(No Model.)

L. BAGGER.

PRIMER FOR IGNITING EXPLOSIVES.

No. 359,491. Patented Mar. 15, 1887.

Fig. 1.

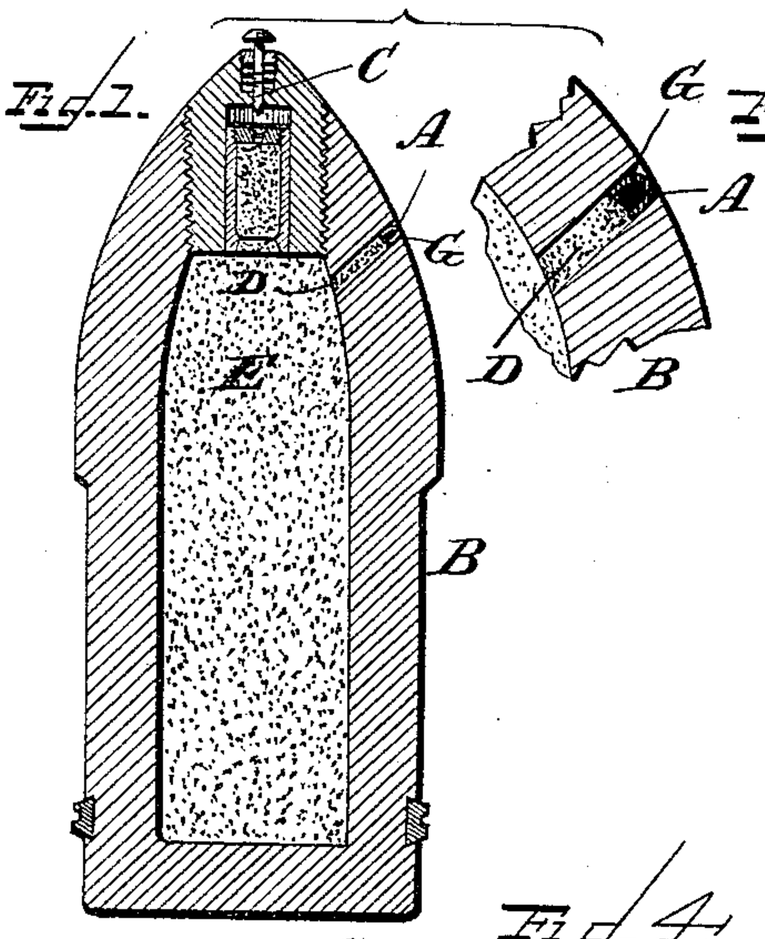


Fig. 2.

