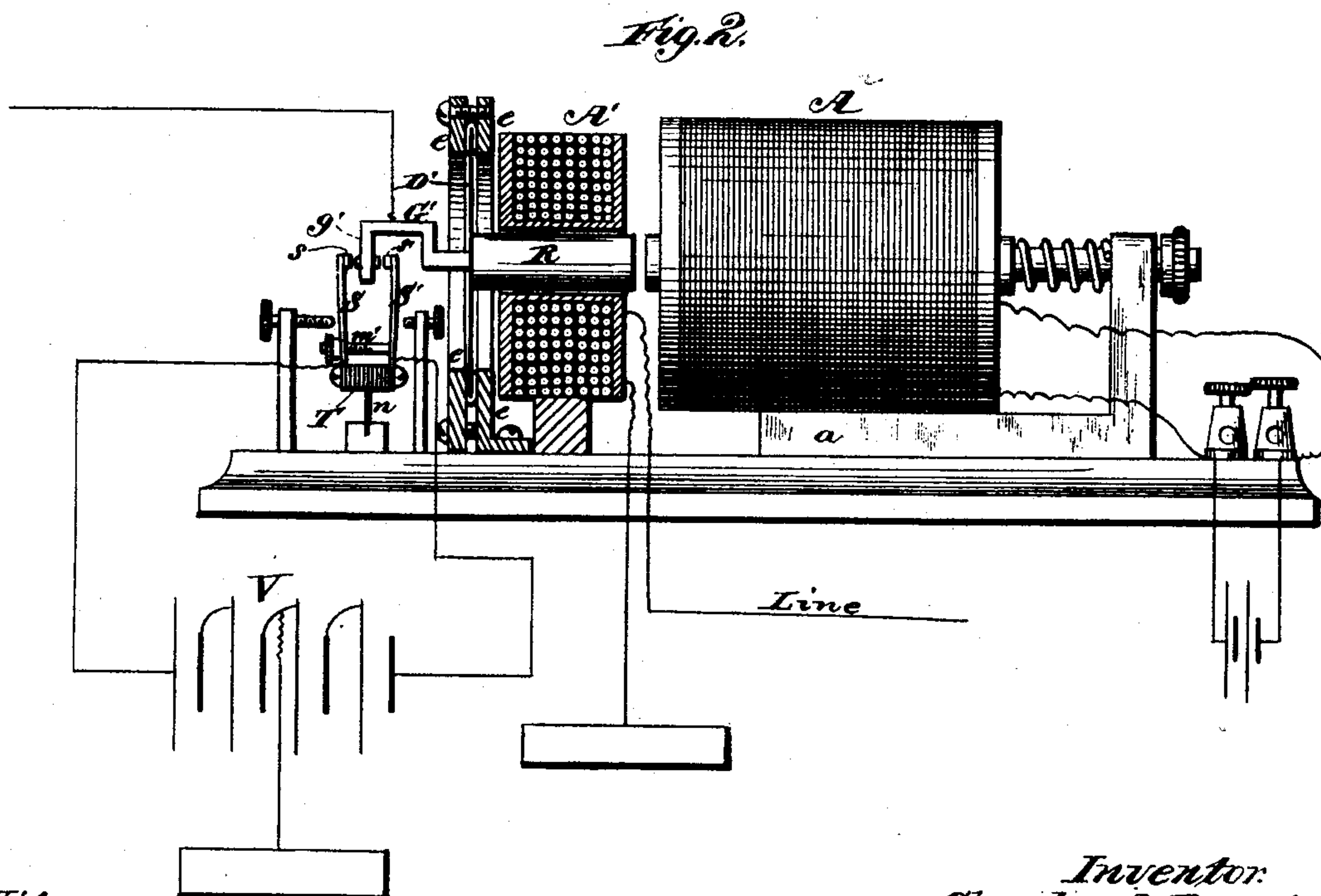
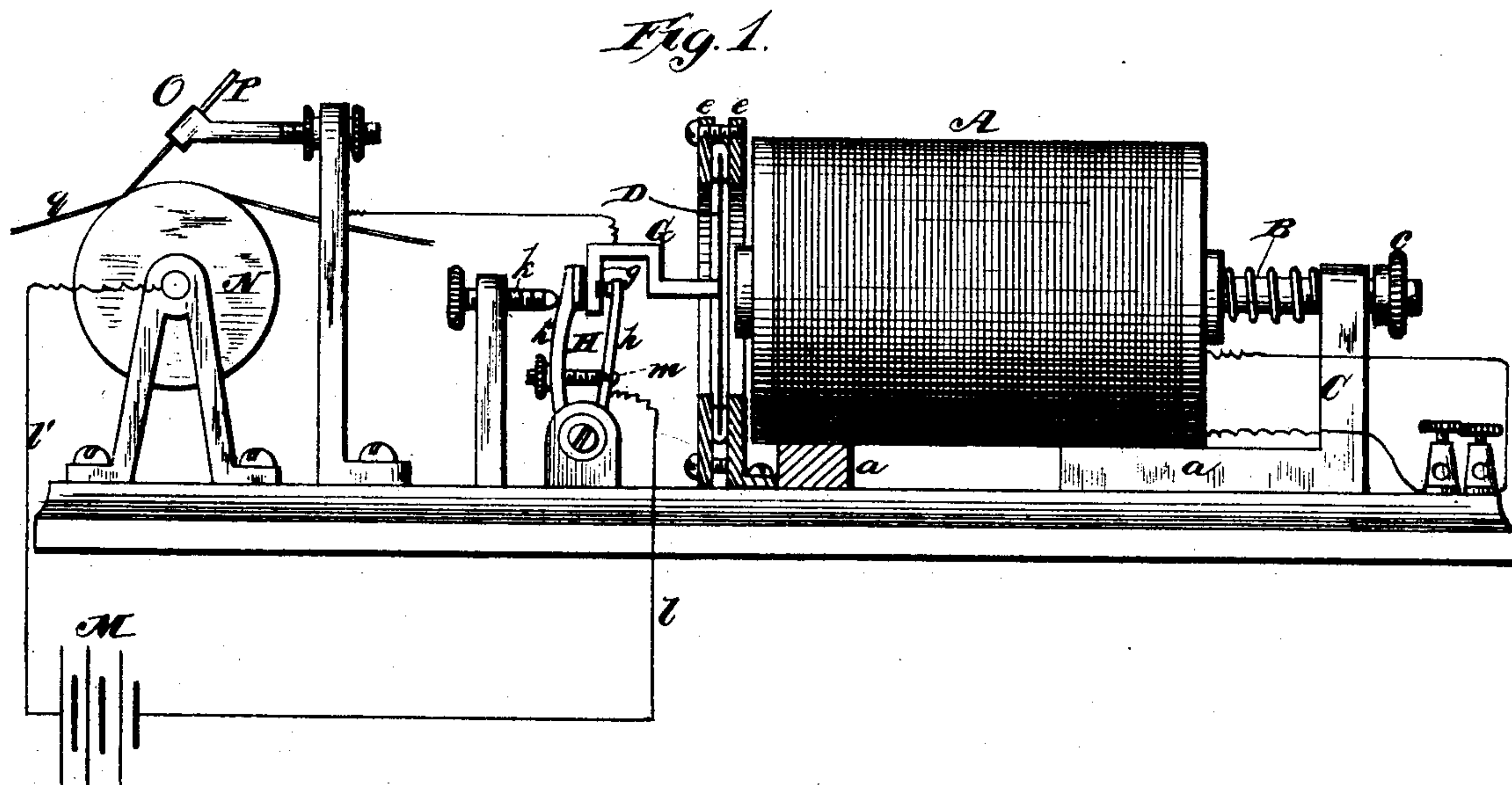


