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UNITED STATES PATENT OFFICE

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BLACK BLASTING POWDER

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The object of the present invention is to provide an improved explosive, of the nature of black powder, and method of manufacturing the same. Black blasting powder is one of the most useful of explosives. It finds many important applications; sells at a lower price than, practically, any of the detonating explosives, but it is open to the objection that it has a low strength factor.

It has, heretofore, been proposed to increase the strength factor of black blasting powder by incorporating with the same, in the usual process of manufacture, one or more of a variety of strengthening agents, such as ammonium perchlorate, potassium perchlorate, ammonium nitrate, nitro-compounds and organic nitrates.

However, most of the methods, heretofore proposed, with which I am familiar, have the disadvantage of an increased hazard which renders them inapplicable to the usual black powder mills, and equipment. Some of them present the difficulty that, when incorporated in intimate contact with the usual sodium nitrate or potassium nitrate of black powder, a greatly increased hygroscopicity factor is introduced and black powder, at its best, is not of great moisture resistance. Further, various ingredients, which might be proposed for incorporation with black powder to strengthen it, have other individual disadvantages in one or more of such items as manufacture, handling, shipment, storage and application.

Some of the objects which should, desirably, be attained or approached in making stronger black blasting powder, are: that it be adapted for manufacture in the usual black powder mills; that there be no increase in cost over usual black powder; that normal black powder safety in manufacture, handling, shipment, storage and application be maintained; that the usual methods of handling black powder, in the respects mentioned, will apply; that there be no increase in hygroscopicity; that the product possess the capability of strength regulation, and that the high temperature of combustion and the deficiency of oxygen of regular black powder be utilized to assist in increasing the strength factor.

Increased black powder strength without any, or at least without a proportional increase in cost, represents a distinct direct saving to the consumer in powder purchases. It offers further saving in less drilling, because of possible increased spacing of holes and less springing of holes because of the lack of necessity of getting so much powder in the holes, to accomplish the desired work.

This invention provides a modification of black blasting powder, which will be characterized by most of the properties and the economy of usual black blasting powder, but with various degrees of increased strength.

More specifically, it concerns the production of blasting powder consisting of intermingled particles of usual black blasting powder and specially treated ammonium nitrate, in such form that the alkali metal nitrate of usual blasting powder is not in such intimate contact with the ammonium nitrate as to cause increased hygroscopicity from this cause, and providing treatment of the ammonium nitrate to aid in its ready combustion or entrance into the explosive reaction.

My co-pending application No. 315,106, filed October 25th, 1928, deals with grains of oxygen carrying explosive salt, as ammonium nitrate, intermingled with grains of usual black blasting powder in such a manner as to provide against the hygroscopicity resultant from intimate contact of alkali metal nitrate and ammonium nitrate, but depends solely on the reaction heat of the usual black powder to cause energy releasing decomposition of the ammonium nitrate. When the percentage of ammonium nitrate present is too high or the explosive is insufficiently confined, this dependence may not be sufficient for best results.

I now find that I can provide for a more ready liberation of the energy of ammonium nitrate under the initiating influence of burning black powder by associating the ammonium nitrate intimately with combustible and oxygen deficient matter, before

mingling it with the usual black blasting powder.

My preparation of ammonium nitrate may take a variety of forms, all, however, pointing to the common end of an intimate association of it with combustible oxygen deficient matter. For instance:

1. In essentially the same manner as usual black powder is made from sodium nitrate, sulphur and charcoal, I prepare a product of ammonium nitrate, sulphur and charcoal. This product is not much of a blasting medium by itself because of slow and difficult combustion and low explosive temperature. It is not intended to be used alone. However, the entire composition is potentially gas forming on decomposition and possesses excellent strength possibilities. I mix the product in any desired proportion with usual alkali metal nitrate black powder. This latter material burns with great rapidity and the development of much heat and a high temperature. These factors initiate and carry on the complete conversion of the ammonium nitrate product into highly expanded gas and water vapor, with a resultant high degree of blasting energy.

2. I may impregnate combustible matter as sawdust, charcoal, nut shells, etc. with a solution of ammonium nitrate, dry and granulate the resultant mass. This product may be intermingled with grains of usual black powder for the same cause and effect as previously described.

