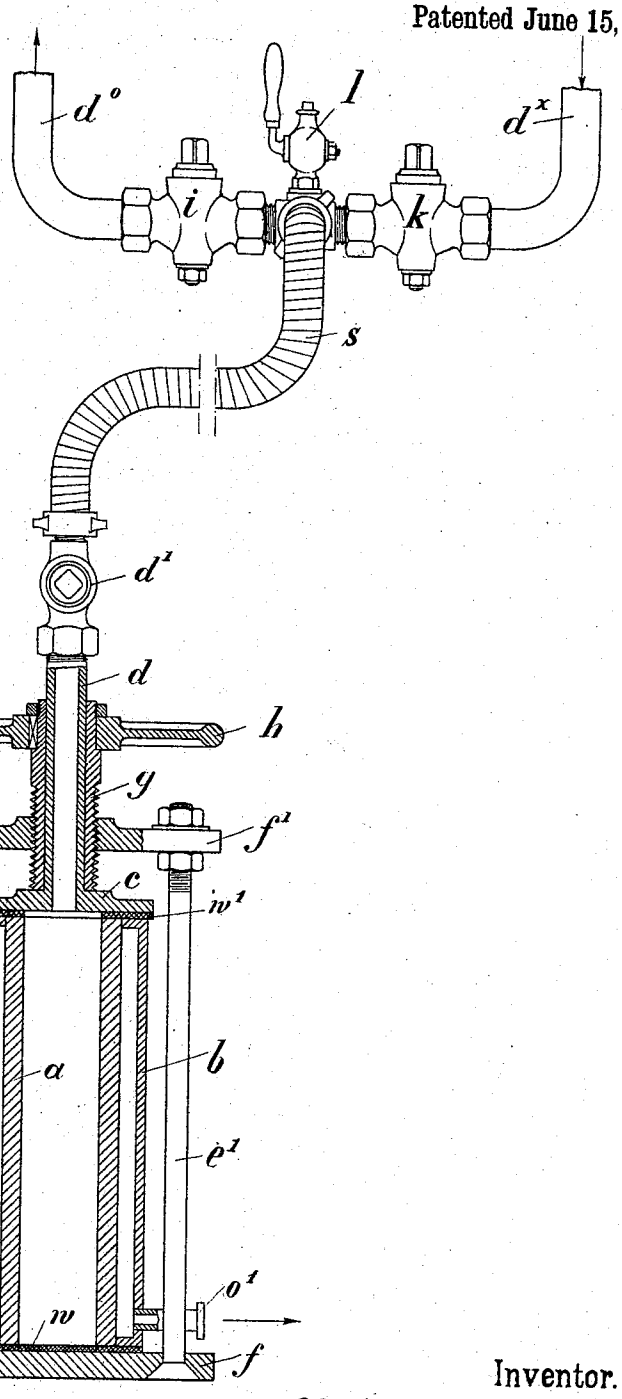
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PROCESS OF INCREASING THE DENSITY OF FUSIBLE EXPLOSIVE NITRO-SUBSTANCES.

APPLICATION FILED AUG. 30, 1906.

925,419.

Patented June 15, 1909.



Witnesses.

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UNITED STATES PATENT OFFICE.

CHRISTIAN EMIL BICHEL, OF HAMBURG, GERMANY, ASSIGNOR TO E. I. DU PONT DE NEMOURS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF NEW JERSEY.

PROCESS OF INCREASING THE DENSITY OF FUSIBLE EXPLOSIVE NITRO SUBSTANCES.

No. 925,419. Specification of Letters Patent. Patented June 15, 1909.

Application filed August 30, 1906. Serial No. 332,673.

To all whom it may concern:

Be it known that I, CHRISTIAN EMIL BICHEL, a citizen and resident of Hamburg, in the German Empire, have invented a certain new and useful Improved Process of Increasing the Density of Fusible Explosive Nitro Substances, of which the following is a specification.

The present invention relates to an improved process of increasing the density of fusible explosive nitro substances.

