(No Model.) 3 Sheets—Sheet 1.

# H. VAN HOEVENBERGH.

## PRINTING TELEGRAPH.

No. 285,709. Patented Sept. 25, 1883.

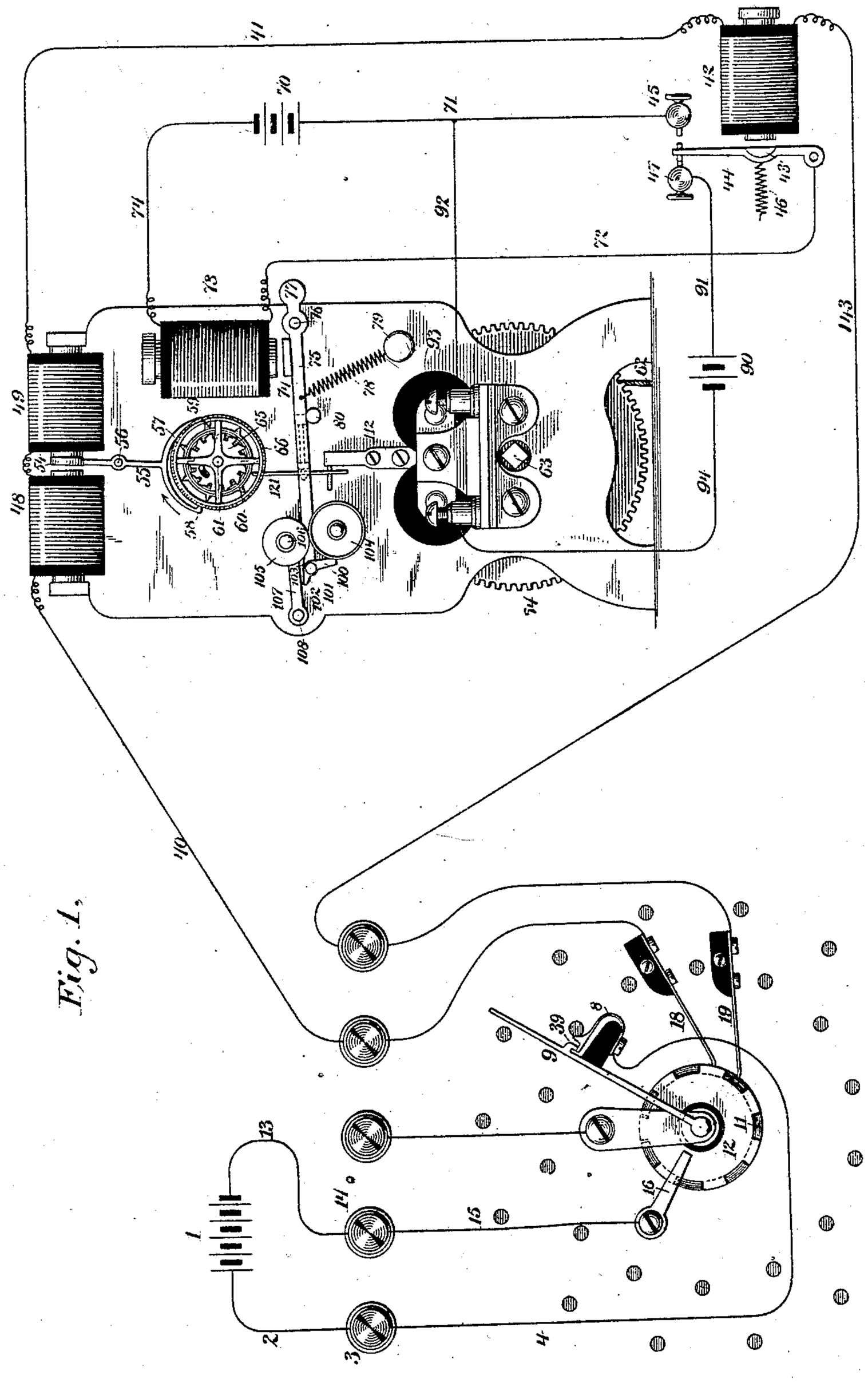

Fig. 1.

WITNESSES

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(No Model.) 3 Sheets—Sheet 2.

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## PRINTING TELEGRAPH.

No. 285,709. Patented Sept. 25, 1883.

