

UNITED STATES PATENT OFFICE.

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PROCESS FOR PRODUCING AN EXPLOSIVE COMPOUND.

1,242,900.

Specification of Letters Patent.

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No Drawing.

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To all whom it may concern:

Be it known that we, RALPH H. TWINING and RALPH W. G. WYCKOFF, citizens of the United States, and residents of Geneva, in the county of Ontario and State of New York, have invented certain new and useful Improvements in Processes for Producing Explosive Compounds, of which the following is a specification.

The object of our invention is the provision of a cheap and simple process for the production of explosive compounds of great power, extreme stability and permanent character from a wide range of materials some of which are exceedingly cheap. Generally speaking our process involves the fusion of substances of two classes, first, salts of the alkali metals with the common inorganic acids of nitrogen all of which are stable on melting, *i. e.*, alkali metal nitrites and nitrates, and second, aromatic substances, non-volatile and stable or undecomposable at the temperature of fusion of the member of the first class with which in any given case the member of the second is employed or at the temperature of the fusion together of the selected members of the two classes. We prefer to use sodium nitrite and sodium nitrate, since they are cheap and since the corresponding salts of other metals are not only more expensive but do not fuse so readily. We also prefer to use aromatic derivatives, but it is to be clearly understood that in the selection of materials of the two classes named we are not limited except as specified. We make this statement after having conducted a wide range of experiments which we believe justify it. As will appear from example hereinafter given, we find among the various materials of the second class which are suitable, aromatic carboxyl derivatives and aromatic sulfonates, both of these as well as the other substances of the second class employed in the examples referred to being aromatic substances containing a negative group. It is a distinct advantage of our process that by it we are able to treat substances of this character commercially whereas this has been very difficult by proc-

esses formerly known. In performing our process we preferably select one material of each of the two classes and form them into an explosive compound by fusion which, since prior to combining they do not change their character when fused, may readily be done and may be done with safety, since there is a wide range between the temperature at which the nitrites or nitrates fuse and that at which the resultant compounds detonate. The points of fusion of the nitrites and nitrates can be readily ascertained from well-known treatises on chemistry. This margin although not identical in all cases is, we believe, always sufficient to constitute a margin of safety should the fusion temperatures of the nitrogen salt be accidentally exceeded somewhat. Obviously if in a given instance a lower temperature than that of the fusion of the nitrogen salt is sufficient to fuse the selected materials, the margin of safety is yet wider. The simplest and easiest mode of operation is obviously to mix the materials before subjecting them to heat and fusing them together, but we do not of course wish to limit ourselves to this mode of procedure, since, although it would be more difficult and expensive, the two materials might in some cases be heated separately to fusion temperature and then mixed, or the salt of nitrogen might be fused and the aromatic substance added to it. Accordingly it is to be understood that the words "fusing . . . with" in some of the claims do not necessarily imply mixing before heating. The temperature should be maintained at or slightly above the fusion point until a homogenous liquid results. We also wish to make it clear that while partly for the sake of convenience, we prefer to use one only of each of the two classes of substances in a given case, we are not restricted to so doing but may use more than one of either or both. Indeed, it may in some cases be desirable to add in making the fused compound some other substance not of either of the two classes above mentioned, as for instance a substance which would lower the fusing point, or one which would make the product

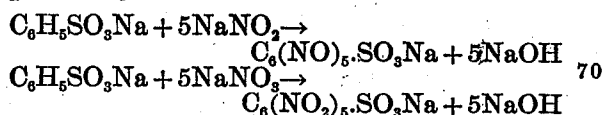
easier to handle, or an inert substance which might act as a retarder. It is apparent also that the compound obtained by our process may be mixed with other materials, as for instance oxidizing agents. If this were done a lesser amount of the nitrogen salt would suffice. Where no oxidizing agent is added, however, the amount by weight of the nitrogen salt should be largely in excess of the amount by weight of the aromatic substance in order to provide an oxidizing agent for combustible elements of the compound at the time of explosion. For theoretically complete combination enough of the nitrite or nitrate should be used to effect complete substitution of the hydrogens in the ring by nitroso and nitro groups, but the reactions are not always exact and it is not at all necessary that the proportions of the respective materials should be in accordance with this rule. It is of course desirable, however, not to clog the compound resulting from the process with an undue amount of inert material. In the examples of successful applications of the process hereinafter given proportions actually used and found satisfactory are indicated, although these proportions, like the examples themselves, are illustrative rather than limiting.

