

No. 890,592.

PATENTED JUNE 16, 1908.

R. APT.

PROTECTIVE DEVICE FOR HIGH POTENTIAL SYSTEMS.

APPLICATION FILED AUG. 17, 1906.

Fig. 1.

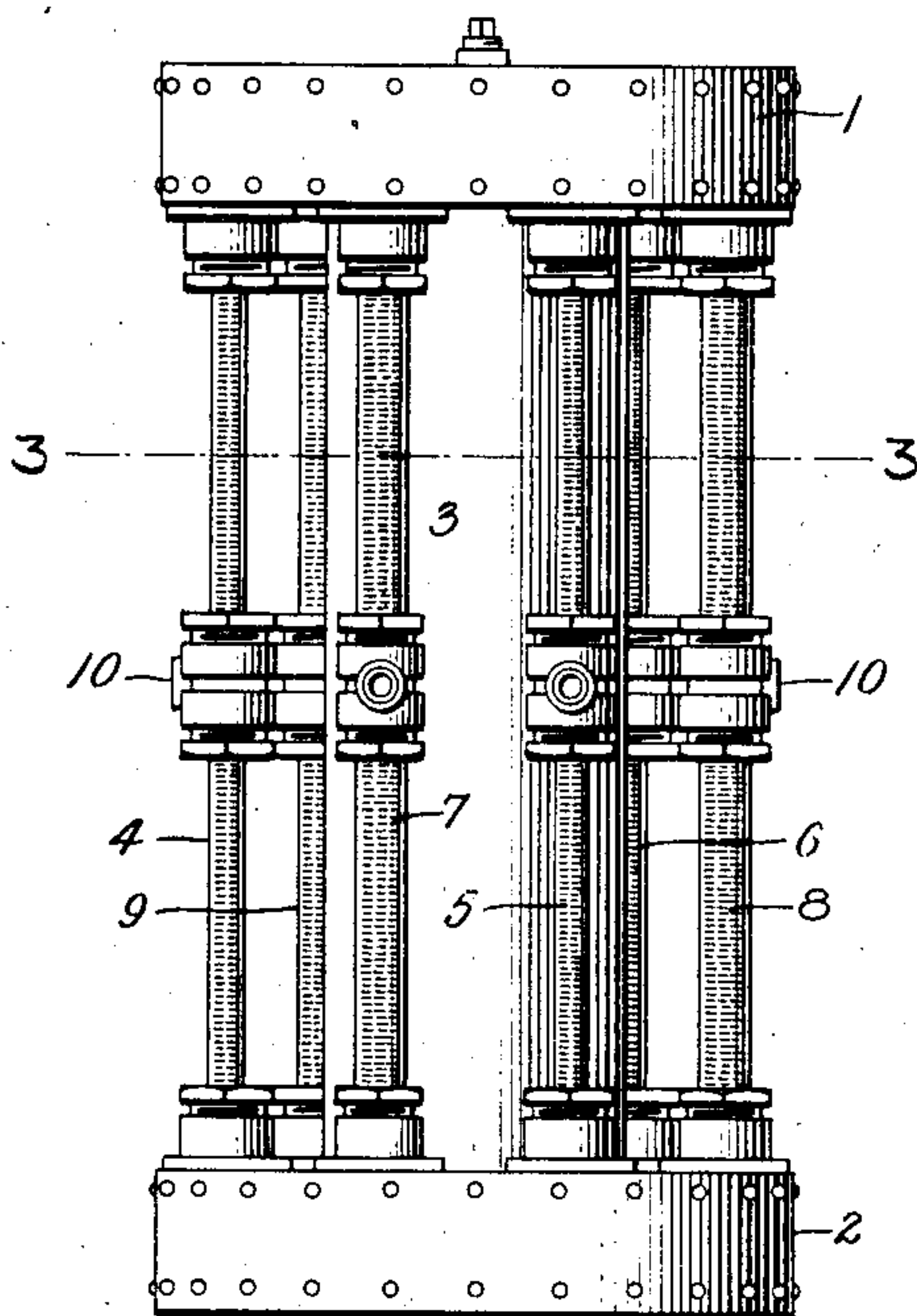


Fig. 2.

