vertical axis concentric with the dial A, and capable of being made to rotate in either direction by means of a crank, B′, upon the axis b' of which is a pinion engaging with a toothed wheel, b, mounted upon the axis of the transmitting-wheel B. The transmitting-wheel B has thirteen teeth upon its periphery, which are separated from each other by intervening spaces, each of which occupies a portion of the circumference of the wheel equal or nearly equal to twice that of a tooth. Three independent circuit-closers, C′, C², and C³, are placed at different points around the circumference of the transmitting-wheel B. Each of these circuit-closers consists of a pivoted arm, the free end of which is normally pressed toward the circumference of the transmitting-wheel by the tension of the spring, as shown at c. The respective circuit-closers are so placed that as the wheel B is rotated in either direction they come in contact with its teeth in orderly succession, and their position is such that only one of them can come in contact with a tooth of the wheel at the same time, in the manner shown at C′.

The main battery E at the transmitting-station has one of its poles connected with the earth at G and the other with a binding-screw, e, which is in turn united by a wire, w, (shown in dotted lines,) with the transmitting-wheel B through its axis. The circuit-closers C′, C², and C³ are insulated from each other and from the base of the instrument, and are respectively connected by wires w' w^2 w^3 (shown in dotted lines) with the binding-screws f', f^2, and f^3, from which three independent line-wires, L′, L², and L³, properly insulated from each other, extend to the receiving-station.

The printing-key K is so constructed that when it is depressed the battery E is connected in multiple arc with the three line-wires L′, L², and L³. This may be conveniently effected in the manner shown in the figure by interposing a spring-contact, k, between the lever K and the contact k' of the key. The key-lever, the intermediate spring, and the contact are separately connected by wires l', l^2, and l^3 with the line-wires L′ L² L³, and as one or the other of these wires is in connection with the battery E in whatever position the transmitter-wheel B may be placed, the depression of the key will connect the three line-wires together; hence a current passing over any one of them will, when the key is depressed, divide itself equally between the three lines extending to the receiving-station.

The type-wheel at the receiving-station is caused to rotate by means of an electromotor, which is similar in principle but different in construction from that shown in my former Letters Patent, hereinbefore referred to. The electromotor consists, preferably, of a wheel or disk, H, of soft iron, mounted upon a horizontal axis, h, and having its periphery formed into a number of projections, h' h^2 h^3, &c., which severally constitute radial armatures. M′, M², and M³ are electro-magnets whose coils are included in the circuit of the respective line-wires L′, L², and L³. The poles of the several electro-magnets are formed with or have attached to them pairs of tapering pole-pieces m', m^2, and m^3, as best seen in Fig. 3. The pole-pieces of each individual electro-magnet are brought close together, leaving just enough room for the radial armatures h h to revolve between them without coming in actual contact with them. The number of radial armatures upon the wheel is the same as the number of teeth upon the transmitting-wheel B, and the number of divisions upon the dial, and also of characters or divisions upon the type-wheel, is equal to the number of line-wires or electro-magnets multiplied by the number of radial armatures, a numerical relation which must be preserved whatever may be the actual number required in any particular case. The armature-wheel H is revolved in either direction by the successive action thereupon of the poles of the electro-magnets M′, M², and M³, which is effected in the following manner:

In the position occupied by the transmitter

in Fig. 1 the circuit-closer C′ is in contact with a tooth of the transmitting-wheel B, and a current from the battery E passes through the transmitting-wheel B, circuit-closer C′, line-wire L′, and electro-magnet M′ at the receiving-station, and thence to the earth at G′. This causes the poles of the electro-magnet M′ to become magnetic and to attract the radial armature *h′*, whereby the same is caused to move into a position of magnetic equilibrium, so that a radial line from the axis H passing through the center of the armature *h′* would coincide with the center of the poles *m′*, thus causing the wheel H to turn, in the direction indicated by the arrow, through one thirty-ninth part of a complete revolution. If the transmitting-wheel B be turned in the direction indicated by the arrow, the tooth which makes contact with the circuit-closer C′ moves away from beneath the latter and allows it to rest against the insulated stop *c′*, thereby interrupting the circuit through the line-wire L′, and simultaneously with this interruption the circuit of the line-wire L^2 is closed through another tooth by the circuit-closer C^2. This brings the electro-magnet M^2 into action, and the radial armature h^2 is attracted in the same manner as the armature *h′* in the former case, whereby the armature-wheel H is again caused to advance through one thirty-ninth part of a revolution. By turning the transmitting-wheel B still farther in the same direction the circuit-closer C^2 is thrown out of contact and the circuit of the line L^3 completed by the circuit-closer C^3, and the action of the electro-magnet M^3 causes a still farther advance of the armature-wheel H. Thus it will be understood that by bringing into action the electro-magnets M′, M^2, and M^3 in orderly succession, in this manner a continuous rotation of the armature-wheel H in the direction indicated by the arrow may be produced. The same result is produced, but in the reverse direction, if the direction of motion of the transmitting-wheel B is reversed, in which case the order of succession is changed so that the current traverses the electro-magnets in contrary order, as, first, M′, and then M^3 and M^2. It will therefore be understood that the movement of the armature-wheel H will coincide in rapidity, direction, and distance with the movements of the transmitting-wheel B, and the type-wheel T, being mounted upon the same shaft with the armature-wheel, will partake of its movements.

