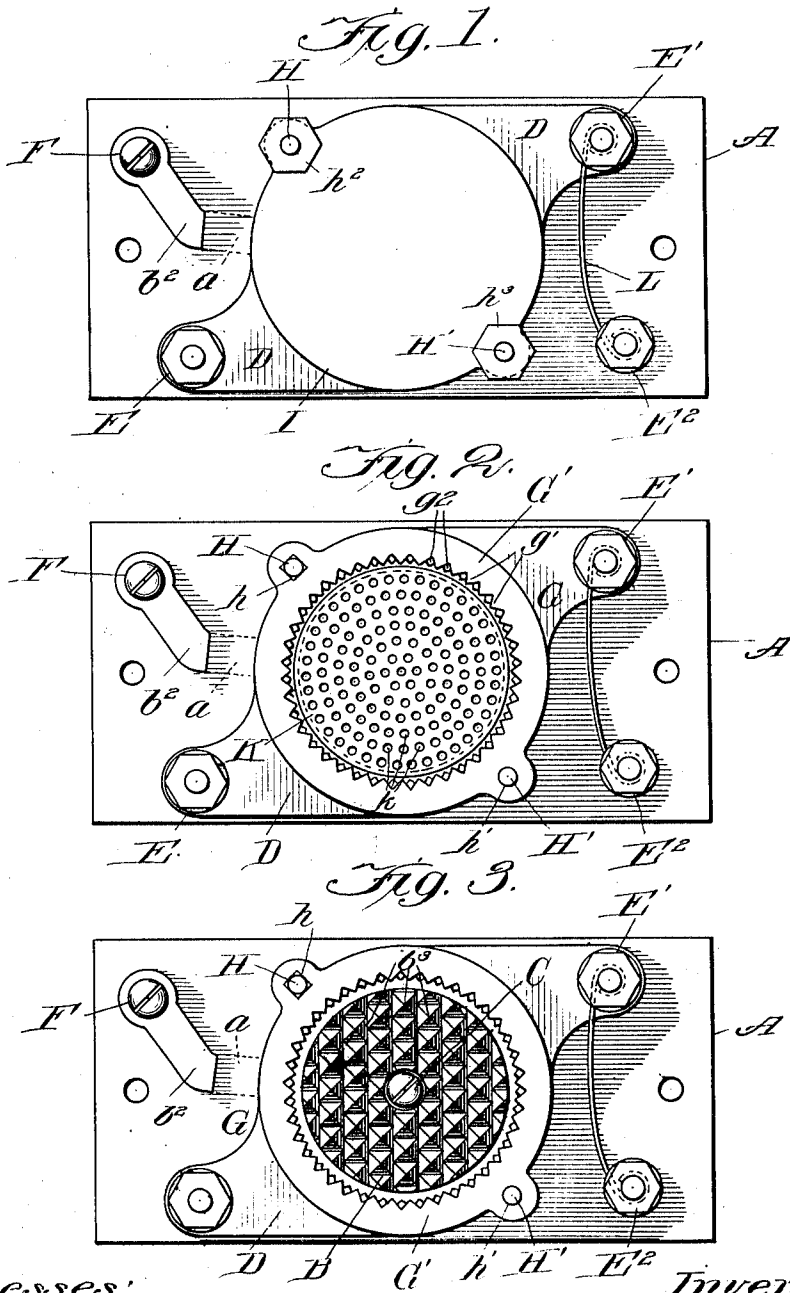


E. W. VOGEL.
LIGHTNING ARRESTER.
APPLICATION FILED JUNE 8, 1908.

991,912.

Patented May 9, 1911.

2 SHEETS—SHEET 1.



Witnesses:
Harry S. Gaister
Ruby V. Nash.