3. Particles or crystals of ammonium nitrate may be coated with a wide variety of combustible, oxygen deficient materials, the following examples indicating the type and range of possibilities, but not being limiting.

a. Nitrated aromatic hydrocarbons as trinitrotoluene, dinitrotoluene, tetryl.

b. The "jelly" produced by treating liquid or molten nitrated aromatic compounds with soluble nitrocellulose.

c. Nitrocellulose in solution in non-nitrated solvents.

d. Pastes of finely divided combustible materials, as wood meal and starch pastes. In items *c* and *d* the solvent or moistening agent is subsequently removed. The coated ammonium nitrate product is mixed with grains of usual black blasting powder to form the effective blasting medium.

Intimate contact of ammonium nitrate and alkali metal nitrate, as sodium nitrate, is avoided in every case. In the usual black blasting powder sodium nitrate, for example, is incorporated with and imbedded in the associated sulphur and charcoal; also, the resultant product may be and usually is glazed or coated with some material as graphite or aluminum dust. Likewise, the ammonium nitrate is covered and protected by its associated materials. I thus avoid the hygroscopicity difficulties which intimate contact of the nitrates would involve.

While I have described ammonium nitrate as being the oxygen carrying explosive salt that I preferably employ, it is to be understood that I may utilize ammonium perchlorate in the same way, if desired.

Having described my invention, what I claim is:

1. A blasting medium consisting of an oxygen carrying explosive salt of the class of ammonium nitrate and ammonium perchlorate mingled with the grains of black blasting powder, and a protective body of oxygen deficient material interposed between the particles of said salt and the grains of black powder as and for the purposes stated.

2. A blasting medium consisting of ammonium nitrate intimately associated with a suitable combustible oxygen deficient material in such manner that the latter forms a protective coating upon the surface of the ammonium nitrate, the whole being mixed with grains of black blasting powder.

3. A blasting medium consisting of an oxygen carrying explosive salt of the class of ammonium nitrate and ammonium perchlorate coated with a protecting medium and mingled with the grains of black blasting powder, said protecting medium being of such nature as to enter into the explosive as a constituent part thereof and to prevent the hygroscopicity which follows intimate contact between such salts and the grains of black blasting powder.

4. The hereindescribed process of preparing a powder blasting medium, which combines the advantages of ammonium and alkali metal nitrate while avoiding the increase in hygroscopicity which the intimate contact of ammonum nitrate and alkali metal nitrate would ordinarily involve, which consists of first coating the ammonium nitrate with a suitable combustible oxygen deficient matter to protect it from too intimate contact with the alkali metal nitrate of black blasting powder and thereafter mingling said ammonium nitrate with ordinary black blasting powder.

5. A blasting medium consisting of ammonium nitrate coated with a suitable combustible oxygen deficient material and mixed with the grains of ordinary black blasting powder.

6. A blasting medium comprising ammonium nitrate which is intimately associated with a suitable combustible oxygen deficient material and mingled with the grains of whole black blasting powder having an alkali metal nitrate content, said oxygen deficient material preventing such intimate contact between the alkali metal nitrate and the ammonium nitrate as would bring about undue hygroscopicity of the said medium, said oxygen deficient material being adapted

to enter into and become a part of the blasting medium.

7. The hereindescribed process of preparing a blasting medium, which combines the advantages of ammonium and alkali metal nitrate while avoiding the increase in hygroscopicity which the intimate contact of ammonium nitrate and alkali metal nitrate would ordinarily involve, which consists of first associating ammonium nitrate with a suitable protecting combustible oxygen deficient material and then intermixing the same with the grains of whole black blasting powder.

8. A blasting powder consisting of granular ammonium nitrate, the grains of which are coated with a suitable combustible oxygen deficient material and intermixed with the grains of ordinary black blasting powder.

9. A blasting medium consisting of ammonium nitrate, coated with a suitable nitrated combustible oxygen deficient material and intermixed with the grains of ordinary black blasting powder.

In testimony whereof I affix my signature.

ROY LINDEN HILL.