

UNITED STATES PATENT OFFICE.

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EXPLOSIVE AND METHOD OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 674,159, dated May 14, 1901.

Application filed November 10, 1900. Serial No. 36,051. (No specimens.)

To all whom it may concern:

Be it known that we, JONAS EMILE BLOMÉN and HENRY C. ASPINWALL, citizens of the United States, and residents of Pompton township, in the county of Passaic and State of New Jersey, have invented a new and useful Base for High Explosives and Method of Making Same, of which the following is a specification.

Our invention relates to a high explosive and method of making same, which high explosive may form a base for other high explosives or for celluloid compounds.

Our object is to produce an explosive which we can regulate in such a manner as to obtain a greater or lesser degree of force, as may be desired or may be most suitable for the purpose for which it may be intended, and to produce an explosive which can be safely manufactured and handled and at a relatively low cost.

In our application, Serial No. 21,709, filed June 27, 1900, we described at length the co-nitration of cellulose with a hydrocarbon of the aromatic group—such, for example, as benzene—and in our application, Serial No. 21,710, filed June 27, 1900, we described at length the co-nitration of a hydrocarbon of the aromatic group—such, for example, as benzene, toluene, and naphthalene—with a hydroxyl derivative of a hydrocarbon—such, for example, as phenol and cresol.

Our present application is directed to the co-nitration of cellulose with a hydroxyl derivative of a hydrocarbon—such, for example, as a member of the phenol group—or with both a hydroxyl derivative of a hydrocarbon and a hydrocarbon of the aromatic group.

In using the term "cellulose" it is intended to include wood and plant fiber in general, without limiting it to what may be technically included in the term "cellulose."

Examples of the hydroxyl derivatives of the hydrocarbons which we find it practicable to employ are the members of the phenol group, such as phenol and cresol, and examples of the hydrocarbons which we find it practicable to employ are members of the aromatic group—such, for example, as benzene, toluene, and naphthalene.

When the hydroxyl derivative of the hy-

drocarbon or both the hydrocarbon itself and the hydroxyl derivative of the hydrocarbon is or are co-nitrated with cellulose, a solvent effect of one substance upon the other is observed. The result of this co-nitration is an explosive combining the explosive effects and properties of nitro-cellulose with the explosive effects and properties of the nitrated hydroxyl derivatives of the hydrocarbons or of both the hydrocarbons and their hydroxyl derivatives. The solvent effect of the co-nitrated substances upon each other results in an intimate mixture partially or wholly dissolved, together forming a colloided mass. This colloid will be more or less complete, depending upon the proportions of the cellulose and the hydroxyl derivative, or both the hydroxyl derivative and the hydrocarbon. The product obtained by these means has been found to be comparatively insensitive to shock or friction and is the explosive base sought and which forms the subject-matter of this application.

This base may be made to fulfil other requirements of an explosive substance, as follows: We may add one or more of the oxygen-bearing salts—such, for example, as the nitrates, the chlorates, or the perchlorates of barium, sodium, potassium, and ammonium. We may also add an inert organic substance—such as camphor, vaseline, petrolatum, or castor-oil—should we desire to produce a celluloid or should we desire to slow down the combustion and provide a less violent explosive. The addition of the oxygen-bearing salts or inert organic substances may be readily effected by means of any of the well-known apparatuses for inserting or incorporating substances. The addition may be effected in a dry state, or the substances may be wet, or the co-nitrated product may be wholly or partially dissolved in a solvent and the substances then added. As an example of the solvents that can be used may be mentioned acetone, amyl acetate, methyl-alcohol, and acetic ether.

