

(No Model.)

A. B. DEPUY.
LIGHTNING ARRESTER.

No. 369,436.

Patented Sept. 6, 1887.

Fig. 1.

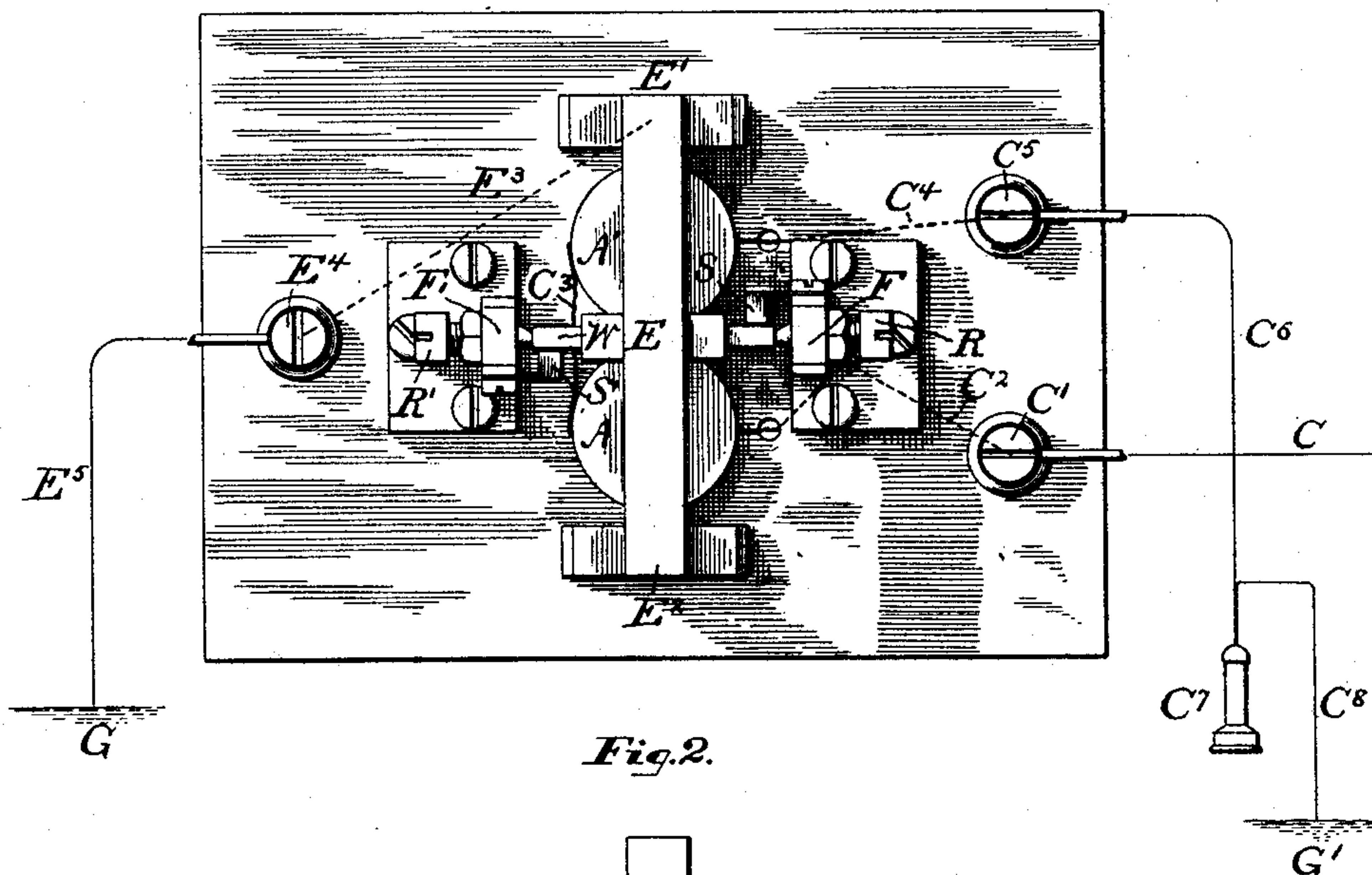


Fig. 2.

