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PLASTIC EXPLOSIVE MIXTURE

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Within the last few years, pentaerythrite tetranitrate has been used either in the form of highly compressed charges for projectiles or as loose crystalline mass for filling detonating fuzes. This method of employment has the disadvantage for projectile charges, that the compression process, owing to the small volume density of pentaerythrite tetranitrate of 0.2 to 0.3, is inconvenient and not without danger. On the other hand it is not possible in filling detonating fuzes, to reach high pressure densities and at the same time high detonation speeds, as such explosive cores always need a comparatively thin, flexible sheathing. Seeing however that for both modes of employment, as great a density as possible is required, if nitropentaerythrite is to display its unique advantages as a shattering explosive, a liquefying process would also come into question in addition to the compression, but owing to the high melting point of 141° and the attendant risk of decomposition, this cannot be considered.

It has been found that the consolidation of pentaerythrite tetranitrate can be effected easily and without danger by an addition of 10 to 30% nitroglycerine or another homologous liquid nitric acid ester such as for instance glycol dinitrate by itself or mixed with nitroglycerine. In such a case use is advisably made of a nitropentaerythrite in fine subdivision, such as is precipitated in the form of short, fine crystals for instance by pouring the stabilized acetone solution into hot water. For instance by simply kneading 80 parts by weight of nitropentaerythrite with 20 parts by weight of nitroglycerine or nitroglycerine-glycoldinitrate mixture, a homogeneous granular-plastic mass is rapidly obtained, the initial density of 1.2 of which can be brought to the shock-proof maximum of 1.74 by a pressure of 500—600 kg/cm²; whereas pure crystallized pentaerythrite tetranitrate requires for this purpose at least 3000 kg/cm² in four stages and owing to its brittleness makes the moulding out of cavities for detonating caps and detonators difficult or impossible. A further advantage of the 80/20% mixture as compared with nitropentaerythrite alone consists in this that with an invariable detonation velocity, owing to the content and excess of oxygen of the nitroglycerine, an increased explosive power is obtained, viz. 1450 as compared with 1403 calories per kg. As pentaerythrite tetranitrate is somewhat soluble in nitroglycerine with a slight thickening and phlegmatizing of the same, the two explosives very easily become moistened and the crystals stick together thoroughly to form a solid mixture which cannot be separated even when heated, and the sensitivity of which to percussion, pressure and ignition is less as compared with the constituents of the mixture. An 80/20% mixture of nitropentaerythrite and nitroglycerine can still be detonated so easily however that 0.2 grms. lying freely on sheet iron are caused to explode with unparalleled shattering power by 0.4 grms. lead azide. The explosive action, more especially the local perforating power is greater than that of any compressible combination hitherto known. With a higher percentage of nitroglycerine however, say 30% and more, the ignition capacity with respect to lead azide and the perforating power of the mixture are diminished considerably to a remarkable degree.

As compared with the compressed fillings of crystalline pentaerythrite tetranitrate, there is the practical advantage that owing to the plasticity of the mixture, increased charging volumes are possible even with far less pressure, which is important more especially in the case of charges for thin-walled detonating caps and detonators.

What I claim is:

A plastic explosive composition detonating with great velocity and energy, consisting of 70 to 90 parts by weight of pentaerythrite tetranitrate in a finely crystalline form and 30 to 10 parts by weight of substances selected from a group consisting of glycol dinitrate, nitroglycerine and homologous substances.

In testimony whereof I have affixed my signature.

ALFRED STETTBACHER.