

(No Model.)

P. WARD & E. M. GREGORY.  
ELECTRIC FUSE OR DETONATOR.

No. 466,856.

Patented Jan. 12, 1892.

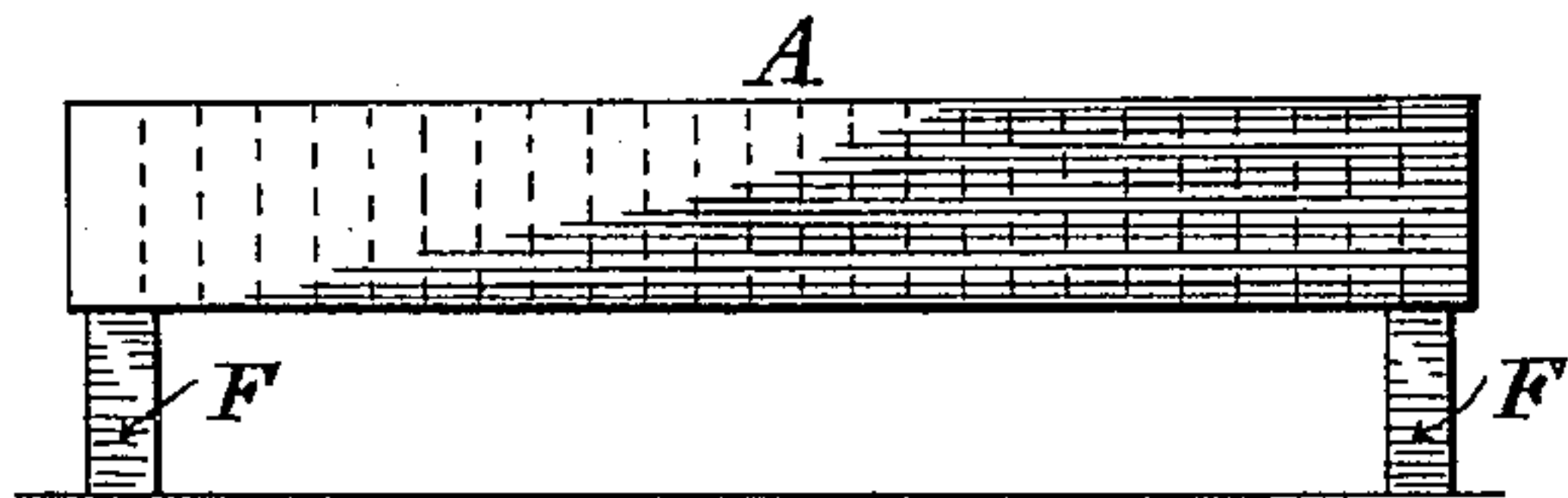


FIG. 1.

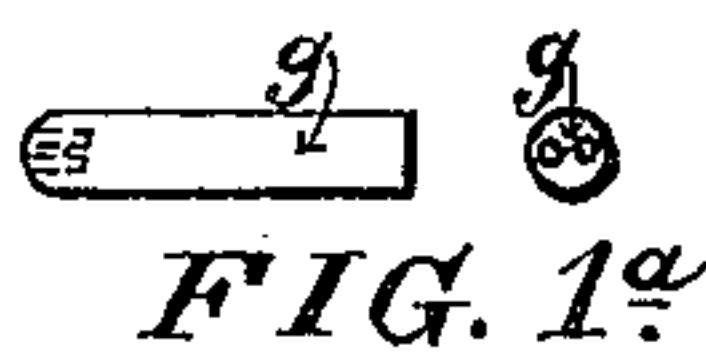
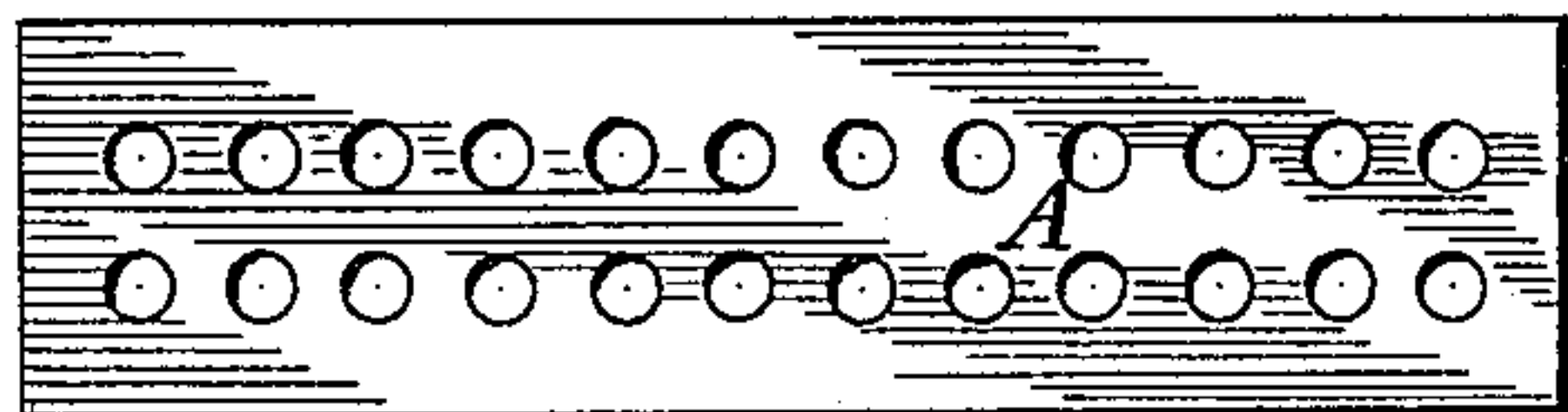


FIG. 2.