(No Model.)

C. A. RANDALL.
Telegraphic Relay and Repeater.

No. 241,067.

Patented May 3, 1881.



Witnesses.

Robert Lovett,
J. A. Rutherford

Inventor:
Charles A. Randall.

by James L. Norris
Atty.

UNITED STATES PATENT OFFICE.

CHARLES A. RANDALL, OF NEW YORK, N. Y., ASSIGNOR TO PHILIP G. RANDALL, OF SAME PLACE.

TELEGRAPHIC RELAY AND REPEATER.

SPECIFICATION forming part of Letters Patent No. 241,067, dated May 3, 1881.

Application filed March 11, 1881. (No model.)

To all whom it may concern :

Be it known that I, CHARLES A. RANDALL, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented new and useful Improvements in Telegraphic Relays and Repeaters, of which the following is a specification.

This invention relates to a telegraphic relay or repeater especially adapted for use in telegraphic systems in which the communications are received by chemical recorders or registers. It is, however, applicable in other systems and for use in lieu of the ordinary relay.

In chemical-telegraph systems, when the line over which a message is transmitted exceeds a certain length the speed of reception of the message by the chemical is very greatly reduced—say from twenty-five to seventy-five per cent.—as is well known. Many causes contribute to this reduction of speed, but chiefly the resistance of the line and the retardation of the current, and inability to carry the rapid impulses definitely and of sufficient force to produce the requisite chemical or electrolytic effect. As a consequence the message for long distances must be reperforated and retransmitted at one or more intermediate stations.

Various devices have been employed having in view the re-enforcement of the current, the obtaining of rapid and distinct recording over long circuits, and the obviation of the reperforation and retransmission; but so far as I am aware none of these devices has proven effectual, all being sluggish in action, limited in speed, and requiring frequent adjustment.

The object of my present invention is to overcome the difficulties referred to and insure the prompt receiving and recording of the rapid impulses by means of a relay working automatically in a local circuit and translating said impulses into strong pulsations from a local battery, in circuit with which is the chemical recording apparatus, such an arrangement being especially designed for dropping copies at intermediate stations. It also has for its object to produce in a second or other main circuit, by means of an automatic repeating-relay, impulses corresponding exactly to those produced in a first or initial main circuit from a transmitter.

In the accompanying drawings, Figure 1 is a side view, partly in section, of my improved relay arranged to control a local-battery circuit, in which is arranged a chemical recording apparatus. Fig. 2 is a similar view of a modified form of the apparatus arranged to send currents of alternately-opposite direction upon a second main line.

