No. 882,218. PATENTED MAR. 17, 1908.

P. H. THOMAS.

ELECTRIC DISCHARGE APPARATUS.

APPLICATION FILED FEB. 6, 1903.

Fig. 1.

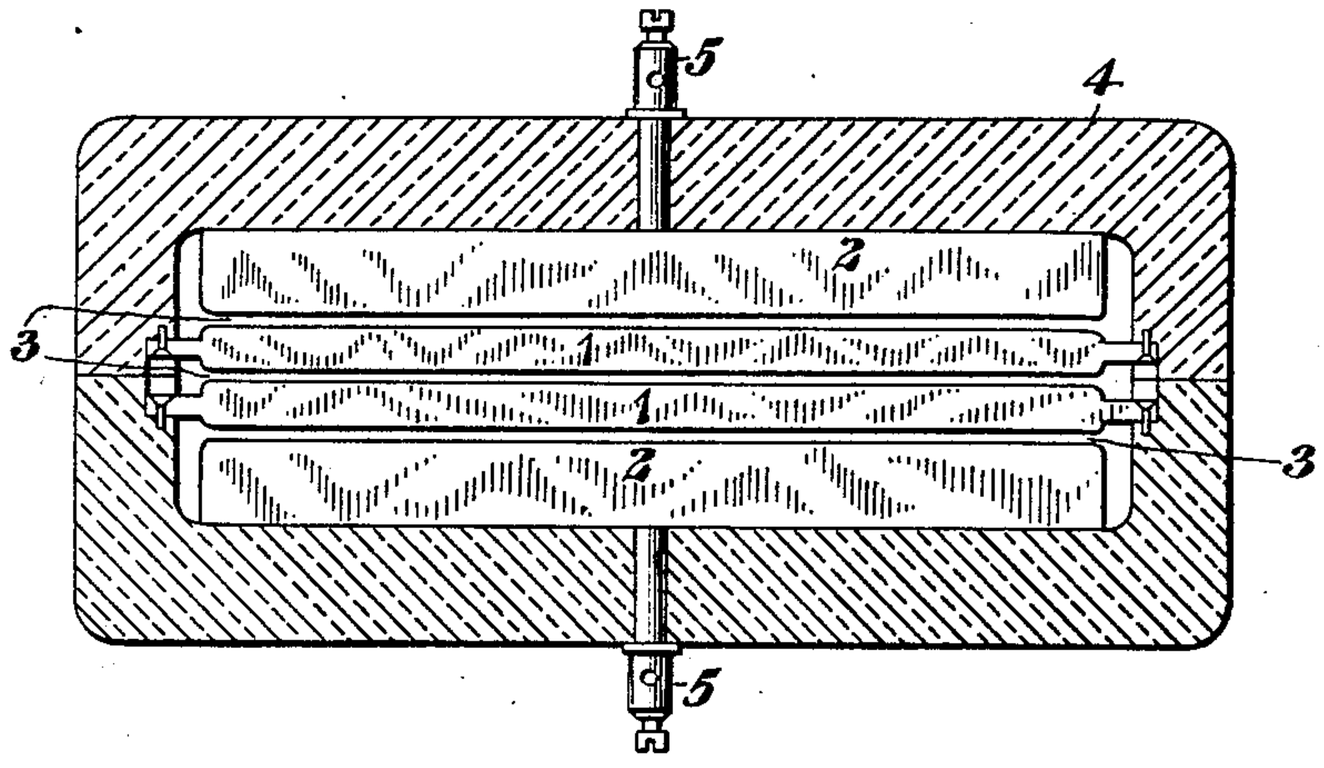
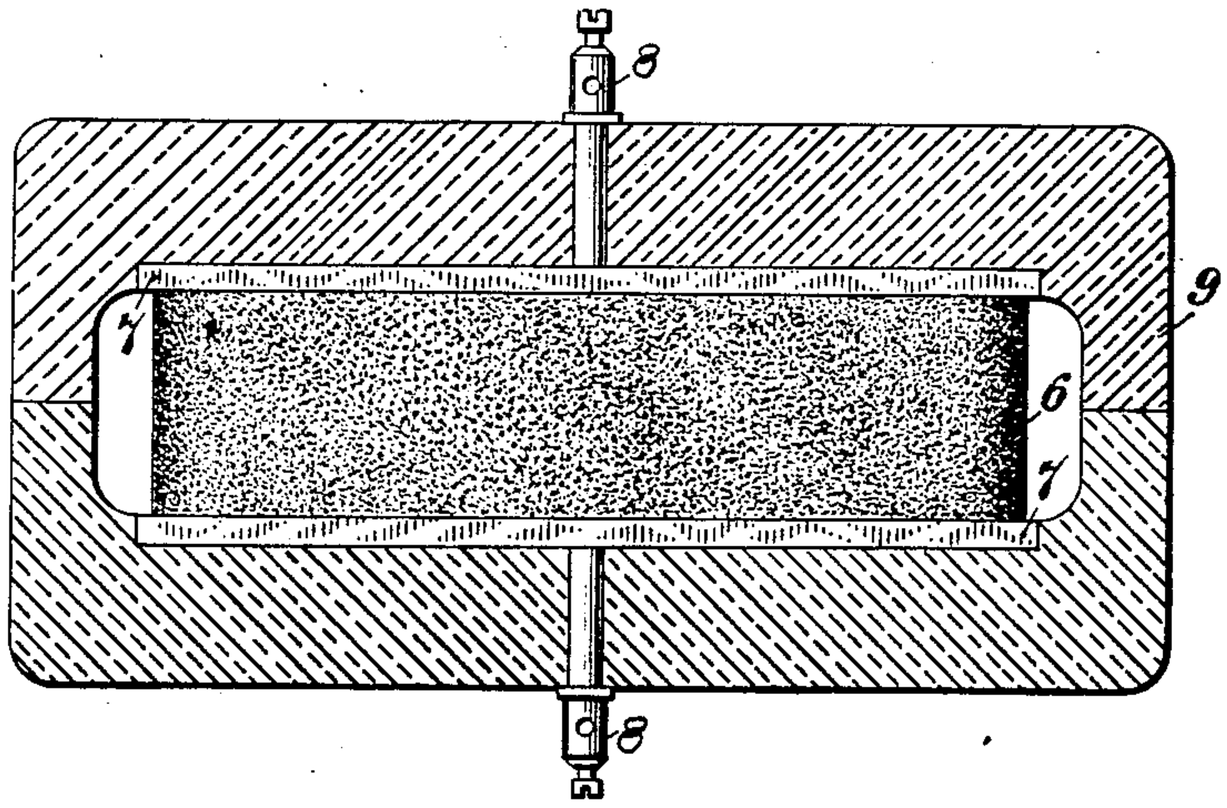


