UNITED STATES PATENT OFFICE.

BÉLA BRONCS, OF VIENNA, AUSTRIA-HUNGARY; HENRY ORTH ADMISTRATOR OF SAID BRONCS, DECEASED.

EXPLOSIVE COMPOUND.

SPECIFICATION forming part of Letters Patent No. 421,662, dated February 18, 1890.

Application filed November 5, 1884. Serial No. 147,226. (Specimens.) Patented in Austria-Hungary January 31, 1884, No. 41,601 and No. 2,061, June 19, 1884, No. 9,858 and No. 26,169, and September 16, 1884, No. 11,989 and No. 42,284; in France October 25, 1884, No. 165,010; in Belgium October 25, 1884, No. 66,699; in Luxemburg October 25, 1884, No. 452; in England October 25, 1884, No. 14,140; in Germany October 26, 1884, No. 32,891; in Italy December 6, 1884, XVIII, 17,500, XXXIV, 451; in Spain March 11, 1885, No. 6,596; in Sweden April 9, 1885, No. 315; in Portugal October 13, 1886, No. 1,076, and in Canada October 23, 1886, No. 25,188.

To all whom it may concern:

Be it known that I, BÉLA BRONCS, chemist, a subject of the Emperor of Austria and King of Hungary, residing at Vienna, Austria-Hungary, have invented certain new and useful Improvements in Explosive Compounds, (for which I obtained Letters Patent in Austria-Hungary January 31, 1884, No. 41,601 and No. 2,061; June 19, 1884, No. 9,858 and No. 26,169, and September 16, 1884, No. 11,989 and No. 42,284; in Germany, October 26, 1884, No. 32,891; in France, October 25, 1884, No. 165,010; in Belgium, October 25, 1884, No. 66,699; in Luxemburg, October 25, 1884, No. 452; in England, October 25, 1884, No. 14,140; in Italy, December 6, 1884, Vol. XVIII, 17,500, Vol. XXXIV, 451; in Spain, March 11, 1885, No. 6,596; in Portugal, October 13, 1886, No. 1,076; in Sweden, April 9, 1885, No. 315, and in Canada, October 23, 1886, No. 25,188;) and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to letters or figures of reference marked thereon, which form a part of this specification.

The explosives hitherto employed for blasting and other purposes, especially nitro-glycerine and the nitro-cellulose compounds, have the disadvantage not only in exerting a crushing power upon the material acted upon, but also in developing poisonous gases as products of combustion, and are for this reason objectionable, more especially in quarrying. These disadvantages, to which may be added the danger inherent to their preparation or manufacture, storage, and handling, gave rise to many attempts to produce an explosive equally as efficient, but free from such dangers and disadvantages. To this end the alkali picrates have been experimented with, and potassium picrate has been especially recommended for use in explosives. Double salts have also been proposed—such as sodium picrate—with magnesia or with an oxide or protoxide, without, however, attaining the desired results. The great disadvantage of all these salts lies in the fact that they are very sensitive to sudden shocks or blows, on the one hand, and on the other their explosive power or effect is deficient.

I have discovered that double picrates may be obtained, by means of which all the disadvantages referred to may be effectually avoided, and an explosive of greater efficiency even than the nitro-glycerine or nitro-cellulose compounds obtained. These double picrates have heretofore been unknown, so far as I am aware, and they are composed of a crystalline combination of sodium picrate and barium or lead picrate. I have also discovered that when nitrated naphthaline is mixed with these double salts the combustion thereof may be materially retarded.

The invention consists, essentially, in an explosive compound of which a double picrate forms the basis, substantially as hereinafter described and claimed.

