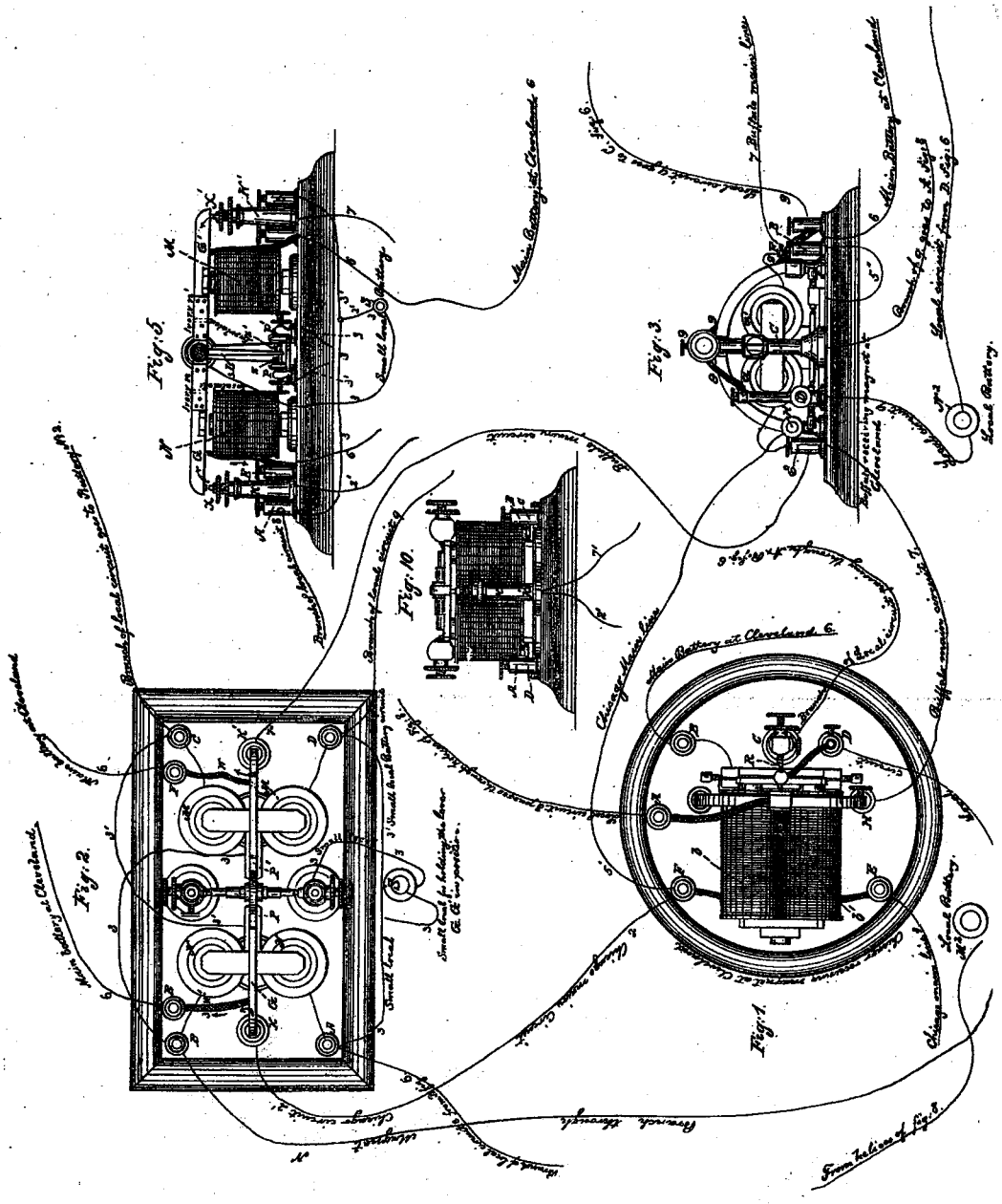
2 Sheets—Sheet 1.

G. B. HICKS.

Telegraphic Repeater.

No. 21,132.

Patented Aug. 10, 1858.



