(No Model.)

L. SEARING.

LIGHTNING ARRESTER.

No. 484,466. Patented Oct. 18, 1892.

Fig. 2.

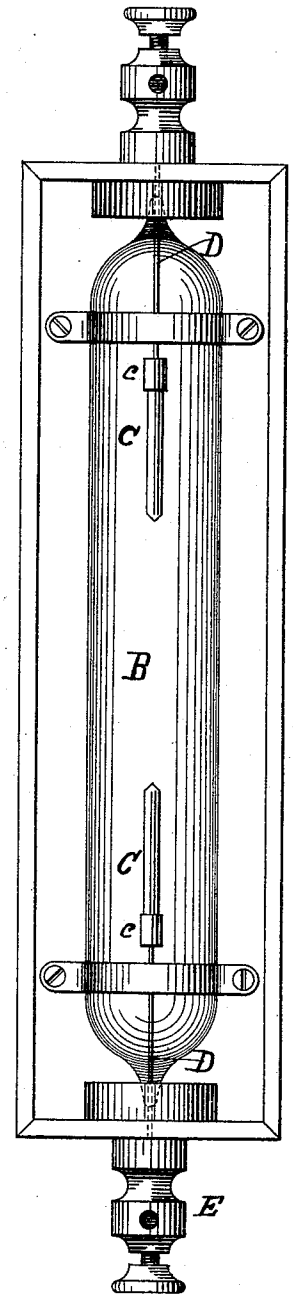

Fig. 1.

Fig. 4.

Fig. 3.

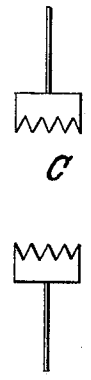

Fig. 5.

Witnesses.

Frank E. Shepard.

Inventor.

Louis Searing.

by G. M. Plympton, Atty.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

LEWIS SEARING, OF DENVER, COLORADO.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 484,466, dated October 18, 1892.

Application filed January 20, 1892. Serial No. 418,630. (No model.)

To all whom it may concern:

Be it known that I, LEWIS SEARING, of Denver, Colorado, have invented a new and useful Lightning-Arrester for Electric Circuits, of which the following is a description, reference being taken to the accompanying drawings, forming a part of this specification.

The purpose of my invention is to afford as easy a path as possible for the lightning-discharge and to prevent the accumulation of dangerous static charges, while presenting at the same time a high insulation-resistance to the regular line-current in the circuit to which the lightning-arrester is applied.

To these ends my invention is embodied in the apparatus and its parts constructed, arranged, combined, and used substantially in the way hereinafter described, illustrated, and claimed.

I have found that a partially-exhausted atmosphere inclosed in a suitable reservoir of glass or other substance will form a ready path for the disruptive or silent discharge of quantities of electricity of excessively-high potential, and at the same time a current of lower potential, such as is used for the instruments in the circuit, will neither pass across between electrodes suitably placed within such reservoir nor preserve an arc between the electrodes when the discharge of lightning or like high-tension discharge has formed one. There being virtually no inductive resistance offered between such electrodes the best possible conditions are present for the discharge of lightning or the brush discharge of high-tension static charges. I have found that such an easy path is afforded to high-tension static charges that a Holtz machine will completely discharge and de-energize itself if its electrodes are connected with the electrodes of my device. With exhaustion equal about to that of the incandescent lamp I find a separation between my electrodes of a half-inch will allow discharge after discharge to pass across without carrying over and maintaining an arc from a one-hundred-and-fifty-volt circuit. With two-hundred-and-twenty-volt circuits somewhat further separation is required; but a separation of an inch and seven-eighths is sufficient for a six-hundred-and-fifty-volt circuit. With somewhat greater electro-motive force and the same separation of electrodes a brush discharge becomes visible, but the line-current will not flow across even when a static discharge has formed a path for it.

The electrodes may be of numerous shapes and materials without very materially modifying these relations.

In the drawings I have shown in Figure 1 one complete form of my device. In Figs. 2, 3, 4, and 5 I have shown various electrodes.

Like letters of reference indicate like parts in all these figures.

