

UNITED STATES PATENT OFFICE.

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MIXTURE FOR IMPACT ILLUMINATING-BULLETS.

1,242,879.

Specification of Letters Patent.

Patented Oct. 9, 1917.

No Drawing.

Application filed June 18, 1914. Serial No. 845,874.

To all whom it may concern:

Be it known that I, WILLIAM H. BUELL, a citizen of the United States, and a resident of New Haven, county of New Haven, State of Connecticut, have invented a certain new and useful Improvement in Mixtures for Impact Illuminating-Bullets, of which the following is a specification.

My invention relates to an exploding and illuminating charge suitable for use in impact illuminating bullets of various kinds, for instance the bullet shown in my Patent No. 1,088,007, dated February 24, 1914.

The object of my invention is to produce a mixture or charge which, when the bullet strikes the target, will produce an explosion accompanied by a brilliant flash of light of sufficient duration to be distinguishable to the eye, and preferably, also, to produce a loud sharp report. A mixture suitable for such purposes must not explode with sufficient violence to shatter the bullet so as to throw particles back to the shooter.

My mixture consists primarily of powdered aluminum and a suitable oxidizing compound such as potassium chlorate. This mixture will on impact ignite and glow with a white light. I prefer, however, to add to this mixture a suitable substance, such as trinitro-toluene, tetryl (tetra-nitro-methyl-anilin), nitro-benzene or nitro-toluene, which in combination with the oxidizing compound, forms an intenser explosive than the aluminum, and which may be termed for convenience of reference a non-gaseous or suitable fuel. The addition of this substance augments the ignition of the mixture and intensifies the heat, thus intensifying the glow of the aluminum as it is being oxidized; and it also produces a sharp loud report. In order to modify the light effect of the exploding mixture, so as to have a light different from the surrounding light, or different from the light of other bullets shot at the same time from other guns, I may add a suitable coloring ingredient. This coloring ingredient is preferably either an oxidizing compound (such as strontium nitrate) which may react either with the alu-

minum, or with the non-gaseous fuel, such, for instance, as the trinitro-toluene, or with both; or a non-gaseous fuel, such as strontium picrate. This coloring ingredient, if a non-gaseous fuel, may in some instances replace in whole or in part the other fuel in the mixture, or, if an oxidizer it may similarly replace the other oxidizer. I may, of course, add powdered glass or a similar exciter; or shellac, or a similar retarder or toner. When I speak in my claims of a combination of a fuel and a coloring compound I intend to include by these terms a coloring compound which acts also as a fuel; and when I speak in my claims of a combination of an oxidizer and of a coloring compound I intend to include by these terms a coloring compound which acts also as an oxidizer.

Thus I may prepare an illuminating and explosive mixture as follows, the proportions being given by weight:

Example I:

Aluminum	40%
Potassium chlorate	30%
Trinitrotoluene	20%
Strontium nitrate	6%
Glass	4%

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All the ingredients are used in finely powdered form.

A homogeneous mixture of these ingredients may be made with or without the addition of water or of a solution of gums. It is a fine white or light colored mass which is preferably moistened with a gum solution or with water, and then introduced into the bullet and compressed therein under heavy pressure, and the compacted charge may or may not be protected or held in place by a covering such as gum, collodion, tin foil, etc., or by partly closing the opening in the bullet in varying degrees as described in my above mentioned patent.

This mixture will on impact explode with a sharp report and produce a white or silvery light with a slight shade of red hardly noticeable as such, but sufficient to distinguish the flash from the usual white light of the moving picture shooting gallery. The diameter of the flash is about two and one-

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half inches. The strontium nitrate may be omitted, in which case the flash will be nearer a true white.

I may employ the following mixture, the proportions being given by weight, and all the ingredients being used in finely powdered form:

Example II.

Aluminum	2%
Potassium chlorate	54%
Tetryl (tetra-nitromethyl-anilin)	16%
Strontium picrate	22%
Shellac	6%

This mixture will flash with a distinctly red light. The strontium picrate not only produces the red light but also acts as a fuel. By reason of the smaller proportion of the aluminum, than in the specific example first given, the diameter of the flash is only approximately three-quarters of an inch, but thus enables the eye to determine more accurately the point of impact. The shellac exerts a toning or slowing action which prolongs the duration of the flash, and thus enables the eye to perceive the light effect which it would miss if the explosion acted too quickly.

I may vary the proportions of my formulae and I may substitute chemical equivalents for one or more substances mentioned therein. As already stated, the coloring ingredient may, if it be a sufficiently intense fuel, replace the fuel of the formula; or it may, if it be a suitable oxidizer, replace the oxidizer in the formula. Thus, when red phosphorus is used as the main coloring agent, it may be necessary or advisable to use strontium nitrate as an oxidizer, as a mixture of red phosphorus and potassium chlorate is too unstable for commercial purposes. In the following formula the strontium nitrate probably acts both as an oxidizer and as a supplemental coloring agent, while the strontium picrate probably acts both as a supplemental coloring agent and as a fuel:

Example III.

