

G. ZAPF.

DEVICE FOR PREVENTING THE OVERCHARGING OF ELECTRIC CABLES.

APPLICATION FILED MAR. 28, 1905.

Fig. 1.

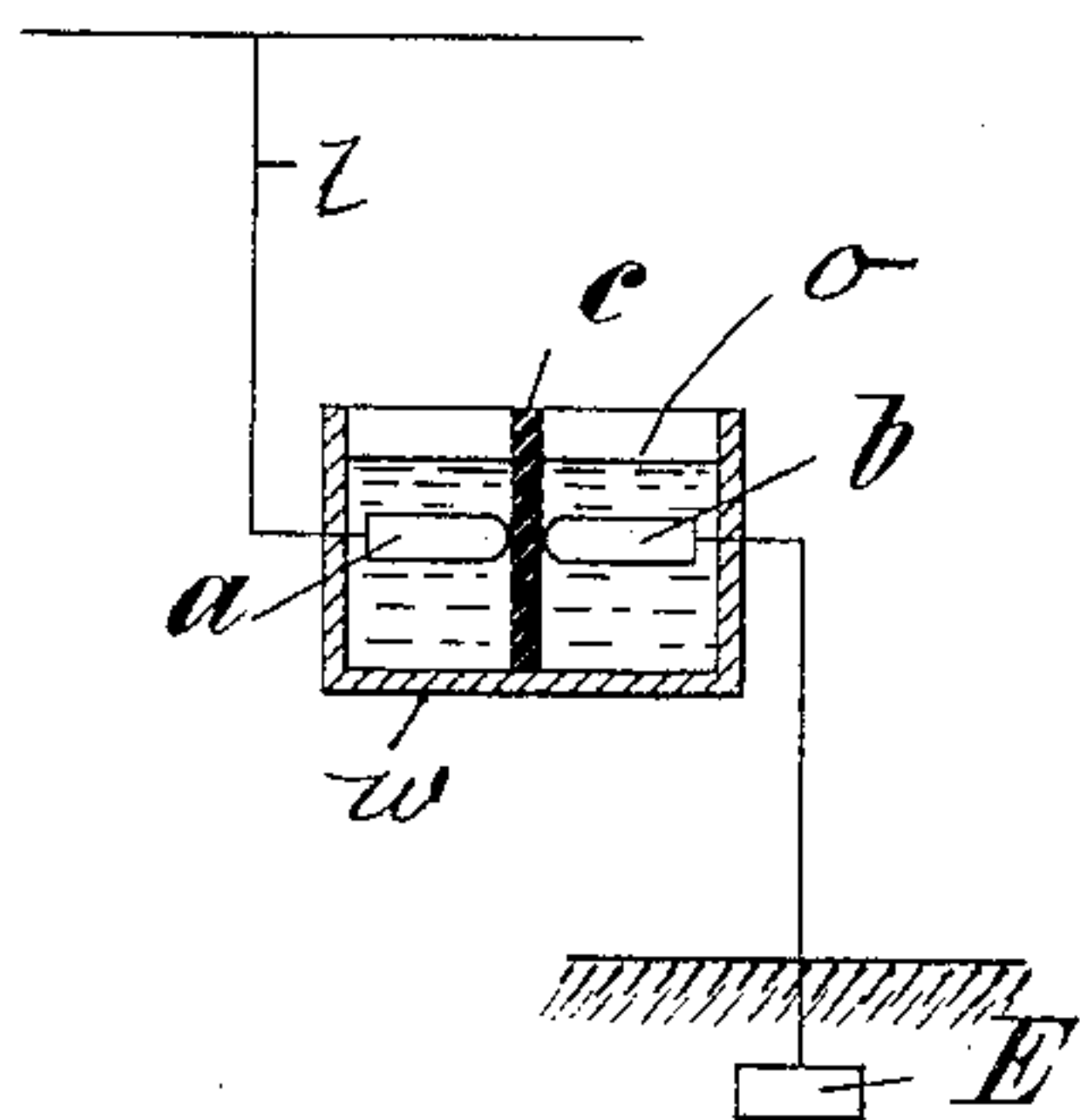


Fig. 2.