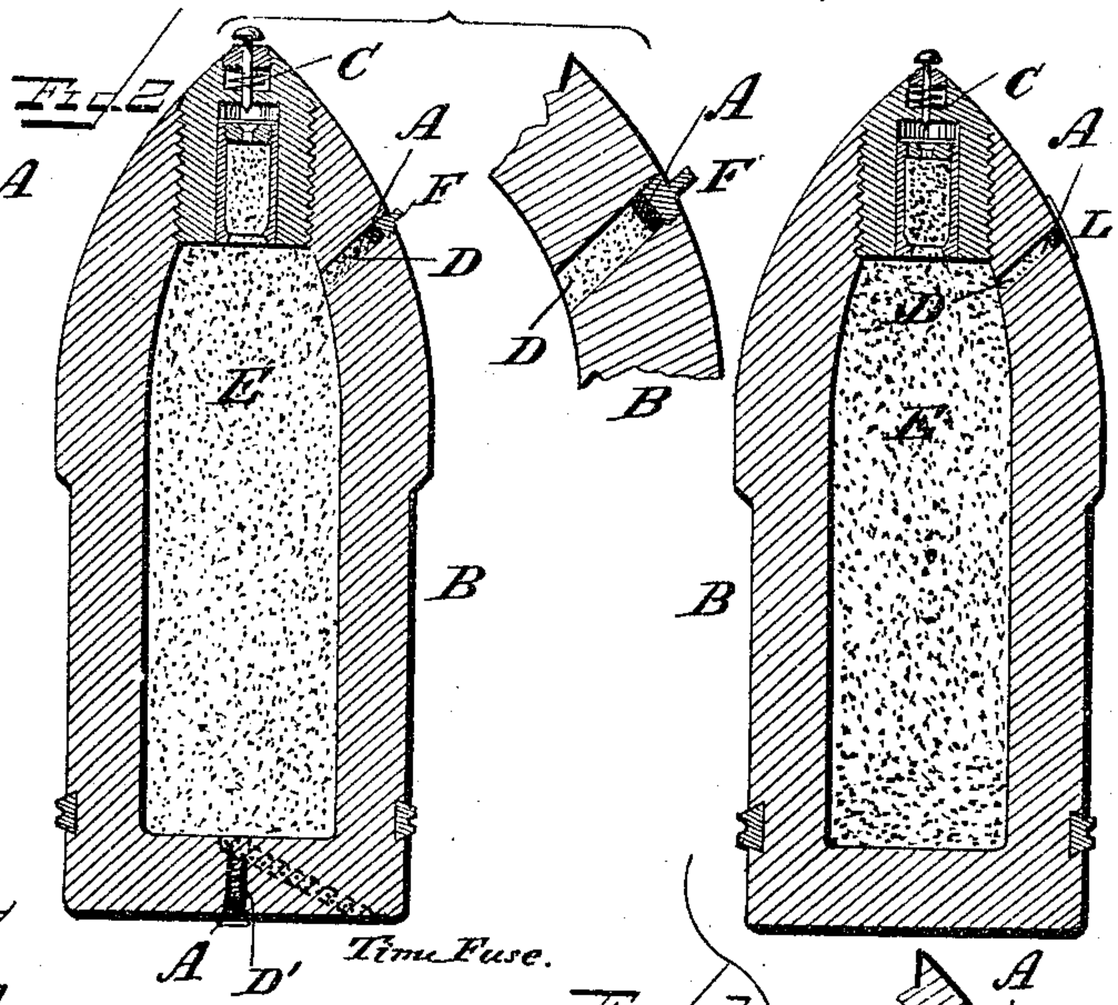


Fig. 4.

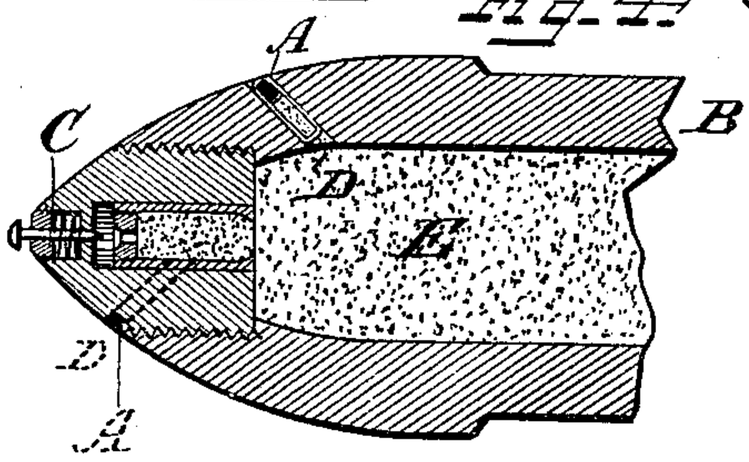


Fig. 5.

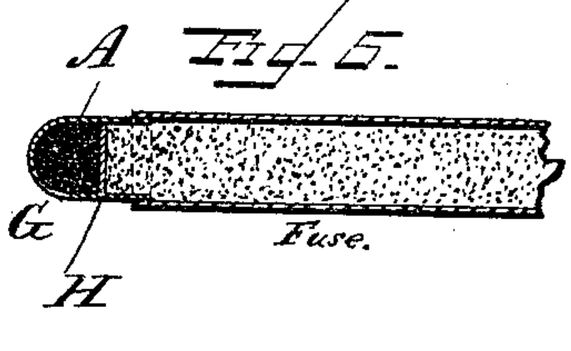


Fig. 3.

