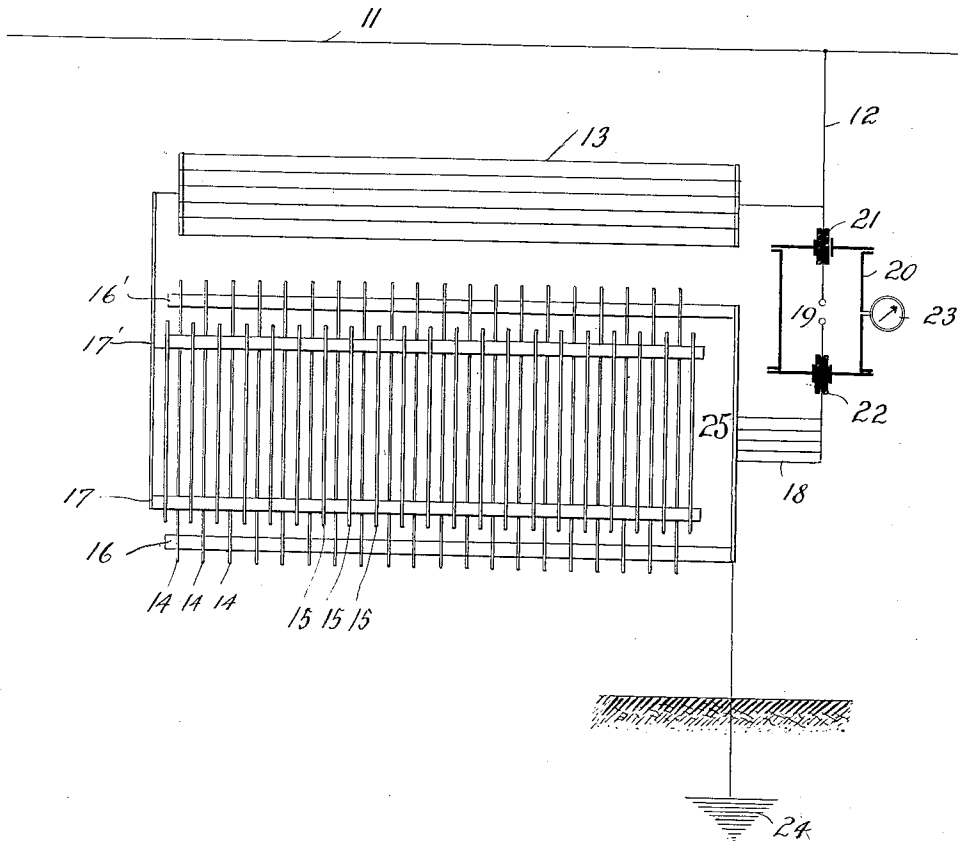


R. A. FESSENDEN.
LIGHTNING ARRESTER.
APPLICATION FILED MAY 9, 1908.

932,112.

Patented Aug. 24, 1909.



WITNESSES:

Chas. S. Pepley.
Fred. Stout.

INVENTOR,

Reginald A. Fessenden.
BY
F. W. H. Clay
ATTORNEY.

UNITED STATES PATENT OFFICE.

REGINALD A. FESSENDEN, OF BRANT ROCK, MASSACHUSETTS.

LIGHTNING-ARRESTER.

932,112.

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To all whom it may concern:

Be it known that I, REGINALD A. FESSENDEN, a citizen of the United States, residing at Brant Rock, in the State of Massachusetts, have invented a certain new and useful Lightning-Arrester, of which the following is a specification.

My invention relates to safety devices for electrical circuits and particularly to means for preventing injury by abnormal voltages.

The primary object is to provide means for safe-guarding against the destructive effects of lightning or other electrical discharges.

The invention is illustrated in one form in the accompanying drawing which is a diagram illustrating a suitable type of apparatus for practicing the invention.

Lightning arresters of the usual discharge type now known have the disadvantage that upon discharging they themselves set up oscillations in the circuits in which they are placed and such oscillations are liable to destroy the insulation of such circuits. When resistances have been used in connection with these lightning arresters, there is always the danger of the resistance being too great to discharge the impulses with sufficient rapidity.

