

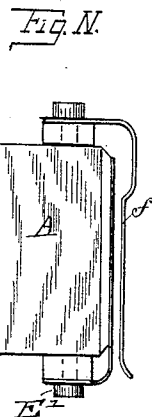
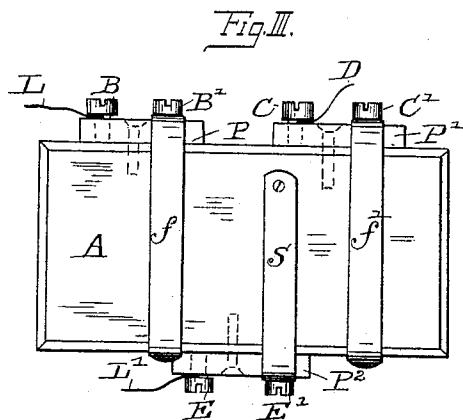
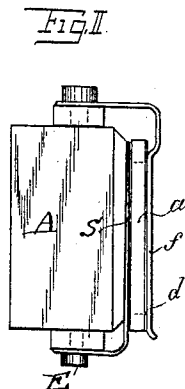
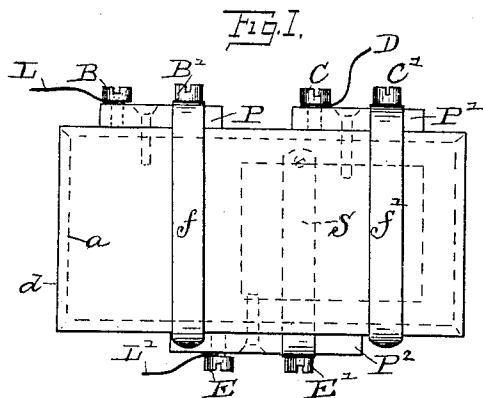
(No Model.)

2 Sheets—Sheet 1.

F. HASELWANDER.
LIGHTNING ARRESTER.

No. 477,656.

Patented June 28, 1892.



Witness.
Charles S. Sturtevant.
Stephen J. Jannus

Inventor.
Frederic Haselwander.
By Atty
Frankland Jannus.

(No Model.)

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Fig. V.

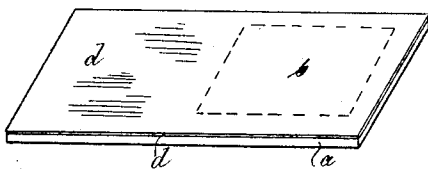


Fig. VI.

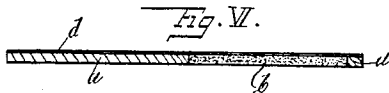
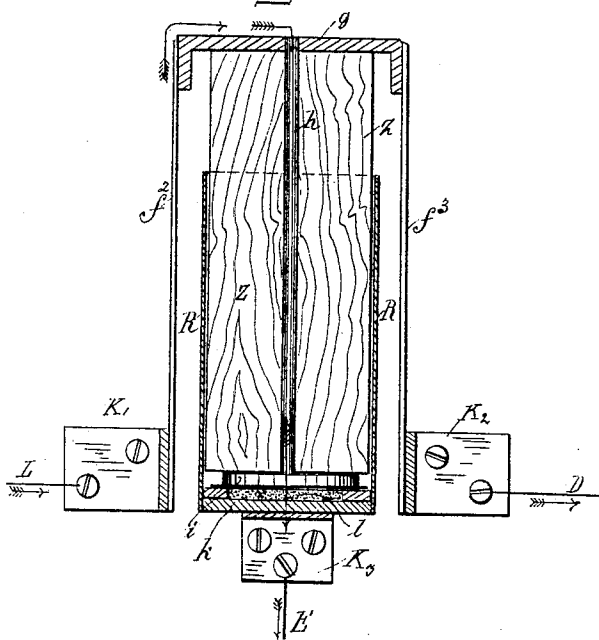


Fig. VII.



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UNITED STATES PATENT OFFICE.

FREDERIC HASELWANDER, OF FRANKFORT, GERMANY.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 477,656, dated June 28, 1892.

Application filed October 2, 1891. Serial No. 407,508. (No model.) Patented in Germany October 15, 1891, No. 56,944.

To all whom it may concern:

Be it known that I, FREDERIC HASELWANDER, of Frankfort-on-the-Main, in the Kingdom of Prussia and German Empire, have invented new and useful Improvements in Apparatus for Protecting Electric Conductors Against Lightning, (patented in Germany October 15, 1891, No. 56,944,) of which the following is a specification, reference being had therein to the accompanying drawings.

This invention relates to apparatus for the protection of electric conductors against lightning or atmospheric currents of electricity. By its means an atmospheric current is led to a space containing an explosive charge, the energy developed by the consequent explosion of which serves to break the circuit. The kind of explosive substance which is employed is optional. Gases in a solid or liquid state and conducting or non-conducting materials may be used. The apparatus and the interruptions brought about by the same may also vary. For instance, the interruptions may consist in the exclusion of the service-current or of the lamp-current or in the exclusion of the dynamo from the open-air conductors and the introduction of a supplementary resistance, and so on, or in the exclusion of the inner lamp-conductors from the outer open-air conductors, which receive their current from a distant generating-station, and the introduction of accumulators in the inner system of conductors or in the exclusion of the outer open-air conductors and the creation of a direct connection with earth.

