G. W. CLARK.

LIGHTNING ARRESTER.

APPLICATION FILED MAR. 20, 1908.

949,565. Patented Feb. 15, 1910.

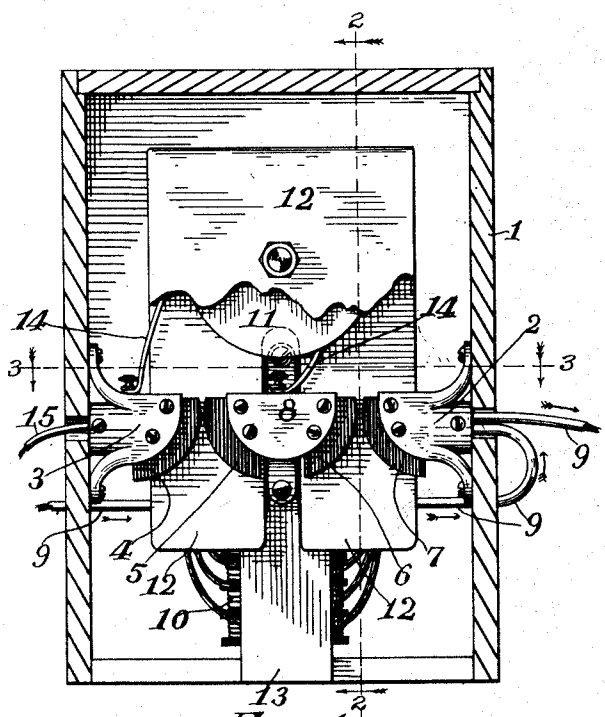

Fig. 1.

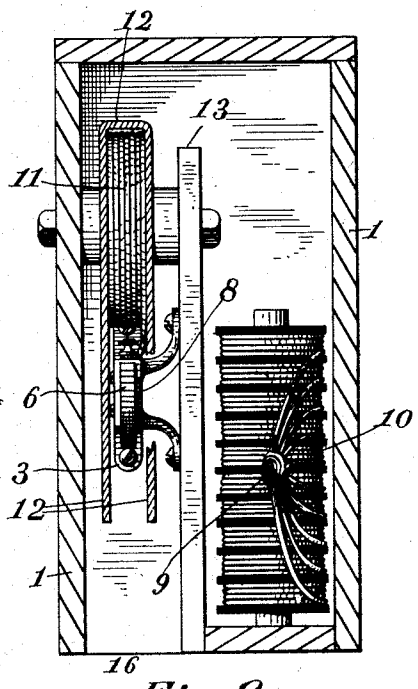

Fig. 2.

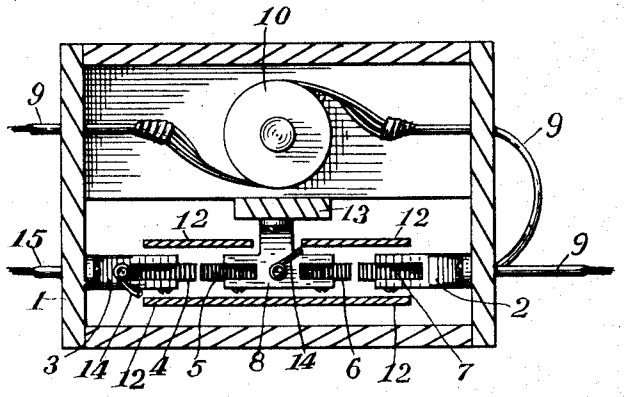

Fig. 3.

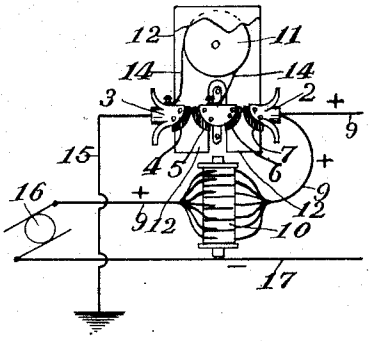

Fig. 4.

Witnesses

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UNITED STATES PATENT OFFICE.

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LIGHTNING-ARRESTER.

949,565. Specification of Letters Patent. Patented Feb. 15, 1910.

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To all whom it may concern:

Be it known that I, GEORGE W. CLARK, a citizen of the United States of America, residing at Grand Rapids, in the county of Kent and State of Michigan, have invented certain new and useful Improvements in Lightning-Arresters; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to improvements in lightning arresters and its object is to provide the same with improved means for blowing out the arc, and to provide the device with various new and useful features hereinafter more fully described and particularly pointed out in the claims.

