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UNITED STATES PATENT OFFICE.

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AMMONIUM-NITRATE EXPLOSIVE.

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To all whom it may concern:

Be it known that I, LEON O. BRYAN, a citizen of the United States, and a resident of Wilmington, in the county of New Castle and State of Delaware, have invented a certain new and useful Ammonium-Nitrate Explosive, of which the following is a specification.

My invention relates to an improvement in blasting explosives and in particular to an improvement in blasting explosives sensitized by means of finely ground propellent powders.

By the terms "propellent powder" I mean to include (1) smokeless powder or pyro powder which consists of colloided nitrocellulose containing a small percentage of residual sulphate and about .5% diphenylamine and occasionally, in addition, a coating or impregnation of a deterrent such as dinitrotoluene, and (2) cordite consisting of 25 to 50% nitroglycerine, 45 to 70% nitrocellulose and about 5% mineral jelly or vaseline.

The utilization of propellent powders such as above described in commercial dynamites became of great importance as a result of the large stocks of these military stores on hand in this country after the war and since released by the Government for commercial use.

Blasting explosives previously made from finely ground propellent powders have been open to two serious objections, namely, dustiness in manufacture and inflammability of the finished explosive. In my co-pending application Ser. No. 527,488 I have described a method of overcoming dustiness by the addition to a smokeless powder dynamite of a small percentage (1 to 10%) of a liquid explosive such, for example, as nitroglycerine, which is capable of becoming gelatinized with said smokeless powder.

By my present invention I have also succeeded in exercising a large degree of control over the inflammability. I have discovered that by the addition to the smokeless powder dynamite of a substantial amount of ammonium nitrate, together with a corresponding reduction in the content of ground propellant, I may decrease the inflammability of the dynamite without interfering with the explosive strength, the amount of decrease in flammability depending directly upon the extent to which ammonium nitrate is substituted for the ground propellant.

I may use my present invention in conjunction with either ground smokeless powder or ground cordite or with mixtures of the two, and in carrying out my invention I may also make use of the improvement disclosed in the previously mentioned co-pending application consisting in adding to the dynamite a small proportion of nitroglycerine or some other liquid explosive such, for example, as a liquid aromatic nitrocompound. I may also make use of small percentages of powdered aluminum, for example, .3 to 5%, for the purpose of increasing the sensitiveness of the explosive.

As examples of compositions of dynamites which come within the scope of my invention I may cite the following, although, as will be evident, it is possible to deviate widely from the compositions given without departing from my invention.

	%	%	%	%	%	%
Ground smokeless powder	15	25	35	42	15	
Ground cordite	--	--	--	--	15	25
Ammonium nitrate	45	72	5	49	62	55
Sodium nitrate	35	--	53	5	5	17
Nitroglycerine	2	2	--	3	2	--
Aluminum	2	--	--	--	--	--
Chalk	1	1	1	1	1	1
Sulphur	--	--	6	--	--	2

In general the proportions of the essential constituents of the new explosive compositions should ordinarily come within the following ranges:

Ground propellent powder	10 to 50%
Ammonium nitrate	5 to 80%
Dust-preventing compound	1 to 10%

Instead of a sodium nitrate I may use other metal nitrates, particularly the nitrates of alkali-forming metals such as potassium and barium.

The fineness of ground propellant may of course vary considerably. I have found however, that for the best results the fineness should be such that all passes a 20 mesh screen, and at least 20% shall pass a 100 mesh screen. I preferably dry my ingredients to a moisture content of 2% or less.

I have also discovered that it is possible to obtain satisfactory regulation of the flame temperature in a dynamite containing a ground propellant and ammonium nitrate by the addition to the dynamite of what may be termed a flame-regulating material, such as sodium chloride, ammonium chloride, ammonium sulphate, or other materials having a high heat of dissociation or vaporization. By this means I have even succeeded in obtaining compositions compris-

ing ground propellants and ammonium nitrate of such low flame temperatures that they may be safely classed with the so-called permissible powders.

In these last mentioned dynamite compositions I may use from 15% to 40% of ground propellent powder, from 35% to 80% ammonium nitrate, and from 3 to 15% of flame suppressant, for example NaCl. I may also, if desired, use small percentages (1 to 10%) of liquid explosive or aromatic nitro-compound for the purpose of eliminating dustiness.

The composition which I have found most suitable for use as a coal mine explosive is as follows:

Nitroglycerine	2%
Ground propellent powder	35%
Ammonium nitrate	52%
Sodium chloride	10%
Chalk	1%

I may also, if desired, add varying proportions of alkali-metal nitrate, wood pulp or other materials normally made use of in dynamite manufacture.

I claim:

1. A blasting explosive comprising ammonium nitrate and more than 10% of a finely ground propellent powder.

2. A blasting explosive comprising ammonium nitrate and from about 10 to 50% of a finely ground propellent powder.

3. A blasting explosive comprising from 5 to 80% of ammonium nitrate and from about 10 to 50% of a finely ground propellent powder.

4. A blasting explosive comprising from 5 to 80% of ammonium nitrate, from about 10 to 50% of finely ground smokeless powder, and from about 1 to 10% of an explosive capable of becoming gelatinized with said smokeless powder.

5. A blasting explosive comprising from 5 to 80% of ammonium nitrate, from about 10 to 50% of finely ground smokeless powder, and from about 1 to 10% of nitroglycerine.

6. A blasting explosive comprising finely ground smokeless powder, ammonium nitrate, from 1 to 10% of an explosive capable of becoming gelatinized with said smokeless powder, and a flame-regulating material.

7. A blasting explosive comprising finely ground smokeless powder, ammonium nitrate, from 1 to 10% of nitroglycerine and a flame-regulating material.

8. A blasting explosive comprising from about 10 to 40% of finely ground smokeless powder, from 35 to 80% of ammonium nitrate, from 1 to 10% of a liquid explosive, and from 3 to 15% of a flame-regulating material.

9. A blasting explosive comprising a finely ground propellent powder, ammonium nitrate, less than 10% of a liquid explosive, a flame-regulating material, and a nitrate of an alkali-forming metal.

10. A blasting explosive comprising finely ground smokeless powder, ammonium nitrate, from 1 to 10% of nitroglycerine, a flame-regulating material, and sodium nitrate.

In testimony whereof I affix my signature.

LEON O. BRYAN.