We carry our invention practically into effect as follows: First, we produce phenol-sulfonic acid by treating ten parts of phenol with twelve parts of sulfuric acid of 66° Baumé at a temperature of about 70° centi-

grade for a period of eight days, more or less, with occasional stirring or until the resulting product is immediately soluble in cold water. We then nitrate this phenol-sulfonic acid
 5 with a weak nitric acid of about 36° Baumé or of sufficient strength to obtain the desired product. The resulting product is of a heavy syrupy consistency at a temperature of about 70° centigrade and consists of a mixture of
 10 mono-nitro and di-nitro phenol with some un-nitrated phenol. Care must be taken that the acid employed in this preliminary nitration is not too strong, so that the nitrated product shall not be of a higher nitration
 15 than is expressed by the terms "mono-nitro" and "di-nitro." It is now necessary to remove any free acid and other impurities as far as possible. This may be accomplished by washing with water at a low temperature
 20 (less than 20° centigrade) and the water removed by means of centrifugal extractor, by filtration, or by melting the substance and separation or similar well-known means. We now take, say, sixteen parts of the mono-nitro phenol above described and eight
 25 parts of a hydrocarbon, such as naphthalene, and thoroughly mix them. By digesting for some days (five days, more or less) at a temperature of about 30° centigrade we obtain a
 30 homogeneous compound consisting of the mono-nitro phenol and the naphthalene which solidifies at a temperature below 25° centigrade. Take two pounds of the above-described mixture in a liquid state. To this
 35 we add one pound of cellulose and treat the mixture with a weak nitric acid or mixture of nitric and sulfuric acids in a manner similar to that in which cellulose alone is nitrated. Mix well and masticate by constant
 40 stirring, employing any of the well-known mechanical means for mixing or stirring which will produce the results to be obtained. We find that it is desirable to commence the nitration at a low temperature. At 0° centi-
 45 grade we have obtained satisfactory results. The co-nitrated product thus produced is thoroughly washed and purified and then dried and may now be used as an explosive in this condition or as an explosive base mixed
 50 with other ingredients.

The introduction of the aromatic hydrocarbon hereinabove described may be omitted at pleasure, the hydroxyl derivative of the hydrocarbon being treated as hereinabove
 55 fully set forth and mixed with the cellulose for the purpose of nitrating the two together. This will produce an explosive and may for some purposes be preferred instead of the product produced by the co-nitration of the

cellulose with both a hydrocarbon and a hydroxyl derivative of a hydrocarbon.

In order to produce the best results, develop more fully the explosive force, and obtain the highest value as an explosive, we may add one or more of the oxygen-bearing salts—
 65 such as the nitrates, chlorates, or perchlorates of potassium, sodium, barium, and ammonium.

The addition or incorporation of the salts with the co-nitrated product may be effected
 70 by any well-known method of mixing. They may be added in a dry state or they may be wet, or the co-nitrated product may be melted, or it may be dissolved in any suitable solvent—such as acetone, methyl-alcohol, amyl
 75 acetate, acetic ether, or the like—and the salts may be added to the liquid or plastic mass thus formed.

We do not confine ourselves to any particular method of mixing, as most of the well-
 80 known methods will effect the results desired.

The proportions of the oxygen-bearing salt or salts to be added to the co-nitrated product will vary with the results we desire to obtain and also according to the nitration of
 85 the co-nitrated product.

The strength of the explosive may be varied according to the proportion of the oxygen-bearing salts added.
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What we claim is—

1. An explosive consisting of a colloided comminuted friable mass containing the following co-nitrated substances, viz; cellulose and a hydroxyl derivative of a hydrocarbon,
 95 substantially as specified.

2. An explosive consisting of a colloided comminuted friable mass containing the following co-nitrated substances, viz; cellulose, a hydrocarbon and a hydroxyl derivative of
 100 a hydrocarbon, substantially as specified.

3. The method of forming an explosive consisting in nitrating together cellulose and a hydroxyl derivative of a hydrocarbon, substantially as specified.
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4. The method of forming an explosive consisting in nitrating together cellulose, a hydrocarbon and a hydroxyl derivative of a hydrocarbon, substantially as specified.

In testimony that we claim the foregoing as
 110 our invention we have signed our names, in presence of two witnesses, this 25th day of October, 1900.

JONAS EMILE BLOMÉN.
 HENRY C. ASPINWALL.

Witnesses:

FREDK. HAYNES,
 C. S. SUNDGREN.