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UNITED STATES PATENT OFFICE.

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PROPULSIVE BLASTING EXPLOSIVE.

No Drawing. Application filed June 7, 1922. Serial No. 566,555.

To all whom it may concern:

Be it known that ARCHIBALD JACKSON STRANE, citizen of the United States, residing at St Paul, in the county of Ramsey and State of Minnesota, has invented certain new and useful Improvements in Propulsive Blasting Explosives, of which the following is a specification.

This application is a continuation in part of my application Serial Number 512,327, filed November 2, 1921.

My invention relates partcularly to modified black blasting powder suitable for use in all cases where ordinary black blasting powder may be suitably used.

The object of my invention is to provide black blasting powder of increased strength and blasting effectiveness and incidentally to provide a means of profitably utilizing waste, surplus or salvaged nitrocellulose smokeless powder, although this sort of nitrocellulose powder is not essential to my invention since, I may, at my option and if trade conditions warrant it, colloid nitrocellulose for the express and primary purpose of making my modified black blasting powder.

It should be expressly understood that my invention is not concerned with black gunpowder, i. e., with black powder in its application as a propellant in firing arms, guns, mortars, and implements of this type. I use the term black blasting powder for my product to indicate this distinction. Neither is it concerned with high or detonating blasting explosives. Explosives may be classified, as will be understood by those skilled in the art, as "high" and "low". Low explosives are suitably initiated by the mere application of flame or heat and their action may be termed rapid combustion with the development of a propulsive or pushing effect on the material to be blasted. High explosives must be initiated by means of a blasting cap or equivalent for effectiveness and their action may be termed detonation with the development of a disruptive or shattering effect on the material to be blasted. The above descriptions and distinctions are of course relative, but leave no doubt in the mind of any one familiar with explosives to any extent as regards my meaning and intent.

My invention deals with black blasting powder as a low or propulsive blasting explosive.

A usual practice in manufacturing black blasting powder consists in keeping the compositions constant and varying the blasting characteristics by varying the granulation sizes—the smaller the sizes of the individual particles or grains the more rapid the rate of burning and consequently the more intensive the effect on the material to be blasted. Thus, there exist the usual grades FFFF, FFF, FF, F, C and CC, arranged according to increasing size of grains, but the chemical and physical composition practically constant. In addition to increasing or decreasing the intensiveness of the effect of black blasting powder by varying the granulation, the same condition may be achieved to a greater or lesser degree by varying the degree of fineness of the individual ingredients, the extent of incorporation, the density and the moisture content. However, the modern powder represents substantially the best that can be practically and economically accomplished along these lines. Yet there remains another consideration—namely; the effect on properties of varying the chemical composition. Confined to the usual ingredients—potassium nitrate or sodium nitrate, charcoal and sulphur, modern powder represents practically the best that can be done. Many solid explosive compounds might be suggested that might, theoretically, be added to black blasting powder to a greater or less extent to increase its strength, but they are practically all open to serious objection on some such ground as cost, safety, hygroscopicity, etc.

I have now discovered that colloided nitro-cellulose of the character of straight nitrocellulose smokeless powder ("American

service powder," for instance) or of nitrocellulose-nitroglycerine smokeless powder ("cordite," for instance), when suitably granulated or when in suitable original condition as regards size of particles, may be mixed with black blasting powder to great advantage as regards the relative strength and blasting efficiency of the resultant product.

My invention does not consist of incorporating the colloided nitro-cellulose with the black blasting powder, but of mixing grains of one with grains of the other, so that, in the resultant product, each individual grain is either nitrocellulose powder or black blasting powder. My principle would be illustrated by mixing grains of corn and wheat. In preparing my powder I proceed according to the following examples. Assuming, for instance, 5" "American service powder", I disintegrate it by any suitable means which possesses a proper degree of safety and which furnishes a disintegrated product of which the majority of the particles are within the granulation sizes commonly used for black blasting powder. Next, the disintegrated product is dried, provided wet disintegration has been used, and the dried product is granulated and graded to the proper size on the usual black blasting powder sizing or grading screens. As a result, I have colloided nitrocellulose powder separated approximately according to the FFFF, FFF, FF, etc., granulation of black blasting powder and may readily make any desired mixtures by any ordinary mechanical means. I find that, if the granulations of both types of explosives are kept approximately the same, there is practically no tendency for one to separate or segregate from the other.

By way of another example, there are certain smaller sizes of smokeless powder which in their original condition are suitable for admixture with one or the other grades of black blasting powder without disintegration.

Regarding the effectiveness of my invention I will show a set of ballistic results obtained by mixing various amounts of suitably granulated, straight nitrocellulose smokeless powder with regular FFFF black blasting powder.

Per cent FFFF black blasting powder.	Per cent smokeless powder.	Ballistic pressures.
		Tons per sq. in.
100		5.12
95	5	6.2
90	10	8.28
80	20	10.74

Further, numerous trials under actual blasting conditions have also indicated the great effectiveness of my invention.

There is a point of especial and novel interest which I desire to point out. If a blaster has used, for instance, FF black blasting powder and changes to FFF he obtains greater apparent explosive strength solely because he has a more rapidly burning powder. With equal weights of charges, there is no more gas or heat evolved in one case than in the other, it is merely that, in the latter case, the gas and heat are evolved in a shorter time. On the other hand, black blasting powder made according to my invention gives greater strength without increased rapidity of burning, because smokeless powder is slower burning than black blasting powder, granulations being approximately equal. The black blasting powder serves to bring the rate of burning of the smokeless powder up to its own rate. It should be obvious, therefore, that I have greatly increased the propulsive or pushing effect of black blasting powder without appreciably increasing the shattering effect. This is an especially valuable combination of characteristics for certain purposes, such as mining some grades of bituminous coal.

A further feature of my invention is that my powder is not more hygroscopic, nor appreciably more dangerous to handle, than regular black blasting powder. Considering the tremendous quantities of cheap, surplus smokeless powder remaining from the world war the economic applicability of my invention is evident.

It is a fact that enormous quantities of surplus smokeless powder are stored in this country and that this powder will probably be sold for one cent per pound or less. Manifestly any process which renders these enormous stocks available for constructive commercial purposes is of value.

Having described my invention what I claim is:

1. A propellent blasting explosive consisting of a mixture of black blasting powder and suitably colloided nitrocellulose powder, each in granular form and in which mixture each individual grain is either all black blasting powder or all colloided nitrocellulose powder.

2. A blasting explosive consisting of a mixture of granulated black blasting powder and suitably granulated "American service smokeless powder," in which mixture each individual grain is either all black blasting powder or all smokeless powder.

3. A blasting explosive consisting of 90% FFF black blasting powder and 10% suitably colloided nitrocellulose powder of a granulation approximately like that of the FFF black blasting powder.

4. A blasting explosive consisting of 80

to 90% granulated black blasting powder and 20 to 10% suitably colloided nitrocellulose powder.

5. A blasting explosive consisting of 80 to 90% granular black blasting powder and 20 to 10% of granulated service smokeless powder wherein the sizes of the grains of both are approximately the same and wherein each individual grain is either all black blasting powder or all smokeless powder.

In testimony whereof I affix my signature in the presence of two witnesses.

ARCHIBALD JACKSON STRANE.

Witnesses:

E. ROE STRANE,

CATHERINE TERSTEEG.