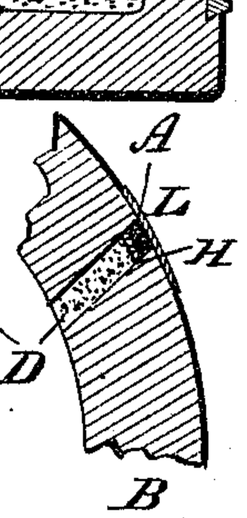
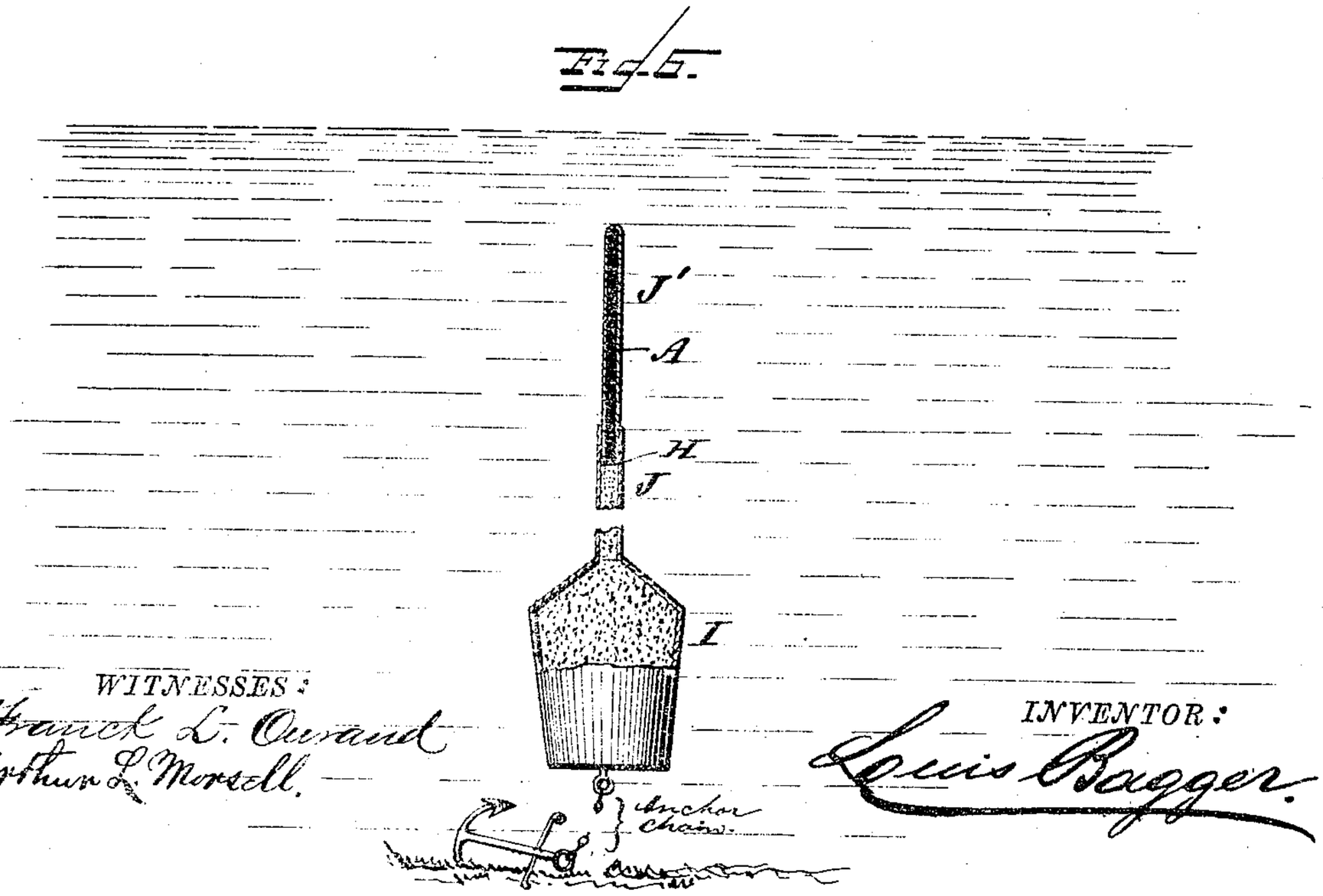


Fig. 6.



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UNITED STATES PATENT OFFICE.

LOUIS BAGGER, OF WASHINGTON, DISTRICT OF COLUMBIA, ASSIGNOR OF ONE-HALF TO AUGUST PETERSON, OF SAME PLACE.

