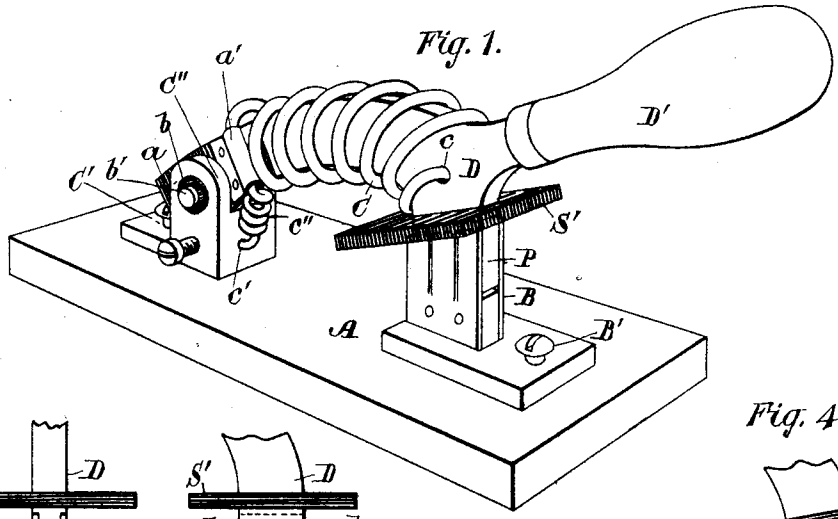
(No Model.)

E. A. SPERRY.

ARC RUPTURING DEVICE.

No. 537,130. Patented Apr. 9, 1895.

Fig. 1.



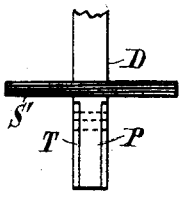


Fig. 2.

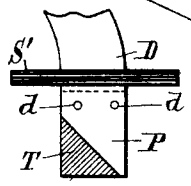


Fig. 3.

Fig. 4.

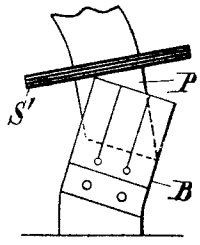


Fig. 5.

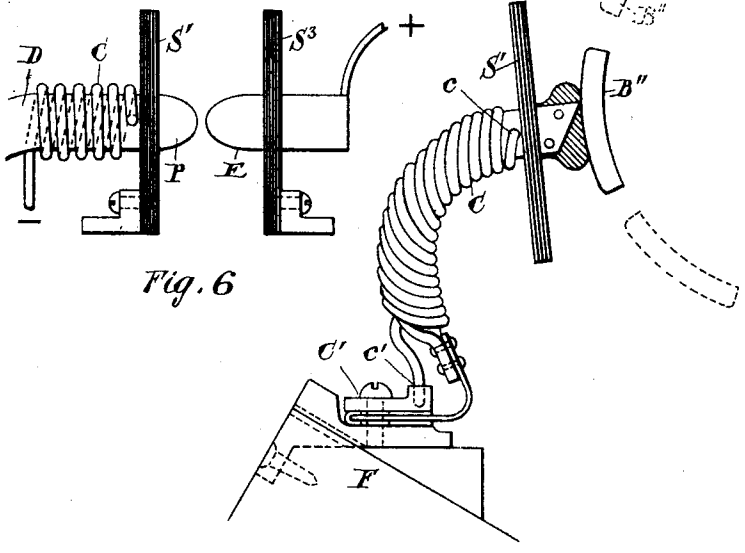


Fig. 6

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UNITED STATES PATENT OFFICE.

ELMER A. SPERRY, OF CLEVELAND, OHIO, ASSIGNOR TO JAMES PARMELEE, OF NEW YORK, N. Y.

ARC-RUPTURING DEVICE.

SPECIFICATION forming part of Letters Patent No. 537,130, dated April 9, 1895.

Application filed October 16, 1894. Serial No. 526,036. (No model.)

To all whom it may concern:

Be it known that I, ELMER A. SPERRY, a citizen of the United States, residing at Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Arc-Rupturing Devices, of which the following is a specification.

My invention relates to arc rupturing devices, and it consists in apparatus for rupturing the voltaic arc applicable to switches, lightning arresters, electrical controllers and similar devices; and it consists in employing the end or pole of a magnet as an arcing electrode, the said pole being electrically connected to and practically free for the direct action of the arc on the one hand while on the other the magnetic lines depended upon to disrupt any such arc are of the most intense nature or form a very intense field, being produced directly at or very near the point where used and therefore more effective than is possible where they emanate from a surface removed at a distance as for instance back of the shield and thus separated from the arcing electrodes.

