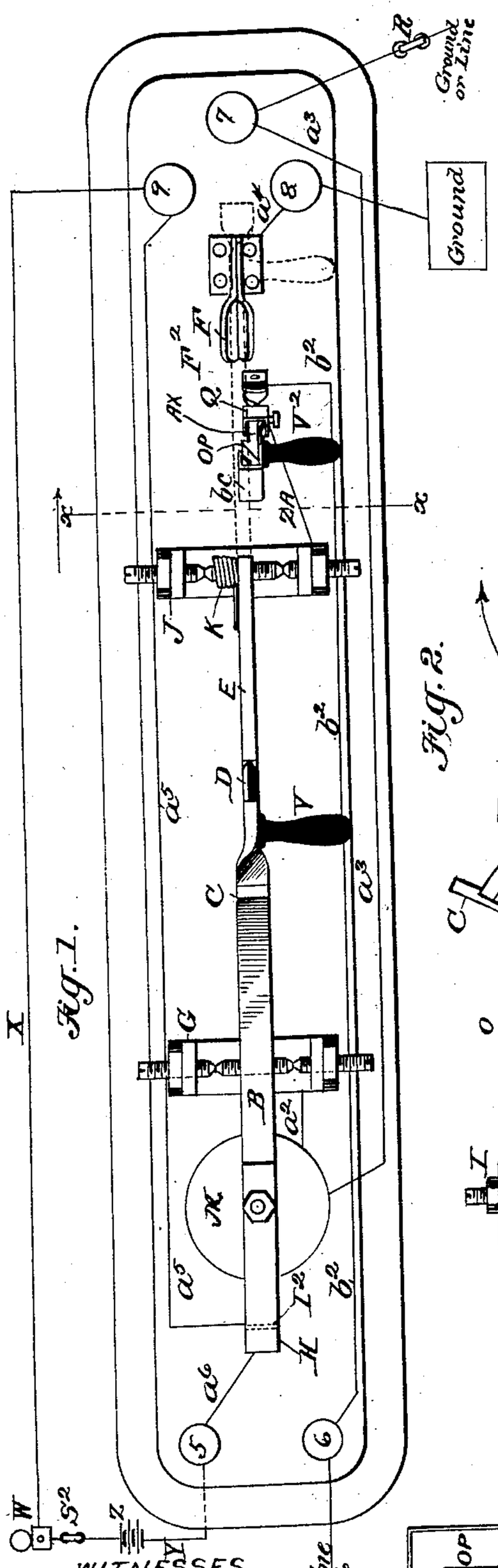
(No Model.)

M. R. HUTCHISON.

LIGHTNING AND HEAVY CURRENT ARRESTER AND ALARM.

No. 549,794. Patented Nov. 12, 1895.