*Fig. 2.*

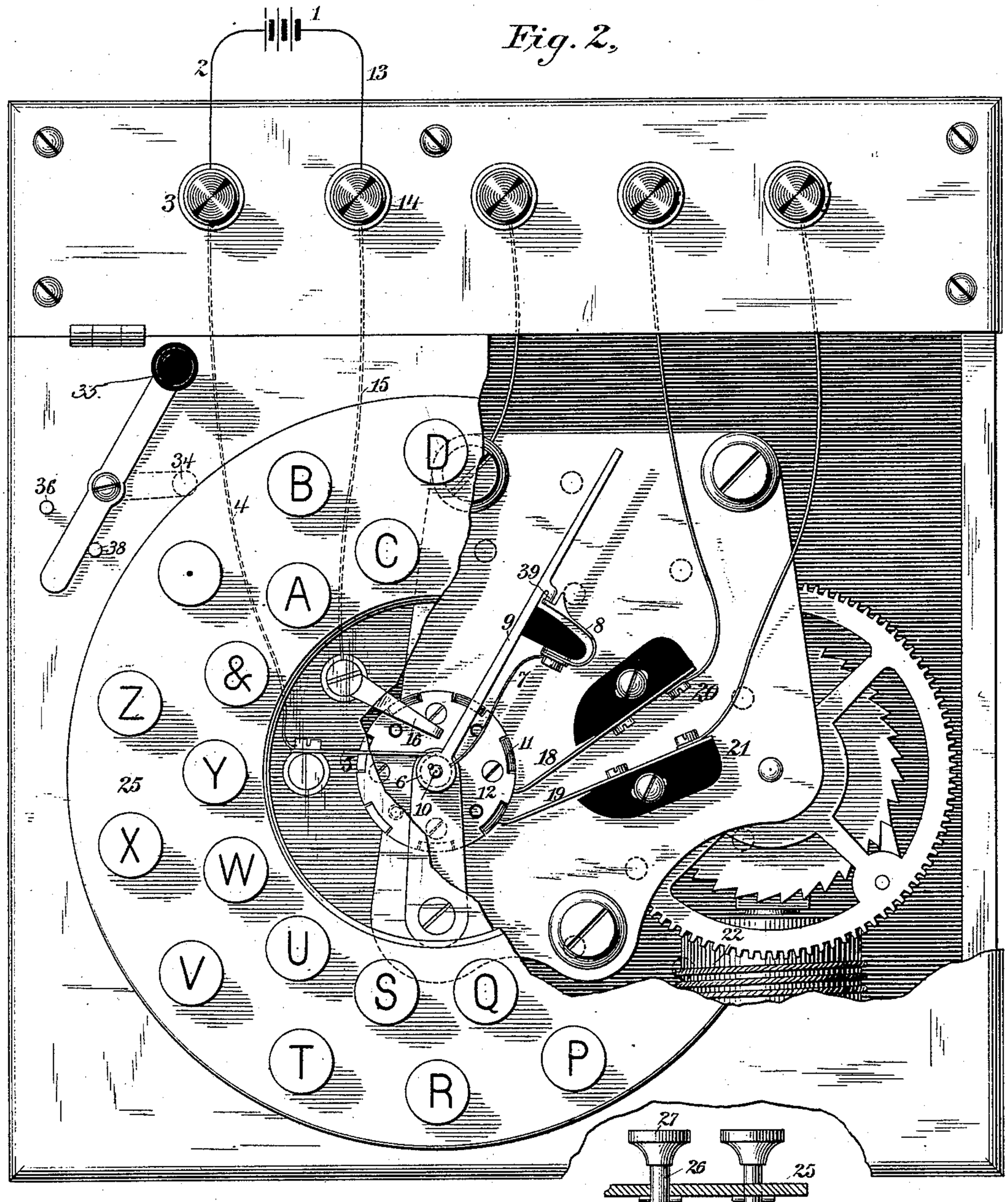


*Fig. 3.*

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# H. VAN HOEVENBERGH.

## PRINTING TELEGRAPH.

No. 285,709. Patented Sept. 25, 1883.

