A. OLESON.

LIGHTNING ARRESTER.

APPLICATION FILED AUG. 1, 1906.

907,866.

Patented Dec. 29, 1908.

2 SHEETS—SHEET 1.

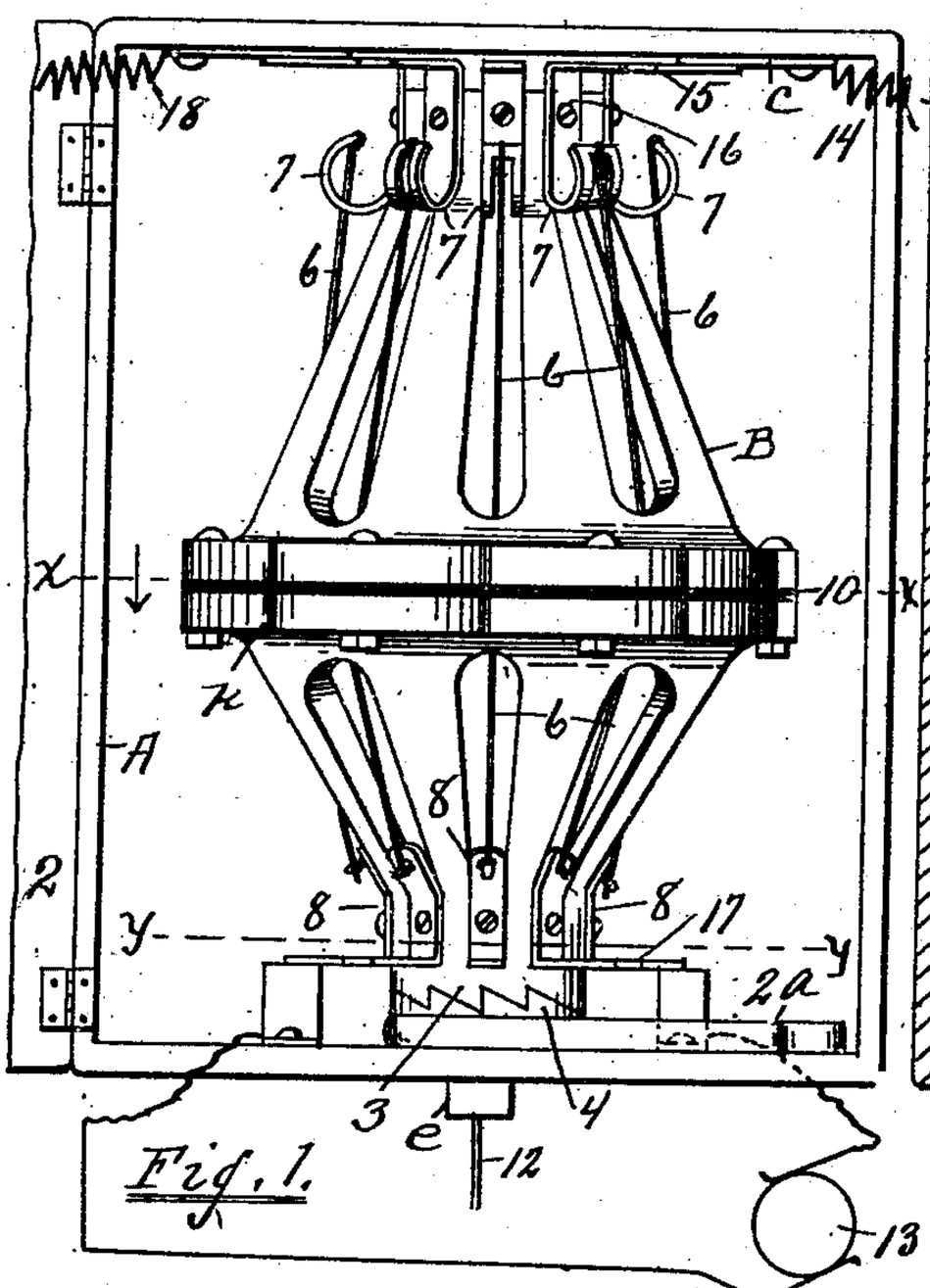

Fig. 1.