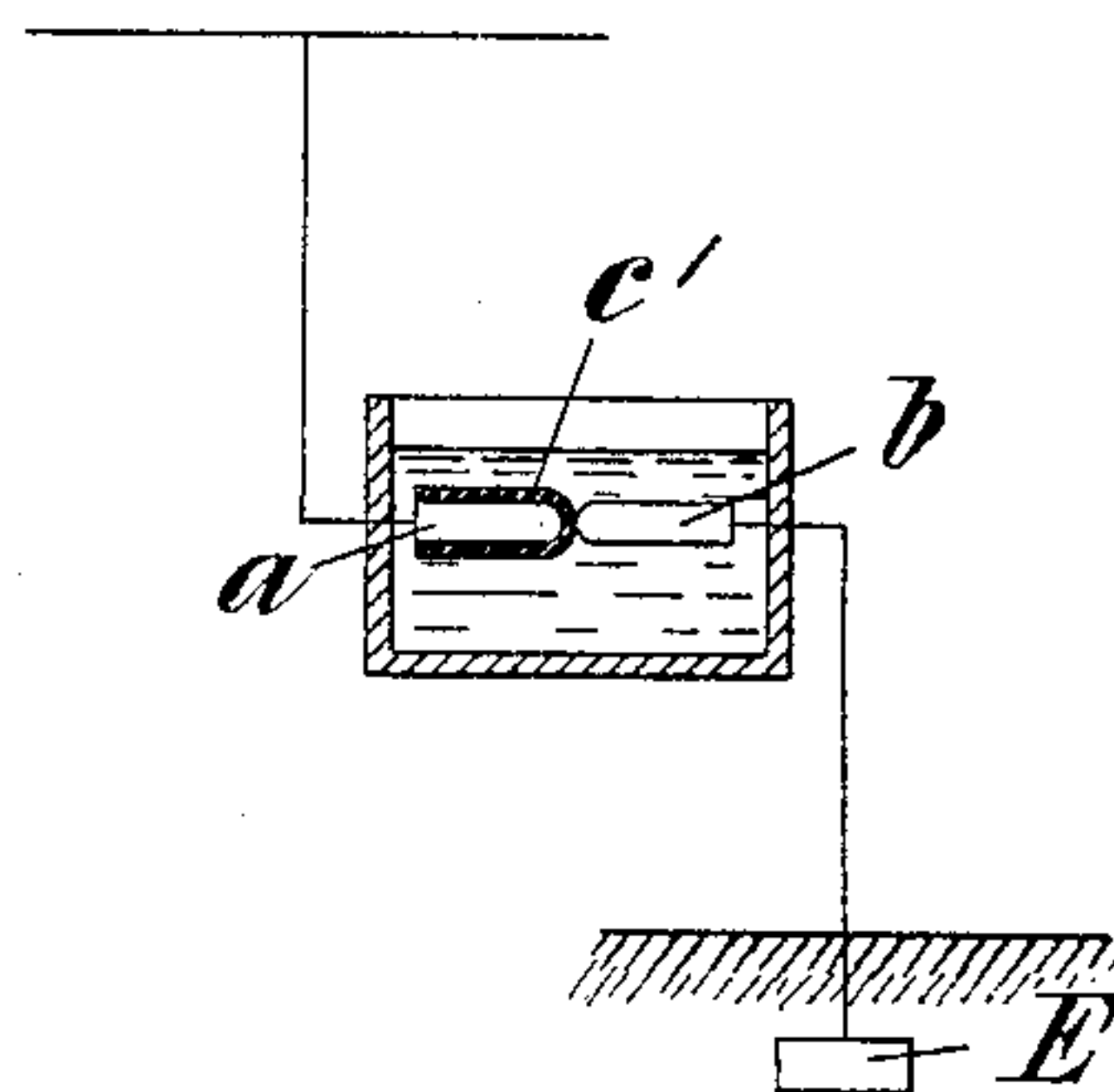


Fig. 3.