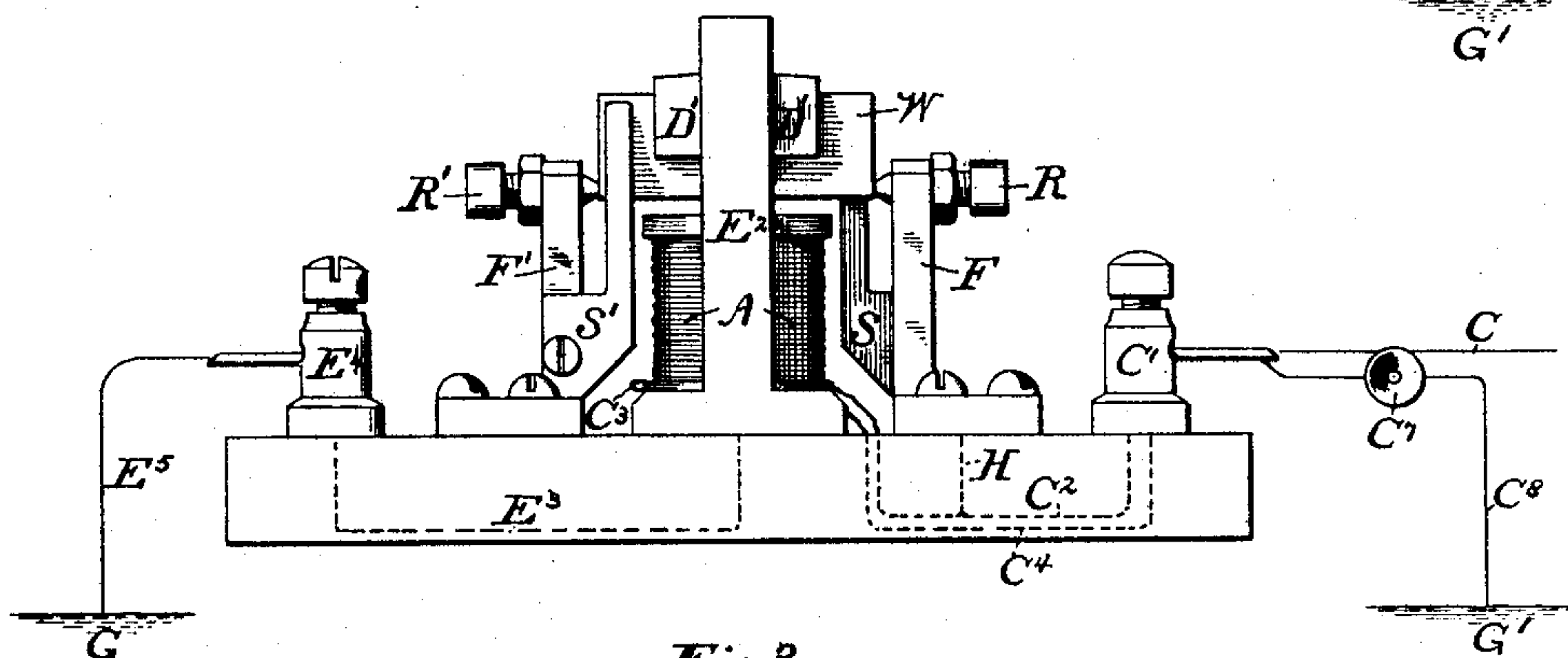
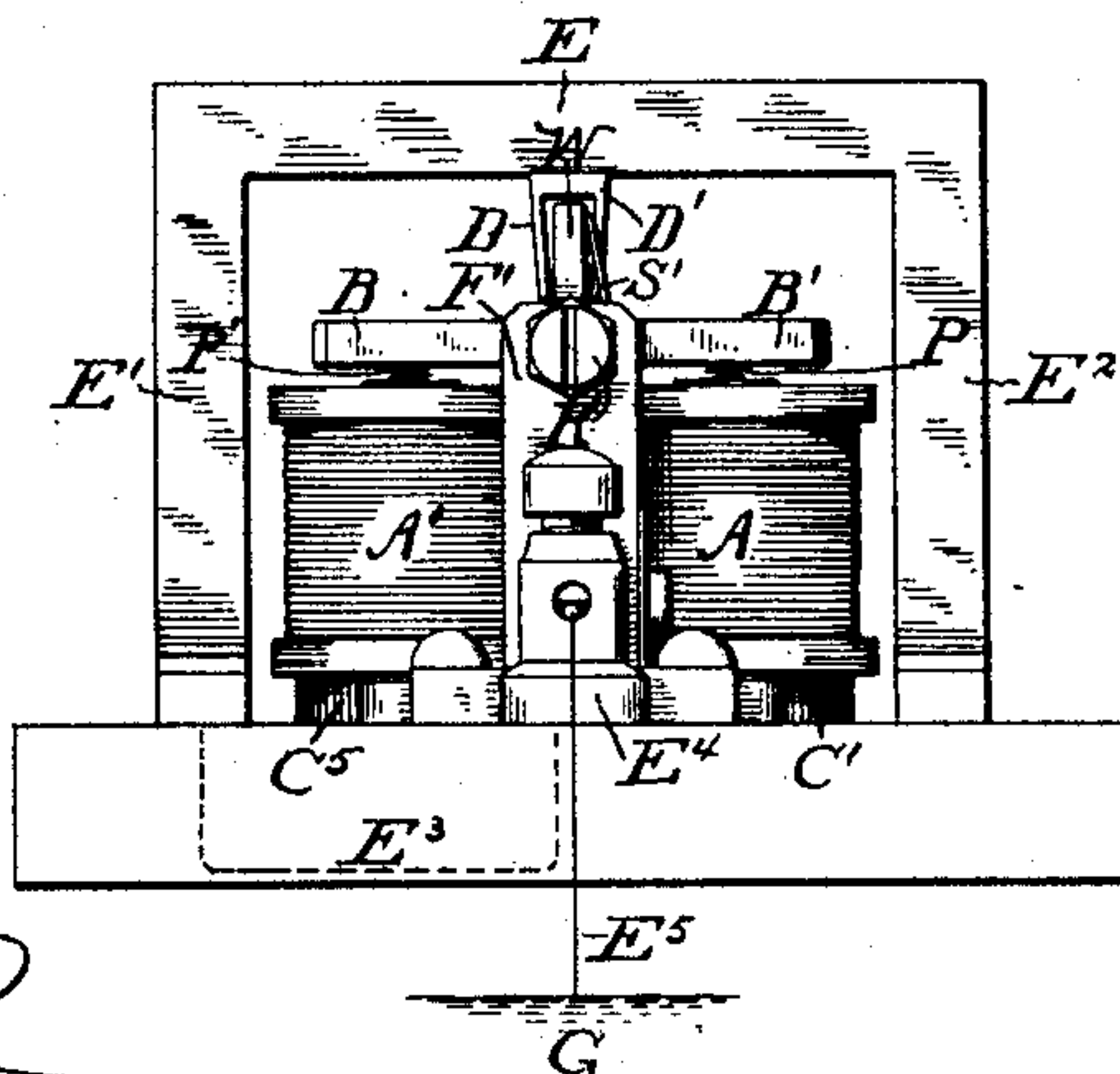