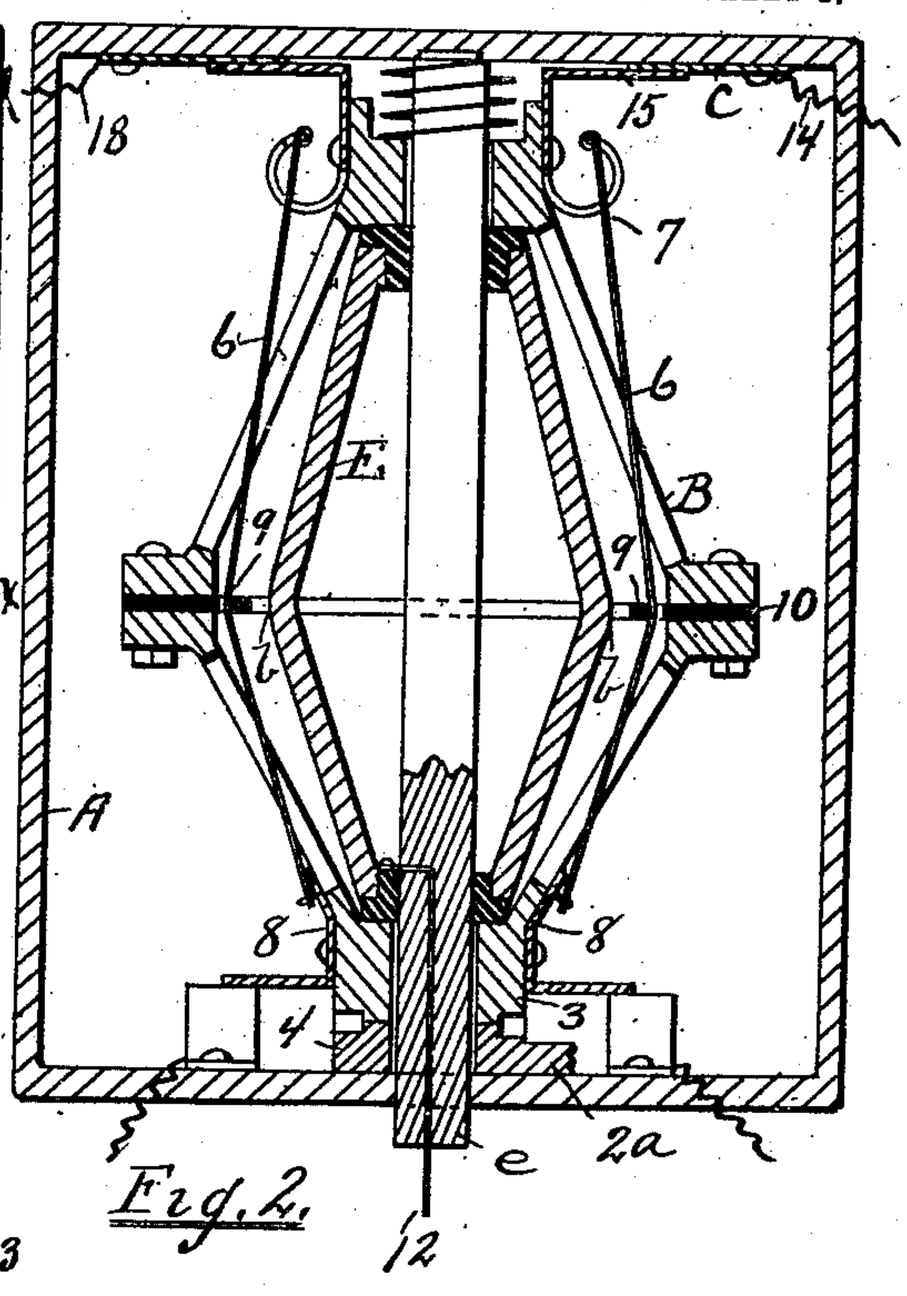

Fig. 2.

