C. H. ALLISON.

DETONATOR.

APPLICATION FILED JULY 18, 1918.

1,306,510.

Patented June 10, 1919.

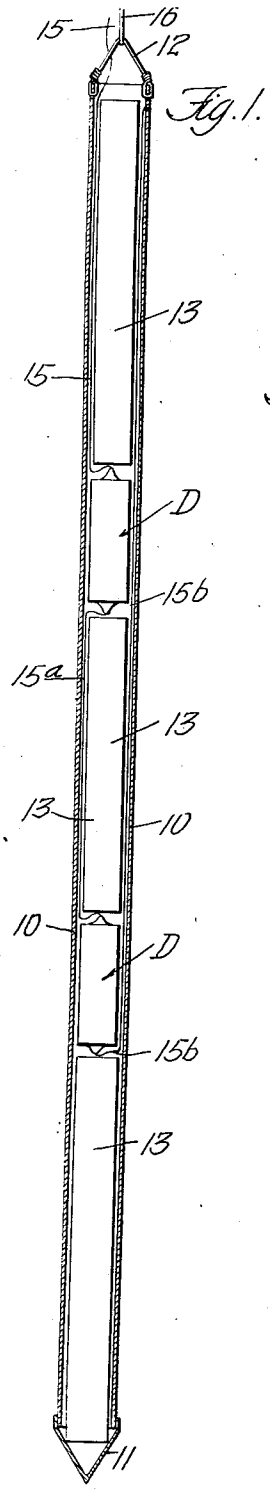


Fig. 1.

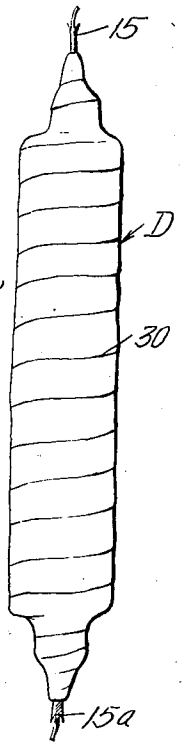


Fig. 2.

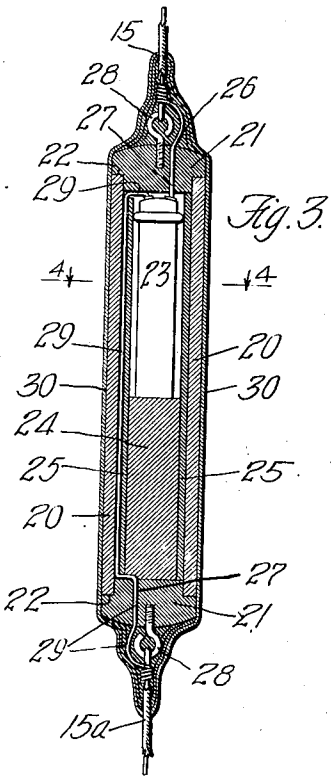


Fig. 3.

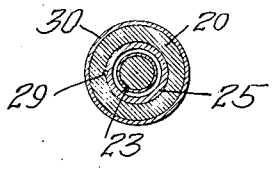


Fig. 4.

Inventor
Charles H. Allison
By James T. Barkley
His Atty.

UNITED STATES PATENT OFFICE.

CHARLES H. ALLISON, OF GLENDALE, CALIFORNIA.

DETONATOR.

1,306,510. Specification of Letters Patent. Patented June 10, 1919.

Application filed July 18, 1918. Serial No. 245,507.

To all whom it may concern:

Be it known that I, CHARLES H. ALLISON, a citizen of the United States, residing at Glendale, in the county of Los Angeles, State of California, have invented new and useful Improvements in Detonators, of which the following is a specification.

This invention relates to detonators adapted for work under great water pressure; and it is an object of this invention to provide a simple form of device for mechanically protecting a cap or detonator against water pressure, or any other heavy pressure; and at the same time to provide an organization in which detonation of the explosive charge is sure and efficient. This invention relates generally to the subject matter of deep water blasting; to which my following mentioned patents also relate:

No. 1,094,692, date April 28, 1914.
No. 1,163,965, date Dec. 14, 1015.
No. 1,215,329, date Feb. 13, 1917.
No. 1,239,247, date Sept. 4, 1917.

