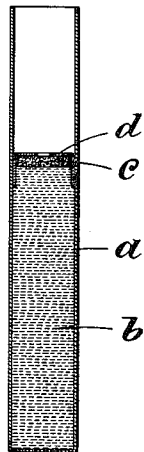


L. WÖHLER.
CHARGE FOR DETONATOR CASINGS.
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1,128,394.

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UNITED STATES PATENT OFFICE.

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CHARGE FOR DETONATOR-CASINGS.

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Patented Feb. 16, 1915.

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To all whom it may concern:

Be it known that I, LOTHAR WÖHLER, a doctor of philosophy and professor of chemistry in the Institute of Technology of Darmstadt, in Hesse, and a resident of 1 Hoftheaterplatz, in the city of Darmstadt, Grand Duchy of Hesse, part of the German Empire, and a subject of the German Emperor, have invented certain new and useful Improvements in Charges for Detonator-Casings, of which the following is a specification.

This invention has reference to charges for detonators having an initial or priming action for the purpose of detonating explosive charges.

In my prior U. S. Patent No. 904,289, a charge has been described in which the heavy metal salts of hydrazoic acid, the so-called heavy metal nitrids, are used in the place of fulminate of mercury either alone or in combination with explosive agents in primers, such compounds presenting the advantage that a smaller amount of the metal nitrid may be used for obtaining the same effect than by the use of fulminate of mercury. In further investigations I have ascertained that the heavy metal nitrids may also be used with advantage in such a manner that they do not constitute a substitute for fulminate of mercury, but may either be employed in very small quantities in combination with fulminate of mercury or as a substitute for fulminate of mercury in combinations with other explosives possessing similar properties, such as diazo-benzol-nitrate and sulfid of nitrogen for instance. These substances such, for example, as fulminate of mercury, are usually designated "primary detonating compounds" or "exploders of the first class," as they detonate directly. They are highly sensitive, and cannot be used as main blasting charges. They do not need primers or initial igniters for their detonation as this takes place by direct detonation, as distinguished from the indirect detonation of detonating compounds or exploders of the second class, such as gun cotton, dynamite, picric acid, trinitrotoluene, and the like, which require separate igniters or detonator caps for their explosion. By combining in my invention heavy metal nitrids with said primary detonating compounds or exploders of the first class as, for example with fulminate of mer-

cury, the activity of the fulminate of mercury and of its substitutes, such as diazo-benzol-nitrate and sulfid of nitrogen, is enormously increased, so that by working in this manner the desired priming or initial action upon blasting compounds can be produced by even a still smaller amount of the primary detonating compound than by the use of lead nitrid or of silver nitrid alone, while without the addition of nitrids in accordance with U. S. Patent No. 904,289, fulminate of mercury is incomparably less active than the nitrids themselves, and while on the other hand diazo-benzol-nitrate and sulfid of nitrogen, even in comparatively large quantities, cannot be used as primers or initial igniters, though they belong to the same class of directly detonating exploders to which fulminate of mercury also belongs. When used, however, in combination with heavy metal nitrids in accordance with my invention, even such exploders of the first class which are otherwise unsuitable for use as primers or igniters for detonating purposes, become very well adapted for that purpose. By thus employing an amount of metal nitrid which, in any case, is not larger than that employed in the case of the exclusive use of this nitrid, it becomes possible to utilize mercury fulminate in its previous modes of application with but a small addition of lead nitrid, which is a point of importance, inasmuch as the manufacture and manipulation of mercury fulminate are well known and convenient. By this means it is also possible to make use of the very valuable advantage of great compactness and tightness of the charge of fulminate of mercury. With an addition of but about one-third of its amount of metal nitrid, of lead nitrid for instance, the fulminate may be compressed to a pressure of about thirty thousand pounds or to a pressure of about two thousand atmospheres and even higher, while without this addition the fulminate is known to have its activity greatly impaired by pressures of 3750 pounds or 250 atmospheres. That is to say, the fulminate has been pressed "dead" by such pressures when previously employed.

The following may be mentioned as illustrative examples for charges for detonator casings embodying my invention:

1. A layer of trinitrotoluene may be used as the main charge which is covered by a

priming layer composed of a mixture of two centigrams of fulminate of mercury and one centigram of lead nitrid. If no lead nitrid were present, thirty centigrams of fulminate of mercury would have to be used as a minimum.

2. Use the same main charge as in Example 1, but as a primer use five centigrams of sulfid of nitrogen or five centigrams of diazo-benzol-nitrate to which from one to two centigrams of lead nitrid are added.

