

UNITED STATES PATENT OFFICE.

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SULFITE-WASTE EXPLOSIVE.

1,056,366.

Specification of Letters Patent.

Patented Mar. 18, 1913.

No Drawing.

Application filed April 11, 1912. Serial No. 690,184.

To all whom it may concern:

Be it known that I, FRITZ RASCHIG, doctor of philosophy, chemist, a citizen of the German Empire, residing at Ludwigshafen-on-the-Rhine, Germany, have invented a new and useful Improvement in Sulfite-Waste Explosives, of which the following is a specification.

This invention relates to explosives; and it comprises an explosive containing as essential ingredients an oxidizing agent such as sodium, potassium or ammonium nitrate, and sulfite waste constituents.

It also comprises an explosive in which the ingredients above mentioned are present in substantially homogeneous intermixture, and in which the individual particles of the explosive, in whole or in part, are made up of both ingredients; and it further comprises a process of producing such an explosive; all as more fully hereinafter set forth and as claimed.

In the manufacture of paper or of paper pulp by the sulfite process approximately one-half of the wood or other cellulosic material treated is present in the waste liquors, commonly known as waste sulfite liquors. The sulfite liquors used in the paper making process, such as calcium, magnesium or sodium bisulfite, disintegrate and break up the wood or other fibers, separating the cellulose from the non-cellulosic constituents, and dissolving the lignin or lignone and other soluble non-cellulosic constituents. Among the products present in this sulfite solution are dextrose and various other sugars, xylose, acetic acid, tannic acid, nitrogen compounds, resins, etc., as well as the so-called alkali or earth alkali lignin-sulfonates, which last named products are the principal products of the reaction of the sulfite upon the wood fibers treated. The composition of these liquors varies somewhat with the wood treated, with the length and conditions of treatment, and with the sulfite used, the lignin compounds however, probably in the form of sulfonic acid salts, forming the principal constituent of the extractive matter present in the solution.

In making the novel explosives of the present invention the oxidizing agent can be dissolved in the sulfite liquors and the liquors evaporated to dryness, or the liquors can be evaporated nearly or completely

to dryness and the oxidizing agent intimately intermixed with the dry material. It is frequently advantageous, especially where the sulfite waste liquors are appreciably or strongly acid, to neutralize or otherwise subject them to a preliminary treatment or concentration before using. The acid present can, for instance, be neutralized with ammonia, the calcium precipitated with ammonium sulfate, and the calcium sulfate filtered off; or again the acidity can be neutralized with lime and insoluble lime compounds removed. The liquors can be concentrated or even evaporated to dryness, and the concentrated liquor, or plastic or solid mass used for making the novel explosives.

In making the new explosives by the dry mixing method the sulfite liquors are evaporated to dryness, and advantageously given a preliminary grinding and breaking up before mixing with the oxidizing agent. The mixing can then be effected in the mixing machine. It is, however, in general more advantageous to mix the oxidizing agent with the waste sulfite liquors while still in solution or while there is still enough liquor or liquid present to make the mixing a wet, as distinguished from a dry, mixing. An intimacy of incorporation of the ingredients is thus possible, and a homogeneity of product obtainable, which it is impossible to obtain with the dry mixing process. For, since the ingredients when in solution are capable of greater interpenetration, the resulting product obtained from such wet mixing contains the ingredients in a more nearly homogeneous intermixture, and the particles of the explosive obtained are made up in whole or in part of both ingredients. The homogeneous nature of the product thus obtainable enables substantially complete combustion to take place, and as a result the formation of smoke is minimized or entirely avoided. The dry mixing process, however, offers the advantage that the constituents of the sulfite waste liquors when evaporated to dryness become much less soluble, so that the mixture partakes more of the nature of a mixture of the oxidizing agent with insoluble ingredients.

The incorporation or intermixture of the oxidizing agent and the wood fiber constituents of the waste sulfite liquors, according

to the wet process of the present invention can be effected in various ways. It is usually sufficient merely to dissolve the oxidizing agent in the liquor, and evaporate to dryness. Such evaporation is advantageously effected with stirring to promote homogeneity. Again the solution can be run in the form of a thin stream on to rollers internally heated by steam to 100° or above by means of which practically instantaneous evaporation can be effected. The evaporated ribbon like mass is scraped off the rollers by scrapers, or other appliances. Again such heated rollers can be arranged in a vacuum chamber and the evaporation or drying effected at a correspondingly lower temperature. In the case of the ammonium nitrate explosives the temperature should be kept below that at which the ammonium compounds are decomposed or volatilized. The evaporation of the waste sulfite liquors tends to make the wood fiber constituents contained in them less soluble, so that the final products are insoluble or relatively much less soluble than before evaporation. The explosive, after removal of the liquid, or when compounded in a dry state, can be further treated to give to it the desired shape or consistency, and it can be used as an explosive either alone or combined with other explosive ingredients, or with modifying ingredients or diluents. Small amounts of such materials as vaseline, wax, etc. can be mixed with the explosive, or film-forming solutions can be used to intermix or coat the particles of the explosive.

