No. 669,155. Patented Mar. 5, 1901.

H. C. WIRT.

LIGHTNING ARRESTER.

(Application filed Apr. 30, 1897.)

(No Model.)

FIG. 1.

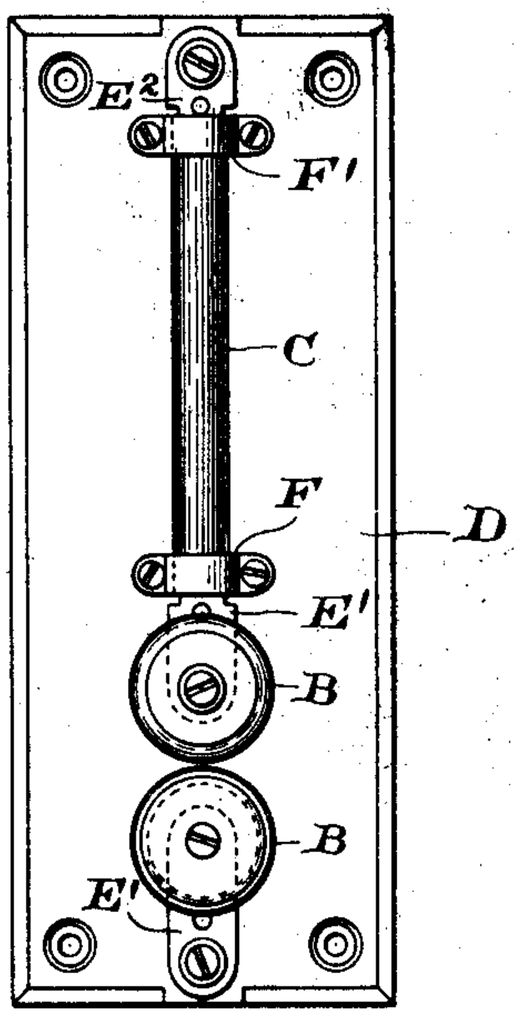
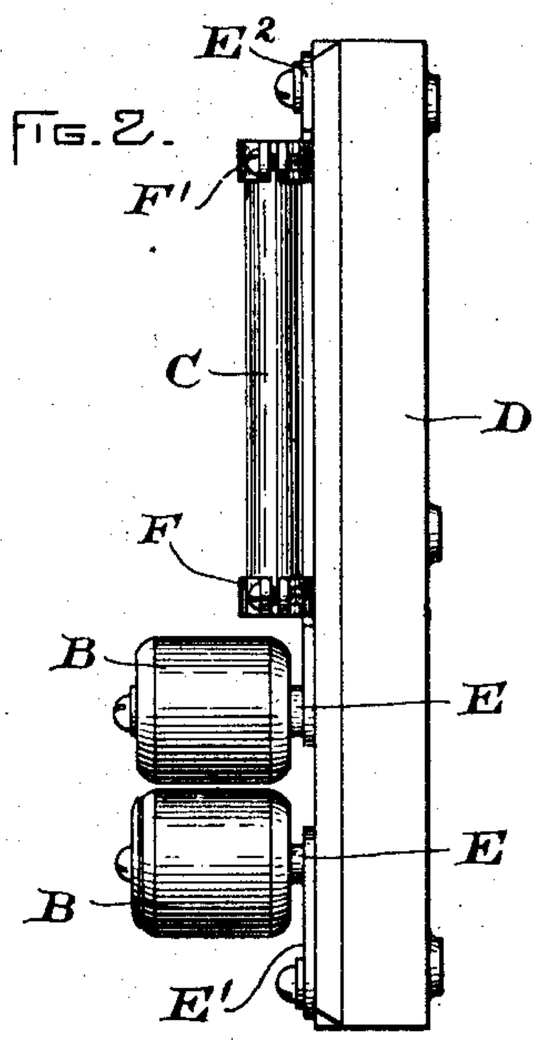


FIG. 2.