*Fig. 4.*

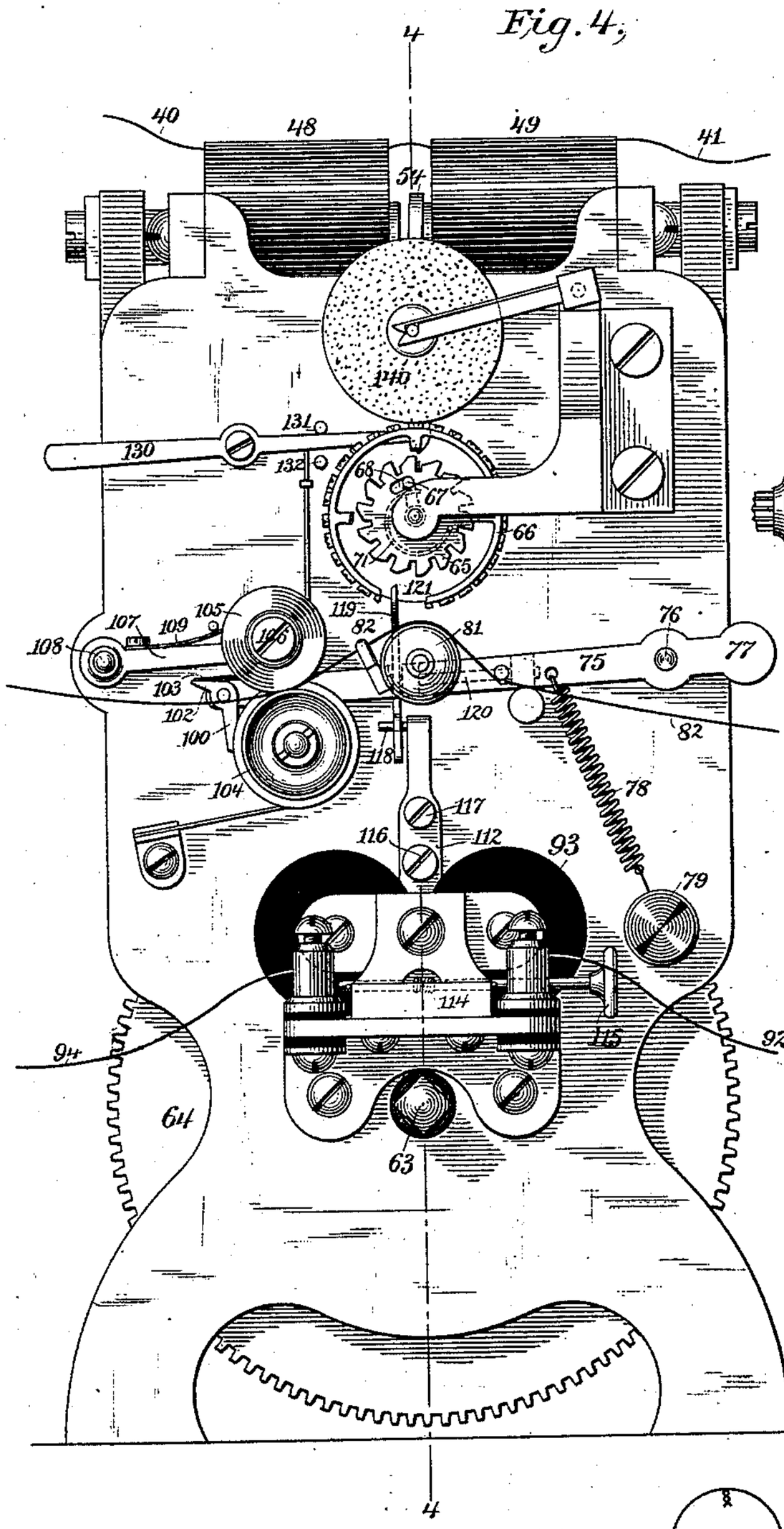



*Fig. 5.*

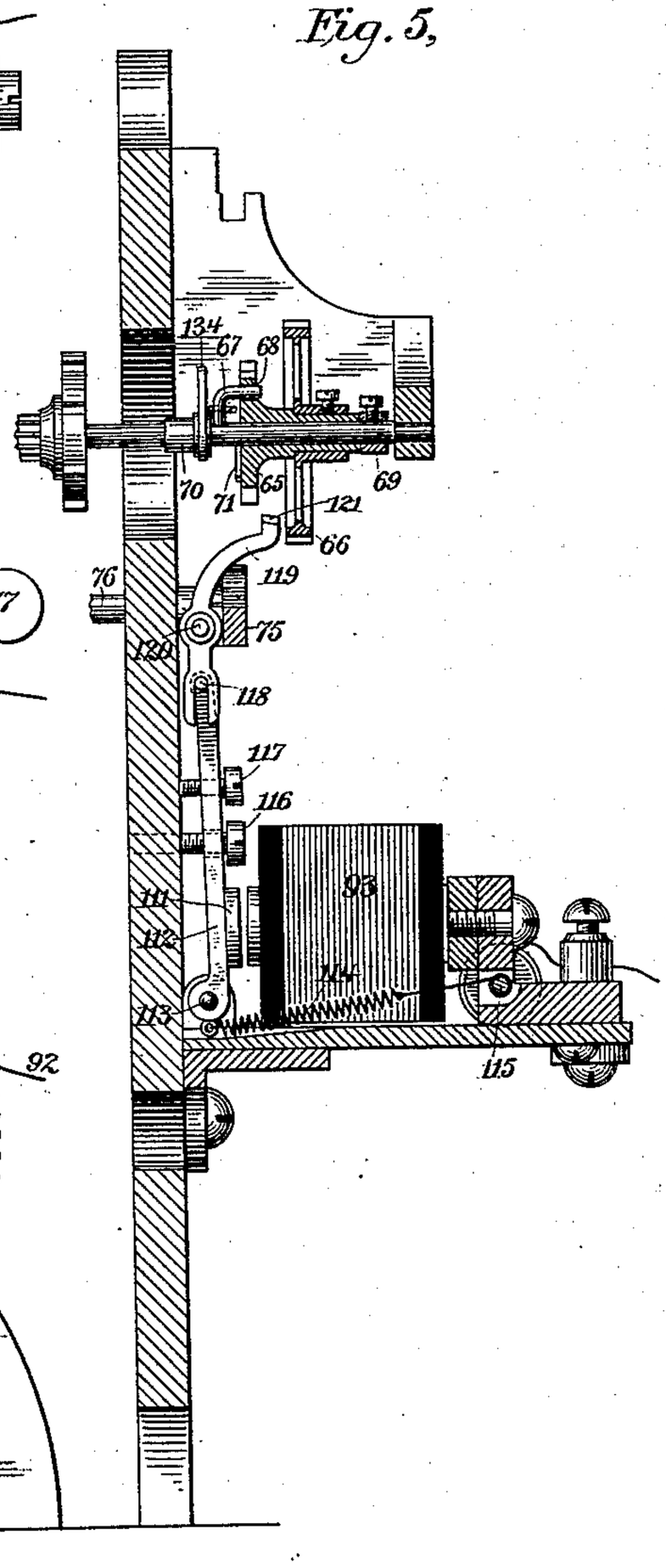
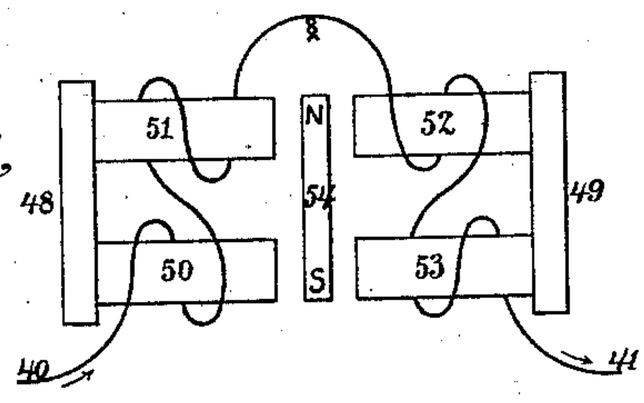



*Fig. 6.*




WITNESSES

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# 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. 285,709, dated September 25, 1883.

Application filed September 23, 1882. (No model.)

*To all whom it may concern:*

Be it known that I, HENRY VAN HOEVENBERGH, a citizen of the United States, and a resident of 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 electro-magnetic printing-telegraph systems. It relates both to transmitting and receiving devices for such systems.

The principal object of the invention is to secure increased rapidity of operation. To this end it is sought to reduce to a minimum the number of mechanical operations performed by the apparatus at the receiving-station. Thus the type-wheel is caused to advance normally through successive arcs, each subtending two characters, or, in other words, so as to skip one character at each step. When any one of the characters thus skipped is to be printed, the wheel is arrested on arriving at the character next in advance of the required character, and a device is brought into action which mechanically advances the wheel through an arc subtending one character. This brings the required character into exact position, and the impression is then taken therefrom.

