April 13, 1948. W. R. ATWOOD 2,439,643

GUN PERFORATOR

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Fig. 1.

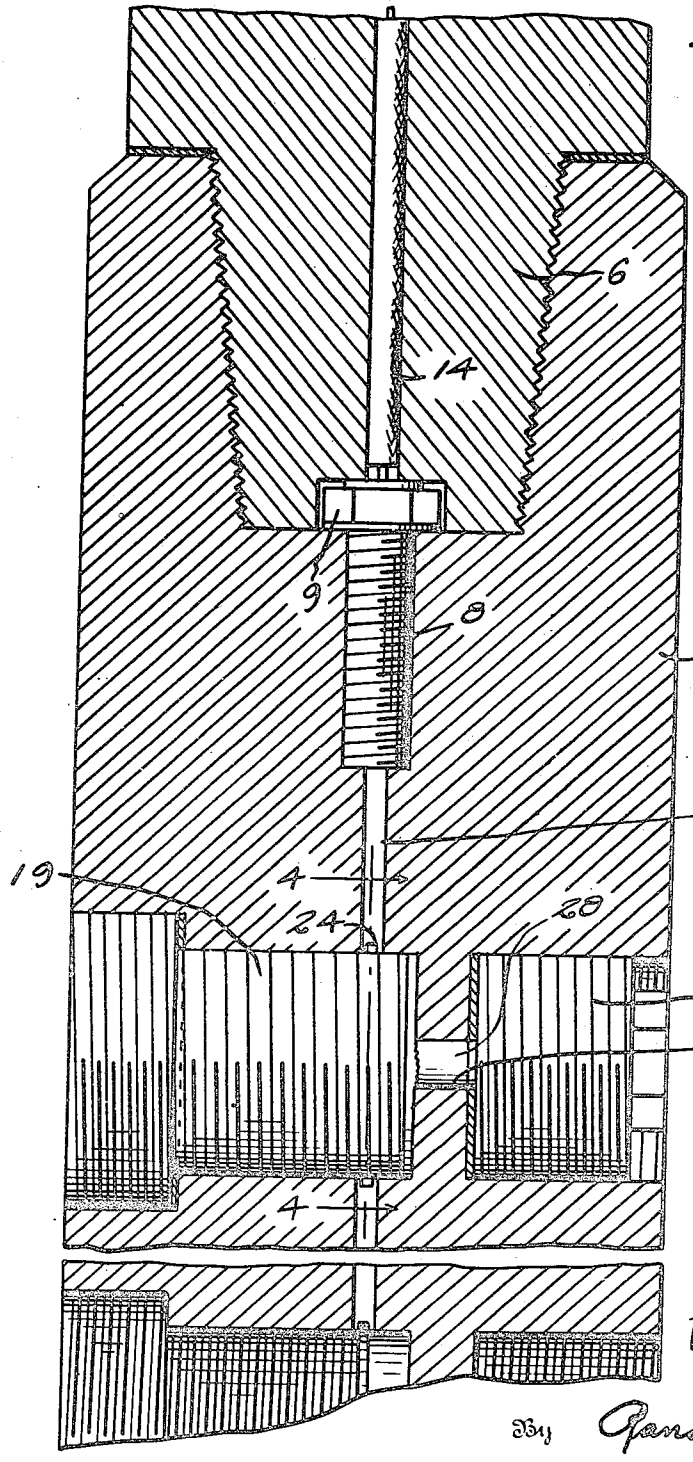
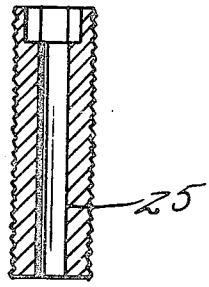


Fig. 5.



