

(No Model.)

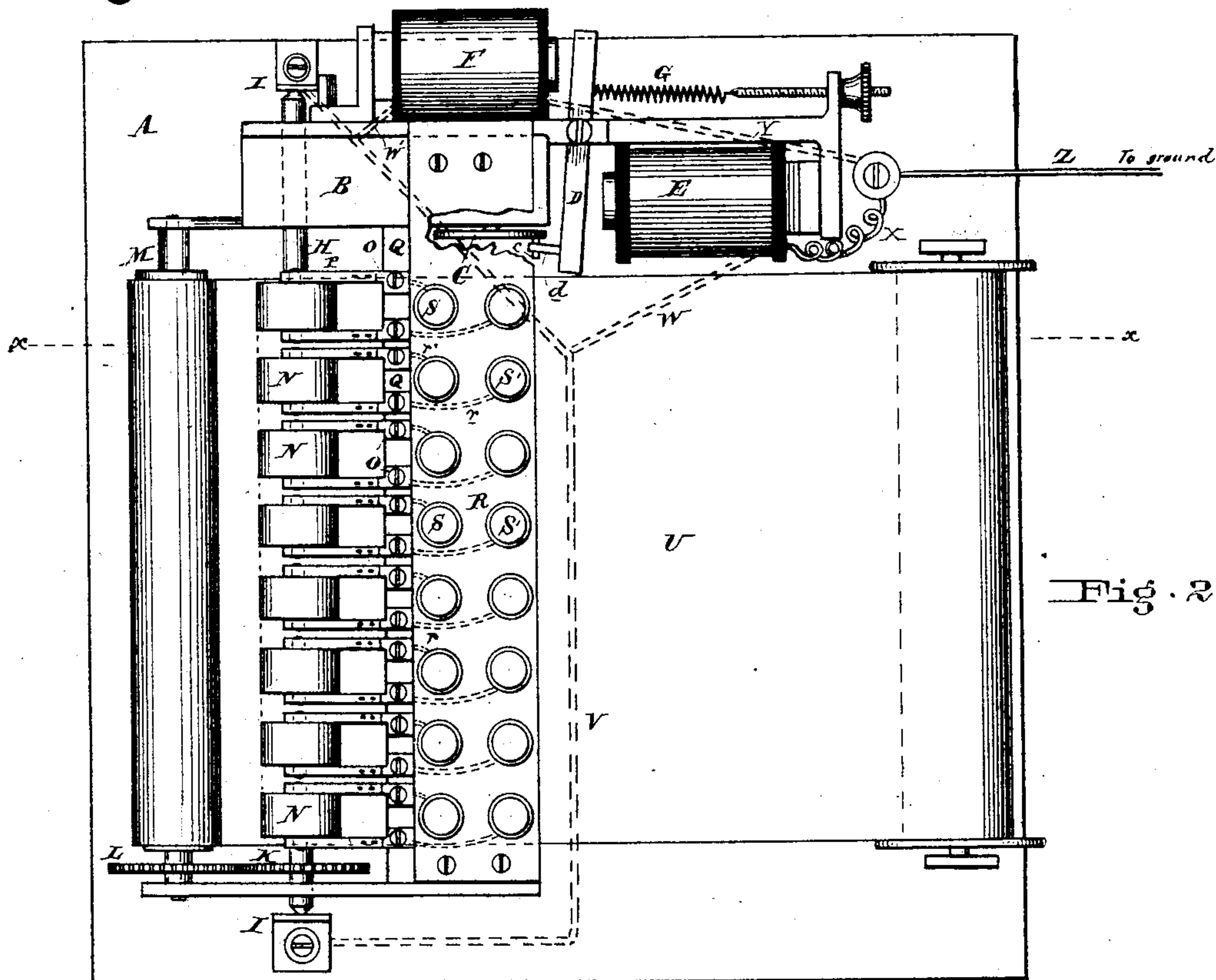