PRIMER FOR IGNITING EXPLOSIVES.

SPECIFICATION forming part of Letters Patent No. 359,491, dated March 15, 1887.

Application filed January 31, 1887. Serial No. 226,010. (No model.)

To all whom it may concern:

Be it known that I, LOUIS BAGGER, a citizen of the United States, and a resident of the city of Washington, in the District of Columbia, have invented a certain new and useful Device for Igniting Explosives and other Combustibles; and I do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates more particularly to an improved method of igniting the explosive charge in shells and torpedoes through the direct action of the water in which the shell may drop, or in which the torpedo (whether stationary or movable) is immersed. It may also be used with advantage, however, in life-buoys, life-rafts, or other life-saving apparatus; for the purpose of igniting signal-lights, sounding high-water alarms, and for numerous other purposes where it is desired to ignite an explosive charge or other combustible material instantaneously through the direct action of water; and for this purpose it makes no difference whether the water is salt or fresh, so that my invention is equally well adapted for use on the open ocean and on inland lakes and rivers.

In the accompanying drawings I have shown my invention as applied to an explosive projectile and to an anchored or stationary torpedo, viz:

Figure 1 is a longitudinal sectional view of a shell provided with my so-called "water-primer." Figs. 2, 3, and 4 illustrate some of the different methods of protecting the water-primer in the shell. Fig. 5 is a sectional detail view of a fuse for shells, torpedoes, or other purposes equipped with my water-primer; and Fig. 6 is an illustration of my invention as applied to a (stationary) torpedo.

Like letters of reference denote corresponding parts in all the figures.

At the outset I will state that one of the advantages of my improvement is that it may be applied to all kinds of explosive shells, without regard to whether these are equipped with percussion-primers or with time-fuses. In such cases, where the primary object is to explode the shell at the moment of contact with the ship or other object aimed at, my improvement assumes the form of an auxiliary device for causing the explosion of the shell if it drops into the water.

Experience with target practice with heavy ordnance has demonstrated the difficulty of squarely hitting a movable target, such as an iron-clad vessel or other ship moving rapidly under steam, and it frequently happens that the shell either falls a little too short of its mark or goes a little too far beyond it, or it may drop into the water a little ahead or astern, in either of which cases it will simply sink to the bottom without doing any damage either to the ship directly aimed at or to surrounding boats.

Now, by providing a shell with my auxiliary fuse, or "water-primer," as I call it, I do not in the least interfere with the prompt explosion of the shell by percussion if it does strike the vessel; but if, through failure of the percussion device to act, it should drop from the side of the ship into the water without exploding, or if, through error of aim or from other causes, it should not hit the ship at all, but drop in the water, then my method and device will cause the shell to explode instantly the moment it reaches the water, scattering its fragments over a large area of water-surface, and subjecting vessels at a considerable distance even to the disastrous effects of the air-wave or concussion resulting from the explosion of a charge of dynamite or other powerful explosive with which the shell may be charged on the surface of the water. If one of these shells should drop in the water in the midst of a flotilla of gunboats or torpedo-boats, for example, without hitting any one of them, it will instantly explode and probably prove far more destructive than if it had struck any one of the boats comprising the fleet. I accomplish this object by providing the shell with an auxiliary or supplemental fuse and priming the same with material which possesses a stronger chemical affinity for oxygen than the affinity which exists between the two components of water—viz., oxygen and hydrogen, (H_2O.) Of such materials several are known to chemistry, among others sodium, (Na.) strontium, (Sr.) and potassium, (K.)

The last-named metal is particularly adapted to my purpose, owing to its excessive chemical affinity for oxygen, and as it is a commercial product which can readily be obtained I use it in preference to other material. This material is known in chemistry by the symbol "K," (equiv. 39, sp. gr. 0.865,) and is one of the most interesting alkaline metals. It is usually obtained by the so-called "Brünner process," as improved by Maresca and Dormé, by the distillation of a mixture of carbonate of potassium (K_2CO_3) and charcoal at a white heat in an iron retort. It floats on water, which it instantly decomposes on account of its great affinity for oxygen, with the following reaction: $K_2+2H_2O=2KHO+H_2$. The evolved hydrogen is kindled by the heat developed by the action and burns with a violet or rose-colored flame as long as any metal remains, while the hydrate is retained in solution.