Inventor:
Eugene W. Vogel
by Walter H. Kambelin
Atty

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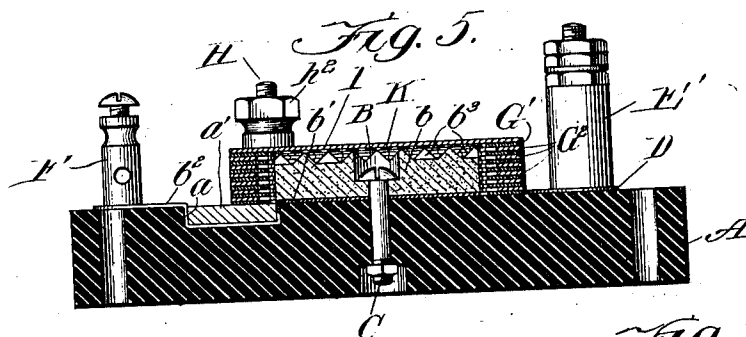
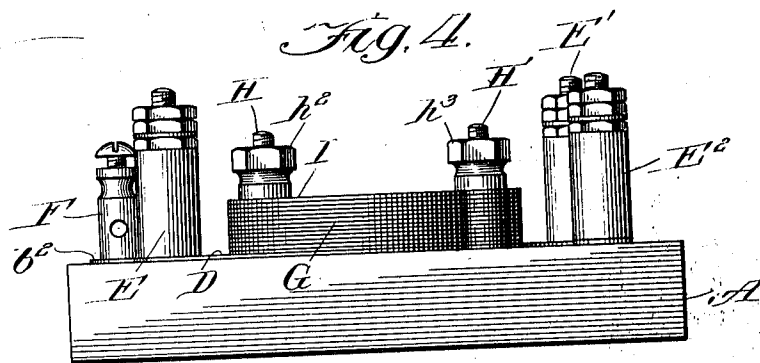


Fig. 6.

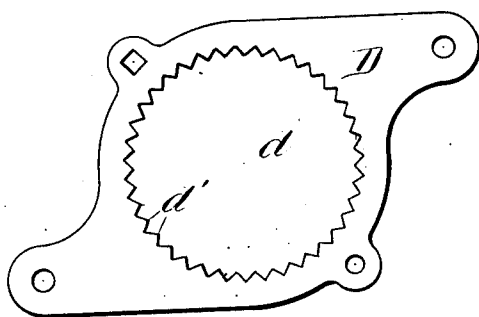


Fig. 7.

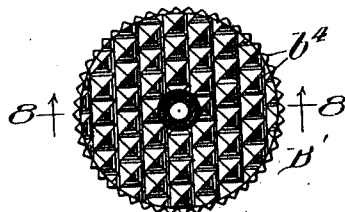


Fig. 8.



Witnesses:

Harry S. Gaither
Ruby V. Nash

Inventor:

Eugen W. Vogel

by Walter H. Hamerlin
Att'y.

UNITED STATES PATENT OFFICE.

EUGENE W. VOGEL, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE RAILROAD SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

LIGHTNING-ARRESTER.

991,912.

Specification of Letters Patent.

Patented May 9, 1911.

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To all whom it may concern:

Be it known that I, EUGENE W. VOGEL, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have invented a certain new and useful Improvement in Lightning-Arresters, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to devices adapted to be applied to electric circuits for protecting the circuits and apparatus therein against lightning charges which may enter upon such circuits, and it has for its object to improve such devices.

A further object of my invention is to provide a device of the character specified which will not be influenced by the surrounding medium.

A further object of my invention is to provide a device of the character specified which may be used both in alternating and direct current circuits.

A further object of my invention is to provide a device of the character described which shall be simple in construction, durable, and efficient in operation.

The various features of novelty which characterize my invention will be hereinafter pointed out with particularity in the claims; but for a full understanding of my invention in its various aspects and of its object and advantages, reference may be had to the following detailed description taken in connection with the accompanying drawings, wherein:

Figure 1 is a plan view of a lightning arrester arranged in accordance with a preferred form of my invention; Fig. 2 is a view similar to Fig. 1, the cover plate and securing nuts therefor being removed; Fig. 3 is a view similar to Fig. 2, the insulating disk above the ground terminal being removed; Fig. 4 is a side elevation of the complete device; Fig. 5 is a central longitudinal section; Fig. 6 is a plan view of one of the annular conductors; Fig. 7 is a plan view of a modified ground terminal; and Fig. 8 is a section taken on line 8—8 of Fig. 7.

Referring to the drawings, A indicates a base made of a slab of insulating material

and having any desired size and shape; the material of the base being preferably marble, slate or other non-inflammable material so that it will not be injured under the influence of a high potential discharge.

