

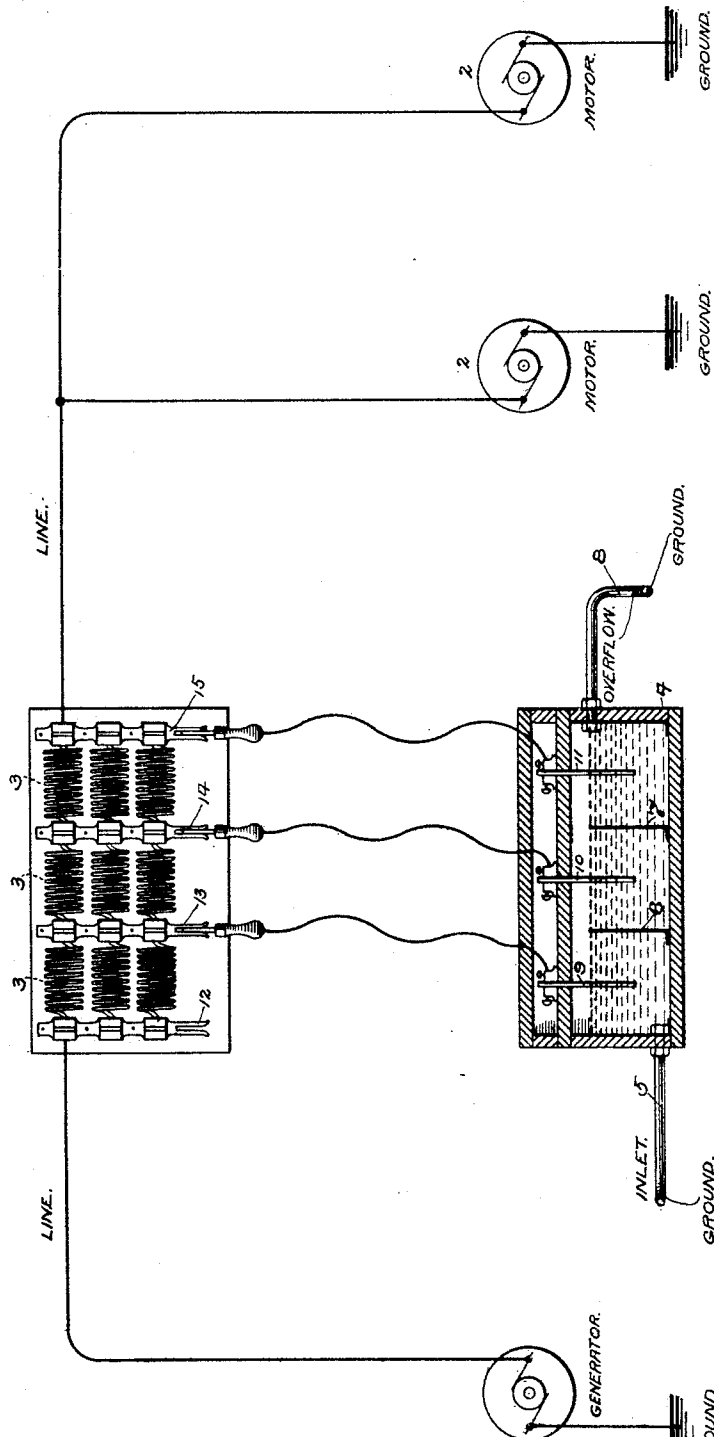
(No Model.)

A. WURTS & C. F. SCOTT.

LIGHTNING ARRESTER.

No. 497,397.

Patented May 16, 1893.



Witnesses

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UNITED STATES PATENT OFFICE.

ALEXANDER WURTS AND CHARLES F. SCOTT, OF PITTSBURG, PENNSYLVANIA,
ASSIGNORS TO THE WESTINGHOUSE ELECTRIC AND MANUFACTURING
COMPANY, OF SAME PLACE.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 497,397, dated May 16, 1893.

Application filed October 26, 1892. Serial No. 450,065. (No model.)

To all whom it may concern:

Be it known that we, ALEXANDER WURTS and CHARLES F. SCOTT, citizens of the United States, residing at Pittsburg, county of Allegheny, State of Pennsylvania, have invented a new and useful Improvement in Lightning-Arresters, (Case No. 515,) of which the following is a specification.

Our invention has relation to devices whereby electric motors and generators may be protected from the destructive effects of static discharges from the line due to thunder storms and other agencies.

The object of our invention is the provision of a device for this purpose which shall not be open to certain objections applicable to other devices of its class and shall be economical and trustworthy.

This invention is in the nature of an improvement over that set forth and claimed in the patent of Alexander Wurts, No. 476,855, dated June 14, 1892, wherein are shown choking coils introduced between the line and the generator and immersed in water.

The accompanying drawing is a diagram of a system of distribution wherein our invention is illustrated, the tank being shown in section.

At 1 is shown the generator supplying current to motors 2, or other translating devices. Between the generator and the line are introduced self-induction coils 3, of such a nature as not perceptibly to impede the current even when an alternating one, but offering a very great self-induction resistance to discharges of such excessively quick pulsations as are present in lightning.

