O. HEIKEL.

Automatic Telegraph Apparatus.

No. 167,242. Patented Aug. 31, 1875.

Fig. 6.

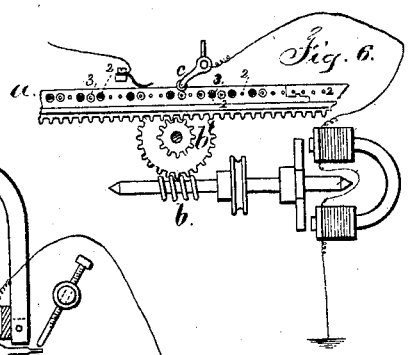


Fig. 5.

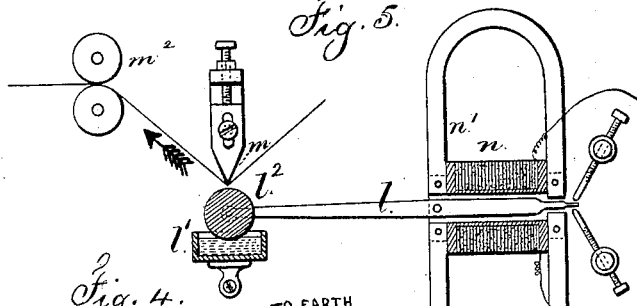


Fig. 4.

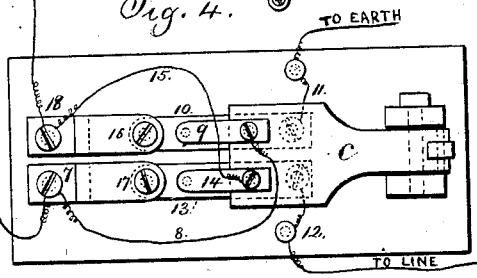


Fig. 3.

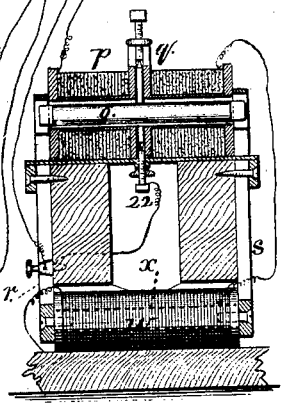


Fig. 2.

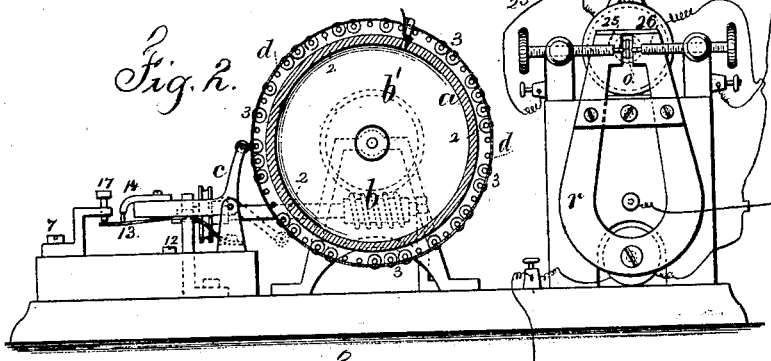
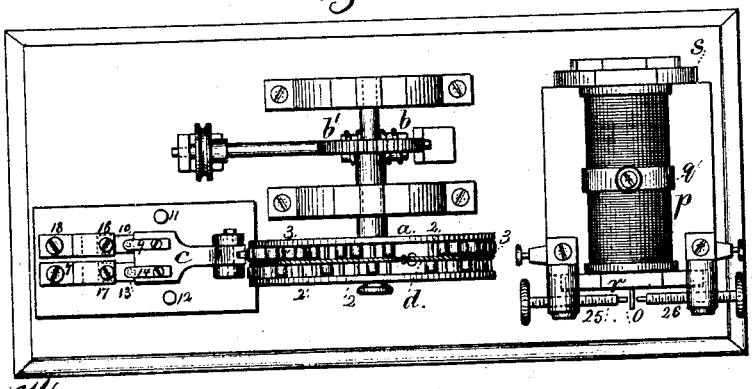


Fig. 1.