Fig. 3.



WITNESSES:

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LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 369,436, dated September 6, 1887.

Application filed March 18, 1886. Serial No. 195,731. (No model.)

To all whom it may concern:

Be it known that I, AUGUSTUS B. DEPUY, a citizen of the United States, residing at Camden, in the county of Camden and State of New Jersey, have invented certain new and useful Improvements in Lightning-Arresters or Protectors for Telegraph and Telephone Instruments, of which the following is a specification.

The object of my invention is to cut out from the circuit telegraph and telephone instruments and protect them from injury by currents of electricity of greater intensity or volume than those normally traversing the circuits in which such instruments are included.

Not infrequently the wires of telegraph and telephone systems become crossed and entangled with those of electric-lighting systems, and, being brought into contact, become conductors to a greater or less degree of currents of abnormal intensity and volume. During thunder-storms or any violent disturbance of the electrical condition of the atmosphere the wires may become overcharged with a dangerous amount of electricity, and destruction of machines in offices and serious injury to the operators often result. The insulated wire of the coils used in wrapping the electro-magnets of the working-instruments in telegraph and telephone systems has not sufficient diameter or conductivity to transmit these extraordinary currents without injury; but when such currents are for any reason sent through them the wires become heated and the insulating-covering is burned off, perhaps the wires themselves melted, the contact-points destroyed, and the instruments rendered useless, if not destroyed. Various devices have been proposed for interrupting the normal circuit and cutting out the machines, but have failed, for one reason or another, to effect their object satisfactorily.

My invention consists in the construction and arrangements of parts, hereinafter pointed out in the claims; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

The mechanism by which I accomplish the desired end consists of, first, an ordinary electro-magnet of low resistance; second, an ordinary soft-iron armature; third, two metal posts or a frame carrying a switch-plate, to which is attached the armature above the electro-magnet, so that it may rock freely as either end is attracted to the magnet; fourth, a metal bar or plate, which I call the "switch-plate," supported at its two ends by pivots passing through the posts, and solidly fastened to the middle of the armature at right angles thereto; fifth, a metal hood or ground-plate hung from and solidly fastened to another post or frame, and so constructed as to present its interior surfaces in close proximity to but without touching the surface of the bar or switch-plate above mentioned, yet so that when the armature is rocked or one end drawn down to the magnet the switch-plate will be pressed hard against the hood, forming a contact for its whole length; sixth, a metal post or frame having the hood or ground-plate attached to it, as above described, and in immediate connection with the ground; seventh, contact-springs attached to the first-described posts or frame and so resting against the switch-plate and balancing one another as to hold it in the hood free from contact therewith in general; eighth, spiral springs resting on the cores of the electro-magnet and supporting the ends of the armature, re-enforcing by their action the effect of the contact-springs, the electro-magnet and posts or frames, and set-screws for holding the wires or electric conductors, all being fixed to a solid base of wood or any suitable material, and the electro-magnet being set with the extremity of one core slightly nearer the armature than the other.

