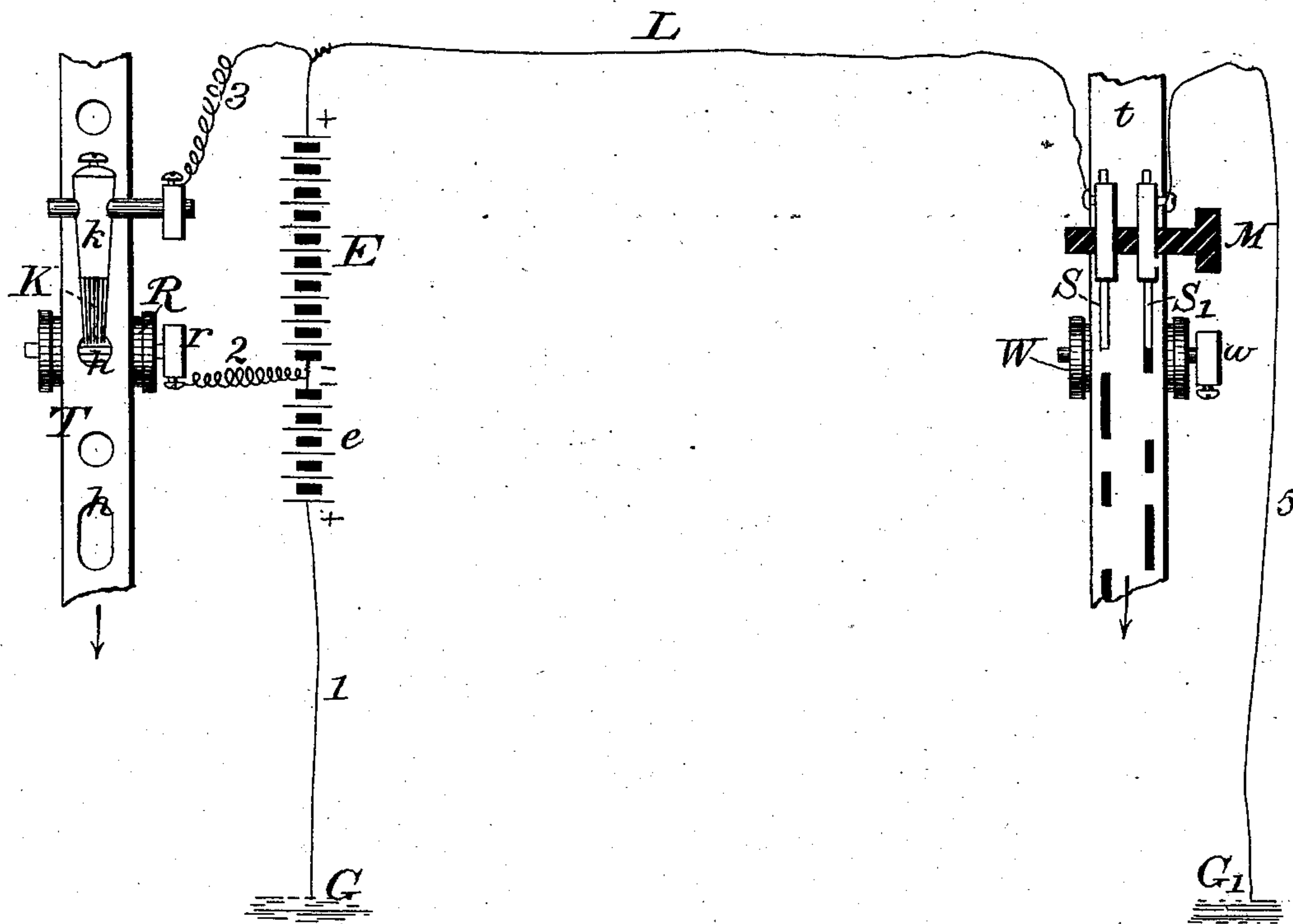


(No Model.)

G. SMITH.  
AUTOMATIC TELEGRAPH.

No. 259,226.

Patented June 6, 1882.



Witnesses:

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# UNITED STATES PATENT OFFICE.

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## AUTOMATIC TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 259,226, dated June 6, 1882.

Application filed November 8, 1881. (No model.)

*To all whom it may concern:*

Be it known that I, GERRITT SMITH, a citizen of the United States, and a resident of Astoria, in the county of Queens and State of New York, have invented certain new and useful Improvements in Automatic Telegraphy, of which the following is a specification.