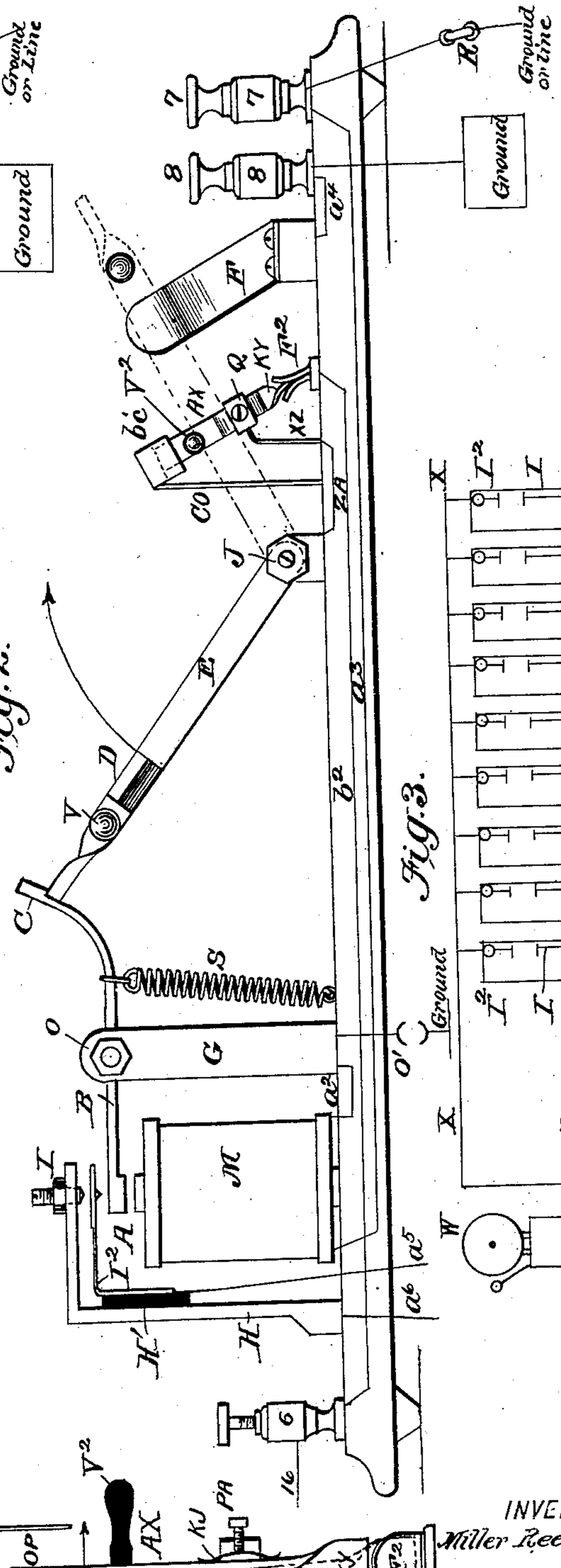


Fig. 3.

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LIGHTNING AND HEAVY-CURRENT ARRESTER AND ALARM.

SPECIFICATION forming part of Letters Patent No. 549,794, dated November 12, 1895.

Application filed May 25, 1895. Serial No. 550,648. (No model.)

To all whom it may concern:

Be it known that I, MILLER REESE HUTCHISON, of Mobile, in the county of Mobile and State of Alabama, have invented a new and useful Improvement in Lightning and Heavy-Current Arresters and Alarms, of which the following is a specification.

My invention is designed to provide an improved lightning and heavy-current arrester, charge-grounder, open-circuit alarm, and automatic live-wire tester, and is intended to protect telegraph, telephone, fire-alarm, call-bell, and all low-potential instruments that are liable to damage from lightning and live wires, to give notice by an alarm-bell of the passage of such heavy current over the line, and to determine whether the charge is due to a temporary stroke of lightning or a continuing and dangerous current from a live wire of high potential.

It consists in the peculiar construction and arrangement of the apparatus and circuits, which I will now proceed to fully describe with reference to the drawings, in which—

Figure 1 is a plan view of the instrument shown in connection with its circuits. Fig. 2 is a side elevation of the same. Fig. 3 is a diagram showing how a number of the instruments are arranged in a single-alarm circuit, and Fig. 4 is an enlarged view of the switch-bar AX, taken on line $x\,x$ of Fig. 1 and looking in the direction of the arrow on this figure.

When a large number of these instruments are used, they will be placed in a vertical position with the left-hand end of Figs. 1 and 2 at the top on a suitable switch-board.

The ordinary line-current enters over wire 16 at binding-post 6, and thence passes by wire b^2 into jaws F^2, through bar AX (which is in metallic contact with F^2) into the support Q, and thence through upright X Z and wire ZA into the metal bearing J. Passing through the metal shunt-bar E it enters the frame G through connection of bar E and lever B at C. Passing from G it enters magnet M whose bottom end of wire a^2 is in metallic contact with G. Passing through M it does not generate sufficient energy to overcome the tension of spiral spring S, Fig. 2, which tends to pull downward on end C of lever B. Passing from M through wire a^3 to binding-post 7 it goes through the relay R and out again to the ground if an end station, or through a similar instrument if an intermediate station; but when a live wire or heavy charge of lightning strikes line-wire sufficient magnetism is induced in M to attract armature A until end C of lever B rises high enough to free shunt-bar E from catch at C. As soon as liberated, shunt-bar E is forced by spiral spring K, Fig. 1, in direction of arrow, Fig. 2, until knife-edge D is set firmly between spring jaws F, as shown in dotted lines. The elasticity of these jaws makes a firm electrical connection without rebound and also prevents the surfaces from being battered up by repeated blows. Jaws F thus form a shunt-bar support and holder and are connected through wire a^4 with binding-post 8 and thence to the ground, so that when E is liberated and falls upon F the charge from E is grounded and magnet M is entirely cut out of charged circuit. Now as soon as bar E is liberated from catch C magnet M ceases to act and spring S forces end A of B firmly against a flat spring I^2, which is mounted upon the side of a standard H but is insulated therefrom by a block of hard rubber H′. When the end A of lever B is raised it lifts spring I^2 into contact with an adjusting-screw I in the standard H, and as these two parts I and I^2 are made the terminals of a bell-circuit, an alarm is sounded.

Attached to standard H, which supports screw I, is a wire a^6, leading through binding-post 5 to circuit-wire Y, battery Z, sounder S^2, and through an alarm-bell W and circuit-wire X, binding-post 9, and wire a^5 to the terminal circuit-wire I^2, Fig. 2. So when spring I^2 touches screw I the bell-circuit is completed and the alarm rings continuously until instrument is reset, thereby preventing line from remaining open any length of time.