In Patent No. 1,163,965 of Dec. 14, 1915, I have described a protection which embodies an outer protective shell and a covering of plastic material around the cap or detonator; and in Patent No. 1,239,247 of Sept. 4, 1917, I have described a cylindrical protective shell which contains a cap or caps and the end of a detonator fuse. The present invention partakes somewhat of the nature of each of these previous inventions; but with the improvement that the present invention provides a means for effectively protecting the cap or detonator by the strength of a surrounding casing, rather than by any other primary means; and at the same time provides an organization that insures effective detonation of the charge. It is an object of the present invention to provide a casing or container which will thoroughly and effectively mechanically protect the cap or detonator against water pressure; to provide a container which is exceedingly strong and at the same time very simple in construction and easy of manufacture; to provide, in combination with such a container, a detonating organization which will give effective results; and to provide particularly an organization which may be placed in a very restricted space. In connection with this last mentioned object it may be here stated that it is very often desirable to make up a blasting charge capable of passing through a string of rotary drilling tools. For such purpose the tube holding the explosive charge must be as small as $1\frac{1}{4}''$ diameter and the protected detonator must be small enough to fit inside such a tube. I have in one of my former Patents, No. 1,215,329, described one means of protecting a cap in such a manner as to make the protected cap of small diameter; but the present means is in its essentials an entirely mechanical means which protects the cap by sheer strength. I shall now proceed to a detailed description of a preferred form of device embodying my present invention, reference for this purpose being had to the accompanying drawings, in which—

Figure 1 is a longitudinal section greatly reduced showing a blasting charge made up in typical form; Fig. 2 is an exterior elevation approximately of the normal size of the protected cap or detonator; Fig. 3 is a longitudinal central section of the same; and Fig. 4 is a cross-section on line 4—4 of Fig. 3.

In the drawings I show a tubular container at 10 which may be relatively long and slender, provided with a cap 11 on its lower end and a bail 12 of any suitable kind upon its upper end. Into this tubular container 10 the explosive charge is placed preferably in the form of sticks of gelatin as shown at 13. In a common form of device there may be first a stick of gelatin placed in the lower end of the container and then one of my protected detonators D; and then one or more gelatin sticks; then another detonator D with another stick of gelatin above it. This arrangement however may be varied at will. An igniting wire 15 extends down to the explosive charge, this wire running alongside the suspension cable 15 which is attached to bail 12. The igniting wire 15 extends down past the gelatin to the upper detonator D and thence the wire 15^a extends to the lower detonator D; and from the lower detonator D a wire 15^b may be grounded upon the tubular container 10. For convenience this ground may be made at the upper end of the container.

Each protected detonator embodies the parts and the organization now about to be described. I employ a tubular shell 20, something over $3''$ long and about $\frac{7}{8}''$ external diameter; and, for a certain size of interior detonating charge, $\frac{1}{2}''$ interior diameter. This shell is preferably of the material known as hard fiber. Such material

withstands excessively heavy external pressure, being very strong in compression. Its strength in tension may not be great enough to resist rupture when the contained charge is detonated; but the strength is sufficient to more or less effectively direct the explosion longitudinally of the shell to blow out the caps which close the ends. These caps are illustrated at 21 and they preferably are made with reduced portions which enter the ends of the shell 20 a short distance, so that there is a shoulder at 22 which bears against the end of the cylindrical shell. These caps are comparatively thick, and the shoulder 22 is of sufficient area (the same as the cross-sectional area of the relatively thick tubular shell 20) to give the caps a solid abutment against the ends of the shell so that excessive water pressure will not force the cap into the shell. The reduced portion projecting into the ends of the shell prevents displacement of the caps from their proper position. The caps are preferably of the same material as the shell.

Inside the container formed by the tubular shell 20 and cap 21 I place a detonating organization made up of an electric cap 23 and a charge of such an explosive as tri-nitro-toluene, as shown at 24. I preferably make up this organization by taking a piece of the detonating fuse known as cordeau, which comprises a leaden tube 25 containing tri-nitro-toluene, and I remove enough of the explosive from the end of the short length of cordeau to insert the electric cap 23 into one end of the lead tube. One wire from the cap, as shown at 26, passes out through a passage hole 27 in the adjacent closure cap 21. The lead wire 15 is brought down and mechanically connected to the detonator by winding around a screw-eye 28 screwed into the closure cap 21; and the wire 26 is then twisted into connection with the lead wire 15. The other wire 29 which leads from the electric cap is brought down alongside the lead tube 25, its insulation being removed so that the wire occupies a minimum space; and as the lead tube is very nearly as large as the bore of shell 20, more or less force must be applied to force the lead tube into the shell. This having been done, the wires 26 and 29 are then passed through the closure caps, and the closure caps put in place, a small amount of glue, shellac or the like, being used to make a tight joint and to help hold the closure cap against displacement. The wires having been connected in the manner described, the whole body is then taped with some suitable tape, either an ordinary insulating tape or a rubber tape; so that it is then covered with an exterior protective taping as shown at 30. This taping is extended over the closure caps and screw-eyes 28 and somewhat over the wires 15 and 15^a and the joints between these wires and wires 26 and 29. The whole may then be dipped in liquid asphalt or may be painted with a hydrocarbon paint. This covering has as its function as much the holding of caps 21 in place as it has the making of the device water-tight. The joints between the closure caps and the shell are essentially water-tight; and when exposed to heavy pressure these caps are pressed more closely and tightly against the ends of the shell.