B is a ground terminal preferably non-metallic and of a non-fusible and non-inflammable character. This terminal may take any desired form, that indicated being, however, advantageous in many respects. In the arrangement shown the terminal is made of two parts, a thick disk *b* composed of hard carbon or other refractory conducting material and a thin metal plate or disk *b'*. The parts of the terminal are secured to the base by means of a bolt or screw C which passes through the base and through the members *b* and *b'*. The two parts of the terminal are therefore clamped in close engagement with each other and are at the same time securely held upon the base.

D is a thin flat plate having therein an opening *d* large enough to freely receive the terminal B. The edge of the plate bounding the opening is provided with numerous teeth or points *d'* so that when the plate is laid upon the base so as to surround the terminal B these teeth or points project toward and into proximity to said terminal. The member D is secured to the base, with the terminal B projecting therethrough, in any suitable manner, as, for example, by means of a pair of binding posts E or E'.

The plate *b'* is connected to a binding post F, supported upon the base at one side of the member D, by means of an integral strip *b²* which extends downwardly from the member *b'* into a socket *a* in the base and leaves this socket at a point beyond the member D. The socket *a* is preferably filled with paraffin or other insulating material so as to effect a tight seal about the lead *b²* at the point where it passes between the plate D and the base member.

A cylindrical housing is built up about the terminal B by means of a series of superposed rings G, the opening in each of the rings being similar to the opening *d* in the member D. These rings are preferably made of metal and each ring of a different metal from that in the adjacent rings. By making the rings of two different metals and arranging them so as to alternate with each other no two consecutive rings will be

of the same metal, and this is the preferred arrangement. While not essential, it is at least preferable to employ two different metals in the rings as this will reduce the danger of fusion of one ring to another under heavy electrical load. Metals which I have found to be satisfactory for this purpose are aluminum and brass.

In order to present as many discharge points as possible, the inner edge of each ring is toothed or serrated in the same manner as the member D. The teeth on the several rings are preferably so arranged that no tooth registers directly with the one immediately above or below it, each tooth therefore forming a discharge point independently of every other tooth. This result may conveniently be attained by making all of the brass rings G' alike and all of the aluminum G^2 also alike but differing from the brass rings in that when the parts are assembled the corresponding teeth on the two sets of rings will be displaced from each other in a circumferential direction a distance half the width of a tooth. Therefore, in looking downwardly into the arrester twice as many points or teeth are seen as there are in any one ring, since the tips of the brass teeth g' alternate with the tips of the aluminum teeth g^2 . The rings may conveniently be assembled by providing a pair of posts H and H' projecting upwardly from the base, each of the rings being provided with perforations h and h' through which these posts may pass. The perforations in the rings are so placed that it is only necessary for the workmen to slip over the posts first a brass ring and then an aluminum, continuing until the pile is complete, in order to be certain that the proper arrangement of the teeth will be produced. Furthermore one of the posts, such as the post H , may be made square or of some other shape so that it will pass only through the openings h and not through the openings h' . It will be seen that the use of the two different metals in the rings makes it very easy for the workman to properly assemble the rings for, if all of the rings were of one metal and therefore of one color it would be difficult for the workman to avoid accidentally placing two exactly similar rings in engagement with each other, thus destroying the completeness of the distribution of the teeth throughout the interior of the cylindrical shell.

On top of the outermost ring is placed a disk I similar to the rings except that the central portion is not cut away. This disk forms a cover as it were, so that when the nuts h^2 and h^3 are screwed down upon the posts H and H' , the rings are all clamped securely together, the plate is clamped tightly upon the rings and the rings and plate are firmly secured to the base. The

terminal B is therefore inclosed within a sealed housing so that there is no danger of short circuiting through moisture or other foreign material.

A thin disk of insulating material K made of mica or the like is laid upon the terminal B before the cap or cover is added, thereby preventing the cover* from being brought into contact with the terminal in case the cover is accidentally bent or crushed inwardly. The member K is preferably provided with numerous perforations j so that a discharge can take place between the members I and B .

If desired, the terminal B may have its outer face serrated as at b^3 so as to furnish a large number of discharge points; or, if desired, serrations or teeth b^4 may be provided around the periphery of the terminal as well as upon its outer face as indicated in the modified form of terminal B' shown in Figs. 7 and 8.

