

(No Model.)

F. H. DOANE.
LIGHTNING ARRESTER.

No. 501,708.

Patented July 18, 1893.

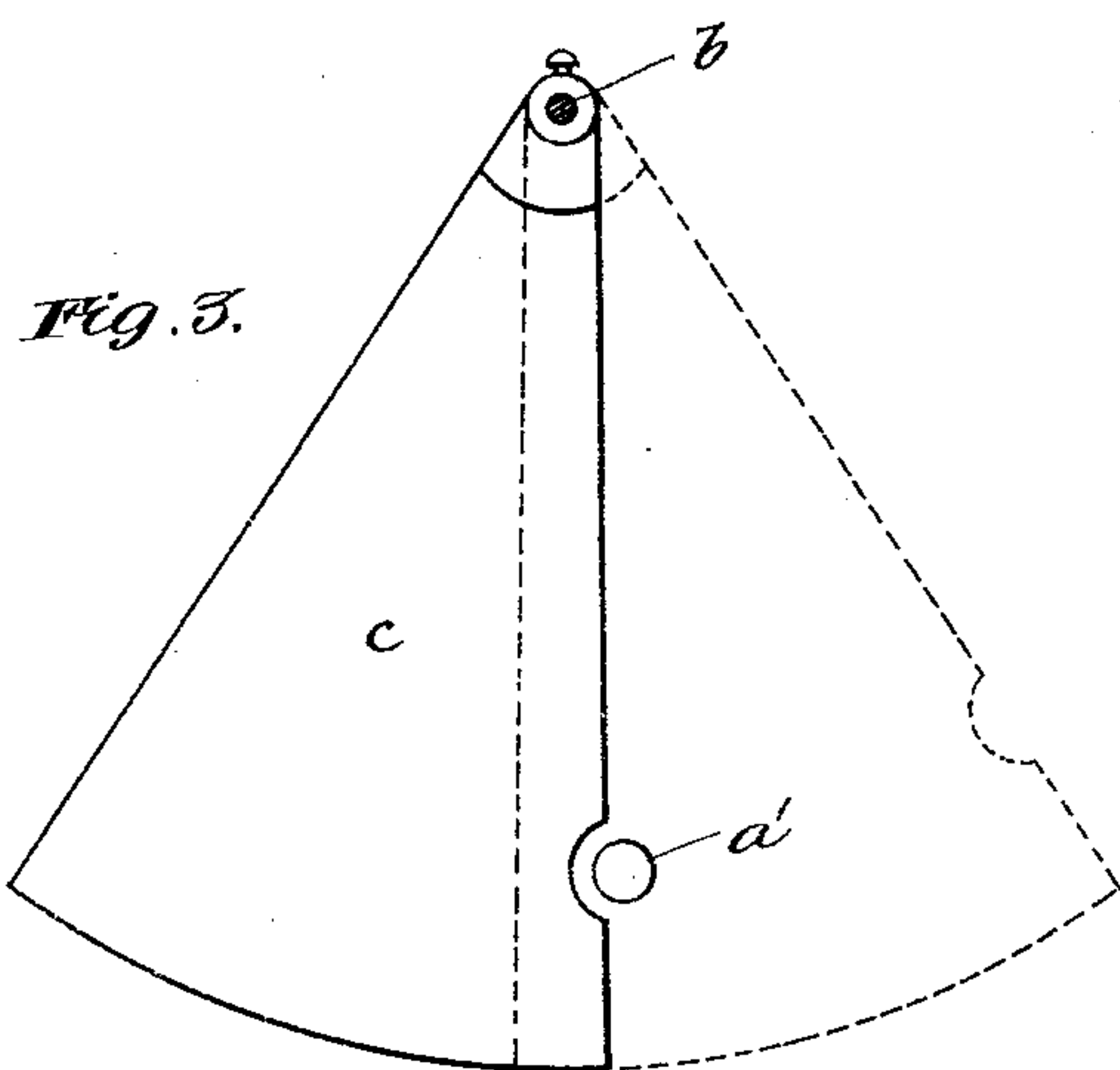
