

UNITED STATES PATENT OFFICE.

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EXPLOSIVE.

1,128,380.

Specification of Letters Patent.

Patented Feb. 16, 1915.

No Drawing.

Application filed January 25, 1913. Serial No. 744,094.

To all whom it may concern:

Be it known that I, FIN SPARRE, of Wilmington, in the county of New Castle, and in the State of Delaware, have invented a certain new and useful Improvement in Explosives, and do hereby declare that the following is a full, clear, and exact description thereof.

The object of my invention has been to provide an explosive of the general nature of black powder, and process of making the same, which shall have the advantages of being safe in manufacture, comparatively low in cost, and capable of manufacture into, and retaining desired mechanical shapes such as different sized grains or pellets, and capable of glazing with graphite, and to such ends my invention consists in the explosive and process of making the same hereinafter specified.

Common, so-called "black powder" is a mechanical mixture of sulfur, charcoal and a nitrate, mostly sodium or potassium nitrate. This explosive is based on the supply of oxygen from the nitrate which oxidizes the charcoal to give gaseous products at a high temperature, while the sulfur is primarily for the purpose of increasing the rapidity of combustion and lowering the temperature of ignition. The sulfur also has a considerable mechanical advantage of aiding in the manufacture as it gives the desired hardness and cohesion of the powder cake so that it can be obtained in grains of the desired density. In the manufacture of black powder a considerable proportion of the cost is due to the necessary care to avoid explosions, requiring many and expensive operations. With the object of reducing the danger of explosion and thus avoiding the expense of these operations, black powder has been manufactured in the presence of water in which the nitrates were dissolved while the sulfur and charcoal were held in suspension. The water was afterward evaporated. On account, however, of the insolubility of the sulfur and charcoal in water, the desired incorporation of the ingredients could not be satisfactorily effected in this way, and while the operation was safe during the first part of the wet process, it subsequently became just as dangerous as the regular process of dry manufacture. In the usual process, the great danger in operation does not commence until the powder is nearing completion.

Consequently, the wet process did not show any material advantage over the dry process. It has also been proposed to produce an entirely water soluble powder by producing a mixture of nitrate and water soluble organic substances such as, for instance, salts of organic sulfonates. The substances proposed in this connection are, for instance, sodium benzol sulfonate and sodium cresol sulfonate. In such a powder the nitrate supplies oxygen, whereas the organic substances form the combustible material. While these powders can be produced with a reasonably satisfactory degree of intimate mixture by dissolving, and subsequent evaporation of the water, with satisfactory safety until the powder is finished, this method is, nevertheless, not satisfactory. In the first place, these organic sulfonates and water soluble organic material in general are expensive as compared with sulfur and charcoal, and, further, this type of powder has the disadvantage that it lacks the property of being able to be compressed into cakes of sufficient cohesiveness to enable the subsequent graining, blazing, etc., to be obtained. This is most important because for practical operations the explosive must be of the desired density, being capable of manufacture into different sized grains or pellets, and capable of glazing with graphite, if desired, etc., so as to enable the desired regulation of the rapidity of combustion for the different powders, to permit satisfactory loading into shells and bore holes, etc. I have discovered that these objections can be overcome by the use of metallic sulfids and particularly polysulfids of alkali or earth alkali metals, for instance, sodium sulfids and calcium sulfids.

While my invention is capable of embodiment under widely different formulæ and with a large variety of ingredients, I shall give two of the best examples known to me.

As the first example, I may use—70% sodium nitrate, 15% sodium polysulfid, 15% sodium cresol sulfonate. In this case all the advantages of the entire water soluble gum powder are obtained and, in addition, the sulfid is cheaper than the sulfonate and also makes the resulting mass capable of pressing, graining, etc., as required in the manufacture of the various mechanical forms of powder.

As the second example, I may use the fol-

lowing formula: 72% sodium nitrate, 13% calcium polysulfid, 15% charcoal. Both the nitrate and the sulfid in this formula are water soluble, thereby in the operation producing an intimate mixture of the nitrate and the sulfur. While the charcoal is insoluble, the formula has, nevertheless, an advantage over the regular black powder because two of the ingredients are water soluble, and the third can be easily held in suspension, this being a peculiarity of finely ground charcoal. In fact, I have found that charcoal is practically as satisfactory as sulfonates.

Obviously, the combination of these two formulæ may be used so as to have nitrate, sulfid, sulfonate and charcoal, the sulfonate having the advantage over the charcoal of being entirely water soluble, but this advantage is not a very great one because the charcoal is readily held in suspension and is very much cheaper.

I claim:

1. An explosive comprising an oxidizing agent and a polysulfid of an alkali-forming metal.
2. An explosive comprising an oxidizing agent and a polysulfid of an alkaline earth metal.
3. An explosive comprising a nitrate and a polysulfid of an alkali-forming metal.

4. An explosive comprising a nitrate and a polysulfid of an alkaline earth metal.

5. An explosive comprising an oxidizable carbon-containing material, an oxidizing agent, and a polysulfid of an alkali-forming metal.

6. An explosive comprising an oxidizable carbon-containing material, an oxidizing agent, and a polysulfid of an alkaline earth metal.

7. An explosive comprising an oxidizable carbon-containing material, a nitrate and a polysulfid of an alkali-forming metal.

8. An explosive comprising an oxidizable carbon-containing material, a nitrate and a polysulfid of an alkaline earth metal.

9. An explosive comprising charcoal, an oxidizing agent, and a polysulfid of an alkali-forming metal.

10. An explosive comprising charcoal, a nitrate, and a polysulfid of an alkaline earth metal.

11. An explosive comprising charcoal, sodium nitrate and calcium polysulfid.

In testimony that I claim the foregoing I have hereunto set my hand.

FIN SPARRE.

Witnesses:

CHAS. E. WEBB, Jr.,
HAMILTON BRADSHAW.