(No Model.)

C. E. SCRIBNER.

EXPLOSIVE PROJECTILE.

No. 571,909. Patented Nov. 24, 1896.

Fig. 1

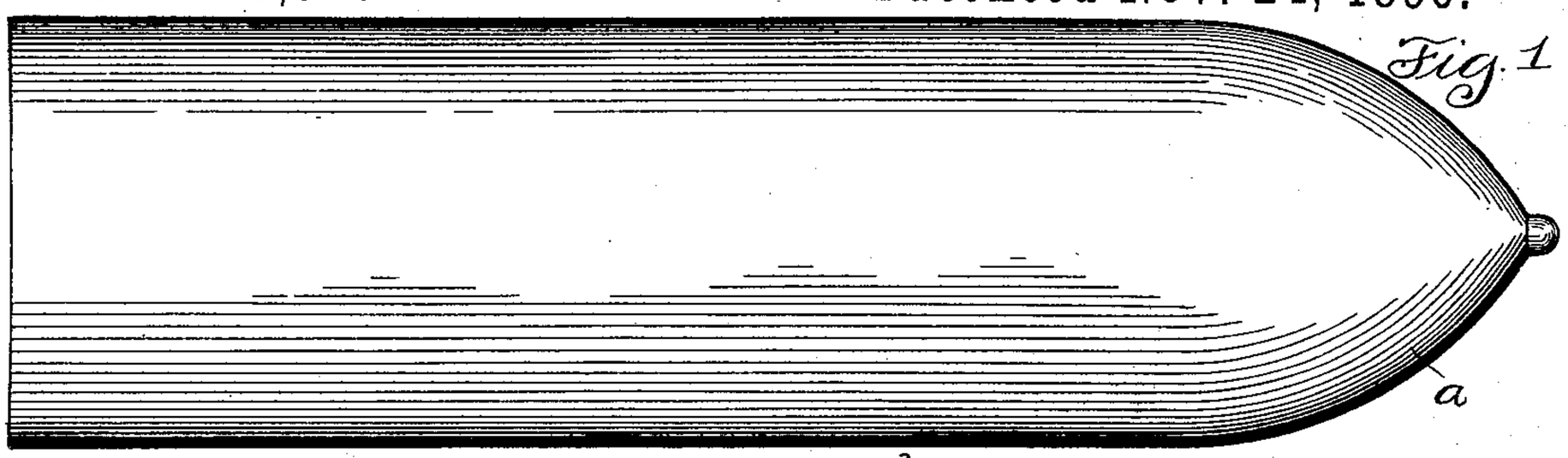


Fig. 2

