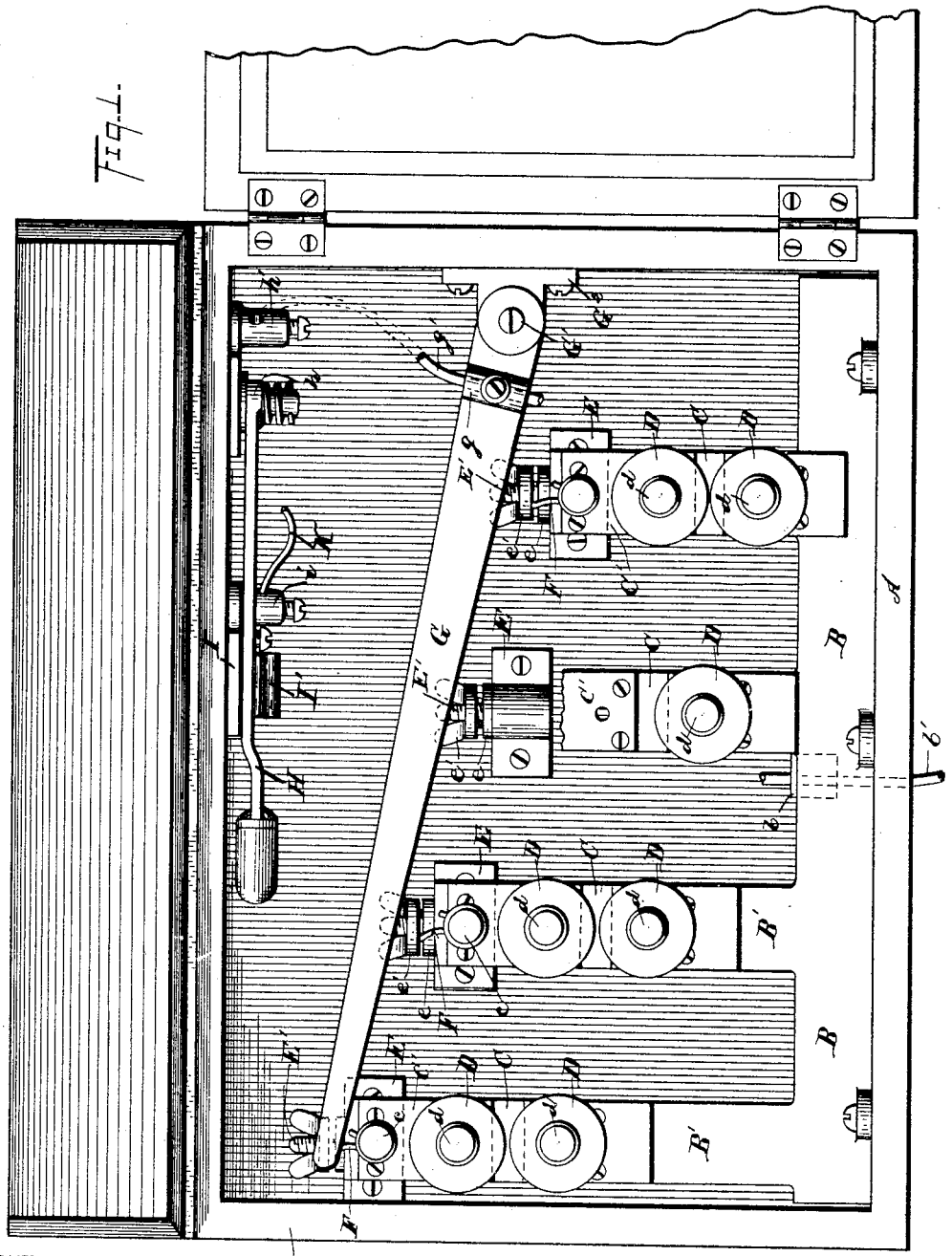
(No Model.) 3 Sheets—Sheet 1.

F. MANSFIELD & C. W. WASON.

LIGHTNING ARRESTER.

No. 455,223. Patented June 30, 1891.

Fig. 1.



Witnesses.
Bell S. Louis
C. H. Wason

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Attorneys.

(No Model.) 3 Sheets—Sheet 2.

F. MANSFIELD & C. W. WASON.

LIGHTNING ARRESTER.

