(No Model.)

2 Sheets—Sheet 1.

C. WIRT.

LIGHTNING ARRESTER.

No. 414,356. Patented Nov. 5, 1889.

FIG. 1.

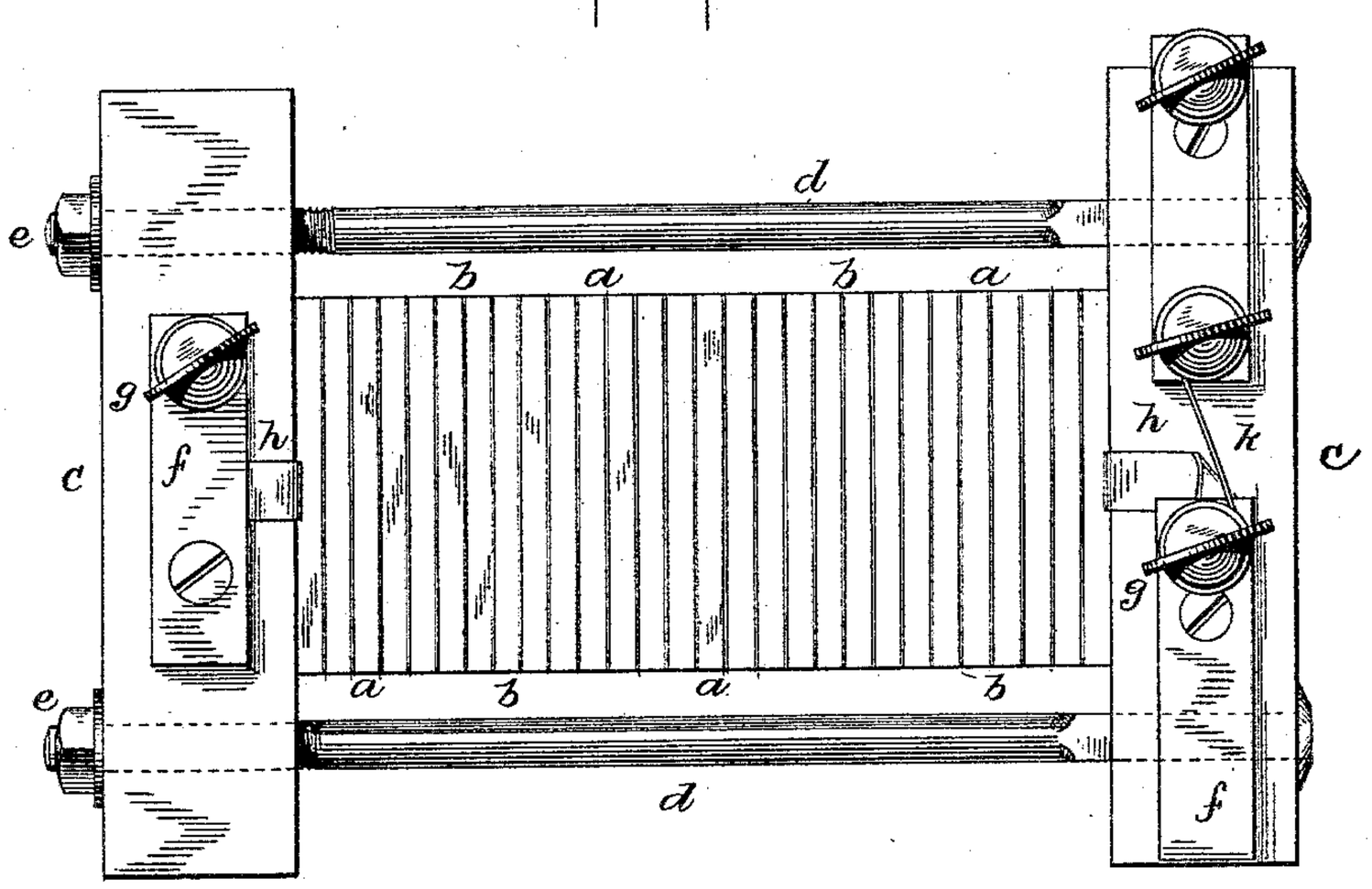


FIG. 2.

