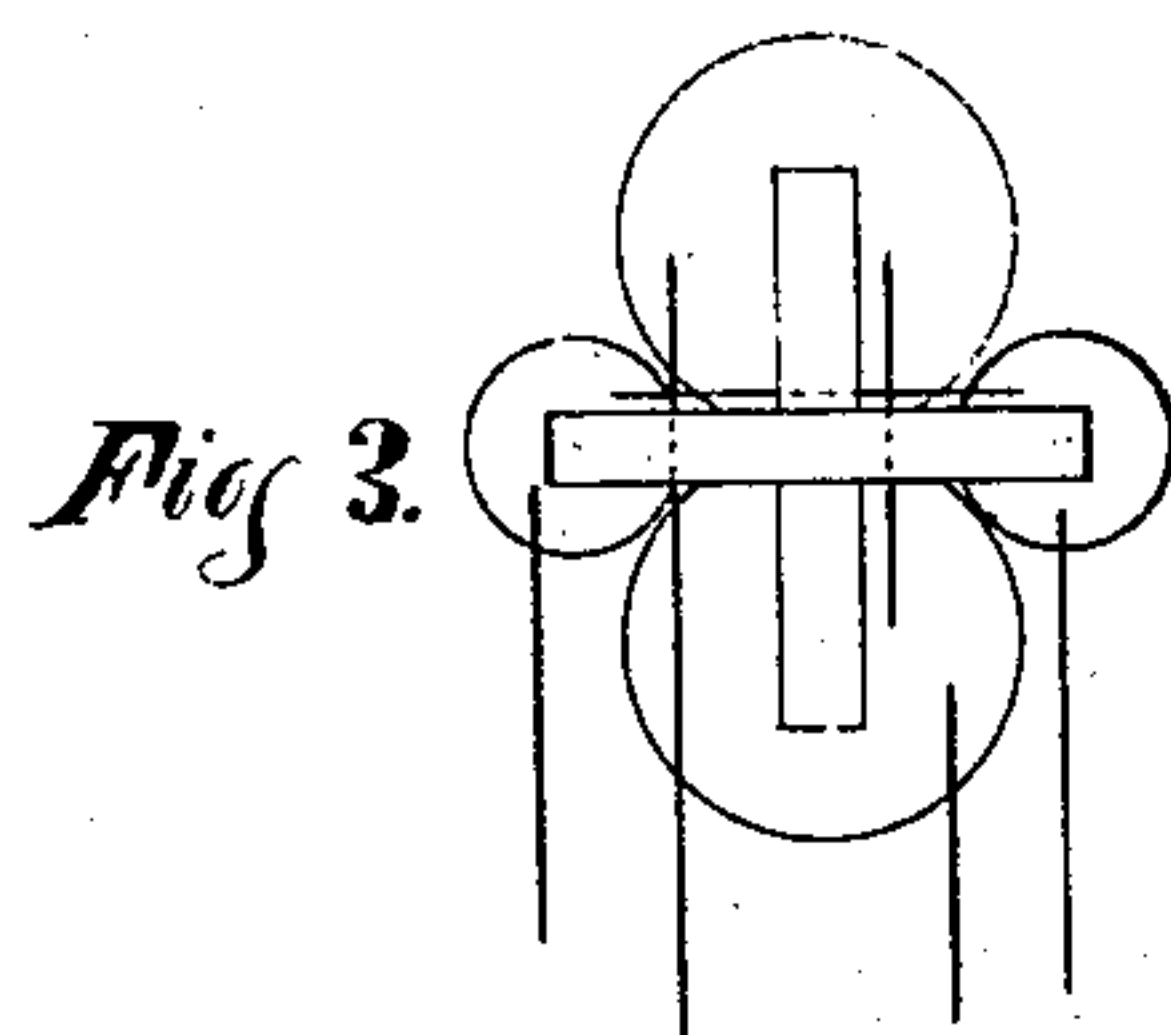
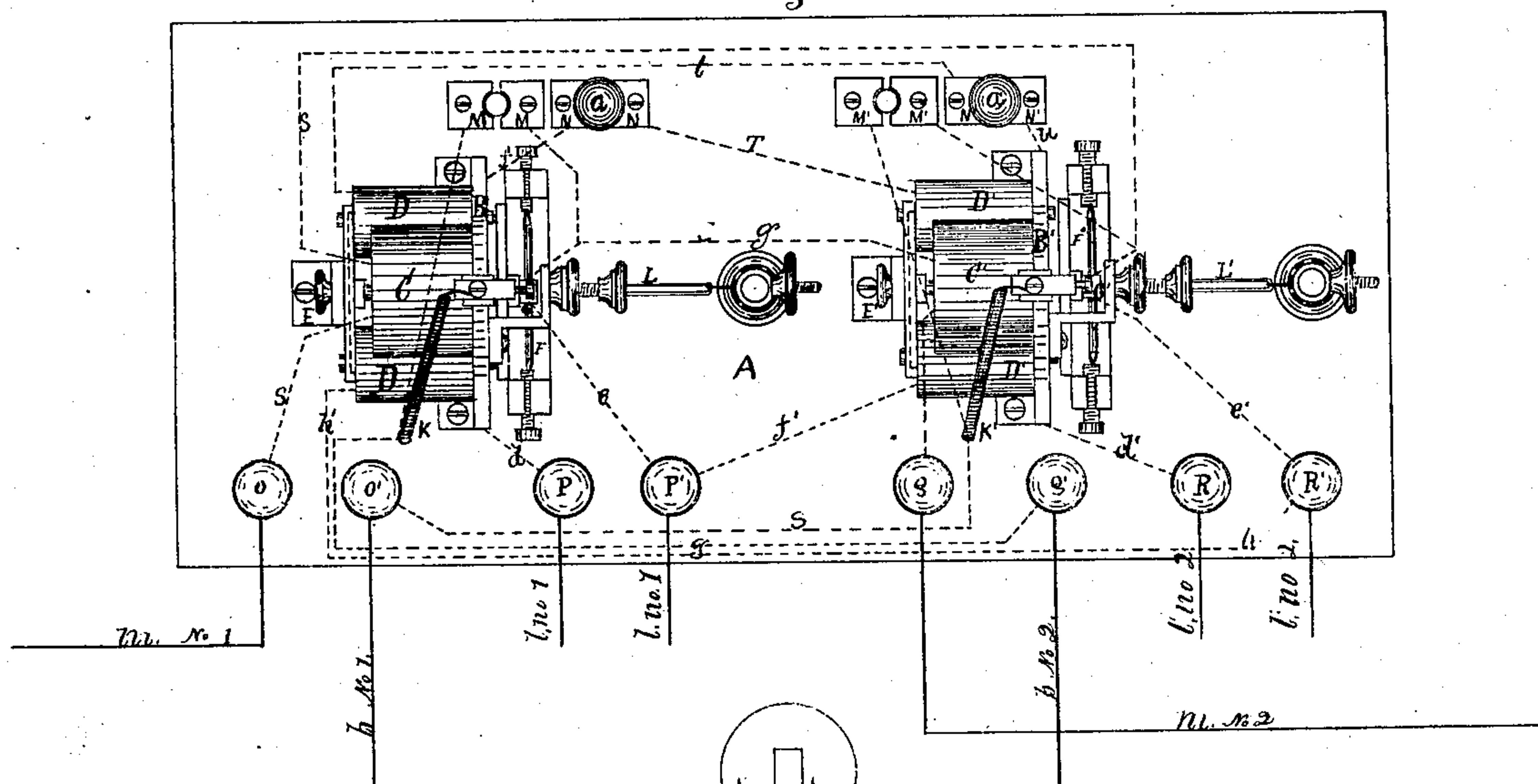
