C. A. WOODBURY.

DETONATOR.

APPLICATION FILED JAN. 9, 1909.

939,371. Patented Nov. 9, 1909.

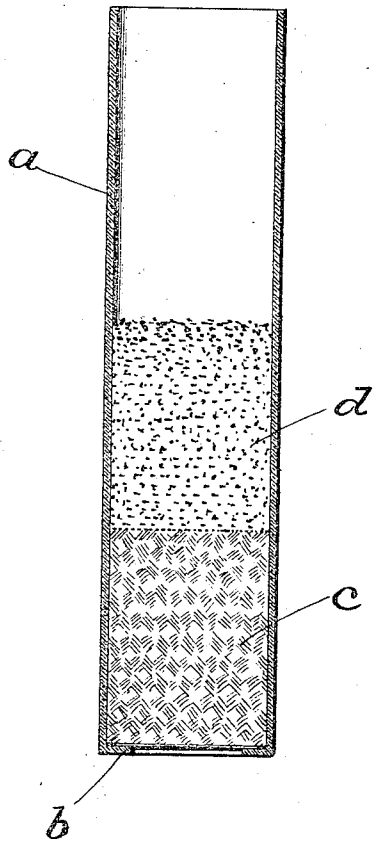

FIG. 1.

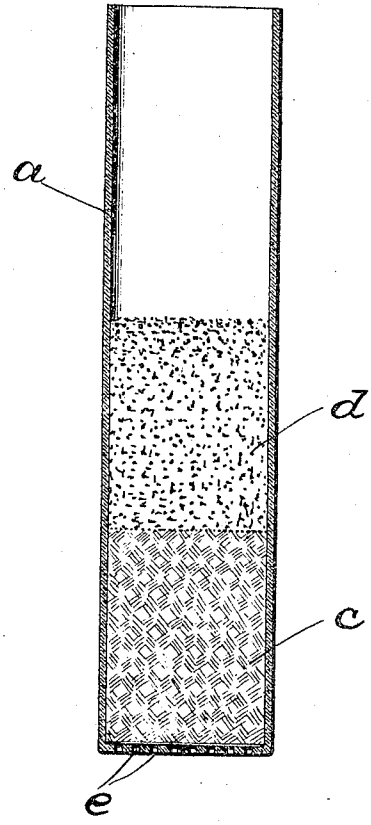

FIG. 2.

WITNESSES:

Robt. R. Ritchel

A. M. Strian

INVENTOR

Clifford A. Keley Woodbury

BY

Stanley & Hendricks

ATTORNEYS.

UNITED STATES PATENT OFFICE.

CLIFFORD AKELEY WOODBURY, OF CHESTER, PENNSYLVANIA, ASSIGNOR TO THE E. I. DU PONT DE NEMOURS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF NEW JERSEY.

DETONATOR.

939,371. Specification of Letters Patent. Patented Nov. 9, 1909.

Application filed January 9, 1909. Serial No. 471,411.

To all whom it may concern:

Be it known that I, CLIFFORD AKELEY WOODBURY, a citizen of the United States, residing at Chester, county of Delaware, and State of Pennsylvania, have invented a new and useful Improvement in Detonators, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, which form a part of this specification.

Detonators for use with explosives are at present made in the form of a metallic capsule having a closed lower end, or bottom, which does not allow the charge therein to come into direct contact with the explosive which it is designed to detonate. I have discovered that if I form the shell or capsule with the lower end thereof, which comes in contact with the explosive, open, and use in the lower end a charge consisting of a rather insensitive explosive which cannot be detonated by a fuse, preferably a solid nitro aromatic explosive, as trinitrotoluene, etc., and above this charge place a primer of a fulminating compound, as fulminate of mercury, silver azid, etc., I obtain a shell which is more powerful than if the charge were composed wholly of the fulminating compound, and the shell had a closed bottom. By open at its bottom I intend to include such cases where it is entirely open, partially open, or provided with a perforated bottom, such, for instance, as wire gauze. With such a shell the charge will remain intact even with rough handling, notwithstanding the open bottom. If a solid nitro aromatic explosive be used, it preferably should be fused at its lower end to protect it from moisture. Owing to the open end, the explosive wave is transmitted directly from the detonator to the explosive to be detonated. Such detonation increases both the sensitiveness and velocity of detonation of high explosives, such as gelatin dynamite, blasting gelatin, and nitroglycerin.

