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EXPLOSIVE

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4 Claims. (Cl. 52—13)

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The invention described herein may be manufactured and used by or for the Government for governmental purposes, without the payment to me of any royalty thereon.

This invention relates to explosives.

Nitroglycerine has been widely used as a constituent of dynamites and propellent powders. One of the main disadvantages in its use for these purposes is its relatively high degree of sensitivity to shock which makes elaborate precautions necessary in the manufacture, transportation and handling of the nitroglycerine as well as many of the explosive compositions containing it. This fact is generally recognized and regulations prohibit the shipment of liquid nitroglycerine. If the nitroglycerine is mixed with nitrocellulose the semiplastic or gelatinized mass resulting may be shipped because the sensitivity of the mixture to shock is much less than that of nitroglycerine and is such that the mixture does not present undue hazard. The mixture is however a powerful explosive and may be used in compounding various high explosives or propellent powders.

A liquid explosive such as nitroglycerine which does not have the extreme sensitivity of nitroglycerine is highly to be desired. Such an explosive might be shipped with on more hazard than the usual high explosives now authorized for shipment, and might be more widely used in compounding various types of high explosives than is the case with nitroglycerine because of restrictions on the transportation of the latter in liquid form. If such a liquid explosive were a solvent or colloiding agent for nitrocellulose it might also be used in compounding propellent powders for various purposes.

I have found by experimentation that such a liquid explosive can be produced by the addition of the nitro derivatives of ethylbenzene to nitroglycerine. Dinitroethylbenzene, for example, is one of the few dinitro aromatic compounds known which is liquid in the pure state and which can be produced on a commercial scale. I have found that dinitroethylbenzene or suitable mixtures of it with the mononitroethylbenzene and with the trinitroethylbenzene are miscible with nitroglycerine in all proportions and that these nitro derivatives of ethylbenzene reduce the sensitivity of nitroglycerine to a remarkable degree, the reduction in sensitivity being greater of course as the content of the nitroethylbenzenes is increased. It has long been known that many nitro aromatic compounds may be added to nitroglycerine to reduce its sensitivity but there are limitations on this as it has been practiced in the past which are not present if the nitro derivatives of ethylbenzene are used; the difference here results from the important fact that the dinitro derivative of ethylbenzene has a low melting point and thus exists as a liquid at ordinary atmospheric temperatures, and the further fact that it is miscible with nitroglycerine in all proportions.

If dinitrotoluene, which when pure is a solid, crystalline material, is added to nitroglycerine the sensitivity of the nitroglycerine is reduced to be sure but nitroglycerine will dissolve and hold in solution at room temperature only about 6% of the crystalline dinitrotoluene; it is a slow, tedious and somewhat expensive procedure to obtain even as much as 6% of crystalline dinitrotoluene in solution with nitroglycerine. On the other hand dinitroethylbenzene which is a liquid at room temperature can be added to nitroglycerine in any proportion by simply mixing the one liquid with the other.

Tests made to determine the sensitivity of mixtures of dinitroethylbenzene and nitroglycerine indicate that a mixture containing 25% of the former and 75% of the latter is less sensitive to shock than a 50% nitroglycerine—50% nitrocellulose mixture which is authorized for shipment. In these tests a Pendulum friction machine as described in Bureau of Mines Technical Paper No. 186, the Impact test apparatus as developed by the Bureau of Mines, and other designs of testing machines employed in the industry to determine the sensitivity of explosives were used. Some of the data obtained are as follows: The sensitivity being interpreted by the minimum drop of a 2 kg. weight to cause explosion.

1. Nitroglycerine ..... 6 cms.
2. Nitroglycerine—50% ..... 22 cms.
   Nitrocellulose—50%
3. Nitroglycerine—80% ..... 20 cms.
   Dinitroethylbenzene—20%
4. Nitroglycerine—70%
   Dinitroethylbenzene—30% ..... 100+ cms.

The very great reduction in sensitivity of mixtures containing above 20% of the dinitroethylbenzene is indicated by the fact that No. 4 above containing 30% dinitroethylbenzene could not be exploded by a 2 kg. weight falling the maximum distance allowed by the testing machine, viz. 100 cms. Such a result is significant in proving that this nitroglycerine composition is less sensitive than many explosives which are being manufactured, transported and used. A sim-

pler significant reduction in sensitivity is obtained by employing mononitroethylbenzene or trinitroethylbenzene separately or liquid mixtures of the nitro derivatives of ethylbenzene in admixture with nitroglycerine. I have found such mixtures to act as efficient solvents for nitrocellulose, the presence of the nitroethylbenzenes not detracting from the well known efficiency of nitroglycerine in this respect. The opportunity is thus offered of employing an insensitive liquid explosive in compounding explosives and propellent powders, which offers much less hazard than nitroglycerine. The practicability of employing the insensitive liquid mixtures alone as explosives is also recognized.

I claim:

1. An explosive composition consisting of a liquid mixture of nitroglycerine and one or more nitro derivatives of ethylbenzene.

2. An explosive composition consisting of nitroglycerine, one or more of the nitro derivatives of ethylbenzene and nitrocellulose.

3. A liquid, explosive solvent or colloiding agent for nitrocellulose consisting of nitroglycerine in admixture with one or more of the nitro derivatives of ethylbenzene.

4. A composition containing nitroglycerine and over 20% of one or more of the nitroderivatives of ethylbenzene.

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