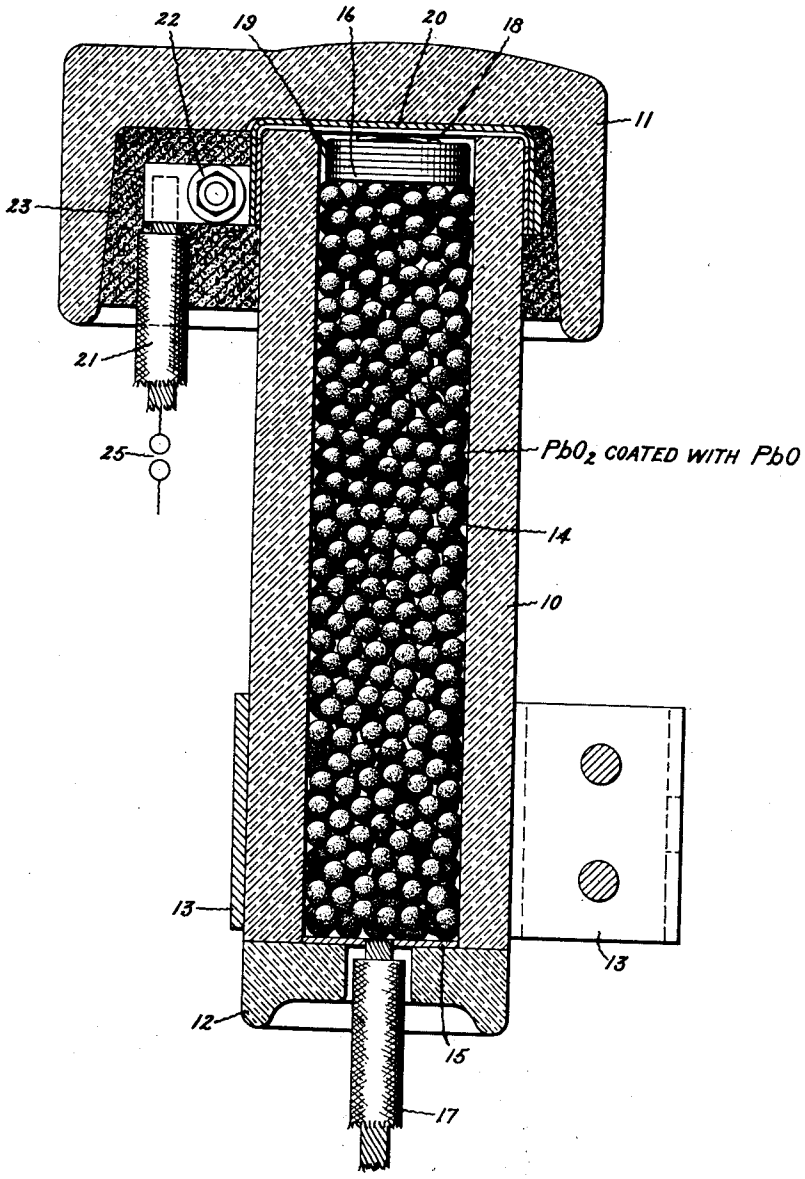
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LIGHTNING ARRESTER

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LIGHTNING ARRESTER.

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This invention relates to lightning arresters, and particularly to those which employ lead peroxide as a medium through which the lightning discharge is caused to pass. Heretofore, it has been customary to construct arresters of this type of individual cells each of which was formed of a body of lead peroxide held between two discharge electrodes, the surface of one or both of the electrodes being coated with a film of insulating material such as varnish. In operation, when the discharge takes place, the film of insulating material is broken down at one or more points and the discharge passes through the lead peroxide. The heat due to the passage of current through the lead peroxide changes the peroxide lying in the vicinity of the portions of the film which have broken down into a lower oxide of lead which has a high electrical resistance. This results in an effective sealing of the arrester against further flow of dynamic current. Each of the cells heretofore employed in effect constitutes an arrester having a break-down voltage of a definite amount, as, for example, 300 volts or over. If it were desired to construct an arrester having a break-down voltage of say 1200 volts or over, three or more of these cells would be placed in series.

One object of the present invention is to provide an arrester which avoids the use of specially constructed cells as above described, by employing a material which in itself permits the passage of a high potential discharge therethrough but limits the further flow of the dynamic current. To vary the break-down voltage of this arrester, it is merely necessary to change the spacing of the electrodes and the quantity of material between the same.

Further advantages and objects of my invention will appear from the following description taken in connection with the accompanying drawing which represents in section, partly in elevation and partly diagrammatic, an arrester embodying my invention and in which 10 represents a porcelain tube having a cap 11 and a lower closure member 12. The tube 10 is held by clamp 13 which is adapted to be secured to a suitable support.

Contained within the tube 10 are the pellets 14, which, according to the preferred embodiment of my invention, are formed of masses or bodies of lead peroxide (PbO_2) upon which have been formed coatings of insulating material preferably litharge (PbO). A convenient method of forming these coats or coatings is by shaking up the lead peroxide pellets with powdered litharge in a suitable container. While these pellets may vary considerably in diameter and shape, I have found that pellets $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter are very satisfactory.