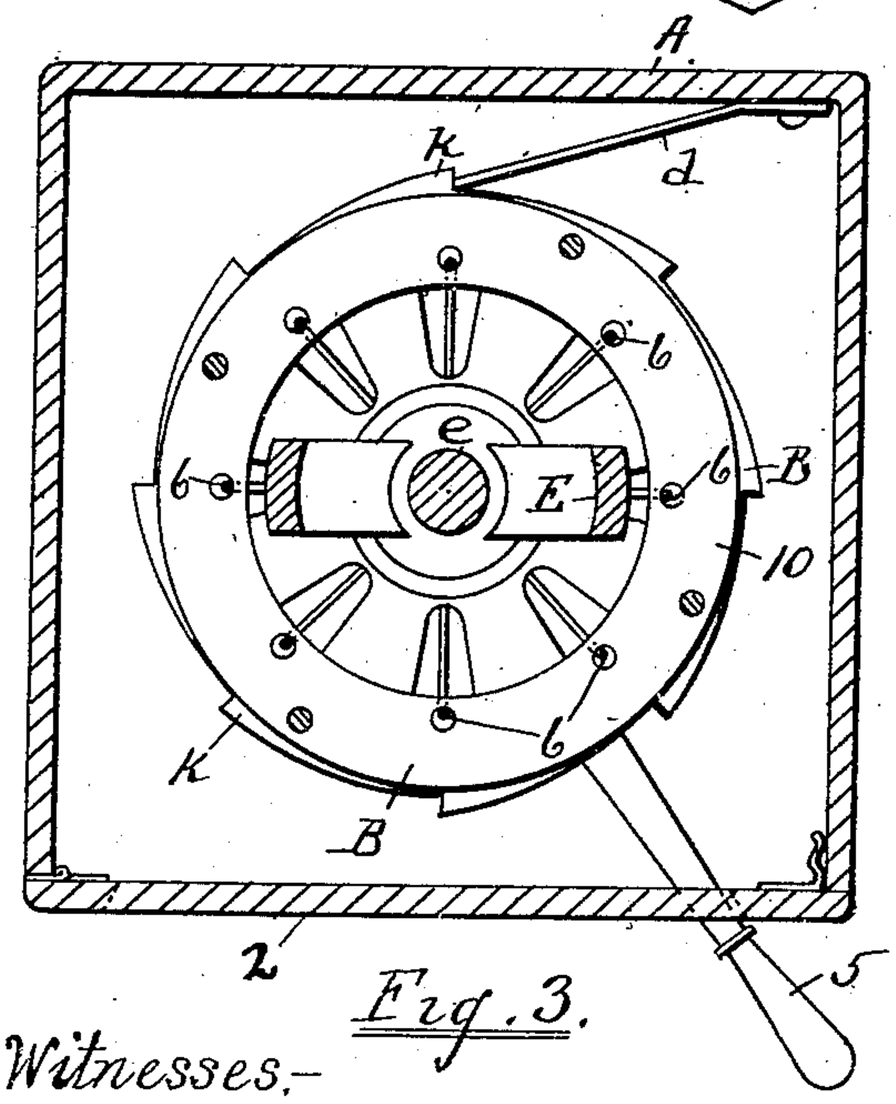

Fig. 3.

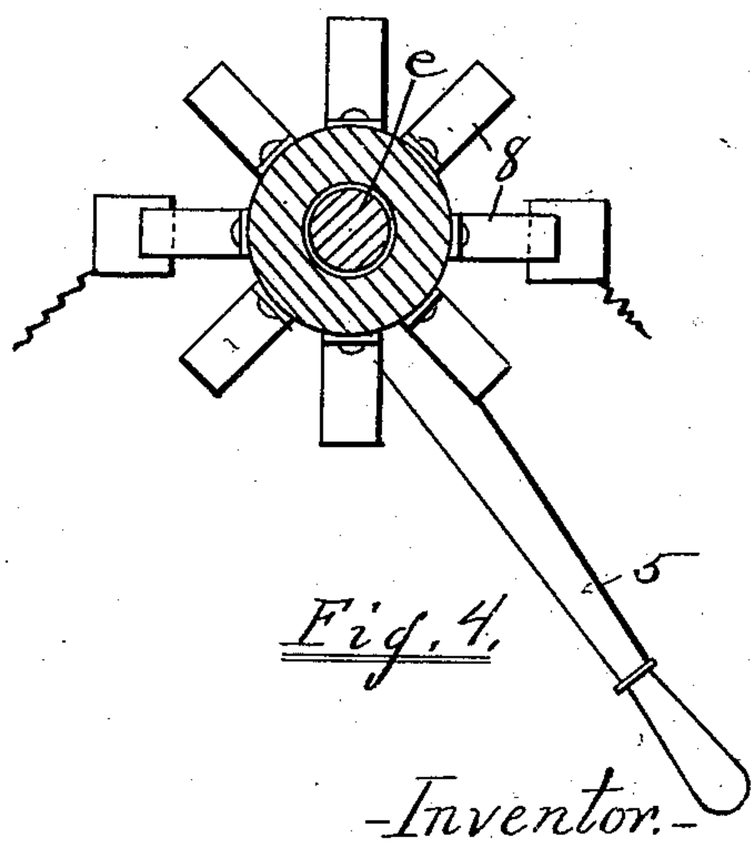

Fig. 4.