Fig. 2.



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UNITED STATES PATENT OFFICE.

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ELECTRIC-DISCHARGE APPARATUS.

No. 882,218. Specification of Letters Patent. Patented March 17, 1908.

Application filed February 6, 1903. Serial No. 142,240.

313-325

To all whom it may concern:

Be it known that I, PERCY H. THOMAS, a citizen of the United States, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Electric-Discharge Apparatus, of which the following is a specification.

My invention relates to apparatus which is employed for diverting static charges of electricity from conductors of dynamic electricity to ground without disturbing the normal operation of such conductors and the machinery and apparatus connected thereto and to conducting bodies utilizable in such apparatus and elsewhere.

One object of my invention is to provide a simple and inexpensive device which shall be adapted to relatively small, initial static discharges at comparatively low voltages and have also a sufficiently low resistance to the passage of static electricity to discharge large quantities at high voltages freely and without dangerous rise of potential on the conductor of dynamic electricity and also without permitting the dynamo current to follow.

Another object of my invention is to provide a conducting body which comprises a large number of small conducting particles or elements so disposed as to provide separate paths for electric currents or discharges which are individually of high resistance.

It is to be understood that the terms "static electricity" and "static charge," as here employed, are intended to embrace all charges of relatively high potential and small energy which are distinct from the energy that normally passes between the generator and the translating devices of a system and which tend, by reason of their excessive and abrupt changes in potential to injure or destroy conductors or insulation.

Heretofore, in cases where the width of the spark-gap or the character of the materials between which it is formed has been relied upon both to permit of the static discharge and to prevent the passage of the dynamo current, difficulty has been experienced on account of the comparatively high electromotive force necessary to start the discharge, and where additional resistance has been included in series with the spark-gap and the latter has been so formed and proportioned as to enable the discharge to start at a relatively low electromotive force, a complete discharge of the line has been prevented or unduly impeded by reason of the large amount of resistance included in series with the spark-gap or because of the form and disposition of such resistance.

I propose to overcome the above mentioned difficulties by the means illustrated in the accompanying drawings, which will be now described.

Figure 1 is a side elevation of one form of discharge device embodying my invention, the casing thereof being shown in section. Fig. 2 is a view similar to Fig. 1, but illustrating a modification.

Referring first to Fig. 1, the principal elements of the device consist of two or more discharge plates 1 formed of a material or a composition of materials which has a comparatively high specific resistance. I have employed discharge plates formed of a mixture of graphite and fire clay with satisfactory results, but I mention this composition as an example, without intention of excluding other suitable materials and compositions of materials from the scope of my invention. The length or width of these plates, or both, should be large as compared with their thickness and they may be used either with or without other plates 2 of good conducting material as terminals. Air gaps 3 may be provided between adjacent plates 1 or between said plates and the plates 2 or in both locations, as may be found desirable.

It is an essential characteristic of my invention that there shall be an opportunity for a large number of independent static discharges between the discharge plates and that each discharge path shall have such resistance that the dynamo current cannot follow the static discharge. If this current cannot follow in any one of the various paths, it cannot follow at all, and on account of the numerous independent discharges, the resistance to the total discharge will be comparatively small.

