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BLASTING CHARGE

James Taylor, Saltcoats, Scotland, assignor to
Imperial Chemical Industries Limited, a corporation of Great Britain

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This invention relates to an improvement in or modification of the invention described and claimed in my specification No. 712,050.

In the said specification there are described 5
blasting devices of the kind comprising a charge adapted, on initiation, to generate gas, and a pressure resistant metal vessel containing the said charge together with suitable initiating means, the said vessel being adapted to release the generated gases at a sufficient pressure to cause a 10
blasting effect in the borehole. The gas release means preferably consists of a rupturable and replaceable bursting disc, but may also take the form of a suitably adjusted valve.

According to the invention of the said specification the charge for blasting devices of the kind described comprises a mixture of an alkali metal nitrite with one or more ammonium salts, the charge being capable of undergoing a self-sustained gas-producing decomposition. Such a 20
charge, while capable of sustaining its own exothermic decomposition when unconfined, does not manifest explosive properties under such conditions; nevertheless, when confined in a suitable blasting device, it is capable of effecting safe 25
blasting in fiery or dusty mines. When suitably ignited in the unconfined state, the charge does not cause a dangerous rise in temperature such as would ignite methane-air mixtures. It may 30
therefore be loaded into a blasting device with safety in fiery or dusty atmospheres.

The object of the present invention is to provide further improvements in charges of the kind described and in particular to provide 35
charges of greater volumetric efficiency. That is to say, as compared with the charge described in the said specification No. 712,050 a smaller total quantity of the charge of the present invention may be used for the production of an 40
equal volume of gas. There is also a decrease in the amount of solid residue formed and this decrease facilitates ready discharge of the gases from the blasting device.

The above-mentioned objects are attained by 45
including with a charge of the nature set forth in my pending application No. 712,050, a quantity of an incombustible composition which is capable on heating of undergoing an exothermic gas-evolving decomposition but which is incapable of 50
sustaining its own decomposition if initiated at ordinary pressure and temperature. The proportions of the components of the charge are suitably such that the charge itself is capable of undergoing, when unconfined, a self-sustained re- 55
action if ignited locally. Under such conditions

the proportion of the alkali metal nitrite ammonium salt mixture of pending application No. 712,050 is such that its decomposition liberates sufficient heat to decompose substantially completely the incombustible gas-evolving composition when the charge is ignited in a confined 5
space. It is preferred that at least one of the components of the mixture of the present invention should be in a granular or pelleted form.

Suitable incombustible gas-evolving compositions for use in the present invention are described in the specification of my pending application No. 712,052. The preferred composition is a mixture of three molecular proportions of ammonium nitrate with two molecular proportions 15
of ammonium bicarbonate. However, good results may be obtained when using smaller proportions of ammonium bicarbonate, or even omitting it altogether. I prefer, however, to employ the first mentioned mixture, as the ammonium bicarbonate increases the efficiency of the charge by 20
forming with the ammonium nitrate a balanced composition and also prevents the formation of harmful nitrogen oxides.

As a means of ignition for the composition of 25
my invention I may use a 30 grain electric powder fuse; but when the use of the charges in safety blasting is contemplated, an extra measure of safety is afforded by the use of an igniter which is itself incapable of igniting a fiery or 30
dusty atmosphere.

By suitable choice of the gas-evolving composition that is incapable of propagating its own thermal decomposition when unconfined, the temperature at which the products of decomposition 35
of the charge ultimately emerge from the blasting device may be lowered sufficiently to render the blast safe in fiery or dusty coal mines.

The application of the present invention is not limited to coal blasting; but it is of particularly 40
great value in that art, since it not only provides a reliable and safe method of blasting, but also favours production of round coal.

The inclusion within the charge of a minor proportion of a cooling, gas-producing material 45
or stabilizer (for instance sodium carbonate or bicarbonate) which need not form gaseous decomposition products exclusively, is within the scope of the present invention. For instance, in 50
granulating the preferred mixture of sodium nitrite with ammonium chloride or ammonium sulphate, the inclusion of a small percentage of sodium carbonate is often convenient and advantageous in conferring an extra degree of stability 55

on the mixture. The inclusion of small percentages of inert materials, such as French chalk, china clay, or the like, to prevent the granules from sticking together and thus to assist in the uniform distribution of the granules, is also within the scope of my invention.

The proportion of the sodium nitrite ammonium salt mixture to the ammonium nitrate ammonium bicarbonate mixture may be considerably varied, as shown in the attached examples. My best results have been obtained when using less than 1.0 part of ammonium nitrate ammonium bicarbonate mixture to 1.0 part of sodium nitrite ammonium salt mixture.

The mixtures may be loaded into the blasting device either in the loose form or suitably cartridge; in the latter case each cartridge is preferably provided with a fireproof wrapper.

As the above-mentioned gas-producing materials are composed of materials that leave little or no residue on ignition, the volumetric efficiency of the charge of the present invention is higher than that of an equal charge of a corresponding mixture of sodium nitrite with ammonium chloride or ammonium sulphate without addition of the said exothermic gas-producing materials.

The following examples illustrate our invention.

Example 1

A rigid container of the kind used in blasting with liquid carbon dioxide, of 370 c. c. capacity and venting at a pressure of 12 tons per square inch, was used. The charge comprised a mixture of 70 grams of a granulated mixture composed of 3 parts of ammonium nitrate and 2 parts of ammonium bicarbonate, together with 80 grams of a granulated mixture of sodium nitrite and ammonium chloride in the proportion of 69/53 by weight. Both mixtures were granulated so that they passed a sieve of B. S. S. mesh 6 to the inch and were retained on a sieve of 10 meshes to the inch. The ammonium nitrate-ammonium bicarbonate mixture was coated with about 1% of French chalk.