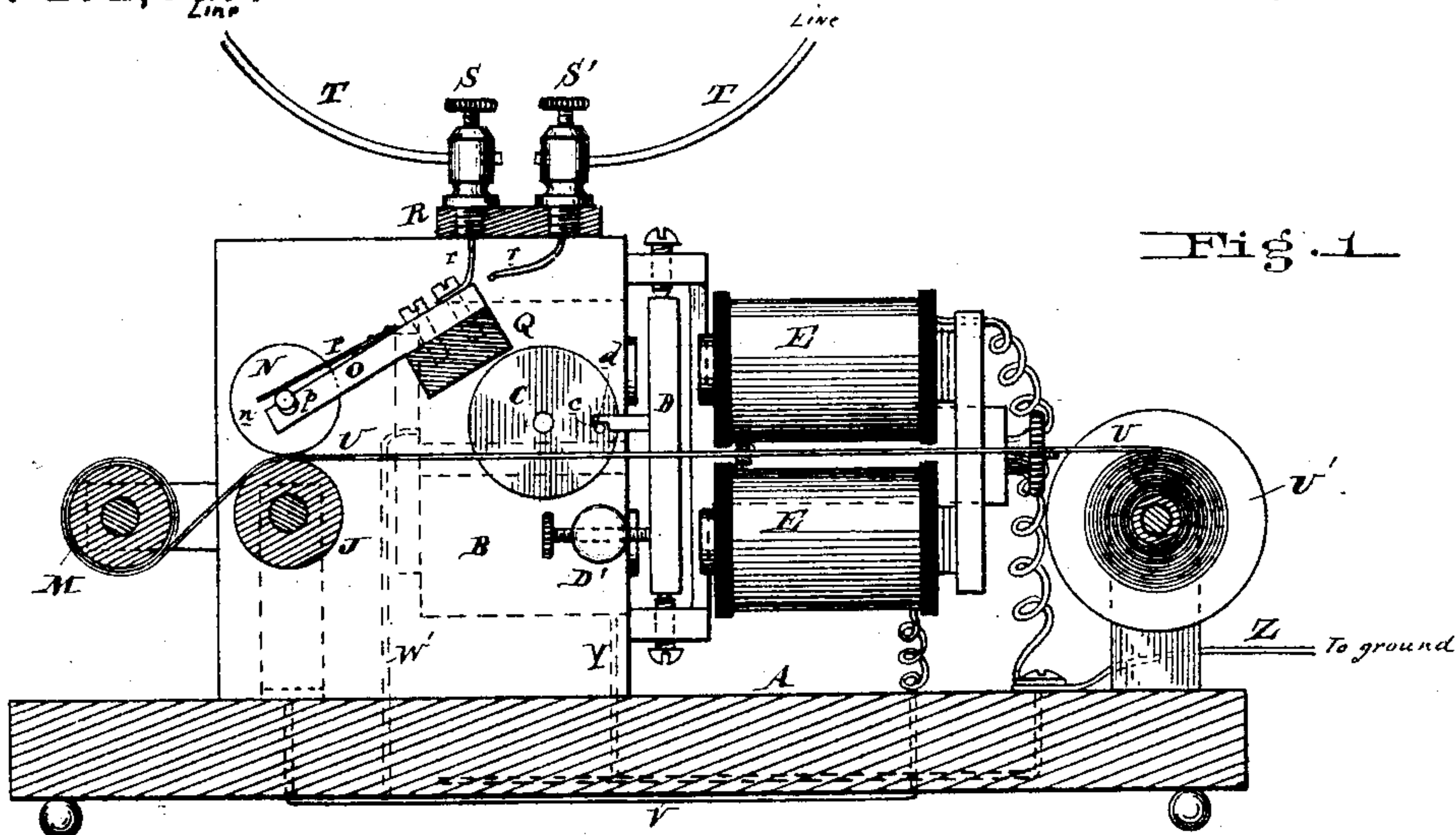
2 Sheets—Sheet 1.