In order to place greater amounts or charges of explosives into shells, mines, torpedoes and the like, it may be desirable to increase as much as possible the density of the fusible explosive nitro substances adapted for the said purpose. In fusing or melting nitro substances, such as trinitrotoluol, trinitrophenol (picric acid), nitronaphthalene or analogous substances under ordinary atmospheric pressure the trinitrotoluol has a density of about 1.55, the picric acid of about 1.62 and the nitro-naphthalene of about 1.23.

The present invention consists in subjecting the fused or molten explosive nitro substance or substances during the solidification to the action of compressed air or another suitable indifferent pressure medium, for example, such as carbonic acid, nitrogen, &c., in order to densify or condense the said explosive nitro substances in the desired degree. It has been found by experiments that by melting a nitro substance of the kind mentioned and by putting the mold or molds into which the molten nitro substance has been poured, singly or united in series or groups, into a closed room, receptacle or chamber adapted to be rarefied or stored with compressed air having a pressure of some atmospheres, the said nitro substance will receive—according to the height of the air pressure applied—a higher or greater density. The density will be increased, particularly when the air or air bubbles contained in the said nitro substance are removed by suction, before the pressure medium is allowed to act upon the nitro substance to be condensed.

By applying the improved process the density of trinitrotoluol is increased from 1.55 to 1.58, when only atmospheric pressure is allowed to act upon the molten explosive after its evacuation. If however an air pressure of two atmospheres is employed the density of trinitrotoluol increases to 1.60, and by using an air pressure of two to three atmospheres to 1.62. Under such pressure the density of picric acid can be increased from 1.62 to 1.67, whereas the density of nitro-naphthalene is raised from 1.23 to 1.32. From a further increase of the pressure, say above four atmospheres, there did not result any material increase of the density except in large bulks of molten nitro substances. It has been proved, however, that by a quick cooling of the molten nitro substance a finer crystalline structure and at the same time still a somewhat increased density may be obtained.

The cooling of the fusible nitro substance may be effected while under pressure by inserting the mold or molds into cold water or into another suitable cooling medium.

For carrying my improved process into practice I have shown in the accompanying sheet of drawing a sectional view of an apparatus constructed in accordance with and embodying my invention.

The molten explosive substance is poured into suitable cartridge shells or directly into the explosive chambers of the projectiles which are placed in a receptacle or cylinder *a* adapted to be closed hermetically. The receptacle *a* may be directly connected to the pressure conduit and also to the suction conduit, and may be put directly into the cooling water or surrounded by an outer casing or jacket *b* provided with an inlet *o* and outlet o^1 so that a suitable cooling medium, for example water, may be circulated through the space between the inner receptacle *a* and the outer casing *b;* the body of water around the receptacle *a* practically forming a cooling jacket. The cover *c* of the receptacle is provided with a neck or tube *d* to which a flexible hose *s* may be attached in any suitable manner. According to the positions of the valves *i*, *k* and *l* the said hose may be brought into communication with the suction-conduit d^o, the pressure-conduit d^x or the atmosphere. Furthermore it is advantageous to provide in the tube *d* or at the end thereof, a valve d^1, which is to be closed before the removal or disconnection of the hose *s*, in order to retain the pressure in the receptacle during the period of solidification of the molten nitro substance. The receptacle *a* is arranged between two transverse-beams or plates *f* and f^1 connected by screw bolts *e* and

e^1. The upper plate f^1 is provided with a threaded hole or perforation for an externally threaded hollow spindle g slid over the tube d and provided at its upper end with a handle or hand-wheel h. By screwing down the spindle g the cover c may be pressed against the upper rim or edge of the receptacle and the latter with its lower edge or rim against the bottom plate f, in order to procure thus a hermetical joint at the top and bottom of the receptacle. Washers w and w^1 serve to increase such hermetical connection. A certain number of such receptacles may be united in any convenient manner, if desired, to form a series or battery.

I claim:

Process of increasing the density of fusible explosive nitro substances, which comprises melting the substances, then exhausting air therefrom while melted, applying pressure sufficient to increase the density thereof by means of a compressed gas on the surface of the molten substances and finally cooling the same until solidification takes place while under pressure.

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Witnesses:
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