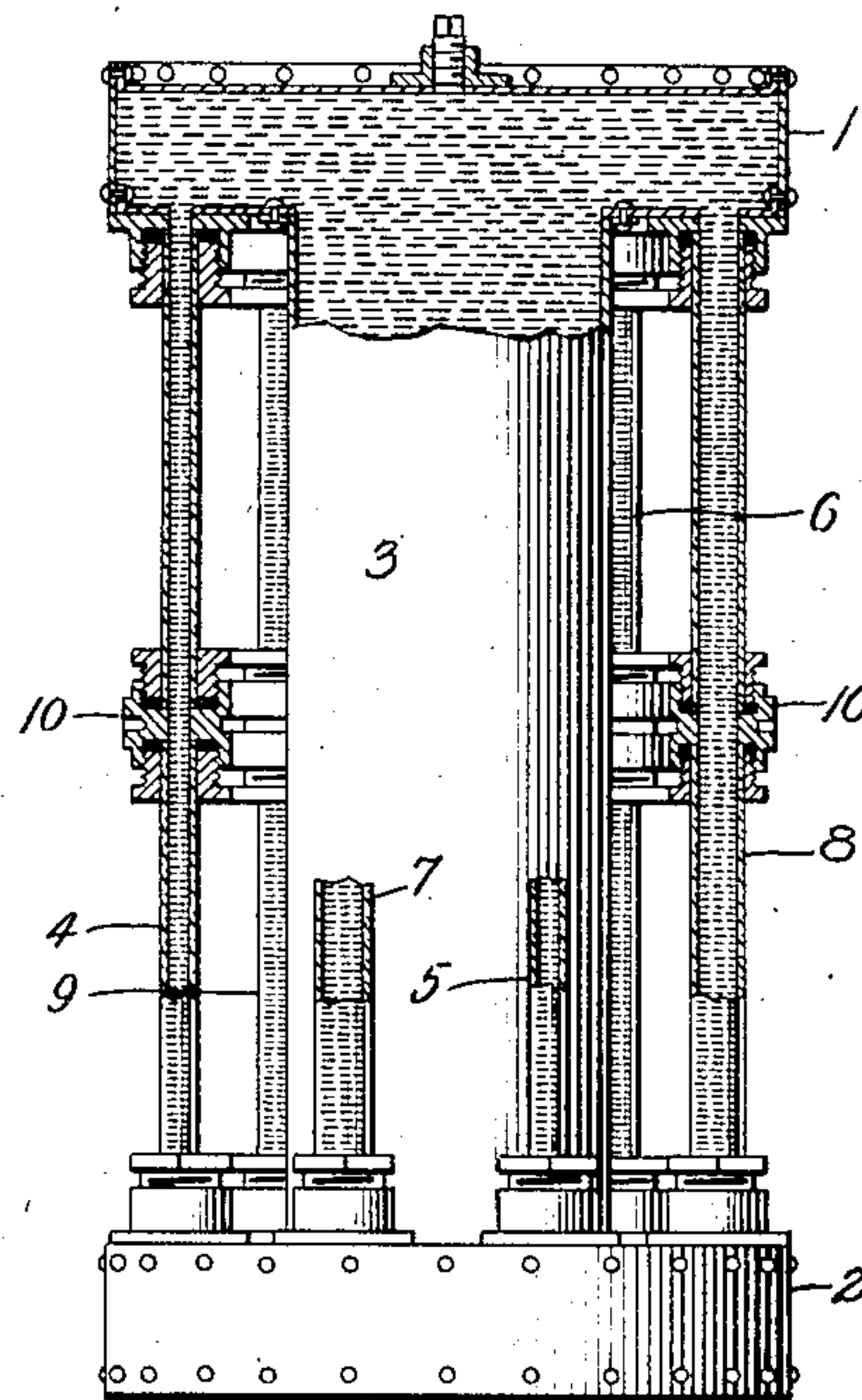


Fig. 3.