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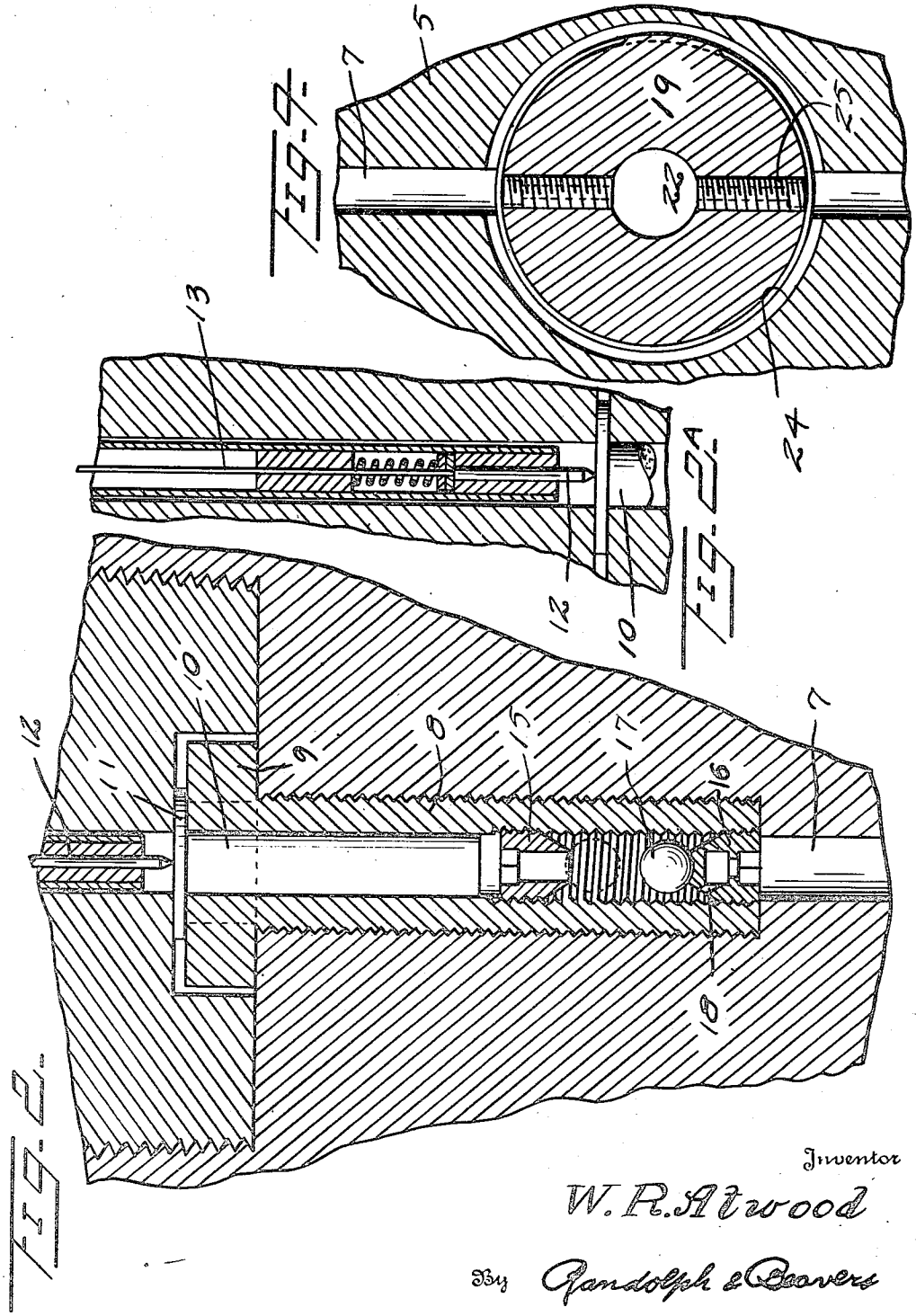


FIG. 1.

FIG. 2A.

FIG. 2.