My invention relates more particularly to that system of automatic telegraphy in which the transmission of the telegraphic signals is effected through the mechanical instrumentality of a pattern-strip, usually consisting of a fillet of paper in which groups of holes are perforated, representing by an arbitrary system of arrangement the letters of the alphabet constituting the words of the communication to be transmitted. The pattern-strip, being prepared in the first place by means of suitable perforating machinery in the hands of an operator, is afterward employed to automatically control the transmission over a telegraph-line of the signals represented by the perforations upon the pattern-strip, and these signals are recorded by means of a suitable receiving-instrument at the terminal station, preference being usually given to an electro-chemical instrument, the construction of which is well known. By the use of a prearranged pattern-strip the actual transmission of intelligence over the line may be effected with great rapidity. The rate of speed at which signals may be transmitted in this manner is, however, limited by two things—first, the time required for the action of the mechanical instrumentalities by which the signals are transmitted and received, and, second, the effects of electro-static induction upon the line-wire.

Automatic apparatus of the general character hereinbefore referred to has been employed, in which a pattern-strip perforated with a single row of holes grouped at different distances from each other has been utilized as a simple circuit breaker and closer to automatically interrupt and restore an electric current passing from the transmitting-battery to the line, thus enabling characters corresponding to the perforations in the pattern-strip to be recorded at the receiving-station. When the rate of speed of transmission by this system reaches a cer-

tain limit the effects of electro-static induction manifest themselves by prolonging the successive signals, and causing them, as it were, to run into each other. This effect is distinctly shown upon a chemical receiving-instrument. The signals, instead of being sharply cut off at their terminations, are prolonged into a tapering line, technically termed a "tailing," which tends to obliterate the space between the signal to which it belongs and the next succeeding signal, and thus renders the record indistinct and even wholly illegible. In order to overcome this difficulty, other methods have been devised in which the spaces between the successive signals are produced by transmitting a current of equal, or nearly equal, strength, but of opposite polarity. Experience has shown that by this means the effective speed of transmission is very greatly increased; but to obtain this result it has heretofore been necessary to make use of a pattern-strip perforated with two parallel rows of holes—one row for transmitting positive and the other negative currents. In order to prepare a pattern-strip having two such rows or sets of perforations, certain objectionable complications have necessarily been introduced into the perforating apparatus, while the transmitting mechanism has also been rendered more complicated and more difficult to adjust and to operate.

My present invention consists in a peculiar organization and arrangement of transmitting and receiving apparatus in connection with batteries and electric circuits, whereby I am enabled to transmit signals consisting of alternate positive and negative pulsations by means of a pattern-strip having but a single row of perforations, and I am thereby enabled to make use of a perforating-machine of the most simple character, and to construct a transmitting apparatus which will send alternate positive and negative pulsations over the line, and which is nevertheless as simple in its construction, adjustment, and maintenance as the make-and-break transmitter formerly used. Thus by means of my invention I am able to secure all the advantages of the alternating and reversing system in which positive and negative currents are employed



without sacrificing the simplicity and convenience of the single-current or make-and-break system.

The accompanying drawing is a diagram illustrating the application of my invention to an automatic telegraph system.

In the figure, R represents a metallic roller at the transmitting-station, which is mounted in a suitable fixed support, *r*.

T is a pattern-strip, consisting of a fillet of paper or other insulating material, which has been perforated by means of suitable mechanism with holes *h h*, arranged in a single row, as shown in the figure. This pattern-strip normally rests upon or passes over the metallic roller R, as shown in the figure, which represents a plan view of this portion of the apparatus.

K is a metallic stylus or comb, which is fixed in a metallic socket, *k*, and placed above the pattern-strip T in such a position that its teeth come in contact with the roller R through the perforations *h h* as they pass beneath it. Thus it will be understood that if the stylus K and the roller R constitute the terminals of an electric circuit, when the perforated pattern-strip T is drawn forward in the direction indicated by the arrow, (by means of suitable wheel-work or other mechanism for imparting a uniform motion thereto,) the electric circuit will be completed during such times as the perforations in the pattern-strip are passing beneath the stylus, while at all other times it will be interrupted by the insulating-paper or other substance of which the pattern-strip is composed.

E is a voltaic battery, the electro-motive force of which should be about twice that normally required to produce a signal at the distant end of the line L, where the receiving-station is situated. *e* is another similar battery, having an electro-motive force preferably about half that of the larger battery, E. These two batteries are united together in the circuit of the main line, with their like poles joined to each other. Hence, when the positive pole of the battery E is presented to the line L, as represented in the drawing, the positive pole of the smaller battery, *e*, is also presented to the earth at G at the same station. A conductor, 3, is connected to the positive pole of the battery E at its junction with the line L, and also with the stylus K. The wire 2 is connected to the negative poles of the batteries E and *e* at the point where they are united with each other, and also with the metallic roller R. The parts thus far described constitute the necessary apparatus at the transmitting-station.

