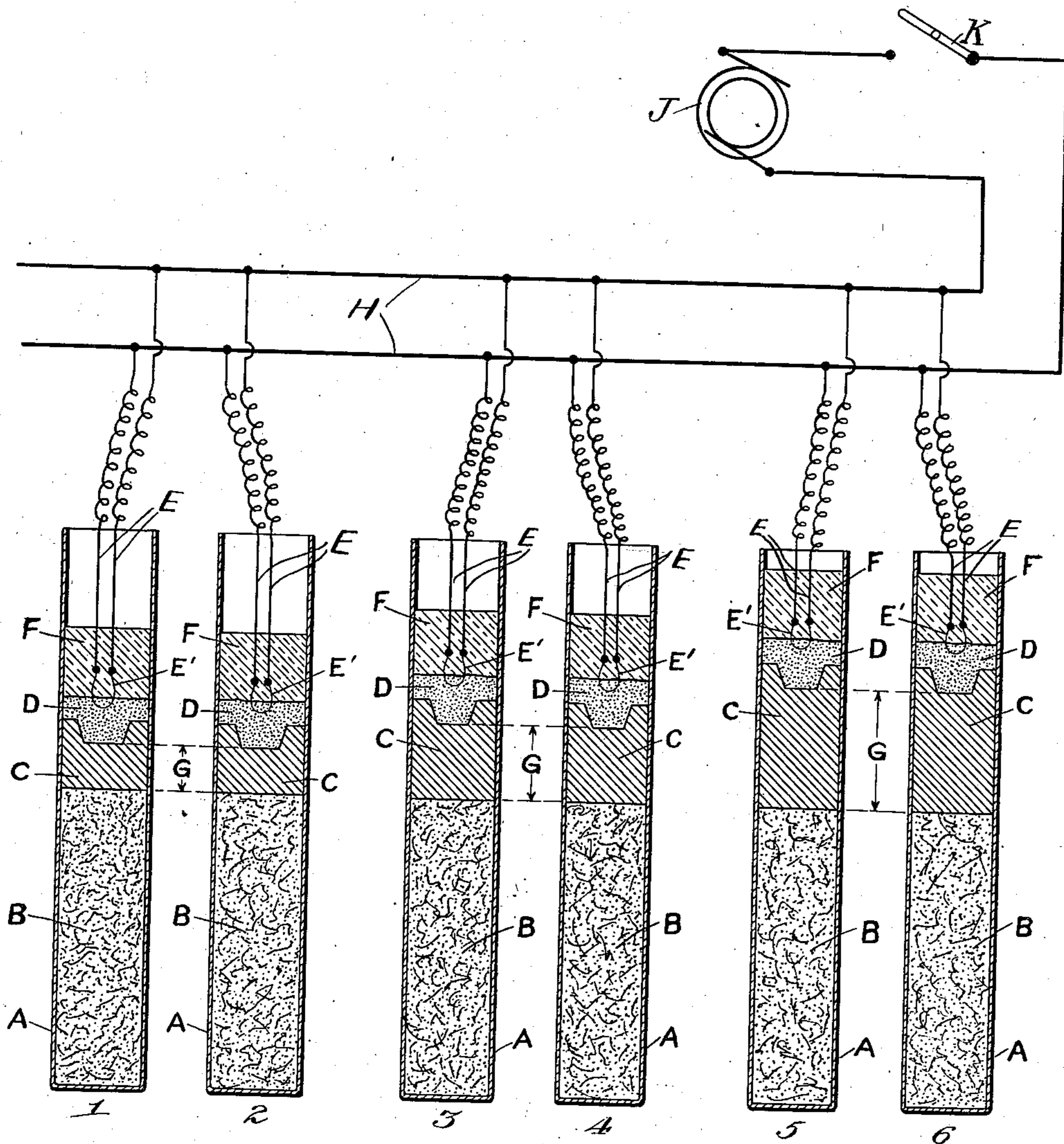


No. 821,883.

PATENTED MAY 29, 1906.

F. I. DU PONT.
FUSE.

APPLICATION FILED JAN. 5, 1906.



WITNESSES:

M. M. Hamilton
Thomas B. Wood

INVENTOR

Francis I. du Pont

BY

Harold H. Hensley

ATTORNEYS.

UNITED STATES PATENT OFFICE.

FRANCIS I. DU PONT, OF WILMINGTON, DELAWARE, ASSIGNOR TO THE
E. I. DU PONT DE NEMOURS POWDER COMPANY, OF WILMINGTON,
DELAWARE, A CORPORATION OF NEW JERSEY.

FUSE.

No. 821,883.

Specification of Letters Patent.

Patented May 29, 1906.

Application filed January 5, 1906. Serial No. 294,719.