To reset, the operator grasps rubber handle V of bar E and pulls E over until the end is caught by the catch C of lever B; but in case the cause is a live wire as soon as the operator attempts to reset the instrument without in some way cutting off the current before it gets to bearing J, then when arm E touches B at C, the circuit being completed, the high-potential current would burn out the magnet M before he could turn loose handle V, so as

a precaution against this the circuit is opened automatically in the following way:

In Figs. 2 and 4 AX is a straight bar with the beveled catch OP at one end and the twist KY at the other end. It is flat, about one-fourth of an inch wide and about three-thirty-seconds of an inch thick. If desired, catch OP can be bent in AX to avoid casting. Near the middle of AX, Fig. 4, there is a friction-spring KJ, extending about one-half an inch downward on AX. KI is another friction-spring fastened to hollow support Q, which tends when AX is in support Q to press AX firmly against friction-spring KJ and thence against set-screw PA in the other side of Q. This arrangement allows of the raising and lowering of AX and of an oscillating motion of same.

ZP, Fig. 4, is a hook-shaped flange formed on a hollow frame *b c*, sustained upon a supporting-standard CO, Fig. 2. V^2 is a hard-rubber handle on AX, by which it is manipulated. KY is the lower end of AX, Fig. 4, twisted and having a knife-edge on its lower end. XZ is a standard holding support Q. F^2 are jaws to receive and press firmly against end KY of bar AX.

When lever E falls upon jaws F, then AX is so arranged that the lever E will pass by the catch OP on AX. When the instrument is reset by the operator, as E is raised its upper edge will catch against OP, and AX is also raised, breaking contact with jaws F^2, and thereby opening the circuit between F^2 and Q; but when AX is carried to the proper distance the flange ZP, Fig. 4, of hollow frame *b c* comes in contact with OP and pulls AX from E, and thereby allows E to be carried on over to B. Friction-springs KI and KJ of support Q prevent AX from again coming in contact with F^2 until the operator closes the switch with his hand by taking hold of rubber handle V^2 and forcing down bar AX, when (if live wire is still on) arm E will again break connection without harm to the instrument.

From the foregoing it will be seen that the bar AX is in function a drag-switch, operated automatically to open the circuit between F^2 and KY by the resetting of the shunt-bar E, which latter in the resetting movement strikes against the shoulder at the bottom of catch OP on bar AX, as shown by dotted lines in Fig. 4, and as the shunt-bar E rises it lifts the drag-switch AX to first break the circuit at F^2, and as bar E carries AX higher the bevel face of catch OP strikes against the stationary incline ZP, and is thereby forced laterally away from and off of the bar E, as shown in full lines in Fig. 4, leaving drag-switch AX open and suspended by the springs KI and KJ until the bar E is carried farther up and over to engagement with catch C. The advantage of the automatic drag-switch AX is as follows: If there were a continuing heavy current on the line and there were no drag-switch AX, but the circuit was directly made with E, then if the current were closed by the hand of the operator bringing E into engagement with C the heavy current would be thrown through the magnet as before, but the operator could not let go of the bar E quickly enough to avoid burning out the magnet. With the drag-switch AX in circuit, it will be seen that there is no current on bar E when reset to C by the operator, and not until the circuit is reformed by adjusting drag-switch AX downwardly by hand, and then if the heavy current is still on the bar E quickly and sensitively parts from catch C without being encumbered and retarded by the hand of the operator. The automatic lifting of drag-switch AX by bar E insures the result without involving an act of memory on the part of the operator, so that no burning out of the magnet can occur from forgetfulness in making the proper adjustments.

To keep the bell from ringing until the live wire is removed the switch-bar AX is opened, the instrument reset, and switch left open, thereby breaking the alarm-circuit and stopping the bell from ringing.

For switch-board use, or where more than one instrument is used, the instruments may be put upon the board or table and the bell connections arranged so that all of the instruments will be in parallel with the two bell-wires, so the alarm will be rung from any one of the instruments, as shown in Fig. 3. In this figure, I and I^2 represent the terminals of the bell-circuit in each instrument, and X and Y are the two bell-wires. All the I's are connected with Y and all the I^2's are connected with X.

Leading from the frame G, Fig. 2, a wire is connected to an ordinary plug cut-out, as shown at O′, Fig. 2, and when one end of the operator's line is cut out by a live-wire contact he can work the other end by grounding the current from the other end with a connecting-plug, or on the end of the base of the instrument could be attached a switch, which, when closed, would carry the ordinary current, but which, opened when switch AX is, would plug out the live-wire end and ground the current from the other end. Either would do, but the plug cut-out is the more reliable of the two.

The magnet is wound with No. 32 insulated copper wire. The metal-working parts are either of brass, iron, or steel, (or other suitable metal.) All the bearings are provided with needle-point set-screws.

I make no claim to the principle of breaking the circuit through magnet M by the arm E and the lever B, but I am not aware that this has ever been combined with the bell-alarm as attached to the instrument in the manner described. The grounding of the charge in the way described and the means for automatically testing for the live wire are also features of my invention.