Feb. 15, 1927. 1,617,675

A. DJIDICS

HIGH EXPLOSIVE DETONATOR

Filed June 7, 1926

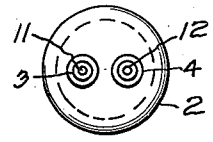


Fig. 1.

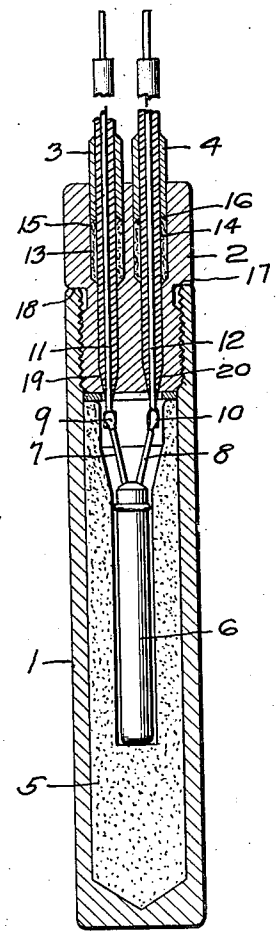


Fig. 2.

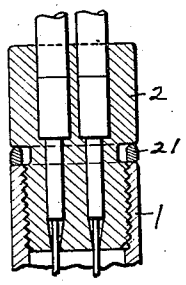


Fig. 3.

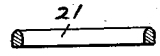


Fig. 4.

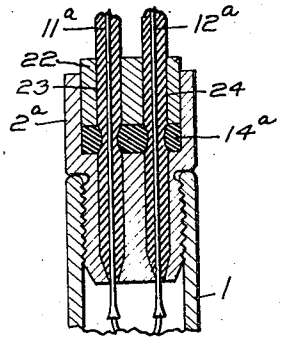


Fig. 5.

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UNITED STATES PATENT OFFICE.

ALEXANDER DJIDICS, OF TAMAQUA, PENNSYLVANIA, ASSIGNOR TO ATLAS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

HIGH-EXPLOSIVE DETONATOR.

Application filed June 7, 1926. Serial No. 114,183.

This invention relates to a device for firing explosives by electricity under extremely high pressures and has for its object to provide an improved device of the character of those known as oil well detonators. The device of the present invention is adapted to be used as a general purpose detonator for firing explosives under great depths of water, oil or the like, or other conditions where the pressure is very high.

Among the objects of the invention is to provide a device of the character indicated, characterized by simplicity in construction, economy in manufacture, and reliability in operation.

An important object is to provide, in a device of the character indicated, an assembly having great mechanical strength, thereby preventing injury to any part of the same while it is being transported or handled, previous to firing.

Further objects and advantages of the invention will be set forth in the detailed description which now follows.

In the accompanying drawings—

Fig. 1 is a plan view of the device of the present invention;

Fig. 2 is a central, transverse, sectional view showing the general method of assembly;

Fig. 3 is a transverse sectional view showing a modified form of joint;

Fig. 4 is a detail view of the ring of Fig. 3, and

Fig. 5 is a transverse sectional view showing a further modification of the invention.

Like numerals designate corresponding parts in both of the figures of the drawing.

Referring to the drawing and particularly to Figs. 1 and 2, it will be observed that the detonator of the present invention comprises, in the main, a shell, 1, a pressure proof plug 2 and packing sleeves 3 and 4. The shell 1, receives the explosive charge 5, said charge being highly compressed and preferably, though not necessarily, in the form of a hollow cylinder, to thereby leave a space within which an electric detonator 6 is adapted to lie. The lead wires 7 and 8 of the electric detonator are united by soldering or other suitable means, indicated at 9 and 10, to the flattened ends of the metallic conductors 11 and 12. These conductors are insulated, except at their ends, and are held in place in the plug 2 by highly compressed lead, or other soft metal, rubber, tar or pitch packings 13 and 14. The packings constituted by the bodies 13 and 14 are placed in suitable cavities indicated at 15 and 16 and forced into the position shown by applying pressure to the packing sleeves 3 and 4. These sleeves may be made of metal, fibre, phenol resin or any other suitable material. The capability of the rubber or soft metal or pitch to densely pack and conform to the shape of the cavities in the plug 2, coupled with the pressures applied to the packing sleeves in forcing them into place, results in the provision of a packing which will successfully resist the passage of water, oil or the like, under the very high pressures encountered in oil wells of great depth. The holes 19 and 20 in the plug 2, through which the wires extend into the shell cavity, are tapered at their ends in order that high external pressures will have a tendency to wedge the insulation into tight packing relation about the wires. While the insulation of the wires may be used as indicated I contemplate the employment of the tapered openings in conjunction with any kind of enlarged packing projection or protuberance on the lead in wires to effect a tight joint under the influence of external pressure. External pressure on the sleeves will also tend to force said sleeves more tightly into compressing engagement with the packing. The metallic conductors or lead wires 11 and 12 extend through the metal sleeves 3 and 4 a distance of approximately 3 feet from the outer ends of the sleeves and are bared and tinned at their outer ends for a distance of about 3 inches.