The invention further includes a transmitting mechanism for operating the improved apparatus at the receiving-station, thus completing a system both simple in construction and rapid in operation.

The several consecutive operations of the apparatus at the receiving-station are as follows: First, the type-wheel is advanced through consecutive arcs, each subtending two characters; secondly, it is arrested either in a position to print the desired character or (when one of the characters normally skipped is to be printed) in position to print the character next in advance thereof; thirdly, if arrested in the position to print the character next in advance of the required character, then it is given a supplementary movement through an arc subtending one character; otherwise this movement is not imparted to it; fourthly, the impression of the character finally brought into position is taken. The object of the third of the above-mentioned operations—namely, that of imparting the supplementary movement to the type-wheel—is to render it practicable to use the two-letter step-movement instead of the usual single-letter step.

The several elements of apparatus made use of in this invention are a transmitter, a receiver, and (in conjunction with the latter) a relay. These elements may be briefly described as follows, it being premised that the various devices employed in each may, in many instances, be replaced by well-known equivalents, as will be understood by those versed in the art:

The transmitter and receiver are each provided with a revolving shaft, hereinafter respectively designated as the "transmitting" and "receiving" shafts. Each of these shafts is associated with a driving mechanism, which imparts to it a constant tendency to revolve in one direction. The organization of the system is such that the receiving-shaft is never liberated to the action of its driving mechanism, except when the transmitting-shaft is in motion, and, conversely, any movement of the transmitting-shaft compels and determines a corresponding movement of the receiving-shaft. This correspondence or synchronism between the respective movements of the two shafts may be brought about through the agency of well-known devices. Thus a pole-changing key may be actuated by the movements of said transmitting-shaft, so that as often as said shaft completes a definite arc in its revolution it will cause the reversal of a battery upon the main line, thus successively establishing alternate positive and negative electrical pulsations throughout the circuit. At the receiving-station these alternate pulsations may be employed to cause the to-and-fro movements of an armature between the pole-pieces of electro-magnets. Each movement of the armature acts, through associated mechanism, to cause the receiving-shaft (as well as a type-wheel which is carried thereby) to be advanced through an arc of its revolution corresponding to that through which the transmitting-shaft must revolve in order to effect such reversal of the current. On the circumference of the type-wheel this angle subtends a space sufficient to include two of the project-

ing printing type or characters, which are symmetrically arranged one after the other upon and around said circumference. A single revolution, therefore, of the transmitting-shaft—which reverses the polarity of the line-current, say, fourteen times—will, through the medium of an escapement mechanism the wheel of which is provided with but seven teeth, produce one complete revolution of a type-wheel carrying twenty-eight characters; hence during each reversal two of said characters will pass in front of any fixed point which may confront the circumference of the type-wheel—as, for example, the point at which the impression is to be taken. By successively arresting such a transmitting-shaft immediately after each of the fourteen reversals, the receiving-shaft may be arrested in fourteen analogous positions, each particular position being governed by the point of stoppage of the transmitting-shaft.

Every character upon the type-wheel has a corresponding key upon the transmitter, and these keys may be conveniently classified with respect to their manner of operation into two divisions, hereinafter referred to as the "first" and "second" series. Those in the first series (which may comprise every alternate character) perform but a single function—namely, to arrest the transmitting-shaft at points in its revolution dependent upon the particular key operated. The stoppage of the shaft in any one of these positions causes the arrest of the type-wheel in a corresponding position in the manner described. Such stoppage will prolong either a positive or negative pulsation upon the line, thus substituting for the previously-alternating current a continuous positive or negative current, as the case may be.

I employ at the receiving-station a relay capable of responding to every pulsation or current, whether positive or negative, which traverses the line, its armature being retracted or drawn back by a spring upon each reversal or interruption of the current. The forward stroke of the armature-lever closes the circuit of a local battery through the coils of the actuating-magnet of a mechanism for taking impressions from the type-wheel; but such mechanism is so adjusted that it will not respond to currents of short duration, such as the alternating currents which cause the advance of the type-wheel. It will, however, respond to the prolonged or continuous current which is established in the manner just described, when any key of the first division is depressed. In this manner alternate characters A C E, &c., are transmitted and recorded.

The keys of the second series have a double function. Besides arresting the shaft, as in the former case, they cause the opening of the line for the purpose of interrupting the current. This causes the armature-lever of the receiving-relay to pause upon its back contact-stop, in which position it closes a local circuit including two separate devices: first, a device for advancing the type-wheel through the angular space corresponding to one character, it being understood that in consequence of the fact that two characters are advanced at every movement of the type-wheel, whenever one of the keys in the second series is depressed, the type-wheel is arrested in a position to print the character next preceding that desired; hence the necessity of this device. The second device is the printing mechanism already described.

The manner in which the printing is effected by the closing of either of said local circuits is as follows: An armature which is actuated by an electro-magnet included in both circuits carries a suitable platen, between which and the type-wheel the paper tape upon which the record is to be printed is caused, by suitable mechanism, to advance, such advancement being preferably effected by the retrograde movements of said armature-lever.

In my receiving-instrument but one type-wheel is required, the same being provided with a single row of type disposed in their proper order at uniform intervals upon its periphery. In the organization of the electrical circuits but one main line is required. To restore the unison between the transmitter and receiver should the same be disturbed by accident or otherwise, I find it sufficient to use a device operated manually.

The invention also comprises certain details of mechanism, the particular subject-matter claimed being hereinafter specifically designated.

