Patented Oct. 18, 1932

1,882,853

UNITED STATES PATENT OFFICE

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BLACK POWDER COMPOSITION

No Drawing. Application filed September 20, 1930. Serial No. 483,390.

This invention relates to a form of explosive of the black powder type, and more particularly to an improved composition of black powder in which the velocity of combustion has been materially decreased.

Black powder is an explosive that has long been known and used, and its general composition over a long period of time has not changed substantially. The usual ingredients entering into its composition are potassium or sodium nitrate, sulfur, and charcoal. Prior to the present invention, a representative composition of black powder has comprised, for example, approximately 72% potassium nitrate, 10% sulfur, and 18% charcoal.

Black powder is generally classified as a low-velocity or deflagrating explosive, as distinguished from the high-velocity, detonating explosives, otherwise known as dynamites. This characteristic low velocity of black powder is due to the fact that the black powder contains no ingredient that is explosive in itself, and that an explosive is formed only when an intimate mixture is made of the ingredients that are in themselves separately non-explosive.

Notwithstanding the fact that low velocity is a characteristic of the black powder type of explosives, the various uses of black powder make desirable a control of the velocity that will allow the use of faster or slower powders, as desired. Various methods have been used heretofore for obtaining increased velocities of combustion.

My invention relates to black powder compositions and particularly to powders that are to be used in fuse. For such a purpose it is desirable that a powder be obtained that will burn at a slow rate and whose rate of burning is capable of very careful control. While a slow-burning powder may be obtained by mere adjustment of the percentages of the different ingredients in the black powder, I find such a means unsatisfactory beyond certain limits. I find a more satisfactory and uniformly slow-burning powder to be obtained by the introduction into the powder, as an ingredient, of small percentages of an oil.

There is disclosed in the co-pending application of B. Austin Gillie, Serial No. 433,186, a method of reducing the speed of burning black powder compositions by incorporating therewith castor oil.

While the method described in the foregoing co-pending application of bringing about a reduction in the speed of the powder is effective, there are certain disadvantages associated with the use of castor oil and other common vegetable and mineral oils. The preferred method of adding the castor oil proposed in the above co-pending application was to add it in the form of a water-emulsion. Castor oil, however, does not emulsify readily with water. In order to form an emulsion between castor oil and water, it is necessary to use emulsifying agents in the form, for example, of small amounts of an additional mineral oil or of a material such as sulfonate. Even when so prepared, a castor oil emulsion is not always permanent and must be used shortly after its preparation. An accompanying disadvantage also of such an oil as castor oil is the fact that special apparatus is usually necessary in order to form an emulsion, such as a homogenizer or other apparatus for producing a very intimate mixture of materials. The preparation of such emulsions, therefore, is relatively costly and time-consuming.

I have discovered that the foregoing disadvantages may be overcome by incorporating in the powder an oil that acts as a speed-retardant and which is directly emulsifiable with water without the use of any additional emulsifying agent. Such oils have been commonly designated "soluble oils" or "water-soluble oils" and have heretofore had quite general application as cutting oils in machine work. Such water-soluble oils may be of various types; for example, some oils of this type are known as sulfonated oils, some as phenolated oils, and some as soap oils. An essential characteristic, however, is that the oil be one that is emulsifiable with water without the use of any additional emulsifying agent.

When such an oil having these designated characteristics is mixed with water the

thoroughness of the mixing or emulsification will be seen by the fact that a white precipitate or cloud appears at once throughout the liquid. The emulsification takes place at once on gentle agitation and the emulsion formed is sufficiently permanent.

The advantages in the use of such a water-soluble oil will be apparent from the foregoing. By its use, the labor of preparing an emulsion from difficulty emulsifiable materials is avoided, as well as the use of the unusual types of apparatus necessary. A further advantage comes from the fact that the easily prepared emulsions with the water-soluble oils can be used immediately after preparation.

The amount of such water-emulsifiable oil for effective use in retarding the rate of burning of black powder may be varied within wide limits. However, I have found that amounts varying from 0.1% to 5.0% give satisfactory results. The degree of retardation will depend on the amount of oil used. While the use of such small quantities as 0.1% will have a retarding effect on the powder, the magnitude of such effect is not as great as is desired. On the other hand, when amounts greater than 5% are used, the rate of burning has been slowed down to such an extent that the propagation of combustion is not certain. I preferably use approximately 0.5% of the oil by weight.

Various methods may be used for incorporating the above oils in the black powder mixtures. A satisfactory method is to prepare the emulsion of the oil with water and to add this emulsion to the other ingredients of the powder, to be wheeled in with them.

In order to illustrate a specific embodiment of my invention without in any way limiting the scope of the invention, the following example is given of a black powder composition according to my invention:

	Per cent
Potassium nitrate	72.0
Sulfur	6.5
Charcoal	21.0
Water-emulsifiable oil	0.5
	100.0

While the above example contains potassium nitrate, it should be understood that this nitrate may be replaced by other nitrates, for example, sodium nitrate, which is the usual oxidizing ingredient in black blasting powder.

The effect of the use of an oil as above described in lowering the velocity of production of a fuse powder composition, for example, will be apparent. To determine this retarding effect quantitatively, I find it satisfactory to fill a length of lead fuse with the powder to be tested. This fuse is then rolled down until it has a diameter of approximately 0.15 inches. Under such conditions of testing, I find the time of burning of one foot of my improved powder containing 0.5% of a water-emulsifying oil to be 57 seconds against 42 seconds for the same length of fuse powder of similar composition but containing no speed-reducing oil.

As many apparently widely different embodiments of this invention may be made without departing from the spirit thereof, it is to be understood that I do not limit myself to the foregoing examples or descriptions except as indicated in the following patent claims.

I claim:

1. A black powder composition characterized by its slow rate of combustion, and containing as an ingredient an oil emulsifiable with water without the use of an additional emulsifying agent.

2. A black powder composition characterized by its slow rate of combustion, and containing as ingredients an inorganic nitrate, sulfur, charcoal, and an oil emulsifiable with water without the use of an additional emulsifying agent.

3. A black powder composition characterized by its slow rate of combustion, and containing as ingredients potassium nitrate, sulfur, charcoal, and an oil which alone is emulsifiable with water.

4. A black powder composition characterized by its slow rate of combustion, and containing as ingredients potassium nitrate, sulfur, charcoal, and from 0.1 to 5.0% of an oil which alone is emulsifiable with water.

5. A black powder composition characterized by its slow rate of combustion, and containing as ingredients sodium nitrate, sulfur, charcoal, and an oil which alone is emulsifiable with water.

6. A black powder composition characterized by its slow rate of combustion, and containing as ingredients sodium nitrate, sulfur, charcoal, and from 0.1 to 5.0% of an oil which alone is emulsifiable with water.

In testimony wherof, I affix my signature.

WILLIAM A. McINTYRE.