In order to insure a large number of independent discharges and a low resultant resistance, it is necessary to have the thickness of the plate small as compared with its other dimensions, since otherwise the whole upper surface of the discharge terminal might be raised to a high potential and the lower surface to a low potential by a single

discharge. An extreme example presenting conditions which my invention avoids would be the use of a long, high-resistance rod or cylinder. When a single discharge passes through the rod or cylinder, from end to end, the potential of the whole upper end is raised thereby, so that no considerable decrease in the total resistance to discharge will occur if another discharge passes in another path parallel to the first. The material and thickness of the plates should be such that the resistance of the path for each discharge may be sufficient to prevent the dynamo current from following.

The parts thus far described may be mounted in any suitable casing, that here shown being a two-part box or receptacle 4 of porcelain or other suitable insulating material provided with binding posts 5.

In Fig. 2, I have shown a single discharge plate 6 provided with backing terminal plates 7 of brass, or other suitable metal, to which the binding posts 8 are connected, the plates 6 and 7 being inclosed within a two-part casing or box 9 formed of porcelain or other suitable insulating material. In this form of my invention, the single discharge plate is of granular composition made up of a mixture of conducting and insulating particles so disposed that the equivalent of an external air gap is obtained between the particles of conducting matter or over the surfaces of the non-conducting particles within the composition. The resistance of each of the several paths, through the material, results either from the high specific resistance or the small dimensions of the conducting particles or from both.

The granular or comminuted conducting material may be any one of several varieties of carbon or other conducting material and the non-conducting material may be any incombustible cement or composition of cement and other non-conducting materials which will not become disintegrated in the use to which it is put and which will serve to maintain the conducting particles in their proper relative positions.

Discharge terminals having the structural and functional characteristics herein specified are not limited to specific conducting and non-conducting materials or to exact percentages of such materials or to any one specific method of manufacture, but, as an indication of what has been found satisfactory in practical operations, I may state that a suitable mixture may be composed of granular coke or carborundum, powdered spar or other suitable non-conducting material, and water-glass or other suitable binder, the proportions of the ingredients of which the mixture is composed being subject to considerable variations in order to conform to the voltage, current and other conditions of the circuit in connection with which the completed device is to be used. After the constituents have been thoroughly mixed, the mass may be compressed in suitable molds and then dried or baked. Since a high degree of heat is generally produced by the discharges to which the blocks are subjected, it is desirable to employ conducting particles that do not readily disintegrate under such conditions, but the specific material, the size of the particles, the kind of insulating material and the specific binder may each or all depend upon any one or more of a variety of service conditions.

Since the essential feature of my invention is the provision of a very large number of discharge paths through any or all of which static discharges may take place and each of which is of such high resistance as will prevent the passage of dynamo current, the discharge block or plate may consist of a mass of high-resistance fibers and suitable insulating material in lieu of the high resistance granules and insulating material above specified. It is also conceivable that the desired mode of operation and result may be attained by means of materials and compositions of materials which differ as to structure and arrangement from what I have specifically described and I desire and intend to include the same within the scope of my invention.

While the foregoing description relates mainly to apparatus employed for relieving electric circuits from static charges having such high potentials or such violent changes in potential as tend to destroy or seriously impair conductors and their insulation, it is not my intention to restrict the scope of my invention to such use.

It is conceivable that blocks or plates having the structural and electrical characteristics herein described may be advantageously utilized in other relations and for other specific purposes, and I therefore desire and intend to include within the scope of my invention all blocks or plates having the structural and electrical characteristics herein described, whatever may be the particular service in which they are employed.

I claim as my invention:

1. An electrical discharge device comprising a discharge plate having large face area presented to the discharge as compared with its thickness and composed of intermingled particles of conducting material and non-conducting material, the conducting particles being held in a substantially invariable relation but out of contact with each other.

2. An electrical discharge device comprising a discharge plate having large face area presented to the discharge as compared with its thickness and composed of particles of good conducting material and a mass of non-conducting binding material which holds the conducting particles in a substantially invari-

able relation but out of contact with each other and terminal plates for said discharge plate.

3. An electrical discharge device comprising one or more plates of resistance material having great face area presented to the discharge as compared with its or their thickness and one or more air gaps, the specific resistance of the material of which the plate is composed being such that dynamo current cannot follow a static discharge at any point.

4. An electrical discharge device comprising a block or plate having comparatively high resistance particles so disposed as to provide discharge paths between them and having a large face area presented to the discharge as compared with its thickness.

5. In an electrical discharge device, a plate or block composed of a mixture of conducting and non-conducting particles of such dimensions and so disposed that each conducting particle has a comparatively high resistance and discharges may take place between said particles, and having a large face area presented to the discharge as compared with its thickness.

In testimony whereof, I have hereunto subscribed my name this 31st day of January 1903.

PERCY H. THOMAS.

Witnesses:
WM. H. CAPEL,
GEORGE H. STOCKBRIDGE.