My improvements are clearly set forth in the accompanying drawings, in which Figure 1 is a general diagram of the system, especially designed to show the electrical circuits. Fig. 2 is a plan view of the transmitting-instrument, the cover being partially removed in order to exhibit the interior mechanism. Fig. 3 is a transverse section of the transmitting-instrument, showing the construction of the keys, the transmitting-shaft, and the pole-changer carried thereby. Fig. 4 is a front elevation of the receiving-instrument. Fig. 5 is a vertical section on the line X X of Fig. 4, and Fig. 6 a diagram of the electro-magnets and the polarized armature of the receiving-instrument.

Parts appearing in more than one figure are designated by similar reference-letters in each.

The transmitting apparatus may conveniently be regarded as composed of four divisions. The first of these effects the transmission of the alternate positive and negative pulsations by which the step-by-step rotation of the type-wheel is produced, the latter passing at each step through an angle subtending two characters. The second establishes the conditions necessary to cause an impression to be taken from the type-wheel at the receiving-station. The third determines the specific character of the impression—that is to say, which of said two characters shall be imprinted. The fourth

provides for re-establishing the unison or synchronism between the transmitter and the receiver in case the same is destroyed.

Considering the first of these divisions, the transmitting-battery 1 is connected by its positive or copper pole, by way of the line 2, binding-screw 3 and line 4, contact-spring 5, contact-ring 6, line 7, flexible spring 8, arm 9, and shaft 10, with the lower circuit-wheel, 11, of a pole-changing apparatus carried by said transmitting-shaft 10, and shown in vertical transverse section in Fig. 3. This pole-changer is composed of two metallic circuit-wheels, 11 and 12, which are insulated from each other, the shaft 10 being in electrical union with the lower circuit-wheel only. The negative or zinc pole of the main battery 1 is connected by way of the line 13, binding-post 14, wire 15, and pressure contact-spring 16 to the upper circuit-wheel, 12, of the pole-changer. It will thus be understood that the circuit-wheels 11 and 12, while free to rotate with the shaft 10, constitute at all times the positive and negative electrodes, respectively, of the battery 1. The periphery of each of these circuit-wheels is provided with a series of seven notches or recesses of equal length. The length of each recess is approximately equal to that of the section of the circumference projecting between two consecutive recesses. The angular position of the circuit-wheels upon the shaft with reference to each other is such that every indentation of one is opposite to a projection of the other. Against the perimeters of these circuit-wheels the contact-springs 18 and 19 press by their own resiliency, and to these springs are attached, at points 20 and 21, respectively, the terminals of the line-wire and of the ground or return wire. As the pole-changing circuit-wheels perform one revolution the spring 18 will impinge seven times against the perimeter of the wheel 11 and seven times against that of the wheel 12. Similarly the spring 19 will, when the spring 18 impinges upon the wheel 11, itself impinge upon the wheel 12, and when the spring 18 impinges upon the wheel 12 it (the spring 19) will impinge upon the wheel 11. In consequence of this action there will be transmitted over the main line fourteen electrical pulsations during each revolution of the transmitting-shaft, seven of which will be positive and seven negative. In practice any desired number of separate independent lines, each provided with its own receiving-instrument, may be operated from one transmitting-station by making use of as many separate commutators or pole-changers such as described as there are independent lines to be operated, and by mounting all these pole-changers upon a single shaft, which may be of any appropriate length, and which will thus actuate all the lines in unison. The mechanical instrumentalities for imparting motion to the shaft 9 and to the pole-changer hereinbefore described may be of any suitable character. I have preferred in the present instance to employ a clock-work mechanism, partially shown in Fig. 2, actuated by a weight, the sustaining-cord of which is wound about the drum 22. The system may be wound up by applying a suitable key to the drum-shaft in a well-known manner. A constant tendency to revolve is thus imparted to the shaft 10, which will take effect whenever the latter is released, by mechanism hereinafter to be described.

The second and third divisions of the transmitting apparatus—namely, that which establishes the conditions necessary to cause an impression to be taken from the type-wheel at the receiving-station, and that which determines the specific character of the impression—may be described conjointly as follows: A key-board, 25, is located upon the upper face of the case in which the entire transmitting mechanism is contained. The keys are arranged upon the key-board in two concentric circular rows, each comprising fourteen keys. The characters which I have made use of in the present instance, and which are sufficient for the general purpose for which this instrument is designed, are the letters of the alphabet, the character &, and the period (.); but it will be understood that the description herein of mechanism for transmitting twenty-eight different signals is not to be construed in prejudice to any application of the same to a greater or less number of characters. The construction of the several keys is illustrated in Fig. 3. Each key consists of a vertical pin, 26, terminating in a knob or button, 27, at the top, by means of which it may conveniently be depressed by the finger of the operator, and it is also provided with a helical spring, 28, surrounding its shaft, for raising it to its normal position when released. These keys may be depressed through a short space—preferably an eighth of an inch—so that their lower ends will slightly project from the under surface of the lower base-plate, 29. This will bring them into the plane in which the projecting arm or cam 9 (rigidly and electrically connected to the shaft 10 at the point 30) travels. In this manner, by depressing any one of the outside series or row of keys, I am enabled to arrest the traveling arm 9 in any one of a series of fourteen positions, thereby prolonging the pulsations of current which traverses the circuit at the time of the arrest. Similarly, by depressing any one of the inner series or row of keys, I am enabled to arrest the traveling arm in any one of fourteen other positions intermediate to those mentioned in connection with the first series. By the depression of any one of the inner series of keys, two operations are performed, namely: First, the traveling arm 9 is arrested in a position depending on the key depressed; and, secondly, the battery is detached from the line, in the following manner: As before described, the circuit-wheel 11 of the pole-changer is connected with the positive pole of the battery 1, the current passing through the

flexible spring 8 and arm 9, normally in electrical contact at the point 39. When one of the inner series of keys is depressed and the flexible spring 8 comes in contact therewith, the consequent pressure is sufficient to separate the contact-points and open the circuit. Thus by the operation of the proper keys a pause of the transmitting-shaft may be made to take place, during which there will be either a positive current, a negative current, or no current whatever upon the line, according to which key is depressed. Any one of these conditions serves to actuate the impression device at the receiving-station, while the pause in which there is no current upon the line serves to operate the determining device as well.