Several methods of carrying out this invention are illustrated in the accompanying drawings.

Figure I is a plan of an apparatus in working order for affording protection against lightning, Fig. II being a corresponding end elevation. Fig. III is a plan of the apparatus before the insertion of a cartridge, Fig. IV being a corresponding end elevation. Fig. V is a perspective view showing the kind of cartridge which is employed. Fig. VI is a vertical longitudinal section through the cartridge. Fig. VII is a view, partly in section, showing a modified form of apparatus.

As seen in Figs. I and II, A is a base of wood or other suitable insulating material upon which are mounted in any convenient manner

the binding-screws B B', C C', and E E'. In this instance they are mounted upon the plates P P' P² of conducting material. To the screws B and C are attached the conductors L D of the working circuit, and a conductor L' leads from screw E to earth. Springs $f f'$ are held in position above the base A by screws B' and C', and a strip of metal s , which may be of similar construction and material, is held upon the surface thereof by screw E'. Circuit is completed from conductor L to conductor D through a cartridge a , which is held in position upon the surface of the base A by the springs $f f'$. These springs also form part of the main circuit. The cartridge a , Figs. V and VI, is preferably made of card-board or a similar non-conducting material pasted together with paper and having an opening or space cut out at b , in which is inserted a suitable explosive. A piece of tin-foil d is pasted on the surface of the cartridge, thus inclosing the explosive. When the cartridge is inserted beneath the springs $f f'$, circuit will be established from conductor L through plate P, spring f , tin-foil d , spring f' , plate P', and conductor D. When an atmospheric discharge takes place, the current will not pass from spring f to spring f' , but from spring f through the cartridge a , strip s , and conductor L' to earth, exploding the cartridge a in its passage, and thereby breaking the circuit between springs f and f' .

In Figs. III and IV, I have shown the device before the insertion of the cartridge a , and the position and relation of the clamping-springs f and f' and strip s are plainly seen.

Fig. VII shows a somewhat different form of circuit-breaker constructed according to the principles of my invention. Here circuit is completed from L to D, through contact-springs $f^2 f^3$ and a bridge-piece g , which is fixed to a piston Z, preferably made of insulating material. The piston Z is arranged to move in a cylinder or tube R, which is closed at the bottom. The piston Z carries on its lower end a metal or carbon plate i , which may be either smooth or furnished with grooves or points, this plate being placed in contact with the bridge g by means of a conducting-rod h . The explosive charge of black gunpowder or other substance lies in the space l at the bottom of the cylinder R. Direct

contact of the charge of powder with the metal plate of the piston Z is prevented by a cardboard disk *k*. The cylinder R is connected with earth at K³. The current from an atmospheric discharge travels through the springs *f*, connected with the outer or open-air conductor L, the bridge *g*, and the rod *h* to the plate *i*, thence through the explosive charge to the base of the cylinder, and so to earth, in the direction of the arrow E. This effects the explosion of the charge, the piston Z being thereupon raised, whereby the contact between the springs *f* in the circuit is broken. The movement of the piston Z can be limited in various ways and the action of the explosive charge can be varied in force, as desired. The apparatus can also be so arranged that reserve parts or fresh explosive cartridges may be inserted, or so that the piston Z automatically remakes the broken contact within a certain period.

Having described my invention, what I claim, and desire to secure by Letters Patent, is—

- 25 1. The combination, with an automatic circuit-breaker having circuit-terminals and an earth connection, of an explosive cartridge interposed between said terminals and the earth connection.
- 30 2. The combination, with an automatic circuit-breaker having circuit-terminals and an earth connection, of an explosive cartridge interposed between said terminals and the earth connection, and a conductor upon said cartridge through which the circuit is completed.
- 35 3. The combination of an automatic circuit-

breaker having circuit-terminals and an earth connection, with a cartridge connecting the circuit-terminals and insulating them from said earth connection.

40 4. The combination, with an automatic circuit-breaker having circuit-terminals and an earth connection, of a cartridge constructed of insulating material, said cartridge containing an explosive and having upon it a conductor 45 connecting the terminals of the working circuit, the cartridge insulating the said circuit from the earth connection.

5. An automatic circuit-breaker, comprising a support upon which the terminals of the circuit are held, a connection to earth, and a cartridge through which the working circuit is completed and through which the disruptive discharge passes to earth, an explosive in the cartridge to be ignited by the passage of the 55 disruptive discharge, the explosion of which breaks the main circuit.

6. For the protection of electric conductors against currents proceeding from atmospheric discharges, apparatus comprising a cylinder 60 R, connected with earth and containing an explosive charge, and a piston Z, which makes contact between the pins K' and K² by a cross-bar *g*, and is provided with a rod *h*, extending from the cross-bar to a point near the explosive charge, substantially as described. 65

In witness whereof I have hereunto set my hand in presence of two witnesses.

FREDERIC HASELWANDER.

Witnesses:

ALVESTO S. HOGUE,
JEAN GRUND.