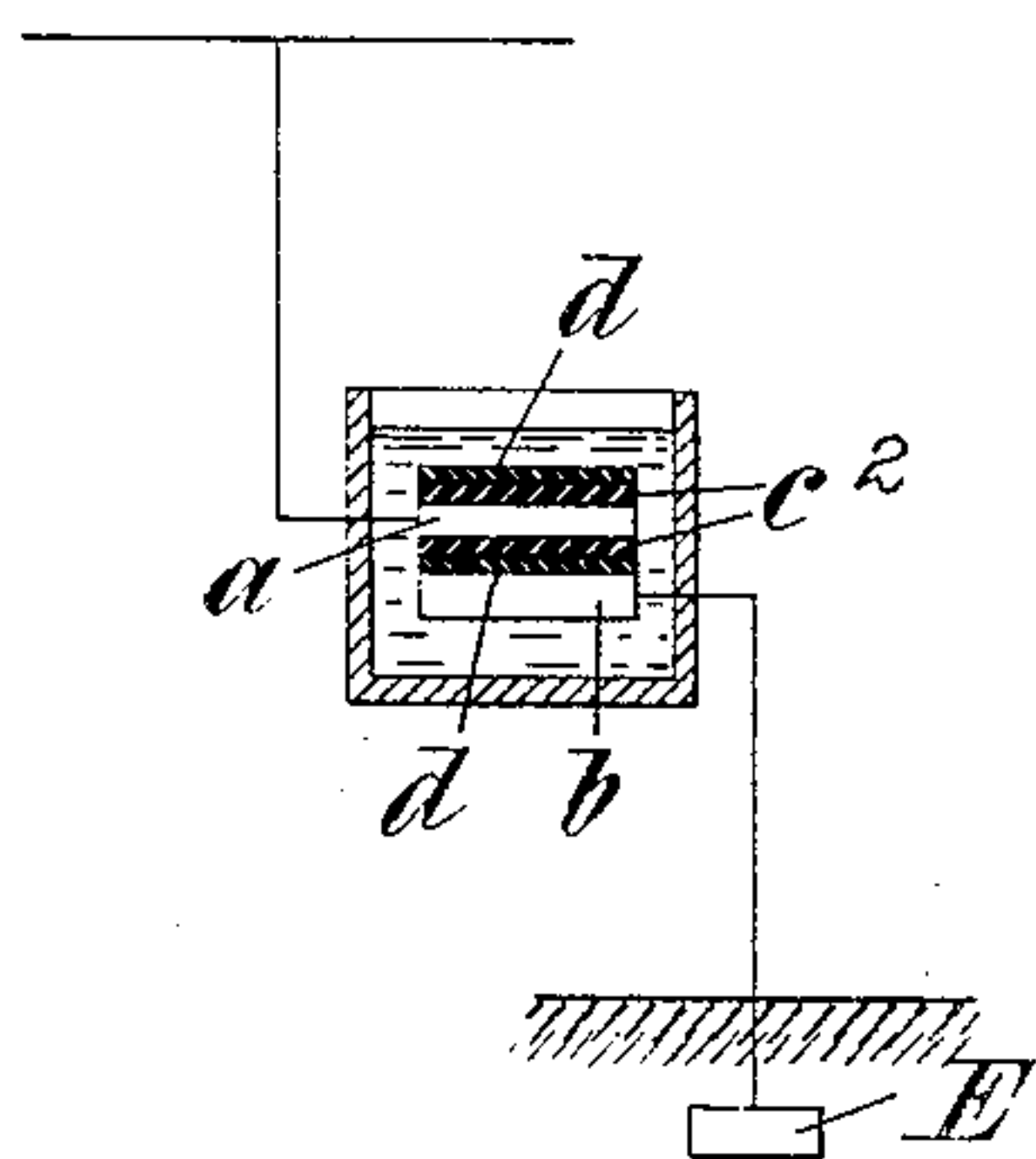


Fig. 4.

