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UNITED STATES PATENT OFFICE.

BENNETT GROTTA, OF TAMAQUA, PENNSYLVANIA, ASSIGNOR TO ATLAS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

SECONDARY CHARGE FOR COMPOUND DETONATORS.

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To all whom it may concern:

Be it known that BENNETT GROTTA, a citizen of the United States, residing at Tamaqua, in the county of Schuylkill and State of Pennsylvania, has invented certain new and useful Improvements in Secondary Charges for Compound Detonators, of which the following is a specification.

My invention relates to improvements in that type of detonator commonly known as compound detonators and relates particularly to the main or secondary charge.

For a long time fulminate of mercury was regarded as the only explosive compound suitable for a detonator composition. This belief has been modified in recent years by the partial substitution of the customary fulminate charge by some other explosive which, alone, would not be suitable for detonator compositions. These secondary explosives, as they are commonly known, may not be detonated by simple ignition as is the case with fulminate of mercury, but they are themselves initiated by a priming charge of fulminate of mercury and more recently by a charge containing a heavy metal azide. Examples of secondary explosives which have been suggested for this purpose are hexanitrodiphenylamine, tetranitroaniline, trinitroxylene, and trinitrophenylmethylnitroamine, which is commonly known as tetryl.

It is well recognized that the problems presented in the production of satisfactory detonator charges are quite different from those existing in the field of general explosives and that apparently slight changes in proportions and in the ingredients frequently produce surprising differences in result.

It is also a well established fact that detonators containing a suitably primed secondary explosive are vastly superior to the ordinary fulminate composition detonator in so far as detonating efficiency is concerned, but the general application of this type of detonator has been greatly restricted because of the greater cost of manufacture as compared with ordinary fulminate detonators. Despite the substitution of a part of the fulminate charge with a less costly nitro-body the ultimate cost of the detonator thus charged is ordinarily no less and usually greater than that of all-fulminate detonators. This is due to the increased number of operations required for the so-called compound detonators and also to the added expense of specially constructed detonator shells which are usually required.

By extensive experimentation I have found that the above mentioned obstacle to the application of the compound type of detonator may be largely overcome by mixing with the nitroaromatic compounds that are suitable for detonator charges another less costly material which by itself is not suited for detonator compositions but which, when mixed with the nitroaromatic compounds in suitable proportions, produces a composition equivalent in efficiency to that of the original nitroaromatic compound. The material which I have found suitable for this admixture is nitrocellulose, of which ground smokeless powder is a form admirably suited for the purpose in question.

I have found that mixtures of such nitroaromatic compounds as tetryl or tetranitroaniline with nitrocellulose, in the form of ground smokeless powder, in suitable proportions, constitute secondary detonator compositions approximately equivalent to the original nitroaromatic compound with respect to, (a) initiating value when applied to insensitive commercial explosives; (b) actual strength as measured by any of the well known tests, (c) brisance, as measured by the usual tests for determining this property, (d) size of priming charge required for initiation, (e) velocity of detonation.

Thus my invention constitutes a distinct advance in the class of initiating explosives by rendering feasible the production of compound detonators with their well known advantages over ordinary commercial detonators and this at a cost very low in comparison with other compound detonators.

The following examples illustrate the application of my invention:

1. A main charge consisting of 0.5 gram of a mixture of equal parts of tetryl and ground smokeless powder is charged and pressed in an ordinary detonator shell. This secondary charge is initiated with a suitable priming charge.

2. A main charge consisting of 0.5 gram of a mixture of equal parts of tetranitroaniline and ground smokeless powder is

charged and pressed into an ordinary detonator shell. This secondary charge is initiated with a suitable priming charge.

3. A main charge consisting of 0.5 gram of a mixture of equal parts of tetryl and ordinary nitrocellulose is charged and pressed into an ordinary detonator shell. This secondary charge is initiated with a suitable priming charge. I do not limit myself with respect to the particular priming charge employed in any of the foregoing examples. I may employ a priming charge of fulminate of mercury or a charge consisting of a heavy metal azide, in conjunction with fulminate of mercury or any other suitable composition.

While I have cited specific examples of nitroaromatic compounds I wish to have it understood that in so doing the scope of my invention is not restricted to these particular explosives. The spirit of my invention includes all nitroaromatic compounds which are suitable for detonator compositions, when used in any suitable proportions mixed with nitrocellulose. It is also to be understood that nitrocellulose in any form is included in this patent,—whether it be in the form of ground smokeless powder, pulped nitrocellulose or in any other physical condition.

Having described my invention, what I claim is:

1. A compound detonator of which the main charge consists of any suitable nitroaromatic compound and ground smokeless powder mixed therewith.

2. A compound detonator of which the main charge consists of tetryl and ground smokeless powder mixed therewith in suitable proportions.

3. A compound detonator comprising a main charge consisting of a suitable nitroaromatic compound and ground smokeless powder and a priming charge containing fulminate of mercury.

4. A compound detonator comprising a main charge consisting of a suitable nitroaromatic compound and nitrocellulose and a priming charge therefor.

5. A compound detonator comprising a main charge consisting of a mixture of a suitable nitroaromatic compound and nitrocellulose and a priming charge containing fulminate of mercury.

6. A compound detonator comprising a main charge consisting of a mixture of a suitable nitroaromatic compound and nitrocellulose and a priming charge containing fulminate of mercury and a heavy metal azide.

In testimony whereof he affixes his signature in the presence of two witnesses.

BENNETT GROTTA.

Witnesses:
RUSSELL M. COOK,
ALLAN F. KRAFF.