In the accompanying drawings, which illustrate my invention as applied to a telephone, Figure 1 is an elevation looking perpendicularly down upon the instrument embodying the same, where the circuit-connections are also shown by the dotted lines. Fig. 2 is an elevation of the same, looking on a line perpendicular to the side of the ground-plate or hood and passing through the axes of the cores of the electro-magnets. Fig. 3 is an elevation of the same, looking on a line perpendicular to the length of the armature and to the plane of

the axes of the cores of the electro-magnets. The circuit-connections are shown by the dotted lines, as far as may be, in each case.

Referring to the drawings, A and A' represent the two electro-magnets, connected at the base and so wound with insulated wire as to present opposite poles at P and P' when an electric current passes through the coils.

B B' is the soft-iron armature carried by the switch-plate W, which is itself pivoted upon two set-screws, R and R', Fig. 2, passing through the heads of the posts F and F'.

C³, Figs. 1 and 2, is the wire loop connecting the insulated coils of the electro-magnet.

In Figs. 3 and 2, D D' is the hood or ground-plate inclosing, without touching, the switch-plate, and firmly attached to the post or frame E E' E².

S and S', Fig. 2, are the contact-springs.

P and P', Fig. 3, are the spiral springs.

The operation of my invention is as follows: Figs. 1 and 2, a normal current entering on the line-wire C at post C' passes along the buried wire C² to the magnet A, and through the coils by connecting-loop C³ to coils of magnet A', but without energizing the cores sufficiently to deflect the armature B B' from its ordinary position, as shown in the drawings; thence along the buried wire C⁴ to post C⁵ and wire C⁶ to telephone or other instrument to be protected at C⁷, and through that on by wire C⁸ to ground at G', or C⁸ may be line-wire continuing to next station. The current also passes (and this is the operative part of my arrester or protector) from the wire C² by the buried wire H into the post F, and thence by the contact-spring S and the pivot-screw R into the switch-plate W, and diffuses itself through it and through all parts of the protector in metallic connection with it. Such is the state and position of the parts with a normal current; but when an abnormal current, excited by any cause, traverses the main-line conductor C and the electro-magnet A A' the armature will immediately respond to the magnetization of the cores, be deflected and drawn down at one end or the other, and in either case will bring the switch-plate W into firm contact with the hood or ground-plate D D', and the excessive current will at once be discharged by and along wire H, Fig. 2, post F, contact-spring S, switch-plate W, hood D D', frame or post E E', buried wire E³, post E⁴, and wire E⁵ to the ground G. The post E² may be connected with the ground as well as E', if desired. As long as an abnormal current is passing over the circuit, the switch-plate will be thus automatically deflected and held in contact with the hood, the contact and spiral springs not being sufficiently heavy to resist the attraction of the electro-magnet when actuated by any current that could prove injurious to the instrument to be protected; but the moment such current ceases to magnetize the cores these springs break the contact with the hood and bring the switch-plate back into the position shown in the drawings, and the operating-cur-

rent passes through the instrument, as usual, the normal connections of the circuit being re-established, as before. Should the abnormal current be caused by atmospheric disturbances—as lightning—and be of high tension rather than great volume, it will jump, in a manner well known, the narrow air-space between the switch-plate and the hood and pass to ground, perhaps before the armature can move, and in any event rather than pass through the coils A A' to the telegraph or telephone instrument.

One arrester can be so placed in the circuit as to protect an operating-instrument on both sides from any abnormal current on either the incoming or outgoing wire by simply connecting the hood or ground-plate with the main line on the other side of the instrument to be protected from that on which the arrester is placed, instead of connecting it directly with the ground.

The apparatus I have now described is constructed either with metallic posts or frame on a wooden base, or may consist of one body of metal, all made fast together, so that there can be no warping or getting out of adjustment, the hood or ground-plate being in such case separated from the rest of the frame, to which it is attached, by some insulating material.

