(No Model.)

C. A. RANDALL.

AUTOMATIC TELEGRAPH.

No. 255,332. Patented Mar. 21, 1882.

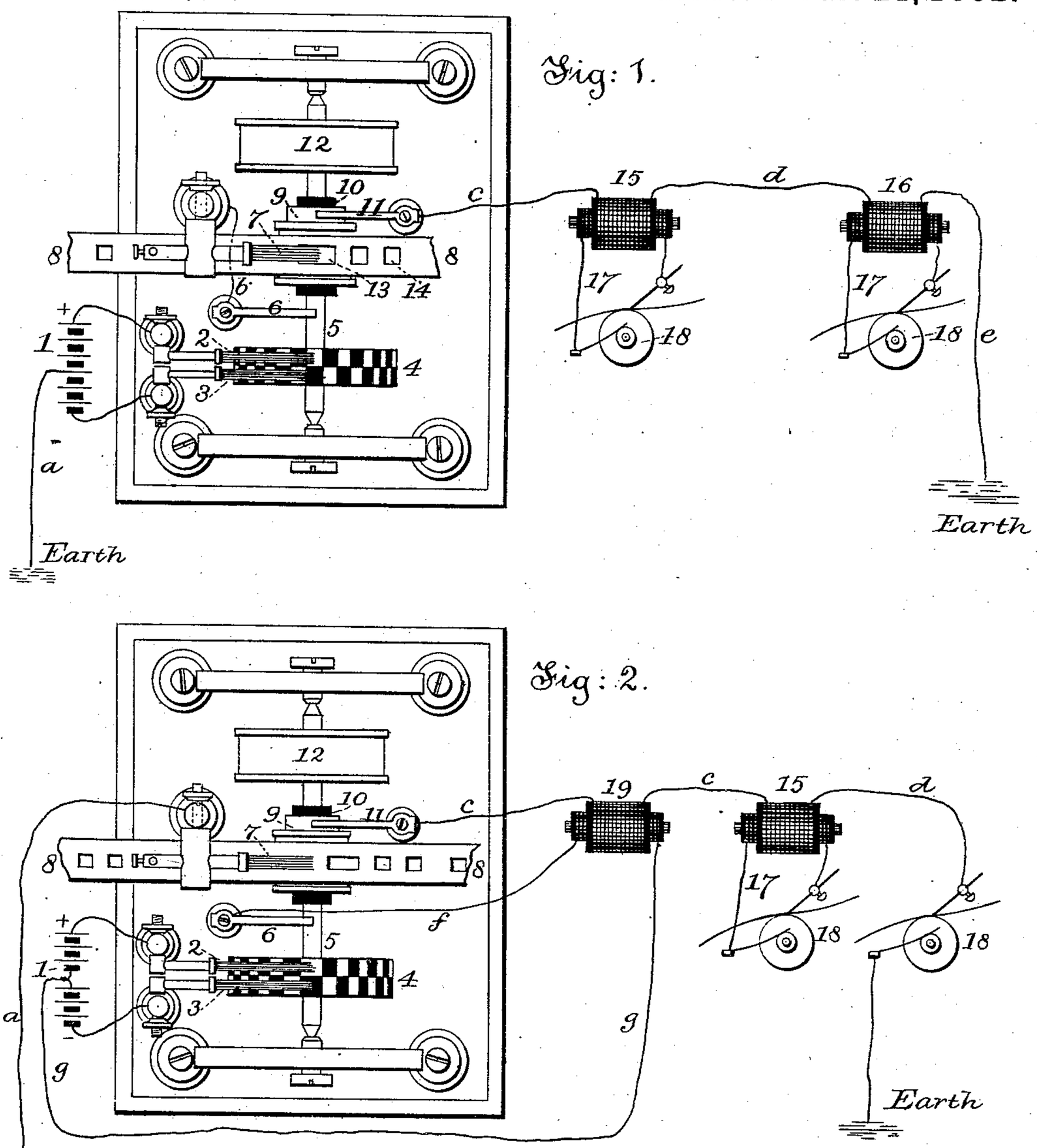

Fig: 1.

Fig: 2.

Fig: 3.

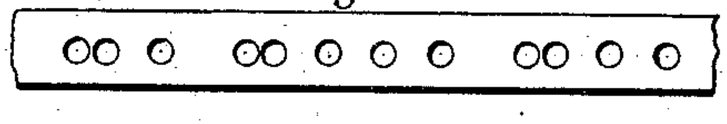

Fig: 4

Witnesses:

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UNITED STATES PATENT OFFICE.

