(No Model.) 2 Sheets—Sheet 1.

E. THOMSON.

LIGHTNING ARRESTER.

No. 454,672. Patented June 23, 1891.

Fig. 1.

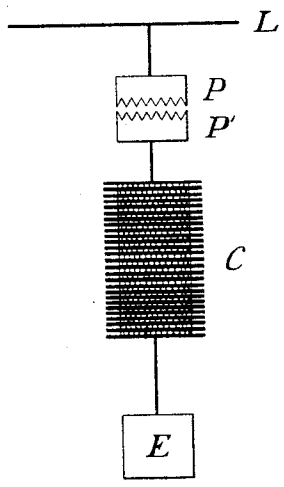


Fig. 2.

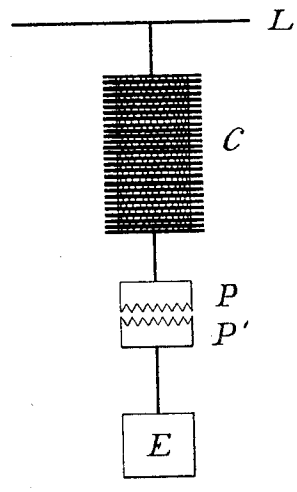


Fig. 3.

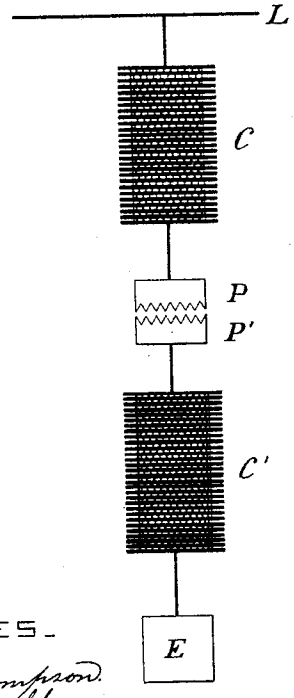
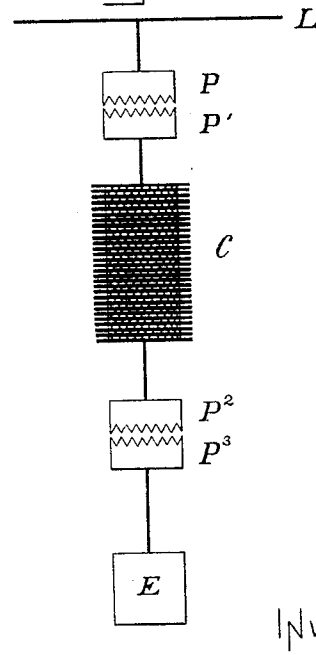


Fig. 4.



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E. THOMSON.

LIGHTNING ARRESTER.

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Fig. 8

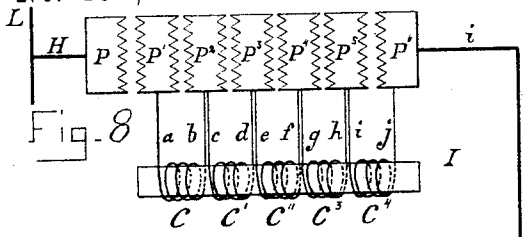


Fig. 10.

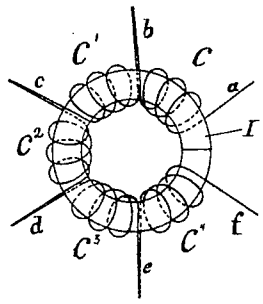
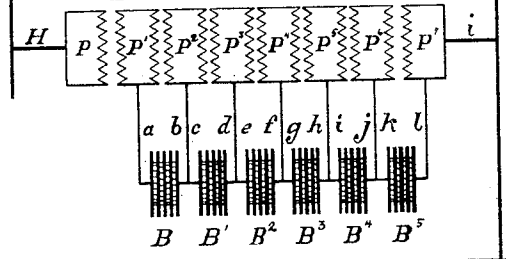


Fig. 6.



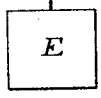


Fig. 9.