The advantages of the construction and arrangement proposed are that the line is never opened; that an instrument may be protected from both sides by the automatic action of one magnet and armature; that the original circuit is automatically restored as soon as the electric disturbance is over; that the arrester at the same time that it shunts out the coils of the instrument to be protected shunts out also its own coils sufficiently to prevent their being heated or injured, and that the armature is not moved by the alternating current sent through the circuit by the ringing of an electric call-bell.

What I claim as my invention is—

1. A protector of the operating-instruments in a telegraph or telephone system, formed by the combination, with the main line of the electric circuit, of an ordinary electro-magnet attached to a firm base, to which base is also attached a metallic frame or posts in electrical connection with and forming part of a branch of said main circuit, a bar or plate of metal, called a "switch-plate," having a socket in either end for the reception of the points of set-screws, which pass through and are secured in apertures in the said frame or posts at the proper elevation, and the points of which are inserted in the sockets in the switch-plate, so engaging it as to support it, yet leave it free to move on them as pivots, an ordinary armature attached to the switch-plate and held by it in operative relation to the pole or poles of the electro-magnet, a plate of metal, called the "hood" or "ground-plate," having a deep longitudinal groove wider than the thickness of the switch-plate, which it almost incloses without touching, attached to a separate post on

the common base, and in direct electrical connection with the ground or line wire the other side of the protected instrument, contact-springs fastened to the first-mentioned posts or frame and whose free ends bear against opposite sides of the switch-plate, and circuit-connections, all substantially as set forth, and for the purposes specified.

2. The combination, substantially as hereinbefore set forth, with the main line of an electric circuit or system in which it is included, of a movable switch-plate (three surfaces of which are exposed in close proximity and juxtaposition with the three interior surfaces of an inclosing hood or ground-plate) and the said hood, acting together as a lightning-guard, the said hood being in direct connection with the earth or main line, substantially as described.

3. In a broken ground or shunt for an electric circuit, the combination of the electro-magnet A A', the flat switch-plate W, carrying the armature B B', fastened to it, the grooved plate or hood D D', covering the switch-plate, a contact spring or springs bearing on the switch-plate, and circuit-connections, all substantially as described, and for the purposes set forth.

4. The combination, with the main line of an electric system or circuit in which it is included, of an electro-magnet, A A', automatically closing and opening a ground branch or shunt by actuating its armature B B', which is firmly attached to a bar or sheet of metal, W, hung on two set-screws, R R', which themselves pass through apertures in a frame or posts, F F', and connected with the main circuit by wire H, the plowed or grooved bar of metal D D', mounted on the frame or posts E E', so as to present as much surface as possible to the switch-plate W, the wires E³ and E⁵, connecting with the ground or main line of circuit beyond protected instrument, and the flat contact-springs S S', attached to the frame or posts F F' and bearing equally on the opposite sides of the switch-plate W, together with their circuit-connections, the whole as described, so as automatically to shunt any abnormal current on the main line to ground or onto the circuit beyond, and when it has passed automatically to restore the circuit again, substantially as set forth.

5. In a lightning-arrester or electric shunt, the hood or double ground-plate D D', formed of a bar of metal with a deep furrow or groove plowed into it, substantially as specified, for the purposes described.

6. The shunting device formed by the combination, with the main line of an electric system, of the electro-magnet A A', included in and forming part of said main line, the branch circuit composed of the posts or frame E E', (which are firmly attached to the same base as magnet A A', and having apertures through which are inserted set-screws,) the set-screws R R', (whose points engage sockets formed at the respective ends of the switch-plate,) the metal bar or switch-plate W, (to which is attached the armature B B', and which, like a tongue, is inserted in a groove or furrow of the metal ground-plate or hood D D' without touching it at any point,) the flat contact-springs S S', (attached to the posts or frame F F' at either end of the switch-plate W, and having their free ends bearing with equal force on the opposite faces of the switch-plate W,) the ground-plate or hood D D', (attached to and in electrical connection with the posts or frame E E', and having a groove for the switch-plate to play in plowed in the face toward the magnet,) the posts or frame E E', (which is immovably attached to the common base of the magnet A A',) and the wire E³, (leading from the frame E E' to the ground or line beyond,) the whole forming a direct ground-shunt legged onto the main line (outside of the magnet A A' and the instrument) by the wire H, connected with the frame F F' and circuit-connections, the whole so constructed and arranged as automatically to shunt to ground outside of the coils of the instrument to be protected as well as those of arrester itself any abnormal current on the circuit without opening the line and automatically restoring the normal circuit by opening this ground or line switch, substantially as described.

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Witnesses:

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EDWARD J. PAXSON.