J. W. DYER.

LIGHTNING ARRESTER FOR TELEGRAPH CIRCUITS.

No. 272,867.

Patented Feb. 27, 1883.



Attest
L. J. Mattoz
[Signature]

Inventor
Josiah W. Dyer
By his atty.
[Signature]

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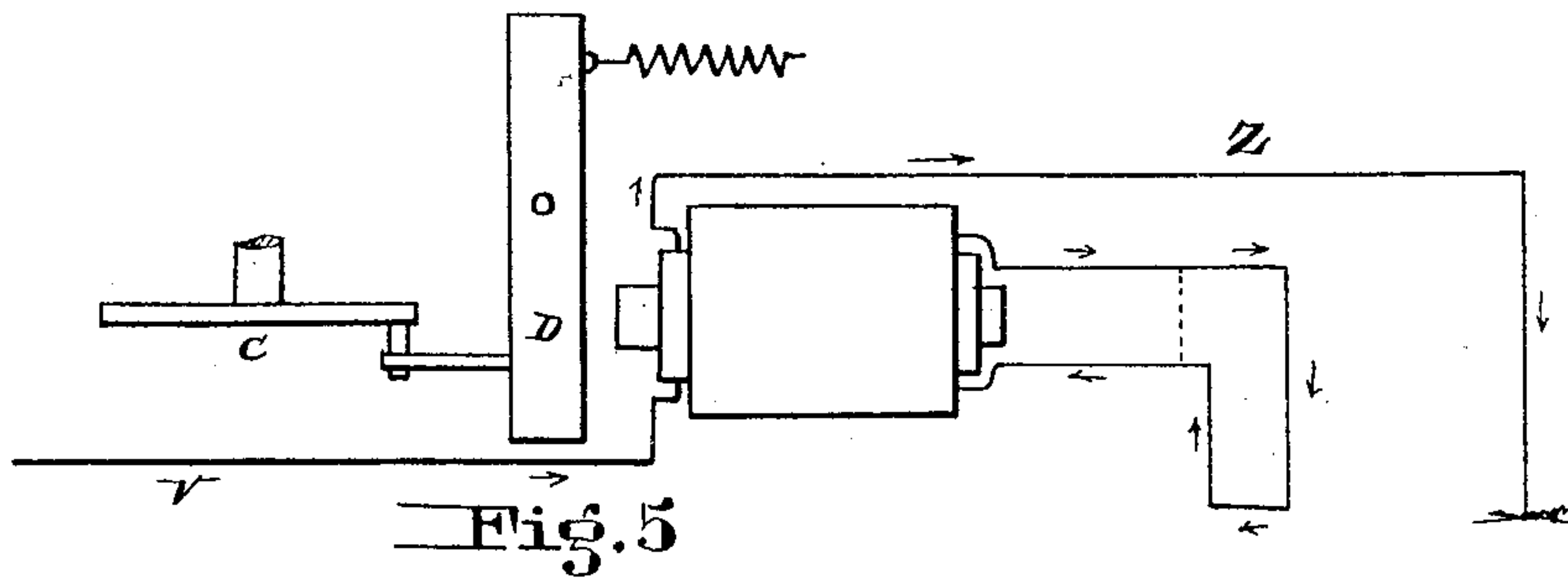
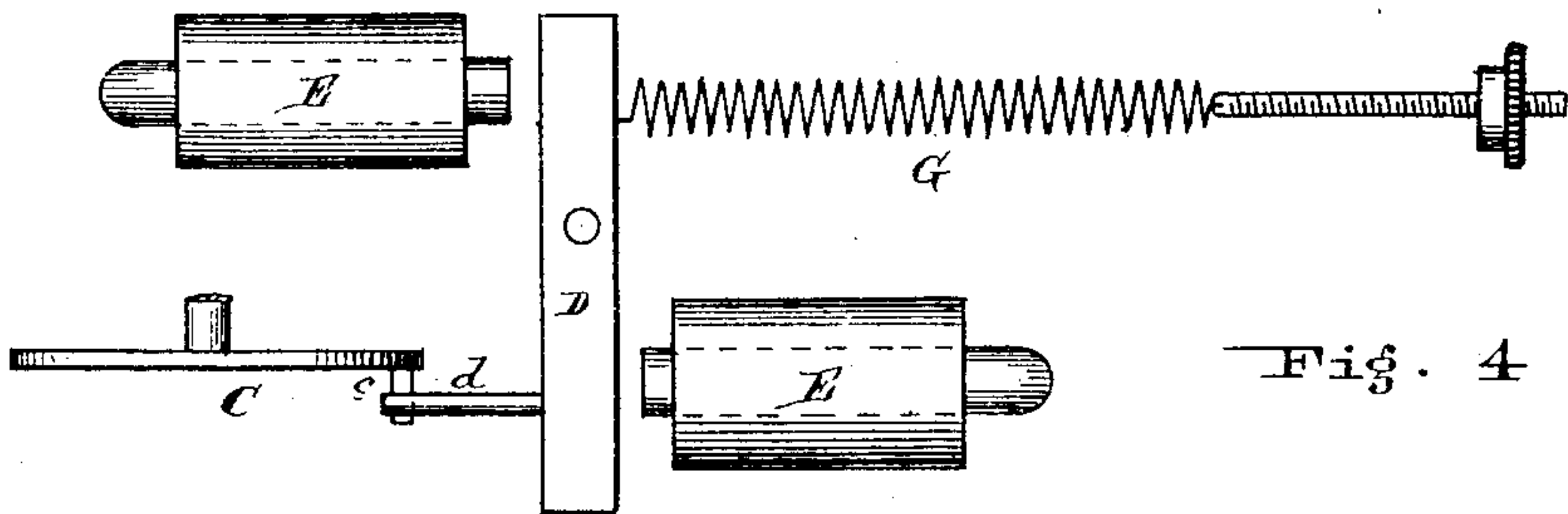
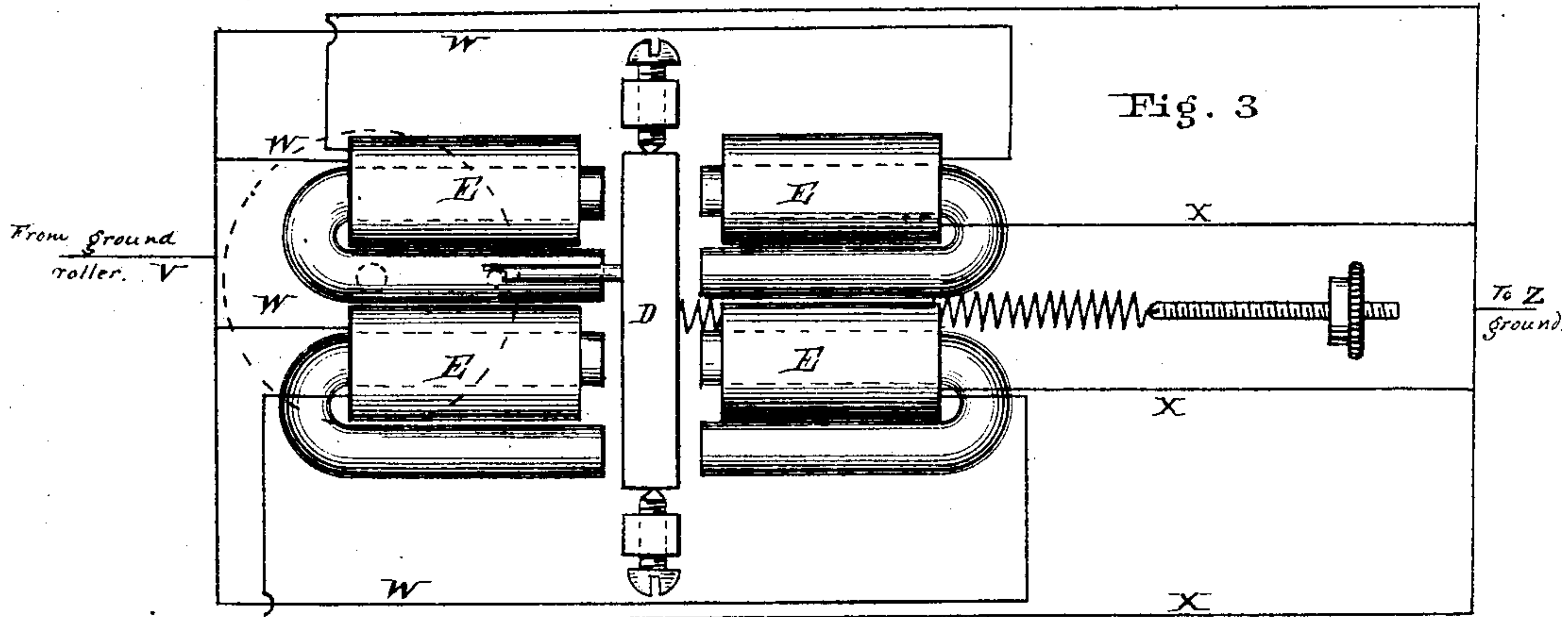
2 Sheets—Sheet 2.