The fourth division of the mechanism at the transmitting-station, or that operating to re-establish the synchronism or unison when disturbed, consists of an additional key operated by the switch 35, which serves to arrest the shaft arm 9 in the same position as does the key representing the zero character (.). When this switch is moved against the stop 36, the projection 34 is brought into the path of the arm 9, and as this projection is not provided with means for automatically returning it to its previous position, as is the case of the other keys, it remains there until normally returned to the point 38, as shown in the figure. When the instrument is not in operation, this switch should be left upon the stop 36. This condition will enable any one at the receiving end to bring his instrument into unison with the transmitter, in a manner hereinafter to be described when the receiving mechanism is considered.

The apparatus at the receiving-station may, like the transmitting apparatus, be conveniently regarded as embracing four divisions. The first controls the intermittent rotation of the receiving-shaft and type-wheel. The second produces the impression upon the paper tape and feeds the latter forward with each impression. The third determines the particular character of the impression—that is to say, whether it shall be one or other of two consecutive characters upon the type-wheel; and the fourth is a device for establishing the synchronism or unison of the type-wheel with the transmitting apparatus in case they are thrown out of correspondence by accident or otherwise.

The first of these divisions is actuated by the alternating electrical pulsations established upon the main line by the rotation of the transmitting-shaft. These currents traverse the coils of the electro-magnets 48 and 49. To understand the winding of these electro-magnets reference is made to Fig. 6, in which the helices surrounding the cores of the electro-magnets are represented by a single convolution, so as to show clearly the direction of the winding. The continuous conducting-wire 40, which is included in and forms part of the main line, is wound helically around these cores, successively, in the manner illustrated in the figure. By tracing this wire in the direction indicated by the arrows, it will be observed that it is wound in one direction around the core 50 of the electro-magnet 48, and in the opposite direction around the other core, 51, of the same. It then passes to the electro-magnet 49, being wound around the core 52 in a direction opposite to that last mentioned; and, lastly, the direction is again reversed in passing around the core 53 of the electro-magnet 49. If no current traverses the line 40, the armature 54 will remain unattracted; but when a current of one polarity traverses the line both poles of the armature 54 will be simultaneously attracted toward one of the electro-magnets and repelled by the other, and the armature will accordingly move toward the attracting-magnet; and when a current of opposite polarity traverses the circuit, exactly the reverse effect will take place. Hence, when alternate pulsations of positive and negative electricity are transmitted through both electro-magnets, (these being included in the same circuit,) the armature 54 is caused to vibrate to and fro. If, however, the current traversing the line 40 be interrupted, the armature 54, being in contact with one or other of the poles of the electro-magnets 48 and 49, will remain in such contact. The conditions which actually occur upon the line 40 are, as described, either a positive current, a period of rest succeeding a positive current, a negative current, or a period of rest succeeding a negative current. Under the influence of such conditions the armature 54 will be actuated by each current remaining inactive during the said periods of rest. The armature 54 is carried by an armature-lever, 55, fixed to a rock-shaft, 56, and carrying an anchor-escapement, 57, provided with pallets 58 and 59, which alternately engage with the opposite teeth of the scape-wheel 60. The latter is mounted upon the arbor 61, which tends to rotate continuously in the direction indicated by the arrow, being impelled by a train of wheel-work actuated by the descent of a weight whenever the escapement permits. The arbor 61 carries, in addition to the scape-wheel 60, another wheel, 65, having beveled teeth, and also a type-wheel, 66, said wheels being rigidly connected with each other, but carried loosely upon a sleeve on the arbor 61, from which arbor projects a pin, 67, entering a slot, 68, in the wheel 65. This slot is of sufficient length to admit of a slight parallel revolution of the wheels 55 and 56 independently of the arbor 61. Longitudinal displacement of the wheels 65 and 66 upon the arbor 61 is prevented in one direction by the stop 69 and in the other by the stop 70. A spring, 71, one end of which is attached to the back of the wheel 65, while the other end bears against the pin 67, tends to maintain the wheel 65 in such relation to the arbor 61 that the pin 67 will

take the position in the slot 68 which is shown in Figs. 1 and 5. It will therefore be understood that with every impulse traversing the electrical conductor 40 the armature 54 and anchor-escapement 57 will be actuated, and the shaft of the escapement-wheel 60 will thereby be liberated, the forward movement of which shaft will be communicated by means of the pin 67 to the type-wheel 66 and beveled toothed wheel 65. There are twenty-eight characters upon the circumference of the type-wheel, symmetrically disposed, one after the other, at equal distances apart, and respectively corresponding to the twenty-eight keys at the transmitting-station. With every movement of the armature the type-wheel advances one-fourteenth part of a complete revolution, or, in other words, through an angle subtending two of said characters.