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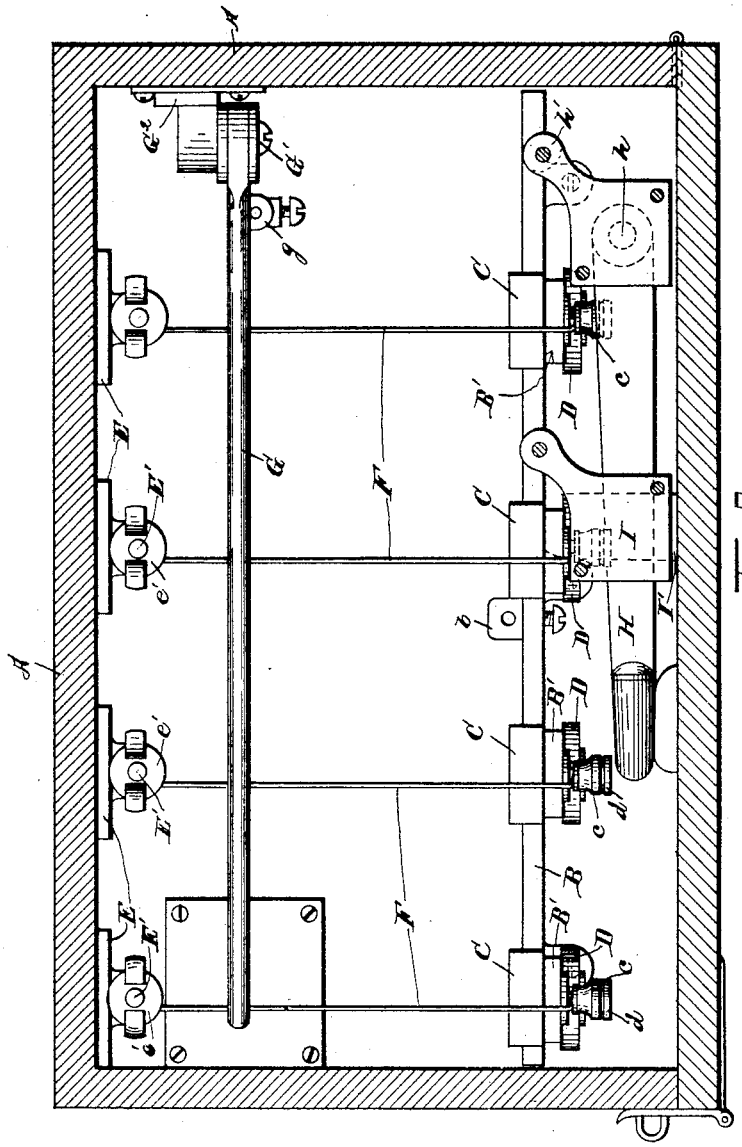

Fig. 2.

Witnesses.
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(No Model.) 3 Sheets—Sheet 3.

F. MANSFIELD & C. W. WASON.

LIGHTNING ARRESTER.

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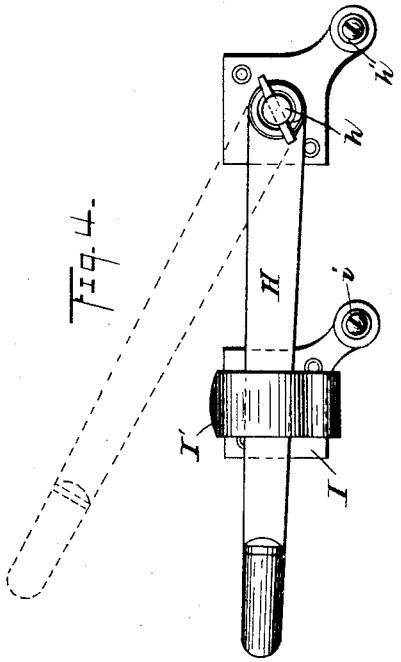

Fig. 4.

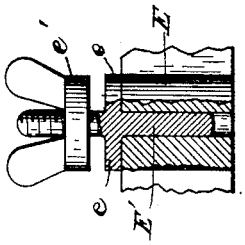

Fig. 5.

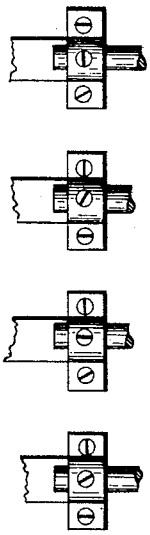

Fig. 6.