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Attest

L. J. Mayo.

[Signature]

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UNITED STATES PATENT OFFICE.

JOSIAH W. DYER, OF PHILADELPHIA, PENNSYLVANIA.

LIGHTNING-ARRESTER FOR TELEGRAPH-CIRCUITS.

SPECIFICATION forming part of Letters Patent No. 272,867, dated February 27, 1883.

Application filed October 12, 1882. (No model.)

To all whom it may concern:

Be it known that I, JOSIAH W. DYER, of the city and county of Philadelphia, and State of Pennsylvania, have invented an Improvement in Lightning-Arresters for Electric Circuits, of which the following is a specification.

My invention has reference to lightning-arresters for telegraphic circuits; and it consists in an insulating medium interposed in the line-wires, which, during the normal statical condition of the electricity in said circuit, offers a sufficient resistance to the passage of electricity to the ground, causing an insulation; but when the line-wires become overcharged by lightning the high potential of the current will very readily remove the insulation and ground the current, thereby freeing the line-circuits of their excess of electricity of high tension, without breaking said line-circuits, the said mechanism, immediately after grounding the electric charge, automatically causing the interposition of a new insulation between said line-circuits and ground-wires, and in many details of construction, all of which are fully set forth in the following specification, and shown in the accompanying drawings, which form part thereof.

Heretofore lightning-arresters for telegraphic circuits have been made to automatically ground the line-wires should they become overcharged with electricity from lightning or dynamo-electric machines; but after the discharge of the excess of current the said line-wires remained grounded, and were required to be insulated again by manual labor, or the line-circuits were completely broken, and the insulation was effected through the medium of the air alone and wide separation of contacts. This of necessity causes much delay in the transmission of messages, for upon the line being grounded its location is not ascertained until located, and when such instruments are placed at the terminus of a cable in which the wires are insulated, and in many places very distant from any telegraph-office, it causes a great loss of time to the operator, who must hunt up the place of grounding.

The object of my invention is to provide suitable and ready means to automatically

ground the line-circuit under the conditions hereinbefore specified, and after discharging the excess of current to automatically reinsulate the said line-circuit from the ground, whereby there is no loss of time due to the wire remaining grounded. This is particularly advantageous at points distant from stations—as the terminus of an underground or submarine cable—and where no operators are in attendance.

In the drawings, Figure 1 is a sectional elevation of my improved lightning-arrester on line *xx*. Fig. 2 is a plan view of same. Fig. 3 is an elevation showing a modified form of magnets for operating the armature which controls the clock-work, and Fig. 4 is a plan view of same. Fig. 5 shows the adaptation of an induction-coil to operate the escapement-armature.

A is the bed or base plate of the apparatus.

B is the clock-work, which is provided with the escapement-wheel C, provided with a pin or stud, *c*. The rotation of the clock-work is arrested by the pin *c* coming in contact with the arm *d*, secured to the pivoted armature D.

D' is a stop, and G is a spring to draw the armature away from the electro-magnets E F and cause the arm *d* to arrest the movement of the pin *c*. The electro-magnet E is wrapped with fine wire and is of high resistance, while the magnet F is wrapped with coarse wire and is of low resistance.

J is the ground-roller, and is adapted to be rotated by the clock-work B when the arm *d* frees the pin *c*. The ends of the shaft of roller J rest against springs I, which are connected by wire V, which is connected to the magnet F by wire W' and to magnet E by wire W, and these two magnets are respectively connected by wires Y and X with ground-wire Z. Arranged above roller J are the line-rollers N, of which there are as many as there are line-wires. These rollers are carried by bearings O, notched at *p* for the reception of the axes *n* of the rollers N, and which are kept in place and electrical contact by springs P. These bearings O are secured to an insulator-support, Q. Upon an insulator-bar, above the apparatus, are placed two series of binding-posts, S and S', into which the two poles of the line-wires are placed, as shown. One of these posts, S, and

one, S', are respectively connected by wires r to the two bearings O, which carry each roller N, as shown, whereby the line-currents are caused to pass through said rollers at all times, except when they are grounded. U' is a paper-wheel, upon which is wound a roll of insulating-paper, U', which passes between the rollers N and J, and upon the roller M, which is rotated by means of gearing K L.

The operation is as follows: When the line-circuits are charged only with battery-power, the currents pass through the rollers N without burning or carbonizing the paper U, which insulates them from the ground-roller J; but just as soon as the line-wires are struck by lightning the intensity of the current is so great that the paper U under the rollers N is burned or carbonized, thereby grounding the line-circuits by allowing the rollers N to become electrically in contact with roller J. The electrical charge then passes through wire V, and is divided into two currents, proportioned to the resistance offered by the high and low resistance magnets E F, and after passing through the said magnets it is recombined and passes to ground. In passing through magnets E F the armature D is attracted and oscillates, freeing the pin c and allowing the clock-work to be set in motion, rotating the roller J and causing fresh paper to be fed between it and rollers N, thereby automatically reinsulating said line-circuits. The object of using two magnets of different resistances is, that if the entire charge passed through the magnet E of high resistance it would tend to burn the insulation and prevent the machine working automatically. Consequently the greater quantity of current is allowed to pass freely to ground through the low-resistance magnet F, enough passing through the high-resistance magnet to insure its working without injury. Again, if the lightning-current failed to free the escapement, the line-batteries, acting on the high-resistance magnet E, would cause it to act and insure positive action of the machine, and when such an instrument is used in telephony it is necessary to use a magnet of high resistance to enable the reinsulation to take place when ringing up a station with the simple magneto-generators now in use.