The explosives obtainable from the sulfite waste constituents and ammonium nitrate as the oxygen carrier form ammonium nitrate explosives with many valuable properties and uses not inherent in the old ammonium nitrate explosives made by mixing ammonium nitrate with such combustible substances as charcoal powder, cornmeal, etc. Such old explosives are not reliable when detonated with primers, it being necessary to add thereto highly explosive substances such as trinitrotoluol or nitroglycerin, etc. The ammonium nitrate explosives of the present invention, on the other hand, can be reliably detonated with primers and are very effective. Even when diluted by the addition of appreciable amounts of inert substances they can still be reliably detonated and possess high explosive power. The addition of up to 30% of such an inert material as sulfate of sodium can be made, and reliable and efficient explosives still obtained.

The present invention, which is of general application, is further illustrated and exemplified by the following specific embodiments of its application.

Example 1: 85 parts of nitrate of ammo-

nium are dissolved in waste sulfite liquors containing 15 parts of dry wood fiber constituents. The liquors are then evaporated to dryness with stirring, or by running the liquid on steam heated rollers heated to 100° or above as already described. The sulfite liquors used may be in their diluted condition, or partially evaporated. Again the sulfite liquors can be evaporated to dryness and the dried material and the oxygen carrier mixed in a mixing machine; or the sulfite waste may be evaporated to a thick but still liquid or pasty consistency and the alkali nitrate incorporated therewith.

Example 2: 60 parts of nitrate of ammonia and 30 parts of sulfate of sodium are dissolved in waste sulfite liquors containing 10 parts of wood fiber constituents, and the liquors are evaporated to dryness as already described.

Instead of the ammonium nitrate of the foregoing examples, sodium or potassium nitrate, or other oxidizing agent or agents can be used, such as potassium perchlorate, etc. Sulfite waste liquors made from other cellulosic material than wood can be used in a similar manner.

Variations and modifications can be made in the processes and products above described without departing from the spirit and scope of the invention, and all such variations and modifications are embraced within the invention as set forth in the accompanying claims.

The term "non-cellulosic wood fiber constituents" is used in the present specification and claims to indicate those ingredients of wood and similar cellulosic material from which the paper stock or cellulose has been entirely or substantially removed by such processes as those employed in paper making, the cellulose itself constituting the pulp or paper stock. The term "sulfite waste constituents" is similarly used, but with a more specific meaning, to indicate those ingredients of wood and similar material which are found in solution in the waste sulfite liquors resulting from the sulfite process of pulp treatment, and from which the pulp or cellulosic material itself has been separated.

I claim:

1. The process of producing an explosive which comprises intermixing an oxidizing agent with sulfite waste liquors, and evaporating the liquors.

2. The process of producing an explosive which comprises intermixing ammonium nitrate with sulfite waste liquors, and evaporating the liquors.

3. The process of producing an explosive which comprises intermixing an oxidizing agent with sulfite waste constituents in the presence of a liquid, and evaporating such liquid.

4. The process of producing an explosive which comprises intermixing ammonium nitrate with sulfite waste constituents in the presence of a liquid, and evaporating the liquid.

5. An explosive comprising an oxidizing agent and non-cellulosic wood fiber constituents substantially freed from cellulose.

6. An explosive comprising an oxidizing agent and sulfite waste constituents.

7. An explosive comprising an oxidizing agent and sulfite waste constituents in which explosive the individual particles include both ingredients.

8. An explosive comprising ammonium

nitrate and non-cellulosic wood fiber constituents substantially freed from cellulose.

9. An explosive comprising ammonium nitrate and sulfite waste constituents.

10. An explosive comprising ammonium nitrate and sulfite waste constituents, in which explosive the individual particles include both ingredients.

In testimony whereof I have hereunto set my hand in the presence of two subscribing witnesses.

FRITZ RASCHIG.

Witnesses:

RICHARD REUREL,
JOHANNES DEUSCHEL.