At B is shown the glass tube, similar to Geissler tubes, which incloses my electrodes C and contains a rarefied gas. The electrodes may be connected to platinum terminal wires D, welded into the glass. The whole may then be mounted upon a suitable frame or back plate and provided with binding-posts E, as shown.

In Fig. 1 the electrodes are of shape like lamp-carbons and may be formed from lamp-carbons pointed and mounted in the holders *c*.

In Fig. 2 is shown a form of metallic terminal in which I utilize the terminal wires D by continuing them within the tube to proper proximity to each other.

In Fig. 3 is shown a modification of the last, in which the tips of the wires terminate in plates or disks, which form the electrodes C.

Fig. 4 shows the electrodes of carbon such as are used in the tube shown in Fig. 1.

In Fig. 5 I have shown electrodes such as are used in many well-known lightning-arresters—that is to say, plates presenting toward each other serrated edges—from the points of which the discharge is intended to pass.

Such are a few embodiments of my invention. It must not, however, be understood that I make claim to the discovery of any new properties of vacua or of the fact that beyond a certain point of rarefaction the properties materially change. Such discoveries, I am aware, were long since made. My invention is not therefore this discovery, but the adapting of the properties possessed by rarefied gases, and the production thereby of a lightning-arrester of no appreciable impedence or of resistance to the static discharge, yet of great insulating resistance to the line-current.

I am aware that Louis Bell, of Lafayette, Indiana, has disclosed to the public a lightning-arrester in which rarefied gas is used with electrodes; but the exhaustion is so arranged in reference to the air-gap that a small increase in the potential difference between the electrodes over that normally existing will cause a discharge across the gap. In the same circuit with the air-gap the said Louis Bell places an electro-magnet to break that circuit after the lightning has passed. This is essential to the apparatus, as the parts are so arranged that the line-current can pass across the air-gap when the arc has been formed by lightning. Bell was not therefore aware that he could so arrange the air-gap and the rarefaction as to render the automatic break with its necessary inductive resistance needless.

I am also aware that Elihu Thomson, of Lynn, Massachusetts, has employed a somewhat similar tube and electrodes, but with gas rarefied to its maximum conductivity to afford a safety-shunt for the line-current of an arc lamp. With such apparatus as this latter the return of the lamp to normal condition will so far reduce the potential difference between the electrodes in the tube that this shunt will be broken. Therefore no other means for breaking circuit are needed.

Where the inventions of Bell and of Thomson may be said to end my invention begins, for the tubes as disclosed by them could not possibly be used or adapted for use without other supplemental devices, as a lightning-arrester, and, on the other hand, my invention possesses properties rendering it unfit for use as a low-resistance line-shunt. I therefore disclaim the types set forth by them as being different, both in properties and in purposes from my invention, and, because by my different arrangement of rarefaction and air-gap, totally new capabilities and unknown adaptabilities are created.

The essential features of my invention are with a given separation rarefying till the line-current will not follow the discharge and till an easy path is afforded to the disruptive discharge. This vacuation I will term a "non-striking vacuum" to distinguish it from the prior art, wherein a slight increase of electric tension caused the current to arc across the air-space.

Of course the form and material of the electrodes may be variously modified without in any way departing from my invention, and somewhat different rarefactions and gases may be used; but all these questions may readily be determined in practice to suit the requirements of different uses and different circuits. I will not therefore go into these details; but,

Having set forth fully and clearly one embodiment of my invention, I claim, broadly, and desire to secure by these Letters Patent, the following:

1. A lightning-arrester or safety device consisting of a pair of electrodes inclosed in a tube or reservoir containing a non-striking vacuum, the separation of the electrodes and the rarefaction of the gas being such that there is afforded a high-insulating resistance to currents of normal tension or electro-motive force and a ready path to static and like discharges of excessively-high tension, substantially as and for the purposes set forth.

2. A lightning-arrester or safety device for permitting the discharge of lightning or like static charges of high tension and for rupturing the arc so formed when the discharge has passed, consisting of a pair of electrodes inclosed in a tube or reservoir containing a non-striking vacuum, substantially as described.

In testimony of the foregoing I have hereunto set my hand this 11th day of January, A. D. 1892.

LEWIS SEARING.

Witnesses:
FRANK E. SHEPARD,
CLARENCE GARDNER.