

F. E. KLEIN.
LIGHTNING CONDUCTOR.
(Application filed Mar. 31, 1900.)

(No Model.)

Fig. 1.

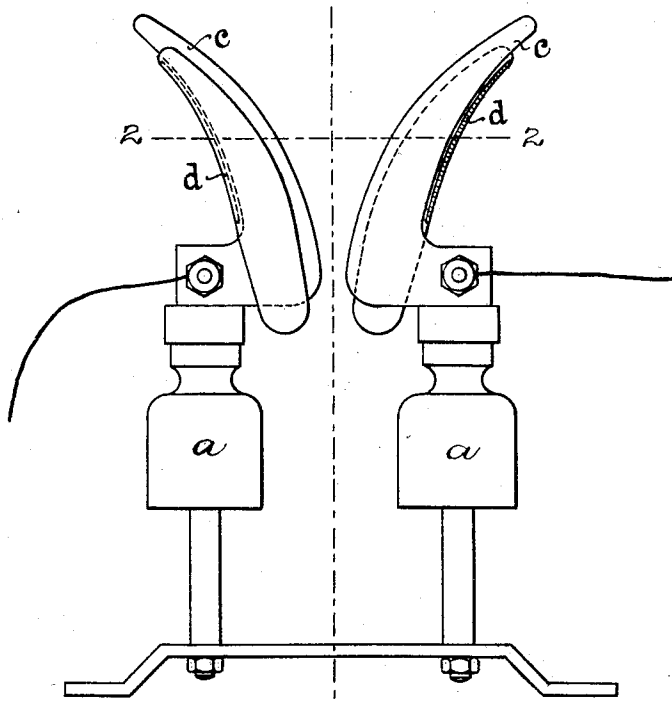
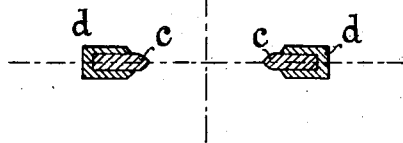


Fig. 2.



Witnesses:
Edward Viesel.
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Inventor:
F. E. Klein
By Attorneys
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UNITED STATES PATENT OFFICE.

FRANZ EUGEN KLEIN, OF DRESDEN, GERMANY.

LIGHTNING-CONDUCTOR.

SPECIFICATION forming part of Letters Patent No. 701,577, dated June 3, 1902.

Application filed March 31, 1900. Serial No. 10,911. (No model.)

To all whom it may concern:

Be it known that I, FRANZ EUGEN KLEIN, a subject of the King of Saxony, and a resident of Dresden, in the Kingdom of Saxony, in the German Empire, have invented a new and useful Improvement in Lightning-Arresters, of which the following is a specification.

This invention consists in an improvement in horn-shaped lightning-arresters of the kind first devised by Elihu Thomson. In these lightning-arresters, which possess no moving parts, the arc is formed between discharging plates the distance between which increases in upward direction, so that the arc in rising is lengthened and is finally extinguished. The rising of the arc Thomson has originally tried to accomplish by the rising current of air originating under the influence of heat. This effect, however, was not efficient enough, and Thomson therefore applied a magnet the lines of force of which were directed crosswise to the arc and repulsed the latter. This lightning-arrester, however, was too complicated to give entire satisfaction, and the demand remained for an arrester which without possessing moving parts and a special magnet promptly causes the rising of the arc. One solution of this problem is given in the German patent No. 91,133 and is that by giving the discharging plates a linear form of exactly determined dimensions and relative position an electrodynamic effect is said to be obtained by which the rising of the arc is secured. As already mentioned, this electrodynamic effect according to said patent is obtained only by giving the discharging bodies a particular shape. Said bodies are formed of relatively thin wires. They are therefore exposed to accidental bending and are ineffective when bent. It is also possible that under unfavorable conditions the mass of metal is not great enough to absorb and conduct away the eventually generated large amount of heat. For this reason I tried to construct a lightning-arrester, as mentioned, with plates as discharging bodies. The experiments carried on in relation to this problem have proved that the plates of the form as used by Thomson (as illustrated, for instance, in Fig. 5 of said German patent) give quite satisfactory results if the plates are

connected in a suitable way with a paramagnetic body, as iron. This connection may be made in different ways; but a very effective arrangement is obtained by providing discharging plates of horn shape with sheaths made of sheet-iron, as shown in Figs. 1 and 2 of the accompanying drawings, in which—

Figure 1 is a side view with the sheath of one discharging plate or horn in section, and Fig. 2 is a horizontal section in the line 2 2 of Fig. 1 of the two horns and their sheaths.

cc are the discharging plates or horns, preferably of copper, which are fastened to insulators *aa*. One of these plates is connected by conducting-wires with the apparatus or lines to be protected and the other earthed. The said plates are each surrounded on three sides by a cover *d*, of sheet-iron. These covers, which leave the inner facing edges of the horns free, have the form of sheaths and are stamped in a suitable form and are simply set on the horns *cc*, whereon they hold themselves by their own slight elasticity.

The numerous experiments made, direct and alternative current being used with voltages from five hundred to two thousand volts, have proved that by using iron the arc which is formed quite at the bottom of the plates receives a very strong impulse upward.

The impulse was not only strong enough to blow out the arc when the lightning-arrester was in its normal (that is, vertical) position, but also when the lightning-arrester stood horizontally and even upside down. In the last case the influence of the rising current of warm air had also to be overcome. In many cases, however, when the connected iron had been removed it was proved that the arc did not rise, but rested stationary.

In the few cases where on the iron connections being removed the arc rose nevertheless this rising was shown to happen from accidentally arriving and very strong currents of air.

As to the form of the connected iron, it may be varied within wide limits. It appears to be essential only that iron has to be provided near the place where the arc forms. This iron gives to the arc the tendency to rise which is aimed at and which increases during the rising the cause of this rising.

What I claim as my invention is—

1. A horn-shaped lightning-arrester in which there are provided near where the arc is to be formed, paramagnetic bodies consisting of sheaths which partly surround the horns but leave free their inner edges which face each other, substantially as herein described.
2. In a lightning-arrester, the combination of two horn-shaped discharging-plates *cc* and two paramagnetic bodies in the form of sheaths

which partly surround said plates, substantially as and for the purpose herein described.

In testimony that I claim the foregoing as my invention I have signed my name, in presence of two witnesses, this 16th day of March, 1900.

FRANZ EUGEN KLEIN.

Witnesses:

CARL KNOOP,
HERNANDO DE SOTO.