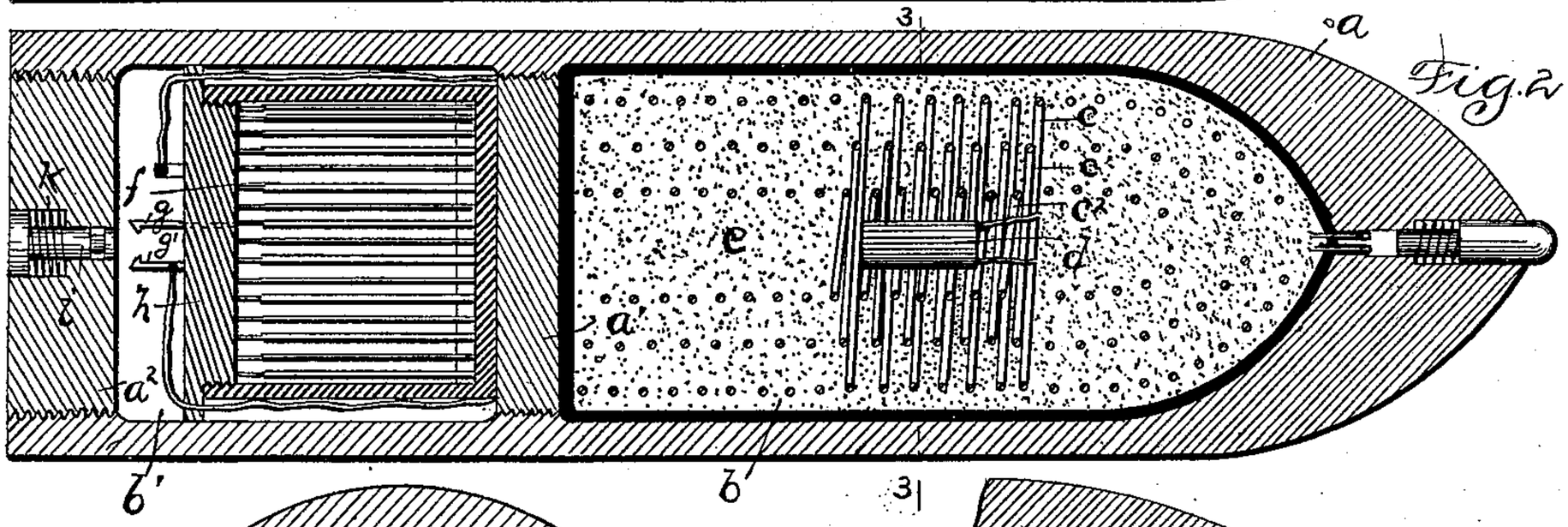
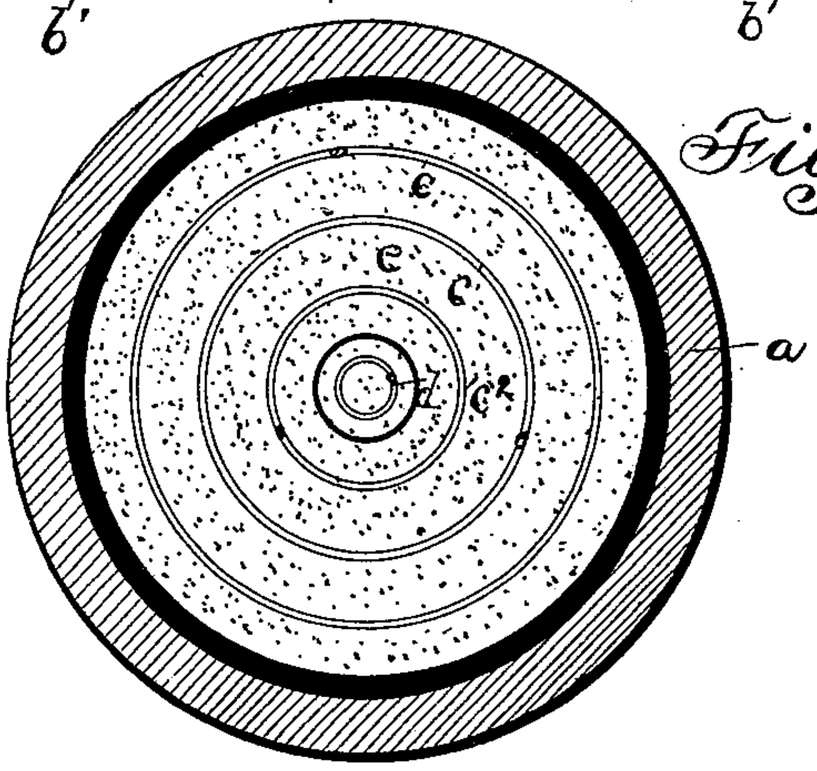


Fig. 3.



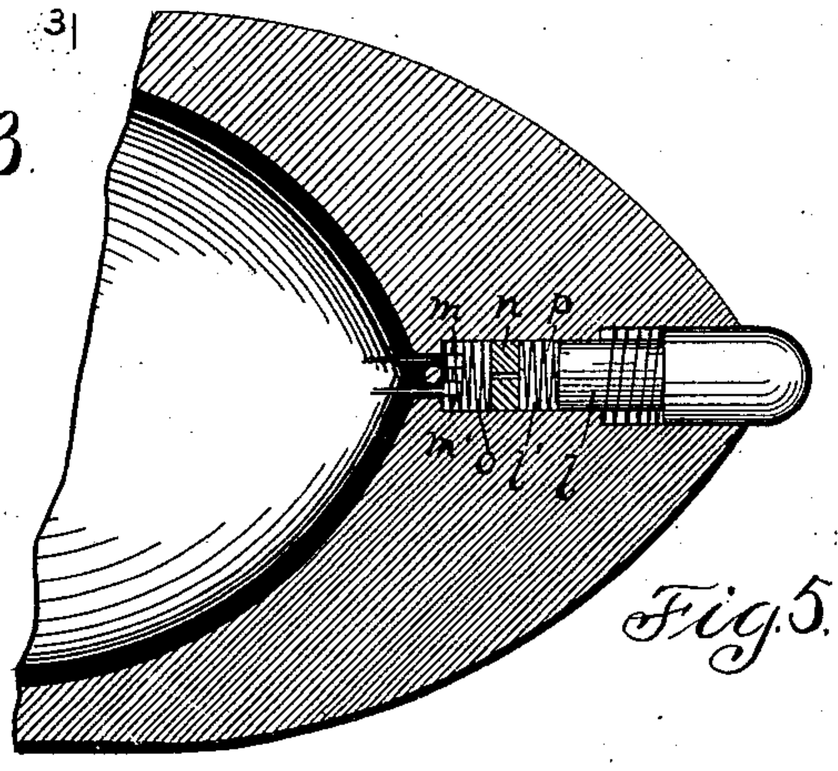


Fig. 5.

