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EXPLOSIVE

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8 Claims. (Cl. 52—18)

This invention relates to the manufacture of explosives and in particular to the production of high explosives suitable for use in coal or other mines.

The explosives heretofore generally employed for use in coal mines fall within what is known as the low density class and usually comprise compositions consisting of ammonium nitrate, carbohydrates or wood-meal, a nitro-compound and a cooling agent. Of the ingredients just mentioned, ammonium nitrate and nitro-compounds are used to a large extent in the manufacture of explosives for military purposes, so that, in view of possible non-availability or severe restriction of the supply of nitrates or nitro-compounds, it is desirable to have industrial explosives in which the particular ingredients just mentioned are not present.

Industrial explosives containing chlorates have been proposed, but owing to their great sensitivity and liability to decomposition and spontaneous combustion in storage, especially in the presence of moisture, they are not "permitted" explosives.

Some coal mine explosives falling within the low density classification (designed to bring the coal down in large lumps as distinct from the shattering effect of high explosives) cannot be relied on to be flameless because exploding by combustion is productive of flame and only a small percentage of "cooling" elements (about 13%) can be employed without preventing explosion.

Potassium perchlorate is much less sensitive than potassium chlorate and is stable even in the presence of moisture; in the case, however, of previous proposals for the production of perchlorate explosives, it has been found necessary, in consequence of the greater insensitivity of the perchlorates as compared with the chlorates and the substantial proportion of cooling salts necessary for a coal mine explosive, to use the former in conjunction with nitro-compounds, since otherwise the perchlorate mixtures were found to be too inert or insensitive to produce complete detonation.

In the present invention a perchlorate explosive has been produced which obviates the use of nitro-compounds and which explodes by detonation and is therefore practically flameless, while at the same time it includes a substantial proportion of cooling salts. It is moderate in its action and so combines the good qualities of the two different types (high and low) but possesses none of their inherent disadvantages for use in coal mines.

The present invention has the foregoing general objects and particularly the production of perchlorate explosives containing no nitrates or nitro-compounds and of the required efficiency and safety in use and storage. For this purpose, the explosive composition according to the present invention comprises a mixture of a perchlorate of an alkali or alkali earth metal with a carbonaceous substance, such as for example coal tar pitch, bitumen, coal dust, coke, charcoal, graphite or lampblack, small proportions of sensitizing agents such as a sugar and a bichromate not exceeding 6% of the total, together with a salt, such as, for instance, sodium chloride, which acts as a cooling agent and is in excess of 20% of the total.

As an example of a preferred explosive according to the invention there may be mentioned one of the following composition: 58 to 60 parts potassium perchlorate, 10 to 12 parts coal tar pitch, 3 parts sugar, 1 part potassium bichromate, and 26 parts sodium chloride. It will be seen that the sensitizing agents do not total more than 4% or approximately so within the limits of the alternative proportions of the other constituents set forth, while the coolant amounts to 26% or approximately so according to the proportions of the other ingredients within the limits set forth.

In manufacturing the composition, it is desirable first to mix together the four soluble ingredients with a small proportion of water to ensure complete safety during mixing. The amount of water may be in the region of approximately 15% by weight, sufficient to make the mixture thoroughly damp. Then, when these ingredients have been thoroughly incorporated together, the pitch is added in a powdered condition, the mixing being continued until a completely homogeneous mixture is obtained. The residual water in the mixture may then be expelled by gently heating it to a temperature of about 40° C.

The improved explosives according to the present invention are efficient, safe and cheap to manufacture and are designed to be of particular use in coal mines, where safety is the primary consideration. The new explosive compositions are insensitive to friction to a substantial extent, but can be detonated in the usual manner of high explosives by the use of appropriate detonators. As they do not contain nitro-compounds, their manufacture can be carried out more cheaply than that of explosives containing such compounds.

I claim:

1. An explosive composition consisting of 58 to 60 parts potassium perchlorate, 10 to 12 parts coal tar pitch, 3 parts sugar, 1 part potassium bichromate and 26 parts sodium chloride.

2. An explosive composition consisting of 58 to 60 parts potassium perchlorate, 10 to 12 parts carbonaceous substance, 3 parts sugar, 1 part potassium bichromate, and 26 parts sodium chloride.

3. An explosive composition consisting of 58 to 60 parts potassium perchlorate, 10 to 12 parts carbonaceous substance containing uncombined carbon, 3 parts sugar, 1 part potassium bichromate, and 26 parts sodium chloride.

4. An explosive composition consisting of a mixture of 58 to 60 parts of perchlorate of the group consisting of alkali metals and alkaline earth metals, 10 to 12 parts of a carbonaceous substance, less than 6 parts of a sensitizing agent comprising sugar and bichromate, and alkali metal chloride in amount upwards of 20 parts but insufficient to render the mixture inexplodable.

5. An explosive composition consisting of a mixture of 58 to 60 parts of perchlorate of the group consisting of alkali metals and alkaline earth metals, 10 to 12 parts of a carbonaceous substance containing uncombined carbon, less than 6 parts of a sensitizing agent comprising sugar and bichromate, and alkali metal chloride in amount upwards of 20 parts but insufficient to render the mixture inexplodable.

6. An explosive consisting of a mixture in predominating quantity of a perchlorate of the group consisting of alkali metals and alkaline earth metals, a carbonaceous substance, a sensitizing agent comprising sugar and bichromate in an amount not exceeding 6 per cent of the total, and alkali metal chloride in an amount upwards of 20 per cent of the total but insufficient to render the mixture inexplodable.

7. An explosive consisting of a mixture in predominating quantity of a perchlorate of the group consisting of alkali metals and alkaline earth metals, a carbonaceous substance containing uncombined carbon, a sensitizing agent comprising sugar and bichromate in an amount not exceeding 6 per cent of the total, and alkali metal chloride in an amount upwards of 20 per cent of the total but insufficient to render the mixture inexplodable.

8. An explosive consisting of a mixture in predominating quantity of a perchlorate of the group consisting of alkali metals and alkaline earth metals, a carbonaceous substance, a sensitizing agent comprising sugar and bichromate in an amount not exceeding 6 per cent of the total, and alkali metal chloride in an amount of substantially 26 per cent of the total.

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