In carrying out my invention good results are obtained with the double picrate of barium and sodium (trinitrophenate of barium and sodium) expressed by the formula

$$_2(C_6H_2(NO_2)_3O(Ba+3(C_6H_2(NO_2(_3NaO)+10H_2O,$$

or with picrate of lead and sodium, (trinitrophenate of lead and sodium,) expressed by the formula

$$_2(C_6H_2(NO_2(_3O(Pb+_3(C_6H_2(NO_2(_3NO+10H_2O$$

in combination with nitrated naphthaline, or sodium picrate with other picrates in combination with nitrated naphthaline may be employed with good results. With these I mix nitrate of potash, saccharine matter, such as sugar, a gum, and soot. The proportions of the above-described ingredients will of course vary according to the uses made of the explosive, the variations being, for general purposes limited within the following proportions: picric acid barium soda, fifteen per cent. to thirty per cent.; picric acid oxide-of-lead soda, eight per cent. to thirty per cent.; potassium picrate, two per cent. to ten per cent.; nitrated naphthaline, twenty per cent. to five per cent.; nitrate of potash, forty per cent. to twenty per cent.; saccharine matter, three per cent. to one and one-half per cent.;

gummy or resinous substances, three per cent. to two per cent.; soot, four per cent. to one-half per cent. The double salts may be employed in smaller quantities if the effect of the explosive is to be a limited one.

In the compounding of the ingredients those that are soluble in water are dissolved, the others pulverized and mixed with the solution, and the whole is then subjected to the action of heat and dried. The explosive thus obtained may be reduced into lumps or granulated or compressed into cartridges.

The manufacture, storage, and handling of this explosive are absolutely free from danger, its igniting temperature varying from 300° to 320° centigrade. It is therefore adapted for general purposes of blasting, as well as in warfare for filling shells, &c. A spontaneous decomposition can never take place, nor is it in the least affected by atmospheric changes or dampness. Even thirty per cent. of moisture in the compound will not affect it. The new explosive is also distinguished from the ordinary explosives by the development of greater volume of gases during the explosion, as may be seen from the following table of comparisons. At a pressure of seven hundred and fifty millimeters and a temperature of 0° centigrade, one gram of black powder, according to Bunsen and Shiskoff, will develop 193.10 cubic centimeters of gas. One gram of gun-cotton, according to Teschenmacher and Paret, will develop four hundred and eighty-three cubic centimeters of gas. One gram of nitro-glycerine, according to L'Hote, will develop two hundred and eighty-four cubic centimeters of gas, while one gram of the described explosive will develop five hundred and ninety-five cubic centimeters of gas.

The new explosive, instead of having a crushing effect upon the material acted upon, as is the case with the nitro-glycerine and nitro-cellulose compounds, its maximum effect is more a pushing or sliding one with a minimum crushing effect, and this quality, coupled with the development of large volumes of gases, will render it clear that in mining or quarrying larger masses will be displaced than by means of any other explosive of like power.

The gases developed are composed of carbonic acid, carbonic oxide, nitrogen, hydrogen, and traces of marsh-gas which are combined with comparatively great volumes of steam, because the double picrates contain water in chemical combination. These gases are free from directly poisonous component parts, which renders the explosive more desirable than those heretofore known, which develop gases containing bioxide of nitrogen, sulphide, and cyanide of hydrogen combinations. After combustion the solid residues remaining—such as barium carbonate, oxide of lead, soda, and potash—do not exceed one per cent. of the entire charge. Finally the ignition of the charge may be effected by the ordinary slow match, if desired, thus dispensing with the dangerous fulminate of mercury and other fulminates usually employed.

It will be understood that I do not desire to claim, broadly, the use of double picrates in the manufacture of explosives, as the use of some double picrates have been proposed prior to my invention, which relates only to the use of double picrates of sodium with barium or lead picrates, which double salts were, in fact, unknown prior to my invention; nor has nitrated naphthaline been used prior to my invention in combination with the double picrates prior to my said invention.

Having now fully described and ascertained the nature of my invention, I claim—

1. The herein-described explosive compound, composed of a double salt combination of sodium picrate with other picrates, nitrate of potash, saccharine matter, a gummy or resinous substance, and soot, in or about in the proportions set forth.

2. The herein-described explosive compound, composed of a double salt combination of sodium picrate with other picrates, nitrated naphthaline, nitrate of potash, saccharine matter, a gummy or resinous substance, and soot, in or about in the proportions set forth.

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

BÉLA BRONCS.

Witnesses:
ADOLF DEMELIUS,
B. ROI.