

M. G. FARMER.

Apparatus for Firing Fuses by Electricity.

No. 148,289.

Patented March 10, 1874.

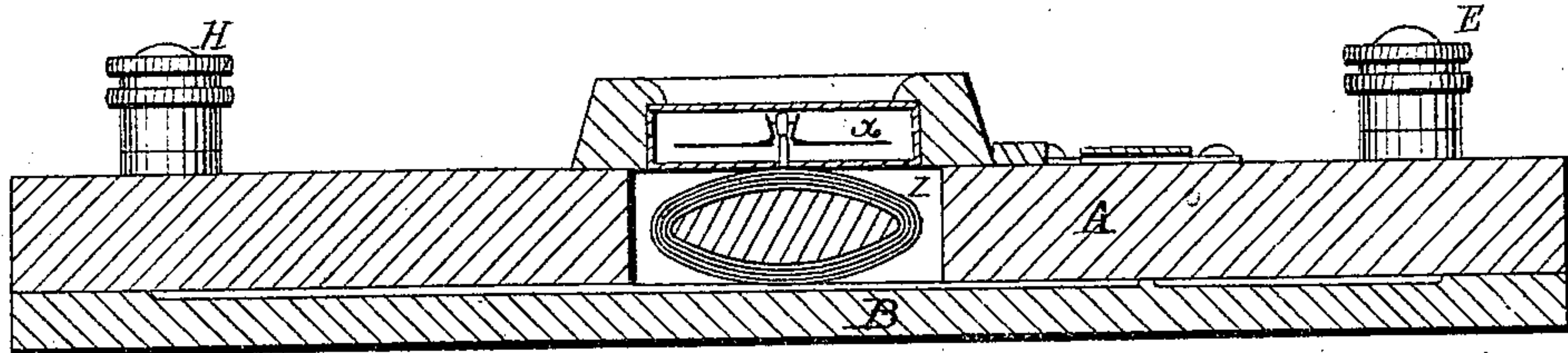


FIG. 3.

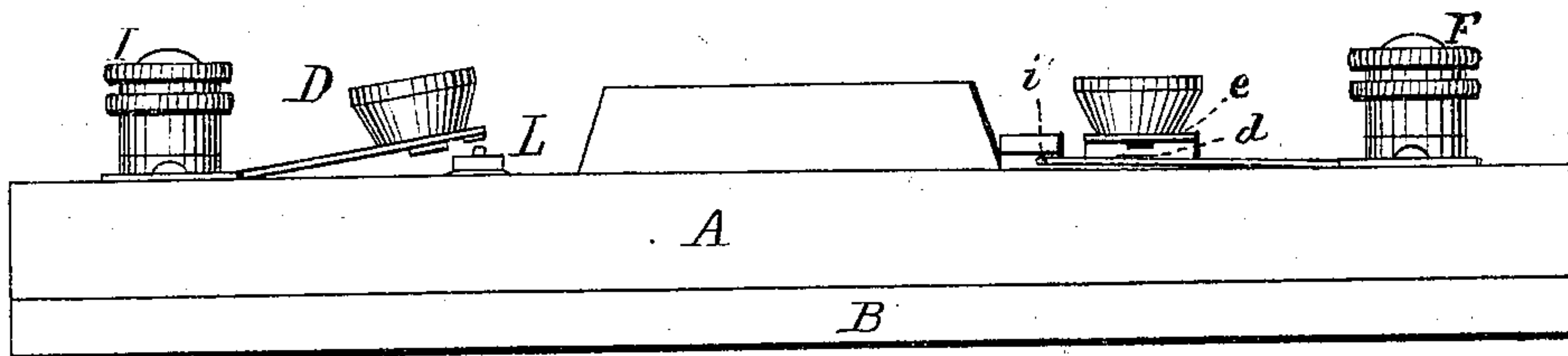


FIG. 2.