My so-called "water-primer" consists in a thin plug, disk, or film of this material or its equivalent, as shown at A on the drawings. The letter B denotes the body of the shell, which may be of any desired shape or construction and charged with any suitable explosive, and C is the usual percussion device and primer, instead of which a time-fuse may be used, if desired. The auxiliary fuse may be made by simply boring a hole through the shell, as at D, leading to the chamber E, containing the explosive material, and charging this hole with gunpowder, gun-cotton, or any other suitable explosive. In my experiments I have used quickly-burning gunpowder with very satisfactory results. The hole and fuse are then plugged or covered with a thin disk or film of potassium, as shown at A, which, to protect it from oxidation, may be placed in a glass tube, G, open on the lower side, where it is in contact with the powder in the fuse. If the shells are to be stored for any considerable length of time before using, a thin film or coating of paraffine, petroleum-paste, or similar material containing a minimum of oxygen in its chemical composition may be applied to the under side of the disk of potassium, as indicated at H. When this is used it will effectually prevent oxidation of the under side of the primer-disk, which is exposed to the gunpowder in the fuse.

Instead of using the device shown in Fig. 1 for protecting the water-primer from the action of the atmospheric air, othrer devices may be employed for the same purpose, and some of these are illustrated on Figs. 2, 3, and 4 of the drawings. In Fig. 2 I have shown a plug, F, fitting air-tight in the aperture D and bearing with its inner end against the primer inserted in said aperture. When the shell is to be fired, this plug is removed; or it may be made of material which will be fractured by the explosion when the shell is fired from the cannon; or it may be of some soluble material which will dissolve instantaneously when the shell comes in contact with the water. And, again, in Fig. 3 the potassium primer is protected from atmospheric influence by a covering in the nature of a plaster, (shown at L,) which may be removed when the shell is fired; or it may be of material which will be instantaneously dissolved when the shell touches water. For practical purposes, where this method is adopted for the purpose of protecting the water-primer, I have found that a piece of canvas treated with a composition of paraffine, rock-oil, and cement will answer the purpose admirably, and will protect the water-primer for an indefinite length of time. When the shell is fired, this plaster can readily be torn off, so as to expose the primer to the action of the water. Again, in Fig. 4 I have shown the shell constructed with a primer consisting of a complete fuse fitting into the aperture D, into which it is not inserted until the moment when the shell is to be fired. Where that construction is to be adopted, these fuses, primed with potassium, are kept separate from the shells, one being inserted in each shell as it is required.

In Fig. 4 I have indicated by dotted lines (marked with a dotted D,) how the fuse-channel may be made to communicate with the percussion-primer instead of with the chamber E in the body of the shell, and in Fig. 2 I have shown how the primer may be used in combination with a time-fuse by drilling a hole, D', which communicates with the time-fuse. Thus it will be seen that my device may be used in combination with a percussion-fuse or with a time-fuse, if desired, instead of using it in direct combination with the body of the shell.

When the shell is to be used, but not before, the potassium primer is exposed by breaking or removing the envelope in which it is inclosed. Should the shell drop into the water, the chemical action of the exposed primer A results in the instantaneous explosion of the shell the moment the primer touches the water through the chemical reaction hereinbefore referred to—that is to say, the primer is instantly ignited, (or, to be more exact, it ignites the hydrogen of the water which is liberated by the chemical affinity between the potassium and the oxygen of the water, or, as we have seen, $K_2+2H_2O=2KHO+H_2$,) the heat being more than sufficient to ignite the fuse and explode the charge within the shell even before this has been completely immersed in the water. By graduating the thickness of the primer-disk, however, the fuse may be so constructed, if desired, that explosion will not take place until the shell has been fully immersed.