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2 SHEETS—SHEET 2.

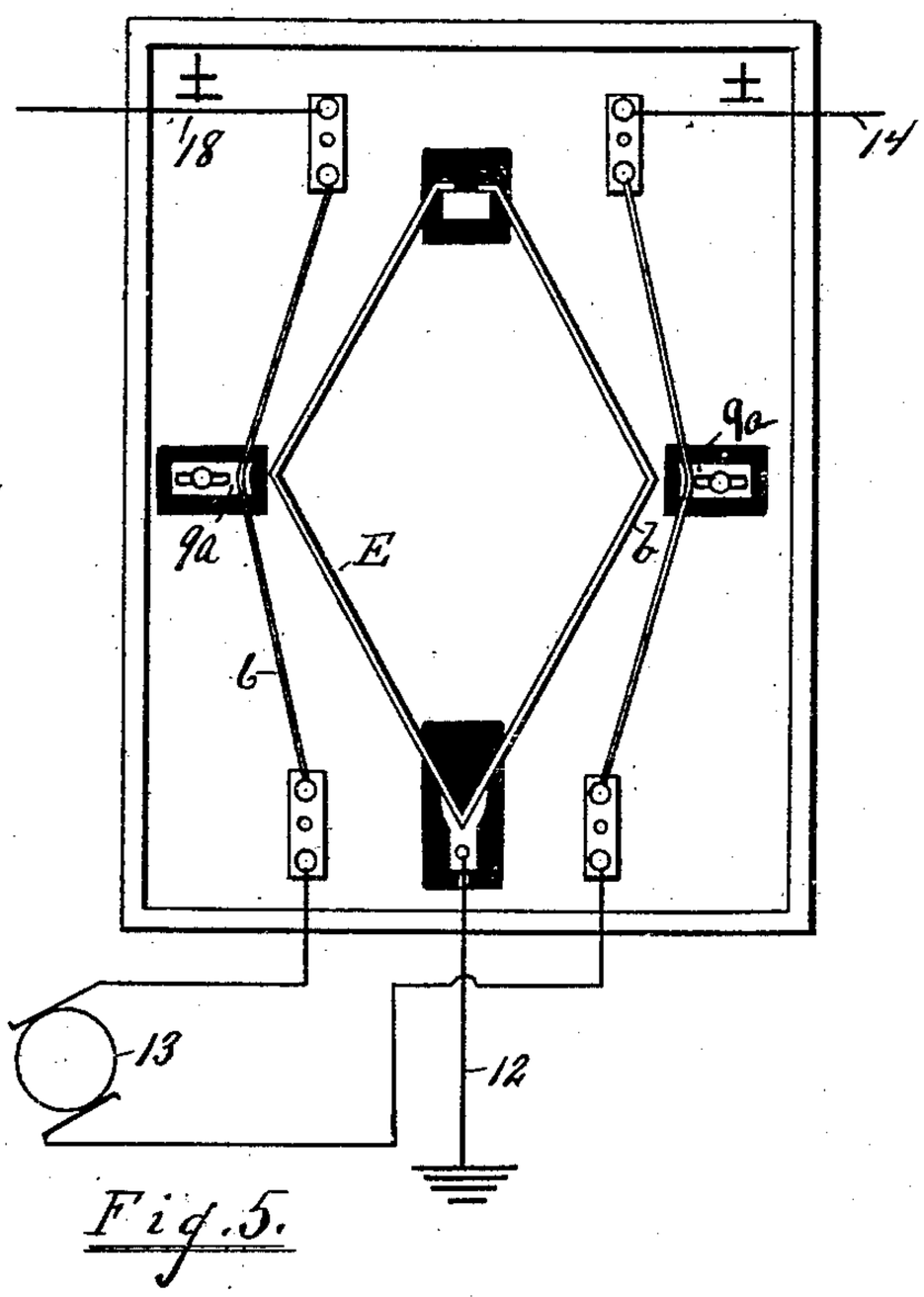

Fig. 5.

