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UNITED STATES PATENT OFFICE.

RUSSELL M. COOK, OF TAMAQUA, PENNSYLVANIA, ASSIGNOR TO ATLAS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

EXPLOSIVE.

No Drawing.

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To all whom it may concern:

Be it known that RUSSELL M. COOK, 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 Explosives of which the following is a specification.

This invention relates to perchlorate explosives which are similar in their explosive properties to existing standard grades of nitroglycerine dynamite. This application is a continuation in part of my copending application Serial Number 524,275, filed December 22, 1921, and relates particularly to potassium perchlorate explosives in contrast-distinction to the ammonium perchlorate explosives to which the application aforesaid has been devoted.

Since dynamite was discovered, numerous attempts have been made to produce explosives more powerful than, or equally as powerful as dynamite, yet possessing superior qualities with respect to stability, economy, resistance to freezing, or physiological effect of handling the powder. By the last named effect is meant the characteristic headaches produced by handling nitroglycerine dynamites.

Among the many proposed substitutes for nitroglycerine dynamite may be mentioned the mixtures of chlorates, sodium or potassium, with resins, gums, and nitroaromatic compounds, and mixtures of inorganic nitrates with resins or nitroaromatic compounds. Each of these proposed explosives possessed some property which recommended it to the attention of the explosive consumer. In most cases this was the property of being non-freezing, or of not causing headaches. In some cases cheapness was claimed as a virtue. However each of these proposed explosives suffered from one or more major, inherent defects which precluded its acceptance as a substitute for or competitor of nitroglycerine dynamite. The explosives consisting of inorganic nitrates mixed with nitroaromatic compounds, such as T. N. T., have not met with favor because of low initial sensitiveness and of the tendency of the powder to become hard with resulting impossibility of detonation. This last named objection applies also to the chlorate powders.

For some years the development of proposed substitutes for, or improvements over, dynamite, seemed to be in a state of comparative coma, induced no doubt by a feeling that success was well nigh impossible, judging by the many previously failures. This condition was suddenly changed, within the last few years, by the development and manufacture of a new type of explosive, having for its base the comparatively new explosive salts, the perchlorates. Perchlorate explosives since their introduction on a commercial scale have enjoyed a remarkable success. Aside from the satisfactory results of several years of extensive use, which period has served to show the satisfaction of the users with their non-freezing and non-headache properties, as well as with their general explosive properties, one testimonial to their value is the large number of recently proposed explosive compositions which have as a necessary ingredient a perchlorate. These compositions usually contain, in addition to perchlorate, a nitro-aromatic compound, such as di- or trinitrotoluol. Sodium nitrate, manganese dioxide, ground coal and wood meal may also be included in the composition. They may also contain various so-called sensitizers, such as powdered metals, sulphur, or sulphides, water-proofing ingredients, such as paraffin and ceresin, and an anti-acid, such as chalk.

The period of use to which perchlorate explosives have been subjected has served to show that while, as now manufactured, they are adapted for general blasting work and other uses to which dynamite is put, some limitations are placed upon their use by their comparatively low propagation sensitiveness, as compared with nitroglycerine dynamites.

The object of my invention is to provide explosive compositions the main explosive in which comprises a large percentage of a perchlorate, or mixture of perchlorates, and in which the above mentioned disadvantages, i. e. that of two low propagation sensitiveness for certain special work, is to a large extent avoided.

It might be reasoned that a logical way to approach this problem, that of combining the desirable properties of both perchlorate

explosives and nitroglycerine dynamite, and yet eliminating the undesirable properties of both, would be to effect a mixture of certain ingredients of each explosive. I have found such to be the case. By exhaustive tests I have found that perchlorate explosives prepared in the manner hereinafter set forth give the desired results. This may be accomplished by including in the explosive composition a low percentage of an explosive liquid organic nitrate, such as might be used in dynamite. This may be further defined as a material, liquid at 75° F., which when mixed with 25 per cent of the inert substance kieselguhr and packed in an 1 1/2" x 8" dynamite cartridge, can be completely detonated with a No. 6 cap. Among these explosive organic nitrates, as above defined, may be mentioned nitroglycerine, tetranitrodiglycerine, the nitroglycols, the nitrochlorhydrins, any of these mixed with nitrated sugars, and any mixtures of these with themselves.

