(No Model.) 2 Sheets—Sheet 1.

J. P. FREEMAN.

LIGHTNING ARRESTER.

No. 458,656. Patented Sept. 1, 1891.

Fig. 1.

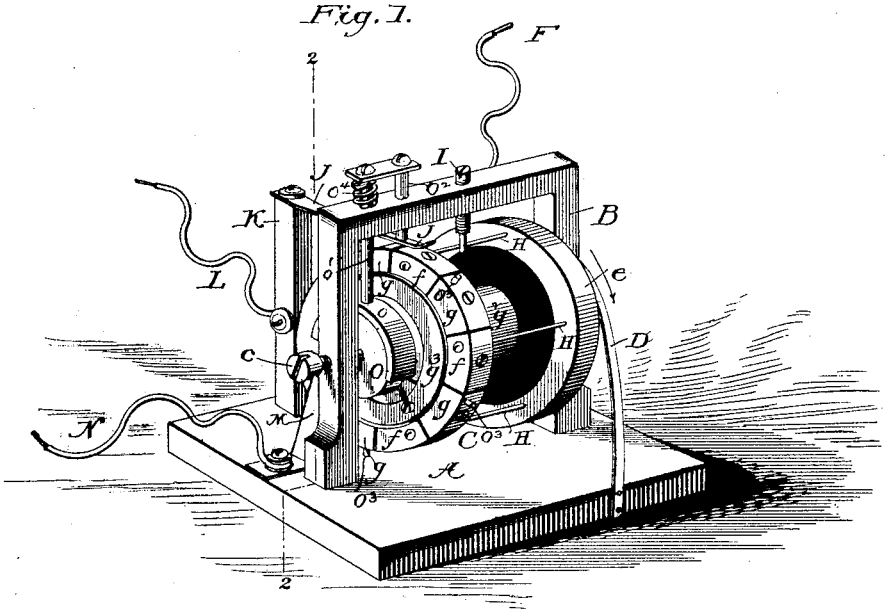


Fig. 2.
on line 2-2

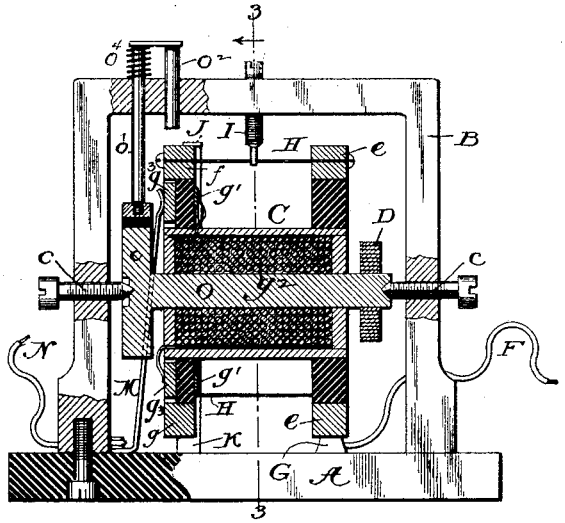
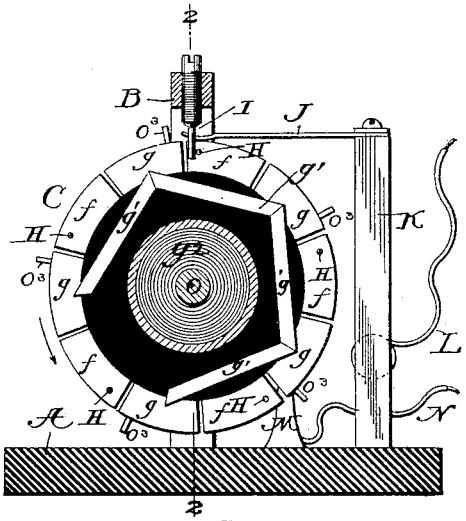


Fig. 3.
on line 3-3



Witnesses:
W. W. Mortimer
A. R. Kennedy

Inventor:
J. P. Freeman
By his Atty
Chas. T. Dodge

(No Model.) 2 Sheets—Sheet 2.