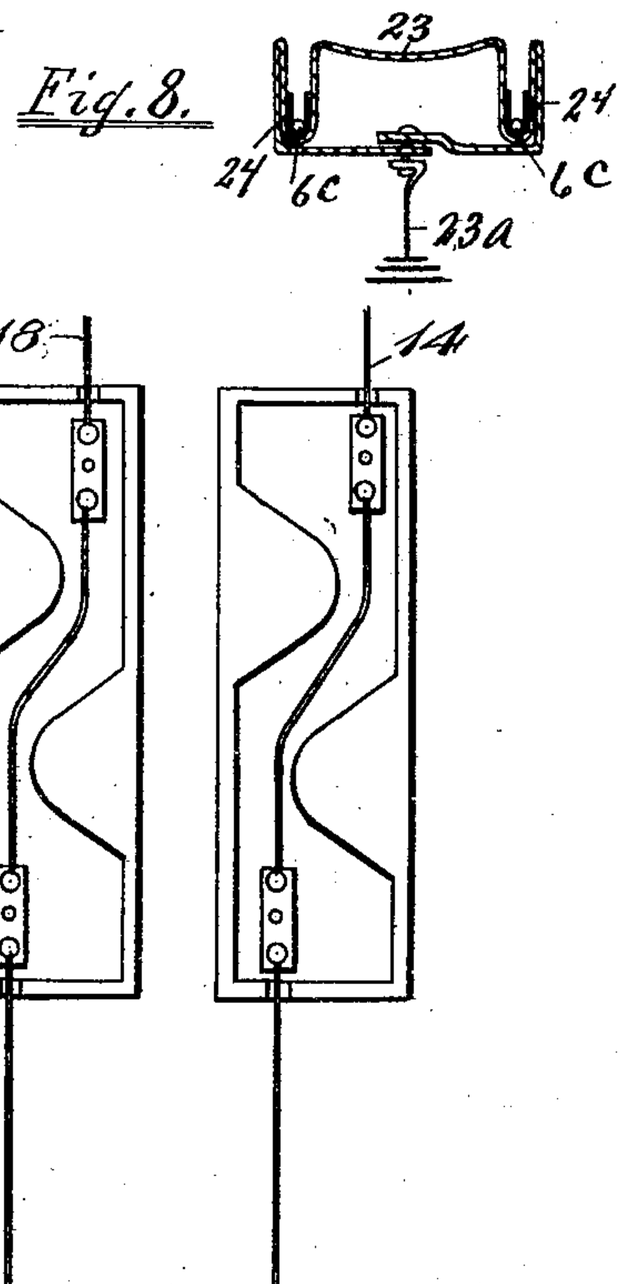

Fig. 8.

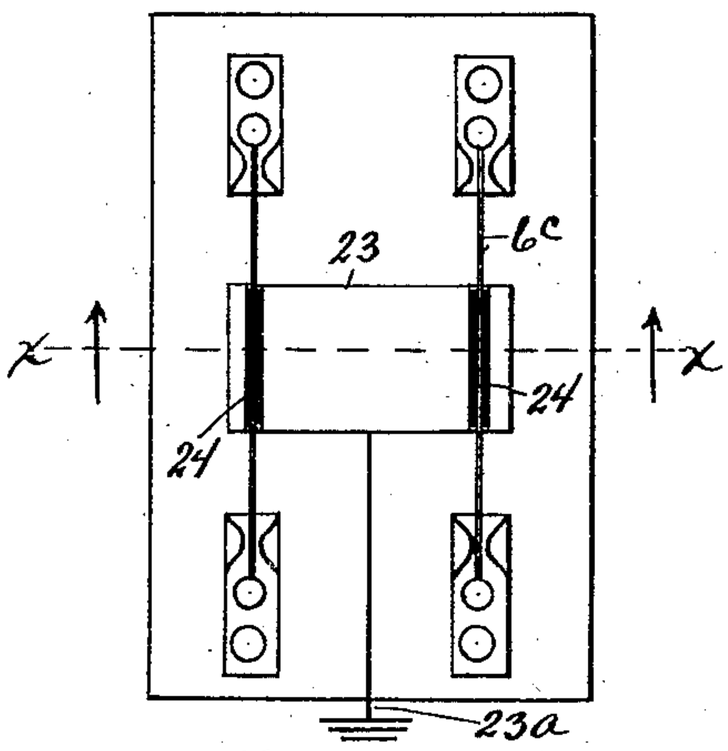

Fig. 7.