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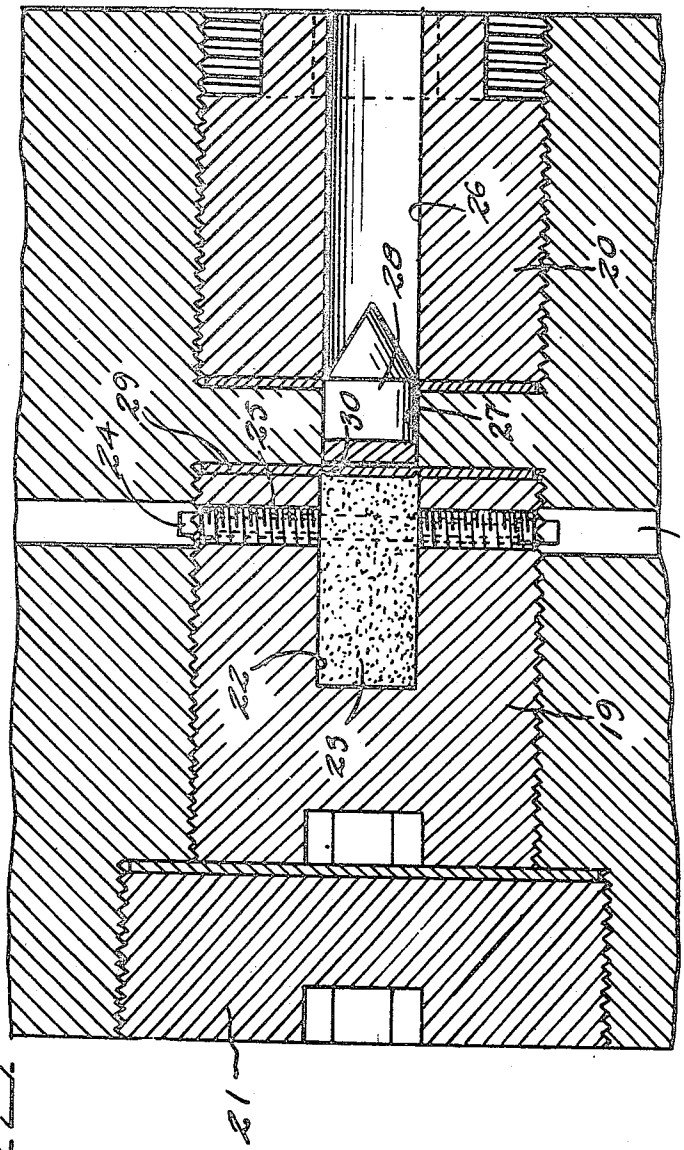


Fig. 3

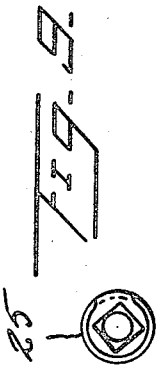


Fig. 5

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Fig. 6.