J. P. FREEMAN.

LIGHTNING ARRESTER.

No. 458,656. Patented Sept. 1, 1891.

Fig. 4.

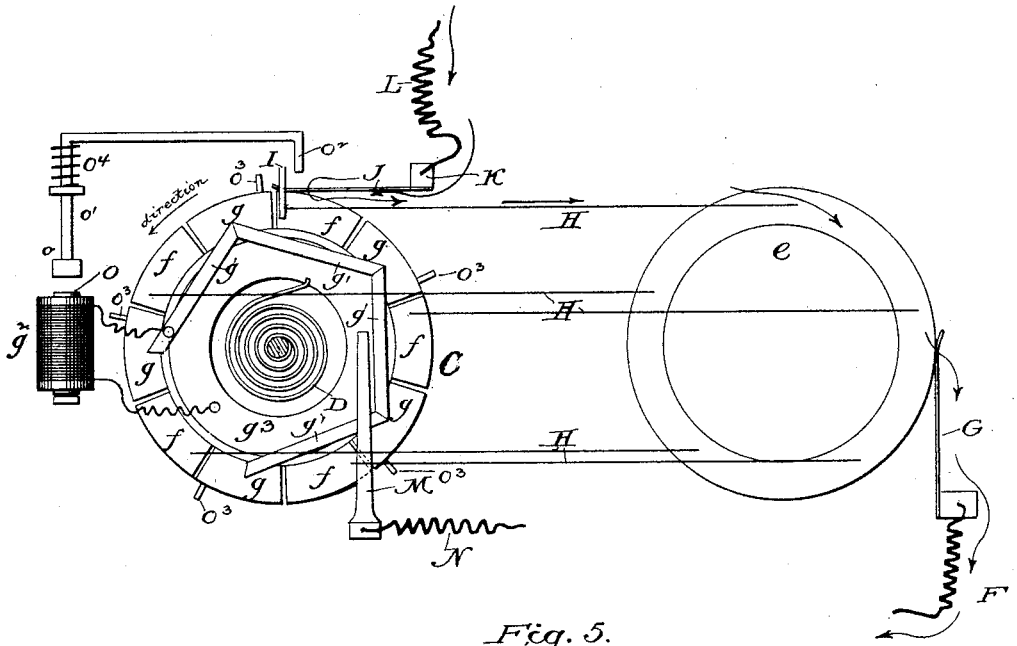
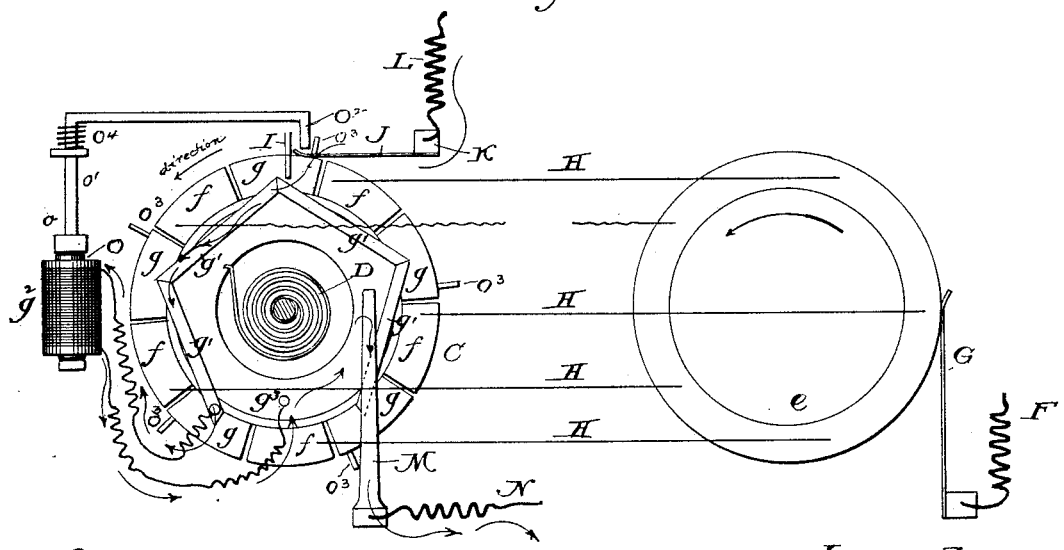


Fig. 5.