It further consists of means for rendering a field efficient and effective for the purposes proposed herein by provisions hereinafter specified for causing the direction of the arc and the direction of the magnetic lines to take up a substantial angle to each other. It being known that when they are practically parallel or coincident no disrupting action can exist.

The invention further consists in the form of the magnet, the form of its ends, of certain shields and details fully described hereinafter, pointed out in the claims and shown in the accompanying drawings, in which—

Figure 1 is an isometrical view of an electric switch embodied in my invention. Figs. 2, 3 and 4 are details and modifications. Fig. 5 is a varied form. Fig. 6 shows a form employed as a lightning arrester.

Like letters of reference indicate similar parts throughout the several views.

Referring now to Fig. 1, A indicates a base plate upon which is mounted the contact B with the terminal screw or binding post B′. C′ indicates another terminal or binding post on the opposite end of the base plate upon which is formed a hinge C″ preferably with the moving part insulated by the lateral insulating faces upon each side, shown at *a*, and the insulating sleeve *b* around the pin *b′*. The co-operating magnetized electrode D which may be provided with a handle D′, consists of iron or like magnetizable substance preferably of crescent-shape, and is wound with an energizing coil C with one terminal secured to the electrode at *c* and the other to the terminal at *c′*, flexible wire being provided at *c″* to allow the movement of the electrode, a part near the end being secured by a loop in the insulating face indicated at *a′*. A shield S′ may be employed which is of non-conducting and preferably non-combustible substance, and is made to surround the magnetized electrode a short distance back from its pole or extremity P, which is left bare or electrically insulated from the electrode.

Fig. 2 illustrates the pole, where below the shield S′ the pole P is provided with a copper or other good conducting tip T. Fig. 3 illustrates a side elevation in section of this tip, showing the pins *d*, *d*, by means of which it is secured to the electrode D, and showing the angular arrangement. This may also be used with a straight magnet or used with a semicircular or crescent-shaped magnet, illustrated in Fig. 1. This peculiar shape—the bevel of the end—is, however, not essential, as any form which produces the peculiarity of field named falls within the scope of the invention. When the copper tip is not used, as in Fig. 1, and the angular shape is resorted to, the contact B may be arranged as shown in Fig. 4. The longer portion of the bevel should, for most purposes, be located farthest from the opposite end of the magnet but may with effect be nearest under altered conditions, for instance, of the relative direction of movement of the electrodes in breaking the circuit.

Fig. 5 illustrates an arrangement in which the magnetized electrode D is the stationary element and the co-operating electrode B″ is the moving element, the dotted lines indicating the relative position after the movement has taken place. Here also a soft iron or soft steel core is used with an energizing coil C but it is evident that a permanent magnet

could be employed. The terminal C′ of the coil is shown at the bottom to the left, the end of the magnet D being secured to an insulating substance F. Here the angle between the direction of the lines and the current-direction in the arc is provided both by the angle of the rupture and the deflected magnetic axis. It is evident that both causes need not be present, as for instance a straight magnet may be here employed.

Fig. 6 indicates the apparatus employed as a lightning arrester the curved magnetized electrode D being of magnetized steel or of iron and receiving an energizing coil, the relation of the shield S′ to the arcing gap being clearly illustrated, the shield in this case being used as a support. In this figure the cooperating electrode is preferably of diamagnetic substance and may be provided with the shield S^3. The wires leading from the electrodes are indicated by the plus and minus signs.

It will be readily understood that the magnets may be straight or curved in any plane, or the pole may be constituted of several magnets or may receive magnetism or the field may be deflected by magneto-induction as well as from the energizing coil C, or may be constructed of a permanent magnet as stated. In any case it should be electrically bare and unprotected from the action of the arc, this being one of the points which characterize the present invention and which secures high efficiency in operation.

The use and operation will be readily understood from the foregoing description.

I do not care to limit myself to the exact construction or proportions shown in the accompanying drawings. They simply serve to illustrate several of the many forms in which the invention may be embodied.

The lines pass the free discharge surfaces at the angles mentioned herein, and their points of approach should be considered while they are still in proximity to each other, preferably such proximity that the arc may or does form, substantially as specified.