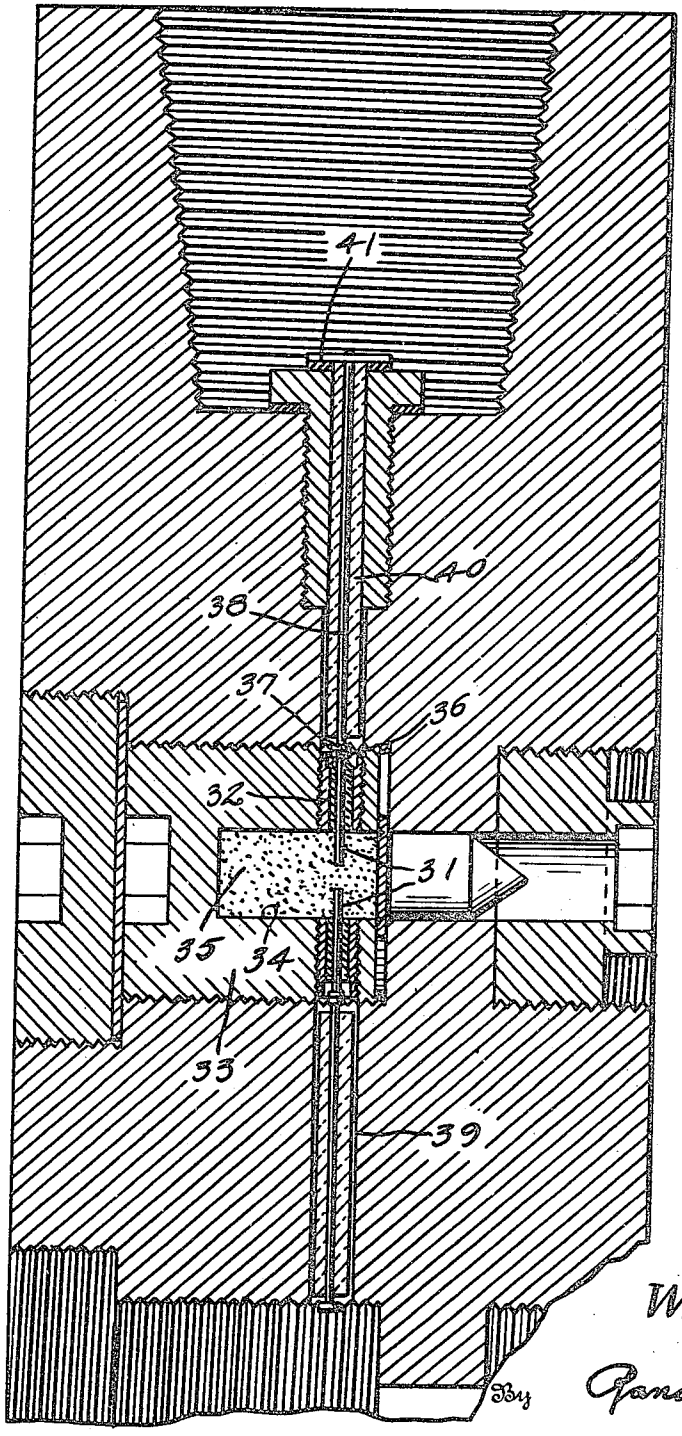


Fig. 7.

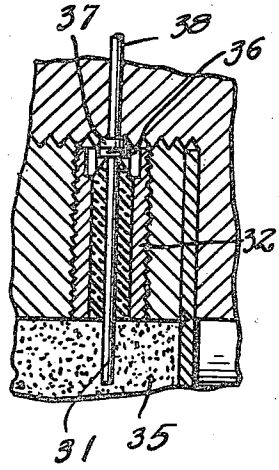


Fig. 8.



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GUN PERFORATOR

Wilmerth R. Atwood, Odessa, Tex.

Application September 6, 1945, Serial No. 614,756

3 Claims. (Cl. 164—0.5)

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My present invention relates to new and useful improvements in gun perforators for oil wells and the like whereby to facilitate the extraction of oil from different strata.

An important object of the present invention is to generally improve perforator guns of this type and to provide simplified means for operating the same, thereby reducing the initial cost of the gun, as well as the cost of operation in actual practice.

A further object of the invention is to provide electric firing means for the bullets discharged from the gun and also to prevent the explosion of the powder in the gun perforator from kicking back and causing damage to the electric mechanism for firing the cap of the gun.

Another object of the invention is to provide firing means for the bullets at longitudinally spaced intervals of the gun and including a vertical passage in the gun to subject a firing charge for each of the bullets to the action of a firing cap to simultaneously fire the bullets.

A still further object of the invention is to provide an apparatus of this character of simple and practical construction, which is efficient and reliable in operation, relatively inexpensive to manufacture and otherwise well adapted for the purposes for which the same is intended.

Other objects and advantages reside in the details of construction and operation as more fully hereinafter described and claimed, reference being had to the accompanying drawings forming part hereof, wherein like numerals refer to like parts throughout, and in which:

Figure 1 is a fragmentary vertical sectional view of the gun showing the longitudinally spaced barrel for firing the bullets and the firing cap in the upper portion of the gun oppositely connected thereto.

Figure 2 is an enlarged fragmentary vertical sectional view of the plug for the firing cap and the kickback check for the exposed charge.

Figure 2a is a fragmentary vertical sectional view of the firing pin for the firing cap.

Figure 3 is a longitudinal sectional view of one of the barrels and the plug for holding the firing charge for the bullet.

Figure 4 is a fragmentary sectional view taken substantially on a line 4—4 of Figure 1.