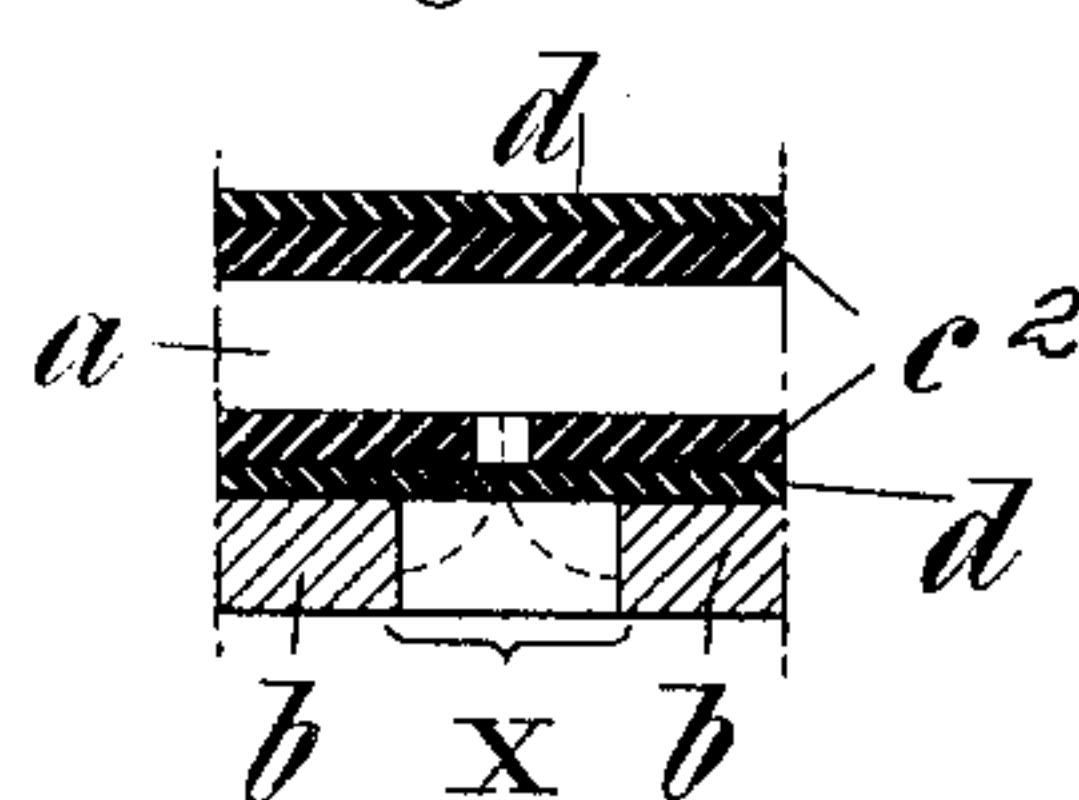
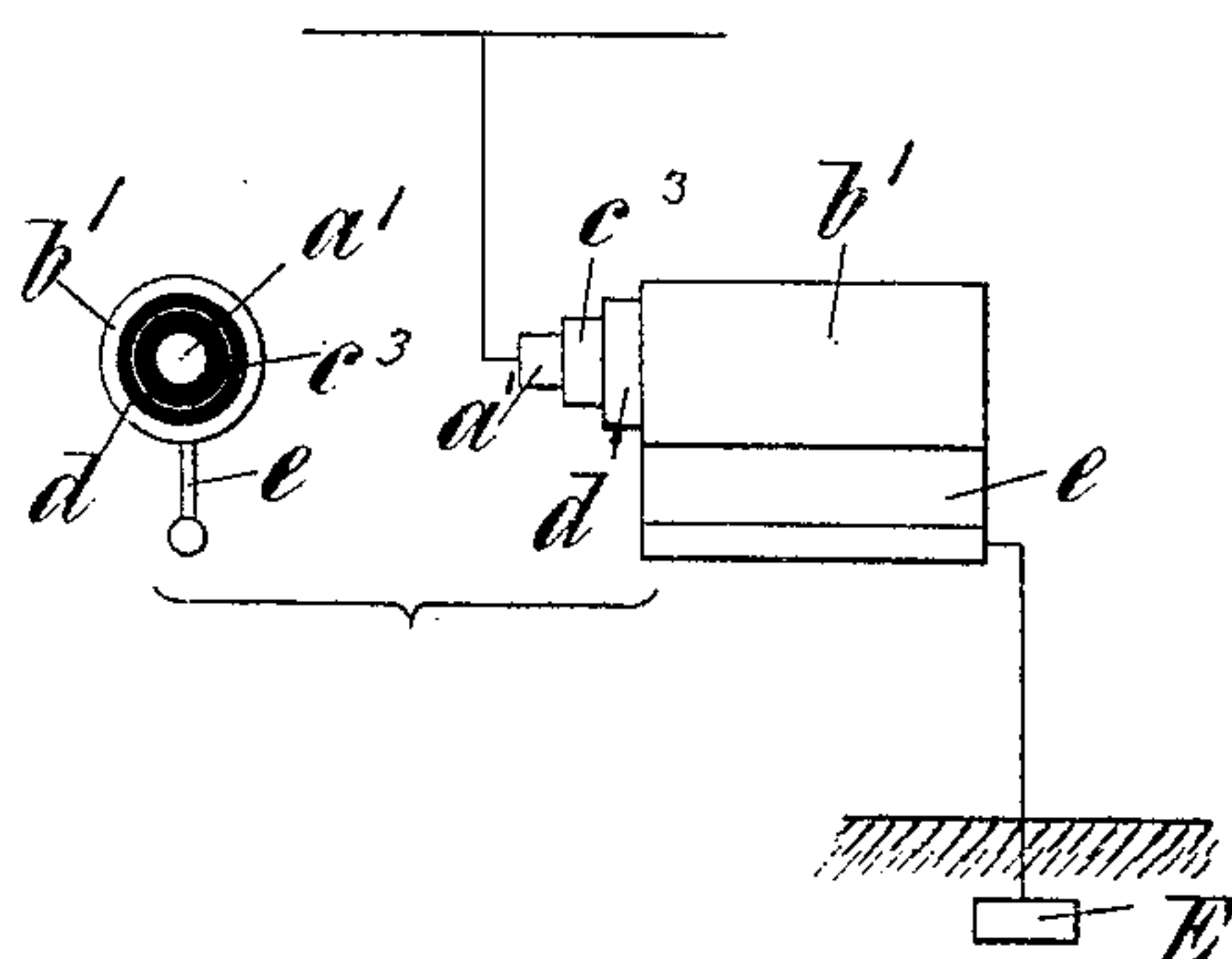