The protected detonator is placed in the explosive charge in the manner indicated, being placed lengthwise of the tubular container 10. In such a position the closure caps 21 are directly against or near the adjacent gelatin sticks; so that the detonation of cap 23 and charge 24 is directed most forcibly directly onto the sticks of gelatin; the closure caps 21 blowing out readily when detonation takes place. The lead tube 25 may have an effect in aiding the direction of the explosion end-wise of the shell.

In order to protect holes 27 against the pressure, the taping may be made somewhat heavier around the caps and over their ends and around the wires, etc.; and a heavier impregnation of asphalt used. But the wires fit the holes 27 fairly tightly so that the taping cannot be forced down into the holes by external pressure; and, if desired, the wires may be surrounded by asphalt, etc., which may be applied to the wires when passed through the caps and which may be applied to the ends of the caps, around the wires, etc., before taping.

Having described a preferred form of my invention, I claim:

1. A blasting organization comprising an elongated container, an explosive charge in said container, and a detonator in said container and arranged longitudinally thereof, with one end adjacent the explosive charge, said detonator comprising a tubular shell capable of withstanding heavy external pressure, a cap seated upon and closing the end of the shell next the explosive charge, said cap being shouldered upon the shell and being of a strength to resist external pressure but relatively easily removable from the shell by internal pressure, and an explosive cap contained within the shell.

2. A blasting organization comprising an elongated container, charges of explosive material in said container, and a detonator placed between two adjacent charges and embodying a tubular shell placed longitudinally of the container with its ends adjacent the two adjacent explosive charges, caps for the ends of said shell of suitable strength and shouldered upon the shell ends to resist external pressure, the shell being also capable of resisting external pressure, and the caps being relatively easily removable from the shell by internal pressure, and an explosive cap contained within the shell.

3. A detonator, embodying a tubular shell of relatively great strength to resist internal and external pressure, a cap for the end of said shell, being shouldered upon the shell end and being relatively thick to withstand heavy external pressure but being relatively easily removable from the shell by internal pressure, and an explosive cap within the shell.

4. A detonator, embodying a tubular shell of relatively great strength to resist external pressure, caps for the ends of said shell, being shouldered upon the shell ends and being relatively thick to withstand heavy external pressure but being relatively easily removable from the shell by internal pressure, a detonating charge within one end of the shell and an explosive cap contained in the other end of the shell.

5. A detonator, embodying a tubular shell of relatively great strength to resist external pressure, caps for the ends of said shell, being shouldered upon the shell ends and being relatively thick to withstand heavy external pressure but being relatively easily removable from the shell by internal pressure, an explosive cap within the shell, and a taping for the exterior of the shell and caps to protect them and hold the caps to the shell.

6. A blasting organization embodying an explosive charge, a detonator lying in proximity to said charge with an end toward said charge, said detonator comprising a shell capable of withstanding heavy internal pressure, a capping means for the end of the shell adjacent the charge, said capping means being relatively freely removable from the shell by interior pressure, and an explosive cap contained within the shell.

7. In a detonator, a tubular shell of relatively great strength to resist internal pressure, a cap for the end of the shell relatively easily removable therefrom by internal pressure, a soft metal tube fitting the interior of the shell, and an explosive cap fitted in the soft metal tube.

8. In a detonator, a tubular shell of relatively great strength to resist internal pressure, a cap for the end of the shell relatively easily removable therefrom by internal pressure, a soft metal tube fitting the interior of the shell, and an explosive cap and an explosive within the tube in end to end relation.

9. In a detonator, a tubular shell of relatively great strength to resist internal pressure, a soft metal tube fitting within the shell as a lining, and an explosive cap within the tube.

10. In a detonator, a tubular shell of relatively great strength to resist internal pressure, a cap for the end of the shell relatively easily removable therefrom by internal pressure, a soft metal tube fitting the interior of the shell as a lining, said tube extending substantially the whole length of the interior of the shell and ending substantially against the cap, and an explosive cap within the tube.

11. In a detonator, a tubular shell of relatively great strength to resist pressure, a cap for the end of the shell relatively easily removable therefrom by internal pressure and set upon the shell to withstand relatively great external pressure, and an explosive cap contained within the shell.

In witness that I claim the foregoing I have hereunto subscribed my name this 10th day of July 1918.

CHARLES H. ALLISON.