The pressure proof plug 2 is united with the shell 1 by means of a fine V thread. In practice I prefer to make the pressure plug of ordinary soft brass or of a metal similar to American soft brass which is used extensively in Europe and is there sold under the name of Messing. I form the shell from a medium hard brass or metal harder than the plug. This combination when assembled forms a seat similar to that of a hydraulic valve and an exceptionally tight and water proof joint, by reason of the fact that the flat shoulder 17 of the soft brass plug 2 is slightly indented by the mouth or upper rounded face 18 of the hard brass shell 1. I have found that a joint of this kind will stand extremely high hydrostatic pressures

without leaking, and when properly made requires approximately from five to seven times more pressure to loosen the joint than was required to tighten the same. While I have described the shell 1 as being of material harder than the plug 2 and while I prefer that arrangement, it is to be understood that the shell may be made of the softer material and the plug of the harder material, if desired. In Fig. 3 I have illustrated a modified form of joint embodying a ring 21 of a metal softer than either the plug 2 or the shell 1 so that when the plug is screwed into place the ring will be caused to conform closely to the surface of the plug and shell between which it is bound, to thereby form a fluid tight joint which will resist high pressures. In this case the plug and shell may be made of metals of the same degree of hardness, or both plug and shell may be made of the softer material and the ring may be made of a harder material.

In Fig. 5 I have illustrated a further modification wherein a single bushing 22 is provided with openings 23 and 24 for the passage of the insulated wires 11^a and 12^a. The bushing has a tight fit in the plug 2^a and the lower face of the bushing bears upon a packing body 14^a of lead, rubber, tar or the like, which, (under the compressing action of the bushing when it is pressed into place and under the further compressing action of high external pressures) is forced into tight engagement with the insulation of the wires. Any of the methods above described for effecting a tight joint between the shell and plug 2, may be resorted to, in connection with Fig. 5.

Having described my invention what I claim as new and desire to secure by Letters Patent of the United States is:

1. A device of the character described comprising a metallic casing of such strength as to resist high fluid or air pressure, a charge of high explosive therein of tubular formation, an electric blasting cap located within the tubular explosive charge, a closure having threaded engagement with the casing said closure being of a different degree of hardness than that from which the casing is made, insulated lead in wires passing through the closure and attached to the blasting cap and means provided in the closure for creating a fluid and air tight joint about the insulated lead in wires.

2. In a high pressure detonator, a closure having an opening for the passage of a lead wire insulated by a covering of soft material, said opening being taperingly constricted in its length, so that the insulation of the wire will have wedging engagement therein under the action of high external fluid pressures.

3. A structure as recited in claim 6 wherein said plug is provided with an opening for the passage of a lead wire, said opening being taperingly constricted at its lower end and a lead wire having a covering of soft insulating material passing through said opening said insulated material reaching to and engaging the constricted lower end of said opening so that the insulating material of the wire may have wedging engagement in said opening.

4. In a high pressure detonator, the combination with a detonator casing, a lead wire passing therethrough, a body of packing material about said lead wire, and a sleeve capable of endwise movement under external fluid pressures, surrounding said wire and bearing upon the packing to compress the latter about said wire.

5. In a high pressure detonator, a shell and plug, a pair of lead wires passing through said plug, packing engaging said wires and a bushing through which both of said wires pass, said bushing bearing upon said packing and having a fit in said plug permitting endwise compressing movement of the bushing with respect to the packing.

6. A detonator of the character described comprising a metallic casing of such strength as to resist high fluid pressure, a charge of high explosive therein, a closure plug consisting wholly of an outer portion and an inner portion of smaller diameter, the inner portion being threaded into said casing and the outer portion overhanging said casing and constituting a shoulder adapted to be brought forcibly into engagement with said casing by the act of screwing the plug into place, said casing and plug being made of materials of dissimilar degrees of hardness, so that as the plug is screwed into place, a rubbing action is exerted by the closure upon the upper end of the casing to deform the same and bring about a tight joint between the plug and casing, packing sleeves carried by and exposed to the action of external pressure at the upper end of said closure plug, the sleeves being capable of direct endwise movement under the influence of such external pressure to thereby compress the packing about lead wires passing through said plug.

In testimony whereof he affixes his signature.

ALEXANDER DJIDICS.