Witnesses:

N. M. Mortimer

N. R. Kennedy.

Inventor:

J. P. Freeman

By his Atty

Chas T. Dodge

UNITED STATES PATENT OFFICE.

JAMES P. FREEMAN, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF TWO-THIRDS TO MARVIN C. STONE AND PHILIP T. DODGE, OF SAME PLACE.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 458,656, dated September 1, 1891.

Application filed April 23, 1891. Serial No. 390,095. (No model.)

To all whom it may concern:

Be it known that I, JAMES P. FREEMAN, of Washington, in the District of Columbia, have invented a new and useful Improvement in Lightning-Arresters, of which the following is a specification.

My invention relates to improved means for protecting telephones and other electric instruments and apparatus from the injurious effects of lightning or other currents of high potential.

The special aims of the invention are to provide a simple and inexpensive device by which in the event of an abnormal current being received over the line the instrument will be automatically cut out of the circuit, the line grounded, the ground connection maintained during the continuance of the abnormal current, and thereafter the original connections re-established, so that the operative condition of the system is automatically restored as soon as the danger is passed.

It is also a special aim of my invention to secure the above-named results without introducing into the circuit any additional or variable resistance, such as would interfere with the proper operation of telephones or other sensitive instruments in series.

I employ in my instrument a series of independent fusible wires of platinum or similar material, which are brought one after another into use as a part of the normal or working circuit. I mount these wires on a rotary or other movable support actuated by a spring, so that when one wire is burned out, severing connection with the instrument and opening the circuit, the rotation of the support will bring the next wire into position to re-establish the circuit. I combine with this rotary carrier ground connections, so that after the fusing of one wire has released the carrier and before the latter has turned sufficiently to introduce the next wire into the circuit the ground connection will be established. In the ground line I locate an electro-magnet, which acts through intermediate parts to maintain the ground connection and to prevent the introduction of the next fusible wire into the circuit until the abnormal current has ceased.

In the accompanying drawings I have represented those details of construction which I recommend as the best embodiment of my invention to meet the ordinary conditions encountered in practice; but the skilled mechanic will understand after reading the specification that the invention is susceptible of embodiment in various forms of mechanical equivalents of that herein shown.

In the accompanying drawings, Figure 1 is a perspective view of my device in its normal condition. Fig. 2 is a vertical longitudinal section through the same on the line 2 2, Figs. 1 and 3. Fig. 3 is a transverse section on the line 3 3, Fig. 2. Fig. 4 is a diagram illustrating the circuit connections under the normal condition of the parts. Fig. 5 is a similar view showing the connections when the instrument is grounded.

Referring to the drawings, A represents a base-board, giving support to a rigid upright frame B of any suitable form, and C is a rotary barrel supported at its ends in the frame B by horizontal pivots *c* or equivalent supports.

D is a spring fixed at one end to the barrel and at the opposite end to the base. This spring is kept normally under tension and tends to turn the barrel in the direction indicated by the arrow. The barrel carries at one end an insulated conducting-ring *e* and at the opposite end a series of insulated conducting-segments *f g*, alternately arranged. The instrument is connected with the device through the conductor F, joined to a conducting-finger G, which bears constantly upon the ring *e*. This ring *e* is connected by a series of fusible wires H with the respective segments *f*, and the wire which is for the time being uppermost bears against a fixed non-conducting pin or stop I, which thus acts through the wire to prevent the rotation of the barrel. A conducting-finger J, bearing normally on the segment *f*, to which the uppermost or top wire H is attached, is in turn connected at its opposite end through post K with the line-