Aluminum	10%
Strontium nitrate	50%
Strontium picrate	28%
Red phosphorus	12%

This mixture gives a beautiful red center flash surrounded by a shower of yellow sparks.

Other coloring agents may of course be employed in place of the strontium compounds, or of a red phosphorus. Thus barium picrate will give a green color, potassium picrate will give a violet color. The coloring agent should in each case be of such a nature and used in such proportion, as to act properly with the other ingredients of the mixture.

The following formulae have given good results, and produce a red flash:

Example IV.

Aluminum	5.8%
Potassium chlorate	33.7%
Gun cotton	9.0%
Strontium picrate	24.0%
Antimony sulfid	14.4%
Shellac	9.6%
Glass	2.9%

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Examples V.

Aluminum	4%	} or {	3.9%	} or {	5%
Potassium chlorate	56%		39.1%		45%
Sulfur	16%		13.3%		10%
Strontium picrate	24%		31.2%		40%
Potassium picrate			12.5%		

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Examples VI.

Aluminum	5.1%	} or {	4%	} or {	3.7%
Potassium chlorate	50.5%		48%		54.6%
Sulfur	15.6%		18%		14.5%
Strontium picrate	23.9%		24%		22.2%
Shellac	5.0%		6%		5.0%
Ferro silicon					

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Examples VII.

Aluminum	5%	} or {	4%	} or {	3.7%
Potassium chlorate	30%		45%		54.6%
Tetryl	45%		30%		14.5%
Strontium picrate	20%		21%		22.2%
Shellac					5.0%

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Examples VIII.

Aluminum	5%	} or {	3.5%	} or {	2%
Potassium chlorate	51%		55.0%		54%
Tetryl	17%		15.5%		15%
Strontium picrate	27%		24.0%		23%
Gum arabic			2.0%		3%

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While the flashes given by the above formulae may not all be of perfect size and shape when the mixtures are prepared in the laboratory, they are sufficient to give operative results, and could no doubt be improved by preparing the mixtures in larger batches, by machinery, and by grinding the ingredients finer, than I have as yet had an opportunity to do. The examples, however, serve to illustrate the possibility of embodying my invention in a number of mixtures of differing composition.

It is obvious that the mixtures embodying my invention may be exploded either in the manner described, that is, by having a bullet inclosing such mixture strike a target or other object, or by having a bullet strike a target to which such mixture is attached, as shown in my Patent No. 1,091,116, dated March 24, 1914, or, in some instances, by having one or more of the ingredients attached to the bullet and the remainder attached to the target, as shown in my Patent No. 1,093,171, dated April 14, 1914; or by having the mixture struck by a hammer, for instance a hammer actuated by a target bull's eye when the bull's eye is hit; or by receiving a blow in any other suitable manner. When I use in my claims the word "bullet" I include in this term any means by which a blow may be struck on the mixture, whether or not such means constitute a bullet in the common acceptance of that term.

I claim:

1. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum and an oxidizing compound, substantially as and for the purpose described.
2. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum and potassium chlorate, substantially as and for the purpose described.
3. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum and an oxidizing compound, and a suitable fuel other than aluminum, substantially as and for the purpose described.
4. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum, an oxidizing compound and a suitable fuel consisting of a nitrated organic body, substantially as and for the purpose described.
5. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum, an oxidizing compound and trinitrotoluene, substantially as and for the purpose described.
6. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum, potassium chlorate and trinitrotoluene, substantially as and for the purpose described.
7. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum, an oxidizing compound, a suitable fuel other than aluminum, and a suitable coloring compound, substantially as and for the purpose described.
8. As an article of manufacture an impact illuminating bullet comprising a bullet

body in combination with a mixture of aluminum, an oxidizing compound, a suitable fuel other than aluminum, and strontium nitrate, substantially as and for the purpose described.

9. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum, an oxidizing compound, trinitrotoluene and strontium nitrate, substantially as and for the purpose described.

10. As an article of manufacture an impact illuminating bullet comprising a bullet body in combination with a mixture of aluminum, potassium chlorate, trinitrotoluene and strontium nitrate, substantially as and for the purpose described.

11. A bullet for indicating hits on a cinematograph target screen, charged with a composition containing powdered aluminium and a small proportion of an oxidizing agent.

12. A bullet for indicating hits on a cinematograph target screen, charged with a composition containing powdered aluminium and a small proportion of potassium chlorate.

13. A hollow nosed bullet for indicating hits on a cinematograph target screen, charged in said hollow nose with a composition containing powdered aluminium and a small proportion of an oxidizing agent.

14. A hollow nosed bullet for indicating hits on a cinematograph target screen, charged in said hollow nose with a composition containing powdered aluminium and a small proportion of potassium chlorate.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

WILLIAM H. BUELL

Witnesses:

Fritz v. Briesen,
John A. Ferguson.