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AMMUNITION

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The present invention relates to priming mixtures for ammunition. More specifically, the invention pertains to priming mixtures of the non-corrosive type which are characterized by the absence of ingredients which would leave residues of a hygroscopic nature in the gun bore, which residues would attract moisture and promote a ravaging corrosion on the steel of the bore. Such non-corrosive mixtures are to be distinguished from corrosive priming mixtures which have contained such an ingredient as potassium chlorate, long known to be in a large measure responsible for the corrosion which sometimes occurs in gun barrels subsequent to firing.

Efforts to combat the evil of corrosion in gun bores have led to the substitution, for the corrosive potassium chlorate, of one or more non-corrosive oxidizers, such for example as barium nitrate and/or lead nitrate. By the use of non-corrosive oxidizing ingredients, however, it has become necessary to change other ingredients of the priming mixture because of certain characteristics of these non-corrosive oxidizing ingredients. In the corrosive type primers it has been customary to use potassium chlorate as the oxidizing ingredient for the reason, among others, of its exceptional ability to yield a large amount of oxygen at comparatively low temperatures. Fulminate of mercury has been long used with potassium chlorate as the flame initiating ingredient therefor. When a non-corrosive oxidizing ingredient, such as barium nitrate, is used, it is sometimes desirable to select other flame initiating ingredients. Fulminate of mercury is essentially a detonating substance, and, when used in amounts large enough to develop sufficient heat for liberating the oxygen from the barium nitrate, has been found to develop forces of detonation in a degree such as to be undesirable for ammunition primers.

Successful non-corrosive priming mixtures have been produced in the past by the substitution, for a part of the fulminate of mercury, of the ingredient lead styphnate, known also as lead trinitroresorcinate

$$C_6H(NO_2)_3O_2Pb,$$

when used with a non-corrosive oxidizing ingredient, such as barium nitrate. Successful non-corrosive priming mixtures have been obtained also by eliminating mercury fulminate entirely, and utilizing instead, as an auxiliary flame initiating ingredient and sensitizing agent for the lead trinitroresorcinate, one of the substances known as tetracenes, such as guanylnitrosaminoguanyltetracene ($C_2H_8ON_{10}$). This substance is especially desirable for use in priming mixtures because it is non-mercuric, and because it is found to function efficiently as a sensitizer even in extremely small amounts. Lead trinitroresorcinate, however, is open to the objection that its manufacture involves complicated, delicate and sometimes dangerous operations, and results in a waste material which requires special treatment to render it safe for disposal in any ordinary manner.

The present invention in one of its aspects embodies the discovery that the substance basic lead picrate, when used with an auxiliary flame initiating ingredient, constitutes a highly efficient substitute for lead trinitroresorcinate in priming mixtures, particularly non-corrosive mixtures. In addition to the fact that basic lead picrate is easier and safer to manufacture, it possesses the further advantage over lead trinitroresorcinate of being less sensitive to friction while possessing about the same sensitiveness to shock.

Basic lead picrate of the formula

$$C_6H_2(NO_2)_3OPbH,$$

or

$$(C_6H_2(NO_2)_3O)_2Pb.PbO,$$

may be produced for example, by a process such as is described in the patent to Friedrich, No. 1,478,429, December 25, 1923; and this material may be used for the purposes of the present invention. It is preferred, however, to use di-basic lead picrate of the formula:

$$(C_6H_2(NO_2)_3O)_2Pb.2PbO$$

either as an alternative for or in admixture

with basic lead picrate of the formulæ given above. Dibasic lead picrate of the last mentioned formula may be prepared, for example, as follows:

Picric acid in the amount of about 4.6 grams is dissolved in about 60 c. c. of a 4% solution of sodium hydroxide, and this solution is added, as by dripping, to a solution of about 10.75 grams of lead nitrate in about 300 c. c. of water. The first solution is permitted to remain at room temperature, while the lead nitrate solution is maintained at a temperature preferably between 50° and 60° C. and is stirred during the addition of the first solution. About .9 gram of dextrine or other colloid may be added to the lead nitrate solution if desired, to facilitate precipitation of the final product into a well defined crystalline form.

The product thus obtained appears to consist chiefly of dibasic lead picrate of the formula given above, although traces of other substances such as lead oxide and/or lead hydroxide also appear to be present. Whether this product is a compound of definite composition or is a mixture of compounds has not been ascertained with certainty. However, it has been definitely demonstrated, in connection with the discoveries of the present invention, that when this product is used in priming mixtures as described herein, new and improved results are obtained as herein set forth. It is to be understood that the term "basic lead picrate" as used in this specification and claims refers to basic lead picrate generally, including the dibasic lead picrate as well as the monobasic salt. It will be further understood that the terms "basic lead picrate" and "dibasic lead picrate" as herein used refer to substances composed chiefly of these monobasic and dibasic lead salts of picric acid, whether or not small amounts of other materials are to be found in these substances.

