UNITED STATES PATENT OFFICE.

WILHELM EBERLEIN, OF BRUNSWICK, GERMANY

PROCESS OF PREPARING PROGRESSIVE GUNPOWDER.

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To all whom it may concern:

Be it known that I, Dr. Ing. WILHELM EBERLEIN, a subject of the Duchy of Brunswick, Empire of Germany, residing at 77 Karlstrasse, Brunswick, Germany, have invented certain new and useful Improvements in the Process of Preparing Progressive Gunpowder, of which the following is a specification.

My invention relates to improvements in the process of preparing progressive gun powder, which powder is adapted for use in ordnance, hand fire arms, and the like.

The explosion of ordinary gun powder in guns is so quick, that the pressure of the gases of explosion attains its maximum, before the projectile has begun its movement. As is known in the art, the velocity of the explosion can be regulated within large limits by increasing the grain, or by adding thereto substances such as camphor. However, when reducing the velocity by such means to such an extent that the powder is not yet completely burnt the moment the projectile begins its movement, the unburnt part of the powder is not burnt at all and is thrown out of the gun. Efforts have been made to retard the explosion of the powder in such a way, that the pressure of the gases is still increasing while the projectile is in motion. For this purpose the grain of the powder which in ordinary powder burns at uniform velocity from the outside to the inner parts thereof has been composed of different layers which burn at increasing velocity from the outside to the center of the grain. Such powders have been termed progressive powders. In such powders the outer layers do not produce more pressure than is necessary to start the projectile, so that the pressure produced by the explosion of the inner layers has merely the function to accelerate the projectile. However the manufacture of such progressive powder is difficult, because so many grades of powder must be prepared and rolled one above the other as layers are required.

The object of my improvements is to provide a process of preparing progressive powder which is more simple and which gives a better powder. And with this object in view my invention consists in preparing a powder in which the increase of the velocity of the explosion from the outer parts to the center of each grain is uniform and continuous, for which purpose the density of the grains is uniformly and continuously reduced from the outer parts to the center of the grains.

In carrying my improved process into effect, I interrupt at the proper moment the vaporization of the gelatinating liquid, which consists for example of acetone, acetic ester, or ether-alcohol. The vaporization of the said liquid begins on the surface of the powder and it slowly proceeds to the center thereof. Preferably the vaporization is accelerated by passing warm dry air over the grains in order to cause their surfaces to harden into a very dense mass and to permit the liquid to escape from the inner parts only slowly. If at the proper moment the vaporization is interrupted by putting the powder into another liquid, such for example as water, which is adapted to stop the action of the gelatinating liquid, a powder is obtained the density of which is gradually reduced toward the center.

This process is particularly advantageous in the manufacture of tube powder in which the powder when suspended in long skeins for drying dries more rapidly at its outer surface than at its inner surface. The explosion is considerably more quick on the inner surface, than on the outer surface, because the inner surface of the grain is also subjected to the explosion whereby the progressive action of the powder is further increased.

In order that my invention may more clearly be understood one example of carrying the same into effect is described hereafter.

Example: Gun-cotton of a solubility of from 20 to 25 per cent. in ether-alcohol is kneaded with camphor and molded in the usual way, whereupon the ropes of powder are uniformly dried in a current of heated air, and the vaporization of the gelatinating substance is interrupted by passing the powder ropes into cold water, as soon as the desired difference in the density is attained. The ropes of powder are left within the water so long that they can still be cut, whereupon they are cut and brought into cold water within which they are heated to boiling temperature. Finally the treatment is completed by drying and polishing the powder. In a similar way porous powders for hunting, sham battles and other purposes

can be treated. After the solvent has been completely evaporated, the powder is dried, watered, again dried, and freed of the dust.

Prior to treating the powder with substances for reducing the temperature or velocity of explosion, it may be so treated as to impart thereto a density which is continuously decreased from the outer surface to the center. However, in this case care must be taken, that the inner portions which are liable to absorb the substances more readily than the outer ones are not excessively enriched which would remove their progressive action.

My improved process is particularly adapted for the manufacture of such powders as consist of nitro-cellulose or mixtures of nitro-cellulose. When powder of especially low cubic weight (for hunting, shambattles, etc.) is to be produced, the preliminary drying in the warm air current may be omitted.

I claim herein as my invention:

The herein described process of making a nitro-cellulose explosive burning with a rate accelerating toward the interior of the separate pieces of the explosive, which consists in gelatinizing nitro-cellulose with a volatile solvent, forming it into pieces of the desired shape and size, vaporizing the volatile solvent until a predetermined graduated density of each piece of powder, diminishing from the exterior to the interior of the pieces, is attained and interrupting vaporization of the volatile solvent by immersion of the explosive in a liquid which will stop the action of the solvent.

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

DR. ING. WILHELM EBERLEIN.

Witnesses:

JULIUS SECKEL,

WILHELM LEHRKE.