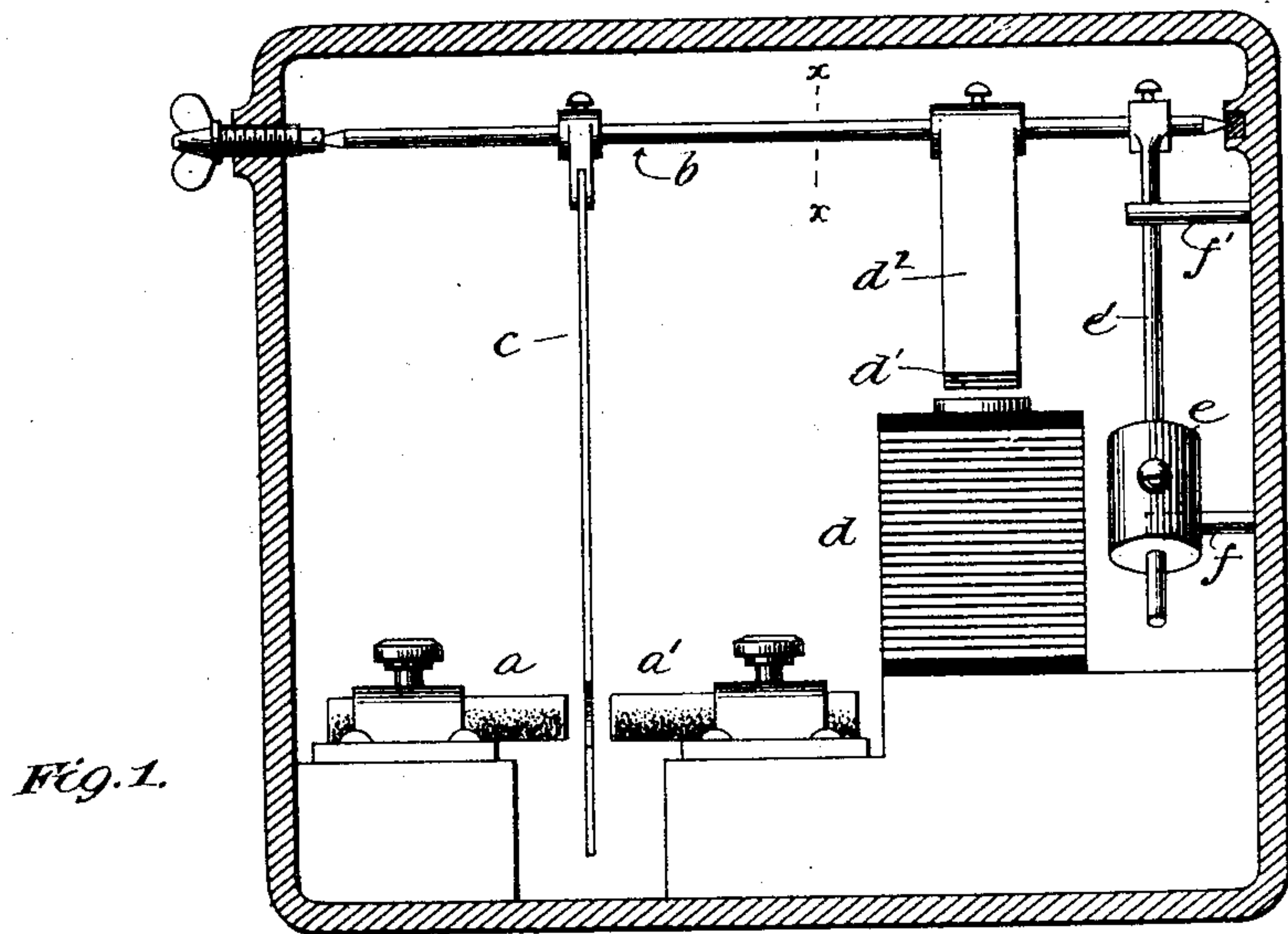
