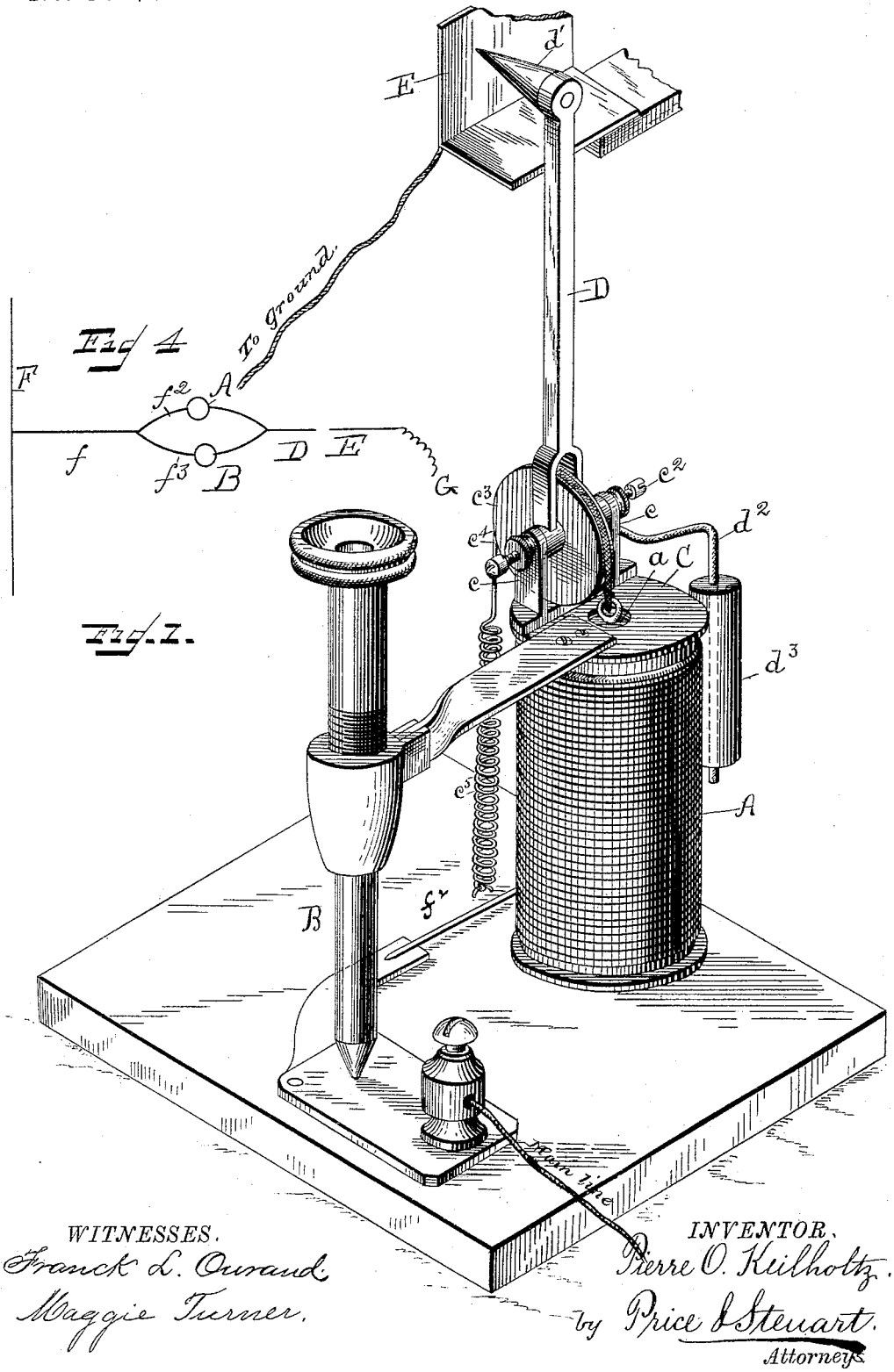
(No Model.) 3 Sheets—Sheet 1.

P. O. KEILHOLTZ.

LIGHTNING ARRESTER.

No. 384,042. Patented June 5, 1888.



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3 Sheets—Sheet 2.

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Fig. 2.