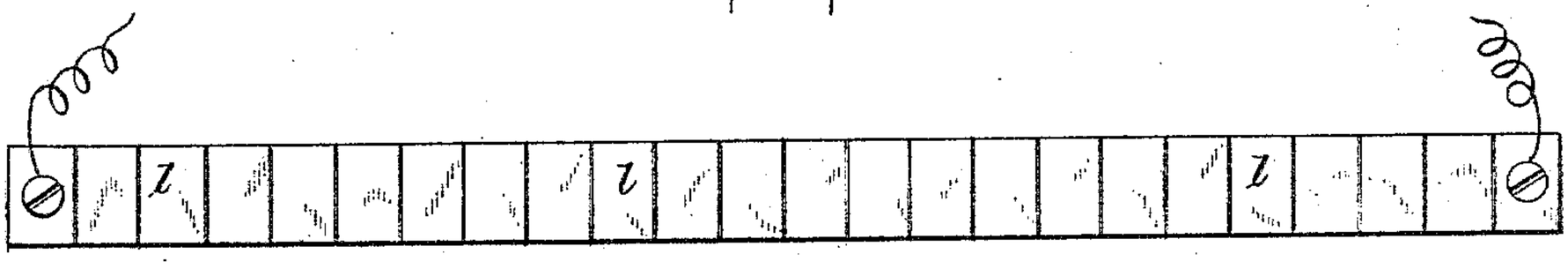
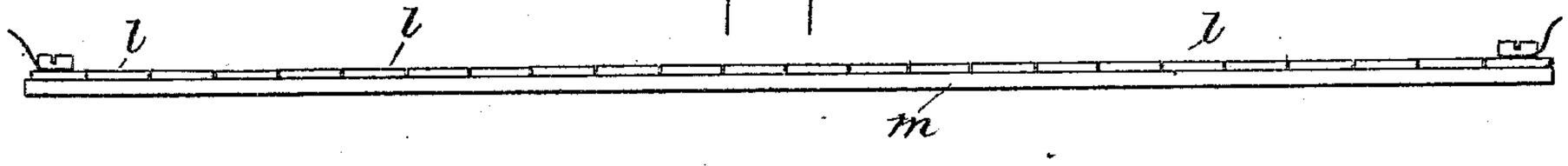


FIG. 3



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(No Model.) 2 Sheets—Sheet 2.

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LIGHTNING ARRESTER.

No. 414,356. Patented Nov. 5, 1889.

FIG. 4.