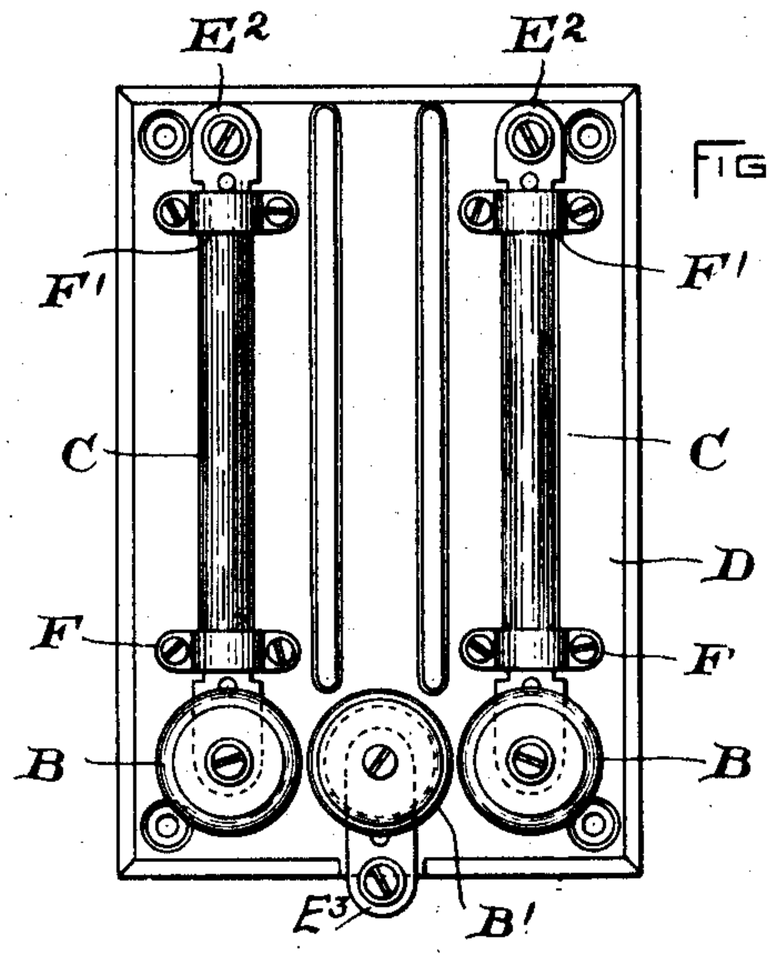


FIG. 3.

FIG. 4.

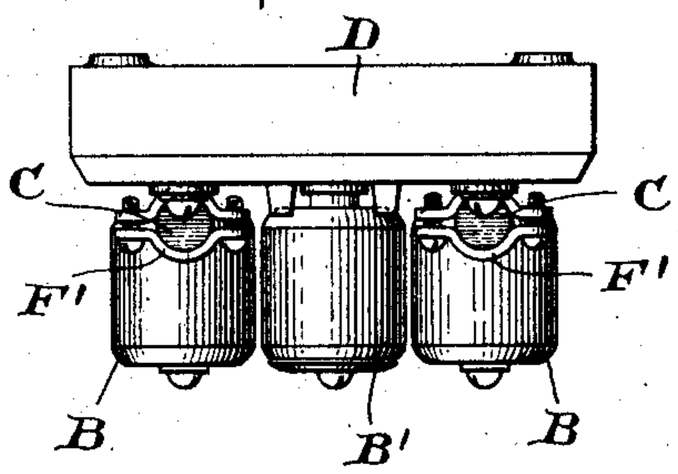
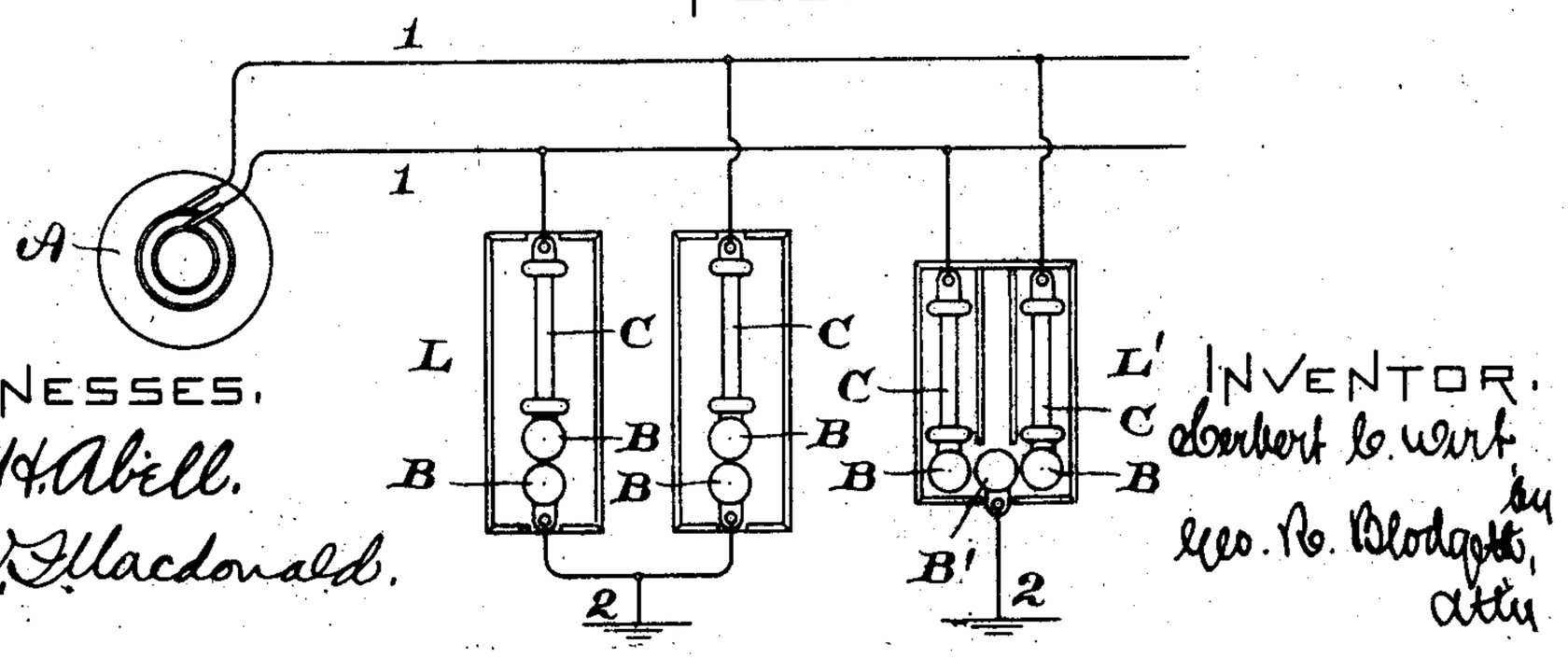