One example of such proposed explosive would have the following composition:

	Per cent.
Potassium perchlorate	65
Trinitrotoluol	32
Nitroglycerine and tetranitrodiglycerine	2
Chalk	1

Another example would have the following composition:

	Per cent.
Potassium perchlorate	45
Coated sodium nitrate	27
Trinitrotoluol	20
Nitroglycerine	2
Ground coal	5
Chalk	1

Other examples may be given as follows:

	Per cent.
Potassium perchlorate	30
Coated sodium nitrate	39
Trinitrotoluol	25
Nitroglycerine	2
Ground coal	3
Chalk	1
Ammonium perchlorate	24
Potassium perchlorate	25
Manganese dioxide	4
Sodium nitrate	17
Wood meal	1
Trinitrotoluol	26
Dinitromonochlorhydrin	2
Chalk	1

It is to be understood that the percentage of these ingredients may be varied and other ingredients added, in order to give explosives with certain desired properties with

respect to strength, fumes, velocity of detonation, and density, without departing from the idea of my invention. For instance, I do not limit myself to the use of two per cent explosive liquid organic nitrate, since the results I desire can be obtained from the use of from one-half to three and one-half per cent (0.50% to 3.50 per cent).

The purpose of the explosive liquid organic nitrate is to raise the propagation sensitiveness of the perchlorate explosives so that they compare more favorably in this respect with dynamite, and can, as a result, be successively used in special cases in which at present only the more sensitive nitroglycerine dynamites can be applied. I have found, by extensive tests, that these new explosives, made as before described, do not cause headaches on being handled.

Moreover, repeated subjection of these new explosives for long periods of time to the temperatures encountered in practical use has resulted in no apparent change in their physical or explosive properties.

On the other hand, under the same conditions, nitroglycerine dynamites become hard, their propagation sensitiveness decreases, they are subject to freezing and they are more dangerously sensitive to some forms of handling.

Having described my invention what I claim is:

1. An explosive containing potassium perchlorate and from one-half to three and one-half per cent (0.50% to 3.50%) of an explosive liquid organic nitrate.

2. An explosive containing potassium perchlorate, from one-half to three and one-half per cent (0.50% to 3.50%) of an explosive liquid organic nitrate and sodium nitrate.

3. An explosive containing potassium perchlorate, from one-half to three and one-half per cent (0.50% to 3.50%) of an explosive liquid organic nitrate, sodium nitrate and trinitrotoluol.

4. An explosive comprising a mixture of perchlorates from one-half to three and one-half per cent (0.50% to 3.50%) of an explosive liquid organic nitrate, sodium nitrate, trinitrotoluol, and manganese dioxide.

5. An explosive comprising a perchlorate mixture which includes potassium perchlorate, from one-half to three and one-half per cent (0.50% to 3.50%) of an explosive liquid organic nitrate and sodium nitrate.

6. An explosive containing a perchlorate mixture including potassium perchlorate and from one-half to three and one-half per cent (0.50% to 3.50%) of nitroglycerine.

7. An explosive containing a perchlorate mixture including potassium perchlorate, from one-half to three and one-half per cent

(0.50% to 3.50%) of nitroglycerine and sodium nitrate.

8. An explosive comprising a mixture of perchlorates, from one-half to three and one-half per cent (0.50% to 3.50%) of an explosive liquid organic nitrate, sodium nitrate and trinitrotoluol.

In testimony whereof he has affixed signature in the presence of two witnesses:

RUSSELL M. COOK.

Witnesses:

W. F. AURAND,
F. H. GILLUM.