wire L, from which the current enters the device on its way to the instrument. It will be seen that in this the normal condition of the parts the current, entering from line L, passes by way of post K and finger J to segment *f*, thence through the top wire H to ring *e*, and out by way of finger G and wire F to the instrument. The intermediate segments *g*, which, it will be remembered, are insulated from the segments *f*, are connected with each other by conductors *g'*, which are in turn connected to one end of the magnet coil or helix g^2, located centrally in the barrel, the helix being in turn connected at its opposite end with the ring g^3, which is in constant contact with conducting-finger M, attached to the ground-wire N. These ground connections have normally no connection with the line. When, however, an abnormal current fuses the upper wire H, thereby cutting off the connection with the instrument and releasing the barrel, the barrel is rotated by the spring until the finger J contacts with one of the segments *g* and establishes a ground connection from the line L through segment *g*, connections *g'*, with a helix g^2, the ring g^3, finger M, and conductor N, the main line being thus grounded and the instrument at the same time wholly disconnected from the line. In order to maintain this ground connection until the cessation of the abnormal current, a magnetic core of soft iron O is inserted through the helix and with one end exposed adjacent to an armature *o* on the lower end of a pin *o'*, guided in the main frame and carrying a stop arm or pin o^2, designed to engage with pins o^3 on the segments *g*. When the ground connection is established so that the current is directed through the helix, the core, becoming magnetic, attracts the armature and causes the stop o^2 to descend in the path of the pins o^3, the effect of which is to arrest the rotation of the barrel in such positions as to maintain the contact of finger J with the grounding-segment *g*—in other words, to maintain the ground connection. When the abnormal current ceases, the spring o^4 lifts the stop o^2 out of action, leaving the barrel free to continue its rotation until the next wire H is brought into contact with the stop I and the connected segment *f* brought into contact with conductor J, the effect of which is to re-establish the original line connections and sever the ground connections.

It will be observed that the short-circuiting of the instrument is accompanied by the destruction of a single wire H, and that as there are a number of these wires to be brought into action one after another the device will operate for a long period of time without care or attention.

The essential features of my structure are a series of fusible conductors to be introduced one after another into the working circuit, combined with a carrier for said wires impelled by a spring or other motor, ground connections established by the advance of the carrier when released by the fusion of a wire, and a magnet in the ground-circuit to check the movement of the carrier until the current falls to its normal potential, and it will be obvious that the form and arrangement of the parts may be variously modified without changing their mode of action.

Having thus described my invention, what I claim is—

1. In combination with the main conductors, a spring-actuated carrier provided with a series of fusible wires arranged for successive introduction into the circuit by the movement of the carrier, a stop device co-operating with said wires to prevent the movement of the carrier, a ground connection opened and closed by the motion of the carrier, and electro-magnetic stop devices located in the ground-line to arrest the motion of the carrier during the continuance of the abnormal current on the ground.

2. The rotary barrel provided with the conducting-ring *e* and the insulated segments *f* *g*, in combination with the fusible wires H, impelling-spring D, stop I, main-line conductors G and J, the ground connection M, plate g^3, connected to the segments *g*, the electro-magnet, and the armature and stop device actuated by the magnet to prevent the rotation of the barrel.

3. In a lightning-arrester, the combination of a movable device for opening and closing the main circuit, a conductor through which the main line is grounded by the opening of the main circuit, and an electro-magnet in the unbroken ground-line to maintain the ground connection during the continuance of an abnormal current.

4. In a lightning-arrester, a spring-actuated device to open and close the main circuit, said device including fusible connections by which it is held and released, in combination with a conductor through which the line is grounded when opened, and electrically-actuated devices in the ground-line to maintain its connection and prevent the reclosing of the main line during the continuance of the abnormal current.

In testimony whereof I hereunto set my hand, this 18th day of April, 1891, in the presence of two attesting witnesses.

JAMES P. FREEMAN.

Witnesses:
W. R. KENNEDY,
HORACE A. DODGE.