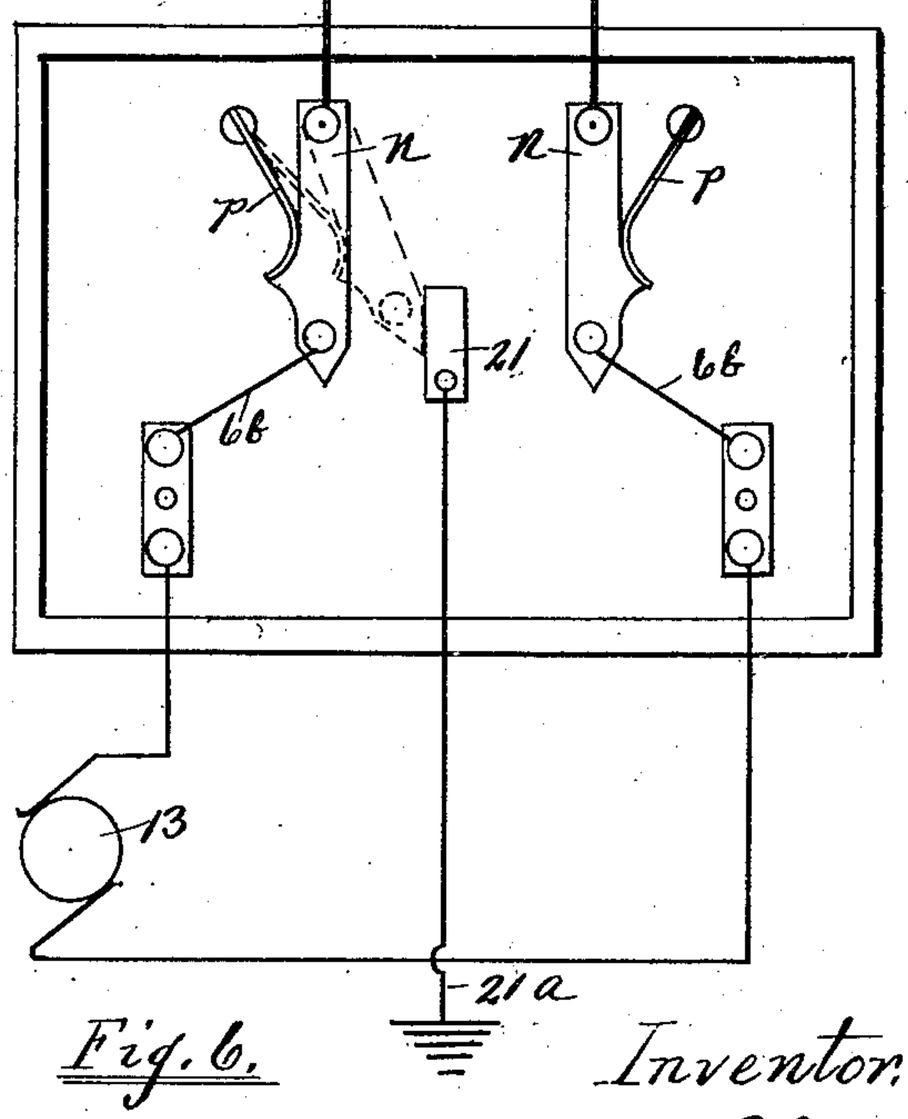

Fig. 6.

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UNITED STATES PATENT OFFICE.

ALBERT OLESON, OF TOLEDO, OHIO.

LIGHTNING-ARRESTER.

No. 907,866. Specification of Letters Patent. Patented Dec. 29, 1908.

Application filed August 1, 1906. Serial No. 328,674.

To all whom it may concern:

Be it known that I, ALBERT OLESON, who am a citizen of the United States, residing at Toledo, county of Lucas, State of Ohio, have invented a certain new and useful Improvement in Lightning-Arresters, and declare the following to be a full, clear, and exact description of the same, such as will enable others skilled in the art to which it pertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to lightning arresters, and has for its object an improved device by means of which an electric circuit may at all times be protected from the effects of an overcharge on the wire due to a bolt of lightning, without in any way diminishing the efficiency of the conducting circuit at times when there is no danger of this character imminent.

