F. I. DU PONT.

SMOKELESS POWDER AND PROCESS OF COATING SAME.

APPLICATION FILED MAY 2, 1916.

1,308,343. Patented July 1, 1919.

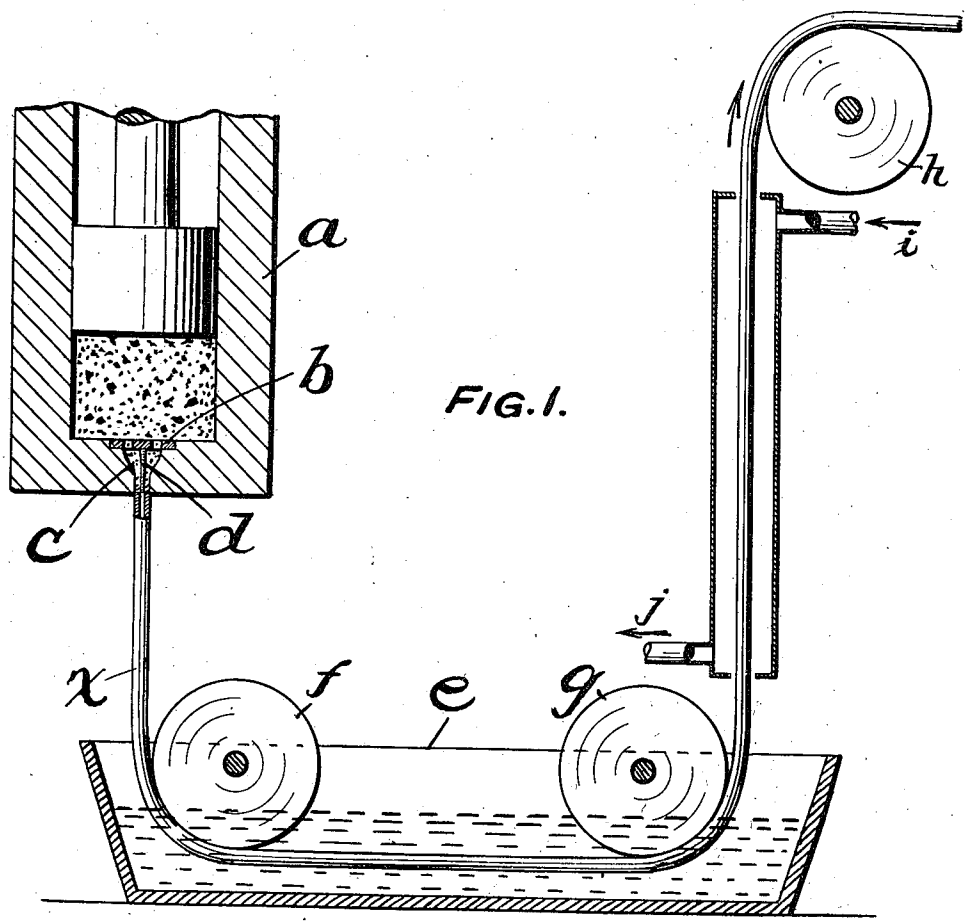


FIG. 1.

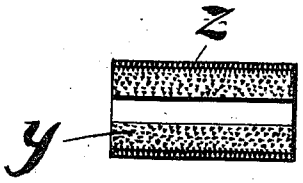


FIG. 2.

WITNESS:

Robt. A. Mitchell.

INVENTOR

Francis I. du Pont

BY

Frank D. Busser

ATTORNEY.

UNITED STATES PATENT OFFICE.

FRANCIS I. DU PONT, OF WILMINGTON, DELAWARE, ASSIGNOR, BY DIRECT AND MESNE ASSIGNMENTS, TO BALL GRAIN EXPLOSIVES COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

SMOKELESS POWDER AND PROCESS OF COATING SAME.

1,308,343. Specification of Letters Patent. Patented July 1, 1919.

Application filed May 2, 1916. Serial No. 94,945.