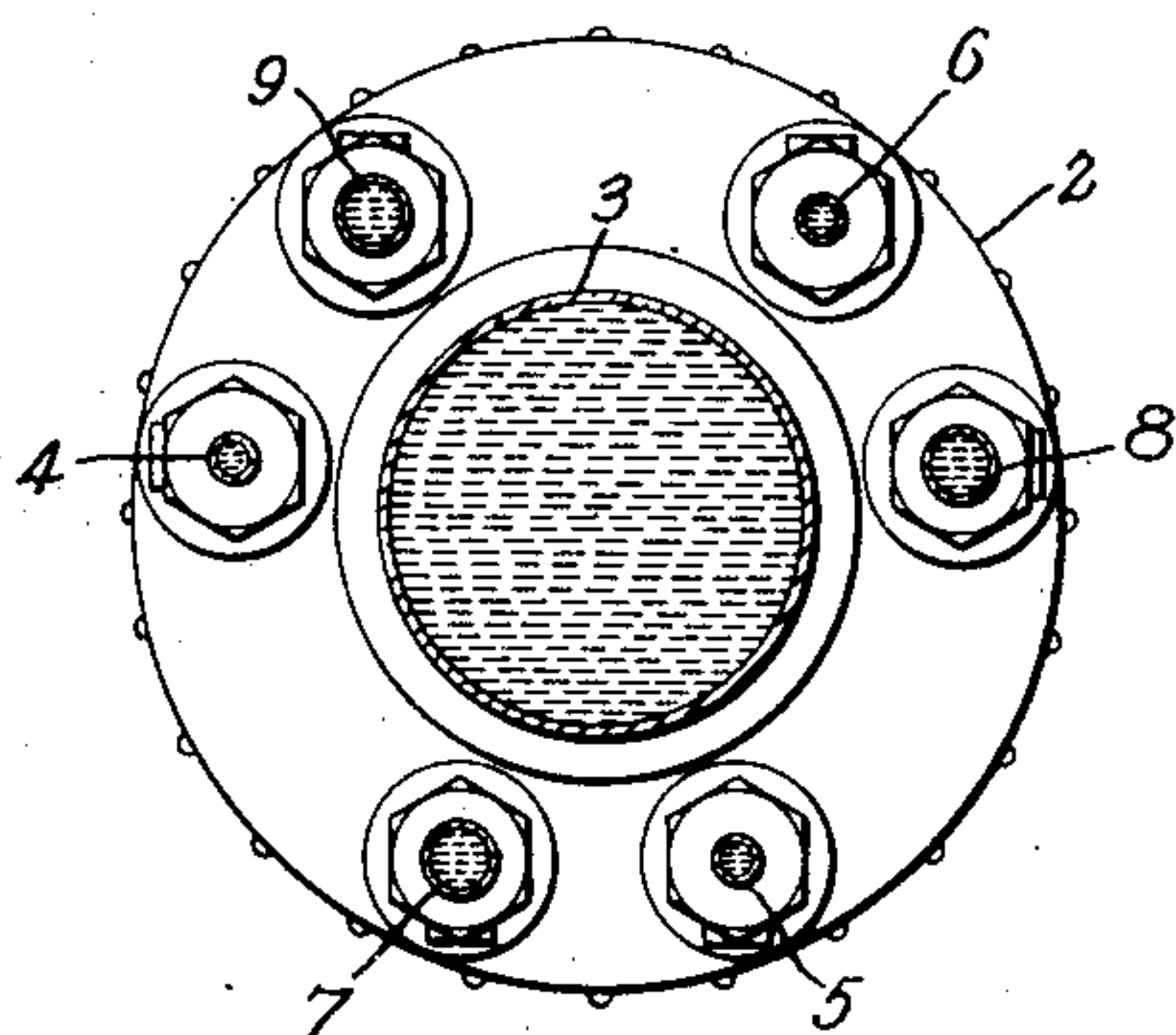
