Nov. 18, 1924.

1,516,009

H. L. GRANT ET AL

ELECTRIC DETONATOR

Filed June 18, 1924

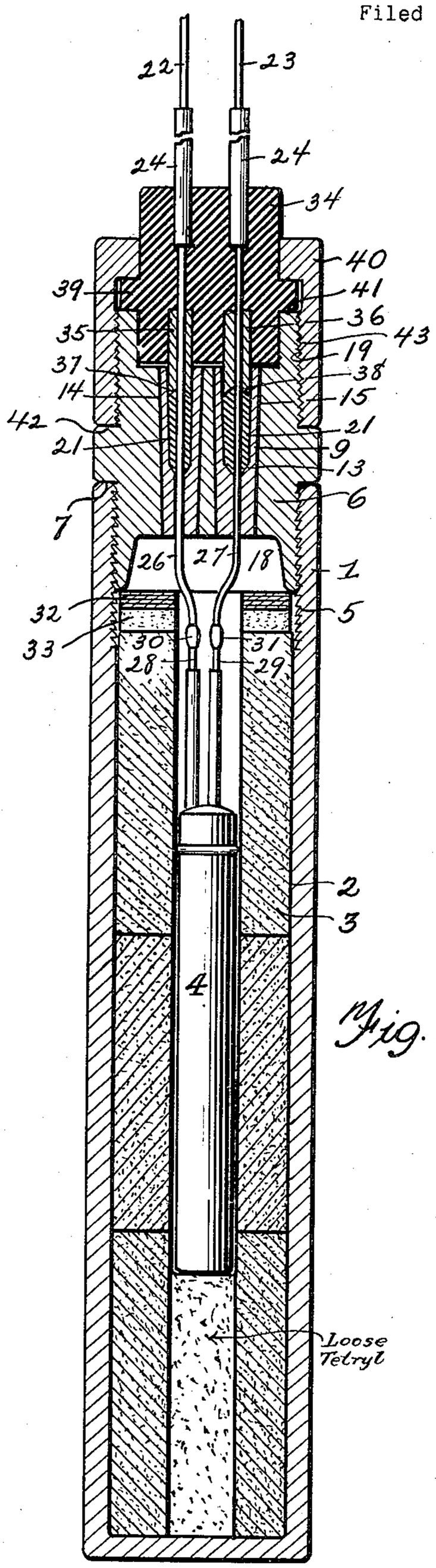

Fig. 1.

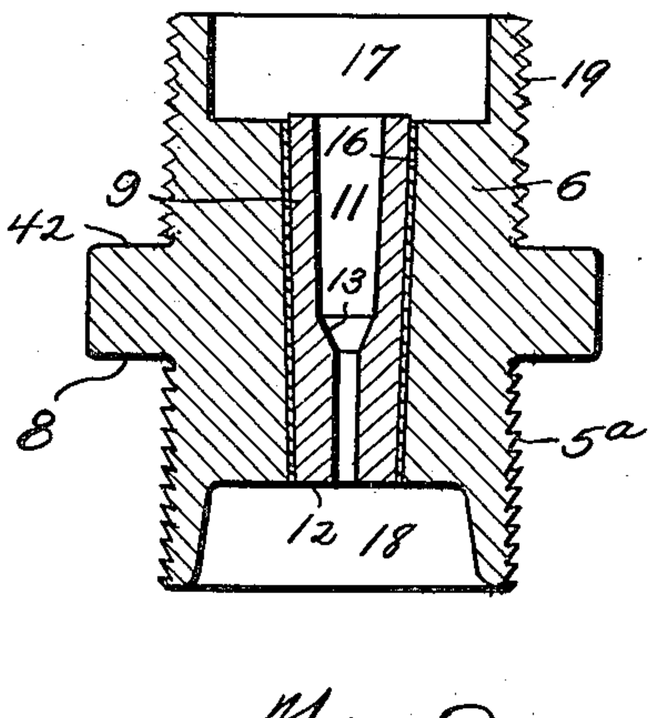

Fig. 2.