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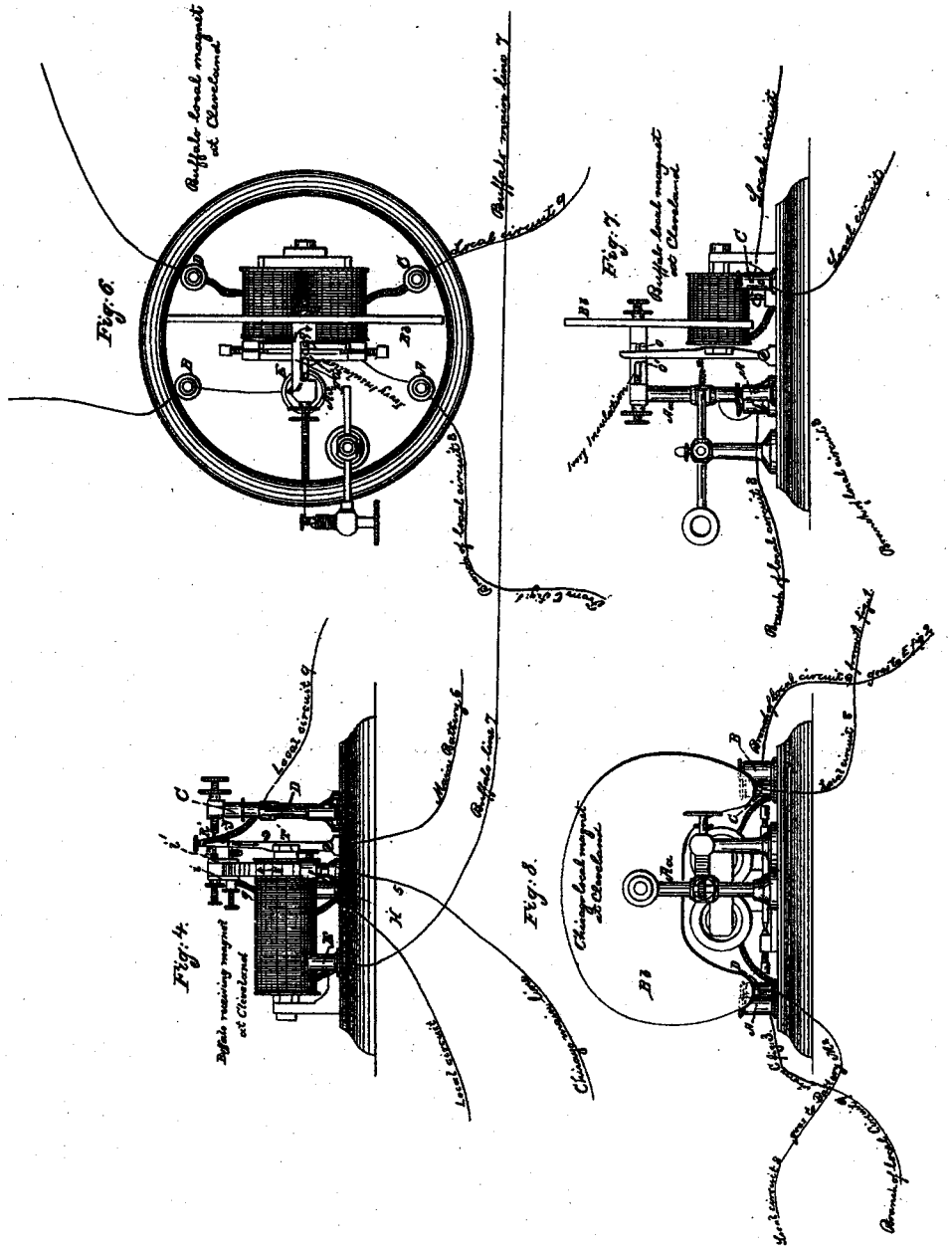

UNITED STATES PATENT OFFICE.

GEO. B. HICKS, OF CLEVELAND, OHIO.

IMPROVEMENT IN TELEGRAPHIC INSTRUMENTS.

Specification forming part of Letters Patent No. **21,132**, dated August 10, 1858.