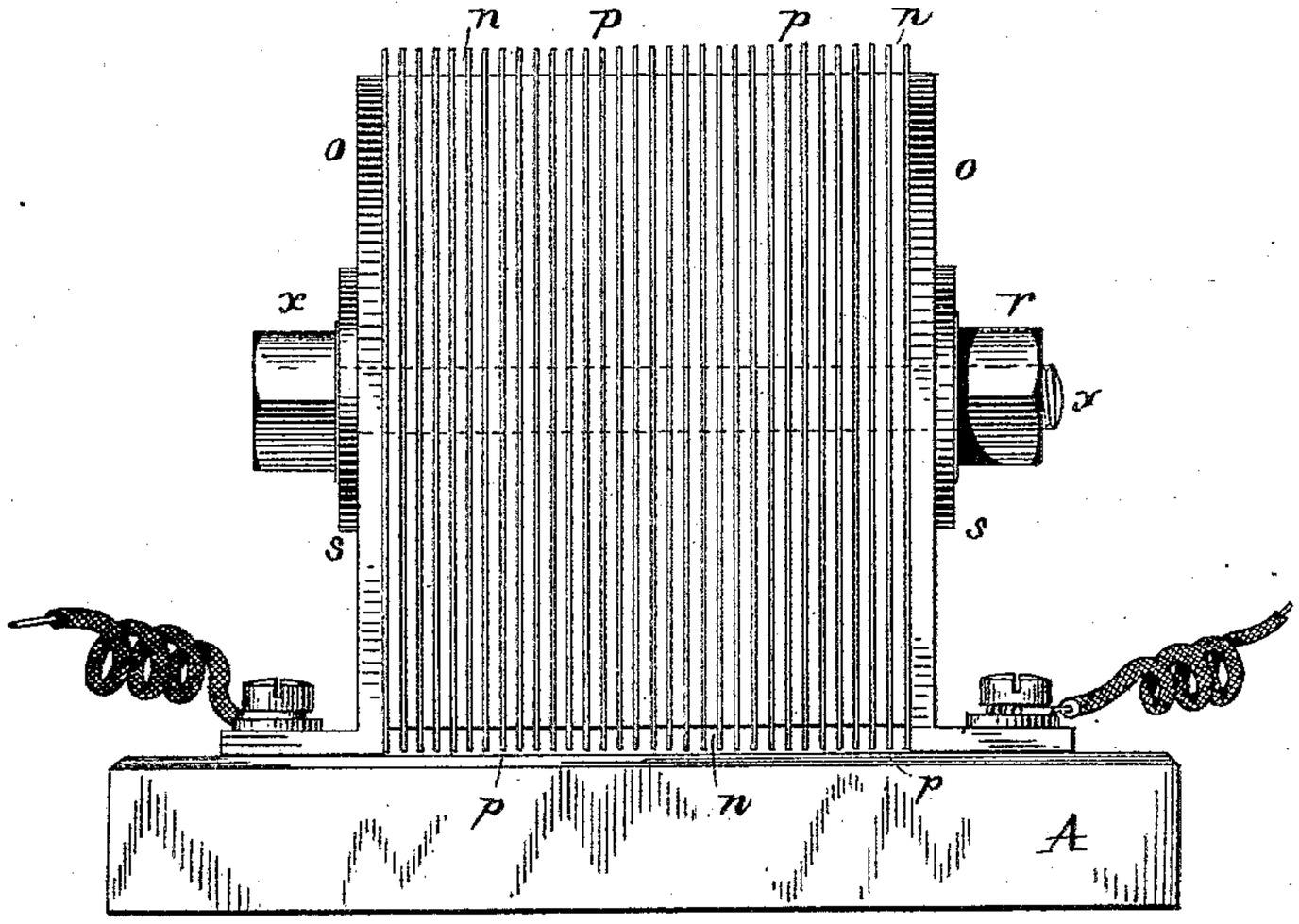


FIG. 5.

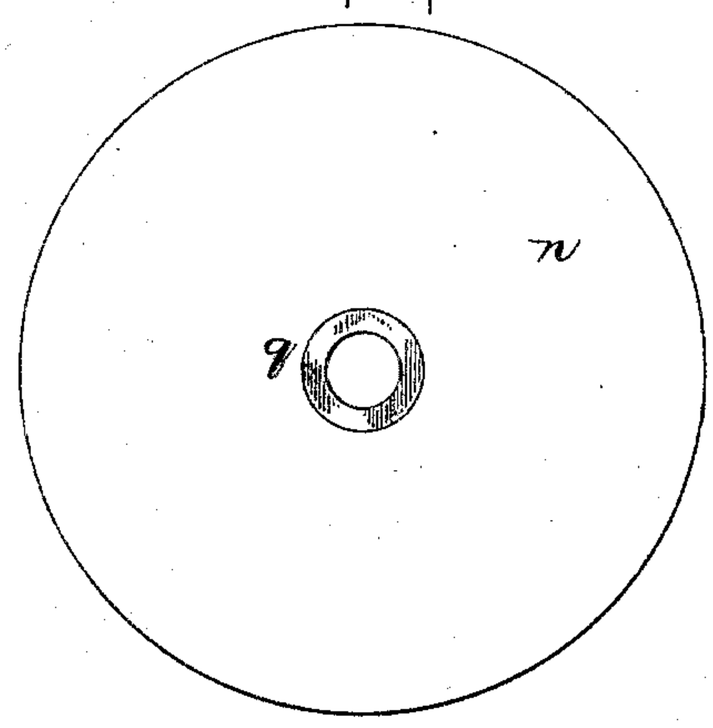


FIG. 6.