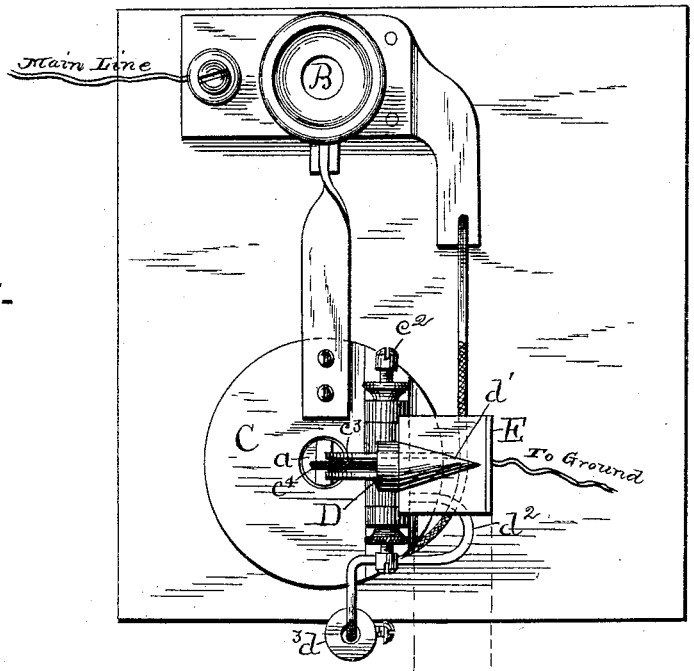
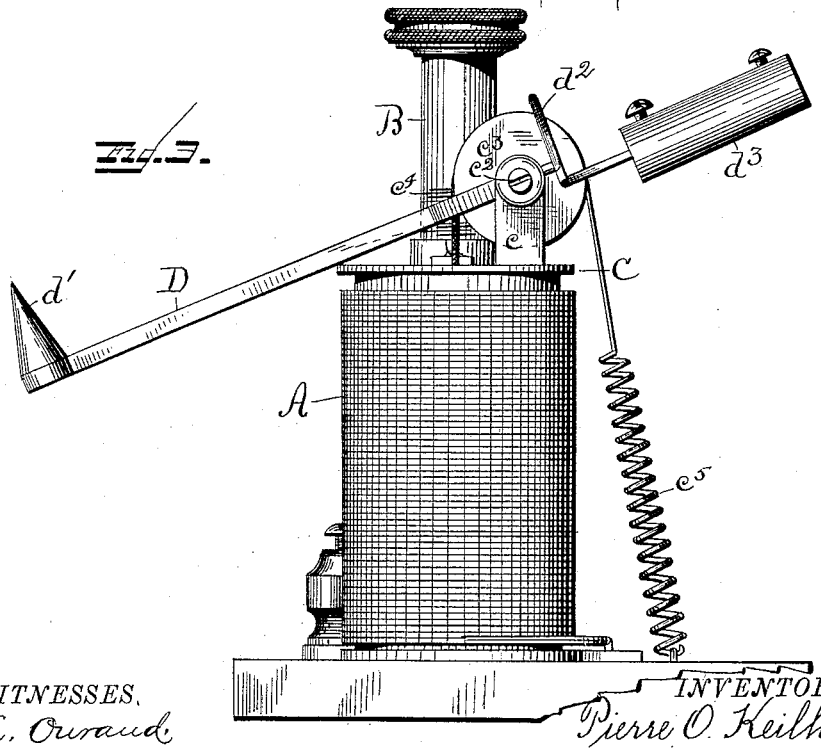


Fig. 3.