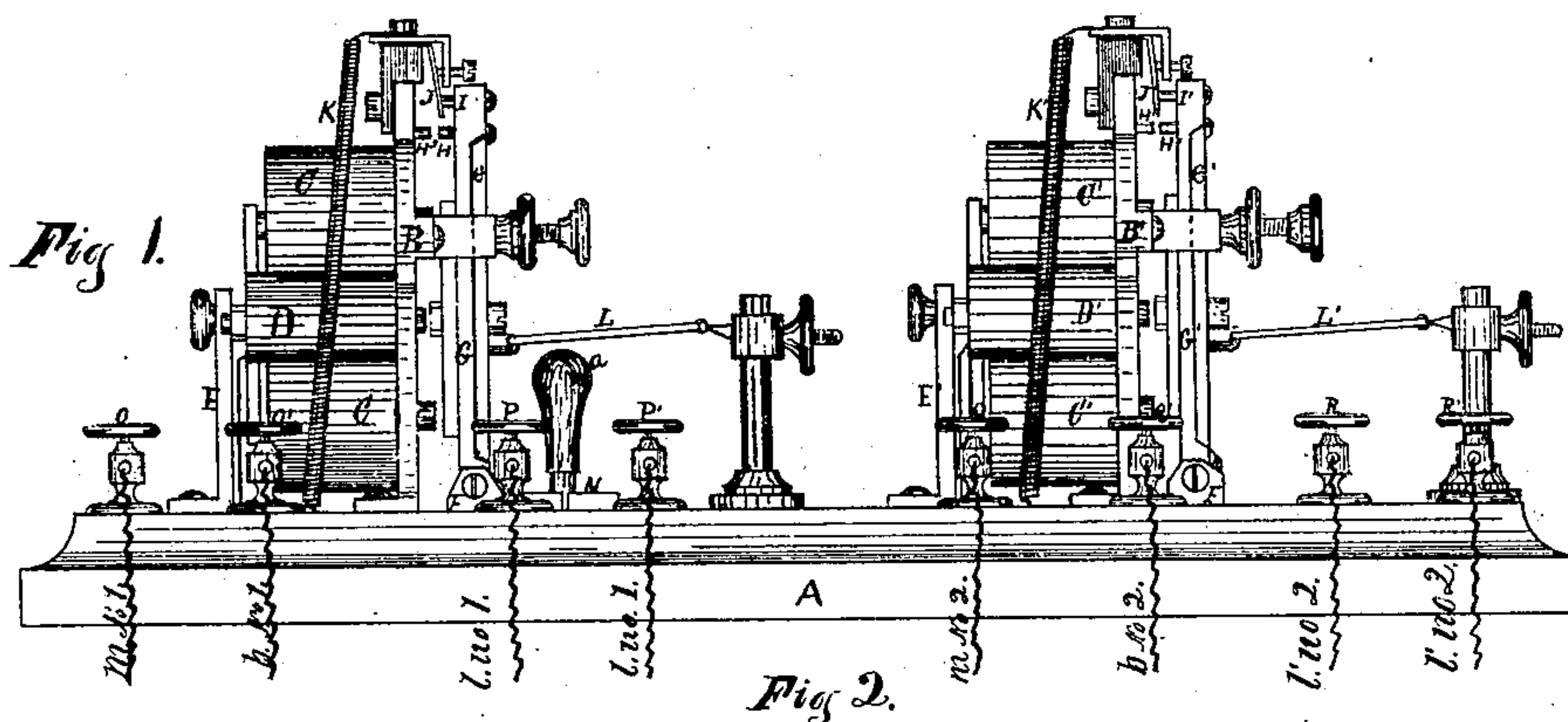


