UNITED STATES PATENT OFFICE.

MAURICE DELVIGNE, OF NAMUR, BELGIUM.

EXPLOSIVE.

977,076. Specification of Letters Patent. Patented Nov. 29, 1910.

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To all whom it may concern:

Be it known that I, MAURICE DELVIGNE, a subject of the King of Belgium, residing at 18 Rue Delvaux, Namur, in the Kingdom of Belgium, have invented certain new and useful Improvements in Explosives, of which the following is a specification.

The addition of metals such as aluminium, magnesium or silicon, either pure or in the form of ferro-silicon to explosives has long been proposed, their combustion giving rise to great liberation of heat which expands the gases of the explosives and increases their power. Nevertheless explosives of this kind could not heretofore be employed industrially owing to the excessive cost of the metals referred to above. Magnesium, which apart from its cost is too readily oxidizable is too expensive and the same applies to pure silicon, the reduction of which is costly, while as regards aluminium the cost of crushing it into powder is very high.

In accordance with the present invention still better results are obtained by employing in place of these too costly metals, alkaline-earth silicids which are not inflammable and which yield a large quantity of heat by oxidation, such as silicids of calcium and of barium, but more particularly calcium silicid which can readily be reduced to powder of the desired degree of tenuity and the employment of which in this form is highly advantageous because it is practically unalterable in the atmosphere.

Comparative tests of nitrate of ammonia explosives containing ferro-silicon and calcium silicid respectively conducted after the Trauzl method in blocks of lead of the pattern adopted by the Vth International Congress of Chemistry have shown that the explosive power of the calcium silicid explosives was over 100 C^3 higher than that of ferro-silicon explosives containing as much as 90 per cent of silicium. It was moreover ascertained that calcium silicid had a much greater aptitude for detonation which latter was more rapid.

The explosives that can be formed with this novel combustible may be divided into three classes.

(*a*). Explosives formed of calcium silicid and of a non-explosive oxidizing agent or an oxidizing agent which is hardly explosive by itself such as ammonium nitrate. According to the power and the explosion temperature that it is desired to obtain, the proportion of calcium silicid is varied as shown by the following examples in which the power indicated has been measured by the Trauzl method with 10 grams of explosive.

First example.

Ammonium nitrate	80
Calcium silicid	20

(Power 650 cubic cm.)

Second sample.

Ammonium nitrate	85
Calcium silicid	15

(Power 550 cubic cm.)

Third example.

Ammonium nitrate	95
Calcium silicid	5

(Power 470 cubic cm.)

As shown by these examples the power diminishes with the proportion of calcium silicid and the explosion temperature diminishes simultaneously. The composition indicated in the third example may be given as that of a safety explosive of high power. All these explosives are remarkably stable, insensible to shock and to fire and 1 gram of fulminate of mercury is always sufficient to cause them to explode.

(*b*). Explosives constituted by the addition of calcium silicid to nitrated or other explosives already complete in themselves, such as trinitrotoluene, picric acid, or nitroglycerin in all its industrial forms. This addition increases the power owing to the supplementary heat produced by the combustion of the silicid and increases the explosive energy of the explosive.

(*c*). Explosives formed by the addition of explosives of the classes (*a*) and (*b*) and an increase of the proportion of oxidizing agent if desired.

First example.

Ammonium nitrate	78.20
Trinitrotoluene	8.00
Calcium silicid	13.80

(Power 750 cubic cm.)

It will be seen that the addition of a small quantity of trinitrotoluene to an explosive of the class (*a*) greatly increases its power.

Second example.

Ammonium nitrate	95.00
Trinitrotoluene	2.50
Calcium silicid	2.50

(Power 450 cubic cm.)

This last composition gives an explosive with a low explosion temperature which constitutes a safety explosive.

In every case the metallic nature of the calcium silicid facilitates the explosion and increases the explosive energy.

What I claim and desire to secure by Letters Patent of the United States is:—

1. An explosive composition of matter comprising an oxidizing agent and an alkaline-earth silicid.

2. An explosive composition of matter comprising ammonium nitrate and an alkaline-earth silicid.

3. An explosive composition of matter comprising ammonium nitrate and calcium silicid.

4. An explosive composition of matter comprising an oxidizing agent and calcium silicid.

5. An explosive composition of matter consisting of an explosive substance, an oxidizing agent, and an alkaline-earth silicid.

6. An explosive composition of matter consisting of an explosive substance, ammonium nitrate and an alkaline-earth silicid.

7. An explosive composition of matter consisting of an explosive substance, ammonium nitrate and calcium silicid.

8. An explosive composition of matter consisting of an explosive substance, a large proportion of an oxidizing agent, and calcium silicid.

In testimony whereof I affix my signature in presence of two witnesses.

MAURICE DELVIGNE.

Witnesses:
ADOLPHE VOGEL,
CHARLES DUPONT.