

UNITED STATES PATENT OFFICE.

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EXPLOSIVE POWDER AND PROCESS OF MAKING SAME.

SPECIFICATION forming part of Letters Patent No. 489,684, dated January 10, 1893.

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To all whom it may concern:

Be it known that I, CHARLES E. MUNROE, a citizen of the United States, residing at the Naval Torpedo Station, at Newport, in the State of Rhode Island, have invented a certain new and useful Improvement in Explosive Powder and the Manufacture Thereof, of which the following is a specification.

The object of my invention is to produce a powder for use as a propellant in fire-arms, which shall be capable of giving a high velocity to the projectile without the production of a dangerous pressure in the barrel of the gun, and without the production of smoke to any serious extent, and which is incapable of being exploded with detonation. To accomplish this I make use of gun cotton, and, preferably, I first purify the same by the method set forth in my application of even date herewith, namely, exposure to the action of a solvent such as methyl alcohol which acts upon the lower cellulose nitrates (that is to say, those which are capable of being dissolved by such a solvent) and other soluble products of nitration, but not upon the higher nitrates (that is, such as are not materially affected by a solvent of this character) to any material extent, and which by percolation through the gun-cotton removes the soluble portions. I thus obtain a uniform material instead of one containing a variable and uncertain quantity of the lower nitrates, and therefore having an uncertain value as an explosive, as has been the case with the gun cotton heretofore employed for military purposes. I mix this material with nitro-benzene, the same being incorporated thoroughly with the gun cotton in a mill or between rolls, so that the gun cotton is acted upon throughout by the nitro-benzene and by which, preferably, it is shaped into sheets. The material, which is now of a plastic, coherent and homogeneous character, is then preferably cut, molded, rolled or otherwise formed into strips, grains, wires or other forms, the size and form given to the material being varied according to the use to which it is to be put. This process by which the dry gun cotton is converted into a plastic homogeneous, coherent and non-explosive substance which retains its coherency and plasticity even while it is exposed to the air, and

which is capable of being indurated or converted into a hard, horny product by the process hereinafter described I term "colloidizing." I believe nitro-benzene to be the most suitable colloidizing agent, but my invention is not confined to the use of such material, for I consider the use of any agent by which the gun cotton may be converted into a material of sufficient plasticity to enable the thorough incorporation of the colloidizing agent to be effected, and which retains its plasticity and coherency while exposed to the air and which is capable of induration as hereinafter described to be within the scope of my invention. I prefer to use from about nine-tenths to about one and eight-tenths parts of nitro-benzene to one part of gun-cotton. I may mix with the material suitable oxidizing salts to perfect combustion; the kind and quantity of such oxidizing salts being varied according to the use to which the product is to be put as will be understood.

I now indurate the material by the action of heated liquids or the vapors thereof. I prefer to employ water or steam or both. I have discovered that nitrated cellulose after being colloidized in the manner described by me, if treated by hot liquid or vapor, becomes indurated and is converted into a material having the consistence of bone, ivory and like substances, and by so treating the colloidized material I obtain a substance of much density, great toughness, very close grained texture, great superficial hardness and smoothness, which is insoluble in water and completely resists disintegration thereby. The material is also incapable of being exploded by detonation, but burns with such rapidity as to produce a high velocity of the projectile when used in fire-arms but without creating a dangerous pressure in the barrel, and also without the presence of smoke to any material extent.

Any suitable method and apparatus for applying the heated liquid or vapor may be employed. For instance, the material may be placed in a vessel through which the liquid is caused to circulate, and through which also the heated steam or vapor is caused to pass. The time of exposure to the liquid depends upon the degree of subdivision of the mate-

rial. For instance, the small grains best adapted to use with small arms require an exposure of about twelve hours with water at the boiling point, to complete the process.

- 5 With larger pieces the time required is proportionately longer.

The heated liquid or vapor used to indurate the material is used at a lower temperature than the boiling point of the colloidizing agent, under the same conditions as to temperature, pressure, and other matters which affect boiling points.

It is not essential that the plastic colloidized material shall be immediately exposed to the indurating process, since the plastic material may be conveniently stored and transported, it being non-explosive, and the indurating step may be performed subsequently or as the material is required for use.

- 20 What I claim is,

1. The method of making explosive material which consists in mixing and incorporating with gun cotton a liquid colloidizing agent which is capable of converting at ordinary temperatures the higher cellulose nitrates into viscous form and then acting upon it with heated liquid or vapor to indurate it, substantially as set forth.

2. The method of making explosive material which consists in extracting from gun cotton the lower products of nitration, then mixing and incorporating with it a liquid colloidizing agent which is capable of converting at ordinary temperatures the higher cellulose nitrates into viscous form, and then indurating it, substantially as set forth.

3. The method of making explosive material which consists in extracting from gun cotton the lower products of nitration, then mixing and incorporating with it a liquid col-

loidizing agent which is capable of converting at ordinary temperatures the higher cellulose nitrates into viscous form, and then acting upon it with heated liquid or vapor to indurate it, substantially as set forth.

4. The method of making explosive material which consists in extracting from gun cotton the lower products of nitration, then mixing and incorporating with it nitrobenzene, and then indurating it, substantially as set forth.

5. The method of making explosive material which consists in first extracting from gun cotton the lower products of nitration, then mixing and incorporating with it nitrobenzene, and then acting upon it with heated liquid or vapor to indurate it, substantially as set forth.

6. The method of making explosive material which consists in first extracting from gun cotton the lower products of nitration, then mixing and incorporating with it a liquid colloidizing agent which is capable of converting at ordinary temperatures the higher cellulose nitrates into viscous form, then forming the material into pieces of the desired form, such as grains or strips, and finally indurating the material, substantially as set forth.

7. The explosive material consisting wholly of cellulose nitrates of the higher orders in a colloidized and indurated condition, substantially as set forth.

This specification signed and witnessed this 12th day of August, 1891.

CHARLES E. MUNROE.

Witnesses:

WM. CROOKE,

G. W. PATTERSON.