The apparatus at the receiving-station may consist of any suitable telegraphic receiving or recording instrument which is constructed and adapted to respond rapidly to successive signals of alternately opposite polarities. I prefer, however, to employ, in connection with my transmitting apparatus, an electro-chemical receiving-instrument consisting of a roller,

W, mounted in a stationary support, *w*, and caused to revolve at a uniform rate of speed by any suitable mechanism of well-known construction, so as to draw the strip of paper *t* forward at a uniform rate of speed in the direction indicated by the arrow. This strip of paper is prepared in a well-known manner by saturating it with a suitable chemical solution, so as to enable legible marks to be produced upon it by the action of an electrical current. S and S' are two metallic pens or styluses, which are mounted parallel to each other in an insulating-support, M, with their tips or points resting side by side upon the strip of chemically-prepared paper, and directly above the roller W. The line-wire L, coming from the transmitting-station, is attached to the stylus S, and the earth-wire 5 in like manner to the stylus S', and terminating in the earth at G'.

The operation of my improved apparatus and system is as follows: When the apparatus is in its normal position the circuit at the transmitting-station is interrupted between the wires 2 and 3, the stylus or comb K not being allowed to rest upon the roller R. The respective batteries E and *e* are in the main circuit between the line-wire L and the earth G. The poles of these batteries being opposed to each other, as hereinbefore explained, and it being understood that the battery E has a much greater—say twice as great—electro-motive force as the battery *e*, it is obvious that the actual current traversing the line-wire L will be a positive current, equivalent to that produced by a battery of half the electro-motive force of the battery E, the remaining half being neutralized by the opposing effect of the battery *e*. When the pattern-strip T is caused to move forward in the direction of the arrow the comb K will be brought into contact with the roller R whenever one of the perforations *h h* in the pattern-strip passes beneath it, and during such time of passing the wires 2 and 3 will be directly connected, and the battery E will be short-circuited thereby, so that its electro-motive force will produce no effect upon the line L. The smaller battery, *e*, being no longer overpowered by the larger battery, E, will now transmit a negative current over the line to the receiving-station. Hence it follows that as the pattern-strip T passes beneath the comb K a positive current will be transmitted over the line during the passage of the spaces between the successive perforations; but during the passage of the perforations themselves a negative current will be transmitted. These alternate positive and negative currents may be made of equal strength, or may be varied with reference to each other, by varying the proportions between the electro-motive forces of the respective batteries E and *e*. It will be understood, moreover, that during the above-described operation the positive and negative currents upon the line must necessarily succeed each other without an appreciable interval of time between them—a result which it is very



difficult to produce by means of any of the alternating transmitters heretofore in use.

It is well known that with the ordinary chemical solutions which are employed for saturating the sensitive paper in a chemical recording-instrument marks will be produced by the action of the positive current only in passing from the point of the marking-stylus to the paper. The alternate positive and negative pulsations passing over the line-wire *L* and through the stylus *S* to the chemical paper *t* traverse the paper strip (which is a conductor of electricity by reason of the conducting properties of the chemical solution contained in its pores) and pass into the metallic roller *W*, from the roller and paper into the parallel stylus *S'*, and thence by the wire 5 to the earth at *G'*. Inasmuch as a negative current passing from the line-wire and the stylus *S* to the paper *t* is precisely the same thing in reality as a positive current passing from the battery *e* through the wire 1 to the earth at *G*, and thence through the earth to *G'* and over the wire 5 to the stylus *S'*, it is obvious that all the positive currents or pulsations will produce a record upon the chemical paper *t* by means of the stylus *S*, and all the negative cur-

rents or pulsations will be recorded in like manner by the stylus *S'*. Hence, when the apparatus is in operation, as hereinbefore described, the perforations in the pattern-strip *T* will be reproduced in the form of lines upon the chemical paper *t* from the stylus *S'*, and in like manner the spaces between the perforations of the pattern-strip will be represented by another series of lines upon the paper from the stylus *S*, as clearly shown in the drawing.

I claim as my invention—

The combination, substantially as hereinbefore set forth, of a pattern-strip having a single line of perforations, a circuit-closer brought into action by each perforation in said line in succession, two transmitting-batteries of unequal and contrary electro-motive forces, and a receiving-instrument which responds to the action of currents of alternate polarity.

In testimony whereof I have hereunto subscribed my name this 7th day of November, A. D. 1881.

GERRITT SMITH.

Witnesses:

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