E. GRAY.
TELEGRAPH REPEATER.



Witnesses
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ELISHA GRAY, OF CHICAGO, ILLINOIS.

Letters Patent No. 114,938, dated May 16, 1871.

IMPROVEMENT IN TELEGRAPH-REPEATERS.

The Schedule referred to in these Letters Patent and making part of the same.

To all whom it may concern:

Be it known that I, ELISHA GRAY, of the city of Chicago, county of Cook and State of Illinois, have invented a new, useful, and improved Telegraph-Repeater; and I do hereby declare the following to be a full, clear, and exact description thereof, which will enable others skilled in the art to which my invention appertains to make and use the same, reference being had to the accompanying drawing forming part of this specification, in which—

Figure 1 is a side elevation of my invention;

Figure 2 is a plan or top view of the same, showing in dotted lines the position of the wires connecting with the several parts employed; and

Figure 3 is a diagram of the magnets employed, showing the relative position of the same and manner of connecting the wires thereto.

Similar letters of reference indicate corresponding parts in the several figures of the drawing.

The object of my invention is to provide a telegraph-repeater so arranged as to overcome the difficulties which have heretofore existed in adjusting the same, and to render it practical to work as easily and under as unfavorable circumstances as the ordinary relay may be worked; and

The improvement consists in so arranging the several parts as to allow the local to shunt the magnets instead of breaking and closing, a description of which, in detail, will be hereinafter more fully given.

In the accompanying drawing—

A is the base or platform, upon which the several parts constituting my invention are mounted.

B and B' are metal plates, the lower ends of which are firmly secured to said base in the position shown in fig. 1.

Upon said plates are firmly affixed magnets C C and C' C', the whole of which are so arranged as to allow their respective heel-pieces to cross each other at right angles, parallel with and vertical to the plane of the base.

Affixed to the outer heel-piece of each system of magnets, at the end opposite to plates B B', are vertical stays E E', the lower ends of which are firmly attached to the base, by which the respective magnets are secured in proper position.

F and F' are metal yokes, which are secured to the base at a point near and parallel to the plates B B', and to which are pivoted vertical armature-levers G G', which extend upward to a point level with the upper extremity of the plates.

Affixed to said levers, and passing through the same, near their upper ends, are platina points H I and H' and I'.

The said points H and H' meet with corresponding

points H² and H'', secured to and passing through plates B B' and points I and I', meeting with springs J J', which are secured to and insulated from the said plates and connected with wires K K'.

The said armature-levers are provided with springs L L', which are so arranged as to adjust the same in the ordinary manner.

M M' and N N' are plug cut-out plates, which serve to connect the lines together for repeating, or to separate the same, as may be desired.

O O', P P', Q Q', and R R' are binding-screws, which are affixed to the base in the ordinary manner, and which receive the wires connecting the instruments with the several lines and batteries.