The apparatus as shown is adapted to eight line-circuits, but may be made to take in as many as desired. Upon the discharge of the current, which was increased by the discharge of the entire battery-power, the spring G causes the armature D to oscillate and arrest the further revolution of the escapement-wheel U; but the escapement will not be arrested until every line-circuit T is reinsulated.

I do not confine myself to use two magnets of different resistances, as set forth, as a single magnet may be used; or, if desired, a series of magnets may be arranged as shown in Figs. 3 and 4, in which are arranged a series of horse-shoe magnets, one leg of which only is provided with a helix, as shown. The wire V is

divided into a number of circuits, and after passing through each of the helices of the magnets they reunite, thus reducing the resistance in any one electro-magnet, thereby preventing any danger from the high tension of the electricity when the line-circuits are charged by lightning. The free legs of the magnets also help in attracting the armature.

In place of the simple magnet or magnets to actuate the escapement-armature, I may use an induction-coil, as shown in Fig. 5. In using an induction-coil the line-circuits are grounded through the coarse or primary wire, and the induced current in the secondary wire causes the core to become magnetized and attract the armature and free the escapement. By this means the electric current of high tension is discharged through a low-resistance coil, thereby preventing burning of the insulation; but as this alone is not reliable enough to insure perfect freeing of the escapement in all cases, I rely upon the secondary coil of fine wire to magnetize the core and attract the armature to free the escapement.

I do not limit myself to the particular construction shown, as my invention comprehends, broadly, the arrangement of automatic mechanism to ground the line-circuit when overcharged with electricity, with automatic mechanism to reinsulate the said line-circuit after the discharge of the excess of current.

In place of the metal contact-rollers, I may use carbon rollers or contacts, as they resist corrosion or fusion; and, to simplify the construction, the upper rollers may all be on a single shaft and insulated from each other, and the electric current brought down by springs which rest upon said rollers.

In this application I do not claim, broadly, mechanism to ground the line-circuit in combination with mechanism to automatically reinsulate said line-circuits without breaking the said line-circuits, and also two carbon contacts with an interposed non-conducting medium, as these features will form subject-matter of a future application.

Having now described my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. In a lightning-arrester, two electric contacts, one in circuit with the line-wire and the other in circuit with the ground, in combination with an insulating medium interposed between said contacts, and mechanism to automatically move a fresh part of said insulating medium between said contacts, should the one already then be destroyed by the passage of an excess of electricity.

2. In a lightning-arrester, two contact-rollers, one of which is in circuit with the line-wire and the other in circuit with the ground, in combination with a strip of insulating material interposed between said rollers, mechanism to cause said rollers to rotate, and means actuated by the discharge of electricity from the line-circuit to control their rotation.

3. In a lightning-arrester, two contact-roll-

ers, one of which is in circuit with the line-wire and the other of which is in circuit with the ground, in combination with a strip of insulating material interposed between said rollers, mechanism to cause said rollers to rotate and feed the insulating material, an escapement mechanism, and one or more electro-magnets in the ground-circuit to control said escapement.

10 4. In a lightning-arrester, two contact-rollers, one of which is in circuit with the line-wire and the other in circuit with the ground, in combination with an insulating material interposed between said rollers, means to automatically feed said insulating material, an escapement to control said feed mechanism, an armature to control said escapement mechanism, and two electro-magnets—one of high and the other of low resistance—arranged in the

15 20 ground-circuit.

5. In a lightning-arrester for an electric circuit, mechanism to automatically ground said circuit upon its being struck by lightning or overcharged with electricity, in combination with mechanism to automatically reinsulate the said circuit immediately after the same is freed of the excess of electricity, a ground-circuit, and two electro-magnets—one of high and one of low resistance—interposed in said ground-circuit to control said automatic insulating mechanism.

25 30

In testimony of which invention I hereunto set my hand.

JOSIAH W. DYER.

Witnesses:

R. M. HUNTER,
JOHN W. STEWARD.