The second division of the receiving-instrument—namely, that which produces the impressions upon the paper tape—may be described as follows: The current which traverses the electro-magnets 48 and 49 passes by the wire 41 to the relay-magnet 42, and by return-wire 143, or earth-circuit in lieu thereof, back to the transmitting-instrument. Every electrical impulse, therefore, that traverses the main circuit 40 will actuate the electro-magnet 42, causing it to attract its armature 43, thus bringing the armature-lever 44 against its front contact-stop, 45. Every cessation of the current will liberate the armature-lever 44 to the action of the retractile spring 46 and cause it to fall upon its back contact-stop, 47. When against the front contact-stop, 45, a local circuit is closed, which may be traced as follows: from the positive pole of the battery 70, by wire 71, to contact-stop 45, armature-lever 44, line 72, electro-magnet 73, and line 74, to negative pole of the battery 70. This local circuit will therefore be closed in correspondence with every pulsation, irrespective of polarity, that traverses the main line 40. When in contact with its back stop, 47, the armature-lever 44 will close a second local circuit, which also includes the electro-magnet 73, and which may be traced as follows: from the positive pole of the battery 90, *via* the line 91, contact-stop 47, armature-lever 44, line 72, electro-magnet 73, line 74, battery 70, line 71, line 92, electro-magnet 93, line 94, to negative pole of battery 90. The pauses of the armature-lever 44 upon its contact-stops are either of very short duration when produced by the alternating current caused by the revolution of the transmitting-shaft, or they are comparatively long pauses produced, in the manner described, by the depression of the keys of the transmitter. The spring 78 is so adjusted that the printing mechanism shall be operated by currents of long duration only, in which case the electro-magnet 73 will attract its armature 74, which is carried by the lever 75, the latter being fulcrumed at 76 and balanced by the counterpoise 77, so that said armature-lever is moved in opposition to the force of the retractile spring 78. Normally the armature-lever 75 rests upon its back contact-stop, 80, and when actuated by the vitalization of the electro-magnet 73 it ascends a sufficient distance to bring the platen 81, carrying the band or tape of paper 82, into contact with the type-wheel 66. The paper-feeding mechanism is actuated in a well-known manner by the retrograde movement of the printing-lever 75 after the impression has been taken. This mechanism consists of a cam, 100, carried at the extreme end of the lever 75, fulcrumed at 101, and provided with a shoulder, 102, and a spring, 103, extending from the lever over said shoulder, and maintaining said cam against a serrated portion of the circumference of the feed-wheel 104. A second friction-wheel, 105, rotates loosely upon the arbor 106, the latter being carried by the lever 107, fulcrumed at 108, and constantly depressed by spring 109, thus keeping the friction-wheel 105 in close contact with the feed-wheel 104. The paper tape is directed in its path by guide-pins carried by the lever 75. The type-wheel receives its ink from an ordinary inking-roller, 140, placed immediately above it.

The third feature of the printing mechanism, namely, the device for determining the particular character—that is to say, which of two succeeding characters shall be printed—is actuated whenever the current of the main line is interrupted, which occurs whenever any one of the inner row of keys at the transmitting-station is depressed. The local circuit, which is closed at the back contact-stop, 47, of the armature-lever 44, has already been traced. It includes the batteries 70 and 90 and the electro-magnets 73 and 93. The magnet 73 is thus again actuated to perform the office of printing, as already explained. The function of the magnet 93 is as follows: Its attraction is exerted upon the armature 111, actuating the armature-lever 112, fulcrumed at 113, and normally kept at a distance from the magnet by a spring, 114, adjustable by the screw 115. (Best seen in Fig. 4.) The excursion of the armature 112 is determined by the adjustment-screws 116 and 117, the former limiting its forward motion toward the magnet and the latter its backward motion away from the magnet. The armature-lever 112 articulates at 118 with the bent lever 119, fulcrumed at 120 upon an arbor carried by and running parallel to the armature-lever 75. To permit the rise and fall of said bent lever 119, the articulating arbor 118 traverses a slot in the end of the lever 119, so that the latter may be operated by the motions of the lever 112, regardless of its vertical position. The end of the bent lever 119 is beveled, as shown at 121, Fig. 4. Let it be assumed that the magnet 93 is not actuated: When the armature 75 is elevated, the lever 119 will ascend in front of the beveled toothed wheel 65. If, on the contrary, both magnets, 73 and 93, are simultaneously actuated, the

lever 119 will be moved into the vertical plane in which is situated the wheel 65. The end 121 of said bent lever will impinge upon the beveled surface of the tooth immediately above and cause the wheel 65, as well as the type-wheel which is rigidly connected thereto, to be advanced through the angle subtending one character, said advancement being determined by the excursion of the pin 67 within the slot 68. Of the two devices thus actuated by reason of the contact of the relay armature-lever 44 with its back-stop, the first to perform its allotted function is the determining device, for the determining-lever 119 is carried by the printing-lever 75, and by the time that the latter has been sufficiently elevated to take an impression the determining-lever has already performed its function.

The fourth feature of the receiver is the unison device. It consists of a lever or detent, 130, swinging under slight friction between the stops 131 and 132. It carries at one end a trip, 133, which, when said lever is in contact with the stop 132, extends into the path of the cam 134, projecting from the arbor 61. By operating the lever the type-wheel may thus be arrested in that position in which it will print the zero character(.). As before described, the transmitting-shaft always starts from the corresponding or zero-point of the key-board.

Reviewing the above description, when the first key, A, is depressed, a positive current is sent to line, the relay 42 is actuated, the magnet 75 is vitalized, but not the magnet 93; hence the character brought into position upon the type-wheel will also be A. If, now, the second key, B, is depressed, the current will be interrupted, both the magnets 73 and 93 will be actuated, and through the agency of the latter the type-wheel will be advanced through the space of one letter prior to the operation of the printing, and hence the letter B will be printed. On depressing the third key, C, another current will be sent to line of opposite polarity to that previously transmitted. The escapement-wheel will accordingly be advanced one tooth, the magnet 73 only will be actuated, and the letter C will be printed. Depressing, now, the fourth key, D, the current is interrupted, both the magnets 73 and 93 are actuated, and through the agency of the latter the type-wheel is advanced through the space of one letter prior to the printing; hence the letter D will be printed. If, however, succeeding letters are not to be printed, but letters are chosen at random, it will be understood that as often as the shaft-arm 9 passes an outer key, so often is the escapement operated, and so often is the type-wheel advanced through the space of two letters; hence whatever key is depressed on the key-board the letter which it represents is impressed upon the paper.