A lower electrode 15 to which the terminal 17 is connected makes contact with the pellets at one end of the tube 10, while a second electrode 16 forms contact with the pellets at the upper end of the tube. A spring 18 forces the electrode 16 against the pellets, there being interposed between the electrode 16 and the spring metallic spacing members 19 to enable a greater spacing of the electrodes in spite of the variations which may occur in the length of the porcelain tube 10. The spring 18 bears against a metallic cap 20 to which the terminal 21 is secured by means of a clamp 22. This clamp and the upper end of the terminal 21 are embedded in cement 23 which fills the space between the cap 11 and the upper end of the tube 10. If it is desired to prevent any leakage current from flowing through the pellets, a gap 25 can be placed between the same and the line.

In practice, when a high potential static impulse or overvoltage occurs upon the line, the gap 25 breaks down and a sufficient number of the insulating coats or films upon the pellets also break down to provide a free passage for the discharge through the conducting material of which the greater portion of each of the pellets is composed and thence to the ground through the terminal 17 or other side of the circuit. Immediately, however, that current begins to flow through the low resistance lead peroxide the heat developed by the current converts portions of the peroxide which lie

in the vicinity of those portions of the films which have broken down, into a lower oxide of lead which has a very high electrical resistance. This results in interrupting the dynamic current, and the arc which is formed across the gap 25 is extinguished.

I have found that by the arrester herein described not only is the static effectively discharged and the dynamic current interrupted but that the arrester will operate in this manner a great number of times. This may be due in some measure to the fact that when a discharge occurs but a small portion of the insulating coating of a pellet breaks down and a second discharge may break down another portion of the same coating. It is, however, possible that a plurality of discharges may pass through the same portion of the coating for the reason that the quantity of high resistance oxide which is formed by the dynamic current is merely enough to reduce the current to a point at which it will be interrupted, which quantity is dependent upon the line voltage. A subsequent static discharge or overvoltage being of a much higher voltage than that of the line, however, is able to break through this barrier of insulating material. If the heat formed by the high potential discharge forms a barrier of a lower oxide of lead having a break-down voltage equal to the break-down voltage of other portions of the insulating film, it is of course possible that the remainder of the high potential discharge may select a path through some other portion of the insulating film.

Instead of using lead peroxide pellets which have been coated with litharge to form an insulating barrier, it is possible to construct the arrester as shown, except that uncoated lead peroxide pellets are used and the insulating barrier is formed by passing current through the pellets. In this process, the voltage is slowly increased from zero to a value approximating the normal voltage of the line, and there results a reduction of the peroxide around the points at which the pellets make contact with the electrodes, or with each other, and the consequent formation of the insulating barrier.

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

1. Fluent material composed of pellets, each of said pellets being formed with an inner portion composed of a compound having a low electrical resistance but which is converted by heat into a derivative of the compound having a high electrical resistance, said pellets being each encased within a shell of the same material as the derivative substance.

2. A body for use in an electric discharge path, said body being composed of a portion formed of material of low electrical resistance having a coat applied thereto which is a derivative of said material, the material of the body being changed into the material of the coat when an electric current flows through the body.

3. A lightning arrester comprising a resistance element in the form of pellets of lead peroxide coated with a lower oxide of lead, said material serving as a passage for an electric discharge through the arrester, said lower oxide of lead constituting a resistance element for shutting off a discharge through the arrester.

4. A resistance element for a discharge device in the form of a pellet of lead peroxide incased in a coat of litharge.

5. An electric discharge device, a spark gap and a resistance material in series with said gap, a pair of spaced electrodes, said resistance material being located between said electrodes and in adjustable contact with said electrodes, said material being composed of bodies formed with inner portions composed of a substance having low electrical resistance and which is converted by a discharge through said device into a substance of high resistance, and outer portions enclosing said inner portions and composed of a substance having high electrical resistance, said high resistance material constituting means for shutting off the discharge.

6. In a lightning arrester, two spaced electrodes and material between said electrodes in contact with said electrodes, said material being composed of pellets of lead peroxide coated with lead monoxide, said material constituting means for shutting off a discharge through the arrester.

7. A lightning arrester comprising a container of insulating material, a mass of loose material in the container, and a pair of electrodes separated by and in contact with said mass of material, said material comprising contiguous pellets of lead peroxide coated with lead monoxide, said lead monoxide constituting means for shutting off a discharge after it is established through the arrester.

8. A pellet for use in an electric discharge path, said pellet consisting of a core and a coat applied thereto, the core having low electrical resistance and the coat having high electrical resistance, the material of the core being converted into the material of the coat when a flow of current is sent through the pellet.

9. A pellet for use in an electric discharge path, said pellet consisting of a core and a coat applied thereto, the core having low electrical resistance and the coat having high electrical resistance, the material of the core adapted to be converted into the material of the coat when a flow of current is sent through the pellet, said core consisting of a high oxide of a metal and said coat consisting of a lower oxide of the same metal.

10. A lightning arrester comprising a spark gap in series with a resistance element, said resistance element consisting of a mass of pellets, each consisting of a core of lead peroxide embedded in a coat of lead oxide, the lead oxide serving as means for shutting off the discharge and putting out the arc across said gap and the lead peroxide serving as a source of supply for producing fresh lead oxide for increasing the resistance of the resistance element when an increase in resistance is necessary to shut off the discharge.

In witness whereof, I have hereunto set my hand this 1st day of October, 1921.

NORMAN A. LOUGEE.