Fig. 5.



Witnesses:

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UNITED STATES PATENT OFFICE.

GEORG ZAPF, OF COLOGNE-NIPPES, GERMANY.

DEVICE FOR PREVENTING THE OVERCHARGING OF ELECTRIC CABLES.

No. 806,728.

Specification of Letters Patent.

Patented Dec. 5, 1905.

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To all whom it may concern:

Be it known that I, GEORG ZAPF, engineer, a subject of the German Emperor, residing at Cologne-Nippes, Province of the Rhine, Empire of Germany, have invented certain new and useful Improvements in Devices for Preventing the Overcharging of Electric Cables, of which the following is a specification.

This invention relates to improvements in safety devices for preventing the overcharging of cables.

It has been common to employ oil at the point where arcs arise or are produced at so-called "spark-gaps" to protect conductors against overcharging, the electrodes between which the equalization of the excess charging takes place being also arranged in oil. This use of oil, however, has the drawback of introducing a very high resistance between the two electrodes, which must be overcome by the current causing the equalizing-spark and, furthermore, the electrodes must be brought so near together that the intended operation of action of the oil is minimized.

The present invention is intended to overcome the disadvantages of the use of oil alone for the purposes stated; and it consists in the construction and arrangement of the several parts, which will be more fully hereinafter set forth.