3. Make up a charge of fulminate of mercury or of a mixture of fulminate of mercury with chlorate of potash, and place upon this charge a layer of one centigram of lead nitrid as a primer.

4. Use a charge of diazo-benzol-nitrate or of sulfid of nitrogen and place upon this charge a layer of one centigram of lead nitrid as a primer.

5. Assuming the detonator to contain a relatively large charge of fulminate of mercury or a mixture of the same with chlorate of potash and a smaller charge of some other explosive, mix the said fulminate of mercury or the mixture thereof with chlorate of potash with one-third its weight of lead nitrid and compress this fulminate mixture by forcing it into the shell by a pressure up to two thousand atmospheres or about thirty thousand pounds.

The different layers of material may for instance be arranged within a shell or casing, as shown on the accompanying drawing which is a longitudinal sectional view, enlarged from the usual size, of a detonator casing, cap or primer for firing an explosive charge according to my invention.

In the drawing I have shown a shell or casing *a*, usually made of copper or of any other suitable material for containing the charge and its priming or firing substance. In the shell there is a detonator charge *b*, upon which a layer *c* of a priming or firing substance, as hereinbefore described, is placed. A small perforated metal thimble *d* is placed upon the contents, and the entire mass is then compressed in the usual manner as, for instance, in accordance with the Example 5 hereinbefore mentioned.

While I have described my invention above in detail, I wish it to be understood that many changes may be made therein, without departing from the spirit of my invention.

I claim:

1. A detonator containing a primary detonating compound and a smaller proportion of an azid of a heavy metal.
2. A detonator containing a primary detonating compound and a smaller proportion of an azid of a heavy metal mixed therewith.
3. A detonator containing a primary detonating compound mixed with an oxidiz-

ing agent, and a smaller proportion of an azid of a heavy metal.

4. A detonator containing a primary detonating compound mixed with an oxidizing agent, and a smaller proportion of an azid of a heavy metal mixed therewith.

5. A detonator containing a primary detonating compound and a smaller proportion of lead azid.

6. A detonator containing a primary detonating compound and a smaller proportion of lead azid mixed therewith.

7. A detonator containing a primary detonating compound mixed with an oxidizing agent, and a smaller proportion of lead azid.

8. A detonator containing a primary detonating compound mixed with an oxidizing agent, and a smaller proportion of lead azid mixed therewith.

9. A detonator containing fulminate of mercury and a smaller proportion of an azid of a heavy metal.

10. A detonator containing fulminate of mercury and a smaller proportion of an azid of a heavy metal mixed therewith.

11. A detonator containing fulminate of mercury mixed with an oxidizing agent, and a smaller proportion of an azid of a heavy metal.

12. A detonator containing fulminate of mercury mixed with an oxidizing agent, and a smaller proportion of an azid of a heavy metal mixed therewith.

13. A detonator containing fulminate of mercury and a smaller proportion of lead azid.

14. A detonator containing fulminate of mercury and a smaller proportion of lead azid mixed therewith.

15. A detonator containing fulminate of mercury mixed with an oxidizing agent, and a smaller proportion of lead azid.

16. A detonator containing fulminate of mercury mixed with an oxidizing agent, and a smaller proportion of lead azid mixed therewith.

17. A detonator containing a primary detonating compound mixed with chlorate of potash, and a smaller proportion of an azid of a heavy metal.

18. A detonator containing a primary detonating compound mixed with chlorate of potash, and a smaller proportion of an azid of a heavy metal mixed therewith.

19. A detonator containing a primary detonating compound mixed with chlorate of potash, and a smaller proportion of lead azid.

20. A detonator containing a primary detonating compound mixed with chlorate of potash, and a smaller proportion of lead azid mixed therewith.

21. A detonator containing fulminate of mercury mixed with chlorate of potash, and

a smaller proportion of an azid of a heavy metal.

22. A detonator containing fulminate of mercury mixed with chlorate of potash, and a smaller proportion of an azid of a heavy metal mixed therewith.

23. A detonator containing fulminate of mercury mixed with chlorate of potash, and a smaller proportion of lead azid.

24. A detonator containing fulminate of mercury mixed with chlorate of potash, and a smaller proportion of lead azid mixed therewith.

25. A detonator containing fulminate of mercury mixed with chlorate of potash, and a smaller proportion of lead azid mixed therewith, the detonator charge being highly compressed. 15

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

LOTHAR WÖHLER.

Witnesses:

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CARL GRUND.