My invention, therefore, consists of a shell, in the lower end of which is placed a comparatively insensitive explosive, above which is a primer composed of fulminating compound. This shell is open at its bottom, either wholly or partially open, or by means of a perforated bottom, such as wire gauze.

I will now describe the embodiments of my invention shown in the accompanying drawings, in which:

Figure 1 is a section of one embodiment of my improved detonator. Fig. 2 is a similar view of another embodiment of my invention.

Speaking of Fig. 1, *a* is the shell, tubular in shape, having at the bottom the flange *b*. The material, *c* nitrotoluene, and, *d* fulminate are packed in the tube from the upper end and against the flange *b*. In Fig. 2 the bottom of the shell *a* is provided with the perforations *e*. In both cases preferably the lower exposed surface of the nitrotoluene is fused to protect it from moisture.

Having now fully described my invention, what I claim and desire to protect by Letters Patent is:

1. A detonator comprising a shell having an open lower end and containing in its lower portion an insensitive explosive, and having a fulminating compound above the same.

2. A detonator comprising a shell having a perforated lower end, and containing in its lower portion an insensitive explosive and having a fulminating compound above the same.

3. A detonator comprising a shell having an open lower end, and containing in its lower portion a solid nitro aromatic explosive, and having a fulminating compound above the same.

4. A detonator comprising a shell having an open lower end, and containing in its lower portion a solid nitro aromatic explosive, and having a fulminating compound above the same, the lower exposed surface of the solid nitro aromatic explosive being fused.

5. A detonator comprising a shell having a perforated lower end, and containing in its lower portion a solid nitro aromatic explosive, and having a fulminating compound above the same.

6. A detonator comprising a shell having a perforated lower end, and containing in its

lower portion a solid nitro aromatic explosive, and having a fulminating compound above the same, the lower exposed surface of the solid nitro aromatic explosive being fused.

7. A detonator comprising a shell having an open lower end, and containing trinitrotoluene in its lower portion, and having a fulminating compound above the same.

8. A detonator comprising a shell having an open lower end, and containing trinitrotoluene in its lower portion, and having a fulminating compound above the same, the lower part of the trinitrotoluene being fused.

9. A detonator comprising a shell having a perforated lower end, and containing trinitrotoluene in its lower portion, and having a fulminating compound above the same.

10. A detonator comprising a shell having a perforated lower end, and containing trinitrotoluene in its lower portion, and having a fulminating compound above the same, the lower part of the trinitrotoluene being fused.

11. A detonator comprising a shell having an open lower end, and containing in its lower portion an insensitive explosive, and having mercuric fulminate above the same.

12. A detonator comprising a shell having a perforated lower end, and containing in its lower portion an insensitive explosive, and having mercuric fulminate above the same.

13. A detonator comprising a shell having an open lower end, and containing in its lower portion a solid nitro aromatic explosive, and having mercuric fulminate above the same.

14. A detonator comprising a shell having an open lower end, and containing in its lower portion a solid nitro aromatic explosive, and having mercuric fulminate above the same, the lower exposed surface of the solid nitro aromatic explosive being fused.

15. A detonator comprising a shell having a perforated lower end, and containing in its lower portion a solid nitro aromatic explosive, and having mercuric fulminate above the same.

16. A detonator comprising a shell having a perforated lower end, and containing in its lower portion a solid nitro aromatic explosive, and having mercuric fulminate above the same, the lower exposed surface of the solid nitro aromatic explosive being fused.

17. A detonator comprising a shell having an open lower end, and containing trinitrotoluene in its lower portion, and having mercuric fulminate above the same.

18. A detonator comprising a shell having an open lower end, and containing trinitrotoluene in its lower portion, and having mercuric fulminate above the same, the lower part of the trinitrotoluene being fused.

19. A detonator comprising a shell having a perforated lower end and containing trinitrotoluene in its lower portion, and having mercuric fulminate above the same.

20. A detonator comprising a shell having a perforated lower end and containing trinitrotoluene in its lower portion, and having mercuric fulminate above the same, the lower part of the trinitrotoluene being fused.

In testimony of which invention, I have hereunto set my hand, at Chester, Pa., on this 2nd day of January, 1909.

CLIFFORD AKELEY WOODBURY

Witnesse:

CHAS. G. WORRILOW,

WM. P. LEAS.