I overcome the above objections, and gain other advantages by making use of a discharge gap so designed that it will break down at an approximately fixed voltage and immediately restore itself with great rapidity, and by shunting such a gap with a circuit which contains capacity, inductance and resistance so as to form a circuit which would be highly oscillatory but for the presence of the resistance, and this resistance is so adjusted as to make the circuit practically non-oscillatory, and thereby absorbing the energy of the discharge in the resistance. The resistance is so constructed as to be capable of absorbing large amounts of energy without injury.

The principle of the apparatus may be roughly illustrated by the analogy of emptying a tank of water step by step by means of an automatic tilting bucket. That is, we may consider the capacity as analogous to the bucket, the line struck by lightning discharge as analogous to the tank of water, and the discharge gap as analogous to the tilting mechanism by which the bucket is automatically emptied when it is full and immediately restored to its original position

ready to be filled again. In the drawing I show a transmission line 11, connected by a conductor 12 to a discharge gap 19, which is placed in the reservoir 20 filled with compressed air at a pressure of say about eighty pounds or more, which may be indicated by the gage 23. The leading-in wires are supported in the reservoir 20 by porcelain insulating bushings 21, 22, and the conductor is grounded at 24. Such a compressed air discharge gap breaks down at a very definite potential, as explained in my prior patent 706,741, and it has extremely little resistance when the discharge is passing; consequently comparatively little heat is produced in the reservoir 20. This gap also restores itself with very great rapidity immediately upon cessation of the discharge or upon the potential falling below a certain value.

In shunt to the spark gap 19, I place a large capacity 25, formed in any suitable way as of wires, or, as here shown, by plates 14, 15 preferably made of sheet iron. The alternate plates 14 are mounted on and connected to conductors 16, 16', and intermediate plates 15 are mounted on and connected to conductor 17, 17'. These conductors may be made out of wrought iron tubing. Also connected to the gap and in circuit with the capacity I place resistances 13 and 18, having inductance and formed of a number of wires in parallel. The material of the wires preferably has a high melting point and the resistance is therefore able to absorb a large amount of energy without being fused. The resistance of 13 and 18 is so adjusted in connection with their inductance and in connection with the large capacity 25 as to make the shunt circuit almost dead-beat or at least greatly dampened.

In operation, when the line wire 11 is raised to an abnormal potential, as for example by a lightning stroke, the discharge current flows through the conductor 12 and inductive resistance 13 and charges the condenser 25 until its potential reaches such a point as to cause a discharge across the gap 19. The condenser itself being therefore discharged at the same time, the energy stored up in it is absorbed in the inductive resistances 13 and 18. As soon as one discharge has passed, the condenser 25 is again charged, and this process is repeated until the abnormal charge of the line 11 is completely dissipated to the earth. The line potential does not continue to pass across gap

19, because after each oscillation the arc at 19 goes out and the distance between the discharge knobs of the gap is of course so adjusted that the normal voltage in line 11 will not pass.

Having thus described my invention and illustrated its use, what I claim as new and desire to secure by Letters Patent, is the following:

10 1. A lightning arrester comprising a discharge gap adapted to be automatically restored to original insulating resistance with great rapidity, and a shunt circuit around the gap containing inductance, capacity and resistance, said resistance being proportioned to make the shunt circuit a highly damped one, and being constructed to safely absorb a large amount of energy, substantially as described.

20 2. In a lightning arrester, a reservoir of compressed air, a discharge gap therein, and a highly damped oscillatory circuit shunted

around the gap, the terminals of the gap being respectively connected to ground and to the device to be protected. 23

3. A lightning arrester comprising a discharge gap and a circuit shunted around the gap and made non-oscillatory and containing a condenser.

4. A lightning arrester comprising the combination of a rapidly self-restoring compressed air discharge gap and a circuit around the gap containing a capacity and inductive resistances on each side of the capacity, adjusted to absorb energy of discharge from the capacity, and make the circuit non-oscillatory. 35

In testimony whereof I have hereunto signed my name in the presence of two subscribed witnesses.

REGINALD A. FESSENDEN.

Witnesses:

JESSIE E. BENT,
AGNES M. GATELY.