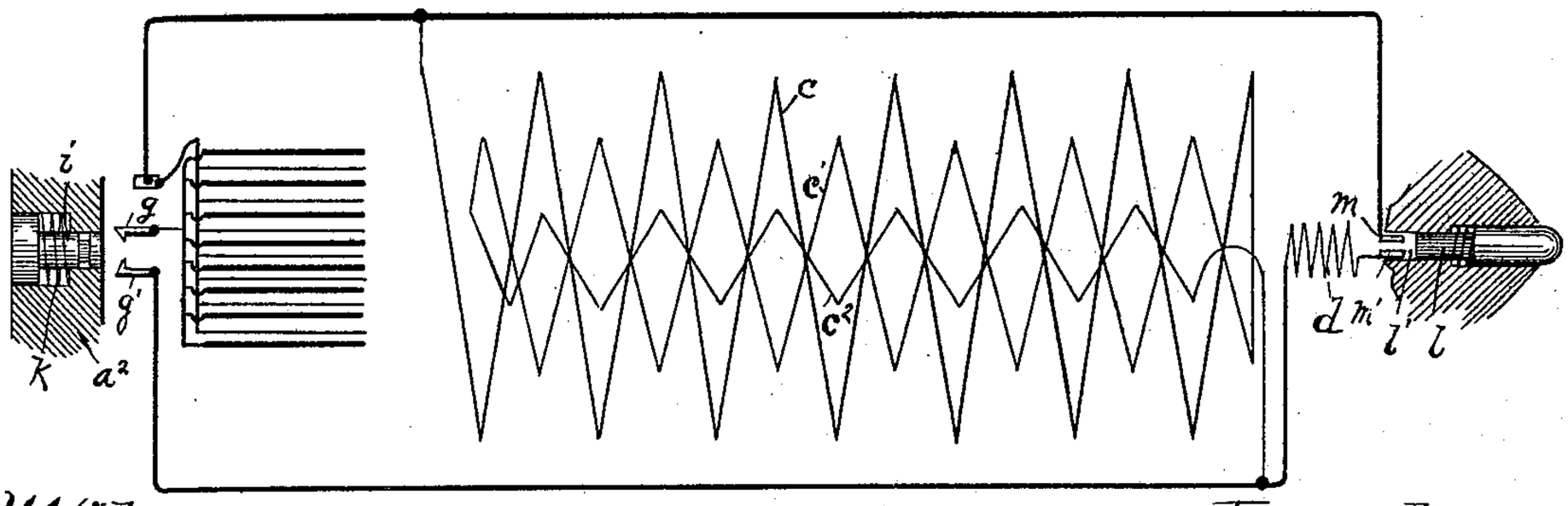


Fig. 4.

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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

EXPLOSIVE PROJECTILE.

SPECIFICATION forming part of Letters Patent No. 571,909, dated November 24, 1896.

Application filed January 15, 1894. Serial No. 496,971. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Explosive Projectiles, (Case No. 343,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to projectiles or bombs which are designed to explode in contact with the object which they strike. In general its object is to provide a projectile or bomb filled with a substance which is normally inert or of stable chemical composition, so that the projectile may be thrown from a gun or mortar of usual construction, but which substance may be converted into an explosive compound or mixture after leaving the gun and may be exploded when it strikes its target. In the case of projectiles which may be thrown with sufficient force to penetrate an armor or fortification a further object of my invention consists in exploding the projectile after it is embedded in the fortification, under which condition it may be caused to act with vastly greater efficiency than if it were exploded at the surface of the fortification.

It is known in the art to which my invention pertains that substances or mixtures of substances which are not explosive at ordinary temperatures may be converted into high explosives by a suitable elevation of their temperature, the heat being distributed uniformly throughout the mass of the active material. When a sufficiently high temperature has been reached, chemical decomposition takes place throughout the entire mass at the same instant, causing an explosion or detonation of tremendous force. Such explosives have heretofore been employed in blasting when the heat could be properly applied to the active material and where the charge could be fired at the proper moment. In my invention I have aimed to employ such materials and to effect the same result in a projectile or bomb. A shell filled with the non-explosive material may thus be thrown without danger from an ordinary gun. After leaving the gun the active material is converted into an explosive compound by a suitable uniform elevation of its temperature, and is finally exploded after the projectile has embedded itself in the object at which it is fired.