To all whom it may concern:

Be it known that I, GEORGE B. HICKS, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented new and useful Improvements in Telegraphic Instruments; and I do hereby declare that the following is a full and complete description of the construction and operation of the same, reference being had to the accompanying drawings, and to the letters of reference and notes of explanation marked thereon, making part of this specification.

The nature of my invention consists in the construction of an instrument that will act automatically between two lines, by means of which an operator at the extremity of either of the lines can at will, by means of the electrical current, change the position of the instrument in regard to its connections, so as to establish a direct communication between different points upon such distinct lines. For example, suppose there be a line from Buffalo to Cleveland, terminating in the ground at both places, and thus completing the circuit, and also suppose there be a line from Chicago to Cleveland, also terminating in the ground at both places, and thus completing the circuit. If, now, the instrument described in this specification be placed at Cleveland and connected with both Buffalo and Chicago lines, as hereinafter described, the offices at Buffalo and Chicago will be able to interchange intelligence with the same facility that either one could communicate with Cleveland, with which both these places are supposed to be in direct communication or connection by a single circuit, the instrument acting automatically to repeat the message of one line upon the other by means hereinafter described, so that the office at Buffalo may communicate directly with Chicago, or Chicago with Buffalo, without the aid of an intermediate operator at Cleveland, as is now required between all connecting lines having distinct circuits.

The receiving magnets or instruments are altered from the ordinary form to that exhibited in Figure 4, in which the armature makes contact with the points *m m'*, as seen in Fig. 4. These are insulated from each other by an ivory insulator, *y*, on the armature T, and the ivory insulators *i i'* upon the summit of the arch H, Fig. 4. The local current passes through the upper point, *m*, Fig. 4, while the main current passes through the lower point, *m'*. A delicate spring is employed, as seen at *m'*, to insure a perfect contact upon both points.

Fig. 6, 7, and 8 are different views of sounders. The "sounder" is so called from its being employed in place of the ordinary registering apparatus, where paper is used, upon which are impressed marks or signs addressed to the eye, the message received being thus recorded by the instrument. Where the sounder is used the operator, in receiving a message, is guided wholly by the click of the instrument, the interval determining the letter of the alphabet, word, or abbreviation indicated, as the case may be, which letter or word is written by the operator with a pencil upon paper. He therefore writes out the message received wholly by sound. The sounder then is simply an electro-magnetic instrument (to which is attached a plate for giving a distinct tone) with an armature-lever influenced by the current from the local battery. These are generally employed in place of the old registering apparatus, and it is obviously necessary (independent of any considerations concerning repeaters) that each line must have a receiving and a local magnet.

Figs. 2, 5, and 10 are different views of my additional piece of mechanism used in repeating. The letters M and N, Figs. 2 and 5, represent local magnets. G G' is an armature-lever, each end of which is insulated from the center by the ivory insulators. (Seen at *n* and *n'*.) I is an arm standing at right angles to the horizontal lever G G', and placed in a vertical position, and, being attached to the lever G G', moves with it, and by means of the connection formed at Z Z' seen in Fig. 5 a current from a small local battery is passed through the magnets M or N, according as the lever G G' is depressed at X or X'. This arrangement is more clearly shown in Figs. 2 and 5, where the directions of the currents are indicated by the red lines at 3 and 3'. The object of this small local current is to prevent the connection at X or X' from being accidentally broken by jarring of the instrument or otherwise. But this weak local current is easily overcome by passing a strong current through the helix opposite to the one in connection, when the lever G G' instantly changes its position, and with that change transfers the small local current

also, and this change can be effected at will by a distant operator in the manner hereinafter described.

The connections and operations in my improvement are as follows:

