UNITED STATES PATENT OFFICE.

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EXPLOSIVE.

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To all whom it may concern:

Be it known that I, WALTER O. SNELLING, a citizen of the United States, and resident of Allentown, Lehigh county, Pennsylvania, have invented certain Improvements in Explosives, of which the following is a specification.

My invention relates to improvements in nitrostarch explosives, and more particularly to improvements in booster charges for shells, torpedoes and the like.

For the purposes of a booster explosive, a material must be highly explosive and have great strength, and at the same time be sufficiently insensitive to be capable of withstanding the heavy shock which is produced on a shell at the moment that it is first moved forward by the powder gases in the gun, and also at the moment that its speed is suddenly checked when it reaches its destination.

Heretofore booster charges have usually consisted of compressed pellets of tetryl or T. N. T., these substances having the ability when compressed under a pressure of 5,000 pounds per square inch or higher, of consolidating from pulverulent form to yield hard and dense tablets of suitable sensitiveness.

While nitrostarch is sufficiently powerful for use as a booster charge, it is in its ordinary condition too sensitive for the purpose, since it would produce premature explosion from the shock of the powder gases on the base of the shell. Ordinary nitrostarch, also, is unsatisfactory for use as a booster explosive because of its pulverulent nature and because even pressures much in excess of those which are employed in forming pellets of tetryl or T. N. T. are incapable of bringing about the consolidation of this material. No pressures employed up to this time have proved sufficient to cause nitrostarch to unite to form a firm pellet, such as is required in booster charges.

I have discovered that nitrostarch, when blended with suitable agglomerating and desensitizing material, is capable of forming a booster explosive superior to either tetryl or T. N. T.

Among the materials with which I have obtained useful results as agglomerating agents are paraffin hydrocarbons, beeswax, ceresin, ozocerite, rosin, and other like materials, these materials preferably being used to the extent of from 1% to 10% of my complete composition.

As an illustration of my invention, I will describe the procedure which is employed in preparing nitrostarch boosters of medium sensitiveness. Ordinary nitrostarch is first warmed with paraffin wax or equivalent waxy material, the nitrostarch preferably being mixed with the agglomerating agent at a temperature at which the waxy material is semi or completely liquid. Pressure is then applied to the composition to form pellets of the desired size and shape, the said pressure preferably approximating 1000 pounds per square inch, although higher or lower pressures may be employed, according to the nature of the agglomerating material, the temperature employed, and the percentage of agglomerating material used.

It is frequently desirable to have present in my new booster compositions an oxidizing agent, and in such cases I prepare a mixture of the nitrostarch, the agglomerating agent and the oxidizing agent. As an illustration of such a composition, I will describe the method employed to prepare a booster composition suitable for trench mortar shells. I first thoroughly mix 40 parts of nitrostarch and 50 parts of an oxidizing agent such as an inorganic nitrate, chlorate or perchlorate, ammonium nitrate being particularly suitable in such composition as I am now describing. I next add to the mixture 2% of a heavy mineral oil as a desensitizing agent, and thoroughly incorporate the entire mass. 8% of powdered rosin is next added, after which the mixture is warmed slightly and is compressed into pellets by application of pressure. The oil acts to desensitize the nitrostarch to the desired extent, while the rosin serves to consolidate the mixture under the influence of the pressure applied to form a pellet of the desired coherence and strength.

It will be noted that the agglomerating agent may be alone relied upon to produce the desired insensitiveness, as in the example first given, or an additional desensitizing agent may be employed with the agglomerating material as in the second example, the use of these materials depending upon the degree of sensitiveness that it is desired to impart to the explosive, and also upon the nature of the particular agglomerating ma-

terial employed. By varying the proportion of agglomerating agent with respect to the nitrostarch, and employing an additional desensitizing agent as required, I can obtain the particular degree of sensitiveness I may require for any particular booster. In other words, by my invention I have a booster of controlled sensitiveness.

When ammonium nitrate is employed in the explosive with a temperature in excess of 50° centigrade during the operation of pressing the pellets, there occurs a recrystallization of the ammonium nitrate, this material then tending to "set," and thus to add to the strength and coherence of the resulting pellet. In the case of mixtures employing a relatively high percentage of ammonium nitrate, a lesser quantity of the cementing or agglomerating agent may accordingly be employed than would be used with mixtures containing a lower proportion of the ingredient.

Many equivalent substances may be used in place of the agglomerating and desensitizing agents hereinbefore named, the essential feature of the invention residing in the preparation of booster compositions of high brisance and great explosive force from nitrostarch by mixing with this material a substance or substances having properties enabling them to act as desensitizing and agglomerating agents, and forming this mixture into masses of the desired shape and size. The composition is a strong coherent mass of completely uncolloided nitrostarch.

I claim:

1. As a new composition of matter, strong coherent masses comprising entirely uncolloided nitrostarch.

2. As a new composition of matter, strong coherent masses comprising uncolloided nitrostarch admixed with an inorganic nitrate.

3. As a new composition of matter, strong coherent masses in tablet form comprising entirely uncolloided nitrostarch admixed with an inorganic nitrate and a readily fusible hydrocarbon body.

4. A booster charge containing nitrostarch.

5. A booster charge of controlled sensitiveness containing nitrostarch.

6. A booster composition comprising nitrostarch desensitized by means of a hydrocarbon body.

7. A booster composition comprising nitrostarch consolidated by means of a waxy material.

8. A booster composition comprising nitrostarch desensitized by means of a hydrocarbon body, and consolidated by means of a waxy material.

9. A booster composition comprising nitrostarch, a cementing agent, and an inorganic salt.

10. A booster composition comprising nitrostarch, a cementing agent, a desensitizing agent, and an inorganic salt.

11. A boster composition comprising nitrostarch, a desensitizing agent, a cementing agent, and an inorganic nitrate.

12. A booster composition comprising nitrostarch, an inorgonic nitrate, and a hydrocarbon material serving to desensitize and consolidate the resulting composition.

13. The method of preparing a booster composition from nitrostarch, which consists of desensitizing and consolidating said nitrostarch by means of a hydrocarbon material, and forming said agglomerated mixture into pellets under pressure.

14. The method of preparing a booster composition from nitrostarch, which consists of consolidating said nitrostarch by means of a waxy material, and compressing said consolidated nitrostarch into pellets.

15. The method of preparing a booster composition from nitrostarch, which consists of mixing with said nitrostarch a desensitizing agent, agglomerating said desensitized nitrostarch with a cementing agent, and compressing said agglomerated mixture into pellets.

16. The method of preparing a booster composition from nitrostarch, which consists of agglomerating said nitrostarch by means of suitable desensitizing and cementing material, and compressing the said mixture into pellets under a pressure of approximately 1000 pounds per square inch.

WALTER O. SNELLING