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UNITED STATES PATENT OFFICE.

OTTO HEIKEL, OF JERSEY CITY, NEW JERSEY.

IMPROVEMENT IN AUTOMATIC-TELEGRAPH APPARATUS.

Specification forming part of Letters Patent No. **167,242**, dated August 31, 1875; application filed June 5, 1875.

To all whom it may concern:

Be it known that I, OTTO HEIKEL, of Jersey City, in the county of Hudson and State of New Jersey, have invented an Improvement in Telegraphic Apparatus, of which the following is a specification:

My invention relates to a mechanical circuit changer or breaker, in which the message is composed, and which operates the key in place of operating it by hand. I also make use of a polarized relay-instrument of peculiar construction, that is adapted to work with weak currents, and I use a circuit preserving and reversing key, that serves to maintain a metallic connection in the line, but change the direction of the currents.

In the drawing, Figure 1 is a plan of the apparatus. Fig. 2 is an elevation of the same, partially in section. Fig. 3 is a section of the polarized relay-instrument. Fig. 4 is a plan in larger size of the key. Fig. 5 is a section of the receiving-instrument, and Fig. 6 is a modification of the instrument in connection with a magneto-electric machine.

I make use of a wheel or drum or bar, *a*, moved by suitable power applied through the worm-pinion *b* and gear *b'*, or otherwise, and this wheel, drum, or bar *a* is the composing-wheel. It consists of a narrow groove between flanges, with wires 2 2 passing through these flanges, and upon which wires are the small rollers 3 3, of a length less than half the width of the groove. These drums, wheels, or bars *a* are of suitable size, and are easily removed from the mechanism and others inserted, or the bars added in succession by connecting one with the other, and the compositor or operator moves the small rollers 3 3 to the right or left upon their wires, so as to bring the rollers into a position to operate upon the key *c*, or not, according to the system of dots or dots and dashes used for the alphabet. In this way the message is composed, and the operator holds the little rollers from end movement by a cord, *d*, laid in between them, as illustrated in Figs. 1 and 2, and this cord should be elastic, and laid in as the cylinder wheel or bar is moved during the composing of the message. If this wheel is large enough to contain an average message, then it will be unnecessary to use a cylinder; otherwise a drum or cylinder may be used with a screw-formed groove around its periphery, within which are the rollers 3, and this cylinder can be of any desired size. It will, however, require an endwise movement upon the shaft as it revolves in contact with the key *c*, or else the key must be moved laterally, so as to conform to the spiral of the cylinder. The spring-key *c* is provided with a roller or rounded end to the arm that extends upward, as shown in full lines in Fig. 2, or downward, as in dotted lines, and the rollers 3, acting against the arm of the key, move the same. If it is a single key the circuit will be broken by a movement in one direction, and closed by a movement in the other direction. If it is a circuit-preserving key, a rise and fall of tension may be produced or a reversal of the polarity of the current. I have shown the reversing-key *c* in Fig. 4, wherein the current passes from the binding-screw 7 through the wire 8, arm 9, spring 10, and wire 11 to earth, the negative returning from line through 12, spring 13, arm 14, and wire 15, and binding-screw 18 to battery. When the key is depressed the contact is made between screws 16 and 17, and springs 10 and 13, and broken between the arms 9 and 14 and these springs, so that the current passes in the opposite direction, going by 7, 17, 13, and 12 to line, and returning by 11, 10, 16, and 18 to battery. This is a convenient construction of reversing-key that may be used either by hand or in the telegraph-instrument aforesaid. I remark that the wires will be in the wooden bed instead of being outside the parts, as represented for greater clearness. The receiving-instrument I employ is shown in Fig. 5, wherein the lever *l* carries at one end a roller, l^2, that is in the ink-fount l^1, and is pressed up against the under side of the strip of paper to mark the same, said paper being drawn along regularly beneath the projecting blade *m* by the rollers m^2. The other end of the lever *l* forms a core or polarized armature within the helix *n*, and it is moved to either side, according to the polarity of the current sent, said lever being attracted or repelled by the magnetism of itself and the stationary magnets *n'*. This polarized relay is made of a swinging circuit-changer, *o*, within the helix *p*, and centered in the yoke *q*, to which yoke *q* the line or battery wrie is connected at 22,

and the other battery-wires 23 24 are connected to the circuit-closing points 25 26, between which the circuit changer *o* swings.

