

UNITED STATES PATENT OFFICE.

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WATERPROOF METALLIC EXPLOSIVE.

No. 845,678.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, THOMAS ABRAHAM BAYLISS and HENRY WINDER BROWNSDON, subjects of the King of Great Britain, residing at King's Norton, near Birmingham, England, and No. 19 Wellington road, Charlton, London, S. E., England, respectively, have invented certain new and useful Improvements in Waterproof Metallic Explosives, of which the following is a specification.

The said invention consists of the improvements in or additions hereinafter described to the materials employed in the manufacture of percussion-caps; detonators, igniters, fuses, and other primers used in fire-arms and munitions of war for the ignition or detonation of explosives, the said improvements or additions having for their principal objects to obtain greater efficiency and certainty of action in the said igniting materials.

According to the said invention we add to the substance or substances ordinarily employed as the igniting material of percussion-caps, detonators, and the like a metal (preferably aluminum) or metals in fine powder, the said powdered aluminum or other metal or metals being intimately admixed (or otherwise used) with the igniting substance or substances.

In applying the said invention to percussion-caps or detonators containing fulminate or other sensitive compositions the composition of the cap or detonator after being pressed is varnished with shellac varnish containing the aluminum or other metallic powder in a state of suspension, the shellac varnish constituting a convenient vehicle whereby the aluminum or other metallic powder may be applied in an even coating to the composition or the like.

For percussion-caps containing from 0.03 to 0.04 gram of fulminate composition we have found one drop of varnish having a specific gravity of from 0.84 to 0.86 and containing ten per centum of aluminum-powder in suspension for each cap to answer well. For larger caps and detonators two or three drops of the above varnish will generally be found sufficient; but the surface of the explosive should be completely covered with the aluminum-powder when the varnish is dry. The quantity of aluminum-powder added to the varnish may be varied within

wide limits; but in all cases sufficient oxidizing agent—such, for example, as potassium chlorate—must be contained in the fulminate or sensitive composition in excess of that required by the composition itself for the complete combustion of the aluminum-powder covering. When the varnish in the cap or detonator is quite dry, it may be finally pressed, so as thereby to obtain a perfectly smooth fast-adhering coating of aluminum or other metallic powder on the surface of the composition in the cap or detonator.

In applying the said invention to igniters, fuses, or other primers containing a non-sensitive explosive—such, for example, as gunpowder or any of the numerous guncotton nitroglycerin explosives—the metallic powder may be applied as is hereinbefore described with respect to its application to percussion-caps or detonators containing fulminate or the like, or the said aluminum or other metallic powder may be intimately mixed with the non-sensitive explosive composition before it is introduced into the igniters, fuses, or the like, or the explosive substance may be moistened with a strong shellac varnish or other adhesive substance and the aluminum or other metallic powder be dusted thereon. Where the explosive composition does not contain an excess of an oxidizing agent, sufficient potassium chlorate or the like is mixed with the aluminum or other metallic powder to insure its complete combustion on the ignition of the explosive substance.

Where the aluminum or other metallic powder is dusted onto shellac varnish or other adhesive with which the composition in the igniters, fuses, or the like is moistened, the said varnish or adhesive, while firmly attaching the metallic powder to the explosive composition, serves to protect the metallic powder from the composition. The addition of shellac varnish has the advantage of retarding the rate of combustion of the explosive substance, while the aluminum or other metallic powder insures an increased heat on combustion, the combined effect—namely, prolonged increased temperature—rendering good ignition absolutely certain.

In the case of igniters, fuses, or other primers the non-sensitive explosive may be

replaced by an inert substance, such as cork-powder, sawdust, or the like. The cork-powder or the like is thoroughly moistened with a strong shellac varnish or other adhesive, and aluminum or other metallic powder mixed with the requisite quantity of potassium chlorate to insure complete combustion is mixed with the cork-powder or the like. When dry, an extremely light granular non-sensitive semi-explosive substance is obtained. The rapidity of combustion and the heat liberated on ignition may be varied by varying the proportion of the mixture of metallic powder and chlorate of potash to the cork-powder and also by employing cork-powder of various-sized grains.

A material prepared as follows is suited to small primers and igniters: Of cork-powder, passed through a thirty but retained by a ninety mesh sieve, about eight grams are taken and thoroughly ground up with a thick shellac varnish until all the surface of the cork grains is covered with the varnish. While damp, with the varnish 35.2 grams of a mixture of aluminum-powder and potassium chlorate in fine powder is added and the whole thoroughly ground up together. The mixture of aluminum-powder and potassium chlorate is composed of about ten parts, by weight, of the former to twenty-four parts, by weight, of the latter. When dry, the substance is sieved by means of a thirty-mesh sieve, and the material passing therethrough is again sieved by means of a ninety-mesh sieve, and the material retained by the said ninety-mesh sieve is found to be of suitable size. The cork in the substance acts as a buffer and renders the substance non-sensitive to shock, while the potassium chlorate, being fixed and waterproofed by the shellac varnish, does not effloresce on repeated moistening and drying.

For the purpose of rendering the cork more combustible it may be boiled in a strong solution of potassium chlorate and dried before being treated with the shellac and aluminum and chlorate mixture.

Although we prefer to apply the aluminum or other metallic powder in one of the ways hereinbefore described, we wish it to be understood that it may be otherwise applied. For example, the prepared varnish may be evenly coated or spread on one or both sides of sheets of paper and allowed to dry. Where one side only of the sheets of paper is coated with the prepared or metallic varnish, the other side is coated with plain or non-metallic varnish, or in place of or in addition to aluminum-powder thin aluminum-foil in the form of a disk may be applied to the igniting substance in the cap, detonator, igniter, or the like.

By the addition to the igniting or explosive substance of percussion-caps, detonators, igniters, and the like of aluminum or other metal or metals in the form of fine powder not only is the temperature on explosion greatly increased and the ignition or detonation of the other explosives rendered certain, but the explosion of percussion-caps *en masse* is rendered practically impossible and a regularity in the ballistics of small-arm cartridges using modified cordite as a propellant results unattainable by the use of ordinary percussion-caps.

Having now described our invention, what we claim as new, and desire to secure by Letters Patent, is—

1. An explosive substance containing an excess of an oxidizing agent and coated with a varnish having suspended therein a powdered combustible metal.

2. An explosive substance containing an excess of an oxidizing agent and coated with a varnish having suspended therein powdered aluminium.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

THOMAS ABRAHAM BAYLISS.
HENRY WINDER BROWNSDON.

Witnesses:

ERNEST HARKER,
MARSHAL HALSTEAD.