I find that the heating of the active material may be readily accomplished by means of the heat of an electric current derived from a suitable electric generator in a compartment of the projectile, and that the same generator may be employed, if desired, to effect the final ignition of the explosive compound. I do not, however, limit myself to either this mode of heating the active material uniformly throughout its mass or of exploding it after it has been heated.

In the construction of my invention as indicated I have found a suitable active material for producing the explosive to be a mixture of chlorate of potash and paraffin-oil, the crystals of chlorate of potash being moistened with the oil. When the mass of this material is brought to a uniform temperature, approximating 450° Fahrenheit, the affinities of the combined elements are so weakened that an unstable chemical condition is produced, after which a slight additional increase of temperature effects the dissociation of the elements simultaneously throughout the mass, producing a detonation of great force. This active material is placed in a closed compartment of the projectile, electric-conducting wires being distributed uniformly throughout the mass of active material. In another small compartment of the projectile I provide a generator of electric current, as a primary or secondary battery, adapted to be connected in circuit through the conducting-wires or "heating-coils" in the active material. Such connection may be effected either immediately previous to or at the instant of throwing the projectile, or after the latter has struck the target. The same source of electric energy may be employed to produce the explosion of the active material by means of an igniter automatically connected into the circuit by the striking of the projectile.

I have illustrated my invention in the accompanying drawings, and will describe it in greater detail in connection therewith.

In Figure 1 of the drawings is shown a side

elevation of one form of projectile. Fig. 2 is a central longitudinal section of the same. Fig. 3 is a transverse section of the same on line 3 3 of Fig. 2. Fig. 4 is a diagram showing the circuit connections of the heating-coils and the igniter in the projectile. Fig. 5 is an enlarged view of a device for retarding the explosion of the shell.

The projectile consists, essentially, of a hollow shell a of usual form, closed at both ends and divided into two chambers by a transverse partition a'. The partition a' is made removable, being screwed into place in the shell in order to obtain access to the forward chamber b. The rear of the shell is closed by the large plug a^2, which is also removable to give access to the chambers b and b'.

The chamber b is designed to be occupied by the material for exploding the shell, together with the means for heating the active material to render it explosive. The chamber b' is designed to receive the generator of electric current or other source of heat. In the chamber b several concentric spirals or coils of insulated wire c c' c^2 are placed, the turns of the coils being as evenly distributed as possible. A small spiral of wire d is also placed in the forward extremity of the chamber to serve as an igniter. The wires being thus properly arranged, the chamber b is filled with the material e which is to be used in exploding the shell—for example, with chlorate of potash and oil—and the partition a' is screwed firmly into place. The chamber b' is occupied by a generator f of electric current, preferably a primary or storage battery, capable of giving a heavy current for a few seconds, the battery being sealed, so as to be self-contained. One of the terminals of the battery is permanently united with the extremity of one of the heating-coils c, which are connected in series. The other terminal of the battery is not permanently connected to the heating-coils, but may be connected therewith by means of an automatic switch adapted to be closed at the instant of throwing the shell.

In the form of switch shown in the drawings two spring-contacts g and g' are mounted upon the cover h of the battery-cell, the spring-contacts being normally separated. One of these contacts constitutes a terminal of the battery, while the other is connected with the other extremity of the heating-coils c c' c^2. In an axial perforation of the plug a^2 a closely-fitting plunger i is placed, which is normally forced outward by a spiral spring k. The spring-contacts g g' are arranged in such position that when the plunger i is forced inward its extremity enters between the spring-contacts and forms a metallic connection between them, being engaged and held by them against the retractile force of spring k. The circuit of the generator may be thus closed through the heating-coils. At the forward end of the projectile a somewhat similar switch is provided for closing the circuit through the igniter d when the projectile strikes the target. This consists of a spring-actuated plunger l, behind which, at the bottom of the hole l', in which the plunger is placed, two insulated contact-plates m m' are arranged. When the plunger l is forced inward by the impact of the shell upon the target, it closes upon the switch-plates m m', thus closing the circuit through the igniter d.

As best seen in Fig. 4, the igniting-coil d is placed in a normally open shunt-circuit of the heating-coil c c' c^2.