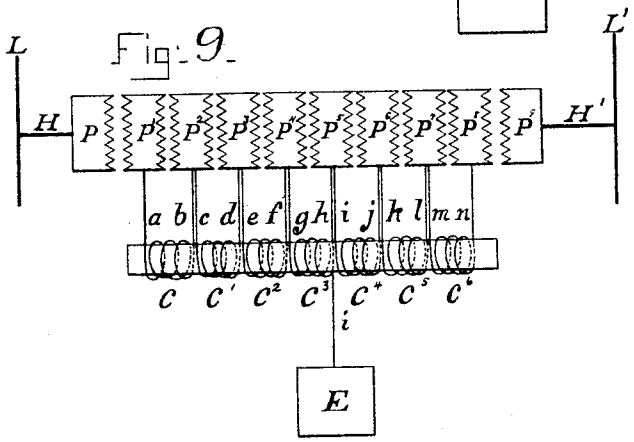


Fig. 5.

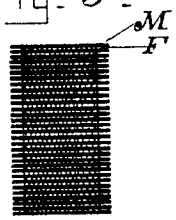
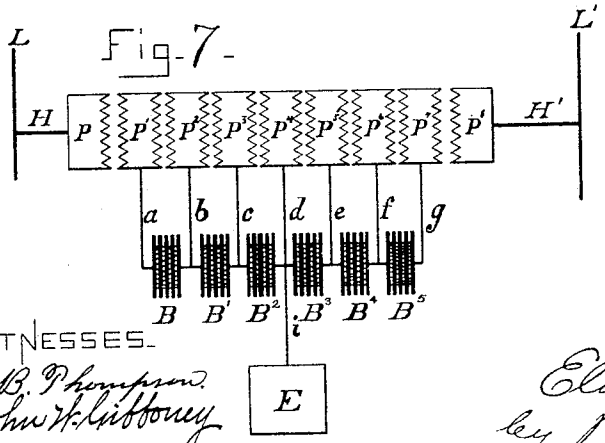


Fig. 7.



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UNITED STATES PATENT OFFICE.

ELIHU THOMSON, OF LYNN, MASSACHUSETTS.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 454,672, dated June 23, 1891.

Application filed November 5, 1890. Serial No. 370,364. (No model.)

To all whom it may concern:

Be it known that I, ELIHU THOMSON, a citizen of the United States, residing at Lynn, in the county of Essex and State of Massachusetts, have invented a certain new and useful Improvement in Lightning-Arresters, of which the following is a specification.

My present invention relates to lightning-arresters, and in using this term my intention is to include discharge-protectors of all kinds for avoiding injury to the apparatus protected arising from lightning or other discharges of dangerously high potential from the line.

The object which I have had immediately in view is to guard against the formation or maintenance of arcs across the discharge-plates of arresters of this character; and the apparatus I have devised for this purpose consists in its most approved form of a counter-electro-motive-force generator in the form of a number of polarizing-cells in series with the discharge-plates and divided into sections, each section being shunted by discharge-plates in series with one another and with the first-named plates.

For use with alternating currents the polarizing-cells would be replaced by counter-inductive devices, and in some cases in operating with direct currents the polarizing-cells may be used without the shunting-plates.

Figures 1 to 4 are diagrams showing the application of the polarizing-cells in series with the discharge-plates, which forms one feature of my present invention. Fig. 5 shows the polarizing-cells. Figs. 6 and 7 are diagrams of the most approved form of the invention, as above described. Figs. 8 and 9 show in a similar manner the use of counter-inductive devices in place of the polarizing-cells, and Fig. 10 is a detail of the form of inductive device which may be employed.

L represents a line-circuit which it is desired to protect from lightning or other high potential discharges. It is therefore provided with a lightning-arrester comprising the discharge plates or surfaces P P′, separated by an insulating interval and connected, respectively, with the line and the earth-plate E. Were no further provision made, a discharge in passing to ground would form an arc across the jumping-space between the plates P P′, and some special form of arc-interrupter would be needed for extinguishing the arc. I avoid this arcing by using a series of polarizing-cells C, which may be interposed anywhere in the discharge-path, so that the whole or a portion of the discharge will pass through them and thereby generate a counter electro-motive force opposing the discharge.