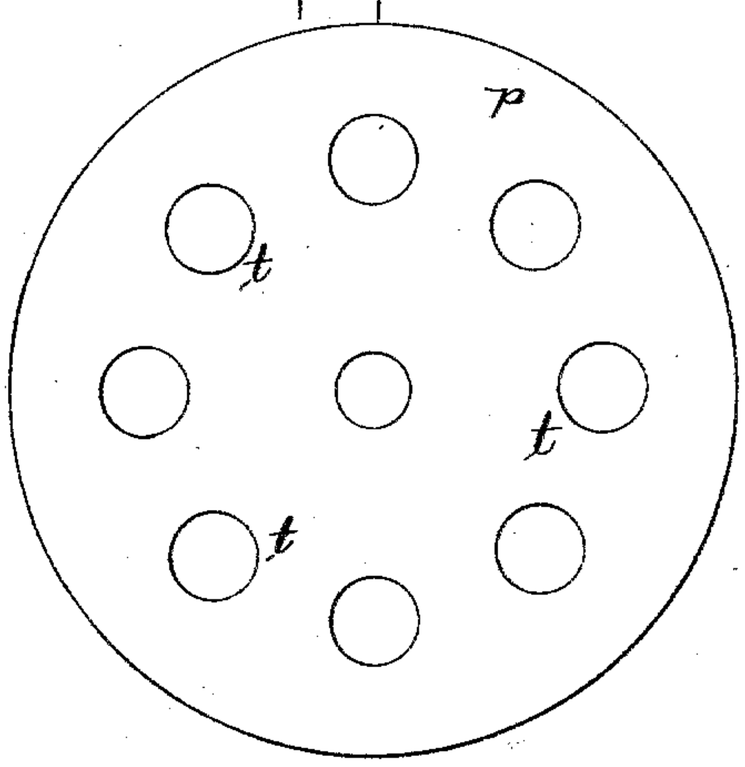
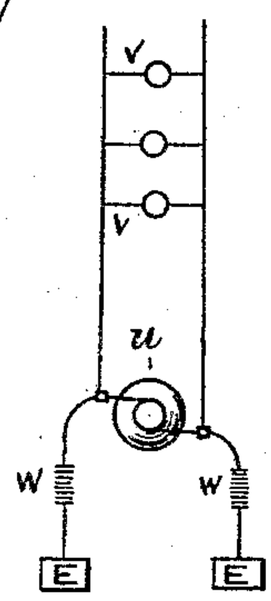


FIG. 7.



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UNITED STATES PATENT OFFICE.

CHARLES WIRT, OF ORANGE, NEW JERSEY.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 414,356, dated November 5, 1889.

Application filed August 15, 1889. Serial No. 320,810. (No model.)

To all whom it may concern:

Be it known that I, CHARLES WIRT, a citizen of the United States, residing at Orange, in the county of Essex and State of New Jersey, have invented a new and useful Improvement in Lightning-Arresters, of which the following is a specification.

The general object of my invention is to protect from lightning electrical systems in which currents of comparatively high tension are employed, such as systems of electric lighting and electric-railway systems. In such systems difficulty often arises in the use of ordinary lightning-arresters—such as those using toothed plates—because the passage of the lightning discharge to earth across the break forms an arc, across which the current of the system will pass to earth and continue to do so unless the arc is broken in some way. Various electrical and mechanical devices have been proposed and used for this purpose; but all of these have been found unsatisfactory in one way or another.

It is my especial object to avoid the difficulty above mentioned in a simple and effective way, and I accomplish this by providing the novel form of lightning-arrester hereinafter described, which is of such character that, while the lightning discharge can pass freely through or across it to earth, no arc can follow it.

My lightning-arrester consists, generally, of a multiplicity of metal plates not in any way electrically connected with one another and massed closely together, with only exceedingly slight insulating-spaces between them. One end of the series of plates is connected with the exposed circuit and the other end to earth. The insulation between the plates is preferably formed by thin plates of mica; but an air-space may be employed instead. I have found that with such an arrangement the lightning discharge will pass readily across the whole series of plates, traveling when insulation is placed between the plates either along their edges or through apertures which I sometimes form in the insulation; but no arc will follow the discharge because of the great number of points at which the circuit is broken.

With the ordinary toothed lightning-arrester the lightning discharge heats the air to such an extent as to make it a conductor, and also causes the passage of heated metallic vapor across the break, so that the current of the system follows the discharge across, and when an arc is thus once established it will continue until some means is employed to break it; but where the circuit is divided among a multiplicity of plates and broken at many points, as in my invention, the air and vapor are not raised to the high temperature required to form the continuous conducting path necessary to convey the following current.

