

UNITED STATES PATENT OFFICE.

CAMILLO MANUELLI AND LUIGI BERNARDINI, OF ROME, ITALY.

EXPLOSIVE AND MANUFACTURE THEREOF.

1,409,933.

Specification of Letters Patent. Patented Mar. 21, 1922.

No Drawing.

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To all whom it may concern:

Be it known that we, CAMILLO MANUELLI and LUIGI BERNARDINI, subjects of the King of Italy, and residents of Rome, Italy, have invented certain new and useful improvements in Explosives and Manufacture Thereof, of which the following is a specification.

The present invention has for its object to provide new explosives.

Since Frank and Caro rendered possible the industrial preparation of calciumcyanamide directly from the nitrogen of the atmosphere, a great number of organic products which previously were costly are now obtainable at moderate cost from calciumcyanamide.

Among these products must be mentioned dicyanodiamidine biguanide, and guanidine together with their salts and derivatives, dicyanodiamide, melanine and amidodecyanic acid. All these products have a high nitrogen content, on oxidation yield nitrogen in the elementary form, and have low heats of formation; which characteristics enable them to be used successfully in the manufacture of explosives.

Dicyanodiamide and nitroguanidine have been proposed as weakening elements in the production of ballistites. Nitroguanidine has been proposed as a component of complex explosives, (English Patent 21529 of 1905) and guanidine nitrate (French Patent 530271) has been proposed in admixture with ammonium nitrate in equimolecular proportions for the purpose of obtaining a lower hygroscopicity and greater stability as compared with ammonium nitrate and melting at 140°.

We have found that by heating dicyanodiamide with ammonium salts the corresponding salts of biguanide and guanidine are obtained, according to the temperature and duration of the heating process. For instance, when heating two parts by weight of nitrate of ammonium together with about one part of dicyanodiamide at a lower temperature than 140°, the result is a nitrate of biguanide; when maintaining the mixture in a bath at the temperature of about 170°, the result is essentially a nitrate of guanidine mixed with a small percentage of secondary products. The reaction develops heat. The reactions are not hindered by the presence of

abnormal amounts of ammonium salts. The nitrates of biguanide and guanidine, under the action of sulphuric acid (66° B.) are transformed into the corresponding nitro-products. In a like manner the perchlorates, sulphates, chlorides and other salts of biguanide and guanidine may be prepared.

The nitrates of biguanide and guanidine associated with ammonium nitrate and with the derived nitro-products of the biguanide or guanidine form mixtures having a great explosive power, which melt without decomposition at comparatively low temperatures and may be handled in the melted condition without risk. Good results are obtained by melting ammonium nitrate, guanidine nitrate and nitroguanidine in proportions not too widely differing from 6:2:2. The nitrate of guanidine may be partly or in the whole substituted by the nitrate of biguanide and in the same manner the nitro-guanidine by the derived products of the biguanide. Explosives having similar characteristics are obtained by melting nitrate of ammonium with dicyanodiamide and nitroguanidine. The product resulting from the melting contains nitrate of guanidine or biguanide according to the heating temperature. Good explosive mixtures are obtained by melting, for instance;

Ammonium nitrate 6-8 parts by weight.

Dicyanodiamide 0.6-0.8 parts by weight.

Nitroguanidine 1.5-2.5 parts by weight.

The chlorate and perchlorate of biguanide or guanidine may be admitted as a component of explosives mixtures or may themselves be used as explosives.

The dicyanodiamide may be also intimately mixed with an oxidizing agent, for instance, a nitrate, chlorate, perchlorate, with or without the addition of some other easily oxidizable substance. Satisfactory explosives of this character may be obtained, for instance, by

Ammonium nitrate 7-9 parts by weight.

Dicyanodiamide 1-2 parts by weight.

Carbon 0.2-1 parts by weight.

or, for instance:

Ammonium perchlorate p. 70-75.

Dicyanodiamide p. 25-30.

Instead of the carbon, aluminium, silicon sulphur or the like may be used.

The products derived from calcium-cyanamide other than dicyanodiamide, biguanide

and guanidine may be used in producing explosives, for instance, amidodicyanic acid, melamine and dicyanodiamidine.

5 All the explosive materials, according to the present invention have a high explosive power, great stability and may be safely handled. The explosive products which are prepared by melting together the constituent materials possess the considerable advantage
10 that the best contact between the comburent and combustible elements is obtained; further they are completely homogeneous. The mixtures of ammonium nitrate, guanidine nitrate and nitroguanidine and the correspond-
15 ing mixtures with biguanide nitrate and nitrobiguanide have the important advantage of melting at comparatively lower temperatures and of being capable of being

handled without risk, so that they may be loaded very easily and charges of uniform density may readily be obtained.

We claim:

A process of preparing an explosive, comprising the step of melting together a mixture comprising the substance resulting from heating dicyanodiamide and an ammonium salt, the nitro-derivative of such resultant substance and an ammonium salt.

In testimony whereof we have hereunto signed our names to this specification in the presence of two subscribing witnesses.

CAMILLO MANUELLI.
LUIGI BERNARDINI.

Witnesses:

GIOVANNI BORTOLMZZI,
GIOVANNI VOLTURINI.