FIG. 5.



WITNESSES.

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INVENTOR.

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by Geo. B. Blodgett, Atty

UNITED STATES PATENT OFFICE.

HERBERT C. WIRT, OF SCHENECTADY, NEW YORK, ASSIGNOR TO GENERAL ELECTRIC COMPANY, OF NEW YORK.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 669,155, dated March 5, 1901.

Application filed April 30, 1897. Serial No. 634,543. (No model.)

To all whom it may concern:

Be it known that I, HERBERT C. WIRT, a citizen of the United States, residing at Schenectady, in the county of Schenectady, State of New York, have invented certain new and useful Improvements in Lightning-Arresters, (D. 551,) of which the following is a specification.

My invention relates to lightning-arresters, and has for its object to provide a lightning-arrester especially adapted for alternating-current work which is self-contained and requires no special arc-disrupting devices.

The arrester constructed in accordance with my invention has a much smaller air-gap and a lower series resistance than has hitherto been possible to use with certainty of preventing the continuance of arcing, and hence a better protection for the line insulation. I accomplish this by the combined action of metal cylinders or balls having between them short-gap air-spaces, with a non-inductive resistance. The combined action of the metal cylinders and non-inductive resistance prevents the heating of the cylinders at the time the lightning discharge passes across the gap or gaps and also prevents the forming of gas in the spark gap or gaps sufficient to maintain the arc by the potential of the alternator. The coöperation of the cylinders or dischargers and the resistance lies in the fact that together they produce a highly-useful result which has not been hitherto thought possible, the cooled dischargers permitting the use of a lower resistance for accomplishing the purpose of preventing re-formation of the arc than would be possible without said dischargers, and owing to the combination of the resistance and the cooled dischargers a much smaller air-gap can be used than with a resistance alone, as hitherto.

Heretofore lightning-arresters having a number of solid discharge-balls have been used, the discharge-balls being made of so-called "non-arcing metal." It has been supposed that these metal pieces gave off a non-conducting vapor or oxid which prevented the formation and continuance of arcs. My arrester is provided with discharge cylinders or balls; but it is designed to operate in quite a different manner. The metal pieces are considerably larger than those heretofore used, so as to have a capacity for absorbing heat, and thereby keeping the temperature of the pieces relatively low. By keeping the dischargers cool no conducting-gases are liberated in the air-gap and the latter is not increased by fusing of the metal.

Ordinarily when a double-pole lightning-arrester is used, or two single-pole arresters connected to opposite branches of the circuit, it forms a shunt-circuit from line to line, and when the lightning discharge passes it establishes a vapor between the discharge-terminals, so as to reduce the resistance of the shunt-circuit through the lightning-arrester to a point such that there is danger of the arc persisting under the potential of the alternator. Especially is this true when the metallic pieces or balls are placed close together, so as to produce a discharge-path for the lightning at relatively low potentials and so insure the protection of the insulating devices on the circuit.