The instruments being located, for example, in Cleveland, and placed in connection with the main lines or wires that lead to Buffalo and Chicago, the Buffalo wire 7, Fig. 3, comes to the post F, Fig. 3, which is connected by the helices *a a'* with the post E, whence a wire passes to K', Fig. 2, from which a connection is formed by the end of the lever G' to the wire W and the post F, Fig. 2, to the main battery by the wire 6. From the post E, Fig. 3, a wire is carried to H, Fig. 1, whence the current passes through the lower point, *m'*, Figs. 3 and 4, (Figs. 3 and 4 are different views of the same instrument, but the position of Fig. 3 is such that the point *m'* cannot be shown,) down the armature T, Figs. 3 and 4, and by the post B, Figs. 3 and 4, to the main battery by the wire marked 6. (See red lines and notes of explanation in the figures.) It is proper to state that in the case we are considering but one main battery is used. When the lever G G' is depressed at X', contact ceasing at X, the Buffalo circuit is closed and broken by the vibration of the armature-lever of Fig. 1. The Chicago main line 5' is attached to post E, Fig. 1, in the same manner that the Buffalo line 7 is attached to the post F, Fig. 3, whence connection is made through the helices *b b'* to the post F, Fig. 1, thence *via* 2', K, G, W', and E, Fig. 2, to the main battery by the wire 6. From F, Fig. 1, a wire, 5', goes to H, Fig. 3, whence connection is made by the lower point on the armature of Fig. 3, (which point is not shown in the drawings, but is precisely like *m'* in Fig. 4,) thence, *via* the post B, Fig. 3, and wire 6, to the main battery at Cleveland, thus causing the Chicago circuit to be closed and broken by the vibration of the armature of Fig. 3. The position of G G', as represented in Fig. 5, shows the Buffalo circuit closed at X, while the Chicago circuit, being broken at X', is written upon by the armature of Fig. 3. The local circuits are arranged to pass *via* D and A, respectively, as shown in Figs. 1 and 3, thence through the helices of Figs. 6 and 8, and thence back to the batteries M^2 and N^2, the closing and breaking of the circuit being accomplished as shown at the points *m m'*, Fig. 4. A wire is carried from C, Fig. 1, to A, Fig. 6; thence connection is formed *via* the armature-lever F E and the post B, Fig. 6. At B, Fig. 6, is attached a wire, which goes to A, Fig. 2. This is connected with B, Fig. 2, by the helices of the magnet N N; thence connection is made direct with the battery M^2, as indicated. This connection is closed or broken, according as the lever O, Fig. 7, is upon the point *o* or *o'*. The local current from the battery M^2 is therefore diverted through the magnet N N, Fig. 2, when the lever of Fig. 1 upon the point R and the levers of Figs. 6 and 7 upon the point *o*. A wire is likewise taken from C, Fig. 3, and carried to A, Fig. 8, whence connection is made, *via* the armature-lever and post B, Fig. 8, with D, Fig. 2, thence *via* the helices M M, Figs. 2 and 5, to the post *c*, Fig. 2, and thence to the local battery N^2. This connection is only complete when the lever of Fig. 3 falls back upon the point R', as shown in Fig. 4, and the armature-lever of Fig. 8 closes upon a point similar to *o* in Fig. 7, but not shown in Fig. 8. A very weak local battery, S, is employed to hold the lever G G' in position, and insure connection at X X', Figs. 2 and 5, whichever of these may be in contact. As shown in Fig. 5, the circuit is now completed by the contact of the arm I upon a delicate spring at *z* upon the post P, Fig. 5, (see also Fig. 2 for connections;) thence to the post C, *via* the helices M M, to the post D and battery S, Fig. 2. Were the lever G G' depressed at X' the arm I, Fig. 5, would leave *z* and connect with *z'*, Fig. 5, post P', Figs. 2 and 5, whence connection would be completed by the wire 3, to the post B, Fig. 2, and *via* the helices N N, Figs. 2 and 5, to the post A, and thence to the battery S. No confusion can result from connecting the post A and D, Fig. 2, or from connecting the magnets M and N, Fig. 2, with wires from the batteries M^2, N^2, and S, if these batteries are so placed that the + and − currents, respectively, flow in the same direction.