In the drawings:—Figure 1, is a front elevation of one form of the device. Fig. 2, is a sectional elevation from the same point of view. Fig. 3, is a plan along the line *x*—*x* of Fig. 1. Fig. 4, is a plan along the line *y*—*y* of Fig. 1. Fig. 5, is a diagrammatic elevation of the simplest type of the device, illustrating with equal clearness the principle of operation of either form. Fig. 6, is a plan of another modification. Fig. 7, is a plan of an arresting device especially adapted to use on telephone circuits. Fig. 8, is a section on the line *x*—*x* of Fig. 7.

The working principle of all of the types shown consists in the interposition in a direct line between the circuit terminals of a mass of metal of high conductivity, which has ground connections, while the fuse wire which normally carries the current is insulated from this part and caused, in some of the devices, to follow a devious path from one terminal to the other.

In the form illustrated in Figs. 1, 2, 3, and 4, A represents a containing box or casing, which may be attached to a convenient space on a wall, similarly to an electric current meter. Rotatably journaled therewithin is a spool or frame B, whose top is slightly and yieldingly spaced from the spring board C, which lies flush with the top of the box. The lower end of the spool is fashioned into ratchet teeth 3, which engage with a complementary pawl 4, which is actuated by lever 5, which, when the cover 2 of the box is closed, projects through a slotted or cut-away portion to permit convenient access. The spool is largest at its center and tapers at each end. Arranged circumferentially of each end of the spool are the brass terminals 7 and 8, respectively, for the fuse pieces 6, which, however, do not extend directly from any of the terminals 7 to the corresponding terminal 8, but are deflected and passed over intermediate shoulders 9, which are supported on an insulated ring 10, which is held within the large central part of the spool or frame B. Within the central cavity of the spool B, is located a diamond shaped frame E of copper, which is normally insulated from all the other parts except its ground wire 12; the base portion *e* of the copper frame is square, and, being fitted into a complementary hole in the bottom of the box, holds the copper diamond from being turned as the spool B is rotated. The electric current, which may be of either the direct or alternating type, is brought in over the wire 14 and passes through the terminal strip 15, in contact with which is some one of the brass feet 16 which constitute the upper ends of the various terminals 7. So long as there is no overcharge of current in the conductor, it passes on through that one of the fuse wires 6 which is in circuit, through the spring clip 17 at the bottom and through the dynamo 13, and the other portions of the working circuit, thence out through the corresponding terminals and fuse wires, to the outgoing wire 18. If, however, to the normal current strength is added the electrical stress of a lightning discharge, the path previously followed by the normal current is because of impedance due to the overload on the circuit and particularly the fuse wire, changed from the line of the fuse wire to the nearest projecting point that is in electrical connection with the earth, which is thus the electro-negative element in an abnormal state. The copper frame E is in this instance intentionally made the nearest point, and it is of course in direct communication with the earth and is itself of high conductivity, so that the tendency of lightning to follow the line of least resistance results in diverting the overcharge from the interior circuit and thus from the motor 13, whose burning-out it is desired to avoid. The same result would follow if the overcharge came in through the normally outgoing wire 18. When the disruption of either fuse wire 6 is thus accomplished, the interior por-

tion of the circuit, that is, that lying between the dynamo 13 and the inner terminals 8 of the protecting arrester, is left wholly without current, for whatever current is still projected toward the outer terminal 7, whose fuse wire 6 is now broken, is either brought to a complete stop, so far as its further flow is concerned, or is allowed to leak into the ground by means of the frame E and its ground wire 12. In any event, the inner circuit and the dynamo 13 are assured by the presence of the arrester that no further current will be passed through them until a current of proper degree, as regulated by the carrying capacity of the fuse wires 6 of a new set, is thrown into circuit, presumably when the overcharge in the outside circuit as well has been brought under control and reduced.

The arrester herein disclosed may be compared to a trap door along a walk or path which is designed for use only by persons of less than a certain weight; so long as only those persons cross it in their progress along the path nothing out of the way occurs, if, however, a person whose weight exceeds the established maximum steps thereon, the trap gives way, and the person dropped into whatever pit may be beneath it instead of being permitted to continue on his way along the path. If, after his fall, the jarring of the structure has not resulted in breaking the door and its connections, (whose corresponding part in this device is the fuse wire 6, either of the ingoing wire 14, or of the outgoing wire 18), the trap swings back to its place ready for the passage thereover of light weight persons, or for the trapping of the next overweight user—this being the corresponding step to the instantaneous and automatic cessation and subsidence of the lightning discharge. If the passage of the lightning discharge through the arrester has not resulted in a rupture of the fuse wire 6, almost instantaneously the normal current flow therethrough and through the interior part of the circuit and motor 13 is resumed. But if the fuse wire 6 has been melted as well, so that there is no longer a continuous and complete circuit leading to and from the motor 13 the lever 5 is moved from its normal position at the extreme right end of the slot in the cover 2 to the extreme left, which throws another fuse wire 6, set of terminals 7 and 8, and brass feet 16 into circuit, and the current then resumes its normal course through the interior circuit and motor 13. The lever is then returned to its former position, the spool being held from returning with it by the fixed pawl *d*, at the back of the box A, which engages the ratchet projections *k* on the periphery of the center portion of the spool B.