While we may use either the nitrites or the nitrates, it is true in general that the nitrites fuse at lower temperatures than the corresponding nitrates, and in some cases the nitrites may be used with an aromatic substance which could not be fused with the corresponding nitrate because it would volatilize or disintegrate before the fusion point of the nitrate was reached. This difference in fusing temperature is exemplified in sodium nitrite which fuses at approximately 271° C. and sodium nitrate which fuses at approximately 315° C., these particular salts of nitrogen, that is nitrite and nitrate of sodium being the ones which we prefer to use, since they are much less expensive than the corresponding potash salts. While because of this property of the nitrites, we may sometimes prefer to use them, greater power is secured by using the nitrates, which are therefore preferable for heavy work.

Any well-known heating apparatus suitable for the purpose may be employed, such as an electric heater, a gas oven or the like. The fused product may be cast or may be ground after it has cooled.

The substances which are produced by the fusion are not merely mixtures but are compounds or compounds with an admixture, a reaction having taken place, resulting probably in the case of the nitrite in polynitroso compounds and in the case of the nitrates in polynitro compounds. That a reaction has taken place can readily be shown by the fact that the resultant compound is alkaline even

though the original mixture was strongly acid. The probable reactions which take place may be indicated as follows:



In order that our process may be more fully understood we now present the following examples of successful applications of it, which are not to be understood as limiting but merely as illustrating our invention. The proportions are in every case by weight.

In the first case 80% of sodium nitrite (NaNO_2) was mixed with 20% of sodium benzene-sulfonate ($\text{C}_6\text{H}_5\text{SO}_3\text{Na}$) and the mixture was fused.

In the second case 82% of sodium nitrite (NaNO_2) was mixed with 18% of benzoic acid ($\text{C}_6\text{H}_5\text{COOH}$) and the mixture was fused.

In the third case 80% of sodium nitrite (NaNO_2) was mixed with 20% of phthalic acid ($\text{C}_6\text{H}_4(\text{COOH})_2$) and the mixture was fused.

In the fourth case 75% of sodium nitrate (NaNO_3) was mixed with 25% of sodium benzene sulfonate ($\text{C}_6\text{H}_5\text{SO}_3\text{Na}$) and the mixture was fused.

In the fifth case 85% of sodium nitrite (NaNO_2) was mixed with 15% of naphthalene di-sodium-sulfonate ($\text{C}_{10}\text{H}_6(\text{SO}_3\text{Na})_2$) and the mixture was fused.

In all of these cases the product was an explosive compound of great power incapable of being exploded by shock even by hammering on an anvil or by pressure, but capable of being detonated by mercury fulminate or other detonators.

What we claim is:

1. The process of producing an explosive compound comprising heating to its fusing temperature a salt of an alkali metal with a common inorganic acid of nitrogen, and fusing therewith an aromatic substance non-volatile and undecomposable at the temperature of the fusion.

2. The process of producing an explosive compound comprising fusing an excess by weight of an alkali metal nitrate with an aromatic substance non-volatile and undecomposable at the temperature of the fusion.

3. The process of producing an explosive compound comprising heating to its fusing temperature a salt of an alkali metal with a common inorganic acid of nitrogen, and fusing therewith an aromatic substance containing a negative group.

4. The process of producing an explosive compound comprising heating to its fusing temperature a salt of an alkali metal with a common inorganic acid of nitrogen and fusing it with an aromatic sulfonate.

5. The process of producing an explosive compound comprising heating sodium nitrate to fusing temperature and fusing it with sodium benzene-sulfonate.

5 6. The process of producing an explosive compound comprising heating sodium nitrate to its fusing temperature and fusing therewith an aromatic substance non-volatile

and undecomposable at the temperature of fusion of the mass.

In testimony whereof we affix our signatures.

RALPH H. TWINING.
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Witness:

JOHN L. FLETCHER.