The charge was initiated by a 30 grain safety powder fuse.

Example 2

The container used had a capacity of 680 c. c., and a 30 grain safety powder fuse was used as the initiator. The charge consisted of 130 grams of a mixture of three molecular proportions of ammonium nitrate with two molecular proportions of ammonium bicarbonate, granulated 6-10 mesh as described in Example 1, but without French chalk, mixed with 190 grams of the sodium nitrite ammonium chloride mixture described in Example 1, also granulated 6-10 mesh. The sodium nitrite ammonium chloride mixture contained 2% soda ash as a stabilizer. This charge gave good results when fired in coal. Five shots were fired from cartridges into a gallery filled with a 9% methane in air mixture. No ignition took place.

Example 3

The container and initiator used were as in Example 2. The charge consisted of 142 grams of the ammonium nitrate ammonium bicarbonate mixture mentioned in Example 2, and 142 grams of sodium nitrite ammonium chloride mixture, both components being granulated 6-10 mesh. A delay of 2 seconds occurred between initiation and venting of the cartridge.

Example 4

The container and initiator used were as in Example 2, except that the venting pressure was 16 tons per square inch. The charge consisted of 120 grams of ammonium nitrate ammonium bicarbonate mixture as in Example 2, and 180 grams of sodium nitrite ammonium chloride mixture. Each component was granulated to 4-10 mesh. The cartridge fired satisfactorily.

Example 5

The container and initiator used were as in Example 2. The charge consisted of 107 grams of a mixture of two molecular proportions of ammonium nitrate to one molecular proportion of ammonium bicarbonate, and 214 grams of sodium nitrite ammonium chloride mixture. Each component was granulated to 4-8 mesh. The sodium nitrite ammonium chloride mixture contained 0.5% soda ash as stabilizer and 2% borax. The cartridge fired satisfactorily.

Example 6

The container and initiator used were as in Example 2. The charge consisted of 130 grams of ammonium nitrate, granulated 6-10 mesh, and 190 grams of sodium nitrite ammonium chloride mixture, also granulated 6-10 mesh, and containing 2% soda ash. The cartridge fired satisfactorily.

Example 7

The container and initiator used were as in Example 2. The charge consisted of 100 grams of ammonium nitrate, granulated 6-10 mesh, and 130 grams of sodium nitrite ammonium chloride mixture, granulated 4-8 mesh, and containing 0.5% soda ash. The charge fired satisfactorily.

I claim:

1. A blasting cartridge comprising a pressure-resistant container provided with a member adapted to permit the escape of gases at a predetermined and considerable pressure, a gas-producing charge comprising an incombustible, exothermic non-explosive gas-producing composition which is incapable of sustaining its own decomposition when once initiated, and an incombustible, exothermic, non-explosive, gas-producing composition which is capable of sustaining its own decomposition when once initiated.

2. The blasting cartridge of claim 1, in which the amount of the gas-producing composition which is incapable of sustaining its own decomposition is not greater than the amount which can be decomposed by the heat liberated by the decomposition of the gas-producing substance which is capable of sustaining its own decomposition.

3. The blasting cartridge of claim 1 in which the ingredients comprising the gas-producing charge are in granular form.

4. A blasting cartridge comprising a pressure-resistant container provided with a member adapted to permit the escape of gases at a predetermined and considerable pressure, and a gas-producing charge comprising ammonium nitrate, ammonium bicarbonate, and an incombustible, exothermic, non-explosive gas-producing composition which is capable of sustaining its own decomposition once initiated.

5. The blasting cartridge of claim 4, in which the gas-producing composition which is capable of sustaining its own decomposition comprises

ammonium chloride and an alkali metal nitrite.

6. A blasting cartridge comprising a pressure-resistant container provided with a member adapted to permit the escape of gases at a predetermined and considerable pressure, a gas-producing charge comprising an incombustible, exothermic, non-explosive gas-producing composition which is incapable of sustaining its own decomposition once initiated, and a gas-generating composition comprising an alkali metal nitrite and ammonium chloride.

7. A blasting cartridge comprising a pressure-resistant container provided with a member adapted to permit the escape of gases at a predetermined and considerable pressure, and a gas-producing charge comprising ammonium nitrate, ammonium bicarbonate, ammonium chloride, and sodium nitrite.

8. The blasting cartridge of claim 7 in which the ingredients of the gas-producing substance are in granular form, and a small amount of an inert non-gas-producing substance is incorporated therewith as a stabilizing agent.

9. A blasting cartridge comprising a pressure-resistant container provided with a member adapted to permit the escape of gases at a predetermined and considerable pressure, and a gas-producing charge comprising ammonium nitrate,

ammonium bicarbonate, sodium nitrite, and ammonium sulfate.

10. The blasting cartridge of claim 9 in which the ingredients of the gas-producing charge are in granular form, and a small amount of an inert non-gas-producing substance is incorporated therewith as a stabilizing agent.

11. A blasting cartridge comprising a pressure-resistant container provided with a member adapted to permit the escape of gases at a predetermined and considerable pressure, a gas-producing charge comprising a non-explosive, nitrogen-generating composition, and an incombustible, exothermic, non-explosive, gas-producing composition which is capable of sustaining its own decomposition when once initiated.

12. A blasting cartridge comprising a pressure-resistant container provided with a member adapted to permit the escape of gases at a predetermined and considerable pressure, a gas-producing charge comprising a non-explosive, nitrogen-generating composition which is incapable of sustaining its own decomposition when once initiated, and an incombustible, exothermic, non-explosive, gas-producing composition which is capable of sustaining its own decomposition when once initiated.

JAMES TAYLOR.