In Fig. 1 the generator C is arranged between the arrester-plate P′ and earth-plate E, while in Fig. 2 it is situated between the line L and arrester-plate P. In Fig. 3 it is divided into two portions—one between the line L and plate P and the other between the second plate P′ and ground. In Fig. 4 two sets of arrester-plates P P′ and P^2 P^3 are arranged in series, and the generator is connected to the intermediate plates P′ and P^2. In all these modifications, however, as well as in the others hereinafter described, the circuit through the generator is normally broken at the jumping-space between the discharge-plates; but when the discharge leaps this space it polarizes the plates of the cells and at once generates a counter electro-motive force, which tends to exhaust the arcing potential. This, together with the resistance due to the jumping-space itself, will quickly cause the arc to break.

The number of coils provided at C will be in excess of that required to set up an electro-motive force equal to the electro-motive force of the line, and thereby provide a margin of safety in guarding against the flow of current from the line to earth, although the number may of course be reduced to an extent such that the electro-motive force of the coils, together with that required to sustain an arc at P P′ when once formed, shall be greater than the electro-motive force upon the line.

Fig. 5 illustrates in detail the counter-electro-motive-force generating polarizing-cells, which I employ. It consists of successive metal plates M—such, for instance, as lead plates—separated by a moist substance, which may be either a liquid itself or a strip of felt F soaked in one, such as a salt or acid, the whole constituting a series of "cells," as I have termed them herein.

The principle of operation shown in Figs. 1 to 4 I prefer to employ in the more extended manner shown in Fig. 6, where successive sets or sections of polarizing-cells B B′ B^2, &c., are placed in series with the discharge-plates P P′, and each set or section is connected in shunt by connections *a b c*, &c., with the discharge-plates P′ P^2 P^3, &c., which are arranged in series with one another and also in series with the discharge or jumping space between P P′. The counter electro-motive force generated by each set or section of the polarizing-cells is made insufficient to sustain an arc between the arrester-plates in shunt therewith, so that the discharge goes to earth either wholly or partly through said cells; but a sufficient kick or back electro-motive force is generated by the polarization of the cells to extinguish the arc between the plates P P′. Fig. 7 shows the same arrangement applied to both sides of a circuit, as a double-pole lightning-arrester.

In case alternating currents are employed counter-inductive devices C C′ C^2, &c., should be substituted for the polarizing-cells in the manner shown in Figs. 8 and 9, while still preserving some of the features and the general arrangement of Figs. 6 and 7. Such counter-inductive devices may consist of a number of coils wound on a common core I, which, as shown in Fig. 10, may be a closed iron ring. As before, the counter electro-motive force generated by each section is insufficient to maintain an arc between the arrester-plates.

What I claim as new, and desire to secure by Letters Patent, is—

1. A lightning-arrester comprising a pair of discharge-plates, a number of sets of polarizing-cells in series therewith, and a plurality of discharge-plates with jumping-spaces in shunt with the sets of polarizing-cells.

2. A lightning-arrester comprising a counter-electro-motive-force generator divided into sections, in series with a pair of discharge-plates, and additional discharge-plates in series with one another and shunting each section of the counter-electro-motive-force generator.

3. The combination, with a pair of discharge-plates in a lightning-arrester, of a plurality of additional discharge-plates in series with one another and with the first-named discharge-plates and separated by jumping-spaces, and counter-electro-motive-force generators shunting some of said spaces.

4. The combination, with the discharge-plates of a lightning-arrester, of a counter-electro-motive-force generator in series therewith, consisting of an electrolytic polarizing device.

5. The combination, in a lightning-arrester, with discharge-plates separated by an insulating interval, of a generator of counter electro-motive force arranged in the discharge-path to oppose the maintenance of an arc between the discharge-plates and consisting of a series of metal plates separated by a liquid or moist material, as described.

6. In a lightning-arrester, the combination of the discharge-plates with a set of polarizing-cells in series therewith, comprising metal plates separated by a moist material and sufficient in number to create a counter electro-motive force upon the passage of a discharge to earth great enough to prevent arcing at the disruptive space.

In witness whereof I have hereunto set my hand, this 30th day of October, at Lynn, in the county of Essex and State of Massuchusetts.

ELIHU THOMSON.

Witnesses:
JOHN W. GIBBONEY,
BENJAMIN B. HULL.