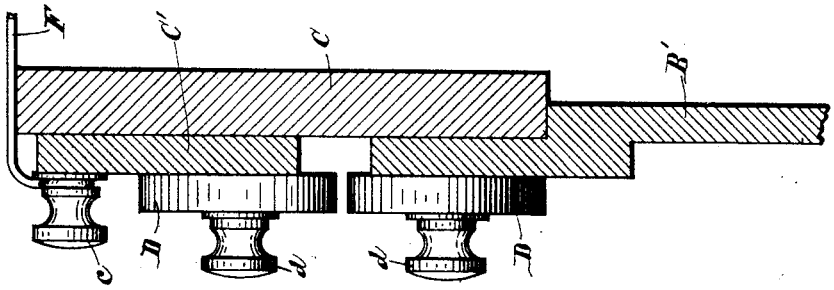

Fig. 3.

Witnesses.
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UNITED STATES PATENT OFFICE.

FRANK MANSFIELD AND CHARLES W. WASON, OF CLEVELAND, OHIO.

LIGHTNING-ARRESTER.

SPECIFICATION forming part of Letters Patent No. 455,223, dated June 30, 1891.

Application filed July 22, 1890. Serial No. 359,534. (No model.)

To all whom it may concern:

Be it known that we, FRANK MANSFIELD and CHARLES W. WASON, of Cleveland, in the county of Cuyahoga and State of Ohio, have invented certain new and useful Improvements in Lightning-Arresters; and we do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

Our invention relates to improvements in automatic lightning-arresters, designed more especially for electric railways; and it consists in certain features of construction and in combination of parts hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a front side elevation. Fig. 2 is a plan. Fig. 3 is an enlarged elevation in section in detail. Fig. 4 is an enlarged bottom plan of the switch mechanism. Fig. 5 is a detail, partly in section, of a binding-post of peculiar construction. Fig. 6 is an elevation showing a modification.

A represents a box or casing constructed, usually, of wood, or in place of wood constructed of other suitable material that is a poor conductor of electricity, wood being preferable on account of its cheapness. This box and contents, hereinafter described, constitutes an automatic lightning-arrester, and these may be placed in the power-house and are distributed along the line wherever it is considered necessary, and such boxes may be fastened, for instance, to the poles that support the electric wires, or may be fastened to other stable supports that may be at hand. Each electric car or motor is supposed to be provided with one of these lightning-arresters, the same being located, usually, under one of the car-seats or wherever it will be most out of the way and at the same time accessible for adjustment, repairs, &c.

B is a metal plate constructed, usually, of brass, this plate being shown secured to the front lower edge of box A. Plate B has a series of upwardly-projecting integral arms B′, and the plate has also a binder of some kind—for instance, as shown at *b*—for attaching ground-wire *b*′.

C C C are strips or bars of wood or other insulating material, shown rigidly secured to the rear or inner face of the respective arms B′, and to the front side of each bar C is attached a metal plate C′, the latter being constructed, usually, of brass and having a binder *c* for attaching a wire or so-called "safety-strip" F. With such construction each bar B′ has an opposing plate C′, such bar and plate being separated a short distance from each other and insulated by means of the connecting-strip C. To each plate C′ and to each arm B′ is attached a disk D, preferably of carbon. These disks have central holes in which fit nicely the screws or bolts *d*, that secure the disks in place. The disks, when in position, are slightly separated, so as to leave a space between opposing disks, and whenever the opposing surfaces of the disks are wasted away or warped by use the securing-screws may be loosened and the disks turned more or less on their axes to bring new surfaces of the disks opposite each other.

E E represent slight brackets fastened, respectively, to the rear wall of box A, approximately opposite the respective binding-posts *c* aforesaid. Each bracket E has a vertical hole for receiving with an easy fit pin E′. These pins are provided with flange *e* and thumb-nut *e*′, a flange and thumb-screw constituting a binder for fastening the rear end of wires F aforesaid. The removable plugs E′ are not essential, as any suitable binding device for securing the rear end of the safety-strip F will answer the purpose; but where the lightning-arresters are located—for instance, in places where these binders cannot be seen—it is very convenient to remove the plugs and attach the safety-strips and then return the plugs to their places.

G is a gravity-lever constructed, usually, of brass and pivoted at G′ to bracket G², the latter being fastened, as shown, to one end of the box A. This lever has a binder—for instance, as shown at *g*—for attaching wires *g*′.

It will be observed that wires F are at different elevations, so that lever G can only engage one wire at a time, this lever being shown resting on the upper or left-hand wire F. If, therefore, the left-hand wire were removed or broken, the lever would fall by gravity onto the next lower wire, and so on throughout the series.

