

## UNITED STATES PATENT OFFICE.

HUDSON MAXIM, OF BROOKLYN, NEW YORK.

## SMOKELESS-POWDER COMPOSITION.

SPECIFICATION forming part of Letters Patent No. 748,200, dated December 29, 1903.

Application filed April 19, 1902. Serial No. 103,727. (No specimens.)

*To all whom it may concern:*

Be it known that I, HUDSON MAXIM, of 891 Sterling Place, Brooklyn, county of Kings, city and State of New York, have invented a new and useful Improvement in Smokeless-Powder Compositions, which invention is fully set forth in the following specification.

The present invention relates to improvements in explosive compounds, especially smokeless powder, and in processes of manufacture, its main object being to prevent warping, twisting, and bending of smokeless-powder grains, particularly those consisting, mainly, of pyro-nitro-cellulose or pyroxylin soluble in ether-alcohol, especially when made in the form of long rods or bars, and it is a further object of the invention to facilitate and increase the rapidity of drying.

When smokeless powder is made of pure pyro-nitro-cellulose unmixed with other ingredients, the material is apt to warp and twist and bend badly when the contained solvents are evaporated therefrom. Furthermore, the process of drying is very tedious and requires a long time. This is owing, mainly, to the hardening of the outer or exposed surfaces of the material into a horn-like substance, which greatly impedes the passage through it of the vapors of the solvents from the undried portions within. I have discovered that by the admixture of a certain percentage of tri-nitro-cellulose to the compound in the manner hereinafter explained not only is the material capable of being dried with much greater facility and rapidity, but at the same time it is largely prevented from warping, twisting, and bending while in the process of drying.

In carrying out my invention I proceed in the following manner: About ninety parts, by weight, of pyro-nitro-cellulose is worked in a mixer in the usual manner, with sufficient ether and alcohol mixture to render the same gelatinous and capable of being molded into grains in the usual way. In another mixer ten parts, by weight, of tri-nitro-cellulose is incorporated with a sufficient quantity of acetone or acetic ether or other suitable solvent, and when the same is thoroughly gelatinated and when the pyro-nitro-cellulose mixture in the other mixer is also thoroughly gelatinated

the tri-nitro-cellulose mixture is added thereto and thoroughly and rapidly incorporated therewith. After the two materials have been thoroughly incorporated the material is molded into grains in the usual manner.

In practicing my invention I may and sometimes do employ sufficient acetone or other suitable solvent for gelatinating or dissolving the tri-nitro-cellulose as will prevent the precipitation from solution of the tri-nitro-cellulose, when the same is admixed and incorporated with the pyro-nitro-cellulose and ether and alcohol mixture, or I may and sometimes do employ such a small quantity of acetone or similar solvent as to allow such precipitation to take place and cause the precipitation from solution of the tri-nitro-cellulose in a finely-divided condition. In the one instance the tri-nitro-cellulose is combined with the pyro-nitro-cellulose while both are in solution—that is to say, their solutions are incorporated—while in the other case the tri-nitro-cellulose is precipitated from the solution in the act of incorporation.

While I have explained that I employ about ninety parts, by weight, of pyro-nitro-cellulose to ten parts, by weight, of tri-nitro-cellulose, I do not confine myself strictly to these proportions; but I may vary those proportions as I desire and within wide limits.

While I may, as already described, dissolve the tri-nitro-cellulose or gelatinate the same before mixing with the pyro-nitro-cellulose paste or solution, I may instead of dissolving or gelatinating the tri-nitro-cellulose pulverize or grind the same to an impalpable powder or dust. This may be done without danger by grinding it in water or in a wet state, the tri-nitro-cellulose then being dried and moistened with alcohol or ether or a mixture of them before adding to and incorporating with the pyro-nitro-cellulose paste.

I have found that by the admixture of from ten to fifteen per cent., by weight, of finely-powdered tri-nitro-cellulose to pyro-nitro-cellulose in the above manner and thoroughly incorporating therewith the density and horn-like and impervious character of the product is considerably modified and that powder-grains made of the material may be dried with greater facility and rapidity and with



much less tendency to warp and lose their shape. Furthermore, smokeless powder made in this manner being less hard and horn-like is burned through a greater thickness of material under a given pressure before the projectile leaves the gun, which enables the burning thicknesses between the perforations to be made greater, resulting in greater acceleration of combustion.

By the term "tri-nitro-cellulose" is meant cellulose of the highest degree of nitration or gun-cotton, and by the term "pyro-nitro-cellulose" is meant the soluble nitro-cellulose composition usually employed in the manufacture of smokeless powder.

What is claimed is—

1. The herein-described process of making smokeless-powder composition, which consists in gelatinating pyro-nitro-cellulose or soluble pyroxylin in a solvent which is not a solvent of tri-nitro-cellulose, and separately gelatinating or dissolving tri-nitro-cellulose in a suitable solvent, and then uniting and thoroughly incorporating the two mixtures.

2. The process of making smokeless-powder composition, which consists in dissolving pyro-nitro-cellulose or soluble pyroxylin in a solvent which is not a solvent of tri-nitro-cellulose, adding thereto a solution of tri-

nitro-cellulose and thoroughly incorporating the same therewith.

3. The herein-described process of making a smokeless-powder composition, which consists in gelatinating pyro-nitro-cellulose or soluble pyroxylin in a solvent which is not a solvent of tri-nitro-cellulose, adding thereto a solution of tri-nitro-cellulose, and precipitating the tri-nitro-cellulose from solution in the act of incorporating the two mixtures.

4. The herein-described process of making a smokeless-powder composition, which consists in uniting and incorporating independent solutions of pyro-nitro-cellulose and tri-nitro-cellulose, in the proportions of twenty-five per cent. or less of the tri-nitro-cellulose, to seventy-five per cent. or more of the pyro-nitro-cellulose.

5. The herein-described smokeless-powder composition or paste, which consists of pyro-nitro-cellulose or soluble pyroxylin in solution, and a precipitate of tri-nitro-cellulose.

In testimony whereof I, HUDSON MAXIM, have signed this specification in the presence of two subscribing witnesses.

HUDSON MAXIM.

Witnesses:

REEVE LEWIS,  
WM. B. KERKAM.