My invention consists essentially in the construction and arrangement of two pairs of diverging terminals in the path of a static discharge from the line to ground, the second pair of terminals being spaced apart less than the first pair, whereby only sufficient resistance in the first instance is presented to the arc to divert a small portion of the current around this gap through a shunt circuit and coil to moderately excite a magnet having its poles extending at the respective sides of both gaps and beyond the same in the direction of the divergence of the terminals. This arrangement causes the arcs to be drawn toward the more widely separated parts of the terminals thus increasing the resistance of the air gaps, which in turn increases the shunted current and increases the excitation of the magnet, which in turn further draws the arc toward the wider part of the gap thus progressively increasing the excitation of the magnet and gap resistance until the arc finally breaks or "blows out". I thus excite the magnet and produce in the second gap only the necessary resistance to break or blow out the arc, and also secure a progressive increase of magnetic action sufficient to blow out the strongest arc without overcharging or heating the magnet coil.

A form of my invention is shown and illustrated herein, reference being had to the accompanying drawings, in which:

Figure 1. is a front elevation of a device embodying my invention with parts broken away to show the construction; Fig. 2. a vertical section of the same on the line 2—2 of Fig. 1.; Fig. 3. a horizontal section on the line 3—3 of Fig. 1.; and Fig. 4. a diagram of the device together with a circuit in which it is arranged.

Like numbers refer to like parts in all of the figures.

1 represents the case, of any suitable dimensions and material; 2 and 3 are terminal holders preferably attached to the sides of the case and provided with sockets adjacent to the case, respectively adapted to receive the line and ground conductors and having slots or recesses at their inner sides adapted to receive the outer carbon terminals 4 and 7. Between these sockets is a double terminal holder 8 supported on a post 13 and having opposing recesses or slots at its respective sides in which are two other carbon terminals 5 and 6 opposite the terminals 4 and 7. These four terminals thus being arranged in a series of two opposing pairs and spaced apart to form gaps across which the lightning passes to the ground conductor 15. The adjacent surfaces of each pair of carbon terminals are segmental in form being arranged close together near their upper angles and diverging downward toward their other angles.

9 represents a line conductor forming the positive side of any electrical system, such as a trolley wire for street car lines, or the like. This conductor first extends through a choke coil 10 and thence into the socket 2 where it is doubled upon itself and thence extends outward to any convenient distance forming the positive side of the system, exposed to the action of the lightning.

11 is an exciting coil arranged between the upper part of a U-shaped blow-out magnet 12 of soft iron or other suitable material, the poles of which magnet embrace the carbon terminals and extend beyond the same in the direction of the divergence of the said terminals. A shunt circuit 14 extends from the middle holder 8 through this exciting coil 11 and to the socket 3. A ground conductor 15 is inserted in said socket 3 and extends thence to the ground.

16 represents a dynamo or other mechanism to be protected from lightning, and 17 the ground or negative side of the system in which the device is placed.

In operation the lightning will come in on the conductor 9 and jumping the gap between the terminals 6 and 7 will shunt partially through the circuit 14 and excite the blow-out magnet 12. Preferably the gap between the terminals 4 and 5 is considerably less than between the terminals 6 and 7 thus permitting the lightning to freely escape across this gap and away by the ground conductor 15 without overcharging the shunt circuit. So long as there is any arc maintained across these gaps between the terminals a part of the current will shunt through the circuit 14 and excite the blow-out magnet and when there is no arc, the working current does not flow through the shunt circuit. The diverging shape of the terminals and the location of the poles beyond the same and in the direction of this divergence tends to draw the arc downward and thus increases the gap between the terminals across which the arc extends. The specific difference in the gaps being constant, as the gaps increase equally, the ratio of difference decreases; the arc across the second gap is thus at first relatively short, and its ratio to the first arc increases as the arcs are blown along toward the more remote sides of the terminals. The arc is thus stretched and broken by the magnet in a manner peculiar to this novel construction. The arc across the second gap is thus relatively short; and increases in proportionate length to the first arc as the arcs move toward the remote sides of the terminals.

What I claim is:

1. A lightning arrester comprising two pairs of diverging terminals arranged in series between a line conductor and a ground conductor and spaced apart unequally, a magnet arranged to blow arcs formed between said terminals toward the more remote sides of the same, a shunt circuit around the lesser gap between the terminals, and a coil in the shunt circuit to excite the magnet, whereby the ratio in length of the arcs is reduced and the shunt current increased as the arcs are moved along by the magnet.

2. A lightning arrester comprising two pairs of terminals having equal degrees of divergence at equal distances from the adjacent sides and spaced apart unequally, and also arranged in series between a line conductor and a ground conductor, a magnet arranged to blow the arcs formed between said terminals toward the more remote parts of the terminals, a shunt circuit around the lesser gap between the terminals, and a coil in the shunt circuit to excite the magnet, whereby the ratio in length of the arcs is reduced and the shunt current increased as the arcs are moved along by the magnet.

In testimony whereof I affix my signature in presence of two witnesses.

GEORGE W. CLARK.

Witnesses:
JAS. B. DOYLE,
LUTHER V. MOULTON.