The permanent magnets *r* and *s* are applied at the ends of the helix *p*, and the ends of the circuit-changer *o* are between the poles of these magnets, and by using a keeper-bar upon the poles of these magnets they are more durable and rapid in their action. According to the direction of the current in the helix *p*, so the circuit-changer *o* will be polarized, and be moved one way or the other, according to the attraction between its ends and the stationary magnets *r s*, and the circuits from the batteries *u* will be closed one way or the other through *o* to the receiving-instrument; thus a positive or negative current will be transmitted, and the instrument, Figs. 1, 2, and 3, work as a relay. If, however, this instrument is not required as a relay, the swinging needle *o* can be used as a visual telegraph.

In the present instrument a helix, *w*, surrounds the bar *x*, that connects these two permanent magnets *r s*, and the helix is in the same metallic circuit as the line and the helix *p*, so that the pulsations passing through the instrument will polarize the circuit-changer *o*, and also intensify the permanent magnets, so that the attraction of the circuit-changer is instantaneous, with only a feeble current, and the same operations take place upon reversing the current; hence the local circuit to the receiving-instrument shown in Fig. 5 is closed either one way or the other, and the ink-roller is pressed against the paper to mark the same by a current of one polarity, or else the roller is drawn back from the paper by a current of the opposite polarity.

The transmitting-instruments shown in Figs. 1 and 2, and hereinbefore described, may be used with a magneto-electric machine of any suitable construction for transmitting messages with great rapidity. In Fig. 6 the magneto-electric machine is illustrated, and it is to be connected so as to give pulsations of alternate opposite polarity, and the magneto-electric machine is to be connected by gearing to the mechanism that moves the trough of circuit-rollers 3 along, and the construction is such that a positive pulsation passes through one of the rollers and a negative through the next, when they are all in line with the circuit-closing lever *c;* hence, to interrupt any pulsation it is only necessary to push one of the rollers back out of line with the circuit-closer. By this construction the operator is able to compose his message and send positive and negative pulsations alternately or at intervals, according to the character of the receiving-instrument and the signals to be given.

I remark that it will be preferable to employ rollers or circuit-closing blocks of alternately different colors, such as copper and brass, one indicating a positive pulsation, the other a negative pulsation, so as to aid the operator in arranging the rollers to compose the message. The straight bars may be supported by grooved rollers and moved along progressively by the magneto-electric machine that acts upon rack-teeth upon such bars. This instrument for transmitting the alternating currents of a magneto-electric machine, when connected with the relay-instrument, Figs. 1, 2, 3, and the receiving-instrument, Fig. 5, is adapted to producing the dots and dashes of the Morse or other alphabet, or the alphabet composed of dots, as has heretofore been used.

I do not claim a range of movable pins to which end motion is communicated, as these have been employed for opening and closing an electric circuit.

I claim as my invention—

1. The rollers 3 3 upon the wires 2 2, and within the grooved wheel or bar, in combination with the cord *d* and circuit-closing mechanism, substantially as set forth.

2. The swinging circuit-changer or needle *o* within the helix *p*, and the permanent magnets *r* and *s*, arranged as set forth, in combination with the bar *x*, that connects the said magnets *r s* and the helix *w*, surrounding such bar, as set forth.

3. The polarized lever *l* and ink-roller l^2, operated by the magnets *n n'* and electric circuits, in combination with the blade *m* and rollers m^2, for moving a strip of paper in contact with such blade and contiguous to the ink-roller, for the purposes set forth.

4. The combination, in a telegraph transmitting-instrument, of movable circuit-closing rollers or blocks, a key, a magneto-electric machine, and gearing connecting the parts, substantially as specified, for transmitting reverse currents alternately and at intervals, to form the message, as set forth.

Signed by me this 1st day of June, A. D. 1875.

OTTO HEIKEL.

Witnesses:
GEO. T. PINCKNEY,
CHAS. H. SMITH.