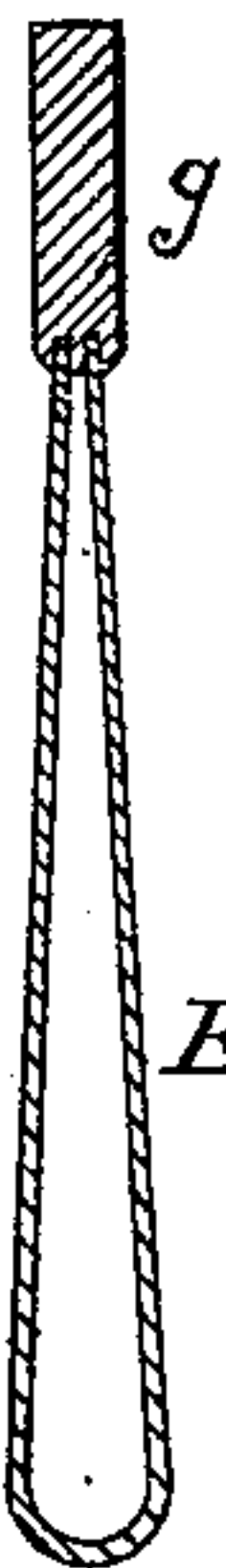
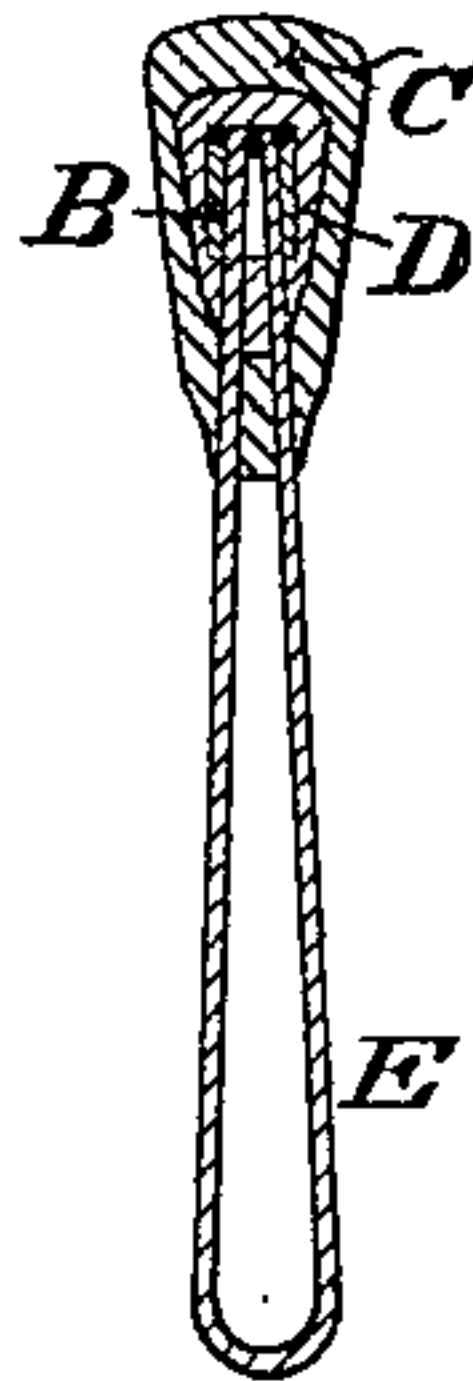


FIG. 3.



FIG. 4.



Witnesses:

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# UNITED STATES PATENT OFFICE.

PAUL WARD AND EDWARD MAMMATT GREGORY, OF LONDON, ENGLAND.

## ELECTRIC FUSE OR DETONATOR.

SPECIFICATION forming part of Letters Patent No. 466,856, dated January 12, 1892.

Application filed May 13, 1890. Serial No. 351,694. (No model.)

*To all whom it may concern:*

Be it known that we, PAUL WARD and EDWARD MAMMATT GREGORY, residing at London, England, have invented an Improvement in the Method of Construction of Electrical Fuses and Detonators, of which the following is a specification.

Our invention relates to improvements in the method of manufacturing electrical fuses and detonators, and has for its object to provide a fuse which by its accuracy of position of the detonating-wires shall be uniformly sensitive.