The printing mechanism is substantially the same as that employed in other instruments of this class, the only material difference consisting in the construction and mode of operation of the printing electro-magnet N. The armature *n* of this electro-magnet is mounted upon the short arm of the printing-lever O, which is pivoted at *o*, and carries a platen or printing roller, P, and a suitable paper-feeding mechanism, *o′*, by means of which a strip of ribbon or paper, *y*, is fed along after each impression between the platen P and the type-wheel T. The printing-lever O should be provided with a retracting-spring, o^2. The line-wires L′, L^2, and L^3, after passing through the electro-magnets M′, M^2, and M^3, are connected, respectively, with one terminal of the helices or coils *r′*, r^2, and r^3 upon the printing electro-magnet N, each of which is wound with wire of like diameter, and having an equal number of convolutions. The remaining terminals of the three coils are united to a single binding-screw, *g*, common to all of them, to which a wire, *x*, is attached, leading to the earth at G′. The number of convolutions in any one of the coils *r′*, r^2, or r^3 is not sufficient to produce a magnetic effect capable of overcoming the tension of the retracting-spring o^2; but when the circuit is closed at the transmitting-station simultaneously through all three of the line-wires, the three coils act in conjunction with each other upon the core of the electro-magnet N, and cause it to powerfully attract its armature *n*, thus producing an impression upon the paper *y* of the letter upon the type-wheel which is then opposite the platen P.

The unison device which I prefer to employ is very simple in its character. A unison stop, *t*, is affixed to the type-wheel shaft *h*, or to the type-wheel itself at the proper point in its circumference, and revolves with it. A swinging arm or lever, V, is pivoted at one of its ends to the frame of the instrument, as shown at *v*, and carries at its opposite extremity a detent, *v′*. A flexible cord or chain, v^2, has one of its ends attached to a point on the circumference of the type-wheel shaft *h*, and the other end attached to the swinging arm V. The length of the cord or chain v^2 should be at least equal to the circumference of the shaft *h*, to which it is attached, and may be somewhat more than this. It is obvious that when the shaft *h* of the type-wheel T is caused to revolve either in one direction or the other, the cord or chain v^2 will be wound upon the circumference thereof, and the detent *v′* thus drawn into the path of the rotating unison stop *t*, arresting the same, together with the type-wheel, at the zero-point. The unison device is released by merely turning the transmitter in the opposite direction; hence it is obvious that the receiving-instrument may be brought into correspondence with the transmitter at any moment by turning the same in either direction for a sufficient distance, according to the length of the cord or chain v^2, and when the index-hand b^3 of the transmitter has reached zero upon the dial, by reversing the direction of motion of the same.

In order to hold the type-wheel and its axis in any position into which it may have been brought by the action of the electro-magnets, and yet to permit it to revolve freely in either direction under their subsequent action, I provide a friction-spring, Q, attached to the frame, (see Fig. 3,) which presses against the shaft *h* with sufficient force to maintain the same in

its proper position after the action of the electro-magnets has ceased.

I do not herein claim the specific organization of the electromotor by which the type-wheel is moved in either direction and stopped at any required point, which motor consists of the combination of three stationary electro-magnets included in three independent circuits, and a rotating armature, consisting of a series of armature-bars symmetrically arranged about an axis, the relation of the several magnets to the rotating armatures being such that they act to turn the wheel in either direction according to the order in which they are successively magnetized, as this organization forms the subject-matter of the claims of another division of this application.

I claim as my invention—

1. The combination, substantially as herein-before set forth, of a rotating shaft, a series of radial armatures mounted upon said shaft, three electro-magnets included in independent electric circuits, means to enable said armatures to revolve said shaft in either direction, a type-wheel mounted upon said rotating shaft, a platen for printing from said type-wheel, and an independent electro-magnet for actuating said platen.

2. The combination, substantially as herein-before set forth, of a rotating shaft, a series of radial armatures mounted upon said shaft, three electro-magnets included in independent electric circuits, and means to enable said armatures to revolve said shaft in either direction, a type-wheel mounted upon said rotating shaft, a platen for printing from said type-wheel, an independent electro-magnet for actuating said platen, and three independent magnetizing-coils upon the last-named electro-magnet, one of which is included in the circuit of each of said line-wires.

3. The combination, substantially as herein-before set forth, of a rotating shaft, a series of radial armatures mounted upon said shaft, three electro-magnets included in independent electric circuits, means to enable said armatures to revolve said shaft in either direction, a type-wheel mounted upon said rotating shaft, a platen for printing from said type-wheel, an independent electro-magnet for actuating said platen, three independent magnetizing-coils upon said magnet, one of which is included in the circuit of each of said line-wires, and an independent key for closing all three of said circuits simultaneously to actuate the independent electro-magnet.

4. The combination, substantially as herein-before set forth, of a type-wheel and its axis, a unison stop fixed upon said type-wheel or axis, a detent adapted to be brought into the path of said stop to arrest said type-wheel at its zero-point, and a cord or chain having one of its ends attached to said detent, and the other end attached to and adapted to be wound upon the periphery of a cylinder or drum concentric with the type-wheel axis, or mechanically connected therewith.

In testimony whereof I have hereunto subscribed my name this 16th day of February, A. D. 1882.

HENRY VAN HOEVENBERGH.

Witnesses:

MILLER C. EARL,

WILLIAM H. KENYON.