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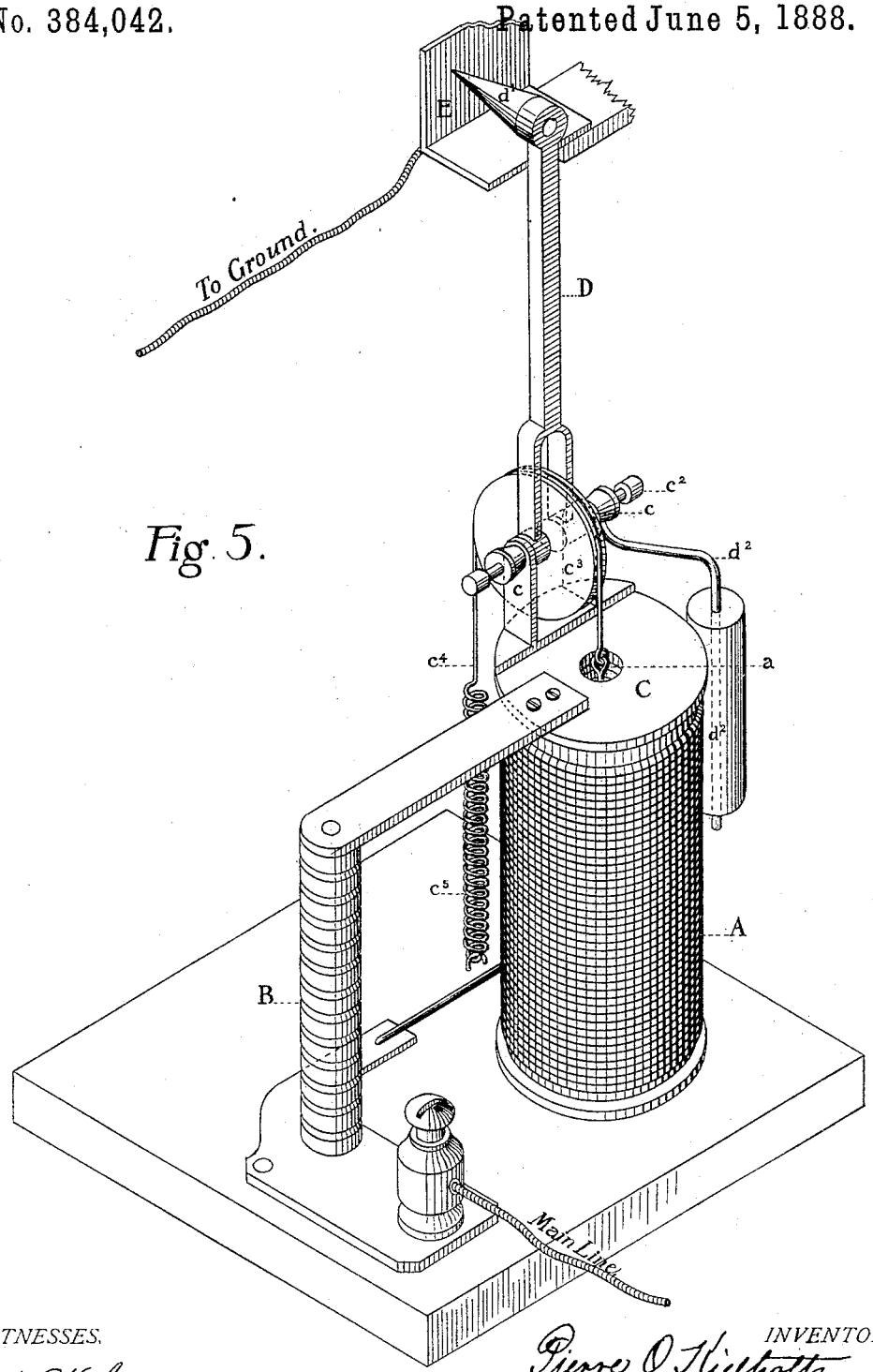

Fig. 5.

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UNITED STATES PATENT OFFICE.

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LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 384,042, dated June 5, 1888.

Application filed February 8, 1888. Serial No. 263,339. (No model.)

To all whom it may concern:

Be it known that I, PIERRE OTIS KEILHOLTZ, a citizen of the United States, and a resident of the city of Baltimore, in the State of Maryland, have invented certain new and useful Improvements in Lightning-Arresters, of which the following is a full, clear, and exact specification, reference being had to the accompanying drawings.

My invention relates to that class of lightning-arresters which are used upon electric-light circuits. Its purpose is to relieve the line and the apparatus included in the circuit from the destructive effect of large transient currents—such as are due to lightning—by providing a means of escape for such currents from the line without injury to the apparatus. To accomplish this result, I make use of the fact that an electro-magnet, on account of its self-induction, offers a great resistance to the passage of transient currents. The electro-magnet I employ as a dam to divert the current from itself to a shunt, which, having little or no self induction, will permit the transient currents to flow through it and thence to ground.

In the drawings, Figure 1 is a perspective view of my apparatus. Fig. 2 is a plan of the same. Fig. 3 is the side elevation showing the lever drawn back by the armature. Fig. 4 is a diagram showing the main line, branch, and electrical connection of the lightning arrester apparatus. Fig. 5 is a perspective view of my apparatus, showing a form of shunt that is desirable for some purposes composed of a pile of carbon disks.