To carry out our invention we employ a bent or closed armature of wire, by which ignition is effected electrically, composed of either insulated or uninsulated wire of any suitable conducting metal—such as copper or iron—and termed a “safety-armature,” because formed in a loop which is ineffective to produce ignition until the said loop has been broken or cut and each side of the loop has been separated from metallic contact with the other.

From the method of construction herein-after described it will be seen that we form the insulator, the wires, and the receptacle for holding the priming composition, all combined with accuracy within special gages or tools, so that an absolutely uniform arrangement of the wire terminals is insured, both in the amount of surface exposed and in the distance of their separation from one another, whereby the article is much simplified and cheapened, and all the fuses may be ignited with certainty and with extreme sensitiveness by a definite small current of electricity and the complete fuses protected from any climatic destructive influences.

In order that our invention may be the better understood, we now proceed to describe the same in relation to the drawings hereunto annexed, reference being had to the letters marked thereon.

Like letters refer to like parts in the various figures.

Figure 1 shows in side and end elevation and in plan the slab or tool in which the fuse-plugs are manufactured. Fig. 1<sup>a</sup> is a side and end view of the plug used in conjunction with the above table. Fig. 2 shows the wire armature in position ready for the

formation of the insulating-plug. Fig. 3 shows the wire armature with the insulating-plug formed thereon. Fig. 4 shows the completed fuse covered by protective coatings.

We employ a slab of metal A (shown in side and end elevation and plan in Fig. 1) or other material, which is drilled through from face to face with holes about one-eighth of an inch in diameter, or of such diameter as is suitable for the fuse required. This slab is supported by feet F of such a height that plugs of metal or other material inserted into the holes in the slab rest on the table supporting the whole, so that the plugs do not reach the upper surface of the slab A by, say, one-fourth of an inch. These little plugs, as shown at g, Fig. 1<sup>a</sup>, are dome-shaped at their upper ends and have two fine holes drilled to a small depth (say one-fortieth of an inch) in their domed ends as close together as is practically convenient without their coalescing. Into these two holes in the said plug are inserted the two free ends of a small hair-pin-shaped wire loop E, so as to hold the two free ends of the wire loop in a certain definite position both as regards length and width apart in the hole in which the plug of metal is contained. When all the holes in the slab and plug are occupied in a similar manner, the remaining spaces above the dome-shaped plugs containing the wires are then filled up with a composition consisting, by choice, of an intimate mixture of whitening and glue or whitening and gum or other suitable insulating ingredient to render the said composition water-proof, and in order to make the said composition both heat and damp proof we mix therewith a suitable quantity of the powder derived from the calcination of “peat.” When the liquid part has evaporated or been driven from the mass contained in the said holes, the plugs are pushed up from the bottom and the wires, surrounded by the composition before-mentioned, are taken out, the result being cup-shaped cavities, as in the non-conducting plug shown at B, Fig. 3, with the two ends of the wires projecting a certain definite width apart and length thereinto, but completely insulated from each other. Any further moisture may be driven off by a gentle heat.

A suitable quantity of explosive compound



(priming material) is now placed into the cup-shaped cavity and the same is laid aside to dry. A suitable quantity D, Fig. 4, of the composition of which the piece B in which  
5 the cup-shaped cavity is formed (before described) is caused to surround the plug B and the priming material, or to cover the priming material only, and the whole may then (if considered necessary) be protected by dipping  
10 into just-melted paraffine or other wax and afterward in Portland, Roman, or other hard cement, and is shown at C, Fig. 4; or the insertion of a second layer D of the composition of the plug B, in which the cavity is  
15 formed may be dispensed with and the fuse protected with the paraffine or other wax and cement.

By the before-described method we form a complete fuse. The whole may then (if considered necessary) be coated over with a fusible alloy of low-melting temperature, or even  
20 with lead, by immersion in the molten metal.

If we wish to make a combined fuse and detonator, we previously to dipping the fuse  
25 into the cement or other protective coating, as aforesaid, but subsequently to immersing it in the melted wax, insert into the cup on the top of the wax a quantity of detonating

material. This combined fuse and detonator is then protected in the manner above mentioned. 30

Having fully described our invention, what we desire to secure by Letters Patent is—

The process of manufacture of an electrical fuse or detonator by which the ends of  
35 the detonating-wires are held in recesses of a metal plug-tool at a desired and definite distance apart, the said plug being inserted into a small cylindrical chamber in a block, the detonating-wires being then permanently in-  
40 corporated in a plug of non-conducting material formed to exact size in the said chamber, so as to allow the ends of the wires to project slightly into a cavity to hold the priming composition, and the completed fuse being  
45 then dipped first into melted paraffine or other wax and then in Portland, Roman, or any suitable cement.

In testimony whereof we have signed our names to this specification in the presence of  
50 two subscribing witnesses.

PAUL WARD.

EDWARD MAMMATT GREGORY.

Witness:

REGINALD W. JAMES,

RICHARD A. HOFFMANN.