The action is as follows: Let the operator at Buffalo be writing—that is, sending a message—and let the operator at Chicago wish to interrupt him. The latter opens his key and breaks the circuit 5', upon which the armature of the magnet, Fig. 1, falls back upon the point R. Then the next instant, if the manipulations of the operator at Buffalo cause the armature of the lever of Fig. 6 (situated at Cleveland) to fall upon *o*, the current from the local battery M^2 will be diverted through the magnet N N, Fig. 2, and this instantly overcomes the feeble magnetism induced in the helices M by the small local battery S, and depresses the lever G G' at X', thereby closing the Chicago circuit *via* E, Fig. 2, and wire 6, Fig. 2, to the main battery at Cleveland, and opening the Buffalo circuit at X, Figs. 2 and 5. Buffalo circuit can then be written upon by the vibrations of the armature-lever of Fig. 1. Similarly, were the operator at Buffalo then to open his key and break the circuit 7, the armature-lever of Fig. 3 would fall back upon the point R', (shown in Fig. 4,) and then the contact of the armature-lever A', Fig. 8, upon a point like *o* in Fig. 7 (not shown in Fig. 8) would divert the current from the magnet N N and cause it to pass through the magnet M M, Figs. 2 and 5, and thus depress the lever G G' at X, thereby closing the Buffalo circuit at this point and opening the Chicago circuit at X'. The Chicago circuit would then be written upon by the vibrations of the armature of Fig. 3, as already shown. Again, let the op-

erator at Buffalo be writing—that is, sending a message. Since the points *m m'*, Fig. 4, connect the local and main circuits (completed through them) simultaneously, the armature-levers of Figs. 1 and 6, operated through these points, must move simultaneously. Consequently the armature-lever of Fig. 1 cannot fall back upon R when that of Fig. 6 falls upon *o*, except when the lever of Fig. 1 is held back upon R by an interruption of the current 5'. No portion of the current from M^2 (the local battery) can therefore escape through the magnet N, Fig. 2, to disturb the position of the lever G G', except when desired by the operator at Chicago, in which case the action is as above described. If the operator at Chicago be writing, the same is true of the local battery N^2 and the magnet M of Fig. 2.

In order to secure a simultaneous movement between the armatures of the receiving and recording instruments—say of Figs. 1 and 7—the armature-levers of both should be of like construction as regards length and position. The receiving-magnet, Fig. 1, being acted upon only by the current of the main line, its action is less vigorous than that of the recording-magnet, which is brought into connection with the local battery by the movement of the receiving-magnet, the armature of which is necessarily so delicately adjusted, and consequently passing through so small a space, that the sound caused by contact of the connecting-points cannot be heard with sufficient distinctness to guide the operator in writing out a message by sound. The recording of messages is, therefore, entirely dependent upon the sound of the instrument shown in Figs. 6, 7, and 8, and not upon the formation of signs or characters made or impressed upon paper by the instrument. I have therefore found it necessary to introduce a sounder of peculiar form and construction, the armature of which coincides in length, weight, and position with that of the receiving-magnet, and having a glass or metallic plate attached to a horizontal bar upon the top of the post A *a*, Figs. 6, 7, and 8. This plate is shown at B *b* in the same figures. The circuit from the local battery through the helices of the recording-magnet being closed and broken by the movement of the armature of the receiving-magnet, a similarity in the construction will insure a simultaneous movement of the armatures of the receiving and recording magnets.

What I claim as my improvement, and desire to secure by Letters Patent, is—

1. The herein-described devices or their equivalents, by means of which two armature-levers, one of which is upon the receiving-instrument and the other upon the recording-instrument, are moved simultaneously, as seen in Figs. 4 and 6, in order to render it impossible for any portion of the current from the batteries M^2 or N^2 to pass through the magnets M M or N N, Figs. 2 and 5, except when required to change the position of the lever G G'.

2. The herein-described arrangement for so connecting a circuit through the armature-levers of the receiving and recording (local) magnets, Figs. 4 and 6, that a current may be diverted through the magnets M M or N N, Figs. 2 and 5, at the pleasure of a distant operator, and thereby changing the position of the lever G G', Figs. 2 and 5, for the purpose of enabling the operators upon two distinct circuits to transmit intelligence from one circuit to the other without the aid of an intermediate operator, by the means and in the manner herein specified.

3. The employment of the devices herein named, or their equivalents, whereby a current from the battery S may be diverted from one magnet, M M, to another, N N, as set forth, by means of the arm I upon the lever G G', Figs. 2 and 5, striking upon *z z'* as the lever G G' is depressed at X or X'.

GEO. B. HICKS.

Witnesses:
J. BRAINERD,
W. H. BURRIDGE.