In the form illustrated in Fig. 5, the same principle of operation is employed, but the rotatable frame is omitted, the parts being attached to the wall or to a supporting board as shown, the fuse wire 6 being carried over the insulated clips 9^a. In this the immediate replacing of a fuse after the circuit has been burned out is necessary before the current can be restored. The device of Fig. 6 shows pivoted copper terminals *n* for the incoming and outgoing wires 14 and 18, which are pressed by leaf springs *p* and which are held by the fuse wire 6^b from being thereby forced over the intervening space to engaging contact with the copper piece 21, which has leading from it ground wire 21^a.

The device of Figs. 7 and 8 is particularly adapted for use on telephone circuits where the fuse wires need scarcely ever be at all large. Each fuse wire 6^c is attached to its two terminals, one above, and the other below, the copper piece 23, which, in this case, is not a solid diamond of copper, but a foliated device bent from sheet copper. Its cross sectional form is shown in Fig. 8, resembling a pair of U's, with a connection between them. In the looped portion of each extends, almost from one edge to the other of the copper piece 23, a U-shaped mica envelop 24, which, however, is brought to an end very slightly within each edge, as shown clearly in Fig. 7. Through each of these the fuse wires 6^c pass, being thus protected, so long as they remain intact, from the communication of the current which they may carry to the folds of the copper piece 23. When, however, even a comparatively slight excess of current is communicated from the external circuit to the fuses 6, and the circuit opened thereby, or in case the circuit suddenly receives a high static charge, as from a lightning discharge, a discharge will occur from some point on the fuse to the copper piece 23, which in this type is the equivalent of the copper frame E of the rotatable form of the device, and is thence conducted to the ground, so that the interior circuit, whose protection is desired, has deflected from it the current whose objectionable strength would have burned out the interior circuit.

What I claim is:—

1. In a lightning arrester, in combination with an electric circuit, a rotatable frame piece provided with a plurality of contact terminals at each end, fuse wires each leading from a terminal at one end of the frame to its companion terminal at the other end, the paths of said wires being deflected from that of a straight line therebetween, a conducting mass within said frame having portions extending to points directly between the terminals at one end of the frame and the complementary terminals at the other end, and a ground wire leading therefrom, substantially as described.

2. In a lightning arrester, in combination with an electric circuit, a pair of fuse wires connecting separated terminal portions there-

of and traversing other than a direct line therebetween, and a mass of high conductivity connected with the ground located between said terminal portions and adapted to receive and carry away a current upon the rupture of one of said fuse wires, substantially as described.

3. In combination with an electric circuit, a fuse wire connecting terminals thereof, said wire being bent and traversing other than a straight line between said terminals, and a conducting mass having a portion lying in a direct line between said terminals though spaced therefrom and from said fuse, adapted to receive and carry away an overcharge of current upon the rupturing of said fuse wire, substantially as described.

4. In combination with an electric circuit, fuse wires inserted between terminals of both the positive and negative portions of the circuit, said wires traversing a roundabout path between the terminals, and an interposed member of high conductivity and normally spaced from said fuses and the terminals whereby upon the rupturing of either fuse the overcharging current is diverted from the circuit, substantially as described.

5. In a lightning arrester, in combination with an electric circuit, a rotatable spool provided with a plurality of terminals some set of which is normally in contact with portions of said circuit, fuse wires stretched between the terminals on said spool but held from a position of directness therebetween, and a metallic mass provided with a ground wire located within said spool and with a portion lying directly between the terminals, adapted to receive the current and carry the same away through its ground connections upon the rupturing of the fuse, substantially as described.

In testimony whereof, I sign this specification in the presence of two witnesses.

ALBERT OLESON.

Witnesses:
WILLIAM M. SWAN,
C. C. JENNINGS.