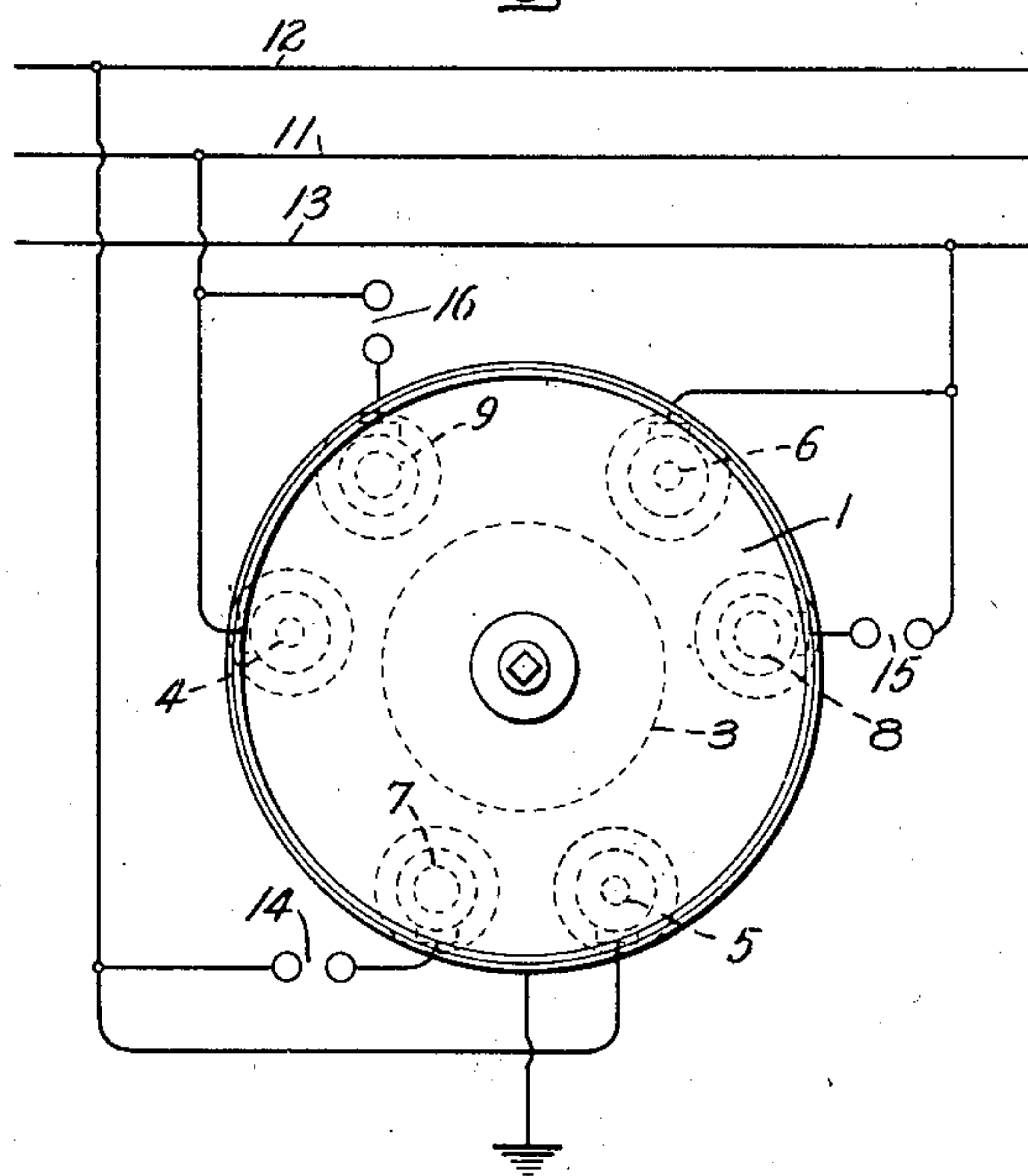