My invention is capable of various forms, some of which are illustrated in the annexed drawings.

Figure 1 is a top view illustrating a form of my invention employing rectangular plates with insulation between them; Fig. 2, a top view, and Fig. 3 a side view, of a form in which the edges of the plates are separated by air-space; Fig. 4, a side elevation of a form employing circular plates of metal and mica. Figs. 5 and 6, respectively, are views of the metal and mica plates of Fig. 4; and Fig. 7 is a diagram showing my invention applied to a system of electrical distribution.

Referring first to Fig. 1, the series of rectangular metal plates *a a* are clamped closely together with thin sheets of mica *b b* between them. The plates are placed between the cross-pieces *c*, of suitable insulating material, and are drawn tightly together by means of bolts *d* and nuts *e*. On each insulating-piece *c* is a plate *f* and binding-post *g*, at which the circuit-wires, leading one to earth and the other to the circuit which is exposed to lightning, are attached. Thin strips *h* at each end connect the binding-post with the end plate of the series, being clamped beneath the plate *f* and between the insulating-piece *c* and the outermost plate *a*. A fusible safety-catch *k* may be inserted at one end as an additional means of safety, if desired. In this form of my invention the lightning discharge passes freely to earth along the edges of the metal plates; but the formation of a following arc is prevented by the multiplicity of plates and breaks. Each break is of such slight width that the whole amount of insulating-space is no greater than the single space of the ordinary lightning-arrester, and

the lightning discharge is readily conveyed across the whole series; but the division of the space into so many parts prevents by the cooling of the vapor, as already explained, the formation of the following arc. Fig. 1 shows the lightning-arrester of the size used by me in practice and with a sufficient number of plates and intermediate spaces for use with a current of about one thousand volts. The number of plates may to some extent be increased or diminished, according to the character of the system to be protected and the varying conditions which may arise in practice, the number being always small enough to let the lightning discharge pass freely and large enough to give the necessary cooling-space for the arc. I find that the best proportion is about thirty plates for each one thousand volts of the current.

In the form shown in Figs. 2 and 3 a suitable number of metal plates *l l* are fixed upon a strip *m* of insulating material, with their edges close together, but not touching. The end plates are connected in circuit, as above described, and the operation is the same as already set forth. The discharge passes freely across the air-spaces between the plates, but the following arc is prevented by the multiplicity of breaks.

In Fig. 4 a series of circular metal plates *n n* are clamped between disks *o o*, attached to a suitable base A, and have placed between them thin perforated mica plates *p*, Fig. 6. The metal plates *n n* and *o o* have each, Fig. 5, a central hub *q*, of insulating material, and a bolt *x* is passed through them, so that the whole is drawn tightly together by a nut *r*, the nut and bolt-head being insulated from plates *o o* by insulating-washers *s s*. The mica plates are larger than the metal ones and their edges extend beyond those of the metal plates, so that the discharge does not pass along the edges; but the perforations *t t* in the mica plates furnish a passage for the lightning between the metal plates, which the current of the system does not follow, for the reason already explained.

In Fig. 7, *u* represents a generator supplying translating devices *v v* of a system of electrical distribution. Lightning-arresters embodying my invention are indicated at *w w*, they being connected between the main conductors of the system and the earth and protecting the generator and translating devices from atmospheric discharges, as above described.

What I claim is—

1. A lightning-arrester consisting of a multiplicity of electrically-unconnected metal plates separated by slight insulating-spaces, substantially as set forth.

2. A lightning-arrester consisting of a multiplicity of electrically-unconnected metal plates with thin plates of insulating material between them, substantially as set forth.

3. A lightning-arrester consisting of a multiplicity of electrically-unconnected metal plates, thin plates of insulating material between them, and clamping devices for holding the whole closely together, substantially as set forth.

4. A lightning-arrester consisting of a multiplicity of electrically-unconnected metal plates with thin perforated plates of insulating material between them, substantially as set forth.

5. A lightning-arrester consisting of alternate plates of metal and insulating material, a bolt passing through said plates, a clamping-nut on said bolt, and insulating material interposed between said bolt and nut and the metal plates, substantially as set forth.

This specification signed and witnessed this 12th day of August, 1889.

CHARLES WIRT.

Witnesses:
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