In the drawing a tank 4 is shown preferably constructed of wood lined with metal whereby a good ground connection may be secured. Through this tank a stream of water is kept flowing and preferably in the following manner: The inflow takes place at one end of the tank and at the bottom, as shown at 5; thence the water flows over the partition 6 and under the partition 7, finally being carried off by the pipe 8. Into each of the various compartments of this tank an electrode 9, 10 and 11 is dipped, supported in any desired manner.

The self-induction coils are preferably

placed in a number of rows, so as to afford the minimum resistance to the passage of the generator current. In each row there is a number of coils equal to the number of electrodes used, and between these coils and at the ends of the rows are as many contact bars as electrodes plus one. These latter are shown at 12, 13, 14 and 15. These contact bars are adapted to be brought at will into electric connection with the electrodes preferably by means of springs and pegs as shown. We provide one more contact than there are electrodes in order that on whichever side of the coils the generator may be placed, the contact bar on the same end may be left idle, so as to leave a self-induction resistance between all the points of lightning discharge and the generator.

We have here shown a multiple arc system with a ground return, as this is the simplest form, there being only one ground connection necessary in this case.

The use of flowing water is desirable because, as we have found, stagnant water rapidly decreases in resistance under the conditions existing in our system. A further use for flowing water is explained below in connection with carrying away the products of disintegration of the electrodes.

The operation of our device is as follows:— When a thunder storm is imminent, the contact bars are connected with appropriate submerged electrodes, these latter being preferably made of carbon. One or more of the contact bars may be so connected, but in any case it is better to leave the bar nearest the generator idle for the reasons above set forth. A leakage of current of course results from this connection, but it is not sufficient in amount to weigh appreciably against the advantage of absolute security against lightning obtained by this system. The leakage of high tension static electricity will, of course, be proportionately rapid and a lightning stroke is reduced to the minimum of probability, the tension of the line not being allowed to rise. If, however, such an event should occur the charge finding a vastly higher resistance through the coils 3 than through the water to the ground, would choose

the latter path and the dynamo would thus be protected. It has been found that in a line thus subjected to lightning action there are certain nodal points which are fixed with relation to the wire system wherein no discharge occurs. Between these an oscillation of potential of high frequency takes place during such a discharge much as a violin string vibrates in nodes when harmonics are played. If by chance a lightning arrester is placed on one of these points, its usefulness will be lost, as there will never be any rise of potential at such point. It is therefore necessary that more than one point of discharge be provided, and that the distances apart of such points sustain a fractional relation to the distance between the nodal points in the given system; in other words, the distance from one point of discharge to the next must not be equal to the distance between the nodal points, nor to a distance expressed by any integral number of times such nodal distance. This latter distance we have found to approximate three yards; but it will vary with the particular system. It is for this purpose that we have provided more than one contact-bar, 12 to 15, and we place these bars about a yard and a half apart in order that if one should occur at a node, the next would be near the crest of the wave of oscillation. It is, of course, within our invention to use any number of desired points, and we are not limited to the four shown.

The arrangement of partitions 6 and 7, as above described, is for the purpose of sweeping away the product of electrode waste. The carbons, under the influence of water and current waste away by disintegration, and the dust resulting is carried over the partition 6, and under the partition 7, the water escaping under the partition and out of the pipe 8 carrying said dust away with it. It is not, of course, necessary that each space between the partitions be occupied by an electrode, nor is our invention limited to the use of three such apartments. The partitions are arranged to slide up and down in grooves for rendering possible various arrangements thereof. By removing the choking coil from the tank, in which latter position it is shown in the patent of Wurts mentioned above, the disintegration otherwise affecting the copper of such coil and threatening a short-circuit is transferred to the comparatively cheap carbon electrodes, which, even if consumed, could not interrupt the current on the line.

What we claim is—

1. A generator and a main line fed thereby, in combination with a group of lightning arresters on said line located at distances apart, sustaining a fractional relation to the distance apart of nodal points in case of a lightning discharge, substantially as described.

2. A generator, a main line fed thereby, a grounded body of running water, and a continuous electrical connection between a point on the main line near the generator, and said body of water, substantially as described.

3. A generator, a main line fed thereby, and a coil of high inductive resistance near said generator, in combination with a body of running water and a continuous electrical connection between said main line, beyond said inductive resistance, and said body of water, substantially as described.

4. A generator, a main line fed thereby, and a choking coil on the line near the generator in combination with a tank of water in connection with the earth, an electrode dipping into said water, and a continuous electrical connection between said water and a point on the line on the opposite side of said choking coil from the generator, substantially as described.

5. A generator and a main line fed thereby in combination with a tank having several apartments separated by partitions, said tank being grounded, means for causing water to flow over and beneath said partitions alternately, and means whereby the water in each apartment is brought into electrical connection with the main line, substantially as described.

6. A generator, a main line fed thereby, a group of contact bars in electrical connection with said line and coils connecting said bars in combination with a tank having as many apartments as there are contact bars less one, partitions separating said compartments and adapted to slide up and down, means for causing water to flow over and under said partitions alternately, an electrode dipping into the water in each compartment and electric connectors attached to said electrodes and adapted to make contact with said contact bars, substantially as described.

In testimony whereof we have hereunto subscribed our names.

ALEXANDER WURTS.
CHAS. F. SCOTT.

Witnesses:

JAMES WM. SMITH,
HAROLD S. MACKAYE.