In Fig. 6 I have outlined how my invention may be applied for the purpose of exploding a torpedo, the letter I denoting the body of the torpedo, and J the fuse, which may conveniently be constructed of a piece of gas-pipe filled with any suitable material adapted to be used as a fuse. The upper part, J', of the pipe or tube J, however, is made of glass or other fragile material, and inside of this is placed a suitable quantity of the water-primer. I pre-

fer to use a glass tube, like a barometer-tube, sealed at the top and filled or partially filled with potassium, care being taken that the glass tube is connected water-tight to the metallic tube or fuse, so that water can only enter the device and ignite the potassium if the glass tube is broken or fractured. This will happen, however, when a vessel passes over it and touches the glass tube, which will then instantly be broken, thus exposing the potassium to the action of the water, when an instantaneous explosion follows. If the torpedo and fuse are made properly, so as to be impervious to water, a torpedo of this construction may be immersed any length of time without deteriorating it in the least. And, again, it is exceedingly difficult to pick up these torpedoes by means of the so-called "torpedo finders," because the least touch of a pole will break off the glass end of the fuse, and thus cause explosion of the torpedo, with the usual disastrous results.

I desire it to be understood that the foregoing illustrations of the applicability of my invention cover only a few of the very many purposes for which this is adapted. It may be used, among other purposes, on life-buoys, so that a roman-candle or signal-light will be ignited through the direct action of the water the moment the buoy is thrown into the water; or it may be used in the construction of shells filled with a suitable combustible and adapted to float on the water and primed with one of my water-primers, so that the shell will take fire when it strikes the water, and when its contents become ignited and the burning shell is floating around on the surface of the water it will serve as a light to expose the position of an enemy's vessels among which these shells are thrown. The very many purposes where my water-primer may be applied to advantage in warfare as well as in the peaceful arts will very readily suggest themselves, and do not require enumeration here.

Having thus described my invention, I claim and desire to secure by Letters Patent of the United States:

1. A primer for igniting combustible or explosive compounds, the igniting-charge of which is composed of potassium or an equivalent material having a stronger chemical affinity for oxygen than the affinity which exists between oxygen and hydrogen in the formation of water, whereby such primer is ignited on contact with water.

2. The combination, with an explosive shell, of a primer or igniting device composed of material possessing a stronger chemical affinity for oxygen than the affinity which exists between oxygen and hydrogen in the formation of water, whereby the shell is exploded on contact with water.

3. The combination, with an explosive shell, of a primer or igniting device composed wholly or in part of the metal known as "potassium," whereby the shell is exploded on contact with water.

4. The combination, with an explosive shell and a primer therefor having an igniting-charge composed of potassium or an equivalent material having a stronger chemical affinity for oxygen than the affinity which exists between oxygen and hydrogen in the formation of water, of an air and water proof covering for protecting such primer, as set forth.

5. The combination, with a percussion-primer of any desired construction, of an igniting device composed of material possessing a stronger chemical affinity for oxygen than the affinity which exists between oxygen and hydrogen in the formation of water, whereby such primer is exploded on contact of the igniting device with water.

6. The combination, with a percussion-primer of any desired construction, of an igniting device composed wholly or in part of the metal known as "potassium," whereby the primer is detonated by contact of the igniting device with water.

7. The combination, with a percussion time-fuse of any desired construction, of an igniting device composed of material possessing a stronger chemical affinity for oxygen than the affinity which exists between oxygen and hydrogen in the formation of water, whereby such fuse is fired on contact of the firing device with water.

8. The combination, with a percussion time-fuse of any desired construction, of an igniting device composed wholly or in part of the metal known as "potassium," whereby on contact of the potassium with water the fuse is ignited, as set forth.

9. A fuse adapted to be ignited by contact with water, consisting of any suitable combustible material confined in whole or in part within a tube or other envelope and provided with a primer or igniting device inclosed within or covered by an envelope of suitable material, said primer or igniting device whereby the fuse is ignited being composed of material possessing a stronger chemical affinity for oxygen than the affinity which exists between oxygen and hydrogen in the formation of water.

10. A fuse adapted to be ignited by contact with water, consisting of any suitable combustible material confined in whole or in part within a tube or other envelope and provided with a primer or igniting device inclosed within or covered by an envelope of suitable material, said primer or igniting device whereby the fuse is ignited being composed wholly or in part of the metal known as "potassium."

In testimony that I claim the foregoing as my own I have hereunto affixed my signature in presence of two witnesses.

LOUIS BAGGER.

Witnesses:
ARTHUR L. MORSELL,
BENNETT S. JONES.