Figure 5 is an enlarged longitudinal sectional view of one of the firing tubes communicating with the explosive charge for the bullet.

Figure 6 is a fragmentary longitudinal sectional view of the gun perforator illustrating a modified form of electric firing device.

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Figure 7 is an enlarged fragmentary vertical sectional view of the contact for one of the electrodes for the explosive charge.

Figure 8 is an end elevational view of the holder for the electrode, and

Figure 9 is an end elevational view of the tube providing communication between the firing cap and the explosive charge.

Referring now to the drawings in detail and first with respect to the form of the invention illustrated in Figures 1 to 5 inclusive, the numeral 5 designates the body of the gun generally, which is of general solid cylindrical form, having an electric wire rope socket 6 threaded in its upper end and to which an electric wire rope socket and electric wire line or cable (not shown) or the like, may be attached for lowering the gun in the well casing.

The body 5 is a formed with a longitudinally extending passage 7 in the upper end of which a tube 8 is threaded having a hexagonal head 9 at its upper end for receiving a wrench to thread the tube in the body.

A firing cap 10 is mounted in the upper end of the tube 8 having a flange 11 at its upper end to support the cap in position in the tube. A firing pin 12 is connected to an electric wire 13 extending upwardly through a bore 14 in the plug 6 to a suitable mechanism for actuating the pin 12 to fire the cap 10.

The lower portion of the tube 8 is internally threaded for receiving upper and lower threaded plugs 15 and 16 respectively, the plugs being arranged in vertically spaced relation in the tube 8 and the opposed end of the lower plug 16 is adapted to be closed by a ball-check 17 normally seated on the upper end of the plug 16 and responsive to back pressure resulting from the firing of the gun to move the ball upwardly into position for closing the plug 15 as shown by the dotted line in Figure 2 of the drawings.

The lower plug 16 is formed with inclined ports 18 below the ball 17 to provide free communication through the tube 8 from the firing cap to the passage 7 below the tube.

The body 5 at vertically spaced intervals is provided with plugs 19 and 20 threaded in diametrically opposite sides of the body. The outer end of the plug 19 is retained in position by a sealing plug 21 threaded in the body and the inner end of the plug 19 is formed with a chamber 22 adapted to contain an explosive charge 23.

The body 5 is formed with an annular channel 24 surrounding the inner end of the plug 19 and

mmunicating with the vertical passage 7 in the dy.

A pair of tubes 25 are threaded in the plug 19 diametrically opposite sides to provide communication between the chamber 22 and the annel 24 both above and below the plug.

The plug 20 is formed with a bore 26 forming barrel which extends entirely through the plug d opens at one side of the body 5. A chamber is formed in the body 5 in communication with e barrel 26 in which a bullet 28 is retained by a ft metal disc 29 soldered or otherwise suitably sered to the rear end of the bullet 28, the disc 29 ing positioned at the inner end of the plug . The disc 29 is of soft metal and is formed its rear face with a circular score line 30 of a ameter corresponding to the diameter of the llet 28 and in alignment with the side edges ereof as indicated in Figure 3 of the drawings, e center of the disc 29 defined by the score line rming a plug closing the adjacent end of the amber 22.

In the operation of the device the gun is lowered the well casing to a desired depth after the lugs 19, 20 and 21 have been placed in position d plugs 19 and 20 loaded with a firing charge and bullet 28, respectively, in the manner as lustrated in Figure 3 of the drawings. The ring pin 12 is then actuated to fire the cap 10 d by means of which the charge 23 is fired by ay of the communicating passage 7, the annular annel 24 and the tubes 25 carried by the plug 19.

The annular channel 24 provides a by-path for ach of the plugs 19 whereby all of the charges rried at vertically spaced intervals by the body are simultaneously fired.

The firing of the charge 23 removes the center f the disc 29 attached to the bullet 28 at the core line 30 and projects the bullet 28 from the arrel 26 in a manner to perforate the casing in hich the gun is lowered.