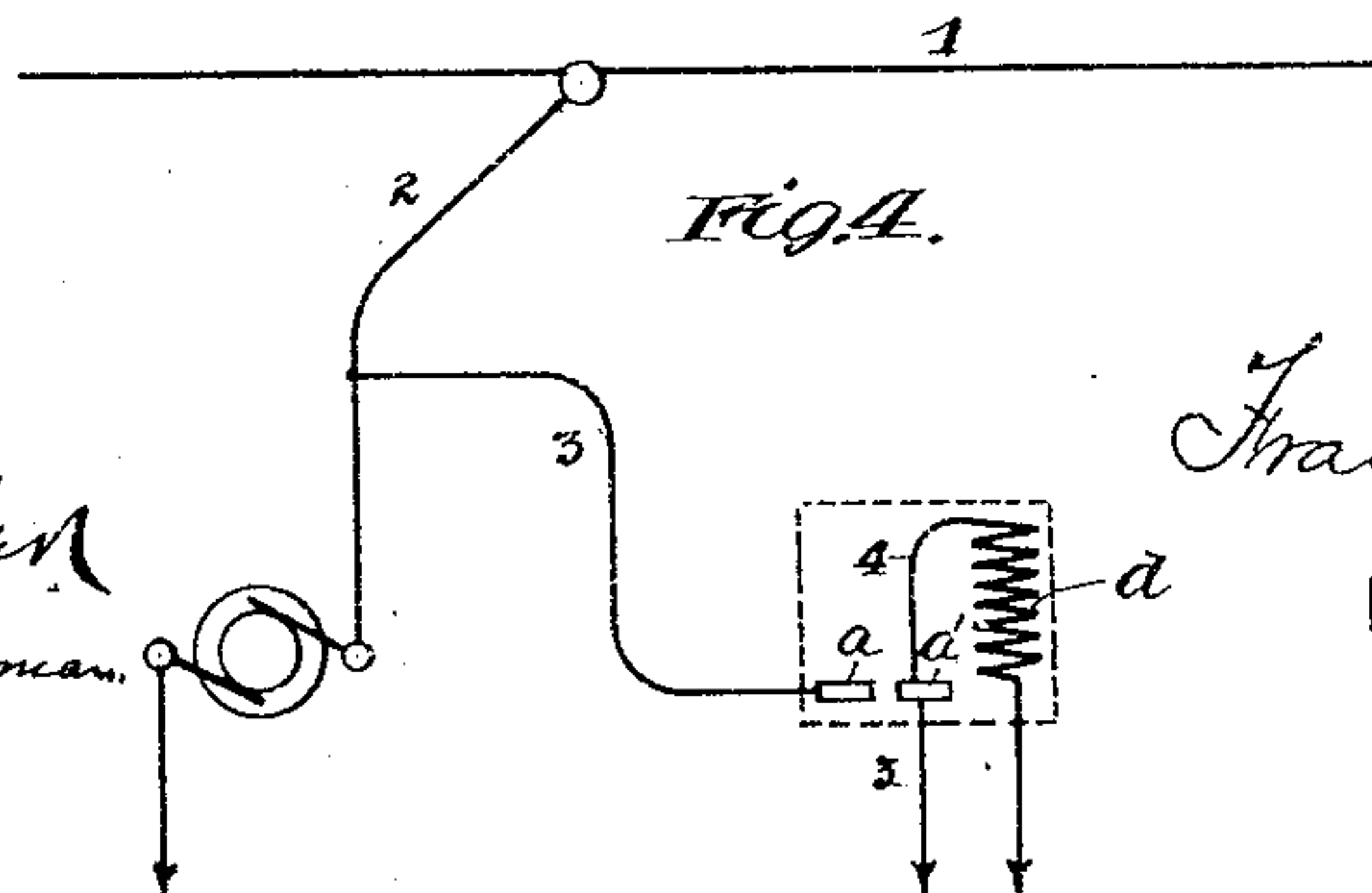
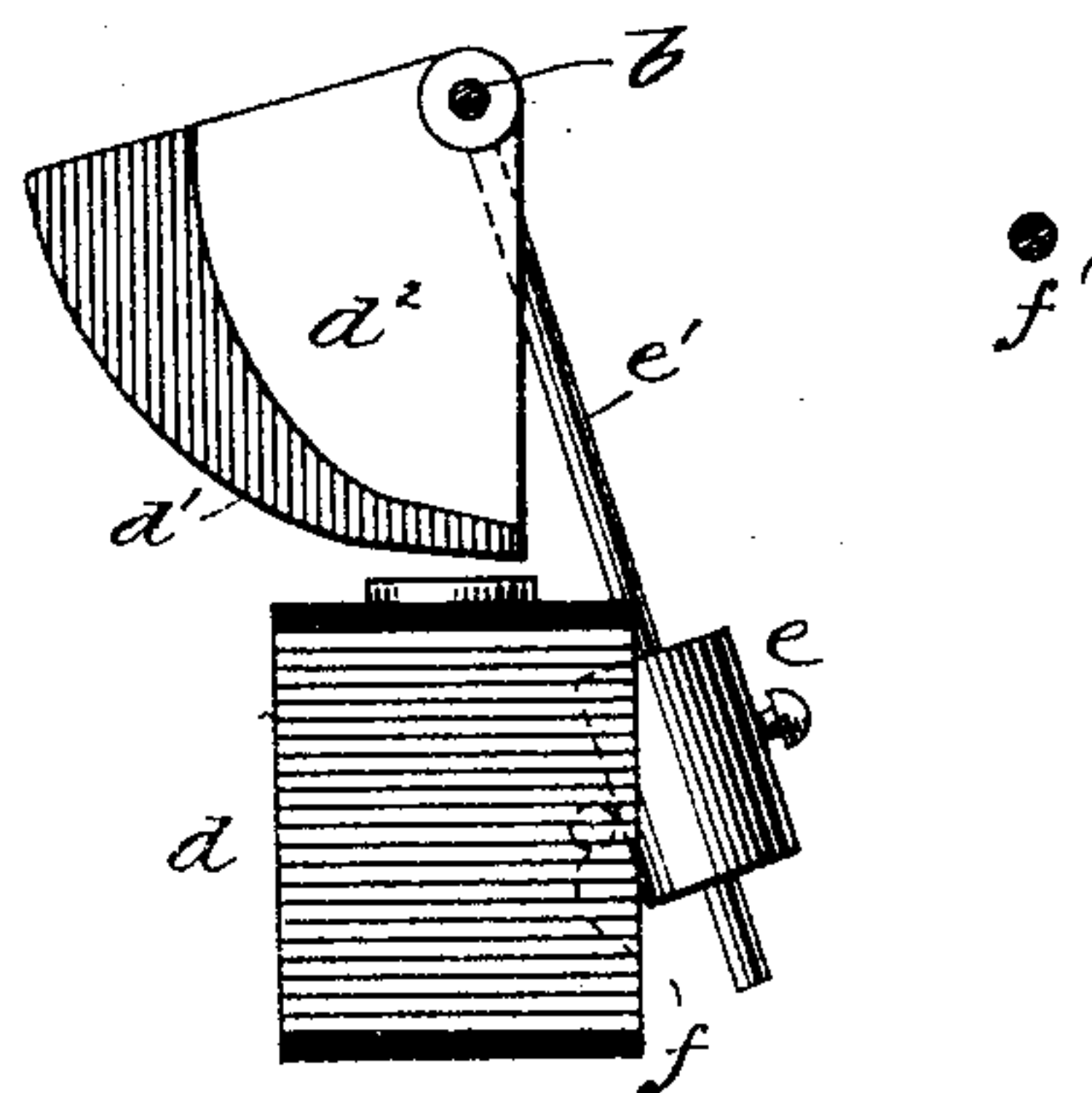