Similar letters of reference indicate similar parts in all the figures.

A represents an electro magnet; *a*, a core or armature suspended upon the interior of the electro-magnet; B, a shunt which may be made in any of several ways.

The drawings, Fig. 4, represent a carbon rod sustained by a holder of conducting material and resting upon a metal plate. Another form of shunt which gives good results, because having less self-induction, is a pile of small carbon disks laid one on top of the other, connected at one end with a line and the other with the arrester, which is in electrical connection with the earth.

On the top of the electro-magnet there is a metal plate, C, with which the holder of the shunt is in electrical contact. Upon this plate C are two standards, *c c*, in which is journaled a shaft, c^2. Upon the shaft c^2 is mounted a disk or pulley, c^3. To the shaft c^2 is secured in a perpendicular position a lever, D, the end of which is provided with a point, d'. d^2 is another lever attached to said shaft and extending in an opposite direction from the lever D, and is provided with a counterbalance-weight, d^3. Opposite the point d', but disconnected from it and mounted upon a standard, is a metal plate or point, E. This plate is in electrical connection with the earth. Over the disk c^3 passes a cord, c^4, which is secured to the core *a* at one end and to a spring, c^5, at the other. The purpose of said spring c^5 is to restore the lever D to its normal position when the electro-magnet ceases to attract the core *a*.

F is the main line, and *f* a single branch. The branch *f* is divided into two parts—f^2 and f^3—one of which is connected with the electro-magnet and the other with the shunt.

The electrical connection through the electro-magnet when discharge takes place is as follows: Line F, branch *f*, branch f^2 to electro-magnet A, through coils, plate C, standard *c c*, shaft c^2, lever D, point d' through the air-space, plate E, to earth. The connection through the shunt where the discharge takes place is as follows: Line F, branch *f*, branch f^3, shunt B, plate C, standard *c c*, a shaft, c^2, lever D, point d' through the air-space or dielectric, plate E, to earth.

The plate E is provided with an offsetting stop, *c*, arranged to prevent the point d' of the lever D from coming in contact with the plate E and to retain said point at a definite distance from the plate. This distance of the point from the plate is arranged to be of such a length that the normal potential or electro-motive force of the line will not be able to overcome the resistance of the intervening air-space, so that it will constitute a complete break in the earth-connection.

The operation of the device is as follows: When a large transient current passes over the line F, it will flow into the branch *f;* thence will divide itself between the branch f^2 f^3, but as it passes into the coil of the electro-magnet

the self-induction of the coil will resist its flow and act as a dam, so as to divert the whole or nearly the whole transient current to the shunt, through which it will pass, thence to the lever D and point d', where it will jump the air-space between the point d and plate E, forming an arc, and thence escape to the earth. The arc thus created will be maintained by the flow of the normal line-current, if a ground exists somewhere else on the line in such a position as to maintain it, and in order to prevent the continued escape of the normal line-current it is necessary to destroy this arc. This is done by the action of the electro-magnet upon the core a. After the transient current has passed the normal line-current continues to flow. The shunt is made of higher resistance than the coil; hence the greater part of the line-current will pass through the coil instead of the shunt. As a result the armature will be attracted and drawn into the coil, the disk c^3 will be turned by the action of the cord which passes over it, the lever D will be drawn backward, and the arc destroyed. As soon as the ground-connection is broken, the current ceases to flow and the electro-magnet is demagnetized, releasing its armature, and the retractile spring c^5 draws the armature up and returns the lever D to its normal position.

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

1. In a lightning-arrester for electric lines, the combination of a main line with a branch from said line and a ground-connection separated from said branch by a small air-space or other dielectric with an electro-magnet of high self-induction but low ohmic resistance, and a shunt of low self-induction but high ohmic resistance, each included in a divisional branch of the main-line branch, said divisional branches reuniting before reaching the dielectric, and means operated by the electro-magnet for breaking the ground-connection automatically after it has been established by an arc bridging the dielectric, substantially as described.

2. In a lightning-arrester apparatus for electric-light lines, the combination of a main line with a branch from said line and a ground-connection separated from said branch by a small air-space or other dielectric with an electro-magnet of high self-induction but low ohmic resistance, which is provided with an armature, and a shunt of low self-induction but high ohmic resistance, each included in a divisional branch of the main-line branch.

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Attest:
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