In Figures 6 to 9 inclusive, I have illustrated modified form of electric firing mechanism hich includes a pair of electrodes 31 secured in he tubes 32 threaded in diametrically opposite ides of the plug 33, the adjacent ends of the lectrodes 31 being spaced apart in the chamber 4 for the firing charge 35 whereby to provide a park gap for firing the charge. The outer ends f the electrodes 31 are formed with contact heads 6 adapted for engagement with similar contact eads 37 on the ends of an electric wire 38 exending longitudinally through the passage 39 f the body of the gun. The electric wires 38 are losed in an insulation housing 40.

The upper end of the wire 38 at the upper end f the body of the gun is also formed with a conact head 41 to provide contact for a circuit wire arried by the electric wire rope socket (not hown) adapted for threading in the upper end f the body for leading upwardly through the lectric wire rope socket and electric wire line or able.

Accordingly an electric current passing through he wires 38 will cause a spark between the elecrodes 31 whereby to fire the charge 35 for propeling the bullet in the manner as heretofore explained.

It is believed that the details of construction, manner of operation and advantages of the device will be readily understood from the foregoing without further detailed explanation.

However it will be apparent that various changes in the construction and arrangement of the parts may be resorted to without departing from the spirit of the invention or the scope of the appended claims.

Having described my invention what I claim is:

1. A gun perforator comprising a body having a vertical passage, a pair of plugs threaded in diametrically opposite sides of the body, one of said plugs having a bore forming a barrel, a lateral passage between the inner ends of the plugs adapted to receive a bullet positioned at the inner end of the barrel, the other of said plugs having a powder chamber disposed transversely of the body and intersecting said vertical passage, a soft metal disk closing the inner end of the chamber and having a severable section attached to the rear end of the bullet to retain the bullet in the barrel, said disk forming a closure between the powder chamber and lateral passage, a vertical passage in the last named plug providing communication between the powder chamber and the vertical first named passage, and means operable from a remote part of the vertical passage to fire a charge in the powder chamber.

2. In a gun perforator, a body of substantially circular cross section adapted to be lowered into a well casing and formed of sections, one of said sections having an upwardly opening internally threaded socket adapted to receive a threaded extension of a section, disposed thereabove, said section being provided with a flash passage extending longitudinally thereof, said first mentioned body section being provided with a plurality of bores extending diametrically therethrough and each having enlarged ends and a restricted portion connecting said enlarged ends, said restricted bore portions each forming a chamber, a projectile mounted in each of said chambers, each of said bores having one of its enlarged ends provided with a detachably mounted barrel having a bore aligning with the chamber thereof, a plug detachably mounted in the opposite enlarged end of each bore and intersecting the flash passage thereof, said plugs each having a chamber containing an explosive formed therein and disposed longitudinally of the bore, a frangible closure between each explosive chamber and its associated projectile chamber, said frangible closure being connected to the associated projectile thereof, and said plugs each having diametrical passages communicating at their outer ends with the flash passage and opening into the explosive chamber whereby a detonating flame may pass through the flash passage and the diametrical passages of the plugs for igniting the explosive charges of each of the chambers substantially simultaneously.

3. In a gun perforator, a body adapted to be lowered into a well casing and having a transverse bore extending therethrough provided with enlarged ends and a restricted portion connecting said ends, said restricted portion forming a chamber and being adapted to receive a projectile, a barrel detachably mounted in one of said enlarged ends and having a bore aligning with said chamber and forming a barrel for the projectile, a plug detachably mounted in the other end of said transverse bore and provided with a chamber containing an explosive charge, said explosive chamber opening toward the projectile chamber, a frangible closure between said chambers connected to the projectile, an electrical conductor extending longitudinally through said body and having one end adapted to be connected to a source of electric current and the other end adapted to be connected to a ground, said conductor having spaced portions disposed

in the last mentioned end of said transverse bore, and a pair of electrodes mounted in said plug and having spaced, adjacent ends disposed in the explosive chamber and opposite, remote ends disposed in electrical contact with spaced ends of the electrical conductor, whereby a spark will be caused to jump between said electrodes when a current is passed through the electrical conductor, for detonating the explosive charge.

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