It will furthermore readily be understood that the shield S′ need not of necessity present plane surfaces to the arc, but may present either concave, convex or irregular surfaces, or their position need not be at right angles or precisely as shown, and still perform the functions described. I do not care, therefore, to limit myself to any particular shape or contour of the surface or to any exact position of the shields, and while it is designed to use all of the above co-operating features in connection with each other, yet it is obvious that some may be used without the others, and the invention extends to such use, it being an essential part of the present invention to cause the lines of force, and the line of discharge of the arc, to be at a substantial angle to each other. For instance in Fig. 1 the magnetic lines issuing from the pole P are compelled to travel back and enter the magnet D at or near the other end of the magnetizing coil C, thus producing a substantial angle approximating ninety degrees between the magnetic lines in the air-gap and the line of discharge of the arc.

The word "air-gap" used herein is taken in its technical sense as designating a particular portion of the magnetic circuit.

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

1. In an arc rupturing device, a magnet, one of the poles of which is at or near one of its ends, the said end constituting an arcing electrode, the magnetic field of the said magnet in the region near the electrode consisting of lines of force having a certain predetermined direction, in combination with a cooperating electrode, a line-connecting the nearest points of approach between the free discharge-surfaces of the said electrodes being at an angle to the direction of the said lines of force.

2. In an arc rupturing device, a magnet, one of the poles of which is at or near one of its ends, an electrode located at such end, the magnetic field of the said magnet in the region near the electrode consisting of lines of force having a certain predetermined direction, in combination with a magnetically neutrally mounted diamagnetic cooperating electrode, a line-connecting the nearest points of approach between the free discharge-surfaces of the said electrodes being at an angle to the direction of the said lines of force.

3. In an arc rupturing device, a crescent-shaped magnet, one of the poles of which is at or near one of its ends, an electrode located at such end, the magnetic field of the said magnet in the region near the electrode consisting of lines of force having a certain predetermined direction, in combination with a cooperating electrode, a line connecting the nearest points of approach between the free discharge-surfaces of the said electrodes being at an angle to the direction of the said lines of force.

4. In an arc rupturing device a magnet with one of its poles at or near one of its ends, this end forming an arcing electrode which may or may not bear an attached contact or terminal, the magnetic field of such magnet in a region near such electrode consisting of magnetic lines passing free or in "air gap" in a certain predetermined line or direction between the said pole and another point or points upon such magnet, in combination with an independently mounted co-operating electrode, a line connecting the nearest point of approach between the free discharge surfaces of said electrodes being at an angle to the said direction of the magnetic lines.

5. In an arc rupturing device, a magnet with one of its poles at or near one of its ends, this end forming an arcing electrode which may or may not bear an attached contact or terminal, the magnetic field of such magnet in a region near such electrode consisting of mag-

netic lines passing free or in "air gap" and in a certain predetermined line to one side of the magnet and between the said pole and another point or points upon said magnet, in combination with an independently mounted co-operating electrode, a line connecting the nearest point of approach between the free discharge surfaces of said electrodes being at an angle to the said direction of the magnetic lines.

6. In an arc rupturing device a magnet with one of its poles at or near one of its ends, this end forming an arcing electrode which may or may not bear an attached contact or terminal, the magnetic field of such magnet in a region near such electrode consisting of magnetic lines passing free or in "air gap" in a certain predetermined line or direction between the said pole and another point or points upon such magnet, an independently mounted co-operating electrode, a line connecting the nearest point of approach between the free discharge surfaces of said electrodes being at an angle to the said direction of the magnetic lines, a coil upon such magnet and a circuit connection for the coil including said electrode.

7. In an arc rupturing device, a magnet, one of the poles of which is at or near one of its ends, a shield of solid insulation mounted upon the magnet in a plane substantially at right angles to the axis of the said magnet, the said pole protruding through the said shield into the arcing space and there forming said arcing electrode, the magnetic field of the said magnet in the region near the said end consisting of lines of force having a certain pre-determined direction, a co-operating electrode, a line connecting the nearest points of approach between the free discharge surfaces of the said electrodes being at an angle to the direction of the said lines of force.

8. In an arc rupturing device, an unprotected magnetic pole formed by one end of a magnet or contact constituting an electrode, a cooperating electrode or contact, means for relative movement of the two electrodes, the final break of contact while disconnecting being in a certain line with reference to said pole, an intercepting shield of solid insulator mounted upon the said polar electrode the face of which is in a plane practically at right angles to the said line.

9. In an arc rupturing device, an unprotected magnetic pole formed by the end of a magnet constituting an electrode or contact, a portion extending rearward from such electrode or contact enveloped by an electro-magnetic energizing coil, a terminal for said coil constituting a hinge for the said rearward projection, and means for insulating said projection and terminal.

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