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UNITED STATES PATENT OFFICE.

HARRY L. GRANT AND ALEXANDER DJIDICS, OF TAMAQUA, PENNSYLVANIA, ASSIGNORS TO ATLAS POWDER COMPANY, OF WILMINGTON, DELAWARE, A CORPORATION OF DELAWARE.

ELECTRIC DETONATOR.

Application filed June 18, 1924. Serial No. 720,819.

To all whom it may concern:

Be it known that HARRY L. GRANT and ALEXANDER DJIDICS, citizens of the United States, residing at Tamaqua, in the county of Schuylkill and State of Pennsylvania, have invented certain new and useful Improvements in Electric Detonators of which the following is a specification.

This invention relates to an electric detonator for explosive charges and it has for its object to provide an improved device of this character constructed in such manner as to withstand the extremely high pressure encountered in present day wells, particularly oil wells.

The present day oil wells are drilled to such great depth that very high pressures exist at their bottoms. Frequently the explosive charge must be exploded in water or other liquid, which, at the bottom of its column, is under the maximum pressure existing in the well. It has been found difficult to construct detonators in such manner as to exclude the liquid when under very high pressure, such high pressure not only tending to crush the external casing of the detonator but also tending to force into said casing any closure or insulating elements, forming part of the detonator construction.

Among the objects of the invention is to provide a casing, within which an electrical fuse head, a priming element and an explosive charge are contained in such a manner as tc thereafter prevent their coming in contact with water, oil, gas, or any element under any pressure and particularly under extremely high pressure.

A further object of the invention is to provide, in a detonator of this character, a high pressure casing in which the wires leading to the fuse head are electrically insulated from each other and from the case and are made so as to be entirely waterproof by packing under high compression.

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

In the accompanying drawing:

Figure 1. is a longitudinal sectional view of a detonator constructed in accordance with the invention; and

Figure 2. is an enlarged sectional view of the pressure head and insulation.

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

In carrying out the invention we provide an electrical detonator consisting of an explosive charge and high pressure casing, comprising a body portion of cylindrical shape, indicated at 1, said body portion being of metal. This body is not of relatively thin stamped metal such as is commonly employed in devices of this character but upon the contrary is of relatively thick and heavy machined metal, such as heavy brass or the like, which is strong enough to withstand high pressure. The body 1 is formed with an internal cavity 2, which provides sufficient space for the explosive charge 3 and electric detonator 4. The hollow body 1 is provided with a special gripping thread 5 which permits the cap 6 to be tightly screwed into the body 1. The mouth of the body 1 is provided with a spherical surface 7 which fits tightly against the flat face of the cap 6, at 8, Fig. 2, forming a substantially flat type of joint which prevents the entrance of water, oil, gas or any other substances coming in contact with the casing under extremely high pressure. The thread 5^a on the cap 6 Fig. 2, is made on a 45° angle with the horizontal and on its top has a 1° recess, said angle extending downward from the horizontal. The cap 6 (see Fig. 2) contains two packing casings 9. These casings are hollowed out at 11 and have a cylindrical hole running through the entire length of said casings from the cavity 11, to the end 12, of such diameter as to permit the lead in wires of the fuse head to be inserted therein. These casings are beveled at 13 and in slight excess of the bevel on the packings, hereinafter described. Both casings are completely insulated from each other and from the body of the cap at 14 and 15, by means of a highly dielectric material 16, such as water-proof paper, wrapped around the tapered surfaces of the casings. The said casings are tightly forced into tapered holes in the body of the cap 6 and cavities 17 and 18 are formed at the ends of said cap. The cap 6 is provided with a standard thread 19 on which a retaining ring 40 is placed. Two lead packings 21 are placed in the cavities 11 of the casing. Lead in wires