According to the present invention, it has been discovered that improved priming mixtures are to be obtained by the use of basic lead picrate admixed with an additional flame initiating or sensitizing ingredient such as guanylnitrosaminoguanyltetracene and/or mercury fulminate, and used with a non-corrosive oxidizing ingredient such, for example, as barium nitrate and/or lead nitrate. Lead peroxide may also be used successfully in some mixtures containing basic lead picrate. In some mixtures it may be found desirable to add one or more fuel ingredients such, for example, as lead sulphocyanate and/or antimony sulphide and/or calcium silicide, although with many mixtures this is not essential. Basic lead picrate, besides serving in the capacity of a flame initiating ingredient, is found also to serve excellently in the capacity of a fuel, and it has been found that successful mixtures may be obtained by the use of basic lead picrate without the addition of any of the usual fuel ingredients. It is to be understood, however, that the present invention contemplates the use of basic lead picrate in priming mixtures with or without the use of additional fuel ingredients. The usual auxiliary ingredients, such as abrasives and binders, may of course be used where found to be desirable.

Successful non-corrosive priming mixtures utilizing basic lead picrate in admixture with mercury fulminate may be prepared as follows:

	Per cent
Mercury fulminate	15–40
Basic lead picrate	5–20
Barium nitrate	25–40
Abrasive	15–35
Binder	.5– 2

A typical mixture which has given good results in non-corrosive rim-fire ammunition is as follows:

	Per cent
Mercury fulminate, approximately	25
Basic lead picrate, approximately	15
Barium nitrate, approximately	34
Abrasive, approximately	25
Binder, approximately	1

A mixture which has given good results in non-corrosive center-fire ammunition is as follows:

	Per cent
Mercury fulminate, approximately	20
Basic lead picrate, approximately	20
Barium nitrate, approximately	36.5
Lead peroxide, approximately	7
Antimony sulphide, approximately	9
Calcium silicide, approximately	7.5

A mixture utilizing basic lead picrate in admixture with guanylnitrosaminoguanyltetracene which has given good results in non-corrosive rim-fire ammunition is as follows:

	Per cent
Guanylnitrosaminoguanyltetracene, approximately	3
Basic lead picrate, approximately	45
Lead nitrate, approximately	26
Lead sulphocyanate, approximately	8
Abrasive, approximately	18

Another successful rim-fire mixture is as follows:

	Per cent
Guanylnitrosaminoguanyltetracene, approximately	3
Basic lead picrate, approximately	45
Barium nitrate, approximately	26
Lead sulphocyanate, approximately	8
Abrasive, approximately	18

A mixture which has given good results in

non-corrosive center-fire ammunition is as follows:

	Per cent
Guanylnitrosaminoguanyltetracene, approximately	2
Basic lead picrate, approximately	25
Lead nitrate, approximately	55
Calcium silicide, approximately	8
Lead sulphocyanate, approximately	10

The terms "sensitizing ingredient" and "flame initiating ingredient" as used in this specification and appended claims are to be understood in the sense in which they are ordinarily used by ammunition chemists; that is, as defining compounds which in and of themselves and apart from other materials are susceptible to explosive combustion and decomposition into simpler compounds or elements under the stimulus of heat and/or friction, and as excluding substances which for their decomposition or reaction under such stimulus require the presence of a second and different material.

It will be understood that many variations may be made without departing from the scope of the invention as defined in the following claims.

What is claimed is:

1. A priming mixture for ammunition containing basic lead picrate in admixture with guanylnitrosaminoguanyltetracene.

2. A priming mixture for ammunition containing dibasic lead picrate admixed with guanylnitrosaminoguanyltetracene.

3. A priming mixture for ammunition containing basic lead picrate, guanylnitrosaminoguanyltetracene, and barium nitrate.

4. A priming mixture for ammunition containing basic lead picrate, guanylnitrosaminoguanyltetracene, barium nitrate, and a fuel.

5. A priming mixture for ammunition containing basic lead picrate, guanylnitrosaminoguanyltetracene, and lead nitrate.

6. A priming mixture for ammunition containing basic lead picrate, guanylnitrosaminoguanyltetracene, lead nitrate, and a fuel.

7. A priming mixture for ammunition containing basic lead picrate, guanylnitrosaminoguanyltetracene, lead nitrate, lead sulphocyanate, and calcium silicide.

8. A priming mixture for ammunition containing basic lead picrate admixed with mercury fulminate.

9. A priming mixture for ammunition containing dibasic lead picrate, mercury fulminate, and an oxidizer.

10. A priming mixture for ammunition comprising:

	Per cent
Mercury fulminate	15–40
Basic lead picrate	5–20
Barium nitrate	25–40
Abrasive	15–35
Binder	.5– 2

11. A priming mixture for ammunition having substantially the following composition:

	Per cent
Mercury fulminate, approximately	25
Basic lead picrate, approximately	15
Barium nitrate, approximately	34
Abrasive, approximately	25
Binder, approximately	1

12. A priming mixture for ammunition having substantially the following composition:

	Per cent
Guanylnitrosaminoguanyltetracene, approximately	2
Basic lead picrate, approximately	25
Lead nitrate, approximately	55
Calcium silicide, approximately	8
Lead sulphocyanate, approximately	10

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