It is very important, as I have found, to keep the heating of the terminals down, for if this is done the arc following the discharge will be broken on an alternating-current circuit by the action of the alternator at or about the zero-point in the wave. Then if the terminals are not allowed to heat I find that even though a good discharge-path for lightning is preserved yet the arc will not start up again under the influence of the alternator potential. It is therefore, of course, desirable to reduce the current which shall flow through the shunt-circuit formed by the arrester after the lightning discharge, for the heating effect increases with the square of the current. I therefore use in combination with the metallic cylinders hereinbefore referred to a non-inductive resistance to limit the flow through the lightning-arrester circuit, thereby keeping down the heating and preserving the terminals at such a temperature that the arc once extinguished does not start up again.

My invention consists in a lightning-arrester constructed and arranged as hereinafter set forth and claimed.

Referring to the accompanying drawings, Figure 1 is a front view of a single-pole lightning-arrester constructed in accordance with

my invention. Fig. 2 is a side view thereof. Fig. 3 is a front view of the invention in the double-pole form. Fig. 4 is an end view thereof. Fig. 5 illustrates a circuit having lightning-arresters constructed in accordance with my invention connected therein.

A is an alternating-current generator, and 1 1 the circuit leading therefrom to translating devices. (Not shown.) Interposed in this circuit are lightning-arresters L L′, constructed in accordance with my invention.

The single-pole form of lightning-arrester (shown in Figs. 1 and 2) consists of two metal cylinders B and a non-inductive resistance C—as, for example, a rod of graphite—said cylinders and non-inductive resistance being mounted on an insulating-base D, such as porcelain. The metal cylinders B are each mounted on a metal post E, projecting from a metal plate E′, secured to the base D. The metal cylinders B are each adapted to be rotated on its post E and can be removed therefrom. Each is secured in position by means of a screw or other suitable means. The non-inductive resistance or graphite rod C is detachably mounted and secured on the base D by means of a removable clamping-ring F at one end, fastened to one of the plates E′, and a removable clamping-ring F′, fastened to a plate E^2, secured to the base D. The metal cylinders and non-inductive resistance are arranged in series.

The arrester shown in Fig. 1 has but two metal cylinders B and one spark-gap of approximately one thirty-second of an inch and is adapted for a one-thousand-volt circuit.

As heretofore stated, the metal cylinders are considerably larger than the metal pieces heretofore used, so as to have the capacity of absorbing heat; thereby keeping the temperature of the cylinders relatively low. They are two inches in diameter and two inches long. One cylinder is connected to the overhead line and one to ground 2.

In the double-pole form (shown in Figs. 3 and 4) there are cylinders or balls, connected one to each branch of the circuit, and a non-inductive resistance. A third metal cylinder B′ is located on the plate E^3 between the cylinders B and connected to ground 2. In this construction there are two spark-gaps of approximately one thirty-second of an inch each.

The lightning-arresters constructed in accordance with this invention may be provided with a number of cylinders in series having one spark-gap for each one thousand volts potential, and the spark-gaps are each approximately one thirty-second of an inch, except as follows: Where more than two cylinders are employed in series with a non-inductive resistance the static condition of the cylinder second to the one adjacent to line is such that there is a tendency to sparking across the gap, and to obviate this instead of making the gap between the first and second cylinders one thirty-second of an inch it is made approximately three sixty-fourths of an inch, which avoids the tendency just stated. The cylinders are rotatable on their posts to bring fresh surfaces opposite each other.

By means of the construction of lightning-arrester herein set forth the operation and effect, as hereinbefore stated, will be accomplished. The heating of the terminals will be kept down with the aid of the non-inductive resistance and the arc following the lightning discharge will be broken by the action of the alternator.

What I claim is—

1. In a lightning-arrester for alternating-current circuits, the combination with metallic dischargers which are prevented from being heated to an intense degree by lightning discharges, and are separated by only a comparatively short air-gap, of a comparatively low resistance in series with the air-gap, said elements coöperating to protect the line insulation.

2. In a lightning-arrester for alternating-current circuits, the combination with metallic dischargers connected respectively to line and ground, and of sufficient mass to cause the heat generated by a lightning discharge to be conducted away from the surface adjacent the air-gap which separates them, whereby the dischargers are kept cool; of a comparatively small non-inductive resistance in series with the air-gap, said elements coöperating to protect the line insulation.

In witness whereof I have hereunto set my hand this 20th day of April, 1897.

HERBERT C. WIRT.

Witnesses:
E. W. CADY,
C. L. HAYNES.