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AUTOMATIC TELEGRAPH.

SPECIFICATION forming part of Letters Patent No. 255,332, dated March 21, 1882.

Application filed September 7, 1881. (No model.)

To all whom it may concern:

Be it known that I, CHARLES A. RANDALL, a citizen of the United States, residing in the city, county, and State of New York, have invented certain new and useful Improvements in Automatic Telegraph Systems and Apparatus, of which the following is a specification.

My invention relates more especially to that class of automatic telegraphs in which the transmission is effected by the means of an automatic controller consisting of a pattern-strip having predetermined characters formed thereupon, which characters are telegraphically reproduced at the receiving-station by the discoloration of chemically-prepared paper in a well-known manner.

In Letters Patent No. 237,595, granted to me February 8, 1881, I have described and claimed an art, method, or system of transmitting over a telegraphic circuit signals composed of alternate positive and negative electric impulses, which consists in producing the required alternation of currents by means of a continuously-operating pole-changer and independently controlling the transmission of said alternate currents over the line by means of a pattern-strip, and which further consists in transmitting two or more impulses from a single perforation in said pattern-strip.

My present invention is an improvement upon the method and apparatus described in my said patent, which consist generally in the combination therewith of one or more induction-coils or inductoriums, whereby the recording-current at the receiving-station is produced in a local or secondary circuit by inductive action when currents from the transmitting apparatus are made to pass through the primary circuit. By means of this organization I am enabled to secure important advantages, as the electro-motive force of the recording-currents may be greatly increased without the necessity of correspondingly increasing that of the currents traversing the line, and communications may be dropped at any required number of way-stations and recorded upon chemical paper without materially increasing the resistance of the main line. The alternate positive and negative pulsations which traverse the line being equal, or nearly equal, to each other in duration, induce but a comparatively small static charge in the conductor, and hence the speed of transmission may be materially increased. The proximity of the separate dots in any one group representing a character is such as to cause them to resemble a continuous line upon the chemical paper, as set forth in my former patent hereinbefore referred to.

In the accompanying drawings, Figure 1 is a plan view of an automatic telegraphic transmitter, together with a diagram of a circuit embodying my invention. Fig. 2 shows a modification of the same. Fig. 3 represents a portion of a transmitting-band or pattern-strip, and Fig. 4 represents a strip of paper marked with the characters corresponding to the pattern-strip as they appear when recorded at the receiving-station.

In Fig. 1 the battery at the transmitting-station is represented at 1. One of its poles is connected with a metallic contact-brush, 2, and the opposite pole with a similar brush, 3, these brushes being mounted upon suitable standards insulated from each other, as shown in the drawings. The battery is also connected with the earth by a wire, *a*, attached thereto at a point nearly midway between its poles.

The earth-wire *a* may with advantage be placed at a point which divides it unequally, so that the positive section of the battery will possess an electro motive force slightly in excess of the negative section. The brushes 2 and 3 bear against the periphery of the pole-changing wheel 4, which is composed of two parallel series of alternating, conducting, and non-conducting spaces of equal, or nearly equal, dimensions, as clearly shown in the drawings. The conducting-divisions of the wheel 4 are all in electrical connection with the metallic shaft 5, upon which it is mounted, and are so arranged with reference to the brushes 2 and 3 that when, by the rotation of the wheel 4, one of the brushes, as 2, is brought into contact with a conducting-surface, the other brush, as 3, rests upon a non-conducting surface, and vice versa. A metallic friction-spring, 6, presses against and makes continuous electrical connection with the shaft 5 as it revolves. This spring is also electrically connected by a wire, *b*, with a transmitting-brush, 7, which serves to complete an electrical circuit through the perfora-

tions in a non-conducting pattern-strip, 8, with a metallic drum, 9. The drum 9 is insulated from the shaft 5, upon which it is mounted by a non-conducting bushing, 10, and is electrically connected with the line-wire *c* by means of a friction-spring, 11. If the shaft 5 be caused to rotate by suitable mechanical means—as, for instance, a belt or band applied to the pulley 12—a continuous and rapid succession of alternate positive and negative impulses will be sent from the battery 1 and pole-changing wheel 4, through the perforations in the pattern-strip 8, and over the line *c*. I prefer to so proportion the dimensions of the pole-changing wheel, 4, the drum 9, and the long and short perforations 13 and 14 in the pattern-strip 8 that during the time that one of the shorter perforations, as 14, is passing under the brush 7 in the direction indicated by the arrow the pole-changer shall transmit four alternate pulsations to line—two positive and two negative—while during the passage of one of the longer perforations, as 13, it shall in like manner transmit eight pulsations.