Fig. 2.



WITNESSES:

Frank S. Ober
H. A. Opperman

INVENTOR
Francis H. Doane

BY

Wm. A. Rosebarr
ATTORNEY

UNITED STATES PATENT OFFICE.

FRANCIS H. DOANE, OF NEW YORK, N. Y.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 501,708, dated July 18, 1893.

Application filed May 31, 1893. Serial No. 476,067. (No model.)

To all whom it may concern:

Be it known that I, FRANCIS H. DOANE, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented certain new and useful Improvements in Lightning-Arresters, of which the following is a full, clear, and exact description.

My invention relates to lightning arresters and has special reference to that type in which an electro-magnetic apparatus located in the ground circuit is utilized to disrupt the arc formed by the excessive abnormal voltage on the line, thus again putting into operation the protected circuit which was momentarily disabled by the discharge.

The object of my invention is to provide an apparatus which shall be efficient in operation and simple and cheap in construction. To these ends, the invention consists of the details of construction hereinafter described and claimed.

In the accompanying drawings, Figure 1 is a vertical section of a box containing my improved arrester. Fig. 2 is a section taken on line *xx* of Fig. 1. Fig. 3 is a side elevation of the disrupting diaphragm; and Fig. 4 is a diagram of the circuits.

Referring to the drawings by letter, *a, a'* represent a pair of electrodes constituting the discharge points of the arrester. As shown in the drawings they are carbon points or pencils, but may be the ordinary serrated metal plates or of any other desired character adjustably mounted.

b represents a rock shaft arranged in suitable bearings above the points and carrying a sector *c* depending therefrom in a plane passing between the points *a, a'*. This sector consists preferably of a sheet of mica, although I do not restrict myself to this material, but it must be non-conducting and non-combustible material, or at least that portion of it which passes between the points when it is swung. It may be a light frame carrying the mica at its lower end only. It is provided with a semi-circular notch on one edge for a purpose which will hereinafter appear.

d is an electro-magnet whose armature *d'* is hung upon the rock shaft *b*. The armature is supported upon a non-magnetic frame or sector *d²* and is gradually thickened at one

end, as shown in Fig. 2. On the rock shaft there is also hung a counter poise *e* adjustable on the arm *e'*. The normal position of the parts so far described is determined by the counterpoise which is adjusted so that the thin portion of the armature will be adjacent to the head of the magnet and the notched edge of the diaphragm close to, but not between the points *a, a'*. A stop pin *f* in the wall of the inclosing case determines this position of the counterpoise and a stop pin *f'* limits the motion of the counterpoise at the opposite end of its throw, to be referred to.

The arrester is designed more specially to protect railway car motors, although it, of course is adapted for any of the purposes to which lightning arresters are commonly applied. In the diagram of circuits, the main line is a trolley wire 1; from this the current leads by wire 2 to the motor, as usual; from wire 2 a branch 3 leads to electrode *a*; from electrode *a'* one wire 3 leads direct to ground and another 4, to magnet *d* and thence to ground.

In operation, an abnormal increase in the electro-motive-force on line will cause the current to jump across the space between points *a* and *a'*, thus establishing an arc and shunting the charge to ground. Sufficient current will be shunted into the magnet *d* to cause it to attract and swing its armature, thus rocking shaft *b* and carrying diaphragm *b'* between the arcing points and disrupting the arc. The moment the arc is destroyed, magnet *d* becomes de-energized and the counterpoise returns the parts to their normal position, in which they are ready for a repeated charge. The swing of the diaphragm across the arcing space is limited by pin *f'* intercepting the counterpoise. The function of the notch in the forward edge of the diaphragm is to partially surround the arcing space so that when the diaphragm swings the arc will be more suddenly and cleanly cutoff. For this reason, too, the diaphragm might normally stand between the points and have an opening in line with them; for purposes of balancing the parts this might be found desirable.

Having thus described my invention, I claim—

1. In a lightning arrester, the combination

of a pair of arcing points, two circuits leading to ground from one of said points, an electro-magnet included in one of said circuits, and a diaphragm of non-conducting material arranged to be interposed between the arcing points by the magnet, substantially as described.

2. In a lightning arrester, the combination of a pair of arcing points, a rock shaft arranged above the same, a diaphragm of non-conducting material carried by said rock shaft, a sector of non-magnetic material car-

ried by the rock shaft, an armature attached to the face of the sector and being thicker at one end than at the other, and an electro-magnet acting upon said armature and located in the ground circuit of the arrester, substantially as described. 15

In testimony whereof I subscribe my signature in presence of two witnesses.

FRANCIS H. DOANE.

Witnesses:

FRANK S. OBER,

WM. A. ROSENBAUM.