Referring to Fig. 1, the letter A designates an electro-magnet, to be included in the main line and arranged to slide on supports *a*, its core having projecting rearwardly from it a screw, B, which passes through an aperture in a post, C, and has upon its projecting portion a nut, *c*. Surrounding the said screw, between the post and end of the magnet, is a spring, the tendency of which is to force the magnet toward the diaphragmatic armature D, which is held between clamping-rings *e e*, supported upon the base of the instrument.

From the center of the diaphragm or armature D, which should, of course, be of a magnetic metal, projects a metallic arm, G, having its end bent to form a finger, *g*. The legs *h h'* of a forked metallic arm, H, terminate on opposite sides of the finger *g*, and these tips are bent slightly toward said finger, so as to alternately make contact therewith when the finger vibrates. The lower end of the arm H is pivoted lightly to a short post, I, and is so balanced that when the finger *g* is between its legs the leg *h'* will rest normally by gravity against an insulating-cushion attached to said arm, but which may be secured upon said finger; or it may be held in contact therewith by a suitable spring. The arms *h h'* may be adjusted toward each other by means of a screw, *m*, which passes through both, their elasticity serving to separate them. An adjustable screw-stop, *k*, limits the outward movement of the arm.

It will be observed that the distance between the contact-points—that is, the ends of the legs *h h'* and the arm *g*—is readily adjustable, and that the separation of these points to a greater distance or irregularly is impossible, from the fact that one leg of the forked arm acts as a stop for the other, so that the finger has always the same distance to travel in order to make contact with either. The magnet A

and the contact-points being once adjusted for use, ordinarily no further adjustment is required.

The forked arm H is connected by a wire, *l*, with one pole of a local battery, M, the other pole of which is connected by a wire, *l'*, with the axis of the metallic wheel N of the recording apparatus O, and the finger *g* is connected with the pen or style P, the point of which bears lightly upon the strip of paper *q*, which moves over the periphery of said wheel in the ordinary manner in such instruments.

In Fig. 2 the electro-magnet A² is constructed in all respects as the magnet A in Fig. 1, but is energized by a local battery, the magnet A' being the main-line magnet in Fig. 2. This main-line magnet is simply a helix with an open central space, through which the core R extends without touching the helix. This core is firmly attached to the diaphragmatic armature D', which is supported and provided with a metallic arm, G', having a finger, *g'*, the same as the diaphragmatic armature in Fig. 1. In Fig. 2, however, the finger *g'* is arranged between the tips of two arms, S S', provided with platina facings *s s'*, the finger being provided with platina points to come in contact with said facings. The arms S S' are both secured at their lower ends to a block, T, of hard rubber or other rigid insulating material, which is carried at the upper end of a plate-spring, *n*, secured to the base of the instrument. The arms S and S' are, respectively, connected by suitable wires with the opposite ends of a line-battery, V, the middle of which is connected to the ground. The movement of the arms S S' is limited by suitable adjustable stop-screws, and said arms may be, by means of a screw, *m'*, adjusted toward each other, to regulate the distance the finger *g'* is required to move to make contact with an arm after separation from another. This distance being always the same and very short, contact will be surely made at each half-vibration of the diaphragmatic armature D', core R, and the finger *g'*, under the influence of the pulsations over a first or initial main line, which also traverse the helix A'. The action of the main-line magnet is very forcible, from the fact that as the core R is magnetized by the current traversing the helix A' it is strongly attracted by the magnetized core of the local magnet A², the polarities being, of course, properly arranged. The finger *g'* is connected with

the line, and as it alternately comes in contact with the arms S and S', currents of opposite polarity or direction traverse the said line, a connection being alternately made therewith from opposite ends of the battery V.

In the modification as in Fig. 1 no readjustments are required after the parts are once adjusted for use.

In both the modifications shown carbon contact-points may be used, and, if desired, supported by springs, so that they may yield under pressure of the contact-fingers and resume their normal position as the pressure is removed, the increasing and decreasing contact-pressure varying the flow of the current.

The legs *h h'* and arms S S' may be made slightly pliable, and platina points be used with substantially the same result as when the carbon points are used.

The armature may be a flat piece of iron in front of the magnet, secured and confined rigidly at the ends and slightly pliable, instead of the diaphragmatic form.

The contact-points may be varied in many ways without departing from the main principle—to wit, obtaining a rapid circuit-closing device actuated and controlled by the limited movement of a confined armature under the influence of an electro-magnet, as and for the purposes set forth.

In an application for Letters Patent heretofore filed I have described and shown the combination of an electro-magnet in one circuit and a tension-changer in another circuit and operated by said magnet, and I therefore do not here claim such combination.

What I claim is—

The combination, with a confined elastic armature arranged for operation by an electro-magnet, of a metallic contact-point carried by said armature, and two other contact-points, either or both electrical, arranged to be operated by the action of the armature, and arranged to yield together, but to preserve a fixed distance from each other, substantially as described.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

CHARLES A. RANDALL.

Witnesses:

P. G. RANDALL,
GEO. M. BAKER.