In the drawings, Figure 1 is a sectional diagrammatic view embodying the features of the invention. Fig. 2 is a view similar to Fig. 1, showing a modification. Fig. 3 is a sectional diagrammatic view showing a still further modification. Fig. 4 is a detail section through the electrodes shown by Fig. 3, showing the hole or opening formed in the fusible electrode and by dotted lines the course of the spark. Fig. 5 shows side and end elevations of the electrodes embodying still further modifications, and particularly illustrating a special ground connection.

a and b , Fig. 1, designate two suitably-shaped electrodes disposed in a holding means w , containing oil o . The electrode a is shown connected, for instance, to a line-wire l , and the electrode b to ground E . Between the electrodes a and b a partition or separating medium c is interposed and formed from material having less resistance than the oil o , said partition or separating medium being fusible or combustible and penetrable by the spark. The distance between the electrodes a and b may be varied as desired and in accordance with the character of material of

which the partition, separating medium, or layer c is composed. This layer is composed, for example, of caoutchouc or a mixture of caoutchouc with a metal oxid, such as the oxid of iron. The operation of this arrangement is simple and is as follows: When the spark is produced, it burns a passage or channel into the partition c of such dimensions that the oil can readily penetrate the partition and extinguish the spark. In this manner the advantage of an oil spark-gap is obtained without the usual disadvantages or accompanying drawbacks.

In the modification shown by Fig. 2 the partition-separating medium or layer c is replaced by a casing of suitable material inclosing the electrode a , and in this connection it will be understood that both electrodes a and b might be inclosed with a similar casing of material having less resistance than the oil, the operation being practically the same in this modification as in the first apparatus set forth.

The modification shown by Fig. 3 illustrates means for further prolonging the equalizing-spark. The electrodes a and b in this instance are disposed in parallel relation, and around the electrode a is applied an intermediate insulating layer c^2 , and on this intermediate layer a further layer d of incombustible material is applied. This layer d is preferably formed of asbestos. In the operation of this form of the invention the equalizing-spark penetrates the incombustible layer d , but does not burn the same. If the electrode b be formed of an easily-fusible conductor—for instance, lead—the spark forms an opening through such electrode by causing the fusible material to recede from the point where the spark penetrates or first attacks the said electrode, and the spark is forced to make a detour, owing to the insertion of the incombustible layer of asbestos, such operation affording the oil convenient opportunity for penetrating and extinguishing the spark. In Fig. 4 a diagram of the operation of this modified apparatus (shown by Fig. 3) is clearly illustrated, x indicating the hole formed in the electrode b and the dotted line indicating the course of the spark.

In Fig. 5 the electrode a' is shown incased by the electrode b' , and between the two electrodes is interposed a filling or cylinder c^3 of insulating material. A brush-like device e has bearing against the electrode b and is connected to the ground E . If the electrode b

be passed through at any point on its periphery, the conducting connection with the ground is lost as regards one part, and even if the electrodes were grounded at both ends after
5 a second spark-discharge the third discharge would take place between the two former, and so the earth-circuit would also be destroyed. To avoid this, the brush *c*, of the same material as the electrode *b* or of any other suitable
10 conducting material, is used, and said brush may itself be grounded one or more times, and in this manner the earth-circuit remains unbroken.

Having thus described the invention, what
15 I claim is—

1. In a safety appliance for preventing the overcharging of electric cables, two electrodes disposed in intimate relation to form a spark-gap, a holding means for the electrodes hav-
20 ing oil therein, and a layer of insulating material separating the electrodes and capable of being fused by heat and having a higher conductivity than the oil.

2. In a safety appliance for preventing the
25 overcharging of electric cables, the combination of a holding means having oil therein,

two electrodes disposed in the holding means in the oil, and insulating means interposed between the electrodes and having a higher conductivity than the oil.

3. In a safety appliance for preventing the
30 overcharging of electric cables, a holding means having oil therein, two electrodes disposed in said holding means and oil, insulating means interposed between the electrodes
35 and having a higher conductivity than the oil, and connections for the electrodes, one of the connections being to ground.

4. In a safety appliance for preventing the
40 overcharging of electric cables, the combination of electrodes arranged to form a spark-gap between them, an insulating layer interposed between the electrodes, and an incombustible layer between the insulating layer
45 and one of the electrodes.

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

GEORG ZAPF.

Witnesses:

WILLIAM KUEPPERS,
JOH. SCHOLZ.