The arbitrary characters which constitute the telegraphic alphabet are made up entirely of perforations of two different lengths, one being twice as long as the other, and these are arranged arbitrarily in groups, according to a conventional code, in a well-known manner.

The main line *c* extends to an inductorium, 15, placed at a receiving-station, and thence by the wire *d* to another receiving-station, also provided with an inductorium, 16, and thence by the wire *e* through any required number of similar receiving-stations, and finally to the earth. The primary coils of each of these inductoriums are included in the main circuit *c d e*, which forms a common primary circuit for them all. The secondary coil of each inductorium is included in and forms part of an independent local circuit, 17, in which is placed a recording-instrument, 18, of any suitable or well-known construction, a chemical recording-instrument being preferred.

The operation of the apparatus is as follows: Referring to Fig. 1, if the non-conducting perforating pattern-strip 8 were to be removed, the brush 7 allowed to rest upon the drum 9, and the apparatus set in motion, it is obvious that a rapidly alternating series of positive and negative pulsations will proceed from the battery 1 and the pole-changing wheel 4, through the shaft 5, spring 6, wire *b*, brush 7, drum 9, and spring 11, and thence over the line-wire *c d e* to the earth. At each change in the polarity of the current traversing the main circuit from positive to negative a secondary current of momentary duration and of positive polarity is induced in the secondary circuit 17 at each receiving-station, and a dot is recorded thereby upon the chemical paper. Hence, but for the interposition of the pattern-strip 8 a continuous succession of short dots would appear upon the paper at the receiving-station. When, however, the pattern-strip 8 is made to pass over the drum 9 and underneath the brush 7, as in Fig. 1, the main circuit is interrupted by the non-conducting material of the strip, except while the several perforations are passing underneath the brush. Hence the passage of one of the longer perforations, as 13, will permit four dots to be recorded, while one of the shorter perforations will only permit two dots to be recorded. The appearance of these groups of dots upon the paper as produced by long and short perforations is shown in Fig. 4.

In the construction of induction-coils or inductoriums for the receiving-stations, it is preferable that the secondary coils thereof should be wound with shorter and thicker wire than the primary circuit which is placed in the main line, thus reversing the ordinary arrangement of such coils.

In Fig. 2 I have shown a modification in the manner of connecting the apparatus with the line, which, however, embodies the same general principle of operation. In this instance the wire *g*, Fig. 2, from the middle of the transmitting-battery, instead of being connected to the earth, is attached to one terminal of the primary coil of a transmitting-inductorium, 19, the other terminal of said coil being connected by the means of a wire, *b*, with the contact-spring 6, thus placing the battery 1 and pole-changing wheel 4 in a local circuit, within which is included the primary coil of the inductorium 19. The transmitting-brush 7 is connected to the earth by the wire *a*, and the spring 11 is in like manner attached directly to the line *c*, as in the first instance. The secondary coil of the inductorium 19 is included in the main line *c*, while the receiving-station may either be arranged as in the first-mentioned case or the main wire, as shown at *d* in Fig. 2, may be attached directly to the recording-instrument 18. The operation in this case is similar to that already described, except in that the secondary current is controlled by the pattern-strip instead of the primary current, as in the first instance.

The pattern-strip or non-conducting band employed in connection with the transmitter may be such as represented at 8 in Figs. 1 and 2, or it may be perforated, as shown in Fig. 3.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of an inductorium, mechanism for producing a regular succession of alternate positive and negative electric impulses of equal duration in the primary circuit of said inductorium, and one or more telegraphic recording-instruments actuated by induced electrical impulses in the secondary circuit of said inductorium.

2. The combination, substantially as hereinbefore set forth, of an inductorium, mechanism for producing a regular succession of alternate positive and negative impulses in the primary circuit of said inductorium, an automatic circuit-controller for transmitting predetermined signals, and one or more tele-

graphic recording-instruments actuated by induced electrical impulses in the secondary circuit of said inductorium.

3. The combination, substantially as hereinbefore set forth, of two or more inductoriums having a common primary circuit and independent secondary circuits, mechanism for producing a regular succession of alternate positive and negative impulses in said primary circuit, an automatic circuit-controller for transmitting predetermined signals, and a telegraphic receiving-instrument included in each of said secondary circuits.

In testimony whereof I have hereunto subscribed my name this 31st day of August, A. D. 1881.

CHAS. A. RANDALL.

Witnesses:

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