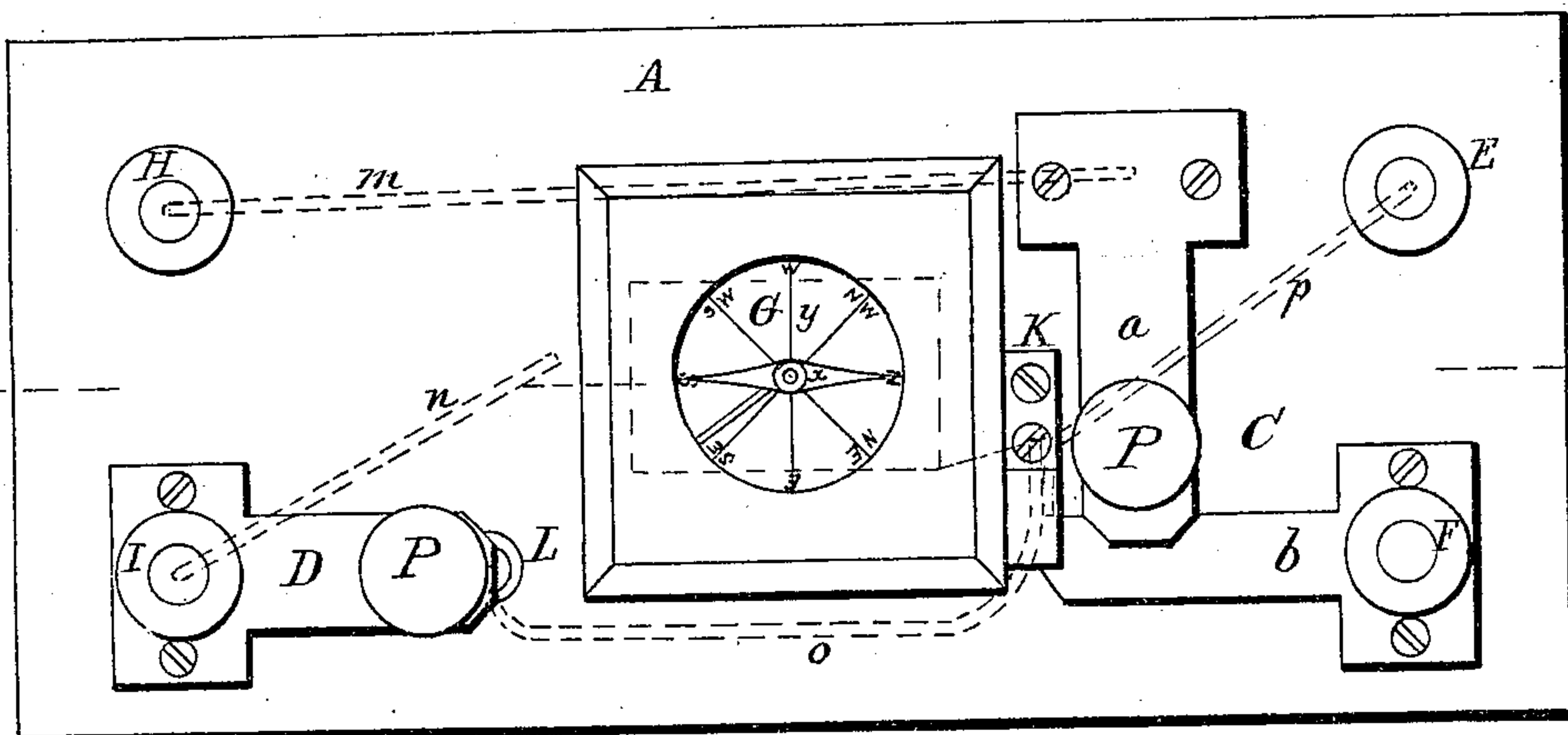


FIG. 1.

WITNESSES.

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## IMPROVEMENT IN APPARATUS FOR FIRING FUSES BY ELECTRICITY.

Specification forming part of Letters Patent No. **148,289**, dated March 10, 1874; application filed June 21, 1873.

*To all whom it may concern:*

Be it known that I, MOSES G. FARMER, of Salem, in the county of Essex, State of Massachusetts, have invented a new and useful Improvement in Apparatus for Firing Fuses by Electricity, of which the following is a specification:

The object of this invention is, first, to provide means for ascertaining the continuity of the circuit through the fuse, before firing the same, by the transmission through it of a weak current of electricity before sending the strong current which ignites the fuse; second, to obtain a firing apparatus in which there is little or no danger of accidentally making such contacts at the keys as will ignite the fuse, thereby preventing a frequent cause of premature ignition; and to this end it consists of the combination of a galvanometer with two contact-closing keys—one single, the other double—arranged in such a manner that when one of these keys is in connection with the fuse, and the other with the source of electricity, a current of sufficient power to ignite the fuse cannot be transmitted unless there is a closed contact at both keys, for the reason that when the contact is closed at one key, and the circuit through the fuse completed, the coils of the galvanometer are included in the circuit, which so weakens the current that it cannot ignite the fuse; but on the depression of the second key, the first key remaining closed, the galvanometer is cut out of the circuit and a current of full strength allowed to flow.

The accompanying drawing, forming part of this specification, represents my invention, Figure 1 being a plan view; Fig. 2, a front view in elevation; and Fig. 3, a sectional view through the line *xy* in Fig. 1.