H is a switch-lever pivoted at *h*, the pivotal bearing thereof being electrically connected with binding-post *h'*, from whence leads wire *g'* to binder *g* aforesaid.

I is a contact-block for engaging the lever, having attached a spring I' for bearing against the under side of the lever for holding the lever in contact with the block. Block I is electrically connected with binding-post *i*, from whence leads wire K, that is supposed to connect with the electric-wire system of the road. In case the lightning-arrester is located on a car, wire *b'* is usually connected with one of the car-axles. By opening this switch the lightning-arrester is entirely cut out, so that it is safe to repair or manipulate the mechanism thereof. By closing the switch the circuit is closed, including the lightning-arrester. In case the lightning-arrester is located along the line, wire K may connect with any of the electric wires of the system—for instance, with the trolley-wire or with the feed-wire—and wire *b'* may connect with the ground, or, still better, with a fire-plug or water-pipe, if such be at hand. The space between disks D D is sufficient to prevent the passage of the normal or volume current that operates the motor, by reason of this current being low in intensity or pressure. The lightning-current, as is well-known, is extremely high in intensity or pressure, by reason of which the lightning-current will readily pass such a space, and having jumped the arc the normal current would follow were it not that the safety-strip F, that for the time being serves as a conductor, becomes instantly fused and separated, so that the circuit is broken and lever G falls from the next wire, of course, after the lightning-current has passed, thus presenting another space in condition for disposing of another lightning-current. The old adage that lightning never strikes twice in a place does not apply to electric railways having, perhaps, many miles of electric wires exposed and more or less attracting the lightning-current; hence the provision for disposing of several lightning-strokes that might occur during one thunder-storm. The lightning-current in passing disks D D is likely to warp or mutilate the opposing edges thereof, and when this occurs these disks are turned on their axes (more or less) to present new surfaces, and hence these blocks may be used for some time or until the entire periphery thereof has become mutilated or out of shape. After each thunder-storm the different lightning-arresters should be looked after. Such of disks D as have seen service should be readjusted, if need be, or new disks supplied, and new safety-strips F should be substituted to take the place of such as have been melted asunder.

Box A, for obvious reasons, had better be lined with sheets of asbestus or other fireproof and non-conducting material. Plate B, with its several arms B', together with wire *b*, constitutes a ground connection having several branches, either of which branch may, in turn, by the co-operation of gravity-lever G, be connected in the circuit and utilized for conducting the lightning-current to the ground. The apparatus shown has four such branches; but the number may be increased indefinitely, if desired. Various modifications may be had without departing from the spirit and purpose of our invention. For instance, it is evident that if the several members B' were not electrically connected, but were, for instance, made separate, each member might have its own individual ground-wire. This would involve considerable extra expense and trouble in providing and keeping in repair so many ground connections, each of which must of course connect electrically with the car-axle or other portion of the running-gear to complete such ground connection.

What we claim is—

1. A lightning-arrester comprising a ground connection having a series of branches, each branch having a so-called "safety-strip" connected therewith, and intervening space incapable of permitting the passage of a normal current, substantially as indicated, of a gravity-lever electrically connected with the electric-wire system, such gravity-lever being adapted to rest successively on the different safety-strips, each safety-strip in turn serving as a stop to limit the descent of the gravity-lever, substantially as set forth.

2. The combination, with a series of ground connections, each provided with a safety-strip included in a normally-open circuit, substantially as indicated, of a gravity-lever electrically connected with the electric-wire system, such gravity-lever being adapted to successively engage and rest on the different safety-strips, substantially as set forth.

3. The combination, with a series of ground connections, each provided with a strip of fusible metal, each strip being fastened at the one end or removable binding-post, said ground connections being included in normally-open circuits, of a gravity-lever connected with the overhead-wire system, said gravity-lever being adapted to successively

rest on the fusible strips, substantially as set forth.

4. The combination, with a series of ground connections, each provided with a safety-strip and included in a normally-open circuit, of a gravity-lever adapted to rest successively on the different safety-strips, and a switch adapted to cut out from the wire system the said gravity-lever and fusible strips, substantially as set forth.

In testimony whereof we sign this specication, in the presence of two witnesses, respectively the 27th day of September, 1889, and 11th day of February, 1890.

FRANK MANSFIELD.
CHARLES W. WASON.

Witnesses to signature of Frank Mansfield:
C. E. KEACH,
C. BAKER.
Witnesses to signature of Chas. W. Wason:
C. H. DORER,
WARD HOOVER.