Among the advantages arising from my improvements the most important is that of rapidity of transmission. It will be understood by those skilled in the art that the same pulsation that in other systems causes a single character of the type-wheel to be advanced, in this invention causes the advancement of two characters, thereby enabling me to transmit three hundred words per minute with no greater rapidity of electric pulsation than has been heretofore required for transmitting one hundred and fifty words.

I do not in this application claim any art, method, or process herein set forth.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. The combination, substantially as hereinbefore set forth, of two series of keys, mechanism operated by the depression of any key in one series to prolong the duration of the current traversing the line at the instant of operation, irrespective of the polarity of said current, and mechanism operated by the depression of any key in the other series for withdrawing whatever current is then traversing the line.

2. The combination, substantially as hereinbefore set forth, of the revolving shaft of a transmitting-instrument, a pole-changer carried thereby for intermittently reversing the current upon the main line, a series of keys for arresting the motion of said transmitting-shaft at predetermined points in its revolution, thereby prolonging the particular current-pulsation traversing the line at the instant of arrest, and a second series of keys for arresting said shaft at other predetermined points and simultaneously opening said main line.

3. The combination, substantially as hereinbefore set forth, of a system of circuits conveying an electrical current, a pole-changer for intermittently reversing said current, a series of keys, each serving, when operated, to arrest the action of said pole-changer, thereby instituting a continuous current in said circuit, and a second series of keys, each serving, when operated, to withdraw said current by interrupting said system of circuits.

4. The combination, substantially as hereinbefore set forth, of a revolving shaft, an arm or cam projecting laterally from said revolving shaft, a system of contact-points carried by said arm, a battery the circuit of which is completed by the contact of said points, and a series of keys for simultaneously arresting the motion of said arm and separating said contact-points for the purpose of interrupting the circuit of said battery.

5. The combination, with a type-wheel shaft, a type-wheel normally moving therewith, and mechanism for advancing said type-wheel shaft through successive arcs, each subtending two characters upon the circumference of said type-wheel, of a device for mechanically imparting a supplementary movement to said type-wheel independent of the movements of said shaft, substantially in the manner described.

6. The combination of a shaft, a sleeve mov-

able thereupon, a type-wheel rigidly carried by said sleeve, a beveled toothed wheel also rigidly carried by said sleeve, and yielding mechanism, substantially as described, whereby the movements of said shaft are communicated to said type-wheel while permitting the movement of said type-wheel independently of said shaft through an arc subtending a single character.

7. The combination, with a type-wheel and beveled toothed wheel connected together and flexibly mounted upon a shaft, substantially in the manner described, of a printing-lever, a subsidiary lever articulating with said printing-lever and moving therewith, an armature-lever articulating with said subsidiary lever, and an electro-magnet actuating said armature-lever to move said subsidiary lever into the plane of said beveled toothed wheel.

8. The combination, substantially as hereinbefore set forth, of a type-wheel normally advancing the distance equivalent to two characters at a time, a printing mechanism capable of producing the impression of one character at a time, a device for still further advancing the type-wheel through a distance equivalent to one character, and a relay vitalized by currents traversing the main line, for setting in action said printing device, together with said device, for still further advancing the type-wheel.

9. The combination, substantially as hereinbefore set forth, of a relay, two local circuits, respectively closed by said relay upon its back and front stops, an electro-magnet for actuating a printing mechanism included in one of said circuits, and an electro-magnet acting through intermediate mechanism to advance said type-wheel through a definite arc included, together with said printing-magnet, in the other circuit.

10. The combination, substantially as hereinbefore set forth, of a relay armature-lever making both long and short contacts upon each of the limiting-stops between which it plays, and two local circuits closed upon said stops, one including the printing electro-magnet, and the other including said printing electro-magnet and an electro-magnet for mechanically advancing the type-wheel, the armatures of both of said magnets being adjusted to respond to the said long contacts only.

11. The combination, substantially as hereinbefore set forth, of mechanism operated by the depression of alternate transmitter-keys for arresting an advancing type-wheel shaft in such position that the type-wheel carried thereby presents for impression the character next in advance of that represented by the key depressed, mechanism for still further advancing said type-wheel independently of said shaft, for the purpose of bringing the particular character represented by the key depressed into printing position, and printing mechanism.

12. The combination, substantially as hereinbefore set forth, of the following elements actuated by electrical currents and controlled by the depression of alternate transmitter-keys, namely: mechanism for advancing the type-wheel to a position such that the character to be printed is in the neighborhood of the printing mechanism, mechanism for still further advancing said type-wheel independently of its shaft, for the purpose of bringing said character into exact position for printing, and printing mechanism.

In testimony whereof I have hereunto subscribed my name this 20th day of September, A. D. 1882.

HENRY VAN HOEVENBERGH.

Witnesses:
DANIEL W. EDGECOMB,
MILLER C. EARL.

Correction in Letters Patent No. 285,709.

It is hereby certified that Letters Patent No. 285,709, granted September 25, 1883, upon the application of Henry Van Hoevenbergh, of Elizabeth, N. J., for an improvement in "Printing Telegraphs," was erroneously issued to the "Western Union Telegraph Company" of New York, N. Y., as assignee of the entire interest in said invention; that the patent should have been granted to the said *Henry Van Hoevenbergh* as owner of the entire interest; and that the proper correction has been made in the files and records pertaining to the case in the Patent Office, and should be read in the patent to make it conform thereto.

Signed, countersigned, and sealed this 2d day of October, A. D. 1883.

[SEAL.]

H. M. TELLER,
*Secretary of the Interior.*

Countersigned:

E. M. MARBLE,
*Commissioner of Patents.*