In these figures like letters refer to similar parts.

A and B are two blocks of wood hinged together at their sides. The upper block A forms the support for the galvanometer, the binding-screws and their connections, and the lower block B is a protection for the lower face of the block A. C is a double contact-closing key; G, a galvanometer; E and F, binding-screws for the connection of the apparatus with the source of electricity; H and I, binding-screws for the connection of the apparatus with the

fuse; and *m n o p*, connecting-wires on the under side of the block. (Shown in dotted lines in Fig. 1.) The galvanometer G is of the usual construction, consisting of a magnetized needle, *x*, supported at its center, so as to turn freely above a dial-plate, *y*, beneath which is a coil of wire, *z*, which, when traversed by a current, causes the needle to move either to the right or left. The galvanometer is included in a suitable case placed in a depression in the block A, and surrounded by a wooden frame, M. The double key C I call the "testing-key." It consists of two flat metallic springs, *a* and *b*, at right angles to each other, and one above the other, each secured at one end to the block A. Upon the free end of the upper spring *a* is a finger-knob, P, by means of which the spring can be depressed, so as to make contact with the lower spring *b*, the points *c* and *d*, where the springs make contact, being made of platinum, as is common in circuit-closers. The free extremity of the lower spring *b* extends under a metal plate, *k*, which is attached to the wooden casing M of the galvanometer, and is in metallic connection with the coils of the galvanometer, as shown by the dotted line, and said spring *b*, when not depressed by the spring *a*, is in contact with said plate. The metallic binding-screw F passes through the fixed end of the spring *b*, and the spring *a* is connected, by a wire, *m*, to the binding-screw H. The plate K is connected to the binding-screw by a wire, *p*. The single key D I call the "firing-key." It consists of a flat metallic spring secured at one end to the block A and binding-screw I. Upon the free end is a finger-knob, P, by which the spring can be depressed and brought into contact with a metallic anvil, L, provided with the usual platinum contact-points. A wire, *n*, connects the binding-screw I with the galvanometer, and the anvil L is connected, by a wire, *o*, with a metallic plate, *k*. Pivoted levers may be used instead of springs in the construction of these keys, but springs are preferred.

I propose to use with this apparatus the dynamo-electric machine of my improved construction as a source of electricity, but I can use a battery or any other source of dynamic electricity equally as well.

This improved firing apparatus is used in



the following manner: The apparatus having been put in connection on one side with the fuse by the screws H I, and on the other side with the source of electricity by the screws E F, and contact having been broken at the key D, and at the spring *a* of the key C, the battery or machine will be short-circuited through the binding-screw E, the wire *p*, the plate *k*, the spring *b*, and binding-screw F. If, now, it be desired to ascertain the continuity of the circuit through the fuse without exploding the same, the spring *a* of the double key C is depressed so as to make contact with the spring *b*, and, by depressing the same, break contact at *k*, and the current will then flow through the screw F, spring *b*, spring *a*, wire *m*, binding-screw H, fuse, binding-screw I, wire *n*, galvanometer-coils, plate *k*, wire *p*, and binding-screw E, to the battery or other source of electricity. If the fuse is intact the deflection of the galvanometer-needle will then indicate the continuity of the circuit, but the resistance of the coils of the galvanometer will be so great that the current passing through the fuse will not have sufficient power to ignite the same. If, now, the firing-key D be depressed, the spring *a* still remaining down, so that contact is broken at K and contact made with the anvil L and wire *o*, the galvanometer is cut out of the circuit, and its resistance having been removed the current has sufficient power to ignite the fuse.

When this apparatus is used with the dynamo-machine the current which flows through the fuse on depressing the key D, after the depression of the key C, is sometimes not at once sufficiently powerful to ignite the fuse. It is, therefore, preferable to depress the firing-key before depressing the testing-key, so that the current does not pass through the galvanometer at all, but electricity is allowed to accumulate in the machine when it is short-circuited, and it is discharged through the fuse when the key C is depressed.

It will thus be seen from the above description of my improved firing apparatus, and of its mode of operation, that by its use the certain discharge of the fuse is insured, for the reason that the continuity of the fuse can be ascertained before firing, and that the danger of discharge by an accidental contact at the key is much lessened, because the successive or simultaneous movement of two keys is required to fire the fuse.

What I claim as my invention, and desire to secure by Letters Patent of the United States, is—

The combination of the double key C, single key D, galvanometer G, and their connections, in the manner and for the purpose as set forth.

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Witnesses:

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S. M. BROOKS.