22 and 23 are insulated at 24 by means of rubber tubing or slow burning insulation and at 26 and 27 by means of a highly dielectric enamel. The outer insulation is removed from the ends of the wires 22 and 23 for some distance and an insulating pressure cap, hereinafter described, holds them in a fixed position when they are inserted in the lead packings 21 and in the tapered casing 9 and allowed to extend down into the cavity of the main chamber 2. Fuse head wires 28 and 29, extending upward from electric detonator 4, are soldered to the wires 22 and 23, at 30 and 31. Dielectric washers 32 and 33 are placed at the top of the explosive charge 3 and act as retaining spacers. The insulating pressure cap 34 is made of a highly dielectric material and has two metal cylinders 35 and 36, having beveled mouths 37 and 38, projecting downwardly therefrom. The pressure cap 34 is slipped down on the wires, 22 and 23 until the cylinders 35 and 36 are seated on the lead packings 20 and 21. The metallic retaining ring 40 is then slipped over the ends of the wires 22 and 23 and down on to the shoulder 39 of the insulating pressure cap 34, which in turn forces the lower face of the shoulder against the flat face 41 of the cap 6 thereby forming a water tight joint at that point. The retaining ring 40 extends down to the flat face 42 of the cap 6, also forming a water tight joint, at that point. The retaining ring 40 is provided with a standard 60° thread at 43 to engage with the thread 19 of cap 6 Fig. 2. The entire assembly is made with a smooth cylindrical surface 44.

It is to be understood that the invention is not limited to the precise construction set forth, but that it includes within its purview whatever changes come within either the terms or the spirit of the appended claims.

Having described the invention what is claimed is:

1. A device of the character described comprising a metallic casing of such strength as to resist high pressure, a charge of high explosive therein of tubular formation, an electric blasting cap located within the tubular explosive charge, a closure for the casing, lead in wires passing through the closure and attached to the blasting cap and means carried by the closure for creating a fluid-tight joint about said lead in wires.

2. A device of the character described comprising a casing of such strength as to resist high external pressure, a high explosive charge located therein, said charge being in the form of a plurality of superimposed tubular elements, an electric blasting cap located within the tubular elements, a closure for the casing, lead in wires passing through the closure and means carried by the closure for effecting a fluid-tight joint about said wires.

3. The combination of a casing of such strength as to resist high external pressure of a cap screwed into the upper end thereof, an explosive charge therein, and exploding means for said charge, lead in wires for the exploding means passing through said cap, a pressure head through which said wires pass, means for moving said pressure head axially of the cap, and nonrotatively with respect thereto and means acted upon by said pressure head for forming a fluid pressure tight joint about the lead in wires upon such axial movement of the pressure head.

4. The combination with a casing of such strength as to resist high external pressure, an explosive charge therein, a blasting cap therein, lead in wires for the blasting cap, a cap threaded into the upper end of the casing through which said lead in wires pass, means for insulating said lead in wires from the said cap, a compression ring, a pressure head of insulating material engaged by said ring and movably axially of the cap under the influence of said ring, and members carried by the cap through which said wires pass, such members being insulated from the cap and having recesses with tapered bottoms formed therein, soft metal packing elements seated in said recesses and tubes carried by the pressure head through which the wires pass, said tubes having beveled lower ends to engage the packing members, when the pressure head is moved axially under the influence of the ring.

5. A structure as recited in claim 4 wherein the pressure cap is provided with an external flange the lower face of which engages the upper end of the case, and the upper face of which engages the lower end of the retaining ring when the parts are in assembled relation.

6. A structure as recited in claim 4 wherein the cap and body are provided with threads so shaped and related to each other as to create a water-tight joint when the cap is screwed into the casing.

In testimony whereof they affix their signatures in the presence of two witnesses.

HARRY L. GRANT.
ALEXANDER DJIDICS.

Witnesses:
F. R. BEARD,
HARRY C. LINKER.