Fig. 4.



Witnesses:

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UNITED STATES PATENT OFFICE.

RICHARD APT, OF BERLIN, GERMANY, ASSIGNOR TO GENERAL ELECTRIC COMPANY,
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PROTECTIVE DEVICE FOR HIGH-POTENTIAL SYSTEMS.

No. 890,592.

Specification of Letters Patent.

Patented June 16, 1908.

Application filed August 17, 1906. Serial No. 330,974.

To all whom it may concern:

Be it known that I, RICHARD APT, a subject of the King of Prussia, residing at Berlin, Germany, have invented certain new and useful Improvements in Protective Device for High-Potential Systems, of which the following is a specification.

Various devices have been proposed for the protection of high potential systems, against atmospheric disturbances and injurious excess potential. According to common practice, the conductor to be protected is connected to ground through a spark gap and a resistance of such size that the discharge current going to earth can attain a high value. As an alternative protective means, a resistance is inserted directly in circuit from the high potential lead to earth, so that a current of a certain magnitude is always flowing off. Experience has shown that the safety of a system is greater, the more varied the protective precautions employed; both the above mentioned arrangements may therefore properly be employed. Protection thus insured, however, carries with it no inconsiderable cost, since two complete resistances are required.

According to the present invention the two necessary resistances are united in a single apparatus, thereby lessening the cost of the system. One of these resistances serves as a current limiting resistance for the spark gap, while the other one is constantly a shunt to earth. The one constantly in circuit is of high resistance and lower current capacity than the one cooperating with the spark gap.

The accompanying drawing shows an illustrative embodiment of my invention.

Figure 1 is an elevation of an apparatus suitable for the protection of a three-phase circuit; Fig. 2 is an elevation of the same with certain of the parts broken away; Fig. 3 is a sectional plan on the line 3-3 of Fig. 1; and Fig. 4 is a diagrammatic representation of the connections employed when the apparatus is used with a three-phase system.

The apparatus shown comprises a metal receptacle consisting of an upper cylindrical metal tank 1 and a lower metal tank 2 connected by a tubular metal stand pipe 3. This receptacle is permanently connected to ground and contains a liquid of high resistance such as ordinary tap water. A plurality of glass tubes connect the upper cyl-

inder with the lower cylinder and contain liquid to serve as current carrying resistances. Three of these tubes, those numbered 4, 5 and 6, are of small cross-section and therefore of high resistance, while the other three tubes, numbered 7, 8 and 9, are of large cross section.

All of the tubes may be conveniently made of glass and each is in two sections connected together by a metal coupling 10, shown in Fig. 1. These couplings are in contact with the solution of the tube and serve as electrodes for establishing connection between the liquid and the conductors to be protected. Current delivered to the liquid by electrodes 10, passes upward through the liquid to the upper cylindrical grounded metal tank 1, or can pass downward through a similar path, including the lower half of the resistance column. The upper and lower tanks being connected by the grounded metal standpipe 3 are, of course, at ground potential. The general arrangement of connections is shown in Fig. 4, in which the high resistance conductors 4, 5 and 6 are connected directly to line conductors 11, 12 and 13, and the low resistance conductors 7, 8 and 9 are connected to these line conductors by the spark gaps 14, 15 and 16.

While the idea lying at the foundation of the invention is applicable to fluid resistance of any desired form, it is evident that those shown in the drawings are so arranged that an automatic circulation of the fluid takes place within the resistance members because of the heating action of the small amount of current which constantly leaks through to ground by way of the high resistance liquid columns 4, 5 and 6.

What I claim as new and desire to secure by Letters Patent of the United States, is:

1. The combination of a grounded receptacle, a column of liquid communicating therewith and connected to a line conductor of an electrical system, and a second liquid column of lower resistance connected between said receptacle and said line conductor through a spark gap.

2. Protective means for an electrical distribution system comprising a metal receptacle containing liquid, a plurality of liquid columns held in separate tubes and connecting with said receptacle, and means for connecting said columns with separate conductors of the system to be protected.

3. In a lightning arrester, a tube of non-conducting material containing a high resistance liquid, an electrode contacting with said liquid near the middle of said tube, and
5 means for providing an automatic circulation of liquid through said tube.

4. A protective device which consists of a plurality of liquid columns held in nonconducting tubes and connecting with a common
10 grounded receptacle, and means for connecting said columns to separate electrical conductors of the system to be protected.

5. The combination of a stand pipe containing a high resistance liquid, a plurality of
15 high resistance columns supplied with liquid from said stand-pipe, a plurality of low resistance columns supplied with liquid from said stand-pipe, and electrical connections for intermediate points on said columns.

20 6. In a lightning arrester, the combination

of a tube of non-conducting material containing a high resistance liquid, an electrode in said liquid located some distance from either end of the tube, a tank connected to both ends of said tube, and a ground connection
25 for said tank.

7. In a lightning arrester, the combination with a tank containing a resistance fluid, vertical columns connected at both ends to said tank, a second set of columns communicating with said tank and supplied with liquid therefrom, and electrical connections
30 for continuously passing electrical energy through said last named columns.

In witness whereof, I have hereunto set
my hand this 2nd day of August, 1906.

RICHARD APT.

Witnesses:

JULIUS RUMLAND,
OSKUR LINGES.