The heating-coil is calculated to be of such resistance with reference to the electromotive force and internal resistance of the generator f that the wire is not raised to a very high temperature, but only to such a temperature as is necessary to produce the dissociation of the active material e in the time allowed between the moment of throwing the projectile and the moment when the latter strikes the target. This time might amount to two to five seconds, or even more, so that the heating-coils would be required to raise the temperature of the entire mass of active material e to a temperature of perhaps 450° in that length of time. In order that the heat may be uniformly distributed throughout the mass of active material, the convolutions of the heating-coil must be placed quite close together. The igniting-coil d is, however, of small size and low resistance, so that when its circuit is suddenly closed in shunt of the high-resistance heating-coils it is quickly brought to incandescence or fused.

When it is desirable to produce the explosive some time after the point of the shell has struck the target in order to permit the shell to penetrate the target before exploding, recourse may be had to the modification shown in Fig. 5. In this case the plunger l is not permitted to close directly upon the switch-contacts m m', but acts upon them through the medium of a retarding device whose slowness of action is adjustable. This device consists of a piston n, moving tightly in the bore of the chamber l', in which the plunger is situated, the inclosed space being filled with a viscid liquid, as glycerin. A spiral spring o between the piston n and the switch-plates m m' maintains the plunger normally raised from the switch-plates, while a second spiral spring p between the piston and the plunger l presses the plunger outward. The piston n is perforated, the size of the perforation being adapted to the length of time which is desired shall elapse between the striking of the plunger l upon the target and the explosion of the shell. It will thus be seen that when the shell impinges upon the target the plunger l is first forced inward, compressing the spring p. This spring then forces the piston n inward, its movement being retarded by the glycerin in the chamber, until the piston makes contact with the plates m m' and closes the circuit between them.

Thus in the operation of my invention the prepared projectile may be handled without risk of its explosion. At the instant of firing the gun the pressure of the gases behind the shell is sufficient to press the plunger *i* into contact with plates *g g'*, thus closing the circuit of the electric generator through the heating-coils *c c' c²*. By the action of these latter the active material *e* is converted into a high explosive by the time the shell reaches the target. Then when the point of the shell strikes the target, or, in case the modification in Fig. 5 is used, a predetermined time after the striking of the plunger *l*, the igniter *d* is fused, causing the explosion of the shell.

Obviously it is not essential in employing my invention that the heating of the active material should be in progress from the moment the shell is thrown. The heating and dissociation may take place after the shell is embedded in the target or fortress, the application of the heat being itself determined by or during the striking of the projectile.

The mode of generating the heat for producing the dissociation of the combined elements is also unessential to the spirit of my invention. The combustion of confined gases or other substances which may be stored or generated within the projectile may be employed. The heat may be distributed throughout the mass of active material in a variety of ways, as, for example, by heating the projecting extremities of metal rods extending through the mass of explosive material.

I claim, broadly, as new and desire to secure by Letters Patent—

1. The combination with a projectile filled with material non-explosive at normal temperature but adapted to become explosive when its temperature is suitably elevated, of a source of heat contained in the projectile adapted to heat the said material uniformly throughout its mass, substantially as described.

2. The combination with a projectile filled with a material non-explosive at the normal temperature but adapted to be rendered explosive by suitable elevation of temperature, of a source of heat within the shell, and means for distributing the heat uniformly throughout the mass of said material, the application of the heat being automatically determined by the act of throwing the projectile, substantially as described.

3. The combination with a projectile filled with a material non-explosive at normal temperature but adapted to become explosive upon a suitable elevation of temperature, of heating-coils in the material, a source of electric current in the projectile, and a circuit-closer operated automatically in the throwing of the projectile to connect the heating-coils in circuit with the electric generator.

4. The combination with a projectile filled with a material non-explosive at normal temperature but adapted to be rendered explosive by a suitable elevation of temperature, of heating-coils placed in the mass of said material, an electric generator inclosed in the projectile in circuit with said coils, and an igniter adapted to be operated automatically by the striking of the projectile, substantially as described.

5. The combination with a projectile filled with material non-explosive at normal temperature but adapted to explode when its temperature is sufficiently elevated, of an electric fuse or igniter in said material, and a delay-action switch operated by the striking of the projectile to close an electric circuit through the igniter, substantially as described.

In witness whereof I hereunto subscribe my name this 7th day of November, A. D. 1893.

CHARLES E. SCRIBNER.

Witnesses:

ELLA EDLER,

LUCILE RUSSELL.