M No. 1 and M No. 2 are the wires of the main line, which are secured respectively in binding-screws O and Q.

b No. 1 and b No. 2 are the wires of the main batteries, which are respectively secured in binding-screws O' and Q'.

l l No. 1 and l l No. 2 are the wires of the local batteries, which are secured respectively in binding-screws P P' and R R'.

f' and T are the wires connecting binding-screw P' of local battery No. 1 with cut-out plate N, through magnet D' D'.

d and f are the wires connecting binding-screw P of said battery No. 1 with cut-out plate N, through plate B.

h and t are the wires connecting binding-screw R' of local battery No. 2, through magnet D D, to cut-out plate N'.

d' and u are the wires connecting binding-screw R of local battery No. 2, through plate B', to cut-out plate N'.

e and e' are the wires connecting the binding-screws P' and R' with the points H and H' on the respective armature-levers G and G'.

s s is the wire connecting the binding-screw O of main line No. 1, through magnet C C, point I' on lever G', spring J', wire K', to binding-screw O'.

In like manner wires h' and g connect binding-screw Q, through magnet C' C', point I, spring J, wire K, to binding-screw Q' of main battery No. 2.

The cut-out plates M and M' serve to throw a circuit around the repeating-points I J and I' J' when the plugs are transferred from N and N' to M and M'. The instrument will not repeat in this position, but act as two relays on separate lines.

The operation of repeating is as follows:

The main and local circuits being all closed, and the cut-out plugs a a arranged as shown in fig. 2, the electrical current enters from the main line No. 1 at O, passing through magnet C C, wires S, up the sides

of armature-lever G' to point I'; from said point through spring J', wire K', to the binding-screw O'; thence to the main battery No. 1.

In like manner the electrical current from the main line No. 2 enters at Q, passing thence through magnets C' C', wire S', up the side of armature-lever G to point I; from thence, through spring J, wire K, to binding-screw Q' and main battery No. 2.

When the instrument is not in operation and all circuits are closed, the local current enters at P and R, passing thence through points H H' and down armature-levers G G', through wires e e', to binding-screws P' and R'.

Should the line No. 1 transmit a message into line No. 2, the operation would then be as follows:

The opening of any key in line 1 will release the armature-levers G, and the elasticity of spring L withdraws the same, disconnecting points H and I from point H' and spring J. Main line No. 2 is now broken at I, and magnet C' has lost its magnetism; contact is also broken at point H, which, instead of breaking local circuit No. 1, has merely opened a loop which allows the circuit to pass through magnets D' D', which prevents the armature-lever G' from falling back. The local current from battery No. 1 now passes from plate B, through wire f, to cut-out plug N; from said plug through wire T, magnet D' D', wire f', back to binding-screw P. When the key in line No. 1 is closed the points H and I are again in contact, and line No. 2 is closed, re-establishing magnetism in magnets C C and demagnetizing magnet D' D' by shunting it at H. The local current now runs practically altogether through point H, as the resistance by that route is less than through the magnets.

By means of the shunt at H a closed circuit is formed, through which the extra or induced current flows, thereby prolonging the magnetism in magnet D' D' a moment longer than would be the case if the circuit were broken, thus giving time for the main magnet C' C' to become more fully charged. In this way the operator of line No. 1 may transmit any number of messages without (as is technically termed) "breaking himself," which would be the case if the armature-lever G' did not remain closed.

If the operator of line No. 2 wishes to break No. 1, to have him repeat, he has only to open his key; then the

first time operator No. 1 closes his key he will break his own circuit at I', for the reason that the closing of point I' does not close No. 2, as it is open in another place; but point H shunts and demagnetizes magnet D' D' as usual, so that there is nothing now to hold the points H' I' in contact, and they instantly fall back, by which the operator of line No. 1 feels the break on his instrument. Operator No. 1 now closes his key, and operator No. 2 may transmit back to No. 1 in precisely the same manner as described. The *modus operandi* is precisely the same in transmitting either way, as may be seen by tracing the circuit-line.

To separate the lines and make two ordinary relays of this repeater, it is only necessary to withdraw the plugs at N N' and insert them at M and M'; this will break the local circuit between the plates B B' and the magnets D D and D' D', and allow the locals to be broken and closed, in the ordinary manner, at the points H H', when sounders may be switched in and used. When the plugs are in M and M' the circuits are completed around the points I and I', so that the working of the armatures does not interfere with either main circuit.

Having thus described the nature and object of my invention,

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

1. The relay armature-levers G and G', arranged to shunt the magnets, as described, whereby the said levers are closed on the receiving side, substantially as and for the purpose described.
2. The arrangement of the main and local circuits, in combination with the shunting and repeating-points H and I, when said points are arranged on the same relay-armature, substantially as described.
3. In a telegraphic-repeater, the combination of circuits and magnets, arranged substantially as and for the purpose described.
4. The magnets C C D D, so arranged as to jointly or separately operate upon the same side of the same armature, substantially as and for the purpose described.

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Witnesses:

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