To all whom it may concern:

Be it known that I, FRANCIS I. DU PONT, a citizen of the United States, residing at Wilmington, county of Newcastle, and State of Delaware, have invented a new and useful Improvement in Fuses, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

The object of my invention is to provide means whereby a plurality of blasts may be fired from the same electric circuit at different times—*i. e.*, non-simultaneously. Thus, for instance, it is often desirable that a certain number of blasts shall be fired at as nearly as possible simultaneously at a given time after a certain number of other blasts. The difficulty in doing this with a single pair of wires is that when the first set of blasts is exploded or set off the wires are as a rule destroyed, so that the next set cannot be set off by an electric current conducted by those wires.

My invention consists in providing what I call a "delay-action" time-fuse, which, although fired simultaneously with the other blasts, will not act until a predetermined period thereafter. In practice I can so arrange these delay time-fuses, which I will hereinafter fully describe, so that a certain number of the blasts may be exploded at one time and a certain number at another time, and so on.

I will now describe the improved delay time-fuse, which is illustrated in the accompanying drawing.

In the drawing, A is a copper case similar to those usually used. In this case the portion B is filled with fulminate of mercury. Above this fulminate of mercury is placed a pressed piece of any of the smokeless-powder compositions now in use or modifications of them. Above this pressed-powder piece or block is a small charge of black powder D. In this charge of black powder extends the ignition-wire E, which is connected with the usual fine platinum circuit E' used for this purpose. The wires E are connected to the wires H from source of current-supply J.

K is the switch for closing the circuit.

F represents any kind of filling—for instance, paraffin.

In operation the electric current heats the platinum part E' red-hot, igniting the pow-

der D, which in turn ignites the upper surface of the block of smokeless powder C. The length of time which elapses between the ignition of the upper surface of the block C and when it reaches the surface of the fulminate of mercury is dependent upon the distance G or the thickness of the block at that point. By making this block or piece of different thicknesses I can produce the explosion of different fuses at different times, although they will all be initially fired at the same time. Thus in the drawing I have shown three sets of fuses—two in each set. Fuses 1 and 2 have a less thickness of block C than have fuses 3 and 4, which in turn have a less thickness of block than fuses 5 and 6. Thus with this arrangement the fuses 1 and 2 will first explode, and then a time thereafter, based upon the difference in thickness between the block C in 1 and 2 and in 3 and 4, the fuses 3 and 4 will explode, and, finally, a time thereafter, dependent upon the difference in thickness in 5 and 6 between that in 3 and 4, fuses 5 and 6 will explode.

Having now fully described my invention, what I claim, and desire to protect by Letters Patent, is—

1. In combination, a plurality of fuses, or sets of fuses, each fuse comprising a casing containing fulminate of mercury, a block of smokeless powder above said mercury, said block in the fuses, or sets of fuses, being of different thicknesses, and an electric circuit including all of said fuses.

2. In combination, a plurality of fuses, or sets of fuses, each fuse comprising a casing containing fulminate of mercury, a block of smokeless powder above said mercury, said block in the fuses, or sets of fuses, being of different thicknesses, and black powder above said block, and said electric circuit including all of said fuses.

3. A fuse, comprising a casing, containing fulminate of mercury, a block of smokeless powder above said mercury.

4. A fuse comprising a casing, containing fulminate of mercury, a block of smokeless powder above said mercury, and black powder above said block.

5. A fuse comprising a casing, containing fulminate of mercury, a block of smokeless powder above said mercury, said block being of predetermined thickness.

6. A fuse comprising a casing, containing fulminate of mercury, a block of smokeless powder above said mercury, and black powder above said block, said block being of predetermined thickness.

7. A plurality of fuses, or sets of fuses, each fuse comprising a casing containing fulminate of mercury, a body of smokeless powder above said mercury, the thickness of the body of smokeless powder varying in the different fuses, or sets of fuses, and an electric circuit including all said fuses.

8. In combination, a plurality of fuses, or sets of fuses, each fuse comprising a casing containing fulminate of mercury, a body of smokeless powder above said mercury, said body in the fuses, or sets of fuses, being of different thicknesses, a black powder above said smokeless powder, and an electric circuit including all of said fuses.

9. A fuse, comprising a casing containing fulminate of mercury, a body of smokeless powder above said mercury.

10. A fuse, comprising a casing containing fulminate of mercury, a body of smokeless powder above said mercury, and black powder above said smokeless powder.

11. A fuse, comprising a casing containing fulminate of mercury, a body of smokeless powder above said mercury, said body of smokeless powder being of predetermined thickness.

12. A fuse, comprising a casing containing fulminate of mercury, a body of smokeless powder above said mercury, and black powder above said smokeless powder, said body of smokeless powder being of predetermined thickness.

In testimony of which invention I have hereunto set my hand, at Wilmington, on this 30th day of December, 1905

FRANCIS I. DU PONT.

Witnesses:

R. J. COYLE,

CLIFFORD V. MANNERING.