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GELATINOUS EXPLOSIVE COMPOSITION

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My invention relates to new explosive compositions and more particularly to gelatinous explosive compositions, such as are formed by the gelatinization of nitroglycerin by a suitable material, for example nitrocellulose.

The gelatin dynamite type of explosive is characterized by the fact that the nitroglycerin, which comprises the principal explosive ingredient of the composition, has been gelatinized by dissolving in it a gelatinizing agent. Nitrocellulose is the material customarily used as such gelatinizing agent. The product formed by solution of nitrocellulose, for example, in nitroglycerin in the proper proportions is a colloidal, gelatinous mass, that may be used as an explosive by itself, or in mixture with various oxidizing and carbonaceous ingredients.

Explosives of the gelatinous type have a number of advantages over explosives of the non-gelatinous, or pulverulent, type. The high density of the gelatinous explosives brings about a greater bulk strength at the place of use, and this increased strength effect is increased by the fact that the gelatinous explosive can be forced into crevices and corners, so that the bore hole is more completely filled with the explosive. The gelatinous explosives are superior also from the point of view of water resistance and fume quality.

In the manufacture of gelatinous explosives, nitrocellulose is dissolved in the nitroglycerin to form the colloidal gel. If this gelatinized nitroglycerin is to be used by itself as an explosive, sufficient nitrocellulose is used so that a plastic solid material is obtained, known as blasting gelatin. Otherwise, a smaller percentage of nitrocellulose is used, so that the resulting solution of nitrocellulose in nitroglycerin is a highly viscous liquid that can be mixed with oxidizing agents, carbonaceous materials, etc., to form the well-known gelatin dynamites.

A gelatinous explosive made as described above has one very great disadvantage, namely that it has a tendency to freeze at temperatures frequently met in practical blasting operations. Frozen nitroglycerin is extremely dangerous to handle, so that the use of nitroglycerin explosives in the frozen state is out of the question. The thawing of frozen nitroglycerin is also an operation presenting many hazards.

Attempts have been made over a great many years to lower the freezing point of nitroglycerin, and with considerable success. This has been done most successfully by dissolving in the nitroglycerin some liquid explosive ester, similar to nitroglycerin in composition and structure. In this way, there has been practically no loss in the strength of the explosive, while the freezing point has been decidedly lowered, due to the molecular depression of the freezing point according to the laws of physical chemistry. Among the materials used for this purpose have been nitrochlorhydrins, tetranitrodiglycerin, nitrated sugars, ethylene glycol dinitrate, and many others.

I have discovered that a low freezing gelatinous composition of particularly desirable qualities is obtained if the liquid explosive oil, in which the nitrocellulose is to be dissolved, comprises nitroglycerin, in which both tetranitrodiglycerin and ethylene glycol dinitrate have been dissolved. I find particular advantages from such a liquid explosive oil in the case of blasting gelatin, advantages that can be obtained by the use of neither one of these freezing point depressants alone. When tetranitrodiglycerin alone is used with nitroglycerin in making blasting gelatin, the gelatinization is very slow and the resulting product is insensitive. When ethylene glycol dinitrate, on the other hand, is used alone with nitroglycerin, the gelatinization is very rapid, with a product that contains lumpy, ungelatinized cotton, and which is not of the proper consistency. Using nitroglycerin in which both tetranitrodiglycerin and ethylene glycol dinitrate have been dissolved, however, a very satisfactory product is obtained that is the equal, in appearance and properties, of the blasting gelatin obtained when nitroglycerin is used alone as the explosive oil. This blasting gelatin is satisfactory from the point of view of sensitiveness, uniformity and time of gelatinization, and consistency. Furthermore, it has the advantage that it will

withstand low temperatures, without freezing, to a far greater extent than blasting gelatin containing nitroglycerin alone.

The proportions of nitroglycerin, tetranitrodiglycerin and ethylene glycol dinitrate in the explosive oil may vary considerably. For example, I may use from 20 to 75% nitroglycerin, 15 to 40% tetranitrodiglycerin, and 5 to 40% ethylene glycol dinitrate. I prefer however to have the following approximate composition, 62% nitroglycerin, 23% tetranitrodiglycerin, and 15% ethylene glycol dinitrate. In making a blasting gelatin with the above explosive oil, the oil and nitrocellulose may be used in the approximate proportion of 91 parts to 8.

When the above explosive oil, consisting of nitroglycerin, tetranitrodiglycerin and ethylene glycol dinitrate, is used in gelatin dynamites, a much smaller proportion of nitrocellulose is used as compared with the nitroglycerin than is needed in blasting gelatin, and the solution of nitrocellulose in the explosive oil is mixed with various other of the usual dynamite ingredients.

In order to illustrate my invention more specifically, and without in any way limiting the scope of the invention, the following examples are given of (I) a blasting gelatin, and (II) a gelatin dynamite made according to my invention:—

I	Per cent
Nitroglycerin	56
Tetranitrodiglycerin	21
Ethylene glycol dinitrate	14
Nitrocellulose	8
Chalk	1
	100

II	Per cent
Nitroglycerin	31.0
Tetranitrodiglycerin	11.5
Ethylene glycol dinitrate	7.5
Nitrocellulose	1.2
Sodium nitrate	37.0
Wood pulp	6.8
Meal	3.0
Chalk	2.0
	100.0

As many apparently widely different embodiments of this invention may be made without departing from the spirit thereof, it is to be understood that I do not limit myself to the foregoing examples or descriptions except as indicated in the following patent claims.

I claim:

1. A gelatinized explosive composition containing a colloidal solution of nitrocellulose in nitroglycerin, in which tetranitrodiglycerin and ethylene glycol dinitrate alone have been incorporated.

2. A gelatinous explosive composition comprising a colloidal solution of nitrocellulose in nitroglycerin, in which tetranitrodiglycerin and ethylene glycol dinitrate have been incorporated, the explosive oil before solution of the nitrocellulose having solely the composition by weight, 20 to 75% nitroglycerin, 15 to 40% tetranitrodiglycerin, 5 to 40% ethylene glycol dinitrate.

3. A gelatinized explosive composition containing a colloidal solution of nitrocellulose in nitroglycerin, in which tetranitrodiglycerin and ethylene glycol dinitrate have been incorporated, the explosive oil before solution of the nitrocellulose having approximately the composition by weight, 62% nitroglycerin, 23% tetranitrodiglycerin, and 15% ethylene glycol dinitrate.

4. A blasting gelatin comprising a colloidal solution of nitrocellulose in nitroglycerin, in which tetranitrodiglycerin and ethylene glycol dinitrate alone have been incorporated.

5. A blasting gelatin comprising a colloidal solution of nitrocellulose in nitroglycerin, in which tetranitrodiglycerin and ethylene glycol dinitrate have been incorporated, the explosive oil before solution of the nitrocellulose having solely the composition by weight, 20 to 75% nitroglycerin, 15 to 40% tetranitrodiglycerin, 5 to 40% ethylene glycol dinitrate.

6. A blasting gelatin comprising a colloidal solution of nitrocellulose in nitroglycerin, in which tetranitrodiglycerin and ethylene glycol dinitrate have been incorporated, the explosive oil before solution of nitrocellulose having approximately the composition by weight, 62% nitroglycerin, 23% tetranitrodiglycerin, and 15% ethylene glycol dinitrate.

In testimony whereof, I affix my signature.

LEON O. BRYAN.