To all whom it may concern:

Be it known that I, FRANCIS I. DU PONT, a citizen of the United States, residing at Wilmington, county of New Castle, and State of Delaware, have invented a new and useful Improvement in Smokeless Powder and Processes of Coating Same, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

In the manufacture of smokeless rifle powder, the separate grains are in the form of cylindrically shaped pellets. These pellets are axially perforated so that combustion may take place from the center outwardly in a radial direction as well as from the outer wall toward the center. It is also known to coat the surface of grains of smokeless powder with a relatively slow burning substance, such as mononitronaphthalene, to cause the combustion to proceed more slowly at first and more rapidly after the slow burning material has been consumed, thus giving to the explosive gases a cumulative propelling force that they otherwise would not exert. It has also been proposed to mix with the smokeless powder ingredients a substance which will have a lubricating effect upon the bore of the gun, but this has resulted in retarding combustion and seriously reducing the propulsive power of the gases.

The object of my invention is to apply a protective coating to the peripheral wall of the pellet of such slow burning composition as to cause the combustion to proceed more rapidly from the center outwardly than from the outer surface inwardly and at the same time to release a material which has a lubricating action upon the bore of the gun.

To this end I coat the peripheral surface of the pellets or grains with a composition composed of a relatively slow burning explosive ingredient, containing a substance having a lubricating quality, and a solvent of the first ingredient in quantity sufficient to render the mixture paint like in consistency. I prefer to use equal parts of nitrocellulose and unctuous graphite. In the accompanying drawings I show an apparatus adapted to manufacture the strings from which the separate grains are subsequently cut and also to apply to the strings my improved coating.

Figure 1 is an elevation, partly in section and somewhat enlarged, of such apparatus. Fig. 2 is a longitudinal sectional view, greatly magnified, of one of the completed smokeless powder grains.

The powder from which the grains are formed, which is of any standard composition, is placed in a press *a* having in its bottom a perforated plate *b* below which is an orifice *c* of a diameter at its outlet bearing the proper relation to the diameter of the grains to be ultimately formed. A pin *d* projects downward from the plate *b* and extends along the axis of the orifice *c*. As the plunger descends, the powder is forced through the perforations in the plate *b* and fills the orifice *c* between the outer wall thereof and the pin *d*, thereby causing the powder to be ejected from the press in the form of a long string *x* longitudinally and centrally perforated. This apparatus is old in the art and forms no part of my invention.

A tank *e* is provided containing my improved coating composition above described, and the powder string *x*, by means of rollers *f*, *g* and *h* is fed into, through and out of the bath, causing the string to be superficially coated with a retarding and lubricating coating. As the string passes beyond the roller *g*, it may be subjected, at the point *i* as indicated by the arrows, to a current of hot air in order to drive off the solvent and dry the coating. At *j* a pipe may be arranged with a suction to convey the vapors to an apparatus to recover a portion of the solvent. Subsequently the string is cut into separate grains in the manner well known in the art.

A finished single grain or pellet is shown in Fig. 2 in which *y* represents the main body of smokeless powder and *z* the coating of nitrocellulose and unctuous graphite.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. As a new article of manufacture, a smokeless powder grain having a relatively quick burning body and an exterior coat-

ing composed of a relatively slow burning composition which contains an ingredient having a lubricating quality.

2. As a new article of manufacture, a smokeless powder grain coated exteriorly with a mixture of nitrocellulose and graphite.

3. As a new article of manufacture, a cylindrically shaped axially perforated pellet of smokeless powder having its outer periphery painted with a coating composed of a relatively slow burning composition which contains an ingredient having a lubricating quality.

4. As a new article of manufacture, a cylindrically shaped axially perforated pellet of smokeless powder, having its outer periphery coated with a mixture of nitrocellulose and graphite.

5. The process which consists in coating smokeless powder with a relatively slow burning composition comprising an explosive ingredient, a substance having a lubricating quality, and a solvent of the first ingredient.

6. The process which consists in coating smokeless powder with a relatively slow burning composition comprising an explosive ingredient, a substance having a lubricating quality, and a solvent of the first ingredient, and then volatilizing the solvent.

7. The process which consists in coating smokeless powder with a composition composed of nitrocellulose, graphite and a solvent of nitrocellulose.

8. As a new article of manufacture, a cylindrically shaped axially perforated pellet of propellent powder having its outer periphery coated with graphite contained in a varnish like matrix.

In testimony of which invention, I have hereunto set my hand, at Philadelphia, on this 24th day of April, 1916.

FRANCIS I. DU PONT.