The member B is preferably the ground terminal and the inclosing member of conducting material a part of the circuit over which the lightning charge may travel. It will be seen that the arrester may be used either in series in a circuit or in multiple. When used in series the leading-in wire is connected to the binding post E and the outgoing wire to the binding post E' . The current flowing through the circuit must therefore pass completely around the ground terminal through the toothed rings and, in case a lightning charge enters upon the circuit, an extremely large number of discharge points between the circuit and ground are provided for it by the arrester. If desired, another binding post E^2 may be provided and a fuse L may be placed between this binding post and the binding post E' . If the arrester is able to take care of the charging then the fuse does not come into play, but if the action of the arrester should happen to be insufficient to protect the apparatus or instruments in the circuit then the fuse will blow and entirely interrupt the circuit.

It will be seen that the arrester may be used both with alternating and direct currents since normally current will flow directly from one binding post to the other through the plate D .

I have found that after a low tension current has flowed through the arrester for some time an oxid is formed on the aluminum which causes the aluminum rings to be insulated from the brass rings, thereby producing a condenser effect. This oxid is, however, readily broken down by a high tension current so that all of the rings become operative to assist in discharging current to ground.

If desired, the exterior of the rings as well as the base adjacent thereto may be

shellacked so as to insure complete tightness of the housing which surrounds the ground terminal.

While I have illustrated and described in detail only a single embodiment of my invention I do not desire to be limited to this particular embodiment for, in its broader aspects, my invention may take many other forms as will be evident from the terms employed in the definitions of my invention constituting the appended claims.

Having now fully described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In a lightning arrester, a ground terminal and a series of superposed electrically-connected annular plates of conducting material surrounding said terminal, certain of said plates having toothed inner edges arranged in proximity to said terminal.

2. In a lightning arrester, a ground terminal and a series of superposed electrically-connected annular plates of conducting material surrounding said terminal, certain of said plates having toothed inner edges arranged in proximity to said terminal, said plates being made of two different materials, plates made of one material alternating with those made of the other material.

3. In a lightning arrester, a ground terminal and a plurality of superposed annular plates surrounding said terminal, some of said plates being made of aluminum and the others of another good conducting material, and the aluminum plates alternating with the other plates.

4. In a lightning arrester, a ground terminal and a plurality of superposed annular plates surrounding said terminal, some of said plates being made of aluminum and the others of another good conducting material, and the aluminum plates alternating with the other plates and each of said plates having its inner edge serrated.

5. In a lightning arrester, a base of insulating material, a ground terminal mounted on said base, a plurality of superposed annular conducting plates arranged upon said base so as to surround said terminal, a cover forming with said plates and the base a closed housing for the ground terminal, and a conductor passing from said terminal through the base.

6. In a lightning arrester, a base com-

posed of insulating material not readily fusible, a ground terminal of non-metallic conducting material mounted on said base, and an annular metal terminal mounted upon said base so as to surround said ground terminal, one of said terminals being provided with teeth projecting toward the other.

7. In a lightning arrester, a discharge terminal composed of a series of superposed rings, each of said rings having teeth on its inner edge, and a guide for positioning said rings angularly in assembling the same, said rings and guide being so arranged that the teeth on one ring are caused to be staggered with respect to the teeth upon the two adjacent rings.

8. In a lightning arrester, a discharge terminal composed of a series of superposed rings, each of said rings having teeth on its inner edge and each ring having one or more openings for receiving a fastening means, the arrangement being such that when corresponding openings in the rings are brought into registration, the teeth on each ring bear a staggered relation with respect to the teeth on the two adjacent rings.

9. In a lightning arrester, a base of insulating material, a ground terminal secured to said base, a series of superposed rings arranged upon said base and surrounding said terminal, said rings being perforated, posts projecting from said base through the perforations in the rings, and means on said posts for clamping said rings together and to the base.

10. In a lightning arrester, a base of insulating material, a ground terminal mounted upon said base, a series of superposed rings arranged upon said base and surrounding said terminal, a disk overlying the upper ring, said rings and disk having registering perforations, posts extending from the base through said perforations, and means cooperating with said posts for clamping said plate and said rings together and to the base so as to form a complete housing for said terminal.

In testimony whereof, I sign this specification in the presence of two witnesses.

EUGENE W. VOGEL.

Witnesses:

WM. F. FREUDENREICH,
HARRY S. GATHIER.